Observations on aneurism, selected from the works of the principal writers on that disease from the earliest periods to the close of the last century / translated and edited by J.E. Erichsen.

Contributors

Sydenham Society.
Erichsen, John Eric, 1818-1896
Royal College of Physicians of London

Publication/Creation

London : Sydenham Society, 1844.

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OBSERVATIONS

ON

ANEURISM

SELECTED FROM THE

WORKS OF THE PRINCIPAL WRITERS ON THAT DISEASE

FROM THE

EARLIEST PERIODS TO THE CLOSE OF THE LAST CENTURY.

TRANSLATED AND EDITED BY

JOHN E. ERICHSEN

LECTURER ON GENERAL ANATOMY AND PHYSIOLOGY AT THE
WESTMINSTER HOSPITAL.

LONDON

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PREFACE.

The Council of the Sydenham Society having done me the honour to intrust me with the editing of a volume to consist of selections from the more important 'Scriptores Minores,' on Aneurism, together with Extracts from those systematic works that contain observations of peculiar interest and originality on this subject, not to be found in detached Memoirs, I am unwilling to let it go forth without giving some explanation of the reasons which have influenced the selections that have been made, and making a few remarks on the arrangement that has been adopted in it.

In making a selection from the very numerous Memoirs that have, at various times, been published on the Pathology and Treatment of Aneurism, I have endeavoured, as far as possible, to be guided by the fact of the Essay under consideration, containing either the original indication, or the fullest and most accurate account of an advance in the Pathology, or an alteration or improvement in the Treatment, of the disease; and I think that it will be found, on a closer examination of this volume, that each one has been chosen in accordance with this principle. The same rule has been strictly attended to in making the Extracts from the works of the more systematic

writers; those portions merely having been selected that contain the original views of the author, or that are necessary for a complete and continuous history of the subject.

The Memoirs and Extracts that have been selected have been translated or reprinted without any comment or annotation, a precise reference being given to the title, date, and page of the edition that has been consulted; in addition to which a reference to the date of the first edition of the work (if there have been more than one) is appended in the margin.

Those selections that were originally published in the English language have been reprinted with the utmost attention to accuracy, the proofs having been carefully compared with the originals; they will, therefore, it is hoped, be found to be free from errors.

In rendering the very barbarous Latin of several of the German and Italian writers on Aneurism into English, I have had a somewhat difficult task to perform; but I trust that it will be found that I have succeeded in giving the correct meaning of the very complicated sentences of some of these writers, though this may occasionally have been accomplished at the expense of the style.

The Extracts from systematic works commence with those from the writings of Galen, and the first Memoir that has been selected bears the date of 1681. The two or three monographs that were published on Aneurism before this period consist merely of compilations from, or of criticisms on the opinions of the older writers, and consequently contain but little worthy of republication; all the information that was possessed on the subject of Aneurism, as on most others, before the close of the 17th century, being contained in systematic works.

The selections have not been brought down any later than the close of the last century, as it was thought that most works of any importance that have appeared since then would probably be either in the possession, or within the reach of the greater number of the members of the Society; and, moreover, that it was desirable to avoid the invidious and delicate task of making extracts from or of reprinting the works of living authors. It likewise appeared to be more in accordance with the objects of the Society to confine the selections to the older and scarcer works.

The Bibliography contains a reference to all Memoirs and detached Essays of any value that have been published on the subject of Aneurism within the period to which the work is confined. Those detached Cases also that are of more than usual interest have been included in it. In order to prevent its being made unnecessarily extensive, those systematic works only have been referred to that contain views of more than ordinary interest or importance. An abstract of the contents of those memoirs or papers that have not been reproduced in the body of the work, is appended for convenience of reference.

The following is the arrangement that has been adopted in this work. The volume has been divided into three parts: the First containing those Memoirs and Extracts that relate more particularly to the Symptoms, Causes, and Pathology of Aneurism;—the Second, those that refer to the Treatment of this disease; the materials of each of these parts being arranged chronologically;—whilst the Third Part consists of the Bibliography. In this way it was hoped (as the selections are for the most part of such a character as to admit

of this arrangement) that the work would be rendered more readily available for the purposes of reference than if the materials of which it is composed were merely put in chronological order, without attention to their nature and character. This plan has the additional recommendation of rendering the history of each part complete in itself.

I cannot conclude without expressing my sincere acknowledgments to Mr. B. Phillips, as well as to Mr. Dalrymple and Mr. Fergusson, for the very valuable advice with which, as members of the Council of the Society, they have favoured me in the execution of my task.

J. E. E.

London: *Nov.* 1844.

CONTENTS.

PART I.—SYMPTOMS, PATHOLOGY, AND CAUSES.

		PAGE
2d Cent.	Galen	3
6th Cent.	Aëtius	4
1542.	Fernelius	ib.
1564.	J. Gorræus	5
1582.	A. Paré	6
1594.	J. Guillemeau	8
1628.	Sennertus	9
1633.	F. Hildanus	11
1676.	R. Wiseman	ib.
1728.	J. M. Lancisi—De Aneurysmatibus Opus Posthumum	14
1733.	A. Monro—Remarks on the Coats of Arteries, their Diseases, and particularly on the formation of an Aneurism	81
1736.	Petit—Observations Anatomiques et Pathologiques au sujet de la Tumeur qu'on nomme Anévrysme	89
1749.	A. Haller—De Aortæ Venæque Cavæ gravioribus quibusdam Morbis	98

PAGE

1757. W. Hunter—The History of an Aneurism of the Aorta, with remarks on Aneurisms in general 101

1760. D. Monro—Cases of Aneurisms, with remarks . . . 115

1761. W. Hunter—Further Observations upon a particular species of Aneurism 160

1769. W. White—Two Letters on the Varicose Aneurism . . 171

1770. T. Armiger—A Letter on the Varicose Aneurism . . 173

1770. W. Hunter—A Postscript to the preceding . . . 174

1789. M. Baillie—Of uncommon Appearances of Disease in the Blood-vessels 175

PART II.—TREATMENT.

6th Cent. Aëtius 183

7th Cent. Paulus Ægineta 184

1582. A. Paré 185

1594. J. Guillemeau 186

1643. M. A. Severinus 188

1676. R. Wiseman 194

1681. Morel—Observations sur la Cure des Anévrismes . . . 203

1681. Royer—Lettre à Mons. l'Abbé Bourdelot, &c. &c. . . 204

1681. Bourdelot—Lettre de l'Abbé Bourdelot, &c. . . . 207

1688. Saviard—Sur un Anévrysme de l'Artère crurale . . 213

1714. D. Anel—Suite d'un Mémoire, &c. . . . 216

1728. J. M. Lancisi—De Aneurysmatibus Opus Posthumum . . 224

1733. J. Macgill—A History of the Operation for an Aneurism of the Arm 225

1733. A. Monro—Reflections on the Aneurism occasioned by bloodletting 230

PAGE

1744. L. Heister—De Genuum Structurâ eorumque Morbis . . 232

1745. Mollinelli—De Brachii Aneurysmate e læsâ in mittendo Sanguine Arteriâ 234

1748. H. F. Albertini—Animadversiones super quibusdam difficilis Respirationis Vitiis 237

1753. Foubert—Mémoire sur différentes espèces d'Anévrisme faux . 242

1753. Morand—Sur un Moyen d'arrêter le Sang des Artères sans le secours de la ligature 250

1761. J. B. Morgagni 261

1761. Lambert—Extract of a Letter to Dr. W. Hunter, giving an account of a new method of treating an Aneurism . . . 264

1765. J. Burchall—An Aneurism of the thigh perfectly cured by the operation, and the use of the limb preserved . . . 266

1772. C. Guattani—De Externis Aneurysmatibus manu chirurgicâ methodice pertractandis. Historiæ duæ Aneurysmatum, &c. . 268

1773. W. Bromfield—Surgical Observations, &c. . . . 347

1774. C. Leslie—An Account of the operation for the Aneurism being performed upon the femoral artery with success . . 348

1779. P. Pott—Remarks on the necessity, &c. of Amputation in certain cases 351

1779. B. Wilmer—An Aneurism of the popliteal artery, with some remarks on Aneurism in general 354

1781. A. Murray—In Aneurysmata Femoris Observationes, &c. . . 359

1786. E. Home—An Account of Mr. Hunter's method of performing the operation for the Popliteal Aneurism . . . 373

1787. Supplement to the Account, &c. 381

1793. An Account of Mr. Hunter's method of performing the operation for the cure of Popliteal Aneurism . . . 385

1796. Desault 402

1797. J. F. L. Deschamps—Observations sur la Ligature des principales Artères des Extrémités, à la suite de leurs Blessures, et dans les Anévrismes, particulièrement dans celui de l'Artère poplitée, &c. . 404

PAGE

1797. Guèrin—Rapport des Commissaires nommés par la Société de Santé de Bourdeaux pour l'examen d'un Mémoire sur l'Anévrisme 467

1799. B. Lacoste—Rapport des Mémoires et Observations du Cit. B. Lacoste, &c. sur un Anévrisme vrai à la partie supérieure de l'Artère fémorale gauche, par le Cit. Deschamps . . . 479

1799. J. F. L. Deschamps—Observations et Reflexions sur un Anévrisme vrai de la partie supérieure de l'Artère fémorale . . . 481

PART III.

Bibliography 495

Index 519

PART I.

SYMPTOMS, PATHOLOGY, AND CAUSES.

SELECTIONS ON ANEURISM.

PART I.

SYMPTOMS, PATHOLOGY, AND CAUSES.

GALEN.[1]

Second Century.

When an artery is opened, the disease that occurs is called an aneurism. It happens in consequence of the skin in the neighbourhood of a wounded artery cicatrizing, whilst an ulcer remains in the vessel, which neither becomes agglutinated nor cicatrized, nor filled up with flesh. Diseases of this description are known by their pulsating, and by their disappearing entirely when pressed upon; the contents of the tumour, which we have elsewhere shown to be a thin and bright blood mixed with much subtile spirit, warmer than that contained in the veins, passing back into the artery. If an aneurism be wounded, the blood is spouted out with so much violence that it can scarcely be arrested. In œdema the part yields to the finger when pressed upon, forming a pit; but there is no pulsation in that disease, and its colour is pale. Œdema likewise is much more widely diffused than an aneurism, unless when any grumous blood is formed in the latter, giving rise to sphacelus.

An aneurism is a dilatation or relaxation of a venous vessel, or a dispersion of the spirituous matter under the flesh, where it diffuses and distributes itself by jerks (per dissultationem.)[2]

[1] Claudii Galeni Opera omnia, tom. viii, fol., Venet. ap. Juntas, 1609. Vol. v, p. 84, De Tumoribus præter Naturam, cap. 11, De Aneurysmate et Sydratione.

[2] Op. cit. vol. i, p. 48. Ascriptæ Finitiones Medicæ Isagoge. See also Method. Medendi, cap. 5, and De Curandi Ratione per Sanguinis Missionem.

AËTIUS.[1]

ON DILATATION OF THE VESSELS.

Sixth Century. A dilatation of the vessels, which the Greeks call an aneurism, may occur in any part of the body, but is most frequently met with in the throat, where it gives rise to a tumour that goes by the name of bronchocele. It very commonly happens to women during parturition, on account of the forcible detention of the spirits. But it may occur in the head, in the situation of the arteries, and also in any other part of the body; as when unskilful surgeons, in opening a vein at the bend of the arm, puncture the artery that lies beneath. But a dilatation of the vessels may occur in any situation in which the blood and spirits flow out of the arteries; or if the mouths of these be opened or burst; the blood and spirits being then gradually poured forth, collect under the skin. The signs of an aneurism are a tumour, which may be large or small, without discoloration of the skin or pain, soft to the touch, having a loose spongy feel, and yielding in such a way to the pressure of the fingers that it almost disappears, but returning again on the fingers being removed, which is very evident in those aneurisms that have arisen without a wound; but when it has been preceded by a wound of the artery, and the skin then uniting, a dilatation of the vessels has occurred, the tumour is not equally soft: for the blood being in larger quantity than the spirits, coagulates, and thus distends the tumour. And these are the signs of an aneurism.

FERNELIUS.[2]

1542. An aneurism is the dilatation of an artery full of spirituous blood. It sometimes occurs externally, as in the hands and

[1] Aëtii, Contractæ ex Veteribus Tetrabiblos; fol. Basiliæ, 1542. Sermo 3, cap. x, De Vasorum Dilatatione.

[2] Joan. Fernelii de Morbis universalibus et particularibus; 8vo, Lugduni Batavorum, 1645.

feet, or about the throat and chest; differing in this respect from a varix, that it is large, swollen, and has often an annoying pulsation. On the tumour being pressed upon, the matter contained within it disappears. It also sometimes occurs in the internal arteries, especially in the chest, or about the spleen and mesentery, where a violent throbbing is frequently observable. 1542.

It is scarcely credible that some imagine that in these affections the vein or artery is ruptured or opened; for if the blood had escaped from the vein or artery, it would soon putrefy, and give rise to a tumour of a different kind.

GORRÆUS.[1]

An aneurism is a tumour, soft to the touch, yielding to the pressure of the fingers, and occasioned by blood or spirits poured out from an artery or vein. The blood may be effused in two ways: from an internal cause, the vessel being opened by anastomosis; and from an external one, the vessel being ruptured, whilst the skin remains sound. It occurs in the throat (where it is called bronchocele), in the chest, and in the groins or limbs, either from a powerful compression or an increased movement of the spirit, in consequence of which, the vessels being distended, give way; or from the vessel being divided with the superficial skin, whether accidentally or by the unskilfulness of a surgeon in bloodletting when he punctures an artery instead of a vein. For if, before the artery is healed, or cicatrized, or filled up with flesh, the integument has united, the formation of an aneurism cannot be prevented; for the blood and spirit being gradually poured forth, collect under the skin, and give rise sometimes to a large, at other times to a small tumour, according to the size of the part in which it happens, but of the same colour as the rest of the skin, and without pain. It is soft and spongy, yielding to the fingers, by the pressure of which it may be made to disappear when it has arisen without a wound. But when it is the consequence of a wound, the skin having afterwards united, it is not equally soft, as more blood than spirit is effused 1564.

[1] Joanni Gorræi, Opera Medica; Paris, 1622, fol. Defin. Medic. p. 56.

1564. in it; which, becoming grumous, makes the tumour less yielding to the fingers; but if this species of the disease were to be pressed back into the vessels, it would do so without any of the noise that is occasioned by that which arises from anastomosis of the artery, in which there is more spirit than blood: and by this difference the causes of the two species of aneurism may be known. There is another difference; for that which arises from anastomosis is larger and deeper, whereas that which is occasioned by a wound is rounder and not so deeply situated. Aneurisms can in general only be cured with great difficulty, and there is no remedy for those that occur in the throat and head; for if they be opened, the blood and spirits escape, and the patient is left dead in the surgeon's hands. It is called aneurism from *ανα* and *ευρυνην*, and not from *νευρον* and *α* privative, as some have erroneously supposed, translating it by the Latin *enervatio*.

PARÉ.[1]

1582. An aneurism is a soft, compressible tumour, occasioned by the blood and spirits being effused under the flesh, in consequence of the dilatation or the relaxation of an artery; so that the author of the 'Definitions' has seemed to suppose that an aneurism might be occasioned by the dilatation of any venous vessel. Galen says that when an artery is opened by anastomosis, the disease called aneurism is occasioned. It may also be occasioned by the wound of an artery, the superjacent skin closing and cicatrizing, whilst the wound in the vessel remains without being agglutinated, blocked up, or closed by flesh; especially if an artery be opened instead of a vein during the operation of phlebotomy. Aneurisms may thus be occasioned by anastomosis, diapedesis, rupture, erosion, and wound. They may occur in any part of the body, but principally in the throats of women who have difficult labours; for these hold their breath forcibly, so that the artery dilates and bursts, when the blood and the spirit escape little by little and collect under the skin. The signs of an aneurism are a large or small pulsating tumour

[1] Les Œuvres d'Ambroise Paré; fol. Lyon. 1641. Liv. vii, chap. 34, p. 184.

of the natural colour of the skin, soft to the touch, and yielding on pressure in such a way that, if it be small, it disappears entirely in consequence of the blood and spirit entering into the body of the artery; and then, on removing the fingers, will instantly reappear as before. When pressure is applied to some, a noise or blowing sound is perceived; this is also sometimes the case without the necessity of applying pressures, in consequence of the impetuosity with which the spirit passes in and out of the small opening in the artery. But no noise is heard in those aneurisms that are occasioned by an extensive rupture of the artery, for this hissing is the result of a small and narrow opening. 1582.

The reason why some aneurisms become large, with a bony circumference is, that the arterial blood becoming heated and boiling, causes the coats of the vessel first to dilate and enlarge, and then to give way; and taking from the neighbouring parts matters similar to themselves, in order to reunite, thus occasion a large or a small tumour, according to the capacity of the part. Then little by little the circumference of the tumour dries and hardens, like a vessel, becoming cartilaginous, and then osseous by a material and efficient cause, as stones are formed in the kidneys and bladder; for the earthy matter of the blood being dried and thickened by the unusual heat, adheres to the coats of the artery and of the parts that it occupies, thus becoming hard and bony; and this, by a great foresight of Nature (the handmaiden of the Almighty), constitutes a rampart or strong barrier, lest the hot and boiling blood full of spirit should escape and pass out of the coats of the aneurismal or dilated artery. It may, however, be said that this hardness is owing to the cold and repercussing applications constantly made to such tumours, which may harden and thicken them, as it is easy to gather from what Galen says in the last chapter of the fourth book 'De Præsagitione ex Pulsibus.' Besides, in very large aneurisms, there is frequently no pulsation; and on pressing upon them, the blood cannot be forced back into the artery, both because it is in too large quantity, and because it concretes into a thrombus, and afterwards putrefies, as it is no longer kept up by the natural heat of the heart, from which great pain ensues, then gangrene and mortification of the part, and, lastly, death.

GUILLEMEAU.[1]

ON ANEURISM, AND THE MEANS OF TYING AND CUTTING IT.

1594. The tumour called aneurism is usually considered to be a dilatation of the artery, which can only apply to small aneurisms, as it is impossible that the artery can really be dilated and enlarged to the size of the large aneurisms that are often met with. Following, therefore, the opinion of the ancients, we will say that an aneurism is occasioned when the blood and spirits pass out of the vessels, in consequence of their orifices being opened, which is said to be by anastomosis; or when the coats of the artery are divided or ruptured, either from a wound or any other cause; which is seen when a surgeon, wishing to open a vein at the bend of the arm, wounds the artery which is below, or sometimes above the vein; and the skin covering it cicatrizing, the wound in the artery remains, in consequence of the continued movement of the vessel, without being glued together, or blocked up or filled with flesh; and as it cannot be compressed or ligatured so tightly as at the temple, the blood and spirits escape little by little and accumulate under the skin, and give rise to the aneurismal tumour. People are sometimes mistaken about this; for being of opinion that some slimy or pituitous matter is contained within, they make an opening into the tumour, in consequence of which the patient quickly dies from the great effusion of blood and spirits that takes place, without it being possible to arrest them.

The signs by which this disease may be known and distinguished from others are a pulsating tumour of the natural colour of the skin, which, whilst it is of small or moderate size, is soft to the touch and yields to the pressure of the fingers, so as almost entirely to disappear, the blood and spirits being driven back into the artery, and on account of their passing forcibly through a small opening, they occasion a noise. The fingers being then removed, the tumour returns immediately, and the blood and spirits re-entering by a small opening, give rise to a

[1] Les Œuvres de Chirurgie de Jacques Guillemeau; Paris, 1612; fol. p. 698.

hissing noise, which usually happens when the aneurism is occasioned by anastomosis, and not by a wound; because, the orifice being open, the spirit being the most subtile, escapes before the blood, and then the tumour is almost entirely spirituous; but if the artery has given way, much blood escapes, and then the tumour becomes more liquid than spirituous, and, becoming harder, at last coagulates, and causes a distension of the part. 1594.

SENNERTUS.[1]

[After examining the doctrines of the older writers on the pathology of this disease, Sennertus proceeds thus:] 1628.

. . . . . For if an aneurism be occasioned by an effusion of arterial blood under the skin, the blood ought certainly to be diffused far and wide and all around, and should discolour the skin, as we see happen in contusions, and in venesections that are unskilfully performed, when either the vein is pierced through or else when the wound is not properly closed; for then the blood is frequently effused under the skin as far as the hand, staining the skin of a red, green, or yellowish colour; which a wounded artery ought certainly to do to a still greater extent, as the arterial blood is thinner and flows with more violence; but which, nevertheless, does not happen in aneurisms in which the tumour is contained within its own limits and in a kind of cyst; nor is the skin discoloured. And likewise, if an aneurism were occasioned by an effusion of blood under the skin, it would, being in an unusual situation, putrefy, as happens in ecchymosis. We must, therefore, endeavour to explain the formation of this tumour in some other way. The author of the 'Libri Definit. Medic.' defines an aneurism to be the relaxation of an artery. Fornelius[2] also, in his 'Pathologia,' (lib. vii, c. 3,) says that an aneurism is the dilatation of an artery which is filled with spirituous blood. But neither of these writers explain the mode of its formation. And it is not to be supposed that an aneu-

[1] Danielis Sennerti Opera omnia; Lugduni, 1650; fol. lib. v, part 1, cap. 42, p. 306.

[2] Vide p. 4.

1628. rism is occasioned by a dilatation of both coats of an artery, but probably of one only: for arteries possess a double coat; an external one, which is thin, fine, and soft, having many straight fibres, but few oblique, and no transverse ones; and an internal one, which is thick, dense, and hard, having transverse, but no straight or oblique fibres. And therefore if the internal hard membrane be either ruptured, in consequence of over-stretching, or be opened by a wound, it will not, on account of its hardness, coalesce readily; but as the external one is softer, it readily coalesces; and because it is softer, and has neither oblique nor transverse fibres, it will be distended by the blood and vital spirits which are urgently seeking to escape; and thus this kind of tumour is formed, in which the impetus of the blood and of the vital spirit can actually be seen. Nor is the objection that has been raised by Platerus of any moment, namely, that if the skin alone which covers the tumour be cut, the blood which lies directly under it will immediately burst forth, and frequently in such quantity that it can scarcely in any way be arrested, but that the patient may suddenly die, having lost nearly the whole of his blood. If we admit that an aneurism is occasioned by the dilatation of both coats of the artery, this objection will have some weight. But if it be occasioned by the dilatation of the external coat alone, the inner one being opened either by rupture or by dilatation, we cannot conceive that the whole of the blood can be contained immediately under the skin, but the external tunic, being excessively distended, may adhere so closely to the integument, which is also in a state of tension, that it becomes almost impossible to divide the one without the other.

Thus the proximate cause of an aneurism is an opening in the internal tunic and a dilatation of the external one. This is more frequently occasioned during bloodletting, when unskilful surgeons mistake the artery for the vein, or puncture it with the vein. When this happens, the external tunic being soft, and resembling the coats of the veins, unites readily; but the internal one, being harder, remains open; whence the blood and vital spirit, attempting to escape through the aperture, distend the external coat, and thus generate this kind of tumour. The same may happen, if, from a violent impulse of the arterial blood, or from the operation of external violence and too great

a distension of the artery, the internal coat be ruptured, the external one, which is better fitted to be stretched, remaining sound and uninjured. 1628.

FABRICIUS (Hildanus).[1]

The external tunic then resembles the coats of the veins, and, like them, readily unites after being wounded, and prevents the escape of the arterial blood in the same way that the veins do that of the venous blood in varices; in accomplishing which, that common membrane which Galen has described as surrounding the arteries in particular situations contributes not a little. Therefore, whatever kind of aneurism may follow a wound, either none of the coats, or, at most, the internal one only, is opened, the external one always uniting. 1633.

WISEMAN.[2]

OF AN ANEURISMA.

An aneurisma, according to my description, is an ecchymosis, and indeed the highest species of it. But since authors have given another account of that tumour, and have allowed it a peculiar chapter, I have done so too, the rather because the nature of the vessel through which the effusion is made doth require a different mode of cure. 1676.

Description. It is a tumour, soft, white, and yielding to the touch, but riseth again upon the removal of your finger, and is for the most part accompanied with pulsation of the artery.

Opinion of the ancients. It is raised, according to the opinion of authors, by dilatations or relaxations of the artery: they supposing the blood to have burst its passage through the first

[1] Gulielmi Fabricii Hildani Opera. Francofurti, 1646. fol. cent. 3, obs. 44.

[2] Several Chirurgical Treatises by Robert Wiseman, Serjeant-Chyrurgeon to King Charles the Second. 2d ed. London, 1692. fol.

1676. coat, and dilated the second, thereby raising the tumour. And this some of them have delivered to us so positively, as if they had, in opening them, found the exterior coat so dilated. This I myself was taught, and some while believed; but not having been able by my practice to discover one aneurisma made by dilatation or relaxation of the outward coat, I am apt to believe that there is no such thing, but that it takes its rise from the blood bursting quite through the artery into the interstices of the muscles, where it raiseth a tumour suitable to the cavity it findeth, growing bigger or less, of this or that shape, as the muscles give way. But this tumour consists of blood extravasated, the artery lying undilated the while. I do therefore suspect the possibility of an aneurisma by the dilatation of the outward or softer coat of the artery, because it seems improbable that a force big enough to burst the inward coat, which is so tough and firm, should leave the exterior (being softer and weaker) whole, and go out so leisurely into it as to give it time for dilatation. Those which I have met with did all come from downright eruption through both the coats; and those that come from external punctures must of necessity begin with a breach of the external coats first, it being next the lancet or other weapon that made the division. Sennertus would have it heal again, though contrary to my experience, who have always found it open as well as the internal; and indeed reason must tell us that the constant eruptions of blood out of the artery in every pulse, must needs keep it open; nay, the blood keeps not within the bounds of any one membrane, but I have seen it extravasated through all the interstices of the muscles of the whole arm.

The causes of aneurismas are divers, internal or external.

1. The internal cause is the impetuosity of the blood, which, moving with greater violence in its channels than the artery can sustain, doth force its way through the side of the vessel, and, bursting a hole in it, doth issue into the space that lieth between it and the neighbouring muscles, and framing itself a nest.

This impetus may arise, first, from the quantity of the blood, either when it is more than the vessel can contain, a case that seldom happens to produce an aneurisma in any conspicuous vessel, but if any such thing be, it opens at the nose, or lungs,

or in the brain, (there causing an apoplexy,) or in the stomach, guts, anus, &c.; or else when this blood is not really more than the whole body should naturally contain, but by violent passion, or motion in stirring, is too forcibly driven forwards from the heart towards some peculiar artery, when the farther progress being (it may be) intercepted by some violent contraction of the muscles through which it must pass, it of necessity breaks the vessel, and thus, in violent vomiting and other straining, aneurismas are often made in the neck, arms, legs, &c. 1676.

Secondly, from the quality of the blood, which, being too sharp or thin, erodes the vessel; or, being highly fermented by other causes, bursts through all.

This blood, though extravasated, doth usually pulse; partly because the body of the artery from which it breaks doth pass through it, and by its pulse doth agitate that, and partly because in every such pulse some addition of blood is made to the tumour, yet this pulse is chiefly in small aneurismas or superficial ones; for in the greater the motion of the artery is not always felt.

2. The external causes are puncture by lancet or weapon, cutting, bruising, erosion, or whatever else may divide the coats of the arteries.

Differences. The differences of an aneurisma are either from its magnitude, situation, or shape. From the magnitude it is denominated great or little, possessing the whole member or a part. From its situation it is superficial, near the skin, or deep in the muscles. From its shape, either it keeps the shape of the part, which usually happens when the orifice in the artery is small, so that the blood comes out leisurely, and finds the neighbour-membranes so well united as to keep it within a certain channel, which membranes are also fortified by an addition of a serum coagulated from the extravasated blood; or else it alters its form, when it groweth suddenly and irregularly, the eruption being so great that it cannot be kept within bounds; or when it is, by an ignorant chirurgeon, treated with lenients and discutients, being mistaken for some other disease; for in this case the membranes are relaxed, and give way to the tumour.

Signs. From these differences the signs of an aneurisma may be taken. If the tumour be small and superficial, a pulsation may easily be felt in every part of it. If it be great, and

1676. rise suddenly, and was white and soft from its first appearance, though there be no pulsation to be felt, yet you may conclude it an aneurisma, there being not any humour save that of blood which can so suddenly raise such a tumour. The often increase and diminution of the tumour is also a sign of an aneurisma; the diminution of it being the return of the blood into the artery, whence it as often cometh out again.

If it happened from a puncture of a lancet, the manner of the spurting out of the blood will show it; and if it do not bleed, yet a sudden tumour thrusts up under your finger, with pulsation, the blood breaking out into the interstices of the muscles, though not quite into the skin.

The tumour is more compact or scattered according as there was care taken at first to restrain it within compass. In some of these there is redness and inflammation by reason of the expansion of the parts beyond their capacity, or from the putrefaction of the blood; in which latter case fever and fainting for the most part accompany it.

LANCISI.[1]

BOOK I.—ON ANEURISMS IN GENERAL.

PROPOSITION I.—*On the etymology of aneurisms.*

1728. Although Galen, in his 'Methodus Medendi,' may not have bestowed any praise upon those physicians who are critical in their inquiries about names, it being more useful to examine carefully into the nature of things than into the meaning of words; yet, as names are the gifts of the learned, as was the opinion of Cratylus, Heraclitus, and the Pythagoreans, serving as a means of communication between the ideas of those who speak or write and those who listen or read, by which we become acquainted with the forms of things, we think that it ought in the first place to be ascertained what the ancients, who had the privilege and the right of giving names to things, thought concerning the etymology of aneurism.

[1] Joh. Mar. Lancisi De Aneurysmatibus Opus Posthumum. Romæ, 1728; and in Lauth's Collection, pp. 1–100.

I find that the word aneurisma, which the Arabians corrupted into emborysma, aporisma, and hyporisma, but which the Latin writers confined strictly to the dilatation of an artery, has been derived by some of the moderns from three Greek terms. Thus Hieronymus Montanus derives the word *aneurisma* from *a* privative and τs νευρου, that is to say, *a nervo*. And although this derivation is not much approved of by Marcus Aurelius Severinus, in his work 'De Novissimis Observatis Abscessibus,' (cap. vii, p. 178,)—who cannot understand how it can hold good, there being a specific difference between a nerve which is not the seat of the disease and an artery which is,—yet it may be explained if we understand by *enervatio* a debility of the artery. And indeed it must necessarily happen that an artery is very much weakened in an aneurism before it can be dilated. Johan. Baptista Silvaticus, one of the most diligent writers amongst the followers of Galen on this disease, has not inaptly derived the word *aneurisma* from the Greek verb ευρυνω, *dilato;* for in ordinary aneurisms the artery is always dilated. Lastly, Severinus thinks that *aneurisma* is derived from ευρηνειν, *exilire* or *effluere*. 1728.

But if any one inquires what good or useful result would accrue to us from these Greek derivations, which appear to belong rather to grammarians than to physicians, I would answer that a knowledge of them is exceedingly useful, as they teach us how many and what kind of differences were established by practitioners between aneurisms, which were looked upon as being of two kinds. First of all they considered that tumour an aneurism which arose from a dilatation of the artery; and, secondly, they called that other disease of the arteries an aneurism in which the blood escapes in consequence of the vessel being in any way opened. We will take care, in the following pages, so to separate these divisions as to establish as clear and useful a theory of aneurism as the difficulty of the subject will admit of.

PROPOSITION II.—*Exposes the general doctrine of aneurism, with a description of the places which are most liable to be affected by this disease.*

As the knowledge of the parts affected was considered of such importance by the older physicians that a distinction was

1728. made by Hippocrates between the places and the diseases themselves, I am induced here to describe those situations that are usually affected by aneurism, so that, being directed by these, we may the more readily be guided through this very complicated subject.

It must, however, be recollected that, as medicine was as yet but in its infancy, Hippocrates did not make mention of aneurism of any artery; and it was not until after the science had become more matured, as under Galen, Paulus, Oribasius, Aëtius, Actuarius, and Avicenna, that instances of this disease were recorded. But, as far as I have been able to ascertain, a profound silence has been maintained by these very writers concerning those aneurisms of the heart and of the larger vessels which have been noticed by more modern surgeons and physicians in their frequent dissections. In order to render the doctrine of aneurism less obscure, it becomes necessary to assume several postulates, which will somewhat clear our way. Hence the following,

PROPOSITION III.—*Those conditions that are considered necessary for the natural and preternatural action of the heart upon the blood, and of the blood upon the arteries, and the arrangement, constitution, and proportion of these are briefly exposed.*

As we are about to treat of aneurisms of the heart as well as of those of the arteries, we think it but right to make some little digression about those circumstances that can give us a clear notion of them, in order that we may rightly understand the causes and the manner of the occurrence of such great differences in the same disease. Now, as an aneurism is a disorder of the blood-vessels, by which the circulation is disturbed, we ought, in order to understand it correctly, to notice beforehand those circumstances that would teach us the normal condition of the organs of the circulation; for their healthy state being known, any morbid condition is more readily remarked.

And it must first of all be laid down as not admitting of a doubt that the circulation is accomplished in accordance with the laws of nature, that a certain quantity of blood is supplied by the vena cava and pulmonary veins to each auricle, and from

these sent into the ventricles, from which again the same blood is propelled with very considerable force into the arteries and veins, in order that it may at length be returned to the cavæ. 1728.

In the second place it may be affirmed, that for such an act to take place several organs and causes must concur. And we think that those which principally conduce to its accomplishment are threefold. In the first place, the action and the well-known structure of the thorax, of the root of the venæ cavæ, of the auricles, and of the heart, all of which tend to the movement and the impulse of the blood. Secondly, the proper quantity and quality of the blood that is to be propelled by the above-mentioned movements. Thirdly, the proper resistance, movement, figure, and freedom of the arteries, and of the veins, as far as the cavæ; all of which may be comprised in a few words, if we say that it is necessary that there be a moving power, a moveable body, and proper channels.

Thirdly, it must also be admitted that between the three above-mentioned agents a certain proportion, in time, in power, and in resistance must exist; for in the first place the organs of respiration ought neither to be acted upon more nor less than sufficient; so likewise the auricles and ventricles of the heart ought not to be disturbed in their movements. It is also necessary that the ventricles propel the blood in the arteries with such a degree of power that it may be greater than the resistance of the blood itself, but not than that of the dilated arteries; and further, that the blood be of the proper quantity and weight, and have the requisite fluidity, momentum, and constitution; for if it be in too small or too great quantity, if it be heavier, less fluid, or more acrid and corroding than natural, those proportions will be disturbed which it is necessary to maintain between the action of the propelling heart and of the propelled blood; and between the propelled blood, and the resistances it meets with from the individual textures, or from the surfaces of the containing parts or vessels. For supposing that the blood be heavier and thicker than natural, it will certainly be less readily propelled from the heart, and will easily leave behind in the irregular and rough cavities of that organ its less liquid and denser particles; and hence the heart will necessarily be so affected, that the blood coming *a tergo* will be arrested in its passage,

1728. which is more likely to happen when there is much difference between the size of its cavities and that of the vessels.

Supposing again that the blood be acrid and corroding, then it is obvious that the delicate texture of the villi of the heart, or of the arteries, may readily be destroyed, if it adhere to these parts.

Lastly, the arteries themselves must possess a somewhat cylindrical figure, and such a degree of firmness and of cohesion of their fibres, but yet be so dilateable, that when they are in a state of systole, they may offer a less degree of resistance to the impulse of the blood; but a greater one when they are in a state of diastole; so that in this way the artery may react and contract upon the blood. Suppose, for instance, an artery that is weakened by a body falling upon and contusing it, or that is naturally made up loosely of fewer fibres, then it cannot otherwise happen but that the power of resistance in the artery being gradually equalled, and in the course of time exceeded by the force of the impelled blood, fissures must form in the vessel—more particularly as the blood, driven from the heart into the arteries, acts in a direction from within outwards, and consequently more forcibly upon them; which is rendered evident by the laws of the strength of impulses, and by the analogy of leaden pipes through which water is conveyed from an elevated site, and which, when it meets with less resistance than usual in the pipe, easily overcomes and breaks through it; for no one will deny that, if an artery be opened, a free outlet will be afforded to the blood, in consequence of the removal of the resistance of its coats.

A free state of the arteries also conduces to the passage of the blood; for if an artery be anywhere compressed, constricted, obstructed, or otherwise injured, then the flow of blood being prevented, the impulse of this fluid will be deflected or turned back against the usual resistance of the upper part of the vessel, or of the cavities of the heart. We will, however, forbear discussing these points here, as each will be treated of at full length in its proper place.

PROPOSITION IV.—*Contains a general definition of aneurisms.*

It would be a laborious and perfectly useless task to refer to the definitions of aneurism that have been laid down by other

writers, since authors have usually included in them merely those particular forms of the disease that were known to or had been seen by them, and not every kind of it, which it is now our intention to do, and which we do not despair of accomplishing; for it is necessary that we admit, in every aneurism of the heart or arteries, with an effusion of blood into the neighbouring parts, or out of the body, or even without an escape of blood, a certain degree of debility, or of separation of the fibres of the coats of the arteries, or of the muscular substance of the heart and auricles. Wherefore we think that it must necessarily be admitted that in all aneurisms the villi and fibres are more or less wanting in that cohesion and interlacement by which they are mutually bound together and connected. 1728.

This, then, is a general definition of the disease in question; viz. an aneurism is a greater or less diminution, or an entire absence of the cohesion of the contractile villi, which everywhere line the heart and arteries; whence arises either a pulsating tumour of an artery, or else a copious flow of blood out of the artery. Now if any one consider this definition attentively, he will to a certainty acknowledge that every kind of aneurism is accompanied by one or other of these conditions, namely, a greater or less diminution, or an entire absence of the cohesion of the fibres that compose the substance of the heart or arteries.

But as a diminished cohesion of the fibres may occur in a variety of ways, we think it best, for the sake of greater clearness, that this disease be divided and subdivided into its different species. Whence we have

PROPOSITION V.—*The necessity of dividing aneurisms into their different species, but especially into true and false, is here pointed out.*

In no art or science is the observation of Plutarch, that the number of names is always smaller than the number of things, more clearly apparent than in medicine, in which we frequently include under the same name diseases differing altogether in nature and termination, as we can easily convince ourselves, if we examine the subject with attention. We can at once point out a remarkable instance in proof of this observation; for although aneurisms, as we have hinted in the preceding propo-

1728. sition, have their seat in the heart and arteries, yet they do not indicate any one particular affection of these parts, if we are to believe the ancients.

Nor have the opinions of medical men only differed in determining the essential nature of this disease, but likewise in considering its different causes. Thus at one time they have looked upon it as depending upon wounds of the heart or arteries, either penetrating into their cavities or merely implicating their external tunics; at another time as arising from contusion, compression, or erosion, or from too violent an impulse of the blood; all of these causes, moreover, not acting in the same way, but some upon the substance of the heart, and others upon that of the arteries: and (which is of greater consequence) as the same plan of treatment is not applicable to all, but as each of the above-mentioned causes requires a particular one, such a multiplicity of conditions of the same disease, and concurrence of causes, could not be remembered, unless each kind of aneurism were referred to its own class and species. Thus, then, the true and specific conditions and the mode of action of the causes of this very fatal complaint being understood, the wise physician will well consider before he undertakes the treatment of this disease how it happens that some aneurisms prove very rapidly fatal, others more slowly so, and some not at all unless the patient be broken by old age.

We therefore primarily divide aneurisms into true and false. We call those true that arise from causes which immediately weaken the texture and the power of resistance of the heart and arteries; namely, such as in a short space of time either destroy or at all events diminish the firm and strong interlacement of the villi. Of this kind are some which arise from external causes, such as wounds or contusions; and others from internal ones, as, for instance, from a deficiency or debility of the villi, which may either be natural, or else be occasioned by diseases that have supervened, as, for instance, erosions and a wasting of the villi.

We call those aneurisms false which do not primarily depend upon a weakened power of resistance in the villi and fibres lining the heart and arteries, but rather on an increased power of the impulse, whether direct or reflected, acting against an increased or normal resistance of the heart and arteries; so that a weakening or rupture of the villi, is the effect of the in-

creased force of the impulse of the blood against the ordinary resistance of the vessels. This kind of aneurism is produced by violent efforts in porters and trumpeters, in whom the rapidity of the motion and the force of the impulse of the blood are very greatly increased above their natural standard, in consequence of their exertions. This kind of aneurism is also occasioned by spasm, compression, or obstruction of the arteries, as in hypochondriacal patients; to which causes, if erosion were afterwards added, the false might pass into the true form of the disease. 1728.

In the second place, we again divide true aneurisms into those in which there is a rupture, an ulceration, or any other gap in the coats of the artery or in the walls of the heart, by which the blood may escape beyond their cavities, and even out of the body; and into those which are merely accompanied by such a dilatation of the cavities of the artery or of the heart, that a tumour is raised up in those situations, not from the neighbouring parts being distended with blood, but from the violent impulse of that which is flowing through their cavities.

On examining attentively these different kinds of aneurism, we may deduce the corollary that all forms of this disease are not to be included under the denomination of tumours; for those that arise from wounds of the heart or arteries must be looked upon as hemorrhages; and those only ought to be referred to the class of tumours that arise from the fibres of the artery being relaxed, eroded, or in any other way distended beyond their natural diameter, the neighbouring parts remaining entire, or at least, if the aneurism be external, the general integuments that cover more immediately the dilated artery remaining perfect.

But as the nature, or at least the mode of formation, is different in aneurisms of the arteries and in those of the heart, we shall, on this account, and in order to render their etiology clearer, first treat of aneurism of the arteries, which are more common and more obvious, and then proceed to the consideration of aneurisms of the heart.

The symptoms by which an aneurism of the heart is distinguished from a tumour of the pericardium will here be adverted to. We saw a certain gilder, who during life laboured under palpitation of the heart and difficulty of breathing, and who was generally looked upon as suffering from an aneurism. After having been several times bled, by which means he ap-

1728. peared to be relieved, he died suddenly. On opening his body a very large abscess was found occupying the cavity of the pericardium, between its two coats, and which, on being punctured, poured out a honey-like fluid.

[The First Chapter of Book Second, which relates to hemorrhage, to wounds of arteries, and to aneurisms arising therefrom, has been omitted, as containing little of interest or of importance.]

BOOK II.—CHAPTER II.—ON TRUE ANEURISMS DEPENDING UPON CONTUSION.

We do not here intend treating of that kind of aneurism that is met with in the smaller arteries during the sloughing or suppuration of the contused parts; for as it generally terminates favorably by the same kind of treatment that is required for the contusion, it does not require a separate dissertation. But the subject of the following propositions will be the consideration of those aneurisms that occur in large internal arteries after the limbs to which they are distributed have suffered any violent contusion. Many cases of this kind have been described by authors, and it has fallen to my lot to see several in the back or near the sternum, or in the intercostal muscles, which I shall by and by relate, as they are of much interest.

We think that the theory of the formation of aneurisms depending upon contusions should first of all be adverted to, as being a matter of the very greatest interest and importance, especially as for the most part they are recognized with difficulty in the beginning, and are frequently taken by those who are not much skilled in the art of medicine for internal abscesses.

Proposition XX.—*Treats of the manner in which aneurisms arise from contusions and of their causes.*

Though it frequently happens that the larger arteries are contused by falls from a height, by blows and other accidents to which mechanics, and more particularly soldiers, are very liable, yet we do not always find that aneurisms arise from these circumstances; let us therefore, first of all, examine and discuss the reason of this.

The observations of practitioners teach us that contusions of the muscles and bones owe much of their power to the internal constitution of the body, so that when the fluids are more acrid and the bones more fragile, the contusion more readily occasions a wound or a fracture than when, as in boys, the bones are softer and the vessels filled with a bland vital fluid. 1728.

Hence, on inquiring into the proximate or internal causes of the kind of aneurism that has been mentioned, we find no less than three which may either act singly or together.

The first appears to be the concurrence of two blows in opposite directions, acting at the same moment on the same part of an artery.

The second is the natural weakness of the arteries.

The third is the existence of morbid humours in the body of the person struck. But as these causes can scarcely be understood unless they are more clearly and fully explained, I may be allowed to make a slight digression, in order to examine them more in detail.

We must, therefore, first of all enumerate amongst the means by which a contusion upon a part situated above a large artery produces an aneurism, the concurrence of two shocks in opposite directions; one of which being inflicted from without, forces and presses inwards the coats of the artery; whilst the other, occasioned by the impulse of the blood driven at the same moment by the action of the heart, stretches and forces them outwards. Nor, indeed, can it appear surprising to any one that these two opposite impulses may weaken the coats of an artery and destroy their normal structure, as it is well known how easily sounding bodies when struck in contrary directions may be broken, and how readily bells may be cracked if they are rapped on the outside with a stone whilst struck by the clapper within. My very learned friend, Laurentius Bellini, in his work 'De Morbis Pectoris,' in the article on Palpitation of the Heart, page 639, has most carefully and diligently inquired into the true causes of these wonderful effects, and finds that, in consequence of these opposite but simultaneous impulses, the contiguous parts mutually recede from one another, and are thus separated to such an extent that the body is broken.

The second cause we consider to be a natural weakness of the coats of the arteries, as we have ascertained from post-

1728. mortem examinations; more especially from those that we have made of several persons who laboured under aneurisms, in whom the arteries have been found to be thinner and weaker than usual; and in individuals who have been affected with this disease in consequence of blows. If it be supposed, for example, that the back close to which the aorta runs be struck, it is evident that this vessel will receive less injury if its coats be strong and resisting than if they be thin, lax, and weak.

The last cause is the existence of depraved humours; if the artery that is struck abounds in nutritious, mild, and bland particles coming from a healthy habit of body, it is possible that an aneurism may not be occasioned by the blow; for a nutritious and mild fluid does not easily become vitiated or acquire acidity. But if the patient be of a bad habit of body, the acrid humours being gradually arrested and stagnating in the contused part, may easily eat away and ulcerate the coats of the arteries.

As a doctrine that is supported by cases makes a deeper impression on the mind than one which is only strengthened by argument, we will relate instances of this disease that are referrible to each cause.

PROPOSITION XXI.—*A case of aneurism occurring in the aorta from an impulse acting in a direction opposite to that of a blow from without.*

As it has been ascertained by anatomists that the diastole of the arteries is to an extent proportionate to the size of their canals, there can be no doubt but that in the aorta the impulse from within outwards must be very great. If therefore it were to happen (which is very possible) that the same artery were struck at the very moment that it is in a state of diastole, it must necessarily be injured from the extreme distension and separation of its fibres. A very remarkable instance of which I saw about thirteen years ago, in a man who was otherwise sound and healthy, and which I will now relate. [Here follows the case of a runner forty-five years of age, who was struck on the left side of the back by a skittle (boccia), in consequence of which a large aneurism occurred in the aorta, which being opened by a quack who mistook it for an abscess, the patient bled to death.

A similar case is to be found in 'Amatus Lusitanus,' (Book vi, Obser. 8.)] 1728.

Remarks. Certain postulates may be deduced from this case, which will lead us partly to a knowledge of the diagnosis, partly to that of the mode of formation, and partly to the treatment of aneurisms of this description.

In the first place, the symptoms of this disease were very clear; as it is related that about two years after the contusion a pulsation, synchronous with that of the heart, was observed in a swelling that occurred under the scapula, by which the shoulder was raised up in consequence of its connexion with that bone. For whatever pulsatile power an abscess may be supposed to possess, yet its pulsation only lasts until pus is generated, when it ceases. But in this case, as the disease increased, the pulsation became more perceptible and deeper; although, after a time, it lessened and was scarcely sensible, in consequence of, as it were, the polypous wall of the internal surface of the aneurism obstructing it.

In the second place, from this case may be learnt the manner of the formation of this aneurism; which cannot assuredly have been in any other way than by the concurrence of two blows in opposite directions on the same part of the artery and at the same moment. For as this patient was robust, healthy, and vigorous, he could not be supposed to labour under a superabundance of depraved humours, nor under a congenital debility of the arteries. For if one or other of these internal and proximate causes had been in operation from the very commencement, there can be no doubt but that not four years but only a few months would have elapsed before the aneurism appeared. We may therefore argue upon the probability of the cause that has just been mentioned, which it cannot be doubted is sufficiently powerful to produce this rupture, and to be the only or the most active cause in the formation of the aneurism; if the artery however be supposed to have been contused whilst in a state of systolic contraction, there can be no doubt but that much of the violence of the blow must have been lost. For when the movement of the striking body and that of the artery tends toward the same point, the fibres that are struck receive an impulse proportionate to the difference between the momenta

1728. of the two moving bodies. But if, on the other hand, the impulses tend towards opposite directions, then the coats of the artery will be acted upon by a force equal to double the momenta of the moving bodies, as is proved by the laws of mechanics. Thus the palm of the hand receives a less violent shock if it be carried backwards whilst a ball that has been thrown up is being caught; and, on the contrary, the blow will be more violent when the resistance is equal to the force of the impulse of the ball which is acting in an opposite direction. Nor is the effect of two opposite impulses only injurious in the arteries, but it is likewise so in those other parts of our bodies, which are at times very much distended; as, for instance, the chest, if it receive a blow when very greatly dilated; and also the penis, if it be violently bent or stretched whilst in a state of erection; in both of which cases a rupture will ensue of the air-cells and blood-vessels in the lungs, and in the penis, of the very minute vesicles of the cavernous body, whence the disease that is called *distortio penis* occurs.

In the third place, I think that we may come to some facts that would conduce to the prolongation of the life of the patients affected by this disease. And indeed it is not an unimportant quality of any particular kind of treatment that it at least is not injurious; hence it is well to have constantly in remembrance the frightful end of this patient, that we may guard against a similar mistake, which, as it leads to the patient's death, renders one liable to punishment, as Paulus Zacchias has lately proved in his 'Medico-legal Questions.'

PROPOSITION XXII.—*A case of aneurism which arose from a blow, aided, however, by a depraved state of the fluids and by the natural weakness of the arteries.*

Although an aneurism occasioned by a contusion may appear to owe its existence to an external cause, yet, as we have already proved, unless it were for some internal cause, as, for instance, the natural weakness of the arteries and the great abundance of depraved humours in the injured body, with which it is occasionally complicated, it would either never, or slowly, or at least less surely become fatal. The following is the history of an aneurism arising from a blow, but complicated with internal

causes. [Here follows the case of a dealer in old clothes, about forty years of age, of an impaired constitution, who received a blow on the upper part of his chest, in consequence of which an aneurism occurred, which soon proved fatal. On examination after death, a large aneurism of the arch of the aorta was met with, and the aorta itself was found softer and thinner than the pulmonary or radial artery usually is in other subjects.] 1728.

Remarks. From the circumstances that were observed at the post-mortem examination, it is very evident that in this case the aneurism showed itself so soon after the blow, (which was different to what happened in the instance described in Proposition XXI, in which, on account of the good health of the patient, the pulsation did not occur until after a lapse of three years,) on account of the simultaneous concurrence of three causes, two of which were internal and one only external, namely, the blow; and it cannot be doubted but that the first of the internal causes was the naturally weak and feeble structure of the arteries, which is of more frequent occurrence in these diseases than the generality of medical men suppose, and by which the vessels become less able to resist not only the impulse of the blood acting from within outwards, but also the influence of efforts and of blows from without. The second of the internal causes was the bad habit of body and the abundance of saline, corroding, and ichorous humours in a thin man accustomed to bad diet. This cause is sufficient whenever the ichorous fluids are, either accidentally or in the way described, determined to a particular part of the artery to enable them to divide or lacerate the fibrous structure of these vessels.

Proposition XXIII.—*Treats of the diagnosis and prognosis of aneurisms from contusions.*

The diagnosis of this affection can easily be learnt both from the general semeiology of aneurisms as well as from the cases that have just been described. For if, after a person has suffered a contusion, he begins to feel in the part injured, after a longer or shorter time, a constant pulsation, which has been preceded by fever, and an irregularity in the movement of that portion of the artery which is below the *dilatation*, the nature

1728. of the case will be evident; more especially if a tumour, accompanied by pulsation, make its appearance, which sometimes, however, (when the aneurism is deeply seated,) is not very apparent.

But the surgeon, being enlightened by anatomy, ought to be on the watch before the disease has openly and unequivocally shown itself; so that if he were unable to prevent its occurrence, he might at least be enabled to guard against the very speedy death of the patient.

Then, with regard to the prognosis, the physician will prove himself learned and skilful in foretelling the nature of the case if he carefully weigh not only the influence of the external blow but also that of the internal causes, of the situation and of the structure of the artery. For if the constitution of the body be good, and if it abound in healthy fluids, and the artery that is struck be small and superficial, he may give a favorable prognosis, especially if proper medical and surgical treatment have been adopted at an early period. But if, on the other hand, the person struck be of a spare habit of body, and if the artery be large and deeply seated, then he may predict the occurrence of an incurable aneurism, as it is beyond the range of surgical means.

PROPOSITION XXIV.—*Describes the mode of treating internal aneurisms depending on contusions.*

We have already said that the condition of the aneurisms of large internal arteries was different from that of those affecting the limbs. Following, therefore, this division, we assert that if this disease occur in the arteries of the chest or abdomen after the receipt of a blow, there is scarcely any mode of treatment that can remedy it, especially when a morbid constitution of the fluids as well as solids has, as has already been fully proved in the preceding propositions, concurred to generate it. The patient's life may be prolonged for a considerable period if a palliative treatment be adopted, which is readily put in practice by a careful physician; if a vein be opened, and the bloodletting be repeated so as to reduce the quantity of blood, if a suitable and a moderately spare diet be prescribed, if all bodily exercise be prohibited, and especially if the administration of

vulnerary herbs externally as well as internally be ordered, which kind of treatment must be particularly insisted upon; for I have seen two or three patients affected with aneurism improve by the use of a strict diet, of fomentations, and of vulnerary drinks. But here there are two circumstances to be observed, namely, that volatile and sulphureous vulneraries must not be selected for internal administration; of which kind are those that are made into extracts by means of spirits of wine, or that are naturally of a resinous nature, as they create an internal movement and too great a heat in the arterial blood. But I have found infusions of nettles, of ground-ivy, of saniële, of the scabious, the plantain or the periwinkle, and similar herbs, most useful, provided a bolus consisting of two scruples of oxide of antimony (*cerusæ stibii*) and six grains of white Peruvian balsam have previously been administered. But if no very evident symptoms, such as a great swelling, pain, and elevation of the superimposed ribs, appear in consequence of the giving way of the opening in the artery, then viper's broth mixed with some of the vulneraries that have just been mentioned may be administered. By the use of these we cured a certain person who was affected with aneurism of the intercostal artery depending upon the concretion of acrid lymph. *Nitrum stibiatum* with crab's eyes and a small quantity of fuller's earth will also be useful in order to correct the salt and acrid humours, and to carry them off together with the lymph by means of the urine. But above all, a strictly regulated diet and rest of body and mind must be attended to. 1728.

Besides, as a blow will give rise to a milder or more serious disease of the arteries according to the concurrence of internal causes, the medical man ought to pay especial attention to any indications of a depraved constitution that he may perceive. He may then exhibit infusion of *salsa* and of French wheat (*sandalorum*) with crawfish, or at least the *magistrale distillatum*, the formula of which will be given in the chapter on aneurisms that have arisen from syphilis.

Likewise if the patient be of a hypochondriacal habit of body, he may use, according to the time of the year, chalybeate waters, baths, whey or skim milk, with an antihectic made of *poterium*.

PROPOSITION XXV.—*Treats of the manner of curing external aneurisms depending on contusions.*

1728. If an external aneurism have arisen from a blow on the limbs or on a subcutaneous artery, not only ought all those things that have just been spoken of be tried under the directions of a good physician, but surgical assistance may, if necessary, be had recourse to; of which we have already spoken in Proposition XI, where we have pointed out the manner of ligaturing arteries, and other means that may generally be had recourse to with success in patients who have the resolution to submit to them.

But it sometimes happens that aneurisms arise in consequence of blows neither in the belly, nor in the limbs, nor in superficial situations, but within the thorax, in which cases a modified method of treatment must be adopted. Whence follows

PROPOSITION XXVI.—*On aneurisms seated in the anterior part of the chest, which arise from a morbid condition of the fluids as well as from contusions.*

If there be any arteries in which aneurisms, whether from internal or from external causes, are likely to occur with peculiar frequency, it is certainly in those that are situated towards the anterior part of the chest. The reason of this appears to be a mechanical one; for not only are these arteries subject to greater disturbance, on account of the respiratory movements, than those that are situated in other parts of the body, but they also receive a greater impulse from the blood that is sent directly from the heart. On this account it happens that by the alternate elevation and depression of the ribs their situation and position is constantly changed. Whence it necessarily follows that, not only in consequence of the very violent impulse of the blood from the heart which is so near, but also on account of the movements of the chest which do not cease either by night or by day, their coats must be kept constantly in motion and separated, and be more changed and acted upon than those of other vessels.

But if during nutrition a corroding humour were to affect this portion of the artery, or if it were acted upon by a blow

from without, then its coats might readily be separated and eroded. Thus I have known many, who from excessive singing, from a fall upon the ground, or over a stone, or who in other ways have struck the chest, especially on the right side, have been afflicted with aneurisms of these arteries; in the treatment of which there are certain circumstances that must either be had recourse to or altogether avoided. 1728.

In aneurisms of this kind those remedies are of service, especially if administered early, that have been mentioned in Proposition XXIV; but more particularly so immediately after the receipt of the blow; such as fomentations with *aqua Nucerina* or *Willena*, in which gallnuts or cypress-berries have been boiled; then a cerate may be applied made of crude antimony with balsam of Peru and laudanum, or a plaster of nettles and similar soothing topical applications; but astringents must not be used, for as they act upon the external integuments they can scarcely penetrate to the substance of the artery. It may also happen that if there be but a very small quantity of fluids in the person that has been struck, styptics may, by obstructing the smallest pores which are necessary for the circulation of saline and ichorous humours, increase the severity of the aneurism.

But since a doctrine is rendered much more intelligible, and is more readily learnt, if illustrated by cases, I subjoin two; one of which contains the account of a man who lived for many years; and the other, that of a man who following his own fancy and urging his surgeon to operate, hastened his death.

Proposition XXVII.

[A case is here related of a man who had received, four years before, an injury of the right side of the chest by the explosion of a fowling-piece, in consequence of which an aneurism made its appearance between the second and third, and the third and fourth ribs. He was treated by venesection, had clysters of almond oil administered, was fomented with chalybeate water, in which bole Armenian, cypress berries, and some simple vulneraries had been infused, took internally veal broth made with aqua Nucerina, and decoction of plantain roots with nettles; which being continued for three months together, with a very spare diet, he improved considerably, and was living when the account was written.]

Proposition XXVIII.

1728. [A canon of St. Laurent in Damasco, fifty years of age, of burly make, sanguine temperament, and much addicted to singing, became affected with an aneurism of the aorta, which pointed between the fourth and fifth ribs of the right side; as it continued to increase in size, a surgeon to whom he applied ordered him to wear a kind of truss in order to restrain the tumour; he derived some benefit from this, but the sac suddenly giving way internally he died of suffocation.]

CHAPTER III.—ON ANEURISMS DEPENDING PRINCIPALLY UPON A CORRODING FLUID.

Although in almost every case of aneurism erosion must be considered as being a concurrent cause, (as we have already proved in some of the foregoing Propositions when treating of aneurisms from contusions,) nevertheless, for the sake of clearness, we must devote a separate Chapter to the consideration of that form of aneurism that arises primarily from a fluid that occasions by itself, independently of other causes, an erosion in the artery. And indeed a disease of this description, which cannot be treated unless its cause be properly understood, is not of rare occurrence in practice. The occasional causes of it should be individually considered by medical men after the example of Hippocrates. We will, therefore, first of all explain what an eroding humour is.

Proposition XXIX.—*What is understood by an eroding humour, and how many kinds there are that give rise to aneurism.*

By an eroding humour we mean whatever is of a saline, harsh, obstructing, and ulcerating nature. And which, when mixed with our fluids and applied to the solids, is enabled to produce a solution of their continuity. Particles of this kind can be mixed with the blood, lymph, and nervous fluid, and while they are in motion and mingled with the other substances composing the humours of our bodies, do not manifest any of their eroding qualities; but only show them when alone and separated from

these. As soon, however, as they attain a certain degree of rest, they are enabled to corrode those solids that they come in contact with. 1728.

Having recourse to hypothesis, I think there are two circumstances to be attended to with regard to the manner in which the eroding fluid is able to act upon the fibrous texture of an artery.

The first is that this fluid cannot act upon the larger arteries whilst it is passing through them, as some of the ancients thought, for the blood is carried through their channels with such velocity that it cannot obtain that degree of rest that is necessary for the eroding particles to emerge and to become attached to the coats of these vessels.

And although I am not ignorant of the fact that the extreme terminations of the arteries which are merely separated by a membrane from the cavities of the body may sometimes very readily be broken through by the eroding influence of the blood, as if by a wedge, as we see happens in hemoptysis, in menorrhagia, and in effusions of blood within the cranium, or pericardium, yet, as these diseases ought rather to be referred to the hemorrhages than to aneurisms, they may with propriety be here passed by in silence. And, for the same reason, although the fluids may be so curdled, and become thickened to such a degree that they may give rise to a complete obstruction in some artery, whence the movement of the blood is necessarily arrested, and whence the eroding particles may easily be separated from their connexion with the others, yet, as diseases of this kind, which we refer to particular classes, do not primarily and essentially depend upon an eroding humour, they should be treated with reference to their own proper etiology and therapeutics, and must not be confounded with the present subject.

The cause of the kind of aneurism that is now under consideration is, first of all, any eroding substance which, being generated on the outside of the arteries, gradually weakens, separates, and impairs their coats, so that they are no longer capable of sustaining the impulse of the blood in the part affected.

And, secondly, it is a corroding humour which is most generally of two kinds; one of which resembles an ichor which, like a poisonous fluid mixing with the nourishing juices of the artery, quickly insinuates itself into the fibrous texture of the

1728. coats of the vessel; this is chiefly met with in hypochondriacal, hysterical, and scorbutic subjects. The other is of a lymphatic and denser nature, giving rise, first of all, to some congestion near the artery, and then, little by little, finding its way into the proper vessels and villi of its coats; of which kind there is not only one species met with, but most generally two, arising from distinct causes, for one proceeds from a rich, full, and sub-acrid kind of nourishment, and is generally conjoined with a cachectic habit, whilst the other is of a lymphatic origin. These different species will be treated of in distinct propositions.

PROPOSITION XXX.—*On aneurisms that are occasioned by an ichorous eroding principle in hypochondriacal, scorbutic, and hysterical persons.*

In the constitutions first mentioned, most acrid and subtile ichorous humours are apt to collect in consequence of the stagnation of imperfectly-fermented fluids in the hypochondria and womb, and, according as they fall upon or settle in different parts of our bodies, give rise to different kinds of diseases, which have been arranged by medical men, after much labour, into different classes. Among these, an important position is occupied by those diseases of the heart and arteries which have only been incidentally noticed, and which commence sometimes by an irregular movement and sometimes with palpitation of that organ, and at length are manifested by or terminate in aneurism of the heart or of some large artery.

We think it most probable that aneurisms of this kind have their origin in the morbid nutrition of some part of the artery; for as there are no organs in the bodies of animals that are, day and night, constantly moved independently of the influence of the will, except the heart and arteries, and, as the fibres and villi of these organs throw off, in consequence of their perpetual dilatation and contraction, a very large quantity of their particles, it necessarily follows that they must be unceasingly repaired by the deposition of similar matter, which is furnished by the liquids that flow through the arteries and nerves that are within that villous structure. If, therefore, it were to happen that in consequence of any lesion of the structure of the vessel, the acrid and poisonous particles were to mix with the

nutrient humours, an erosion might very easily supervene on a slight spasm of the artery; the strong fibrous textures of which being divided on the outside, might begin to dilate in the way that we have pointed out whilst treating of aneurisms depending on a lesion of the external coats of the vessel. 1728.

Nor indeed can any one in his senses be surprised that, if an eroding humour be mixed with the nutrient particles within the very texture of the artery, it may exert an injurious influence upon the structure of the vessel; when we see that even the very dense structure of the teeth may be eroded by the action of deleterious liquids. In order to illustrate this doctrine more clearly I will subjoin one or two cases of aneurism which have arisen from the action of an eroding humour.

PROPOSITION XXXI.—*A case of aneurism of the right carotid artery, occurring in a noble lady affected with a scrofulous and hysterical complaint, is here described.*

[A lady, fifty years of age, having suffered from hysterical symptoms in her youth, became affected with blackness of the teeth, ulceration of the gums, and impetigo of the head and ears; after this, palpitation of the heart came on, together with great pulsation of the right carotid artery; by the use of fomentations of veal broth, made with *aqua nuceriana*, &c. she was so far cured that the pulsation of the artery almost entirely ceased.]

We clearly learn from the history of this case that the eroding and ichorous fluids which had been deposited in the gums, on the scalp, and behind the ears, gradually fell upon the carotid artery; and, in the same way as they had corroded other parts, began to affect the external coats of this vessel; which, as it makes an oblique curve, resembling the letter S, at its passage through the osseous canal into the interior of the cranium, can more readily be dilated in this than in any other part, the blood meeting here with some obstacle to its free entrance into the skull.

We may further remark, that when there is a large quantity of eroding saline humour present, patients invariably suffer more harm than good from the application of astringents, which, by narrowing and contracting the fibres and orifices of all the

1728. vessels, and thus preventing the exit of ichorous humours, detain them in internal parts.

Finally, we must not neglect the corollary that may be deduced from this case, namely, that if generally fatal diseases be treated at their very commencement by a mild and gentle plan, life may not only often be much prolonged, but the patients may even be restored to perfect health; whereas, if an opposite mode of treatment be pertinaciously followed, they will, for the most part, quickly die.

PROPOSITION XXXII.—*On the mode of formation, the causes, and symptoms of a syphilitic aneurism.*

As an acrid fluid, distilling from the aneurismal cyst or sac, may penetrate as far as the bones or ligaments, which it may gradually corrode, and wear away; so, on the contrary, it may sometimes happen that the lymph, abounding in syphilitic humours, may, first of all, give rise to congestion in the bones and ligaments; but by and by, having become more acrid, and settling in the external coat of the artery, it may begin to corrode, and thus to dilate it into an aneurism; which being produced both by compression and erosion, is much worse than the others, more particularly as physicians, being formerly but imperfectly acquainted with its nature, were most generally accustomed to treat it by bloodletting and the administration of whey; when, on the contrary, the proper method of cure consists entirely in acting upon it with particular and appropriate remedies, so as to promote the transpiration and the diuresis of the venereal lymph, as will clearly be shown by the subjoined cases. Marcus Aurelius Severinus has also stated, in his treatise 'De Novissima Observatione Abscessûs,' that aneurisms arise from a syphilitic cachexy.

A venereal aneurism may be known not only by the suspicious connexion and the appearance of syphilitic infection in other parts of the body, by which it has been preceded, but more especially by the manner in which any particular vessel becomes affected with aneurism; for the pulsation of the artery is not suddenly perceived, but it is preceded, especially at night, by pains in the joints and bones, which gradually projecting in the form of a tumour, press upon the subjacent artery, corrode it, and cause it to begin to pulsate.

PROPOSITION XXXIII.—*The nature of the aneurism in question confirmed by two cases.*

[Here follows the case of a fishmonger, forty-five years of age, who, after having been several times affected with syphilis, applied to Lancisi with an aneurism of the left subclavian artery. He was put upon a course of sarsaparilla and other antisyphilitic medicines, and a spare diet, by which means the tumour and pulsation disappeared, although the artery was still dilated to a greater extent than natural. However, after a lapse of five years the disease had not returned. 1728.

The next case is that of a celebrated player on the harp, who likewise, after having laboured under syphilis, became affected with an aneurism under the same clavicle, which was treated in the proper way. He remained well for six years, at the expiration of which Lancisi lost sight of him.]

PROPOSITION XXXIV.—*In which it is shown how easily aneurisms may be occasioned by the use of mercurial preparations.*

All chemists agree in this, that aneurisms may very readily be occasioned by mercurial inunctions. Thus Paré, Ballonius, and others have indubitably proved it to us by the examples they have adduced.

On inquiring into the reasons why this disease sometimes arises from a cause of this description, two present themselves to us: one depending on the power of the mercury; the other on the peculiar constitution of the body in which the disease is excited; for aneurisms do not always follow mercurial frictions, but only under peculiar circumstances. The whole influence of mercury in giving rise to aneurisms consists in the strength of the impulse by which the weakened lymph and blood are forced and tossed about on all sides; which fluids, as they become erodent by the admixture of acid salts within the diseased body, are easily enabled to act upon and to distend the vessels like a wedge, as is very apparent by the swelling and distention that takes place in the salivary glands of the mouth and intestines after mercurial inunction.

As far as regards the constitution of the body, there can be no doubt but that the occurrence of aneurism depends upon a

1728. weakness or obstruction, or some other morbid diathesis, under which a part of the artery labours; nor indeed will this opinion be looked upon as being far from the truth, if we refer to the case related by Ballonius of a certain merchant, who suffered for a year from pain in the region of the spine. He used mercurial frictions three or four times, and at length died from the bursting of an aneurism, a large quantity of blood being evacuated both upwards and downwards.

A prudent physician may conclude from the instance that has here been related that mercurials, especially in the form of inunction, ought not to be employed in any case of aneurism even when arising from syphilis.

PROPOSITION XXXV.—*It is proved that aneurisms do not arise from paralysis of the fibres covering the coats of an artery.*

The opinion of a certain modern writer appears more ingenious than true, who places amongst the causes of aneurism a looseness and paralysis of some portion of an artery, in consequence of which he does not believe it capable of resisting the impulse of the blood, whence the vessel must necessarily be dilated; but it may be proved by two arguments that this opinion is incorrect.

The first is, that the paralysed fibres are so far from being more ready to generate an aneurism, in consequence of their debility and weakness, (by which they are supposed to be rendered less capable of resisting the impulse of the blood,) that they rather break and deaden the power of this fluid, so that it cannot tear or separate them. For the more vehemently that the coats of the artery resist the impulse of the blood, by so much the more violently are they acted upon by it, as has already been proved in Proposition XXX, and which indeed may be readily shown by some common experiments; for wool, cotton, feathers, and other soft things of a similar kind, easily break and deaden the impulse of moving bodies, without themselves receiving any injury.

The second argument is deduced from the every day observation of patients labouring under paralysis, in all of whom, if the hypothesis of the author alluded to were true, aneurisms ought readily to occur; whilst, on the contrary, there are no

persons less liable to this kind of disease than those who are palsied. 1728.

I will not, however, deny that it may be possible that aneurisms may be occasioned in consequence of the wasting of the fibres from bad food, especially if it be of too acrid and irritating a quality; for the nourishing juice being of a bad quality, and abounding in acrid particles, may by its corroding influence weaken, lacerate, and tear asunder the fibres themselves. Of which kind of aneurism we have spoken in Proposition XXX, in which we have treated of aneurism depending on an eroding liquid.

Having thus finished with the influence of paralysis of the fibres, and having completed our treatise on true aneurisms, we will proceed to the remaining species of the disease.

CHAPTER IV.—ON FALSE ANEURISMS.

In accordance with the division that has already been pointed out in Proposition IV, after the consideration of *true* succeeds that of *false* aneurisms; which depend upon the quantity or the impulse of the blood exceeding the capacity and ordinary power of resistance of the arteries; so that a weakening, a dilatation, and rupture of the villi and fibres ensue, as if from the increased quantity and force of the blood that is propelled against them. Here it may, however, be remarked, that false aneurisms often exhibit the signs of a dilatation and even a separation but never of a rupture of the coats of an artery; for they pulsate and tumify in the same way that the true ones do. We therefore call an unusual pulsation of any artery with a dilatation of its coats beyond their usual diameter a false aneurism. And we say that a false has changed into a true one when the dilatation has passed into a rupture of those fibres that encircle the artery.

PROPOSITION XXXVI.—*Explains that the impulse of the blood can, in two ways, overcome the resistance of the arteries; namely, by a direct impulse and by an impulse composed of a direct and a reflected one.*

Although all that is necessary for understanding false aneurisms may be clearly deduced from those facts that have been

1728. pointed out in Propositions III and IV, concerning the differences between aneurisms and the relation between the impulse of the blood and the resistance of the arteries, yet the general doctrine may be treated of more in detail here, as may also the manner in which the power of the impetus of the blood may be increased in proportion to the reaction of the arteries, which must be investigated by us.

I imagine that there are two ways in which the impulse of the blood is increased: one of these we may broadly term the increased direct impulse; the other is made up of the increased direct and of the reflected impulses.

The first is occasioned by the organs that carry on the circulation as well as by the blood itself, inasmuch as the organs of respiration and the heart, acting with greater power on that fluid, give rise to increased impulses and vibrations in it. The blood again, by its great mass, and by a certain elastic force, pressing outwards and distending the arteries, these begin to be weakened in those situations in which any particular structural lesion may exist; which is of frequent occurrence in persons addicted to gymnastic exercises, in wine-drinkers, in players on wind instruments, and in porters, in whom the blood is acted upon by a direct impulse to a greater extent than usual. For during the great efforts that these men make, the diaphragm and all the muscles of the thorax act upon the blood flowing into the auricles and ventricles; whence it must necessarily follow that the heart, during its contraction, drives that blood more forcibly into the arteries, which has been carried with greater rapidity towards that organ through the veins; in the same way that a ball is driven with greater force towards an opposite point in proportion as it is struck with greater violence.

The very bulk and elasticity of the blood may increase its momentum in a straight line, for the greater the mass of the flowing liquid is, so much the more numerous and powerful are the parts, which can, like a wedge, distend and separate the villi and the fibres of the arteries. Severinus (De Novis Abscessibus, cap. 36,) records the case of a young woman, of Burgundy, much addicted to gluttony and to drinking, who was carried off by an acute fever, occasioned by the quantity and the heat of her blood; on examination after death the cæliac artery was found dilated to the size of the closed fist.

But this happens much more readily if, to the increased momentum of the direct impulse of the blood, another momentum be added, arising from the deflection in a lateral and superficial direction of the cylinder of blood; the consideration of which we have in the second place proposed to ourselves. But it is difficult to prevent a momentum of this kind from being added to the first; for if, together with the fulness of the vessels and a certain impulse of the blood, any artery were, by being compressed or obstructed, or by any other means, to be preternaturally and constantly diminished in its diameter, there can be no doubt but that the waves of the blood moving in a direct line and occupying the axis of the vessel and the neighbouring spaces, would, if they fell upon the obstructed or compressed part (which they could easily and freely traverse if no obstacle existed,) necessarily, according to the laws of reflexion, be deflected; and being driven into the upper part of the artery would press its sides out; which otherwise are dilated in consequence of the blood naturally acting upon them like a wedge. From the operation of these two forces, the direct and the reflected one, the upper segment of the artery cannot fail being distended and dilated. 1728.

But in order to make the manner of the formation of a false aneurism clearer, I will adduce several arguments derived from the laws of hydraulics as well as from anatomical observations.

PROPOSITION XXXVII.—*The action of the power composed of the direct and oblique impulses of the blood explained and demonstrated.*

The fluids circulating through membranous tubes, that can easily be distended by the force of the liquid impelled into them, may be considered as so many lines; some of which proceed from the orifice of the tube through its axis, whilst others again pass along and fall upon its internal surface. Now if this tube be anywhere obstructed or compressed, it necessarily follows that many of these lines, those near the axis as well as those that are nearer the sides, being prevented from following their free course, suffer deflection, which may easily be understood from the accompanying figure. [Here follows the description of a figure which it would be useless to insert without the plate.]

1728. Nor, indeed, will it be difficult to understand the rationale of the operation of the increased impulse of the blood if it be recollected that leaden water-pipes soon become weaker, and will at length give way, if from any obstruction or compression the momentum of the fluid that is flowing through them be increased.

But what occasion is there to have recourse to experiments when very evident examples present themselves in the bodies of animals? Let any one expose an artery, the iliac for instance, in the dog, and having ligatured or compressed it, carefully observe the result; he will then learn that in proportion as the impulse is increased so will there be a greater degree of distension in the whole of that portion of the artery that is above the ligature. The very interesting experiment of cutting an artery across, and then tying a tube in it, as performed by the great Harvey, and detailed in his work on the 'Circulation of the Blood,' at page 214, and which was proposed rather than performed by Galen and Vesalius, bears on this point. Harvey says as follows: "For as soon as you will have tied the artery, it will begin to dilate above the quill or pipe on account of the impulse of the blood driven from above, so as to exceed the circumference of the tube; whence the flow of the blood will be arrested and its impulse broken, so that the pulsation of the portion of the artery placed below the ligature will be lessened, as it has not the impulse of the blood that flows through it, which is driven back above the ligature," &c.

PROPOSITION XXXVIII.—*It is deduced from numerous experiments that the powerful compression or constriction of an artery, if it have lasted a very long time, renders the vessel impervious, and will give rise to the formation of a polypous substance, which blocks up the cavity of the upper portion of the artery.*

It is most likely to happen in a diseased condition of the system that affections which, in the beginning were simple, may, in the progress of time, become complicated; and one which might have commenced in the solids may afterwards be propagated to the fluids. This is plainly manifested in the powerful compression and ligature of arteries; for if these be continued a sufficiently long time, they not only hinder the flow of

blood through the artery, and bring on a morbid repercussion of this fluid, but they also occasion some of its more viscid parts, which are less easily deflected, to become agglomerated, and gradually to adhere to the sides of the vessel until the mass having increased in size by the afflux of similar particles resembling threads, coalesces into a dense and fibrous kind of body which is called a polypus. 1728.

But a mistake would arise here if it were supposed that such a polypus could not form unless the artery were cut or divided, as we have elsewhere stated to be the case with regard to the polypous incrustation lining the sac of an aneurism. For in an aneurism that resembles a bag in shape, the polypous crust lines the sides, so that the blood can flow through the centre of the artery, the circulation not being interrupted. But in the spurious aneurism of which we have spoken, the polypous body, by obstructing entirely the canal of the vessel prevents the direct passage of the blood, interrupting the circulation, and compelling the fluid to take a collateral route. Hence, from this cause, the pulse is often obliterated at the wrist, as happened to the Marchioness Paulutio.

An experiment that we have often performed on dogs proves our assertions; for, having ligatured one of their iliac arteries with a waxed thread, and having left the wound to be cured by their saliva, the vessel was, after a lapse of fifteen or twenty days, divided longitudinally, when we found a polypous concretion above the ligature which completely blocked up the canal of the artery, so that, although the string was taken away, and complete liberty given to the tube, yet the obstruction could not be removed by the blood that rushed in from behind; and indeed the polypous substance could either not be removed at all, or only after a long time by repeated pressure, and by dissolving it by washing with ammonia.

We may further remark, that we never found any, or at all events but very small, polypous substances adhering to the sides of the canal when the compression and constriction were not so powerful, that the flow of liquid from above downwards was suddenly checked, but was still allowed to continue for some time; for when the blood reaches the constricted spot, part of it is driven back, and a part flowing with greater violence carries with it the denser particles. But things may happen differently

1728. in the human body when already diseased; for as a constriction of the vessel may be conjoined with a fluid that is disposed to stagnate, the formation of a polypous concretion, which would not occur from mere lesion of the vessel is hastened by the morbid condition of the fluid.

This hypothesis is confirmed by the examination of bodies of patients affected with aneurism, in which a polypous substance of this kind was found obstructing the course of the blood. The case of aneurism related by Panarolus being particularly interesting, we will transcribe it: "A certain monk, of robust habit of body, had suffered for many years from an aneurism in the right armpit. The physicians that he had consulted ordered him every year to be blooded to a great extent in the opposite arm. He died suddenly, whilst otherwise in good health and spirits. On opening the body I found the vena azygos excessively distended, so that it seemed ready to burst. Likewise all the arteries and veins that supply the intercostal muscles on the right side were exceedingly tense and full, so that whilst the dissection was being proceeded with a very large quantity of blood flowed out from about the clavicle and shoulder. But what was most remarkable, was the appearance of the axillary artery, for it was not burst or corrupted as in other aneurisms, but was everywhere sound, with this difference, however, that a white, solid, hard, cartilaginous flesh adhered so firmly about it and the vein, and within the artery, that it could in nowise be separated, and resisted the knife even in a very wonderful manner. Whence, as the blood was gradually prevented from supplying the arm by its natural passage on account of the great internal obstruction, it suffocated the heart by its retrocession, and thus occasioned the sudden death of the part."

In the work by Marcus Aurelius Severinus, (de Novissimis Observatis Abscessibus, cap. 34, § 5,) there is related a case of aneurism of the cæliac artery, which was carefully observed by Nicolas Larcheus, a Roman surgeon, of the dissection of which the following is an account: "On proceeding from below after we had come to the emulgent arteries, having passed that spot where the aorta divides, we found three little corpuscles of phlegm concreted by the power of heat (for the size of this artery is much larger than that of the vein,) which were stuffed

in transversely in such a way as to obstruct the canal of the artery, closing up the way for the spirit that ought to pass; and on proceeding upwards, the cæliac artery, which is naturally not larger than the ring-finger, was found dilated to the size of the closed fist; in which cavity a large quantity of black grumous blood having the appearance of incipient putrefaction was found; which morbid condition of the artery no one could doubt to be the sole cause of death." A case may also be found in the Anatomico-medical Observations of Johannes Baptista Fantonus, in which is described an aneurism of the aorta a little above the iliac arteries, in a man of a muscular habit of body, who was troubled with frequent fainting fits and vague pains in the belly, and in whom, after death, very dense polypi were found below the situation of the aneurism, impeding the flow of blood towards the iliacs. But it is now time to proceed to other subjects. 1728.

PROPOSITION XXXIX.—*Proves that an increased impulse of the blood, which gives rise to a spurious aneurism, can rarely occasion a true one, unless, at the same time, the coats of the artery are generally or partially weakened, so that an eroding liquid may increase the power of this cause.*

This Proposition has two parts: the first, in which we state that it is but seldom that arteries can be weakened or ruptured by an increased direct or reflected impulse; and the second, in which we undertake to prove that the arteries are not more frequently or easily ruptured, and true aneurisms produced by this increased impulse, unless a natural weakness of the vessel, or an eroding tendency of the surrounding or contained liquid be conjoined.

The first part is easily proved by *a priori* reasoning as well as by experiment. For it may be laid down as a fact, that although the blood may be forced with an augmented impulse against the power of resistance of any individual artery, (as sometimes happens in lying-in women and in those who vomit long and violently,) yet unless the vessel be very weak and superficial it could not be ruptured by the sole power of this impulse; for that resistance which depends merely upon the arterial coats ought not alone to be taken into account, but that

1728. superadded one must also be considered which proceeds from the union of the membranes, glands, and muscles, by which the arteries are surrounded on all sides. For although this increased power of the blood may overcome the natural resistance of the artery *alone*, yet it cannot very easily that of the surrounding parts.

This statement is also proved by experience; for however often a strong pulsation, lasting even for years, may be felt in an amputated or ligatured limb, or in the spasmodic or ossified arteries of hypochondriacal or hysterical people, yet it never passes into a true but into a spurious aneurism, with mere dilatation of the arterial tube, which sometimes continues for a long time. Of this kind was the one under which the monk, whose case is related by Panarolus, laboured for a considerable time without any rupture or putrefaction taking place. A spurious aneurism terminates favorably, when by a mild plan of treatment, the obstruction being removed, the artery returns to its natural condition.

With regard to the other part of the Proposition, this will be much more easily understood if our readers will remember what we have already said concerning the innate but abnormal weakness of the arteries, and of the operation of depraved humours in conjunction with the other causes.

For if the body that obstructs or compresses the artery were to generate from itself any eroding particles, or were to obtain them in any way from the blood or nerves of the affected artery (which might very easily happen in a diseased system), they might, by penetrating like wedges into the substance of the fibrous texture of the vessel, gradually dilate, and at length rupture it; so that an aneurism that is spurious in the beginning may finally become true; as we saw eight years ago in the dissection of the body of a lawyer who had laboured under a hypochondriacal affection. He had for many years suffered from a pulsation of the cæliac artery, which originally arose from spasm; but during the last two years a tumour, about the size of a pomegranate, had made its appearance. The branch of the cæliac artery, which had in the first instance been affected with the spasm, gradually became so dilated by the impulse and the force of the eroding fluid, that it formed a kind of pouch full of a fleshy and polypous humour, which obstructed the pas-

sage of the blood into the smaller arteries, and which at length giving way at the point that was nearest to the sound part of the artery, occasioned the sudden death of the patient by pouring out the blood into the cavity of the abdomen. There is another instance of a false aneurism arising from the distension of the aorta by too large a quantity of blood; which passed at length into a true one on account of the acrimony and eroding powers of the fluids, related by Laporta, (De Tumore Præternaturali, lib. i, cap. 43;) which I am surprised that Sennertus could have doubted being a true aneurism. 1728.

Nor indeed must we pass by in silence what we have elsewhere spoken of, namely, the innate weakness of the arteries; which are found in certain persons to be less able than usual to resist the impulse of the blood; whence it may easily happen, as for instance in porters, trumpeters, or parturient women, that, on account of the increase in the propulsive power of the blood occasioned by the violence of the respiratory efforts, a great impulse may be determined against a particular artery, which may, either from its own nature or from some obstructing cause, be less capable of resistance; whence it must necessarily give way as we have already more fully proved.

In the meantime we think that it will be sufficient if we point out the reasons why porters and others who make violent exertions, and also those whose arteries may in any other way be obstructed, do not always become affected with true aneurisms.

PROPOSITION XL.—*Physicians ought the more diligently to acquire a knowledge of the early stages of false aneurisms, as these, if they are recognized at once, may be cured with less difficulty than most true ones.*

As there is never in the early stages of false aneurisms a diminished resistance of the arteries conjoined with a normal impulse of the blood, but only an increase of the force of the contained fluids; and as it has already been proved that an increased impetus of the blood can scarcely give rise to a true aneurism unless debility of the vessel itself, or an eroding humour be conjoined with it, it follows that false aneurisms, if they be recognized in the beginning, are easier of cure than true ones; because it is then very probable indeed that there is not as yet

1728. a superadded disease of the arterial coats, by which a greater weakness of the fibres, and a diminished power of resistance, may have been induced. The object will therefore be to remove in the beginning of these complaints the cause of the increased impulse in the blood; which it is easier to accomplish than to increase the resistance of the solids. And hence it happens that occasionally aneurisms of this kind are observed to be cured in plethoric and hypochondriac persons, in whom, if the treatment had been deferred, all labour would afterwards have been in vain; because, as we have already pointed out, the arteries become much weakened by the increased power of the blood conjoined to the action of an eroding liquid. Wherefore, we would again and again, impress upon our readers to attend to what we are about to lay before them in the following pages, as being not opinions loosely stated, but as being facts that have been carefully worked out and submitted to the touchstone of experience. For it will be in vain to attempt the cure of those aneurisms in which the membranes are eroded, and which no needle can stitch together again.

PROPOSITION XLI.—*On the differences and the symptoms of aneurisms depending upon the wedgelike action of a superabundance of blood.*

Although, when a superabundance of blood has reached an extreme pitch, all the movements of the animal become languid, in consequence of the interspaces between the smaller vessels and in the different tissues, which are necessary for their contractions and expansions, being obliterated; and without which the separation of the liquids and the dilatation of the fibres under the influence of opposite impulses cannot so easily be accomplished, whence those persons are slow in their movements whose bodies are plethoric; yet when a moderate fulness of the vessels is accompanied by very considerable efforts, by compression, by forcible flexion of the limbs, or by an innate debility of the arteries, it tends much to the dilatation of the vessels and acts as by no means an unfrequent cause of aneurism; hence we intend treating of it at present.

We may, however, before proceeding further, lay it down as a matter of common observation by all physicians and surgeons,

that of a hundred aneurisms which have arisen spontaneously 1728.
or without the concurrence of an external cause, more than half
are met with in persons addicted to gluttony and drinking, and
the remainder in those who are affected with hypochondriacal,
hysterical, or syphilitic diseases. On this subject the learned ob-
servations made by Marcus Aurelius Severinus (De Novissimis
Observatis Abscessibus, cap. vii, p. 177) may be read; as well as
those by Nicolas Larcheus, in the history of a case of aneurism
which is given by Severinus at page 280 of the same work.

But since gluttony, from the different kinds of meat and drink that are taken, as well as from the general mode of life, must occasion a double plethora,—one of laudable blood, that is, a dry blood endowed with a volatile and oily salt; the other of imperfectly formed blood abounding in a fixed acid salt dissolved in the phlegm of the crude juices,—an aneurism may be occasioned by either the one or the other, more especially if there be an innate debility of any artery, or if any circumstance unknown to us were to excite it.

But a superabundance of blood of good quality will rarely occasion an aneurism, unless it be preceded or accompanied by the constriction or compression of an artery, or by disturbance of the mind. Wherefore this disease may be known if a violent pulsation begin in persons of robust habit of body, of good constitution, with colour in their cheeks and strong limbed, in whom either any sudden fear or a constant grief has impeded the free circulation, or a sedentary life, and the compression or bending of any limb may have occasioned any particular artery to be stretched to such an extent as to become spontaneously dilated.

An aneurism that arises from an unhealthy plethora is more easily recognized; the previous kind of life being fully proved by the very large quantity of humours, but more especially by certain pulsations being felt in different parts of the body by the patient himself; whence it follows that the arteries are slightly obstructed towards their terminations from the quantity of fluid contained in them, and are apt, on account of the irritation of their fibres, to be torn; so that the transmission of the blood from them into the veins being interrupted, it is taken back and passes by collateral vessels, until too large a quantity being retained in any particular artery in

1728. consequence of a greater obstruction, the foundations of a false aneurism are laid. But from the consideration of the symptoms let us pass to that of the treatment and the etiology of false aneurisms.

PROPOSITION XLIII.—*On the different species of aneurism that arise from spasm of the arteries.*

Amongst false aneurisms, certainly those do not occupy the lowest grade that depend on spasm of the nervous fibres. For as the nerves on all sides surround the arteries like ivy, penetrating deeply into the fibrous interlacement of the coats of these vessels, the movements of which are probably reciprocal with the impulse of the heart, if it were to happen, as occurs with other nerves, that the nerve of any artery were affected with spasm, then the muscular coat must necessarily be torn on account of the contraction of its villi; and, therefore, as the diameter of the artery must be lessened at that spot, the blood will either be deflected towards the heart, or, at all events, into the upper part of the artery, and thus those other circumstances will occur that we have already stated in the former Propositions as being likely to happen.

A spasmodic affection of the arteries of this kind presents several differences, but more particularly two; for sometimes it attacks the longitudinal and sometimes the oblique or spiral fibres, and now one, and at another time several arteries.

We have already pointed out in its proper place that an artery possesses oblique decussating as well as longitudinal fibres, and no one that is accustomed to dissection and practice can pretend that these divisions of its contractions are fictitious.

As the nerves likewise terminate in the substance of the arteries, not only in the aorta but also at the bend of each joint, and especially in the abdomen, it follows that spasm of the arteries sometimes occurs about the heart, at other times in the abdomen and about the uterus, and again at the extreme terminations of their canals; this we have sometimes observed to happen in persons who, abounding in much acrid salt, have experienced very violent pulsations of all the terminal arteries, until the whole of the eroding matter that had been dispersed through the body generally, being accumulated in one spot,

gave rise to (unless it were rendered much milder) a true aneu- 1728.
rism. In Paré's Works (book vi, chap. 28) may be found a
remarkable case of great pulsation of all the arteries, with heat
of the whole body, which was succeeded by an aneurism of the
arteria venosa.

PROPOSITION XLIV.—*Treats of the diagnosis of spasm of the longitudinal fibres of an artery.*

It may be known that the longitudinal fibres of an artery are affected with spasms when the patient experiences pulsations in the præcordia, together with a most unpleasant sense of dragging and tearing in several of the arteries from their ends upwards, which, when it happens, I do not doubt but that the oblique fibres are likewise pulled upon; but yet the chief lesion is seated in the straight fibres; and although this kind of disease is very rare indeed, yet I have several times seen it, especially in a hysterical woman whom I carefully observed during the intervals between the spasms, in whom there was very great palpitation of the heart, of the arteries of the temples, and of the veins, which were enlarged; together with pain during their contraction or retraction towards the heart. It is probable that in this case the superior branches of the aorta suffered spasm in a longitudinal direction, whence, their canals being constricted, there was not only a difficulty in the passage of the blood from the arteries into the veins, but like what happens in the iliac disease, the contained fluid was driven back towards the aorta and heart by an antiperistaltic movement, whence palpitation and anxiety were excited. This woman got perfectly well by change of air and by the removal of the different objects by which her mind was troubled.

I knew a young man of a bilious complexion and melancholic temperament who was practising medicine in the town of Bracciano, and who, after much mental disturbance, and long continued abuse of acid and acrid food, became affected with disease of the præcordia and of the axillary arteries, which induced not only palpitation of the heart, with much noise, but also a violent pulsation in both wrists, together with, at regular intervals of time, the sensation of a strongly and painfully contracted artery. The disease increased until it became probable

1728. that some large vessel near the heart had become dilated. After he had been treated with whey, with various vegetable juices, with chalybeate, cardiac, and purging medicines, and much weakened by bloodletting, he came to Rome in the early part of spring, principally to consult me about the treatment he was to adopt. Having heard the history of his disease, I suspected that acrid, ichorous humours, which, for the sake of shortness, we will call melancholic, had pricked and irritated both the fibres of the heart and of the axillary arteries; and the diameter of the canal of the artery being diminished by the contractions of the vessel, the freedom of the passage of the blood from the arteries into the axillary veins was interfered with; whence from the very beginning there was a reflexion and a repercussion of this blood. Having accordingly interdicted the use of other medicines, I recommended perseverance in the employment of infusion of apples, with fresh-water baths, and the oil of sweet almonds, together with abstinence from wine. The patient returning to town at the expiration of a year, candidly confessed to me that, by the use of the apple juice alone for two months, he was perfectly cured. So true is it that both the commencement of and the remedies for serious diseases are for the most part very trivial.

Here I will state, by way of corollary for those who are not much skilled in medicine, that unless palpitations of the heart and pulsations of different arteries be not remedied as quickly as possible, they will pass into true aneurisms of the præcordia, which admit of no cure.

PROPOSITION XLV.—*The diagnosis and treatment of false aneurisms depending on spasm of the circularly spiral fibres of arteries are explained.*

This disease affects for the most part persons disposed to nervous affections, especially of a hypochondriacal and hysterical nature; for in them the nervous fluid, having become acrid, is very much disposed to excite spasm of the arteries; or else the ichorous humour, having attacked the nerves, is carried by the smaller arterial branches into the fibres of the coats of the larger arteries, where, in the way that has already been explained, it creates a spasmodic affection.

Aneurisms of this kind most frequently occur in the cæliac artery, as the experience of learned men everywhere proves; and as Riverius, in his treatise 'De Melancholiâ Hypochondriacâ,' as well as ourselves in the cases that have been related, have shown. The reason of this is very obvious; for as the direction of this vessel is oblique, and as it is surrounded and bound down on all sides by plexuses of nerves as if with straps, it necessarily follows that when in hypochondriacs the fermentation of the first digestion has become less bland than natural, the fibrous and nervous parts (of which there are many in the abdomen) are kept in a constant state of spasm, as is clearly proved by the constipation, griping, tension, eructations, borborygmi, and other symptoms of the same kind; and as the chyle abounds in acrid and abnormal saline substances, a nervous fluid of the same constitution must be generated from it, whence it necessarily follows that things gradually go on to such an extent that the membranes which are situated outside the intestines, being acted upon, the fibrous texture of the cæliac artery may also be destroyed, which first becomes known by a frequently recurring sense of uneasiness, and afterwards by a severe pulsation, which, when it continues for years without yielding to any remedies, and is accompanied by a tumour at the bottom of the stomach which pulsates on pressure, is a sure sign that it has passed into a true aneurism; which at length giving way, occasions the patient's death, as we have already proved by the cases we have adduced. 1728.

But it is perfectly certain that diseases of this kind, if they come, in the earlier stages, under the care of a prudent and skilful physician, can, without much difficulty, be cured. I will, therefore, here relate a case of this species of aneurism that was successfully treated at an early period.

PROPOSITION XLVI.—*The history of a case of aneurism of the cæliac artery and lower part of the aorta, that was cured.*

[Two cases, of which the following are abstracts, are then related: The Marquis Litta, of Mediolana, a studious young man, of melancholic temperament, suffered from great pulsation in the cæliac artery and in the lower part of the aorta, with breathlessness and oppression about the heart. He was treated with

1728. emollients mixed with oil of almonds, fomentations, and clysters for eight days. He then took the *aqua nuceriana*, and after a time was perfectly cured.

The other case occurred in a lawyer of eminence, of a bilious temperament, who was affected by a pulsation and tumour of the artery of the right thigh, which was pronounced by his surgeon to be an aneurism. He was treated with fomentations, soft-water baths, diluents, and asses' milk, by which means the tumour disappeared entirely, and the patient lived afterwards for sixteen years.]

We have also seen many cases of aneurism occurring in delicate women whilst suckling, who, when endeavouring to give their children more milk than their strength would allow, have been seized with pulsation and pain in some of the arteries, which, unless they left off suckling, was apt to give rise to wasting, and at last to true aneurism.

But as it very commonly happens that aneurisms of the auricles and ventricles of the heart arise from spasm, I will explain the mode of formation of these aneurisms, and also the way in which they can in their earlier stages be very readily cured.

CHAP. V.—ON THE HEREDITARY DISPOSITION TO ANEURISM OF THE HEART, AND ON PROLAPSUS OF THAT ORGAN.

PROPOSITION XLVII.—*Some cases of hereditary disposition to aneurism of the heart are related.*

As we find in Hippocrates a clear exposition of the doctrines of the propagation of diseases from parents to their children, in consequence of a morbid condition of the fluids: "Et quia animal secundum parentes enascitur tot humorum species et sanorum et morbosorum in se habet;" and also in consequence of disease of the solids, when he says: "Limoso limosus, ex tabido tabidus nascitur." No one will deny that affections of the heart can be propagated from parents to their offspring; and indeed, whenever a lesion of this description is transmitted from the ancestors, as, for instance, when the root of the venæ cavæ, or the right auricle and ventricle are composed of weaker and looser fibres, whilst the parietes of the left side of the heart

are much stronger; then, as the size of that organ increases, a dilatation of the right cavities will begin to manifest itself from any slight causes, such as violent movements of the body, mental disturbance, or any excess in acrid food. 1728.

But a certain pulsation on the right side of the heart is by no means an equivocal sign of this hereditary disease, which people, who are otherwise in good health, appear occasionally to be affected with after violent bodily exercise, or after a surfeit.

We had a very evident proof of this fact in a noble family, in which four generations, namely, the great-grandfather, the grandfather, the father, and the son, were successively affected by a very severe form of this disease.

Indeed, the great-grandfather, who was in every respect a very estimable man, being entirely ignorant of the nature of his complaint, used to joke with his friends, saying that nature had given him a double heart, as he felt the usual impulse on the right side of the chest as well as on the left. After a few years, however, he died, with very marked aneurism of the right ventricle.

He was followed by his son, certainly as noble and excellent a man as his father, who, after having been occupied by various journeys into different parts of Europe, and by many public and private duties, began to be affected with a hypochondriacal disease, the severest symptom of which was a palpitation of the heart; conjoined with which there was anxiety about the præcordia, breathlessness, an œdematous swelling of the feet, and a deep-seated pulsation in the right side of the chest, together with very considerable pulsation of the jugular veins; so that there could be no doubt but that the right cavities of the heart were affected with aneurism. However, some person, who was but little skilled in the practice of medicine or anatomy, very foolishly opposed this opinion, until the patient's body having been opened, these cavities were found to be larger than the closed fist.

And, indeed, I find it impossible to restrain my anger at the conduct of certain empirics, who, when they first observed this nobleman labouring under a palpitation of the heart, treated him with spirits, volatile oils, and aromatics, in order, as they thought, to dispel the flatus; which means were ignorantly used, to the great injury of the patient; for these spirituous remedies must very considerably have hastened the dilatation of the heart.

1728. There is at present living, in the third generation, a man a little above forty years of age, who, especially whilst fasting during Lent, experiences in the afternoon a disagreeable pulsation in the chest, which is soon removed, however, by quiet of body and by sleep. I trust that a death like that of his father is not in store for him.

Lastly, in the fourth generation, the son of the brother of the patient who has just been mentioned having died of epilepsy, at the age of four years, was dissected, and in him we found the same hereditary disease of the heart.

It may happen that the same thing occurs in other parts of the circulating system that we have, as yet, only observed in the right cavities of the heart.

PROPOSITION XLVIII.—*Treats of the increased bulk of the whole heart with aneurism, and of its prolongation or prolapsus upon the diaphragm.*

The diseases of the heart are so different and so serious, that this organ is frequently found affected with an increase of bulk, at the same time as with aneurism; and here we do not merely understand by an increase of bulk the dilatation of its cavities, but an increase in the thickness and solidity of the fibres, together with the surrounding fat, which, making the base of the heart larger and heavier, renders the viscus too weighty to be suspended and balanced by the ordinary resistance of its vessels.

This disease does not only affect the heart, but may also happen in almost any organ; so that the liver, the stomach, the spleen, the pancreas, the uterus, or the kidneys being increased beyond their usual size by the stagnation and arrest of their fluids, a prolapsus or descent of them may be occasioned.

Nor indeed will we here fatigue our readers with a long examination of the causes, symptoms, or signs by which we may arrive at the knowledge of this disease; for we think that all these may be learnt more agreeably and easily from the history of a case, which, as it comprehends a narration of the causes, the symptoms, and the dissection, will explain everything that is necessary in order to learn it both theoretically and practically.

Amongst medical authors, as far as we have hitherto read, there are only found very imperfect histories of this disease,

like the one that has been reported by Peter Marchetti, in his 49th surgical observation in the following words: 1728.

"A certain Venetian, forty years of age, of a warm and moist temperament, and addicted to gluttony, suffered from difficulty of breathing and oppression about the hypochondria, for which many remedies had been fruitlessly administered. He accordingly came to Padua for further advice, but died suddenly on the following night.

On opening his body nothing unusual was found in the hypochondriac regions. But in the thorax I saw the heart three times its natural size; the ventricles, likewise, were very large indeed, and it adhered by the whole of its upper part to its capsule, laterally to the pleuræ, and inferiorly to the diaphragm; and not only to the membranes, but also to the fleshy portion of this muscle. Hence it is not unreasonable to suppose that the difficulty of breathing arose from the compression of the lungs and diaphragm, which was also the cause of the pain and distension in the hypochondriac regions."

The case that we read of in the 'Miscellanea Naturæ Curiatorum' (Dec. 1, tom. 5, obs. 40), in which a very large heart with great dilatation of the vena cava pressed down upon the diaphragm, does not differ much from the preceding one.

The utility that is derivable from cases is in proportion to the accuracy and completeness with which they are related, so as fully to explain, not merely the present condition of the patient, but also his natural constitution, the occasional causes of his illness, the first symptoms, and then the successive steps of his disease, and finally, if he die, to give a minute account of the examination of his body. For otherwise only a rude, imperfect and empirical notion of the disease is acquired, which it is better to be without than to possess—as an untouched canvass is better than a badly-painted picture.

On this account we think that one complete and comprehensive form for cases should be laid down that would include all the causes and symptoms of disease.

CHAPTER VI.—ON ANEURISMS OF THE HEART.

A knowledge of these is especially necessary, not only because aneurism of the cavities and of the vessels of the heart is

1728. a more common disease than the majority of medical men have hitherto thought on account of the small number of dissections performed by them, but more particularly because the hidden causes of many diseases are to be found in a dilatation or obstruction of the cavities of the heart. For, indeed, frequent dissections have proved to me that many suffocating asthmatic affections, obstinate oppressions, and frequent palpitations about the heart, dropsy of the chest, and more especially sudden deaths, depend upon one cause, namely, unequal and sudden dilatation of the vessels of the heart. Wherefore, in order that a matter of so much consequence may be clearly treated, we would particularly insist upon the importance of the following remarks.

PROPOSITION XLIX.—*Proves that the cavities of the heart and large vessels can scarcely be dilated by the simple erosion of their internal surface.*

In order that the truth of this proposition may be made more clearly apparent, it is to be observed that the blood is nowhere moved more quickly and rapidly than through the larger vessels and the cavities of the heart; on which account, when the eroding salts are formed in the fluids and begin to be separated from surrounding parts, and thus to exert their influence, they are either carried away by the force of the whole of the blood, or diluted and weakened by the many mild and bland particles contained within it, so that they cannot dissolve the internal surface of the heart to such an extent that its fibres be eaten away and corroded.

This is fully confirmed by the experience of medical men. For abscesses, erosions, or ulcers are rarely observed on the surface of the cavities of the heart, or between its muscular fibres, or those of its vessels; the eroding fluids being rarely, except in dying people, found separated and quiescent in the larger cavities as they are in the pericardium and the small coronary vessels.

When the exterior of the heart is eroded, or affected with an abscess, we do not consider the patient to be labouring under an aneurism unless, at the same time, an obstacle exist in the canals or orifices of the larger vessels, as will immediately be proved.

PROPOSITION L.—*Aneurisms of the heart and of the larger vessels happen very easily, in consequence of the continued action of the repercussed blood.* 1728.

In order to prove this proposition, it would be sufficient to conclude, from the common observations of all practitioners, which may be read in Bonetus's 'Sepulchretum Anatomicum,' that aneurisms of the ventricles, auricles, vena cava, and pulmonary veins are found in no class of people with greater frequency than in those who have suffered either from a long-continued palpitation of the heart, from any obstinate kind of asthma or catarrh, or from a severe and long-continued distress of mind; for in all of these (however it happens, and in whatever way the cause operates) the free passage of the blood through those vessels and cavities is impeded. It is therefore evident that the cavities can readily be distended by the force of the blood that is driven back.

But in order to explain this hypothesis more clearly and distinctly, we think it best to examine more closely into each one of the above-mentioned diseases, which are, for the most part, the precursors of aneurisms of the heart; so that their nature having been discussed and explained, there may be nothing left that will throw any obscurity upon the subject.

In the first place it may be stated as being beyond a doubt that palpitation is a very common cause of aneurisms of the præcordia, inasmuch, as during palpitation the contractions of the heart are not only increased, but the freedom of the passage of the blood from the ventricles into the arteries, or from the larger trunks of these into their branches is interfered with, on which account the pulse is always, in cases of palpitation, small, irregular, and often intermitting, but never large, full, and regular. In consequence of this it cannot but happen that the blood is forced and beaten back from the arteries into the ventricles, from the ventricles into the auricles, and from these again into the trunks of the vena cava and pulmonary veins (for the impulse of the blood that is driven back overcomes the slight impediment of the flexible valves); and if this morbid condition be continued for any length of time, it necessarily follows that the fibres of the cavities of the heart, as well as of the auricles and the larger venous trunks, become separated and

1728. dilated at those points that offer least resistance. For two opposite impulses meet in these cavities and canals: the first being the direct impulse of the blood, depending upon the organs of respiration and the contractile power of the veins and heart, which clashes against the second, which arises from the force of the repercussion of the blood.

In the second place, when, in long-continued asthma or catarrh, there occurs any impediment either in the vessels of the lungs, or in the organs that force the blood through them, so as to interfere with the freedom of respiration and the proper purification of that fluid, the organs of respiration will be called into powerful action, and the two above-mentioned impulses will come into operation in the vessels of the heart; whence its fibres, and those of the auricles, and of the trunks of its larger vessels will be dilated.

In the last place, in severe and lasting mental distress, a peculiar but not dissimilar action occurs in the præcordia. For in the natural condition the blood must always be propelled properly and orderly at regular intervals from the vena cava into the auricle, from this into the right ventricle, the pulmonary artery, and thence into the pulmonary veins, whence it passes into the left cavities of the heart until it reaches the aorta and the arteries arising from it. Now if from agitation of mind a sudden or inordinate movement occurs (as may happen from the vessels and fibres being contracted and wrinkled) so that the contraction, the pressure, and the action of the solids against the blood do not proceed from the vena cava into the auricle, from this into the ventricle, and thence into the artery, but, on the contrary, from the artery into the ventricle, and from this into the auricle and vein, then the movements of these parts will necessarily be deranged, and the blood being acted against will necessarily lead to a dilatation of the fibres of the above-mentioned cavities.

It may here be observed that the doctrine of the irregular and abnormal contraction of the vessels and the cavities of the heart, which we have just shown as arising from distress of mind, may also apply to any other disease in which a powerfully stimulating humour, being driven against the fibrous texture of the vessels and muscles of that organ, irritates them; which may happen in chronic diseases of the præcordia without any mental

influence. We have frequently seen these irregular and abnormal movements of the heart and arteries excited by an accumulation of serum, and have noticed that they have ceased after a copious diaphoresis or an abundant diuresis, unless the serous fluid being arrested in the præcordia occasions a dropsy of the chest together with the aneurism. 1728.

PROPOSITION LI.—*It is shown that there is nothing easier, when there is a great excess of acrid humours and the blood begins to be driven back, than for the cavities of the heart to be dilated, for the villi of that organ and of the larger vessels to give way, and for an aneurism to be occasioned by the concurrence of these two lesions.*

In whatever way it may have occurred, and wherever the cause of the narrowing and constriction of those channels by which the blood passes through the heart and larger vessels, may exist, and in consequence of which that fluid is repercussed; it will, if it happen in an intemperate person, or in one naturally abounding in acrid and eroding humours, by obstructing and narrowing the orifice of the aorta or pulmonary arteries, easily enable the particles of the deleterious fluid to pass through the smallest rupture that may exist at the points of least resistance the texture of the heart or arteries.

It would clearly appear from this that aneurisms of the heart occur for the most part in those who suffer from hypochondriacal, hysterical, or syphilitic affections. In such persons the disease commences with merely an irritation in the fibres or an obstruction in the cavities of the heart; but, in the progress of time, there is added an erosion or separation of the villi in consequence of a superabundance of those acrid humours that render the texture of those parts on which they fall less capable of resistance.

But the truth of this doctrine may be rendered evident by an opposite line of argument; for as often as the præcordia are affected with those diseases that arise from a somewhat tenacious and acid phlegm, but that are not dependent upon an acrid or eroding one, as are some kinds of leucophlegmasia, or of catarrhs accompanied by a difficulty in breathing, and which are owing to too great a quantity of ingesta, and more particularly

1728. those cases of chlorosis in which palpitations not unfrequently occur from a fault in the density and weight of the blood, rather than from too great irritation, aneurisms very seldom occur, though they happen so frequently in those patients that abound in acrid and eroding humours, as we have already remarked.

Therefore, if to the forces that drive in and beat back the blood, distending the cavities of the heart as if with a wedge, another power that separates the villi be conjoined, it may readily be understood that aneurisms of the cavities and vessels of that organ may, as we have already stated, very easily occur.

PROPOSITION LII.—*How it happens that aneurisms are more frequently met with in the auricles and the coats of the larger veins than in the ventricles and larger arteries of the heart.*

What we have assumed in this Proposition, namely, that aneurisms of the heart occur more frequently in the auricles and veins than in the ventricles and arteries, would scarcely appear to require proof by those who are accustomed to dissection or who are acquainted with the observations of authors, for nothing is more frequently met with in either one or the other of these.

The reason of this will be found in the less degree of resistance offered by the auricles and the coats of the veins than by the stronger and more complicated texture of the ventricles, more particularly of the left one; on which account, the blood being driven back from the large orifices of the arteries into the ventricles, and thence into the auricles and veins, will always exert a greater power of distension in those parts in which there is a less power of resistance; and as the right ventricle, both auricles, and the root of the venæ cavæ, are of a more delicate texture than the left ventricle, it follows that this ventricle is very rarely enlarged, whereas the other cavities of the heart are very frequently indeed found dilated.

A naturally lax and weak formation, either of the whole or part of the heart, renders the dilatation of one or more of its cavities more easy, as I have frequently seen in the inspection of dead bodies.

But as a natural weakness and looseness in the fibres of the vessels, membranes, and organs of our bodies, create a tendency to the stagnation of the fluids and to the occurrence of diseases

dependent upon such a condition, so this very laxity and weakness of the heart, and of the vessels belonging to it, disposes to the occurrence of aneurism of these parts, as can clearly be deduced from the preceding observations. 1728.

PROPOSITION LIII.—*Treats of a bony induration that affects the arteries and valves of the heart, and which is often found in those who have died of aneurism.*

There are very many instances of the arteries and valves having become converted into a bony matter in those who have laboured under aneurism of the heart. There is reported a celebrated case in Ambrose Paré's first book on Tumours, chap. 28, of a tailor, who whilst playing at ball suddenly died from the rupture of the pulmonary artery. On the body being opened, the trunk of this vessel was found dilated, with its internal membrane converted into bone. During life the patient used to say that he felt a strong pulsation of all the arteries, and great heat of the whole of the body.

We likewise have seen in the body of the most illustrious Johannes Baptista Palaggi, a canon of St. Peter in the Vatican, that of the valves at the orifice of the aorta one was osseous and two were cartilaginous, in consequence of which the passage of the blood into that artery was very much impeded. We also found in the same body the vena cava, the auricle and right ventricle dilated to such an extent as to admit the fist, and noticed, not without surprise, that the left cavities of the heart were still strong and unaffected by any dilatation. This nobleman, who possessed whilst alive a remarkable suavity of manner and great erudition, was subject to a hypochondriacal affection, together with palpitation of the heart and an irregular and intermittent pulse, more particularly when he made any mental or bodily exertion; he was likewise troubled with a suffocative asthma and giddiness.

I hope that the reader will pardon me if I relate the very great and probably unexampled fortitude of this patient. For having been attacked in the month of January, 1695, after some epileptic fits, with gangrene of the right hand; as soon as he saw the disease spreading up the arm towards the shoulder he strongly seconded our advice that the limb should be amputated. And

1728. he urgently entreated Marius Cecchini, a very celebrated surgeon who was to undertake the operation, to cut into the living tissues and not into the dead parts, and begged him besides to be of good cheer. He smiled and spoke cheerfully to me, who was assisting, and to some of the priests, so that it might be said that we suffered more pain than the patient. He survived this operation until the spring of the year 1698, when, being affected with a suffocative asthma, he soon died.

The reader may here be reminded how easily, when the vessels about the heart are dilated, humours that are very apt to occasion gangrene may collect. As may be seen by the case reported by Hildanus, (Cent. 2, observ. 99,) of a certain woman, who having for a long time suffered from palpitation of the heart, a slight cough, and difficulty of breathing, was at length seized with gangrene of the left hand, which, as it could not be arrested by any means that were employed, not even by amputation, proved fatal. On the body being opened, an enormous dilatation of the pulmonary artery was found, which is graphically delineated by the author. The reason why gangrene so very frequently arises in consequence of aneurisms of the larger vessels, would partly appear to be accounted for by that eroding and poisonous principle, which, as it gives rise to aneurisms, may also occasion gangrene; and partly by the proper admixture and progress of the particles of the blood being disturbed, on account of the abnormal diameter of the vessel, whence the vital part of the spirits, or the oily and volatile portion of the blood is necessarily lessened and weakened.

We will omit the consideration of those causes which might in the first instance have given rise to this disease in the most illustrious Palaggi, and will only refer to the more immediately exciting ones. These we would more particularly attribute to two principal reasons; namely, to the valves of the aorta having become cartilaginous and osseous, and to violent mental and bodily exertion. With regard to the first of these, the valves having become partly osseous and partly cartilaginous, were prevented by their very hardness from being properly bent and moved so as to be alternately applied to the parietes of the aorta, in order to allow the passage of the blood from the ventricles, and to fall back, in order to prevent the regurgitation of this blood into that cavity, whence the movement of the blood in

the aorta was necessarily very much disturbed, weakened, and deranged: and a disturbance of this kind would infallibly be greatly increased whenever any other causes came into operation; such as violent exertion of the body or of the mind. For a larger quantity of blood than usual being, in consequence of this, driven into the præcordia, where its movement is disturbed and interfered with, it will necessarily be forced back into the left ventricle. Whence it will naturally follow that the return of blood through the pulmonary veins being interrupted, the lungs, which are already suffering from an accumulation of thick lymph, will be still more oppressed by the increased quantity of blood stagnating in them. It may easily be understood how, from all these causes, palpitation of the heart, asthma, and an enormous dilatation of the right cavities of that organ may be induced. Moreover, in addition to the causes already specified, a weakness of the fibres, which in this patient appeared thinner than usual, and a degree of acrimony of the fluids have had not a little influence in exciting the disease. 1728.

Although the obstacle to the passage of the blood may be situated at the orifice of the aorta, it does not on this account follow that the dilatation should occur in the left cavities of the heart, and indeed it more frequently happens in the right, on account of the less degree of resistance in their fibres. When it occurs in the left side it is more frequently met with in the auricle than in the ventricle, as would appear from the case related by Josephus Bonetus, (book ii, sect. 7, obser. 49, of his Anatomia Practica,) on the authority of Daniel Horstius; in which the semilunar valves of the aorta being ossified, the left auricle appeared larger than the right.

Besides, the same cause that gives rise to an ossification of the membranes and tendons may tend to occasion the aneurism. For these parts become ossified in consequence of the want of an alkaline humour, by which their coats and delicate texture may be moistened, so that they may be preserved in their natural flexible condition; when deprived of this they become dry, rigid, and hard.

On account of the same want of mild and oily particles, the fluids become more acrid at the same time that the solids become indurated. For the saline particles that float in the fluids run together and unite, and lacerating and eating into the

1728. fibres of the heart and vessels occasion their dilatation, and the consequent formation of aneurisms.

PROPOSITION LIV.—*On aneurism of the heart from long-continued mental disturbance.*

It is not a novel fact to those who have been long engaged in practice that aneurisms of the heart may originate from long-continued mental disturbance. We have, in this very year in which we are writing, seen many men as well as women naturally of weak habit of body, who have become affected with aneurism of the heart in consequence of excessive fear occasioned by an earthquake; and we have known others who laboured under the same disease in consequence of extreme jealousy or sudden frights. There may be read in the fourth book, 20th chapter of the 'Catoptron' of Andreas Cesalpinus, a case of aneurism of the whole of the heart and pulmonary artery in a man who had often suffered from palpitation of that organ in consequence of a violent ecstacy, which is a disease of the mind as well as of the heart.

The reason why disturbance of the mind, if it be severe and long-continued, is apt to occasion dilatation of the vessels of the heart, should be looked for in the fluids as well as in the solids of the præcordia, which are much changed in consequence of the disturbed state of the mind.

With regard to the fluids, who is there that does not know that if the movements of the blood be disturbed by affections of the mind, the excrements will become more acrid, and will even remain within the body, in which case they may easily be arrested in the præcordia, wherever a structural lesion has occurred.

This lesion can readily be understood if we reflect upon the use of those two remarkable nerves, which anatomy has shown us are distributed to the two principal arteries of the heart, and which the celebrated Willis has graphically delineated in his work 'De Medicamentorum Operationibus' (sect. 6, cap. iii, p. 104,) and if we recall to mind what has been mentioned above in Proposition XLI, in which we have proved that aneurisms of the heart may easily happen from the long-continued action of regurgitating blood. For the arteries of the heart being convulsed,

and constricted by the nerves, it necessarily follows that the movement of the blood through the præcordia must be irregular and regurgitant, as is clearly shown by the palpitations of the heart, the anxieties, the irregularity of the pulse, and other symptoms of a similar kind, which are frequently observed in those who labour under severe distress of mind, and which, if they continue long enough, must necessarily give rise to an accumulation of acrid ichor in the weaker parts, and thus gradually occasion those aneurisms that follow them. 1728.

PROPOSITION LV.—*On those aneurisms of the heart that arise from violent movements, but more particularly from the straining of the organs of respiration.*

A not unfrequent cause of these aneurisms is a violent straining of the muscles of the chest and diaphragm. There is still living a hatter who, in consequence of too great exertions, especially of an afternoon, in beating the felt of which hats are made, and inhaling at the same time coal-smoke mixed with a watery vapour, gradually became affected with dilatation of the pulmonary artery. Public speakers, and players on wind-instruments are also, if they be naturally of a delicate habit of body, and addicted to drinking, peculiarly liable to aneurism of the heart.

But there is not a more marked cause of these diseases than the complication of acrid, sulphureous, or aromatic nourishment with the violence of the venereal orgasm; for the vessels being distended to a greater extent than natural in consequence of the force of the pulsations, and the violence of the straining of the muscles during connexion, both above and below the diaphragm, as well as by the irregular contractions of the vessels of the heart, the flow of the blood is necessarily retarded, and it is driven back into the præcordia, where, as it is of an acrid and sulphureous nature, it dissolves, separates, and corrodes the bundles of fibres.

But as a remarkable case arising from this cause occurred to us about two years ago, which we were enabled to follow up to the autopsy, it may be interesting to the reader to have it related.

1728. PROPOSITION. LVI.—*The history of a case of aneurism of the pulmonary vein, and of the left auricle and ventricle, arising from an acrid and eroding condition of the blood.*

[The Abbé Pennoni had been for three years subject to a spitting of blood and of tenacious viscid lymph, which was arrested by astringent powders. A short time after this he noticed a deep-seated pulsation at the bottom of the ensiform cartilage, which became more distinct when he made any mental or bodily exertion; besides this, he suffered from breathlessness and a tendency to catarrhs, with a troublesome moist cough: the pulse was very irregular and intermittent. Œdema of the feet, vertigo, and tension of the hypochondria gradually came on, and he died of dropsy of the chest.]

And although we were not allowed (in consequence of the foolish scruples of the relatives) to examine the body, so that we are compelled to reason upon the subject without direct evidence; yet, being guided by the analogy of similar cases, we think it most probable that the hemoptysis having been checked, an eroding and acrid lymph was driven by the power of the circulation to the left ventricle, and thence passed into the pulmonary veins and the extremity of the auricle, where it gave rise to an aneurism by corroding the villi of the internal coats. The principal symptoms of which are oppression about the heart, fainting, breathlessness, and pulsation under the ensiform cartilage, in consequence of the heart, which is suspended by its own vessels, falling down somewhat on account of its bulk.

We think that the following corollaries may be deduced from what has been stated in the history of this case:

In the first place it is probable that the salutary hemoptysis, by which the patient's life was preserved, had been excited by the eroding lymph which, being poured out from the pulmonary arteries into the air-tubes and vesicles had made a passage for the blood by eroding the membranes, by which means a quantity of it, abounding in salts, was discharged with advantage to the patient, as is the case with the critical flux from piles. But when the hemoptysis was arrested by the use of astringent powders, which ought particularly to have been avoided, it necessarily followed that the morbid humour was compelled to flow back into the left cavities of the heart, where,

by its eroding qualities, it still farther weakened the parts that were already disposed to dilatation. For it is almost always observed in hereditarily asthmatic subjects that the coats of the vessels carrying blood from the lungs into the heart are weakened, and hence when the occasion offers itself they readily become dilated. And so true is it that the greatest number of cases of difficulty of breathing that occur during bodily exertion are attributable to aneurism of the pulmonary veins, that the very celebrated Peter Poterius says as follows, (Cent. 3, Observationum, cap. 22:) "There is a certain kind of difficulty of breathing that arises in those who are walking about. In this state there is such a degree of weakness that those affected by it are either obliged to seize hold of the nearest support or else fall upon the ground; these for the most part die suddenly. In this disease the pulmonary vein in the left side of the heart gives way, and the blood and spirits being effused, suffocation ensues." 1728.

In the second place, when this kind of aneurism has once commenced, it should not be treated by copious and frequent bleedings, which weaken the blood and tend to render the eroding salts more active, but rather by bland dissolvents and vulneraries, such as the cerusa stibii, goat's blood, syrup of turpentine, and similar things. For I remember another case in which the pulmonary hemorrhage having been suppressed by an empiric, the disease was cured when this returned.

The third corollary will be the origin of the dropsy, which we have elsewhere said not unfrequently accompanies internal aneurisms when the lymphatic as well as the sanguineous vessels are oppressed and eroded, and serum as well as lymph is constantly being effused into the cavities.

PROPOSITION LVII.—*Explains mechanically the reason why, in dilatation of the trunks of the cavæ, and of the right auricle and ventricle, the jugular veins alternately dilate and collapse, undulate, and are agitated in a very extraordinary manner.*

There are two consequences of the dilatation of the right auricle and ventricle that deserve the utmost attention, and which principally occasion this alternate dilatation, and collapse of the jugular veins. These cavities, being in the first place dilated

1728. and enlarged to the utmost, a great quantity of blood will be contained in them. Then the orifice of the vena cava becoming dilated to such an extent that it cannot be entirely closed by the valves, it follows that, when the heart contracts, the blood is not only driven from the right ventricle into the lungs through the pulmonary artery, but is also, on account of its large quantity, and of the orifice of the vena cava not being sufficiently closed, forced back into the whole course of the superior cava, and is carried from this vessel more directly and with greater force into the jugulars than into the other branches of the cava, as they are situated more immediately in the direction in which the blood moves. Wherefore a kind of eddy or undulation being occasioned by the increased quantity of blood as well as by the meeting of the currents moving in opposite directions in the jugulars, these vessels necessarily become distended at this part. And this dilatation is more perceptible in the neck, as there is nothing there to compress or cover them except the common integuments. When the systole of the heart has ceased, the blood flows back again from the jugulars into the cava; on which account they alternately swell and collapse.

This symptom is of such importance in diagnosticating dilatations of the right cavities of the heart, provided it continues whilst the patient is lying down and is not disturbed by any movement of his chest, that it is wonderful how often I have (contrary to the opinion of other physicians, who thought that the patient was labouring under dilatation of the left cavities) been able confidently to pronounce the case to be one of aneurism of the right side; about which symptom also authors are profoundly silent, although it presents itself at once to those who examine nature by opening dead bodies.

But a similar pulsation in the jugulars, that is of daily occurrence in unmarried girls affected with chlorosis, and which is not attended by any dilatation of the right cavities of the heart, may be urged as an objection to our theory. And indeed I have more than once been obliged to turn over in my mind this fact before I could discover the cause of the difference. In girls this pulsation is principally observed at a time when the flow of blood through the veins into the heart is increased by going up ascents; and as the blood is heavier and thicker, its circulation through the lungs is impeded by the state of the

vessels, which are at the same time partly obstructed, partly compressed and convulsed, and thus the contractions of the right cavities of the heart, by impelling a portion of the blood towards the cava, forces it back into the jugulars. In those persons indeed who suffer from a dilatation of these cavities, the pulsation of the jugulars continues even when they are at rest. But if it happen that girls when sitting still are affected with this disease, and, if it have continued a long time and have not yielded to chalybeate medicines and viper's broth, we may suspect the existence of the above-mentioned dilatation (as we have already observed); for the thickness and acrimony of the blood may, in the progress of time, over-distend and erode the fibres of the heart, whence they gradually become weakened and dilated. 1728.

But if a pulsation of the jugular veins occur in a man or woman who is not labouring under any other obstruction or under chlorosis, and continues for a long time with the other symptoms of dilatation of the cavities of the heart, the physician may safely pronounce the case to be one of aneurism of those parts.

Whilst we were correcting this for the press, we met with the following observations by Homberg, which are inserted in the Memoirs of the Academy of Sciences of Paris for 1704, page 159. They are as follow: "A woman, thirty-six years of age, consulted me for a disease of the lungs under which she had laboured for six years. Her symptoms were a severe asthma, a frequent and intense headach, with constant watchfulness, and pain in the chest; whenever she moved in the least the asthma was increased, and violent palpitation of the heart came on, which lasted from one to six hours; she was also troubled with other attacks, by which she was brought to the point of death. During the time that she suffered from the more violent palpitations and asthma, she also laboured under a violent and very evident pulsation of the veins of the neck and arms which differed little from that which affected the arteries. This pulsation in the veins followed exactly the movement of the heart."

In order to account for this movement in the veins, he gives the dissection of the body, by which it was found that the heart was more than double its natural size, and very flaccid. The

1728. cavities were larger, and their walls thinner than usual; there were also found in the trunks of both arteries polypi adherent to the heart, and which extended down the aorta to a distance of two feet. The author suggests that the pulsation of the veins might depend upon the blood; which, as it would pass into the heart without any difficulty, there being no polypus in the veins, would be arrested by the polypi in the arteries, and thus necessarily filling the right ventricle, would excite convulsive contractions and palpitations, whence the blood that was contained in the veins would be driven back at the time of the impulse into the cavæ, and would, on account of its violent regurgitation, communicate to the veins in the neighbourhood of the heart a pulsation similar to that which occurs in the arteries; and as these pulsations would be occasioned by the convulsive contractions of the heart, they would follow them exactly.

PROPOSITION LVIII.—*In which the following problem is solved: How it happens that, in old aneurisms, the pulsation gradually decreases, and at length is no longer perceptible, or disappears entirely.*

As we have here stated a circumstance that may perhaps not be believed by those who have only attended to the subject in a superficial manner, we will produce the very weighty testimony of two most celebrated men, Marcus Aurelius Severinus and Frederick Ruysch, who have observed this peculiar occurrence in large aneurisms, and which we have likewise remarked in persons who have for a long time been affected by this kind of disease. This fact ought more particularly to be noted by surgeons; for pulsation is believed to be so unusual and pathognomonic a sign of aneurism, that it is not thought possible that this disease can occur without it; indeed, unskilful surgeons have often, by falling into this mistake, incurred the ridicule of the profession, as well as done irreparable injury to their patients, by rashly opening, either by the cautery or the knife, aneurisms that did not pulsate; unfortunate examples of which may be found in the works of Dekkers and Ruysch, to which we will also add a dreadful instance in its proper place.

But in returning to the subject of our proposition, we find that

the cause of the absence of this symptom has not been accounted for in the same way by all writers. Marcus Aurelius Severinus (de Obs. Nat. 178) states that the pulsation disappears in consequence of the putrefaction of the artery itself, by the blood effused in the neighbouring spaces becoming putrid; and he endeavours to prove the accuracy of this explanation by a very remarkable case that he relates. Frederick Ruysch, in his 38th Observation, endeavours to account for the fact by the resistance which the accumulation of coagula within the aneurism offers to the impulse of the blood. 1728.

But although I have no doubt but that one of the causes of deficient pulsation may exist in the resistance offered by the grumous and polypous incrustation of the aneurismal tumour to the passage of the blood; yet I cannot allow that this resistance is sufficient of itself, unless there be conjoined with it a diminution of the power of the heart in propelling the blood, more particularly as Ruysch (p. 52) states that he found in the case of aneurism that has been alluded to, that the pulsation, which used to be most violent, ceased entirely a few weeks before death. Now if it be assumed that the power of the heart's action continued the same, it necessarily follows that the impulse of the blood acting from without would have been able, during the time that has been mentioned, to overcome the resistance of the polypous concretions that were opposed to it, since it can raise up and even separate the bones themselves.

But besides the reasons that have been adduced, I am persuaded by the fact that the remedy that is of most avail in lessening the impulse of the blood against the coats of the aneurism and in diminishing its pulsation, is bloodletting. For as soon as blood is taken away, the pulsation in the affected part is immediately observed to be much weakened. This does not happen merely because the quantity of blood being lessened, it occupies less space, but more especially because the force of the heart's action is necessarily diminished in consequence of the loss of blood, which acts both by weakening the animal spirits, as well as by the blood being driven in smaller quantity and with less force into the coronary arteries when the ventricles contain less than usual.

1728. PROPOSITION LIX.—*Explains how it happens that in large aneurisms of the arteries in the neighbourhood of the heart all the arteries in the body appear more slender than usual, and the greater part of them are also irregular; but that, if the aneurism occurs in the arteries of the limbs, this slenderness and irregularity is only perceived in the artery that is situated below the part affected with aneurism.*

The solution of this problem depends entirely upon a knowledge of the causes of the size and regularity of the pulse in its natural condition. There are, as we have already pointed out, three circumstances that conduce to the regular movement of the blood: these are, a certain bulk and fluidity of the blood; a certain power of the heart; and a certain figure, diameter, and resistance in the vessels themselves. But, in order not to repeat uselessly and *ad nauseam* those circumstances, by which the pulsation may be rendered irregular without disease, we will only consider the shape and diameter of the arteries; for if these be either wider or narrower than the natural shape of the body requires, the movement of the blood will be disordered and disturbed; for unless the diameter and shape of the vessels correspond exactly to the propulsive power of the heart, they will either interrupt, or retard, or repercuss, or accelerate, the movement of the blood; which cannot happen without giving rise to an irregularity in the pulsations of the arteries.

If the trunk of the aorta be in any part dilated by an aneurism, the blood which is driven from the heart through its canal will, when it reaches the cavity of the tumour, be immediately retarded, in accordance with the laws of hydrostatics, on account of its passage from a narrower into a wider space; hence that which passes into the arteries beyond this point will be slower and more sluggish in its movements, and will thus cause the pulse to be smaller and weaker.

The same fact may be observed in rivers, which, when they suddenly pass from a confined channel into a very large and wide lake, or into a large subterraneous cavity, become less rapid in their movements, in proportion to the size of the lake into which they fall. We see the same taking place in certain conical and oblong vessels made in such a way that they are alternately narrowed and dilated; so that when fluid is poured

into them it is alternately accelerated and retarded as it runs through the narrower or wider parts. 1728.

When the aneurism occurs in certain arteries, as, for instance, in the axillary or popliteal, then the irregularity and smallness of the pulse, is only perceptible in that part of the vessel that is below the tumour. Thus Harvey, in his 'Exercitatio de Motu Cordis,' page 36, relates the case of a patient labouring under an aneurism of the lower part of the subclavian artery, near the axilla, in whose arm the pulsation was exceedingly feeble, on account of the movement of the blood being interrupted by its influx into the tumour.

And hence may be deduced the reason why physicians ought not to trust merely to an examination of the pulse at the wrist, when, as Celsus truly observes, a thousand circumstances may cause it to vary; a mere change in the shape or diameter of the artery, occasioned by a momentary spasmodic affection of the neighbouring muscles or nerves being capable of making it irregular. In connexion with this we may remark, that some persons who desire to feign disease of the præcordia are accustomed, when they give their wrists to be felt by the medical man, to contract the biceps muscle as strongly as possible, by which means the axillary artery, as well as those that pass down to the hand, being unequally compressed by the stretched fibres of the muscle, the pulse at the wrist is rendered unequal in its rapidity and strength. It is therefore of much importance to know the various ways in which preternatural phenomena may be induced, and also the cunning of depraved and crafty minds; for if he be ignorant of these, a well-informed medical man even may be deceived.

But I agree with what some practitioners may suggest, that in aneurisms of the venæ cavæ, and of the right auricle and ventricle, the pulse is not small and irregular, but is, on the contrary, for the most part, large, tense, and regular; and that therefore it does not follow that in every case of aneurism the pulse should be small and irregular.

I am not ignorant of this, but freely confess that it may occur; however, even if it do so, it does not influence my position, as there is a difference between an aneurism that occurs in the arteries and the left cavities of the heart, and one in which the trunk of the vena cava and the right cavities of that

1728. organ are dilated; for when the first occurs the existence of the aneurism may be ascertained by the irregularity of the pulse, as has already been proved; but when the other happens the pulse is generally observed to be large and regular, the cause of which we will explain in the next proposition.

PROPOSITION LX.—*Explains the reason why, when the trunk of the vena cava and the right auricle and ventricle are dilated, the pulse is usually large and regular.*

It is in accordance with experience, that when the right cavities of the heart are enlarged beyond their natural diameter, the pulse is full and regular, unless there be likewise disease of the left cavities or of the aorta; and I have seen very skilful physicians so far deceived by these conditions of the pulse, that they have obstinately contended that the vena cava and adjacent parts could not be affected with any dilatations, merely because there was no irregularity in the pulse. They have, however, been abundantly convinced of the truth of my statement when the patient died.

But the reason of the occurrence of a full and regular pulse in the disease in question (provided there be no dilatation of the left cavities and the larger vessels) depends entirely upon the fact that, in consequence of the dilatation of the trunk of the cava and of the right auricle, there will be a smaller quantity of blood passing from the cava into the right side of the heart. For the fibres of the vena cava being relaxed, the power by which the blood is forced into the ventricle will be impaired, and consequently, as often as the tone of the fibres is lessened and the cavity of the vein is enlarged a portion of the blood will, by accumulating in it, offer a mechanical obstacle to the return of the blood from the smaller and even the most minute veins towards the heart. This will occasion the orifices of the arteries to be filled to a greater extent than usual with blood that is slowly circulated. In consequence of which, the passage of the blood from the arteries into the veins being less rapid and free than usual, the blood which is propelled from the heart into the arteries at each pulsation, though it be in smaller quantity than natural, causes the pulse to appear fuller, the arteries being much distended, on account of the impossibility of the same quantity

of blood passing from them into the veins that they receive from the heart. 1728.

We not unfrequently find the same occur in dropsy of the chest and in leucophlegmasia, in which diseases the pulse is full and regular; not, indeed, on account of the good qualities of the blood or of the power of the heart, but in consequence of the free passage of the blood from the extreme arteries into the veins being prevented by the obstacle that it meets with in the cava or its branches.

But if any one, urged by a thirst of knowledge, will inquire how a physician can diagnosticate with certainty, or nearly so, the existence of a dilatation of the vena cava or of the right cavities of the heart, we may answer, that in addition to the oppression of the chest and the violent palpitation, another symptom exists, which may be justly said to be pathognomonic. This is a marked pulsation and undulation in the jugular veins, which has by some been mistaken for a pulsation of the carotids. The causes of this we have already pointed out in Proposition LIII.

PROPOSITION LXI.—*The reason why in large aneurisms the external surface of the dilated artery is incrusted with a thick and polypous blood.*

It is well known that in large aneurisms, and more especially in those in which the artery is either very greatly dilated, or, having given way, is distended into a bag, a sort of polypous and grumous arch is formed, which incrusts and protects with its laminæ, which are closely applied to one another, the remaining coats of the artery that have been weakened by distension. The celebrated William Harvey was either the first to discover, or, at all events, to the best of my knowledge, the first to publish an account of this apparently fleshy bag. In his 'Exercitatio de Circulatione Sanguinis,' are the following words: "An aneurism occasioned by the ulcerated coats of an artery has not the tunics of the vessel dilated, but consists of a cyst surrounded by membranes and formed of a fleshy substance."

The same thing may be seen (by those who have not had an opportunity of observing it in the dead body,) accurately delineated in Observation 18, of the first year of the first century, of the 'Observat. Curiosorum Naturæ Germaniæ,' in which is repre-

1728. sented an aneurism with two investments or layers of coagulated and fibrous blood. There is also an accurate description of the same thing in the 38th Observation, by Frederick Ruysch; where he relates, that amongst the other things that were seen by him in a large aneurism of the chest, he found a body composed of lamellæ, or of innumerable thick, fleshy, and sufficiently tenacious layers placed one above the other, and between which a considerable quantity of coagulated blood was found; which observation answers perfectly to what we have ourselves seen several times in the examination of dead bodies. Our observation may be found in Chap. II, Proposition XXII, in the account of aneurisms arising from contusions.

This symptom having thus been proved to occur, it remains for us to investigate its causes, for it would appear difficult to explain how a concretion of a polypous and grumous substance could take place within an aneurism when the pressure of the blood from without would appear to be sufficient to prevent such an accumulation of thick humours. Certain facts, however, that we will presently mention, easily explain this occurrence by the known laws of the actions of the animal body.

In the first place, the blood is not a simple but a heterogeneous fluid, composed of different parts, solid as well as liquid, thick as well as thin, into which a current of glutinous chyle is poured, at least twice every day, in sufficiently large quantity, which chyle is immediately mixed with the blood by its internal movement, and being made thinner by the attrition and collision of the particles is rendered very subtile and volatile.

In the second place, we may state, that in order to mix the chyle thoroughly with the blood, many things have been prepared by nature, but above all, a proper shape and diameter and an active or peristaltic movement of the vessels. Now if these be disordered in consequence of any affection of the solids, it necessarily follows that an abnormal condition of the fluids of the body will also manifest itself; but more particularly the exact admixture of the fluids with the solids, of the thicker with the more subtile constituents of the blood, will be disturbed, so that the heavier, more fibrinous, and less moveable parts of this liquid will stagnate in the affected places.

The explanation of this Proposition, which is otherwise difficult, is rendered easy by these two circumstances; for as it is

certain that the larger an aneurism is, so much the more rea- 1728.
dily are the figure, diameter, and peristaltic movements of the artery liable to be affected, those fibres which are necessary to render its canal elastic or contracted being weakened, or altogether destroyed, it follows that the blood being a heterogeneous mixture and abounding in chyle, will, when driven by the impulse of the heart into the cavity of the aneurism move there more slowly; partly because it passes from a narrower into a wider portion of the artery, whence, according to the laws of hydraulics it must be retarded; partly because the coats of the sac or of the dilated portion of the artery being ulcerated and torn cannot contract, and thus either properly propel the blood as it flows past, or even propagate the impulse of the heart. But the movement of the blood being diminished, and the particles of the chyle not being properly mixed up with it, many of them being specifically heavier than the others, separate, and, coalescing concrete into fibres, of which the different lamellæ that form the mass of the polypus are afterwards composed, and from these the arched contents of the aneurism are afterwards formed.

Since the parts that more rapidly separate from the blood wherever it may be arrested, are chiefly of two kinds, namely, the chylous or crude, and those that are too much concocted and which abound in earthy or saline matters, it necessarily follows that in the aneurismal sac there are found mixed with the polypous layers (which are the nutritious and chylous parts) clots of very black blood, which are nothing else than a collection of particles of blood that have been too much concocted, or, I might say, the earthy, saline, and tartareous lees of the old blood.

The circumstances relating to the accumulation of the polypi and coagula in aneurisms that we have just exposed, will not appear difficult to any one, although he may not be much versed in the study of the more abstruse anatomy, and of the operations of the animal body, provided he is acquainted with the laws of the movements of torrents and rivers, as explained by the celebrated P. Benedictus Castelli, in his excellent work 'De Mensura Fluentium Aquarum.' This author has shown in his corollary that, if the rapidity of the movement of a torrent of turbid water be arrested by its passage into a lake, then a certain quantity of the turbid, thick, and heavy matters will be precipitated, so

1728. that the bottom of the lake, will be raised up by a muddy, and I was on the point of saying, a polypous deposit.

Two circumstances that are occasionally observed in large aneurisms may be deduced in the form of corollaries, from what we have just proved.

One is, that this arched incrustation everywhere serves as a support to the ruptured and dilated coats of the artery taking the place of a membrane and closing them up tightly, lest the impetuous current of blood bursting into the neighbouring cavities and spaces might occasion the death of the patient. And nature is, even in an abnormal condition, so full of resources and so industrious, that in the same way as she supports with ivy walls that are crumbling and tottering from age, so does she strenuously endeavour to support, by implanting a disease, the life that would otherwise quickly be lost.

The other diseases that are occasioned by large aneurisms in the neighbourhood of the heart, and which always happen in the course of time, are leucophlegmasia and dropsy, which arise in consequence of the dilatation and want of propulsive power in the pulmonary artery and aorta, interfering with the proper mixing and incorporation of the chyle and lymph with the blood; whence the serum and fibrine gradually separate from the more subtile parts of the fluids, and easily accumulate in those parts (such as the feet and legs) in which the impulse derived from the heart becomes feeble. In this way leucophlegmasia, ascites, and dropsy of the chest occur; because the humours increasing, and becoming daily more acrid, all the lymphatics of the viscera swell, are obstructed, and eroded. And this kind of dropsy is by so much the more dangerous and incurable than others, as the disease of the fluids cannot readily be cured by art or nature. I have sometimes seen patients in a most deplorable and wretched condition, who, having fallen into the hands of unskilful and incautious physicians, and being treated by such remedies as will cure dropsies arising from a primary disease of the fluids, have been, when the disease is produced by a great dilatation of the arteries and by a corrosion of their coats, quickly and cruelly killed. So true is it, that no treatment is sometimes better than an unskilful one. Forgive, I beseech you, reader, the author's freedom of speech, but he can say with Epimetheus

"Felix quem faciunt aliena pericula cautum."

A. MONRO.[1]

The curious and accurate account of the aneurism which was shown to me before it was sent you by a gentleman, to whom I stand indebted for many obliging acts of friendship, and Mr. Macgill's desire that I would endeavour to explain the nature of this disease, which appears neither to have been exactly examined, nor rightly understood by chirurgical writers, have given rise to the following remarks on the coats of arteries, their diseases, and particularly on the formation of the aneurism; and, as a sequel to this, I shall soon lay before you some figures of the arteries of the arm, accompanied with a few reflections on the aneurism occasioned by venesection, which is by much the most frequent that admits of any cure. 1733.

In several parts of the body arteries receive a strong firm covering from the contiguous parts, which has been described as their exterior coat; such as the membrane that surrounds the aorta, while it is within the pericardium; the pleura and peritoneum spread over the descending aorta in the thorax and abdomen, &c. But seeing this coat is only to be observed in some parts, where particular purposes are to be served, such as strengthening an artery, where it is more than ordinarily exposed to the stretching force of the circulating fluids, counteracting the resistance made by some solid body on its opposite side, saving it from compression, &c.; I think it ought not to be considered, when we speak of the coats of arteries in general.

All arteries are covered externally with a cellular substance, composed of very fine pellucid membranes, which are capable of being stretched, even suddenly, to a great extent, without breaking; and they collapse as quickly when the stretching force is removed. There is always more or less of an oily liquor contained in the communicating cells of this substance; and the proper vessels of the arteries run in it, spreading branches everywhere on

[1] Remarks on the Coats of Arteries, their Diseases, and particularly on the Formation of an Areurism; by Alexander Monro, Professor of Anatomy in the University of Edinburgh.—Medical Essays and Observations, Edinburgh. Vol. 2. Edinburgh, 1771. 5th edition.

1733. the cells for the secretion of that oil. When either the membranes are distended by a liquor thin enough to enter the cells, or when the exterior part of the membrane is gently drawn, the cellular texture is very evident; but when a gross substance is forced into the more internal part of this cellular membrane, it conceals the fine threads of the membranes mixed with it; and, whenever the cells are empty, they collapse so close together, that the whole appears to be one membranous coat, consisting of several layers.

All arteries are surrounded with such a substance as I have just now described, and therefore it may be reckoned one of their coats; though I must observe that the same kind of cellular substance is common to, at least, all the flexible parts of the body, where every little fibre is connected to another by the same contrivance. See Boerhaave's preface to his edition of the 'Autores varii de Morbo Gallico.'

This cellular substance of the arteries serves to connect them to the surrounding parts, without hindering or disturbing their actions or motions; it prevents their being so readily compressed; it gives a safe passage to the vessels of their other coats; it contains oil for lubricating and keeping the interior coats flexible.

What really deserves to be called the first proper coat of the arteries is the muscular or tendinous, which, in the human body, at least, consists of annular fibres connected strongly together. It is to these principally that the recoiling of an artery is owing, after it has been distended by the superior force of the systole of the heart; and the elasticity of the substance connecting the annular fibres, which is of the cellular kind, is very remarkable in the quick contraction of an artery, after it has been stretched longitudinally.

The most internal coat of arteries cannot be rightly observed while they are sound and recent; because it is so thin, and adheres so firmly to the muscular coat, that it appears in form of a very thin layer of longitudinal fibres; but after the arteries are kept some time, and their texture becomes more easily unravelled by the beginning putrefaction, it separates very easily, and shows numerous inequalities on its interior surface, with vessels dispersed on it, and a cellular substance is seen connecting it with the muscular coat. But there is no appearance of any muscular structure in it, and it tears very soon upon at-

tempting to distract or stretch its fibres; so that it would seem 1733.
to bear a very strong resemblance and analogy to the villous coat of the intestines, whose proportional greater distensions and contractions above what arteries ever suffer, and thicker *tunica cellularis interna*, will account for the papillæ and rugæ, so much more observable in the guts than the arteries. I suspect it must be this coat which Mr. Winslow[1] calls the duvet, which he affirms he saw filling up the cavity of the small secerning arteries of the glands, and on which he builds his account of secretion. I imagine it a membrane analogous to this, which, divested much of its cellular substance, forms the valves in the veins.

This interior coat will prevent any particles of our fluids from insinuating themselves into the cellular substance of the other coats; it renders the surface of the arteries more smooth and polished than otherwise it would be; and we may conclude, from the analogy of other parts, that its vessels separate a liquor to protect and lubricate its own interior surface.

From the texture of the external cellular coat of arteries, as above explained, it is evident that obstructions are very apt to be formed here, which, according to the different series of vessels in which the obstruction is, and the different natures of the obstructed liquors, will produce various diseases, as well as in the *tunica cellularis*, elsewhere in the body, which is the seat of numerous diseases that are said by authors to affect other parts. To take but one example of the many which Boerhaave[2] names; here it is that inflammations are placed; this it is that melts down into pus in all its suppurations. Let surgeons reflect whether ever they saw the proper muscular fibres dissolved into pus; or if firm membranes, ligaments, the skin, &c. do not cast off in sloughs, when they are eroded. Let those who examine the bodies of people dead of pleurisies, inflamed guts, &c. remark whether the membranes said to be affected are not entire, and the pus is not collected in the cellular substance under the membrane. But to return to the present subject: the diseases of the external cellular coat of arteries may serve to diminish the diameter of the artery, if they compress it. If the oil

[1] Mém. de l'Acad. des Sciences, 1711. [2] Præfat. in Autores de Morbo Gallico.

1733. in the cells becomes too thin, or only lymph is contained in them, the muscular coat may be too much relaxed. If there is too small a quantity of the moistening liquors, the artery loses that flexibility that is necessary for it; and if the morbid matter becomes acrid, it may erode or destroy the muscular coat, though this will be done with difficulty, because of its firm texture. Hence we daily see large arteries long soaked in the pus of abscesses without any hemorrhage.

The muscular coat will be subject, as well as other muscles, to too great rigidity or laxity, to convulsive contractions, or paralytic affections, though these will not show themselves evidently, because of the action of the heart upon the artery, and of the elasticity which this coat has, independent of the circulation. What was said of the texture of the most internal coat will naturally lead one to think that it must be subject to diseases, and that these will be much akin to the maladies of the external cellular coat, allowance only being made for the violent compression which the internal one must always suffer, from the impetuous stream of blood on one side, and the brisk reaction of the muscular coat on the other; the effects of which may be readily enough understood from what I have had occasion to say elsewhere[1] on such compression.

It is only in the cellular membranes of this interior coat that ever I saw any of the bony or calculous concretions of arteries. I have more than once observed the cavity of a large artery almost blocked up by a steatomatous thickening of this coat, and frequently I have observed purulent matter collected in it.

Notwithstanding the morbid state of this coat, and of its cellular membranes by which it is connected to the muscular coat, offers itself so frequently to the view of those who dissect the human body, practical authors and observators have not been at pains to remark how far the animal economy was thereby disturbed; I offer the few following conjectural queries to their consideration.

May not diseases here often occasion great inequalities and irregularities of the pulse? May not a *tabes purulenta* have its

[1] Accounting for Ossification in the anatomy of the human Bones, Part I.

seat here, without any bowel being affected? Will not a small erosion of this coat, and a consequent oozing of the blood through the cellular texture of the other coats, more naturally account for the ecchymoses that happen so frequently in diseases, where the blood is acrid, than breaking of the vessels can do? 1733.

Are not the small vessels, where the motion of the fluids is slowest, more liable to suffer this erosion than the larger ones are?

The preceding account of the coats of arteries may let us see that no aneurism can happen unless through some fault of the interior coats; therefore it will be necessary to take a view of the several ways these coats may be so vitiated as to give any chance for the formation of an aneurism.

1st. A large opening made into an artery, with a proportional aperture in the teguments, produces only an hemorrhage; but if the external orifice in the skin is so small as not to allow the blood to escape as fast out at it as it flows from the artery, the neighbouring cellular membranes will soon be filled with blood; the member becomes everywhere swelled and discoloured; and, in short, what is generally called a bastard aneurism is formed.

2d. If the aperture into the artery is very small, and the blood cannot escape through the teguments, it will coagulate before it can be pushed to any considerable distance from the orifice by which it escaped, and thereby an obstacle will be made to the succeeding blood's spreading in the *tunica cellularis*, which soon will be formed into a lamellated membrane, by the oil being squeezed out, while the extravasated blood becomes firmer and harder, so as to appear of the polypous consistence, by the pressure it suffers. I had sometimes occasion to be much surprised at seeing how soon such a change can be brought on the arterious blood; the instances I mean are where, after a limb was amputated, the patient's faintness hindered the arteries to spring as usual, by which one lay undiscovered, and was not stitched, but in a few hours after the dressings were put on occasioned an hemorrhage, notwithstanding the bandages had been tightly applied, and an apprentice pressed strongly with his hand on the end of the stump. When the wet dressings were removed, I saw the clotted blood on them become

1733. firm, of a pale colour, and having the appearance of a fibrous texture.

Since then such coagulated blood is contained in a membranous substance, the disease, in the case we have supposed, will have the appearance of a circumscribed encysted tumour, which the pulsation of the neighbouring artery and the jet made at its open orifice will communicate a pulsation to, till either the bulk of the swelling, the quantity of liquor below the coagulum, or the great resistance of the parts stretched on the tumour, render the vibration imperceptible; and, till once the polypous concretion turns very large, the tumour will become less on compressing it strongly, by the fluid blood being forced back into the artery through the perforation in its coats; that is, a tumour attended with all the symptoms of what is called a *true aneurism* is formed, though the principal part of the ordinary definition, viz. the distension of the proper coats of the artery, is wanting.

3d. If the muscular coat only is perforated, the interior coat will be pushed out at the interstice of the divided fibres, and, not being capable of being stretched far without breaking, the case is soon reduced to one or other of the two former suppositions.

4th. If part of the muscular coat only has suffered a solution of continuity, the remaining fibres are either able to resist the force of the blood without being distracted beyond their natural tone, in which case they will reunite, especially if they have been divided by a sharp instrument cutting transversely; but when there is loss of substance, or a longitudinal incision, the breach can only be made up by syssarcosis; but in neither case will either sort of aneurism happen unless more fibres afterwards yield to bring it to be no longer able to resist the impetuous blood, as I think would for most part follow, from what I have seen in trying some experiments for observing what happens in an artery taken out of the body, when it is filled with quicksilver and pressed, after some of the muscular fibres have been cut or broke. If either then the fibres continue to break gradually, or the distension of them is sudden, when all are torn, the disease is reduced to the supposition made in §§ 1 and 2.

5th. When part of the fibres are broke, cut, or eroded, (any

of which ways you may conceive the solution of continuity to be made on all the suppositions yet mentioned,) we can imagine such a proportion to remain entire, as being very near, but not altogether, able to resist the fluids, will yield very gradually, and form a true aneurism in the sense the common chirurgical books explain it. But, besides the many chances against such a precise approach to an equilibrium happening between a lesed artery and its contained liquor, I must observe that, though membranes become stronger and thicker as they are gradually stretched, yet muscular fibres separate more and more, leaving larger interstices. And therefore, if the annular fibres of an artery were thus separated, the interior coat would soon yield in their intervals, and the blood would burst out to form one or other of the tumours described in §§ 1 and 2; and when it is confined, as in § 2, the circular fibres would appear like so many columns or cross bars in the tumour, which agrees very well with several descriptions of aneurisms handed down to us. 1733.

6th. If a small part of the muscular coat of an artery loses its natural tone or contracting force by any paralytic disorder, it will yield to the stretching force of the blood, and thus an aneurism may be formed which will have all the characters of what is commonly named a *true aneurism*. You see that a partial palsy, and that very gradually coming on, must be here supposed, otherwise, the fibres being separated, and the internal coat breaking, will reduce it soon to the state mentioned in § 5; and indeed it would appear from what is there said, that before it becomes of any very considerable bulk, we have reason to judge the same would happen here. Besides, such a palsy as has been here supposed will very rarely be formed, because of the great sympathy and connexion which the whole arterious system has, the pulmonary artery and aorta making each one hollow muscle continued from the heart to their small ramifications. And I believe a palsy is seldom or never observed to affect only one extremity or the middle of a muscle while the other parts of it continue to be vigorous and active.

7th. The only supposition we need make concerning the interior coat of arteries alone being affected is a solution of its continuity, which will readily happen by all sudden over-stretching

1733. of an artery, or it may be made by any eroding causes, such as suppuration, &c. I cannot say positively that the want of this coat is capable of producing an aneurism, but shall offer a conjecture which may possibly be improved afterwards by observation. It is this: when this coat is removed, some particles of our liquids may insinuate themselves into the cellular membrane, connecting the muscular fibres, and gradually enlarging these passages, may at last penetrate through it, to be diffused in the external cellular coat. And thus at length this case is reduced to what is mentioned towards the close of § 5. I was brought into this way of thinking partly by observing how readily cellular membranes transmit liquors, and by seeing air escape through all the other coats of the guts when the villous one is removed.

From the whole we may see that what authors call now-a-days a true aneurism, will very seldom be found, which may be still further confirmed by mentioning the remoter causes which are agreed on by all to occasion it for ordinary: these are, wounds, bruises, straining, loud laughing, crying, &c. All such, you see, make a sudden violent effort on the arteries, and therefore do not rightly answer to any of the suppositions we made of the manner this disease could possibly be brought on.

And to establish what you see I argue for, of the true aneurism being a very rare disease, I perused a considerable number of histories of aneurisms, besides those mentioned by Dr. Freind,[1] and could not find above two or three that were dissected so much as alleged to have been true aneurisms, and there was not one where it is said that the aneurismal sac consisted of strong annular muscular fibres, which must, however, be the true criterion whereby the true aneurism can be known, seeing from what was said in § 2, confirmed by several accurate histories, blood, extravasated in the *tunica cellularis*, will have all the other symptoms that are described as proper to the true aneurism.

[1] History of Physic, vol. i.

PETIT.[1]

When a certain portion of an artery has lost its elasticity it becomes less capable of resisting the impulse of the blood; this part of its canal being constantly pressed upon by that fluid, gradually becomes larger, and a tumour, to which the name of *aneurism by dilatation* is given, may be seen to be formed there, and little by little, to increase in size. This dilated portion is, as it were, a lake, through which the fluid that gives rise to it passes. 1736.

When, in whatever way it may happen, the artery is opened or punctured, the blood becomes extravasated, and forms in the vicinity of the opening a tumour called *aneurism by effusion.*

These two diseases, which have the same name, differ, however, considerably in their characters. They have only this in common, that they are formed by arterial blood, and they differ inasmuch as in the first species, the blood which forms the tumour is still in the current of the circulation, whereas in the second it is extravasated.

It is also easily understood that the blood which forms the first kind of tumour preserves its fluidity and does not cease to circulate; for if it pass from the upper portion of the artery into the tumour, it likewise passes from the tumour into that part of the artery which is below it, so that the blood contained in the tumour at the moment *A* is not precisely that which is in it at the moment *B*.

On the contrary, in the aneurism by effusion, the same blood that begins to form the tumour remains in the neighbourhood of the opening in the artery, loses its fluidity, coagulates, and does not return into the current of the circulation.

The aneurism by dilatation is formed very slowly, and its progress is almost imperceptible, because the membranes of the artery, though relaxed, still preserve a portion of their elasticity, and only yield, little by little, to the impulse of the blood; but the aneurism by effusion is suddenly formed, and increases in

[1] Observations Anatomiques et Pathologiques au sujet de la Tumeur qu'on nomme Anevrysme. Par M. Petit.—Mémoires de l'Académie Royale des Sciences. Paris, 1736. pp. 244-255.

1736. size in proportion to the quantity of the blood and to the rapidity with which it issues by the opening in the artery.

The aneurism by dilatation is soft, because the blood that it contains is fluid; and the aneurism by effusion is hard, because the blood contained within it is coagulated; it is on this account also that the aneurism by dilatation disappears when it is compressed by the finger, as happens to a hernia that is reduced; and that, on the contrary, an aneurism by effusion may be pressed upon without being made to disappear.

When either species of aneurism is touched, a pulsation, corresponding exactly with the movement of the artery may almost always be felt; but this pulsation is less marked in the aneurism by effusion than in that by dilatation.

A thrill may be felt in the aneurism by dilatation, but is rarely perceptible in the aneurism by effusion.

When the ear is applied to the aneurism by dilatation, a noise similar to that occasioned by the passage of water through the pipes of a fountain may be heard; this noise is seldom, or but indistinctly perceived in the aneurism by effusion.

The aneurism by dilatation always forms an equable and circumscribed tumour, whereas the aneurism by effusion is irregular and usually confounded with the fatty tissues.

The aneurism by dilatation does not change the colour of the skin, whereas in the aneurism by effusion the integument assumes a brownish or leaden tint, as if there were a bruise.

These differences characterize so perfectly the two diseases that one ought never to be mistaken for the other. This, however, happens occasionally, and lately several physicians and surgeons in Paris, as well as in the country, entertained different opinions about an aneurism that they had several times attentively examined. Some thought that the tumour was formed by the effusion or extravasation of arterial blood, and others maintained that it was occasioned by the dilatation of the artery, and that the blood was still in the vessel. But although of different opinions as to the nature of the disease, they all agreed that the operation was the only means to be employed to cure the patient. It was performed in their presence, and all were convinced that the artery had been opened, and that this tumour was an aneurism occasioned by the effusion of blood.

This is not the first time that I have seen skilful persons

entertain contrary opinions as to the nature of these diseases, 1736.
which can, however, be seen and felt; and the signs of which
are so different. It is true that those who have not seen these diseases in all their stages, and who have not observed them during their progress, may sometimes be mistaken about them. For in order to judge them correctly it is not sufficient to know that such and such symptoms accompany their origin, that, from day to day, these symptoms may increase or diminish, that they even disappear, and that in their place others of an entirely different character are substituted, which may deceive those who are not beforehand aware of the possibility and of the existence of these variations.

I have several times observed that an aneurism by dilatation may resemble, and even become an aneurism by effusion, and that an aneurism by effusion may resemble an aneurism by dilatation.

We know that so long as the weakened portion of the artery dilates without giving way, the tumour that is formed can only be an aneurism by dilatation, and that it may almost always be recognized by the signs that have been pointed out as belonging to this species of the disease; but when the aneurismal sac or pouch, after dilating, at last gives way, the blood is effused and the tumour formed by it increases in proportion to the quantity of blood that escapes by the pouch. This effused blood coagulates, and from that moment the soft tumour which could be made to disappear on slight compression is no longer found; the pulsation becomes more feeble, the thrill and noise diminish, or even disappear entirely; and that aneurism which, in the beginning was an aneurism by dilatation and presented all its symptoms, becomes, as it were, an aneurism by effusion, in which will be found the greater number of the signs of both species of the disease, inasmuch as it is composed of the two.

This is not the only change that an aneurism by dilatation may undergo, as will be seen by the observations I have made on this disease, and which will be published in another memoir.[1] I shall for the present content myself with giving a portion of those that I have made on the aneurism which supervenes on an opened artery, called *aneurism by effusion*, the characteristic signs of which I have already mentioned.

[1] This Memoir was, I believe, never published.—Ed.

1736. I begin with this one, because it has a close connexion with the subject of hemorrhage, especially the kind that I have treated of in the memoir of 1735. It is well to recollect that it is stated in that memoir, that when the canal of the artery is only moderately opened, the blood will, if proper compression be exercised, form a clot; which, by blocking up the opening in the artery, will prevent any more from escaping, not only during the treatment of the accident but after its cure; and that in the end this clot will only diminish in the same way that the cicatrix of a wound does, namely, in proportion as it (the wound) closes. At the time of reading this memoir I showed to the academy, for the second time, an artery that had been thus wounded and healed by means of a coagulum, on which I had made several experiments to prove its solidity and durability, two circumstances that are essential, in order to procure the arrest of the hemorrhage.

But all wounded arteries are not healed in the same way, because the clot formed in them is not always sufficiently solid, nor, consequently, sufficiently durable; and if it does not always possess the same solidity, it is because it is not always formed under the same circumstances. It is this that determined me to make some researches in order to discover what circumstances are favorable to the formation of a solid clot, and to ascertain the way of supplying them when they do not exist; which is but too frequently the case, whether on the part of the disease, or of the patient, or even of the surgeon.

This is an extensive subject, and comprises an infinity of facts which deserve to be examined individually and thoroughly. I begin with the one that occasioned the derangement of which I have already spoken, because I think it will conduct me by degrees to the examination of the others.

The aneurism in question was occasioned by the puncture of the artery during venesection. I saw the patient, for the first time, five weeks after the accident had happened. The external opening had been perfectly healed from the first day, and the tumour was not larger than a small hen's egg. The pulsation was not stronger than is usually the case in this variety of the disease; and, besides, on compressing the tumour it disappeared in a great measure, being reduced to a very small bulk. These circumstances, which are generally met with in aneurisms by

dilatation only, had deceived many, who could not imagine the tumour to be an aneurism by effusion. But, although it is not usual for an aneurism by effusion to disappear on compression, nor for the pulsation in it to be as strong as in this case, yet this should not have been sufficient to have induced the physician and surgeon to believe the tumour to be an aneurism by dilatation; it would only have been necessary for them to have called to mind the other contradictory circumstances that have just been mentioned and they would not have been deceived. Nothing more indeed was required than the patient's own account of all that had happened. By questioning him, we learnt that at the time of the bleeding the blood had flowed in jerks, that the surgeon had experienced considerable difficulty in arresting it, that he had doubled and tripled the compresses and the bandage, that he had ordered him to remain quiet and to keep the arm at rest, that he had bled him several times in consequence, and had put him upon a very strict diet. So many precautions would lead one to believe that the surgeon was not ignorant of what had happened; he did, however, all in his power to remedy the accident, and he had the advantage of succeeding. The puncture in the artery and the external wound closed, the cure was advancing, and would, to all appearance, have been complete, if the patient had persevered in the treatment; but at the end of twelve days he discontinued the use of the bandage; two or three days after having taken it off he perceived a small, soft, pulsating swelling, which could be made to disappear on pressure. Having made an unusual exertion eight or ten days afterwards, he felt pain in his arm; and immediately afterwards the small tumour increased very considerably in size. His surgeon reapplied a new compressive bandage, bled him, ordered him to be kept quiet, and put him upon the same plan that had so well succeeded before. 1736.

From this report the nature of the disease cannot be doubted, more particularly as the tumour was not regular, as an aneurism by dilatation always is. The thrilling was not perceptible, the colour of the skin was changed, the softness, the pulsation, and the diminution in the size of the tumour when it was compressed, were all less marked than in the aneurism by dilatation.

This then was the disease, and the following were the consequences. The compressive bandage was continued for some time;

1736. but, notwithstanding the compression, which certainly was not exact, the tumour increased from day to day, so that the patient determined to come to Paris in order to undergo the operation.

When the skin had been laid open to a sufficient extent, I found much black blood, which was still, however, slightly fluid, because, although it appeared the furthest removed from the vessel, it was, as will be shown by and by, the last that escaped by the opening in the artery. This blood surrounded a mass as large as a goose's egg, covered with blood a little more coagulated and less dark than the first; this in its turn enveloped a third substance still less black, but so firm and so solid, that those who have not seen the operation for this variety of aneurism, might have taken this mass of coagula for flesh if they had only attended to its colour and consistence.

I passed my finger round this mass of clots, and detached it entirely and with ease, except at the part placed upon the opening in the artery to which it was strongly adherent; it was there that the artery itself appeared uncovered to the extent of an inch. In the midst of this extent was the opening or incision that the lancet had made. This incision, which was oblique, was, at least, three lines in length.

After the operation, which was successful, I collected the clots, which I presented to the academy, and separated them one from another before it.[1]

In the first and second figures, the trunk of the brachial artery, with its three branches, may be seen; the tumour may also be seen, which did not appear so distinct until after the escape of the more fluid blood. This blood, as I have said, was the last to escape, and had not had time to coagulate. The external surface of this tumour was covered with black and coagulated blood, less hard than the clots that formed the interior, and which can be seen in the figures that represent a vertical section of the tumour.

I separated these clots from one another with ease, and I observed that they did not all possess the same degree of solidity. The hardest covered immediately the opening in the artery; the blood, by constantly pressing against this clot whilst it was still too soft to resist, had formed it into a species of pouch or ap-

[1] Figures of these clots are here given.—Ed.

pendix, into which the blood entered and from which it partly, at each pulsation, passed out and returned into the artery, in the same way that the blood enters and leaves that pouch, which constitutes an aneurism by dilatation. This appendix was as large as the shell of a good sized hazel-nut, and was firmly adherent to the borders of the opening and to the external part of the artery even. Its internal surface was smooth and polished like the interior of all blood-vessels. By its external aspect it was adherent to the second clot. This, placed on the outside of the first, possessed its figure, but it was larger, less solid and less adherent to the third than to the first; the third and all the others, unto the outermost, were arranged one upon the other, and became successively of a larger size but less solid. 1736.

The difference in size, consistence, and position of these clots led me to think that not only had their formation been successive but that each had been the product of a hemorrhage. Indeed the blood was only arrested in the first instance because it formed a clot that blocked up the opening in the artery. This natural plug always succeeds, provided that care be taken that it be supported by a bandage; that the patient be kept upon a strict diet; and that he maintains a state of quiet until the clot has become sufficiently adherent to the borders of the opening, and even to the exterior of the artery; and that it has hardened sufficiently to resist the impulse of the blood like the artery itself did before it was wounded.

The clot in the patient under consideration had already formed strong adhesions to the borders of the opening, and to the parts in its vicinity; it had sufficient solidity to meet the impulse of the blood, and it resisted so long as this was moderate and that it was sustained by a bandage. We have thus reason to suppose that if the patient had continued the bandage sufficiently long, and had been careful in his movements, he would have been perfectly cured, without an operation, in the same way as the case that I have related in the memoir of 1735; but not having done this, the clot, which was still too weak and not supported, was forced to obey the impulse of the blood, which extended it little by little and formed it into a kind of pouch.

During the operation I found this pouch or clot still adherent to the whole of the circumference of the opening in the artery, except at one point, from which it had only been detached by

1736. the violent effort that the patient made twelve days after having left off his bandage.

It is by this point of separation that the blood which formed the second clot escaped, and it is by this opening, blocked up by this second clot, but renewed at six or eight different times, with an interval of several days between each, that the blood which formed the seven or eight clots of which the tumour was composed likewise escaped.

This would be the place to remark that, during the successive formation of these clots, the character of the tumour must have been somewhat uncertain, as it must have appeared alternately under the form of an aneurism by effusion and an aneurism by dilatation; but I shall not enter upon these details as they constitute a part of another memoir. For the present I content myself with saying that these clots can only be distinguished from one another by their different sizes, degrees of colour, and of consistence, when the first clot is not entirely detached by the blood that constitutes the second hemorrhage. And I have observed that it is in this case only that the clots can be thus distinct, because the first clot preserving almost all its adhesion to the wound in the artery, the blood of the second hemorrhage does not detach it but passes above it; this covers the first clot, coagulates in its turn, and forms the second coagulum. If a third hemorrhage supervene, the blood, always escaping by the same opening, will pass above the second clot and will form the third, and thus so long as new hemorrhages supervene, and the first clots continue adherent, the new coagula will always be placed above the preceding ones, and will always be larger and longer.

With regard to their consistence, it is and ought to be proportioned, as well as their colour, to the time that has elapsed between each hemorrhage, and consequently between the formation of one clot and that of another: thus the first will always be firmer because the blood that forms it will have been poured out for a longer time, and the lymph will have had more time to separate and to harden; for the same reason the second, the third, and the others, to the last formed, will have less consistence, and this always in proportion to the time that has elapsed between the formation of one and of the other.

There is yet one observation to make on the facility with

which the clots may be separated from one another; this does not merely proceed from their not possessing the same degree of consistence, but because there is between them a kind of diploë, that is to say, one part of the clot is softer than the other, and of a redder hue than the more solid portion of the coagulum, it is also less lymphatic; and I consider it to be the red portion of the blood separated after each hemorrhage; because, as I have already pointed out in my first memoirs on Hemorrhage, when the blood is at rest, the white portion separates, rises above the red, coagulates separately, and constitutes the solid part of the clot; with regard to the red portion, it remains fluid or only coagulates feebly, but always in proportion to the quantity of lymph retained in it. According to this, the most external part of the clot ought to be the most solid, as it consists almost entirely of lymph, and the interior the softest because it contains almost all the red part; consequently the soft substance or diploë between the first clot and the second belongs entirely to the second; that which is formed above this belongs to the third clot, and so on with the others. With regard to the red part, that should have belonged to the first clot; as it ought to be found near the opening in the artery, there is every reason to believe that it had been carried away by the current of the blood in that vessel. 1736.

What I have just said is proved by observation: when one hemorrhage occurs immediately upon the other, this gradation in the clots is not found. I have several times operated for aneurism without meeting with it; and it has been shown to be more or less distinct according as there is a longer or shorter interval between the hemorrhages. If the second hemorrhage occur before the clots of the first have had time to harden and to become adherent to the opening in the artery, the blood will drive out or penetrate into the clot. The third hemorrhage, and all the succeeding ones, will do the same thing if they are close upon one another, and then the coagula can no longer be distinguished; they will be broken up by the blood and driven pell-mell into one another; whereas if the hemorrhages come on only at intervals of several days, and if the first clot continues adherent, the coagula will differ so much in their size, colour, and consistence, that the number of the hemorrhages can be ascertained by the number of the clots met with in the

1736. tumour. And we may even be able to discover, by the thickness of the clots, which of several hemorrhages has been the most violent; and, by their consistence and colour, which have been the most recent or the most remote. These observations are not matters of mere curiosity, but they have been of practical utility to me in operating on wounded arteries; and I hope to be able to deduce from them the means either of avoiding those operations or of rendering them safer, easier, and less painful.

HALLER.[1]

1749. 1. Aneurisms of the aorta, near the heart, are no longer of rare occurrence;[2] nevertheless, I am persuaded that I shall not do anything that is displeasing to well-informed medical men, if I relate two cases that have lately occurred, which I saw when the bodies were dissected, and both of which are observations of interest.

2. The first was that of a woman, whose case Wincklerus[3] has related. In her the aorta, where it is attached to the heart, had become so enlarged as to attain a circumference of five inches and two lines. In this dilated part, which was bounded by those vertebræ that were near that vessel, there was considerable ulceration, the internal membrane of the artery being everywhere changed into projecting floating tufts, and being torn and rugged. These tufts consisted for the most part of scales, that were either osseous or that resembled bone; but the muscular and internal coats were healthy. The whole of the thoracic and abdominal aorta was in a similar condition. In the smaller vessels, such as the hypogastric, iliac, uterine, and the other arteries of the pelvis (which we have lately described),[4] there were many incrustations, partly osseous, partly flexible and hard, which were so closely connected to the muscular fibres,

[1] Albertus Hallerus, &c., de Aortæ Venæque Cavæ gravioribus quibusdam Morbis. 4to. Gottingæ, 1749. And also in Opuscula Pathologica. Lausannæ, 1768.

[2] Morgagni Advers. Anat. 2, p. 81.

[3] De Lithiasi in Corp. Human.

[4] IV Fascic. Iconum Anat.

that the transverse direction of these was imprinted upon them by so many transverse lines. The valves of the aorta were partly indurated, and partly studded with knobs of a stony hardness. The other valves situated in the heart were healthy and natural. 1749.

3. But that disease was a much more remarkable one which we saw in the month of January of the present year, in the body of a beggar-woman, who, being found dead at the door of an inn in the neighbouring village of Weenden, was, according to law, brought to our school. The body appeared sufficiently healthy, the omentum covering all the viscera of the abdomen. The stomach was very much contracted, being for the most part of smaller diameter than the rectum. The ovaries gave evidence of age, being scirrhous and dry, as they are about the fiftieth year.

4. When we opened the thorax a tumour of the aorta immediately appeared. After leaving the heart this vessel continued of its usual diameter for two inches; but at the lowest part, and in the whole of the arch, as far as the vertebræ, it was of larger size, and its diameter was three inches greater than it usually is. As soon as it reached the vertebræ, it returned to its natural diameter, and continued so for the remainder of its course.

5. On cutting into the tumour, the nature of which we did not well understand, there was found a large quantity of grumous blood about the centre of the artery. A great part of it was collected not so much into coagula as into broad laminæ, scarcely a line in thickness; these were tough, pale, resembling membrane, but softer, and were free and floating, being indeed distinct polypi. Lastly, as the coats of the aorta appeared to be five or six lines in thickness, we found that a new accessory membrane growing from the tumour had adhered to its internal tunic, and might easily have been taken for a part of it. It was white, pulpy, and lamellated, being partly of a membranous character and partly composed of a kind of cruor, but it everywhere adhered equally to the internal coat of the artery. In the artery itself there were found many white hard scales, appearing as if full of pus, such as we have just described.

6. But we were much more surprised to find that this membrane was prolonged into the left carotid artery alone, and not into any of the other arterial trunks; so that the vessel through-

1749. out the whole of the neck was full of it, no cavity whatever being left: and this abnormal pulp, which was continued from the aorta into the carotid artery, was white, soft but tough, and separable with difficulty, from the true coats of the artery, filling up the vessel in the form of a continuous cylindrical polypus, as far as its division, where it also, being divided, passed into the different branches. In the external carotid, the polypus was continued as far as the origin of the labial artery, which was the first one that was pervious. In the internal carotid, the trunk of which was narrow and constricted, the polypus was prolonged up as far as the carotid canal.

7. But it appeared even more surprising to us that a similar polypous and fibrous pulp existed in the internal jugular vein of the same side, filling up its whole cavity, and terminating at the transverse branch which joins the internal to the external jugular under the parotid gland. At the lower part this pulp was inseparably attached to the parietes of the vein. The other vessels in the body were perfectly free, and the right carotid artery and jugular vein, being pervious, transmitted the blood without any difficulty. We made preparations, and had drawings taken of the arteries of the thigh.

8. A little more than three years ago we saw a similar, if not a more remarkable disease, in the vena cava. This vessel was blocked up in a woman not much more than forty years of age, between the renal and iliac veins,[1] so that nothing was left in its canal except a fibrous, polypous, and hard fleshy mass. The right spermatic vein, which was enormously enlarged, being an inch in diameter, returned the blood from the lower part of the aorta, opening into the vein of the right ureter, which arose from the iliac of the same side.

9. On inquiring into the progress and formation of these very serious diseases, it is not at all improbable that the aneurism has arisen from the large number of osseous scales which did not admit of dilatation, and which were formed of the concretion of a yellow humour. These offer such an obstacle to the heart,[2]

[1] John Rhodius also relates a case of obstruction of the vena cava. Mantipæ Anat. Obs. 21.

[2] It appears that these aneurisms are occasioned by a greater resistance than natural in the arteries; as they never occur in children, very rarely in young persons, and most frequently in the old.

that it being, during life, excited to overcome this resistance,[1] 1749.
gradually distends the artery very forcibly, thus giving rise to an aneurismal sac. Hence, as often as osseous laminæ are found about the heart, so often will a dilatation of the trunk of the artery be met with. The blood moving more slowly in the sac, as is the case in all aneurisms,[2] coagulates, and being converted into grumous masses, from these into membrane and polypi, and lastly into a diseased or abnormal membrane, is pressed by the pulsations of the heart against the parietes of the aorta, to which it adheres. The same polypi being forced into the carotid fill it, and are changed into a pulpy mass, such as is found in the umbilical arteries. I cannot explain the occurrence of these bloody polypi in the accompanying vein in any other way than that the artery being obstructed, the venous blood of the same side is moved on less freely, whence it stagnates, and is converted into a similar matter.[3] I confess that I cannot assign any reason for the obstruction of the vena cava, as in the body no cause that could compress the vein, nor any disease in the arteries, was discovered.

W. HUNTER.[4]

Isaac Bradwell, a man of a well-made active body, and of a 1757.
quick and choleric disposition, died of an aneurism of the aorta, October 29th, 1752, at the age of thirty-nine years. His distemper, by his own account of the case, commenced about three years before his death. In October, 1749, he first began to be very uneasy in his chest. I was called to him about two months afterwards, viz. in December, 1749; from which period to his

[1] Those moderns who have taught that the movement of the blood is retarded by a resisting power, have not sufficiently considered the nature of the living heart, whose powers, when exercised, act as obstacles.

[2] Saviard, Obs. 61, and Fauton Obs. 1.

[3] Hence, when the arteries are osseous, gangrene is a common consequence of the stagnation of the blood. Philos. Trans. 280-99.

[4] The History of an Aneurism of the Aorta, with some remarks on Aneurisms in general; by William Hunter, M.D.—Medical Observations and Inquiries; London. vol. i, 1757; 8vo. pp. 323-57.

1757. death I saw him from time to time, sometimes in his own lodging, and sometimes in St. George's Hospital, into which he was admitted a patient the 13th of June, and continued to the 7th of November, of the year 1750, when he was discharged, and again admitted the 18th of October, 1752, under the care of Dr. Ross and Mr. Middleton. From the time of his leaving the hospital in 1750, to his re-admission in 1752, he was made an out-patient, was assisted with the advice of these gentlemen, and had his medicines from the house. He was seen by many of the faculty in London, particularly by the students who attended my lectures, where he was presented several times to exhibit the appearance and progress of the disease.

After many conversations and inquiries upon the subject, I could not with any degree of probability ascertain the cause of his disorder. Sometimes he imagined he had hurt himself by wrestling, but he had been well for many years after he had left off that exercise. At other times he suspected he had injured himself by going on foot a great way, and in a great hurry, to vote at an election; after which he had a bad fever; but this was eleven or twelve years before his death. Among other things, he would sometimes impute it to walking round the park for a wager, about three years before he was taken ill; after which, he was troubled with a pain in his right side and under his right shoulder. But, upon the whole, he seemed to think it most probable that his labour, in the way of his business, had strained his breast. He was a stay-maker; and he told me, that in that business they push in the whalebone with the whole force of the right hand, sitting upon a table; that it is very severe labour; and that he had worked hard when he was very weak, just after an illness, about nine months before he had any outward appearance of the complaint. This account agreed with what I learnt of him among his acquaintance and people of the same trade.

When I first saw him there was an oblong swelling between the cartilages of the second and third ribs of the right side. The integuments were sensibly raised two inches in length, about one inch and a half over, and about half an inch perpendicular in the most elevated middle point. The skin was not discolored. The tumour was very hard, but would almost disappear when much pressed, and then it was painful. Its pulsation was strong,

and perceptible even to the eye, and corresponded with the pulse in the wrist. From this time, till within a few months of his death, there was no alteration with respect to its colour or pulsation; but it increased in size so as scarcely to be covered by the expanded hand and fingers; and after it was become of a considerable size, it always felt solid and fleshy in some parts, and in others softer, as if it contained a fluid; and never could be strongly pressed without causing great pain. 1757.

From the first to the last the symptoms were pretty much the same; viz. great pain in the part, which very commonly darted through to his right shoulder, (he expressed it, as if swords were struck through him,) great anxiety and labour in his chest, difficult breathing, and, from time to time, a teazing cough, which raised or exasperated his other complaints. He never could sleep on his back without waking suddenly with great pain and terror; nor could he lie on his right side without much pain; so that he generally had most ease lying on his left side or sitting up. He was sometimes extremely ill for two or three days together; and then he was desponding, and had all the terrors of death expressed in his countenance. Then he would be pretty easy for a while; and as sure as he had a little ease he flattered himself he should do well. His pulse was always regular; but, for some months after I first saw him, I could feel none, neither in the temple nor arm, of the left side; and yet he was not sensible of any numbness or want of strength in that arm. After this, the pulsation gradually returned in those parts, but was always weaker than in the right side.

When I first saw him, in company with his apothecary, Mr. Justamont, I gave it as my opinion that it was an aneurism of the aorta; that it was absolutely incurable; and that he would most probably die of its bursting either outwardly or inwardly. I therefore proposed that he should keep as quiet as possible, both in body and mind, guard against costiveness, take soft and quieting pectorals for his cough, and lose some blood, from time to time, as his symptoms might require and his strength permit. I judged it proper to do nothing to the part, neither by medicine nor compression; for as the force of the heart was become so far superior to the resistance of the artery, I apprehended that compression on the outside would either occasion greater mischief and violence within, or bring on a mortification in the

1757. integuments the sooner. These measures were accordingly pursued, not only all the time he was immediately under my direction, but likewise by the above-named gentlemen of St. George's Hospital, who, from first to last, proposed nothing farther than to calm the most pressing symptoms, to give as much ease as possible, and to prolong life.

Some months before he died the colour of the skin began, very gradually, to show the part where the breach was to happen. On the most prominent part, towards the left end of the tumour, it became of a dead pale colour, and felt œdematous, or like dough. The colour grew deeper, and the softness increased at that part, till about six weeks before he died, when there was evidently a fluid ready to burst through a thin deadened skin, of the size of a shilling, or somewhat more. I then ordered his wife to attend him very closely, gave her some lint to press upon the wound if it should bleed when it broke, and bid her, in that case, call me immediately to her assistance.

In a day or two it broke, and discharged first a considerable quantity of water, and next a watery blood. The bleeding was soon restrained by the application of lint, and gentle pressure; but returned several times, at some days' interval. The swelling was not diminished by the discharge, and we could hardly discover the aperture by which the water and blood found vent. The mortified skin became dry and horny, like the slough from a caustic applied to the skin when not kept moist by dressings. About a fortnight before his death, the dead skin began to separate from the living, and, from time to time, there was an oozing of blood from the fissure, and this daily increased as the fissure deepened.

The day before he died the mortified piece of skin was quite loose all round, but showed evidently that it was united to a large fleshy substance, or coagulum of blood, which it covered, and which served as a plug to the orifice: for when the heart contracted itself this plug was pushed outwards, and the aperture in the integuments was thereby dilated; and during the systole of the artery, the plug retired inwards, and the opening in the skin became smaller; so that by alternate motions, like the sucker of a pump, it showed distinctly the two motions of the heart and artery. I could not however examine the case with attention in this state, it struck me with so much horror. For

as it was not possible to know of what size the plug might be, 1757.
or what inward stay or support it might have; so it appeared
uncertain which stroke of the heart might be the last.

Next morning, the last of his life, it bled with some violence. The house-surgeon of St. George's Hospital immediately applied flour and lint, with moderate pressure, and sent notice of this to Mr. Hawkins and to me, who had both desired to be informed of any accident that might happen.

When I came, all was quiet again; the bleeding, though violent, had stopped immediately; and Mr. Hawkins had ordered a moderate bandage. He was in bed, and had eaten his breakfast cheerfully. I left him, and was got about fifty yards from the hospital, when a messenger overtook me, and told me he was dead. He had been seized with a cough, and, in turning himself in bed, the blood gushed out with such violence as to dash against the curtains and wall; and he died, not only without speaking, but without a sigh or a groan.

The coagula were gathered up from the floor and bed, and, among them, I found the largest, with the dry eschar of integuments upon it, which had been the plug that had stopped the bleeding for some time before he expired. I had leave from his wife, and from the physicians and surgeons of the hospital, to open the body, and was allowed time to do it with deliberation, and to make drawings of the principal appearances.

The external tumour, which was now very much sunk and flaccid, being opened by a crucial incision, its cavity appeared smooth, wherever what remained of the coagulated blood was wiped off. The smooth lining of the bag seemed to be formed of the compacted cellular membrane. Round the bottom of the cavity, the substance of the cartilages of the second and third rib, and the eroded sternum, was without perichondrium and periosteum; but, in most places, the laminated coagula of blood stuck very close to them. These cartilages, and that bone, formed the edge or brim of an irregular passage, leading inwards to a large reservoir, which proved to be the dilated artery filled with blood, partly fluid, and partly grumous.

The state of the artery, and of the contents of the thorax, will be understood by the figures, and their explanation.

[Here follow several pages of references to the plates.]

1757. *Remarks.* May not some of the disputes about the nature of aneurisms be settled by dividing them into three kinds rather than into two, as authors commonly divide them? Thus: aneurisms are either, 1, *true,* that is, by dilatation; or, 2, *false,* that is, by rupture; or, 3, *mixed,* that is partly by dilatation and partly by rupture.

The *true* aneurism will generally be of an oblong figure, have a strong pulsation, and subside under pressure; and these last symptoms will be in a lesser degree when there is a considerable proportion of consolidated blood.

The *false* aneurism is of two species. One may be called the *diffused,* in which the extravasated blood runs through the cellular membrane in the interstices of firmer parts. This generally makes a rapid progress, may extend itself to a great distance, and has little or no pulsation except very near the aperture of the artery. But these circumstances will be a little different according to the size of the opened artery and the strength of the circulation. With regard to the lodgment of the fluid, this species of the *false* aneurism is analogous to the emphysema and anasarca.

The second species of the *false* aneurism may be called the *circumscribed.* It beats and sinks under pressure like the *true* aneurism, and indeed cannot be distinguished from that except by the knowledge of its cause, or by a careful dissection of the part. It appears soon after the accident that gives rise to it, and is commonly slow and gradual in its progress. It consists of one bag with a smooth inside, and communicates by an aperture with the cavity of the artery. The bag is formed by a condensation of the cellular membrane that lies round the artery, and may take the additional substance of any aponeurosis or membrane that happens to cover the artery at that part. It will not seem strange that this circumscribed aneurism should happen from a puncture of the artery, notwithstanding the loose and porous texture of the cellular membrane, when we consider how strongly that membrane resists the passage of air, and of every fluid, even in the dead body, when its lamellæ and fibres are compacted by pressure. In this state they are brought contiguous, and act as so many valves. And in the living body there is an additional resistance, arising from the thickness and union which all these lamellæ acquire by inflammation, and

the soldering of every chink by the coagulated blood. This species of aneurism is perhaps the most common among those that happen in the arm after bleeding, especially when considerable pressure has been made use of immediately after the accident. 1757.

The third kind of aneurism is the *mixed*, that is, formed partly by a wound or rupture of some of the coats of the artery, and partly by a dilatation of the rest. It will not generally be distinguished from the circumscribed species of the *false* aneurism; and will often so far emulate the *true* aneurism as not to be distinguished from it but by a very careful dissection. The outer part of the substance or coats of an artery may be wounded, and then the inner will be gradually stretched. This, no doubt, has often happened in the arm from bleeding, particularly in those cases where there was no symptom during the operation of the artery being wounded; but where a little throbbing tumour arose in the part some time after. It is possible, too, that the *mixed* aneurism may arise from a laceration of the inner, and a dilatation of the outer, coats. At least the structure of arterial coats, as has been remarked by authors, seems to admit of such an accident.

Paulus was the author of the division of aneurisms into two kinds, one by *dilatation* and the other by *rupture*. He has used the very terms *enlargement* and *rupture*, has distinguished their symptoms, and has expressly laid down a different cure for each, extremely well adapted to the different nature of these two diseases.

Does it ever happen in surgery, when an artery is opened through a vein, that a communication or anastomosis is afterwards kept up between these two vessels? It is easy to conceive this case; and it is not long since I was consulted about one, which had all the symptoms that might be expected, supposing such a thing to have actually happened, and such symptoms as otherwise must be allowed to be very unaccountable. It arose from bleeding, and was of some years' standing when I saw it, about two years ago; and I understand very little alteration has happened to it since that time. The veins at the bending of the arm, and especially at the basilic, which was the vein that had been opened, were there prodigiously enlarged, and came gradually to their natural size, at about two inches

1757. above, and as much below the elbow. When emptied by pressure, they filled again almost instantaneously, and this happened even when a ligature was applied tight round the fore-arm, immediately below the affected part. Both when the ligature was made tight, and when it was removed, they shrunk, and remained of a small size, while the finger was kept tight upon the artery, at the part where the vein had been opened in bleeding. There was a general swelling in the place, and in the direction of the artery, which seemed larger, and beat stronger than what is natural; and there was a tremulous jarring motion in the vein, which was strongest at the part that had been punctured, and became insensible at some distance, both upwards and downwards.

There is such a disease as the *true* aneurism. This proposition, though generally allowed, has been denied by some writers, who have imagined that in every aneurism the arterial coats are ruptured, not stretched. But nothing is more plain than that the coats of the artery are stretched in five of these cases that I have examined and still preserve. That they were stretched in the above case every one readily allowed who saw the dissection; and it may be well enough understood from the annexed figure where the artery is seen becoming gradually larger from its very beginning at the heart, and contracted again gradually in the descending part. But what proves it beyond doubt is the preternatural distance of the three ascending branches from each other, which could not have been if the coats had not been stretched there. The coats of arteries, like other parts, may grow thicker in substance at the same time that they are stretched in dimension. This was actually the case, though in no great degree, in all aneurisms of the aorta that I have seen; and is commonly enough the case in all encysted diseases.

The length and shape of the dilated part is very different in different aneurisms of the aorta. In all the five which I have met with, and which are now before me, the dilatation begins with the artery at the heart. In one of them it continues only to the origin of the left subclavian; in another, a little beyond that part; in a third and fourth, it is continued half-way down the thoracic portion of the aorta; and in the fifth, it is continued almost to the bifurcation of the artery in the loins. In two of them, the common trunk of the right subclavian and

carotid is likewise considerably enlarged. In two of them, the shape is oblong and uniform; in three, the shape is more circumscribed and irregular, with particular cells or enlargements, as if the coats had been there weakened by some partial rupture or otherwise. 1757.

In the aneurism of the aorta the arterial coats are apt to be stretched more in proportion, and to form particular cells, where they meet with firm resistance, than where the support is more soft and yielding. Though at first sight this must seem problematical or improbable, I believe it will be found to be true. In four of the five cases that have fallen under my examination, it was very plain that the anterior part of the curvature of the aorta was protruded into a *sacculus*, with a stricture between it and the rest of the aneurism. There I presume the arterial coats must have been weakened by pressure, and the resistance of the sternum and ribs must have made the protruding part swell out in its lateral circumference; whence a stricture between this sac and the rest of the aneurism, and the appearance of the whole as of a double aneurismal sac, one part communicating with the other by a narrow orifice. That this peculiar sac was not formed in consequence of a rupture of the artery at that place was plain, from the different degrees of it in these four different cases, as well as from an obvious continuity both of the surface and substance of the artery in all of them.

The injury that happened to the sternum and vertebræ in the above case was different from a common caries: for in such cases, where there is a loss of substance in a bone, there is something analogous either to ulceration or mortification. But in this case the appearance was rather as if the blood had insensibly dissolved and washed away the substance of the bone, making greatest havoc in the softest parts of the bone, as we see in stones of unequal texture that have been long washed by dripping, or a stream of water. Has the blood that property which some have ascribed to it, of dissolving bony matter? A surgeon of my acquaintance, whose experience, abilities, and veracity are unquestionable, told me, upon my asking this question, that he once opened a little tumour upon the temple that contained only pure blood, and that there was no bone under it. He supposed that the blood had dissolved that part of the skull upon which it lay.

1757. It has been imagined by some, where a caries of the spine and an aneurism of the aorta have been found together, that the disorder in the bone must have been the cause, and not the effect, of the dilatation of the artery. This conjecture is surely very ill-founded; and, were there no other arguments against it, the preceding case furnishes a very convincing one; the sternum was as much affected as the spine; both of them were affected only where they were in contact with the dilated artery; and at both these places, and nowhere else, the coats of the artery were destroyed.

What is the state of blood contained in a true aneurism? It may be taken for granted that there will be no coagulated blood in the artery of the living body when it is of an uniform figure and not greatly dilated; as, on the contrary, that there will always be coagulated blood in such cells or protrusions of the artery as receive blood that has no progressive motion. I have had but one opportunity of examining the contents of an aneurism with coagulated blood where no material disturbance had happened to it at death. In that case the state of the blood was as follows. The trunk of the artery, though enlarged to at least three inches in diameter, contained only such blood as must have been fluid while there was life and circulation. The protruded sac at the anterior part of the curvature, which communicated with the trunk of the artery by an orifice not much more than one inch in diameter, contained partly such fluid blood as was in the trunk of the artery and partly a firm laminated coagulum. This coagulum formed a lining to the sac, and clung to it everywhere with adhesion. Its inside was hollow and perfectly smooth, that is, without any ragged inequality, but rugose, like the surface of water that is gently moved. The last circumstance was probably owing to the contracted state of the artery, and therefore it may be supposed that the rugæ were levelled during every diastole of the artery in the living body. The coagulum was of very considerable thickness in the middle or at the bottom of the sac, and thence becoming gradually thinner, it was lost insensibly on the inner surface of the sac, near its mouth or aperture, so that every vertical section of it would have made the figure of a crescent. Towards its outside it was as hard and tough as a cake of glue that has been soaked in cold water, and of a cineritious complexion; towards

its inside it was more tender and of a redder colour. The laminæ of which it was composed were thin as paper, regular, and did not readily separate from each other, especially in the tougher external part of the coagulum. 1757.

Of all animal substances, gristle perhaps is the least affected by pressure on the living body. This seems probable, from the known structure and uses of the joints, but was particularly evinced by the above case. The constant pressure of the sternum had destroyed the coats of the artery, the periosteum, the bone, the muscles, the tendons, the cellular membrane, the skin, in short, everything that was in its way, except the cartilaginous parts of the ribs. These were pushed to one side indeed, but almost perfectly sound in their texture.

Does not the *true* aneurism happen most commonly in the beginning of the aorta? This conjecture is formed partly upon the authority of others, partly upon speculative presumption; supposing that the accident is most likely to happen where there is the greatest force of circulation, and where there are no collateral passages to carry off the tide, when any uncommon resistance or obstruction happens in the great canal; but it is chiefly founded upon this observation, that four such cases have come under my inspection in London, nearly within as many years.

The aneurism is said to happen often in the neck and throat. But many scirrhous, glandular, and encysted swellings, in the fore part of the neck and in the throat, may be observed to have a very manifest or strong pulsation in every part of them, from the stroke of the adjacent arteries. I have seen this deception so remarkable in many instances, and so many of these cases suspected or believed to be aneurismal, that I cannot help being persuaded that the mistake may have been very general.

Are there symptoms peculiar to the aneurism of the aorta, by which it may certainly be known before there is an external tumour with pulsation? I am inclined to believe, that, at most, a probable conjecture only can be formed.

If it should be difficult sometimes, or impossible in practice, to determine the particular species of an aneurism, we may be the less solicitous about it, as the method of cure is so nearly the same in all of them.

The aneurism of the aorta may, no doubt, prove fatal, otherwise than by bursting outwardly. I have known it occa-

1757. sion death by disturbing the functions of the thoracic viscera, so as gradually to destroy general health, and bring on constant inquietude, atrophy, and dropsy. It may, no doubt, burst into the trachea. It is possible, too, that, by some accident or violence, the coagulated blood may be dislodged, and choke up the artery; and it seems even possible that the vertebræ may be so far affected by an aneurism, as to leave the spinal marrow exposed to fatal compression.

In aneurisms of the aorta, where there is an outward swelling, artificial pressure will generally do mischief. This remark, with its reason, was mentioned in the preceding history. In that case, the coats of the artery were totally destroyed, and had been so some time before death; both where they met with the resistance of the sternum and where they pressed against the vertebræ. And just where the aneurism was contiguous to the trachea, the coats of the artery and substance of the trachea were united by pressure, and reduced almost to a gelatinous tenderness. From all which circumstances, it is evident that, for the most part, in the course of such a disease, compression, or tight binding, will only aggravate the evil. But from what was observed of the coagulated blood forming a lining or pouch within the dilated coats of the artery, it seems likewise plain, that as soon as the coagulum begins to lose its support, by the mortified integuments giving way, it is necessary to have immediate recourse to a bandage; and if this substitute for the integuments be judiciously applied, it may preserve life for some considerable time, especially if assisted with such topical medicines as are most powerful in retarding suppuration and putrefaction.

In aneurisms that admit of the operation, it is advisable, first to attempt the cure by compression; because it sometimes proves effectual, and is always a commendable preparatory step to the operation, inasmuch as it enlarges the collateral anastomosing branches, and thereby disposes the part to have a more free circulation after the operation.

The palliative cure, by compression, should not be long continued, when the tumour is pretty large; because it injures the neighbouring parts, and will occasion more inflammations, sloughings, and suppuration, when the operation is at length performed.

The pressure which is made use of in aneurisms, whether before or after the operation, should be confined, as much as pos-

sible, to the affected part, that the passage of the blood, through the anastomosing vessels, may be free. 1757.

Though the brachial artery, in most people, divides into its two branches a little below the part where we commonly bleed in the arm; yet perhaps it will be found that the aneurism happens oftener to one of the branches than to the trunk of that artery, because these often lie nearer the skin, and are thereby more exposed to the injury.

When the brachial artery divides into its two branches above the elbow, sometimes these branches lie at a considerable distance from each other in the bending of the arm; but, commonly, they lie close together at that part: therefore, in an aneurism so circumstanced, it will sometimes be very easy, but commonly it will be extremely difficult to tie the one without the other. And no doubt it has often happened that both have been tied, when only one of them required it; and that an aneurism in one branch had no better chance from the operation, than if it had been in the trunk of the artery.

In performing the operation for the aneurism in the arm, the readiest method of avoiding the nerve, which lies on the inside at a little distance from the artery, is to relax that vessel, by bending the arm moderately, and to raise the artery from its bed, by a probe introduced into its orifice, or by pinching it up with the finger and thumb.

In doing that operation, after having made the first ligature above the orifice of the artery, it will be satisfactory to slacken the tourniquet, just to see if it still bleeds. If it does there is a fairer prospect, because there is proof of a free circulation. But whether it bleeds or not, a ligature must be made below the orifice for security.

The history of the operation for the aneurism would alone show that surgery is capable of making considerable advances towards perfection from little more than bare practical experiments and observation; but that the art receives its great lights from anatomy and physiology. As an instance of this, we may observe that Aëtius recommends the very operation that we practise at this day for an aneurism of the arm. But instead of the tourniquet, by way of preparation, he orders first of all to lay the artery bare below the armpit, to tie it twice at that place, and to cut it quite through between the ligatures: a proposal which

1757. a modern surgeon would think of with horror, not only as a practice which must occasion a great deal of unnecessary pain, but as one of the most effectual measures for rendering the operation unsuccessful.

The uncertainty of cures in many cases, both of physic and surgery, gives the ignorant and hardy empiric frequent opportunities of exulting over science. Ignorance is rash and fearless: knowledge is always cautious and circumspect. The first, amidst much mischief, boasts now and then a random cure: the other, though active when there is a prospect of success, is frequently restrained by the fear of doing harm. At the same time, by this caution, and a proper view of the bounds of the art, the rational practitioner enjoys much secret satisfaction, and has frequently, in his turn, ample cause of triumph over empiricism. The preceding history might illustrate and justify this remark. The case in itself was clearly incurable from the beginning. The opinion of some, at least, of the most eminent in the profession was given and repeated, from time to time, with steadiness; and no lucrative view could be suspected to warp their judgment, or influence their attendance: yet, even in this case, empirics of all kinds were pressed upon him, who tempted and tortured him with vain promises. They understood no more of the case than that it was thought desperate; they knew they could lose no reputation; they were conscious they could not feel remorse; and were desirous, at all events, of being in fortune's way. A foreigner insinuated that it was a case which English surgeons did not understand, and pressed warm bathing with the Montpelier method of curing the pox. A quack recommended his pill, which he said was so peculiarly adapted to inward swellings, that none of them could withstand its operation. An old woman would engage to cure him with her herb-poultice, which, she said, though she was turned of three-score and seven years, had never once failed her in such a case; and the poor man could not help having a partiality for the remedy, when she protested there were above thirty herbs in the composition, and that she gathered them all with her own hands. Another, who knew that an aneurism is seldom curable by other means, proposed the operation; but the patient was prevailed upon to reject the proposal, when he understood that it must be a very painful operation, and that he could not

expect that his life would be comfortable after the great artery was tied so near the heart. 1757.

D. MONRO.[1]

Case I. London, August 1st, 1760. John Parker, in the fortieth year of his age, about five feet ten inches high, of a strong, muscular, but thin make, a pump-maker by trade, who had always been accustomed to hard labour, and to work in deep wells, and other places below ground, and to drink freely (though not to be intoxicated) of porter, but of no other strong or fermented liquor, about twenty years ago received a venereal infection, and had a bubo in the left groin, which was cured by being brought to suppuration and opened; after which he married, had several children, and neither he nor his wife had any symptom of the venereal disorder. 1760.

Some time in the summer of 1759, he received a blow in the left groin with the end of a pickaxe, and soon after perceived a swelling in that part, which proved to be a rupture. About Michaelmas it came down, which he at first neglecting, it inflamed so violently, and put him to so much pain, that he sent for Mr. Arnaud, the surgeon, who, after bleeding him and ordering him a clyster, finding it impossible to reduce the rupture, performed the operation for the bubonocele. In the herinal sac he found part of the small guts and omentum greatly inflamed, and so black that he was afraid a mortification had already begun; however, he reduced them both, after having cut away part of the omentum.

After this the cure went on extremely well without any accident; the patient was blooded a second time some days after the operation, and kept upon low diet to prevent any danger from inflammation; and as he lay in bed, kept his thigh bended towards his body, and his leg towards his thigh, being the posture in which he found himself most at ease.

In November, when the wound was almost skinned over, a

[1] Cases of Aneurisms, with Remarks, by Dr. Donald Monro, Physician to St. George's Hospital, London. Read 1760 and following years.—Essays and Observations, Physical and Literary. Vol. 3. Edinburgh, 8vo. 1771.

1760. small tumour in the ham of the same side was perceived, and showed to Mr. Arnaud, who at first imagined it to be a slight swelling of the small glands from the position which the leg had been kept in during the cure of the rupture, and therefore ordered only a liniment to rub it with.

About Christmas, the patient observed another tumour in the right ham, and that both had a strong pulsation, which alarmed him a good deal, and he sent again for Mr. Arnaud, who, upon examining them, immediately discovered them to be aneurisms, and attempted by bleeding, the application of astringent fomentations, and proper compresses and bandages, to prevent their further growth, but without any effect.

In January, 1760, another tumour of the same kind appeared in the right groin; and, in the month of February, another smaller one about the middle of the same thigh.[1]

On Wednesday, the 19th of March, John Parker offered himself as a patient at St. George's Hospital, was admitted, and came under my care. At this time the tumour in the left ham had a very strong pulsation, with the feel and appearance of a circumscribed tumour of the size of a large hen's egg, but occasioned no swelling of the neighbouring parts, and gave him no pain That in the right ham had neither the appearance nor feel of a circumscribed tumour, but looked and felt like a large swelling of the whole ham and knee, and had still an evident pulsation; it kept him in perpetual pain and uneasiness, and occasioned an œdematous swelling of that leg. The swelling in the right groin was about the size of a small hen's egg, but that in the middle of the thigh was about the size of a pigeon's, and could only be felt when one pressed the thigh at that part where the artery is about to sink deep among the muscles of the inside of the thigh; both these had a strong pulsation and the feel of circumscribed tumours, but gave no pain.

As this was an extraordinary case the advice of all the physicians and surgeons belonging to the hospital was asked, who all agreed that it was a lost case, and that all that could be done was to endeavour to alleviate the patient's misery by a mild cooling regimen and the occasional use of opiates. Ac-

[1] The above account I had repeated several times afterwards from the patient himself and his friends during the course of his illness.

cordingly, from this time till his death, the only medicines he took were a little lenitive electuary to prevent costiveness, which always increased his pain, and some of the tinctura thebaica, or of the pilulæ saponaceæ, Ph. Lond. when the pain was severe. 1760.

On the 2d of April he went home, but was an out-patient of the hospital till he died, and I visited him once a week, or oftener, as it gave him satisfaction, and I was desirous of seeing the progress of the disorder. He continued the use of the medicines already mentioned, and used no other remedies excepting that, when he was in great pain, he rubbed the right ham with sweet oil, or some soft liniment, which he thought gave him a little present ease.

From the time of his first coming to the hospital, the swelling in the right ham and knee gradually increased, and the pulsation as gradually diminished, so that at last it could not be perceived. About the end of April, the swelling was increased to a prodigious size, attended with excruciating pain. The integuments began to rise into a point in the middle, and afterwards gradually grew thinner and more inflamed till the 8th of June, when the blood began to ooze through the skin, upon which one of Petit's tourniquets was put loose on the thigh above the tumour, and the patient was desired to turn the screw if the tumour should happen to burst and bleed. The other aneurisms all this time gave no uneasiness, at least the violence of the pain in this made him less sensible of any from the others; and they remained nearly of the same size, excepting that the one in the left ham seemed rather to have increased.

On Saturday, the 14th, in the afternoon, the tumour burst, and before he could turn the screw of the tourniquet sufficiently he lost a great quantity of blood which reduced him very low, and he became faint and sick, with an inclination to vomit. On Sunday, in the morning, I found him very low, with the same sickness and inclination to vomit, which he had had the day before. He complained that since the tourniquet had been screwed tight the tumour in the groin had begun to enlarge, and to have a stronger pulsation; and he told me, that from what he observed, and from the symptoms he felt, he thought he had not long to live, and begged to have some remedy that would alleviate the violent sickness that oppressed him. I

1760. ordered him a mixture made of simple mint water and spirituous cinnamon water, with a little of the tinctura thebaica and syrup, to be taken by spoonfuls. After this he sunk fast, by the bleeding from the ham whenever he relaxed the tourniquet, and the symptoms of a mortification of the right ham appeared on Monday. On Tuesday, in the afternoon, he died. The people about him alleged that he lost five quarts of blood, from the time of the bursting of the tumour till his death.

To give an idea of the external appearance and situation of these aneurismal tumours, I obtained the favour of Mr. Lens to draw two small figures, representing them in their natural situation, from my description, having had no opportunity of getting them done, either during the patient's illness or from the body after death.

On Wednesday, in the afternoon, his body was opened by Mr. Arnaud, in presence of several other gentlemen and myself. The abdominal and thoracic viscera were all in a sound state; the heart was small, the liver had a few black spots on its surface, but did not seem otherwise diseased. The aorta, the iliacs, and all the other arteries within the thorax and abdomen, seemed to be in a sound state, and had no perceptible dilatation.

The crural artery of the right side, about a quarter of an inch below where the epigastric artery goes off, was dilated, and the dilatation continued down for two inches and three quarters; it was covered with numerous inguinal glands, swelled to the size of very small beans, which had made this aneurismal sac appear to be larger before death than it was found on dissection to be, after these glands were separated; when distended with air it had much the appearance of an egg; from the lower part of it the large muscular branch of the femoral artery was sent off.

Below this the artery returned to its natural size, and continued so for above two inches and a quarter, and then began to be again dilated into another oval sac of near two inches long; this was the aneurism which was to be felt by pressing the thigh at ths part just above where the crural artery begins to sink down among the muscles on the inside of the thigh.

The artery then assumed its natural form and size for an inch

and a half, but afterwards was dilated into the small sac, which had not been observed during the patient's life. 1760.

After this it returned to its natural size, and continued in this form for three inches and a half, and then opened in the lower part of the ham into the large sac; the bursting of which had been the immediate cause of the patient's death. An inch and three quarters below its opening into the sac, it resumed its natural form and capacity before it was distributed to the leg.

This cyst, when entire, was capable of holding two or three pints of liquor; it was filled with fluid and grumous blood mixed, and with a large polypous concretion, such as is commonly found in large aneurisms; part of the sides of the cyst was worn away where it lay contiguous to the lower part of the os femoris and head of the tibia; for a finger being introduced into the posterior orifice these bones were felt rough and carious.

The crural artery of the left side, a little below the groin, was dilated to about the size of a small bird's egg; but this part of the artery having been left by mistake in the body, no figure was drawn from it; we had only observed it about two days before the patient's death.

There was no other aneurism observed in this crural artery till it reached the ham, where it was dilated backwards into a pouch, capable of holding six or eight ounces of liquor; this was the first tumour that had appeared, and was filled with fluid and grumous blood, and firm polypous concretions.

This much was observed at the opening of the body; but having afterwards got from Mr. Arnaud the crural artery of the right side with its four aneurismal sacs, and the aneurismal sac of the left ham, I separated the different coats of this last mentioned sac where it had been slit open on the fore part, and in tracing them, found them continued with those of the artery. I first dissected away the loose cellular membrane which connects the arteries with the surrounding parts,[1] by which we had a view of the membrano-cellular coat[2] lying immediately below;

[1] This loose cellular substance, when separated from the other parts, collapses into the form of a membrane, and has very improperly been reckoned by many authors one of the coats of the arteries.

[2] This coat was demonstrated, nearly thirty years ago, by my father, to be composed of a dense cellular substance. See Med. Essays, vol. ii, 1733. It has been called tendinous by Heister, and *ligamento-elastica* by Nichols, and *cellulosa propria* by Haller.

1760. and then raised this membrano-cellular coat from that called muscular,[1] which was everywhere lined with the fine villous coat.[2]

I would have dissected all the other aneurismal sacs, but my brother being desirous to have them to make an anatomical preparation I proceeded no further, lest I should spoil them for his purpose.

When I sent them to Edinburgh I begged the favour of my father and brother to give me a particular account of what further observations they should make in examining them, and have since received the following from my father:

"The aneurismal sacs you sent to Edinburgh were dissected by your brother in my presence; the appearances were the following: The external loose cellular and the cellulo-membranous coats being dissected away carefully, the circular fibrous, commonly called muscular, coat was evidently seen continued on all the three small sacs in every part of them, but was thicker there than in the second part of the artery; and in the most enlarged part of the sacs an extraneous substance, resembling a soft steatomatous matter, was intermixed with the muscular fibres. The cellular substance lining the inside of the muscular coat, was considerably thicker than natural, and had much the same appearance of an extraneous substance filling its cells. The internal membrane of the artery adhered so firmly to these cells, that it could not be separated, but seemed thicker than in a sound state. Though the circular fibres could be observed at the sides of the incision made into the fore part of the sac of the left ham; yet, as the dissection was continued backwards towards the most distended, these muscular fibres became less observable, and could not be traced. Whether this apparent defect of them here was owing to a much greater proportion of the extraneous substance above mentioned, or to their having been destroyed by the great distension, is difficult to determine.

[1] This coat, composed of reddish, circular, and flesh-like fibres, has been called muscular by most anatomists; they who call it white tendinous seem either to have mistaken the former for it or to have raised the two together.

[2] This most internal coat is dense and smooth; it has been called by some nervous, by others villous. Besides these, there are two fine cellular coats: 1. One which connects the membrano-cellular with the muscular. 2. Another which joins the muscular with the nervous or villous.

The internal cellular coat of this sac was considerably thicker than in the smaller ones, but of the same texture. The most internal membrane was in a thickened adhering state. In the part of the great sac of the right ham, which came to Edinburgh, no circular fibres could be seen, and the structure was otherwise much the same as that now described of the back part of the sac in the left ham." 1760.

Case II. Thomas Cook, a soldier of the third regiment of foot-guards, some time in the beginning of the year 1759 perceived a swelling in his left armpit, for which he could assign no cause, having received no blow or bruise on that part, nor having been sensible of having overstrained himself in any manner.

This he immediately showed to Mr. Fordyce, surgeon to the regiment, who discovered it to be an aneurism. The swelling gradually increased till the month of October, when Mr. Fordyce declining to attempt any operation, the patient brought a recommendatory letter to St. George's Hospital, and was taken into the house on the 20th of that month. At this time the tumour was large, and extended itself far down the arm; it had still a pulsation, and the pulse at the wrist was feeble and weak.

The physicians and surgeons of the hospital, upon examining the case, were of the same opinion with Mr. Fordyce; they thought the tumour was situated too high up to attempt any operation, and advised only mild palliatives and anodynes to be given. After this the swelling gradually increased, and its pulsation as gradually diminished, so that at last only a tremulous motion could be observed in it; the pulse at the wrist grew daily weaker, and at last ceased entirely. In the end of November, or the beginning of December, the tumour began to rise in the middle, and at last bursting, on the 29th of December, the patient died immediately of a profuse hemorrhage.

Next day the body was opened in presence of all the physicians and surgeons of the hospital. The axillary artery was found to open into the large aneurismal sac, which extended above two thirds down the arm. This sac was filled with a large lamellated polypous concretion, entirely of the same nature as those generally found in large aneurisms of long standing; and

1760. along with it a quantity of fluid and grumous blood. The beginning of the sac seemed to be continued with the coats of the artery, but the rest of it to be formed of the neighbouring cellular membranes, &c. in the same manner as the sides of any common encysted tumour. The humeral artery run behind the aneurismal sac, but was impervious for about half an inch, immediately below where the axillary artery opened into the large sac, its sides being grown together, as we found by making a hole into the artery below, and introducing a probe upwards, and then cutting open the vessel upon the probe till we came to the part where it was stopped. The rest of the humeral artery and the ulnar and radial arteries were still open, but much smaller than they commonly are in adult subjects, where the vessels are all free. The heart, the aorta, and subclavian arteries were all of their natural size; and the left axillary artery did not seem to be dilated till it was just about to open into the large sac. No drawing having been made from the body, I have sent you an outline done from memory, upon one of Dr. Haller's tables, as a groundwork, which perhaps may serve better to explain the nature of this aneurism than any description I can give.

Case III. The case of a gentleman, who, after recovering of the gravel and an hemoptysis, died of an aneurism of the aorta. By Sir John Pringle, Baronet, M.D. F.R.S. Physician to her Majesty, and Fellow of the Royal College of Physicians at Edinburgh.

An officer of distinction, in the forty-first year of his age, received a wound at the battle of Fountenoy, 1745; and, from the long confinement to his bed on that occasion, became first subject to the gravel, with which he was afflicted for some years after. During that time he had several nephritic paroxysms, attended with sickness and vomiting, and a discharge of sand, sometimes of small calculi of a rough surface, from the left kidney.

In the month of March, 1751, this gentleman was seized with a vomiting and spitting of blood; of this he had several returns, but got quite free of the disorder by the end of autumn, after having been two or three months at Bristol. It was doubtful whether the chief part of the cure was to be ascribed to those waters, or to the revulsion made by repeated bleedings, or to a

spare and cool diet, to riding, and the strengthening quality of the bark, which at first had no effect as an astringent. It was remarkable that, from the time the patient left Bristol, he not only had no return of the hemoptysis, but none of the gravel; though, from certain sensations, he still suspected the soundness of the left kidney, and therefore would never lie on that side, in order to keep it the cooler. After leaving the wells, he continued to drink every morning, fasting, and every night at bedtime, about half-a-pint of Bristol water, aired, with about an ounce of Minorca honey dissolved in it. One of his old servants told me that he believed his master had not for one day intermitted this draught, from the time he began to take it to his last sickness; and that, from the first attack of the hemoptysis to his death, he had lived in a very regular manner, eating of the lightest flesh meats, and that sparingly; living chiefly upon vegetables, drinking a little pure wine, seldom any malt liquor, keeping good hours, and using constantly moderate exercise, mostly on horseback. 1760.

About the middle of March last, 1760, the patient began to complain of great want of rest, and, about three or four weeks after, of a tenesmus, of gripes, and mucous stools streaked with blood. But this disorder of the bowels, after two doses of rhubarb, soon yielded to some draughts of oil and manna, taken twice a day. However, as the watchfulness continued, and the patient felt some more than usual pain in his belly towards the left side, apprehending a return of the gravel, he first consulted Dr. Duncan, and in a few days after (on the 27th of April) he likewise called me.

At that time he was troubled with a hiccup, which had begun the day before I saw him. The pain of his belly was almost constant, sometimes sharp and darting to his back, sometimes to both the groins and testicles, especially when he turned to his right side; for as to the other, he never attempted to lie on it. He complained of want of rest to such a degree as not to be sensible of having slept half an hour together for six weeks, or of shutting his eyes for the last three. His pulse was quicker, harder, and fuller than natural; he had some drought, but otherwise no feverish symptoms, and his head was perfectly clear. Sometimes he mentioned a numbness in his feet, and such fits of lowness as confined him to his bed, and

1760. made him call for more wine than he usually drank when he was well. Since the purging was stopped, he had scarce had a motion without taking some laxative, and then the pain of his belly was generally lessened for some time. His water was of a natural colour, was made freely, and in due quantity; it sometimes had a cloud, but never any sediment. He complained of no sickness at his stomach, but his appetite was quite gone.

Though the patient had been blooded twice before, yet we judged it proper to take away seven or eight ounces more of blood, which, like the former, was very sizy. But as none of these evacuations relieved him, and as he grew daily weaker, the bleeding was not further tried. Upon the first attack of the hiccup, he took some musk, which having no effect, we suspected that this symptom might be occasioned by a large quantity of acids which the patient had used for some time before, and therefore we attempted to remove that sharpness by absorbents, which likewise proved ineffectual. We then repeated the musk in such large doses that he swallowed three drachms in twenty-four hours, but with no better success. Opiates were not omitted; and, both on account of the hiccup and in order to procure sleep, laudanum was given first in smaller doses, but on the 30th (the fourth day after I was called) we ordered forty drops at bedtime, with directions to give, every three hours, twenty drops more, till the patient should fall upon rest. That night 100 drops were taken without bringing on a slumber or checking the hiccup in any degree. But the opiate raised a thorough sweat; and when that broke out, his spirits were relieved and the pain ceased. In this state we found the patient in the morning, and his head being still clear, we ordered a draught, with forty drops of the tinctura thebaica and a scruple of musk; but this composition had no more efficacy than the ingredients separately. He continued broad awake, sensible, and in good spirits, though the hiccup never stopped. About four in the afternoon, he called for something to drink; but, before the servant could warm the liquor, he suddenly expired.

Next day, in the afternoon, the body was opened by Mr. Burnet and Mr. Hunter, surgeons, Dr. Duncan and I being present.

The abdominal viscera were, to all appearance, sound, even to the left kidney, which some years before had generated much sand and calculi, and continued still to be suspected by the patient. The stomach, the intestines, and the diaphragm were free from any mark of inflammation, notwithstanding those parts had suffered, first by the flux and afterwards by the hiccup, which symptom had been almost constant for the last six days of his life. The gall bladder contained a moderate quantity of bile of a natural colour, without any stones or obstructions in the ducts. 1760.

The only diseased part of the body, so far as it was inspected, was a tumour larger than one's fist, of an oblong figure, lying upon the left side of the spine and the aorta descendens, in the direction of that vessel. This tumour was of a firm consistence, beginning as high up as the emulgent arteries, where it adhered to the transverse flexure of the duodenum, and from thence descending till it came near the pelvis. Upon its surface, but within the cellular membrane, we perceived a good deal of extravasated blood, and found some more of the same in the adjoining parts of that membrane, extending to the pelvis and to the left side, between the peritoneum and abdominal muscles. In order to the better examination of this substance it was taken quite out of the body, together with some part of the aorta above and the iliacs below. Having laid open that part of the aorta the whole length of the tube, we observed a complete rupture of all its coats upon the left side of the vessel between the emulgents and lowest mesenteric artery. This aperture had lacerated edges, was large enough to admit the dissector's thumb, and led into the tumour, which now appeared to be a spurious aneurism of the great artery, that is, a sac formed of the cellular membrane, containing some blood of different degrees of coagulation, which, apparently, at different times had issued from the aorta. That portion which lay next the artery was as firm as what is found in aneurisms of a year's standing, and was of the same lamellated structure. Beyond this there was a much larger quantity of blood slightly clotted, and this, with the blood which, as observed before, was diffused on the surface of the tumour, and in the rest of the cellular membranes near it, seemed to have burst from the vessel just before the death of the patient, and indeed to have

1760. occasioned it. The whole quantity contained in the cyst, and diffused around it, exceeded a pint. The aorta was not dilated about the aperture, but its coats at that place were harder than natural as if tending to ossify; and having lost their natural elasticity and toughness were easily pulled asunder. The heart and lungs were in a natural state. The former was without any polypous concretion, and the latter without any tubercles or adhesions except in the right side, where the lower part of the lobe adhered slightly to the diaphragm, and about that part we found in the lungs a few small concretions of no consequence.

Upon the review of the whole we concluded that a small aperture had at first been made at this weak part of the aorta some considerable time before the death of the patient; that the tumour had been gradually formed by the oozing of the blood into the cellular membrane surrounding the artery, and which thereupon was dilated into that sac mentioned above. That this tumour, growing larger and in time pressing upon the intercostal nerves, had excited the pain which the patient complained of in the left side of his belly; and that it became at last so large that, either by pressing more upon those nerves or upon the transverse flexure of the duodenum, it occasioned the hiccup, which could never be stopped as the irritation was always increasing. That the continuance and violence of the hiccup had been the cause of a sudden and greater rupture of the aorta at that part which was already open, and that, by this enlargement of the orifice, the blood had gushed out in such a quantity as to occasion a considerable effusion around the tumour, and to stop the circulation at once.

The chief practical conclusion was, that after a violent hemoptysis of some months' standing, a patient may still hope to have sound lungs; and that, after undergoing many nephritic paroxysms for years together, the kidneys may be perfectly restored. That the thorough recovery from those illnesses was principally owing to temperance or cool regimen, and constant moderate exercise on horseback. That it was probable that the Bristol water had been of service both in the hemoptysis and gravel, but that the honey, afterwards joined to it, had been the chief means of keeping the kidneys clear, and thereby allowing nature time for repairing the damage which

that organ had suffered by the generation of so much sand and stones during a course of years. 1760.

Case IV. London, October 3d, 1760. A man, thirty years of age, was brought into St. George's Hospital on account of an aneurism in his ham, of the size of a hen's egg.

It had begun three months before that, after he had laboured for a considerable time under a fever and rheumatism. As he was otherwise seemingly in good health except weak, and had no other aneurism but this, the amputation of the limb above the ham was performed. For nine days after the operation everything appeared to go on well; but on the morning of the 10th, he was suddenly seized with a locked-jaw, and died the following night.

The second day after his death his body was opened. All the viscera seemed perfectly sound; and we could observe no appearance of any other aneurism in the arterial system: but the arteries, we thought, were rather of a more lax texture than common.

Case V. Michael Conolly, a middle-aged man, who used to carry a sedan-chair, some time in the beginning of the year 1763, perceived a swelling about the size of a walnut, which had a strong pulsation in the upper part of the right thigh, contiguous to the *os pubis*, which he could not account for. Several months after this, he showed it to Mr. Gataker, serjeant-surgeon extraordinary to his Majesty, who immediately knew it to be an aneurism; it was then about the size of a very small hen's egg, had a strong pulsation, and the feel of a circumscribed tumour.

Mr. Gataker brought the man to St. George's Hospital, where he consulted with the other surgeons, who all agreed that the aneurism was situated too high to attempt any operation.

About Midsummer, 1764, when it was rather larger than a common egg, it lost its form of a circumscribed tumour; the whole upper part of the thigh swelled, and the pulsation became more obscure, and at last was scarcely to be perceived. Some months after this, the skin on the fore part of the thigh became very thin and red in one or two places; and soon

1760. after, an oozing of blood and matter was perceived to come from one or two small orifices, which gradually enlarged till the 27th of January, 1765, when one of them burst suddenly in the evening, and the man fell down dead immediately as if he had been shot with a ball through the heart.

Next day his body was opened. The right crural artery, just as it passed over the os pubis, opened into a very large cavity filled with a firm coagulum larger than the head of a child of three years of age, and a quantity of grumous and fluid blood mixed with a black very fetid matter.

Upon emptying the sac, and clearing it with a sponge and water, part of its fore and inner side seemed to be formed of the coats of the artery, and the rest of this and the other sides to be formed of muscles, cellular membranes, aponeuroses, &c. Part of the thigh-bone was bare and carious, and several of the muscles were flaccid, livid, and eroded.

The part of the side of the cavity which appeared to be formed of the coats of the artery was smooth on its internal surface, and continued from the upper opening of the crural artery into the sac for about two inches down, till it came to its lower orifice, which was so covered with a membranous matter formed of the coagulable part of the blood, that it was some time before we could discover it. Upon opening the artery from this part, downwards, it was found to be filled with a firm polypous substance for some inches, till where it sunk behind the adductor muscle to get into the ham.

The crural and iliac artery above the upper opening into the sac were in a natural state.

This seemed to me to have been originally a true aneurism, such as the one situated in the right groin of John Parker, but which had burst on the back part, and the blood from the artery formed the large cavity filled with the coagulum and grumous blood.

Case VI. On the 4th of February, 1765, I was present at the dissection of the leg of a man which had been taken off above the knee in the Westminster Infirmary, for an aneurism in the ham, which had begun in May 1764, without any evident cause.

It had had, at first, the feel of a small circumscribed tumour,

but long before the operation, had lost that appearance, and the whole ham was distended into a large tumour. The cavity was large, filled the whole ham, and distended itself between the poplitæus and gastrocnemii muscles, and was capable of holding above a pint of liquor; the fibres of part of the gastrocnemii muscles were eroded. 1760.

The crural artery, at the part where it gets the name of poplitæa before it divides into the two large branches, the tibials, opened into the aneurismal sac, which was filled in the same manner as the other, and had a similar appearance in every respect; the orifices of the arteries which went off from the sac were impervious, and covered with a firm membranous coagulated blood, and the arteries themselves filled for some way with polypous concretions.

The patient's foot had begun to mortify for want of circulation before the operation was performed.

This aneurism was certainly a true one originally, and had burst on the back part, and was of the same kind as the large one in the right ham of John Parker, only the bones were not bare and carious as in his case.

Case VII. The following is a remarkable instance of the rupture of a large artery from a fall.

On the 23d of December, 1764, John Robertson, a carpenter by trade, in full health, being in liquor, fell several times in the streets. On the 26th or 27th, he perceived a swelling in the middle of his left thigh, which had a strong pulsation, and gave him pain; by the 3d of January, 1765, it had increased considerably, and gave him racking pain, and he was brought to St. George's Hospital.

Next day, the surgeons had a consultation on his case, and were all of opinion that it was a false aneurism occasioned by the rupture of some large artery; that the aneurismal sac ought to opened, and if the ruptured vessel was found to be only a collateral branch of the crural artery, that it ought to be tied, and the wound treated as after the operation for the false aneurism of the arm; but if it be proved to be the trunk of the crural artery which was ruptured, that the amputating the limb was the only method to be used to save the patient's life. When the operation was performed on the 5th, it was found to

1760. be the trunk of the crural artery which was ruptured; the limb was amputated, and the man is now in a fair way of recovery, it being four weeks since the operation. There was a little hardness round the artery below the rupture, but the man had never felt any uneasiness in that thigh before the accident of the fall on the 23d of December.

Case VIII. A strong middle-aged man, who served as a sailor on board one of his majesty's ships of war, in the time of the siege of the Havannah, felt a pain in his heel which he did not know how to account for; soon after he perceived a swelling and throbbing in the calf of his leg.

When he returned to England the swelling increased, and was attended with such a strong pulsation in the part as evidently showed it to be a true aneurism.

From the size and the feel it was evident that the coats of the artery had already given way, and that the aneurismal sac was formed of membranes, muscles, &c.

Many remedies were applied, but they gave him no relief. At last, in February, 1765, the surgeon who attended him, after consulting some of his brethren of the first eminence, performed the following operation: a tourniquet being put above the knee, he made a large longitudinal incision through the gastrocnemii and soleus muscles into the aneurismal sac, and took from thence a very large firm coagulum of blood. Having wiped and cleaned the cavity with a sponge dipped in warm water, he tied the ends of the arteries which opened into the sac at the ham, filled the wound with soft lint, and applied proper bandages.

For three days after the operation everything seemed to do well; there was a kindly warmth in the foot, and no more fever than was to be expected after such an operation; but on the fourth day the patient began to sink, the foot to feel cold, and a gangrene to appear on the sides of the wound, and he died the sixth day after the operation.

Case IX. The following case was similar to that of John Parker, in the patient's having more aneurisms than one, and there being seemingly an universal weakness of the arterious system, and a disposition to form aneurisms.

A middle-aged man, who used to be employed in husbandry

work, about Michaelmas, 1764, after being one day much fatigued, sat down to rest himself, and having accidentally put his hand on his thigh, perceived an uncommon beating in the part, and showed it to some of his neighbours, but thought of it no more till some time after that he felt an uneasiness, and perceived a small swelling and a strong pulsation in the part. The swelling did not increase much for five months after, but about the end of February, or beginning of March, 1765, it began to increase very fast. In the beginning of April he came to town, the swelling was then as large as a hen's egg, had the feel of a circumscribed tumour, and such a strong pulsation as pointed it out to be a true aneurism of the femoral artery, at the part where it begins to sink among the muscles to get behind into the ham. 1760.

Upon inquiring into the man's history, he told me that he had long enjoyed a good state of health before he perceived the throbbing in his thigh, and that he was not sensible of his having made any violent effort, or of his having done anything to occasion the swelling.

As the aneurism of the thigh was the only one that was to be observed, and it had already somewhat the appearance of pointing outwardly, and must burst, and put an end to life soon; it was thought advisable to amputate the limb above the aneurism. This was done; but the man died next day.

Upon dissecting the aneurismal tumour of the thigh, it was found to be formed by a dilatation of the coats of the artery; the cavity was about the size of a small hen's egg, and was filled with a firm coagulum of blood, such as is commonly to be met with in true aneurisms; it was somewhat of the shape of that found in the left ham of John Parker; it protruded forwards, and towards the inside of the thigh; and, at one part, the coats of the artery were extremely thin, and ready to burst. The distance between where the artery opened into the aneurismal sac or dilated part of itself, from where it went out of it, or returned to its natural size, was only about an inch, though the aneurismal sac was double this length on the fore side of the artery, and towards the inside of the thigh. The coats of the artery were somewhat indurated and surrounded with small steatomatous tumours for some inches below the aneurismal sac.

As the man died so suddenly, his body was opened the second

1760. day after his death, when several aneurisms were found in the cavity of the abdomen.

The superior mesenteric artery, just as it arose from the aorta, was dilated far above the length of an inch and a half, and was near an inch diameter in the middle of the aneurismal sac, and was filled with a firm coagulum. The left emulgent artery was dilated at its beginning to the size of a filbert nut, and the inferior mesenteric artery was beginning to be dilated just as it arose from the aorta.

An attempt was made to inject the vessels of the left kidney, but the vessels burst upon a very small force being used to push forward the injection.

From the case of this man, and that of John Parker, we may conclude that the arterious system is sometimes universally diseased, though we neither as yet know how this happens, or can assign any cause for such a disorder; and from these cases we may judge how doubtful the success of any operation must be, that is attempted for the cure of any true aneurism in the extremities, which comes without any external injury done to the part.

Are aneurisms become a more frequent disorder than formerly, or do physicians and surgeons inquire more minutely into the nature and causes of diseases, and inspect more narrowly into dead bodies than in former days? The latter I should suppose to be the case, from the aneurisms which I have seen, which were all in people in a low rank of life, who, in former times, had not so frequent opportunities of consulting physicians and surgeons of experience, or of being received into public hospitals.

Case X. Ann Fowler, a woman between twenty-seven and twenty-eight years of age, was admitted into St. George's Hospital the 13th of June, 1763, for an aneurism in the aorta, which protruded outwards on the back, between the lowermost rib and the os innominatum of the left side, of which she gave the following account:

That on the 22d of the March preceding, being nine months gone with child, she fell down some steps of a stair, but did not perceive that she had received much hurt. That she was brought to bed the 25th, and in a few days thought herself as well as a woman in that situation could expect; but that in a

fortnight thereafter she felt a strong throbbing in her back, and in a few days perceived a small tumour, which protruded on the left side of the spine of the back, and which had gradually increased from that time to the size it was then of, which was about equal to that of half a large China orange. This tumour had a strong pulsation, and the patient complained of having lost her appetite, and being often sick; and that she had particularly much pain and sickness if the tumour was hard pressed. Her pulse was quick and small, but had no intermission, and was otherwise quite regular. 1760.

These complaints continued without much alteration till within four or five weeks of her death; only that once or twice, on being fretted, and turning incautiously on her back, her pulse became quick, and so extremely low, attended with an excruciating pain in the part, and sickness at the stomach, that we imagined she was dying; but she recovered gradually from these low fits, and her pulse returned to its former state.

About five weeks before she died the tumour extended on the lower part towards the spine, and the skin became of a light reddish colour in the middle of the tumour, and we began to suspect that it would break outwardly.

From her first admission into the hospital it was evident what the case was; and therefore I ordered her no other medicine but a saline draught twice a day, to amuse her, and added to it, occasionally, a little magnesia alba, or gave her a little lenitive electuary when she was costive, and an opiate at night, when she complained much of pain through the day; and I allowed her whatever sort of mild food she had a mind for.

Four weeks before her death her pain increased, and she became low, and said she felt as if a stream of cold water was running down from the tumour into the lower part of the left side of her belly.

For a week before her death the pain became so excruciating, that, though she took a grain of opium every two or three hours, she found no relief, and could not lie with ease in any posture; and she sunk daily, and died the 24th of March, 1769.

Next day her body was opened. The stomach, intestines, liver, and spleen seemed to be all in a perfect sound state. The diaphragm on the left side was pushed up some way into the cavity of the thorax, and the lungs of that side adhered very

1760. much to the pleura, and contained a good deal of a thin, bloody, somewhat purulent-like matter, and had a number of small tubercles dispersed through their substance.

The lungs of the left side, and the stomach, intestines, and spleen, being taken out of the body, and the lungs of the right side, and the upper side of the liver being turned to the right side, and stitched firmly to the inside of the ribs, we observed that the left side of the cavity of the abdomen was filled with one large black tumour, which, on examining, proved to be the cellular membranes behind the peritoneum, which covered the kidney, filled with blood. On cutting through the peritoneum and these membranes, we found the kidney sound below, which we removed, and then laid the aorta bare from its coming out of the heart till near its division into the two iliacs, which brought into view a large aneurismal sac, which extended from the diaphragm to the os pubis.

The upper part of this aneurismal sac was formed by a dilatation of the coats of the left side of the aorta, which at first view seemed to be dilated from where this vessel first passes through the diaphragm till some way below where the emulgent artery of the right side goes off to the kidney, though it afterwards appeared that the dilatation began much lower, about an inch above the rise of the cæliac artery, and extended no further than just below where the right emulgent goes off. The distended coats of the artery extended upwards and downwards, and towards the left side; so that this part of the sac which seemed to be formed by them was full four inches long and three inches broad, though the length of the aorta, which was dilated, was but two inches in all.

The lower part of the sac was larger than the upper, and extended as far down as the os pubis, and its coats seemed to be made up of the peritoneum and cellular membranes; and it appeared as if this part of the sac had been recently formed by the coats of the true original aneurismal tumour giving way at the lower part, and allowing the blood to pass into and distend the cellular membranes behind the peritoneum, and to raise and push it forwards. Perhaps the coats of the true aneurism began to give way at the time the patient complained of the sensation of a stream of cold water running down into the lower part of the left side of the belly.

In dissecting off the membranes, to have a more distinct view of the whole tumour, I accidentally tore part of the sac, where its coats seemed to be formed of the peritoneum and cellular membranes, and there came out a quantity of clotted blood. I then introduced my finger through this aperture, and found that the upper part of the sac was filled with a firm fibrous coagulum, which afterwards, when it was taken out, appeared to be exactly similar to what is always found in aneurisms which have been of any standing; but the lower part was filled only with recent coagulated blood. The aneurismal sac adhered firmly to some of the vertebræ, and to the lower ribs; and these bones were become carious, and formed part of the sides of the sac. 1760.

I then had the aneurismal sac cut out of the body, and in dissecting it away I observed that it adhered very firmly to the last dorsal and the first and second lumbar vertebræ; and that the pulsation of the blood had worn away part of the aneurismal sac where it adhered to these bones, and that they were bare and carious on the left side of their bodies; that a number of small osseous spines had grown out everywhere from the carious parts; and that the cartilage between the first and second lumbar vertebræ was wore away for nearly half an inch deep on the fore and left side; and that the lower side of the last rib was bare and carious.

I next examined that part of the sac which had formed the large tumour on the back, and found that the force of the blood had drove the sides of the dilated artery backwards, quite through the muscles of the back till it had reached the skin. The hollow which remained, after the aorta with the aneurismal sac and fibrous coagulum were taken out of the body, appeared to be about three fourths of as exact a spherical figure, of three inches and a quarter diameter, as if it had been formed by a turning-wheel. It reached from the lowermost rib to the spine of the ileum.

On examining the inside of the fore part of the aneurismal sac, (the only part which could be taken out entire,) I observed that the aorta had not begun to be dilated for near an inch lower than it had appeared to be on the outside, and that the artery had returned to its natural size again immediately below where the right emulgent artery takes its rise from the aorta;

1760. and that there were a number of osseous concretions spread on the internal surface of the sac round the lower orifice where the aorta returned to its natural size, and went out of the sac. And on examining the fibrous bloody concretion, which filled the upper and back part of the aneurismal cyst, I found that there was a hollow or furrow on the fore part, through which the blood could pass freely from the upper part of the descending aorta to the lower, to be distributed through the lower extremities, which was certainly the cause why the pulse continued regular and without intermission during the whole course of this tedious and troublesome disorder.

As this was a very singular and particular case, I prevailed with young Mr. Home, of Suffolk street, to make a drawing of the aorta and aneurismal sac in their natural situation, which gives a more distinct idea of the situation of this aneurism than any description. As we expected that the friends would bury the body soon, he had time to make only a sketch, and that not so finished as otherwise it would have been; and next day he made a sketch likewise from the inside of the fore part of the aneurismal sac; both which I send you with this.

OBSERVATIONS ON ANEURISMS.

London; August 15th, 1760. The disorders which now go by the name of aneurisms, seem to have been overlooked by the ancient physicians, till Galen,[1] who mentions anastomosis and a wounded artery as causes that may produce them; but describes only the symptoms by which aneurisms in general may be known, without telling any appearances by which we can distinguish whether the disease is owing to the one or the other of these causes. Paulus, of Ægina, after copying Galen's words, pretends to relate the symptoms peculiar to the disease, when caused by anastomosis or by a wounded artery; and directs a different method of operation for each.[2]

At present, physicians understand by the name of aneurisms, all considerable dilatations of arteries and all tumours filled with blood which communicate with the internal cavity of any of the larger arteries, but divide them into the *true* and the *false*,

[1] See Galen de Tumoribus, cap. 2.

[2] See Paulus Ægineta, lib. 6, cap. 37.

or *spurious*, and the *mixed;* calling those *true,* where all or some of the proper coats of an artery are dilated; and those *false* or *spurious* where there is no such dilatation of the coats, but such an aperture in an artery of the larger series as allows blood to flow into a cavity or cavities, and form a tumour; and those *mixed,* where an artery has been first dilated, but afterwards, by the great stretching or erosion of its coats, they have given way; and the blood has either distended the neighbouring cellular membranes into one cyst or diffused itself everywhere through its cells.[1] 1760.

Part I.—*Of true aneurisms.*

For a long time it was a matter of dispute whether, in the true aneurism, all the coats of the arteries were dilated, or whether some of them, particularly the circular fibrous, commonly called muscular, was not always ruptured or wounded before the force of the blood was capable of dilating the vessel. Later experience has shown that aneurisms may be formed in both these ways.

That all the coats of arteries are sometimes dilated is plain to ocular demonstration, from the dissection of the aneurismal sacs in the case of John Parker.[2] For in the three smaller ones of the right side, the circular fibres and all the other coats, were traced distinctly over the whole circumference of the tumours: in the one in the left ham they were seen on the fore side; and, although they could not be traced on the back part, nor be at all observed in the large sac of the right ham, it is most probable that these two aneurisms were originally formed in the same manner as the others; though the violent stretching, and the mixture of other substances with the coats

[1] Lancisi thinks that dilatations of the ventricle of the heart should likewise be called aneurisms; but in this he is not generally followed.

[2] It may seem surprising that I should quote so particularly this case for a fact now so generally looked upon as common. The reason of it is, that, although we have many histories of cases of true aneurisms related, yet I have not found one of all those I have examined, where the different coats of the arteries have been traced by dissection, continued over the whole circumference of the aneurismal sacs. Haller is the only good anatomist who says he observed all the arterious coats, particularly the muscular, in an aneurism. But then he gives no figures of these coats, nor is he particular in the history of their dissection. See his account of an aneurism of the aorta, Opuscul. Pathologic. Observ. 18.

1760. of the sac, confounded all the parts so much as to make such a demonstration impracticable. And we may presume, that so many good anatomists, who have given us histories of what they call true aneurisms, were not deceived in the nature of the disease, although they have not described minutely the texture of the aneurismal sacs, corresponding to that of the arteries in a natural sound state. Probably the state to which the greater part of true aneurisms have been reduced before they were examined, has contributed to this inaccuracy of the observators. Most of them, we have any account of, had degenerated into the mixed kind; and the coats of the artery were either blended with osseous, steatomatous, purulent, or other morbid matter; or they were destroyed by erosion or overstretching, or were incorporated or confounded with the neighbouring cellular substance and membranes, or aponeuroses, that lay above the artery, as was the case with the one in the right ham of the first history I mentioned, long before the tumour burst externally, or otherwise put an end to the patient's life.

All the cavities of the human body are capable of being distended, and the vessels of being dilated. The veins are often observed to become varicose, and the arteries, on some occasions, to swell into aneurismal sacs.

The greater part of the true aneurisms we have any account of came of themselves, and no cause could be assigned for their origin. Strainings of the body, an increased momentum of the blood, and a stop put to its free circulation through some of the large vessels, has been alleged to give rise to several. However, this can only happen where some particular vessel has been overstrained, and so much weakened as not to be able to resist the force of the circulating blood; or, where there has been a former relaxation or predisposition in the vessels to suffer themselves to be dilated, otherwise aneurisms should often be observed in high fevers, and after amputations of the larger extremities.

In many cases there seems to be some cause which we cannot ascertain, either from the habit of body or from any particular structure or disorder of the parts observed after death.

Sometimes a scorbutic or venereal taint, or some other acrimony in the blood, has been accused; at other times particular obstructions or diseases of the arteries, at the part where they were dilated, have been said to occasion them. And certainly there

must either be a particular disposition of the blood, which renders it capable of softening or relaxing the arterial fibres, or some disorder in the fibres or vessels affected, or a particular quality in the fluids thrown upon such parts before an aneurism can be be produced; though these causes may be too subtle to come under the observation of our senses; for how often do we meet with cases of general lax habits, of palsies, of a general softening of the bones of the body, where we can discover no fault, either in the blood or in the structure of the parts? 1760.

The particles of our fluids are too subtile, and the sensible qualities of our blood, even when affected with diseases of very opposite natures, are so near to each other, and the vessels and fibres affected are so fine as not to be capable of coming under the observation of our senses, which can only judge of objects many thousand times more gross than these.

The cases of the two unfortunate patients I related above, are amongst those for which no causes can be assigned.

John Parker certainly laboured under no venereal taint; otherwise, in the space of twenty years, it would have showed itself some way or other.

He had committed no excesses, or received any particular injury in the parts where the aneurisms appeared. He was in a good state of health when the rupture came down; he underwent a dangerous operation, was blooded and kept upon low diet, by which the force of the circulation was moderated; a good suppuration came on, and a complete cure of the rupture was made, which showed his juices to be in a good state.

The keeping the knee bended towards the thigh, while he lay in bed under cure for the rupture, might have been alleged to have given rise to the aneurism under the left ham which first appeared, had not others come afterwards in the right ham and thigh, where no such cause could be assigned. There was no particular obstruction in the arteries for some inches below any of the tumours; and although we omitted examining the state of the arteries down to their extremities, yet, as in so many months no gangrene threatened till the circulation was stopped in the thigh with the tourniquet, and as the natural heat, sense, motion, and size remained in the left leg, and that there was no more œdematous swelling came on the right one than was to be expected from the pressure of so large a tumour in the ham on

1760. the returning veins, we may conclude that there was no such obstruction in the arteries below, as was capable of giving rise to the aneurisms.

Nor can we, with certainty, assign any cause for the aneurism which appeared in the armpit of Thomas Cooke, for it may be doubted whether an obstruction of the axillary artery gave rise to the aneurism, or whether the pressure of the aneurismal sac on the artery was not rather the cause of the concretion of its sides.

We have no pathognomonic symptoms by which we can know the true aneurisms when seated deep in any of the great cavities of the body till such time as they become so large as to be felt by external pressure or to protrude outwards, for the symptoms attending them differ according to their situation, and are so similar to those produced by other diseases as to make it impossible for us to distinguish them in the beginning. Perhaps a train of circumstances and symptoms, joined to the patient's complaining of a strong pulsation in the part, may lead us to suspect what the case is, though we can never be certain till it can be felt or seen. But when aneurisms are situated in the neck or in the extremities, then they are immediately distinguished by their yielding to the fingers, and having a strong pulsation, though afterwards, when they grow large, they sometimes lose it.

Most aneurisms gradually increase in their size, and sooner or later they protrude towards that side where they meet with the least resistance,[1] as we see by the two which were situated in the hams of John Parker, which both extended backwards, and by the histories related of true aneurisms proceeding from an internal cause. Aneurisms of the aorta, at its beginning

[1] De Haen gives an instance of an aneurism of the aorta which protruded between the second and third ribs of the left side, where the external tumour, instead of increasing, as generally happens, suddenly disappeared, and was not to be perceived for above a month before the patient's death, though, upon dissection, the aorta at its curvature was found to be dilated to the size of three fists. De Haen attributes this sudden disappearance of the external tumour to the weight of the aneurismal sac having loosened its attachment, and to its having fallen more within the thorax when the patient lay on the right side; for the difficulty of breathing and other symptoms of oppressed lungs increase immediately on its disappearance. Ratio Medend. par. 4, cap. 2, 17, 9.

and curvature, however, are exceptions to this rule, for here we find that they have generally protruded either forward towards the sternum or upward towards the neck, as the stream of blood coming from the heart strikes stronger against the fore part, and the upper sides of the curvature of the aorta, than anywhere else. 1760.

In the true aneurism, the pulsation, I believe, for the most part continues strong till the coats of the artery burst, and the aneurism becomes a mixture of the true and of the false kind; after which, indeed, the tumour often increases considerably, large polypous concretions are formed, and the pulsation ceases. Many authors tell us that the pulsation frequently ceases before the aneurism bursts; this often happens in false aneurisms; but from what I observed in the case of John Parker, where we had examples of true aneurisms in all their different stages, I think we have reason to believe that the pulsation does not in general cease, (though perhaps it may in some rare cases,) till the true coats of the artery have burst. For in all the aneurisms where the coats of the artery were entire, there was a strong pulsation to the last, even in the one of the left ham where there was a large polypous concretion, and in the one of the right ham, which at last burst, there was a strong pulsation long after the aneurism had lost the appearance and feel of a circumscribed tumour; and we had reason to believe that the true coats of the artery had burst, and that it had degenerated into an aneurism of the mixed kind. Hence, surgeons ought not too hastily to conclude, from the want of pulsation, that soft tumours situated above large blood-vessels are not aneurisms, but ought carefully to examine into their cause, progress, situation, attachments, and other circumstances of all such as are in the least suspicious, before they make any puncture or incision into them; for many fatal accidents have happened by their opening aneurisms[1] which they mistook for abscesses, from their having no pulsation.

[1] We have a great many instances of fatal consequences from aneurisms being opened by mistake for abscesses.

Vesalius was consulted for a tumour on the back, which he declared to be an aneurism; some time after an ignorant surgeon opened it, and the patient died instantaneously of a profuse hemorrhage. Bonet. Sepulch. Anat. lib. 4, sect. 2, obs. 21.

Lancisi gives a similar case, where a quack made an incision after he (Lancisi) had given his opinion that it was an aneurism. De Aneurism. Prop. 21. De Haen tells

1760. Aneurismal sacs generally contain lamellated and fibrous-like polypous concretions; the true aneurisms, however, when small, may be without them, as was the case with the three upper ones of the right, and with the small one situated high up in the left thigh of J. Parker.

The smaller an aneurism is, the more equally its coats are distended every way, and the more gradually it increases to and diminishes from its largest transverse diameter, the less apt it will be to have polypous concretions formed in it, as the stream of blood through it is then freest; but the larger it is, and the more it protrudes to one side in form of a pouch, the less free will the stream of blood be through it, and the more the blood will be apt to stagnate and to concrete.

These were the reasons why there were polypous concretions in that of the left ham of John Parker; why they are found almost always in mixed and false aneurisms; and why there were none in the four mentioned above.

Most aneurisms, when they come to be large, and lie contiguous to bones, render such bones carious; the sides of the aneurismal cysts generally grow firmly to the bone, and the force of the blood acting continually against the sides of the artery, while it is resisted by the firm bone on the other side, wastes away that part of the cyst, gives rise to obstructions and suppurations of the bone or its membranes, lays bare the bone, and renders it carious, as we find by examining many cases of aneurisms related by authors.[1] Frequently the pulsation of the blood against the sides of the cyst, and the pressure of the cyst against the bone give rise to obstructions and con-

of a patient who died from one of the knee being opened, after Boerhaave had advised the patient not to allow an aperture to be made. Rat. Medend. par. 4, cap. 2. Ruysch says that a friend of his, though an expert surgeon, opened a small aneurism near the heel for an abscess, and the patient was very near dying of a hemorrhage. Obs. Anat. observ. 38. Many more examples of this kind are to be found among the observators.

[1] See a case where the ribs were rough and carious in Magnet. Bibliothec. Chirurgie, vol. i, p. 92, from Ephemer. German. cent. 1 and 2. The end of the clavicle was laid bare, and rough and carious in the case related by Le Dran, Obs. Chir. vol. i, obs. 40. I felt the vertebræ rough and carious when I introduced my finger into the dilated aorta of a man who died from the bursting of an aneurism in St. George's Hospital in the year 1752. This case is related by Dr. Hunter in the first volume of Medical Observations and Inquiries, published at London. Many more such cases might be quoted.

sequent suppurations, and render the bone carious without laying it bare.[1] 1760.

Some people might have imagined that the caries of bones accompanying aneurisms was not produced in any of the manners just now mentioned, but that the blood served as a menstruum for dissolving the bony matter. Numerous cases, however, of ossifications[2] occurring in aneurisms, and the experiments made with the blood on bones,[3] are all repugnated to this opinion of the blood's being capable of dissolving and rendering the bones carious.

The sides of aneurismal sacs have been found in very different states. In the aorta, they have been found mostly firm; in some, approaching to a cartilaginous nature; in many, covered with long incrustations; in others, in a purulent corrupted state.[4] They

[1] Ruysh mentions two cases where the ribs were carious, although the cysts of the aneurism were entire. Observat. Anat. 37. Du Vernoy gives us the case of an aneurism of the aorta, which had made pits in the vertebræ which were lined with a membrane. Acta Petropolitan.

[2] Ambrose Paré tells us that the internal surface of an aneurism of the arteria venosa was quite ossified. De Tumor. contra Naturam, lib. 6, cap. 20.

The inside of an aneurism of the aorta was lined almost all over with long lamella, some larger, some smaller, like so many shells. Lafage in Phil. Trans. No. 267.

De Haen says he twice found aneurisms covered with bony incrustations on the inside, not continued over all the internal surface, but interspersed like so many little islands. Ratio Medend. par. 4, cap. 2, p. 15.

Haller says the external membranes of an aneurism of the aorta which he examined had a number of little scaly excrescences, the most part of which were ossified, or, at least, had a bony appearance. Opuscul. Patholog. Obs. 18.

An observation of Mr. Sharp's (Surgery, chap. 36) of the dilated aorta in the neighbourhood of the cyst being generally ossified, and of ossifications and indurations of the artery appearing so constantly in the beginning of aneurisms of the aorta that it is not easy to judge whether they be the cause or the effects of them, is just.

It may be worth while here to observe that, in the first two cases of aneurisms I related above, there was no ossification; which shows, at least, that aneurisms may arise from other causes, if it does not make it probable that ossifications are rather the consequences than the causes of such disorders.

[3] Dr. Pringle told me that he digested bones in putrid blood, but did not find that the blood had the least effect in dissolving them as a menstruum. The stream of blood indeed, by perpetually washing the caries of bones laid bare by aneurisms, prevents the oily matter separated from the bones from stagnating and acquiring the strong fetid smell and high degree of corruption observed in other caries.

[4] An aneurism of the aorta at its curvature, where the coats are thick and cartilaginous. Lazar. River. cent. 4, obs. 34.

The most internal or tendinous coat cartilaginous and tending to bone, the muscular

1760. are not generally of equal thickness throughout, but for the most part thicker, though not much, than the sides of the aorta naturally are. In the case of John Parker, the sides of the cyst which remained entire were nearly of the natural thickness of the arteries.

In the one which had burst and degenerated into the *mixed*, the sides of the cyst were thicker and firmer; in general, all aneurisms in this state, and all the *false* ones, like other encysted tumours, have their sides thick in proportion to their size.

2. Aneurisms which follow wounds, blows, violent strainings of the body, or other such accidents, probably often take their rise from a rupture of some of the proper coats, or of the cellular substance which connects them to the neighbouring parts, and serves by way of an outer covering, and from a dilatation of those coats or parts of coats which remain entire; for Dr. Nichols alleges, in the 'Philosophical Transactions,' No. 402, that if air be blown forcibly into the pulmonary artery, the coat called muscular will yield and burst, and the external be dilated into a cyst; and Dr. Haller,[1] in a memoir which he published on the Motion of the Blood, tells us that he has frequently, in living frogs, separated the arteries from the two lamellæ of the mesentery, and from the surrounding cellular membranes, and found that, as soon as he cut or wounded the artery, an aneurism was formed.

It is not only confirmed by experiments and observations of this kind that aneurisms may be formed in this manner, but likewise by cases which have occurred in practice. Cæsar Hawkins, Esq., serjeant-surgeon to his majesty, told me that, in performing the operation for an aneurism which had appeared

all ruptured or broke. Magnet. Biblioth. Chirurg. p. 92, from Miscel. Curios. dec. 3, an. 9 and 10.

In an aneurism of the aorta which terminated where that vessel approaches the vertebræ there were a great many ulcers. Haller, Opuscul, Pathol. Obs. 13. The sides of the aorta at the dilated part appeared five or six lines thick (i. e. about half an inch); in the artery itself were many white, callous, scaly bodies, which seemed to be full of pus. Ibid. Obs. 19.

The inside of most large aneurisms have been found covered with lamellated polypous concretions of blood, which many authors have either mistaken for coats of the cyst, or at least have called them by that name.

[1] See Act. Societat. reg. Gottingen, 1755; and Memoir 1, sur le Mouvement du Sang, p. 10; 1756.

after a wound in the fore-arm, made with a small sword, had been healed for some months, he found the artery dilated into an oval cyst, [like to that of tab. i, fig. 1, No. 2,] and not a cyst communicating by a small hole with the cavity of the artery, as is common. To be sure of not being mistaken, he opened the cyst; and, after having taken out a polypous concretion, he found the artery opening into the upper end of the cyst, and continued again from its lower end, with an apparent continuation of the coats of the artery with those of the cyst, and performed the cure in the same way as if it had been one of the false encysted aneurisms. 1760.

An erosion, or destruction of any of the coats of an artery, by pus or acrid matter of any kind, or such an obstruction or relaxation of any of the coats of an artery, as to render them incapable of resisting the force of the blood, may likewise give rise to such aneurisms.

3. These two species of true aneurisms may be complicated together; for after an artery has been stretched to a certain length, some of its coats may give way, and the others which remain entire be dilated into a cyst.

I once saw, with Dr. Hunter, an aneurism of the aorta, of a man who had been a patient at our hospital, but had gone out of the house before he died, which had this appearance: the aorta was distended to several times its natural size, from the heart to a little below its curvature; about an inch from the heart, in the right side, a cyst protruded from the aorta forwards, between two of the cartilages of the sternum; upon pressing this tumour with the finger towards the aorta, one felt as if there was a hole in the side of that vessel at the root of the tumour. Upon opening it, its cavity communicated with that of the aorta, and the membrane lining its inside seemed to be continued with the internal membrane of the aorta.

However, I own this case was doubtful; because the blood, when it forms a cyst in the cellular membranes, after the sides of an artery are burst, gives the internal membrane lining the cyst the appearance of being continued with the internal membrane of the artery; and this tumour had appeared some weeks before death.[1]

[1] A case a good deal similar to this, but where the sac protruded backwards, we have related by De Haen. An aneurism of the aorta began at the heart, and was beset

1760. The cure of all these kinds of aneurisms is nearly the same. When they are situated in any of the large cavities of the thorax or abdomen, they are seldom known till such time as they have become as large as to be absolutely incurable; when the only thing left to be done is to endeavour to prevent their bursting, which is followed with immediate death, and to palliate those painful and uneasy symptoms which almost always attend them. This is to be attempted by moderating the force of the blood, when too great, by bloodletting, and a mild low diet; by avoiding everything that will increase the heat and momentum of the blood in the vessels; by keeping the belly loose by means of mild eccoprotics or laxatives; by deadening the pain with opiates, when severe; and by giving such other remedies as the circumstances of the patient may require, and which can be administered with safety. Handling or feeling and examining of such tumours with the fingers ought to be avoided as much as possible; for in some cases it may bring on an anxiety, giddiness, suffocation, or other troublesome symptoms; in others, it may so change the situation of the large polypous concretions as to block up the passage through the dilated artery, or it may break off part of the polypous lamellæ or filaments, and give rise to new obstructions; in others, it may be in danger of bursting the aneurismal sac.

Gentle pressure, when the integuments come to be in danger of giving way, may preserve life for some time; but all strong pressure and tight bandages increase the patient's misery, and hasten the progress of the distemper.

When aneurisms are situated on the external parts, and are observed before they make any great progress, then something more may be attempted; for we know that various swellings of the veins have been removed; and if Lancisi and other practical authors have not mistaken the disorders, aneurisms have sometimes been cured by a proper regimen and medicines.

with a number of long incrustations; at the back part of the beginning of the descending aorta there was a hole the size of one's thumb, which opened into a large cyst which lay between the aorta and spine; this cyst was four inches long and two wide, and had raised the aorta from the spine, and separated the fourth and fifth ribs from one another, and protruded outwardly on the back into a cyst as large as one's fist; it was full of lamellated polypous concretions, and had had no pulsation for a considerable time. Rat. Medend. par. 4, cap. 2, p. 16.

In such cases, if the patient labour under any venereal, scor- 1760.
butic, or other disorders, we ought to endeavour to remove them by proper remedies, choosing such as can be given with safety under the present circumstances; and we must endeavour to allay the heat and momentum of the blood, and to keep the body cool by the means proposed immediately above in the cure of internal aneurisms; at the same time that astringent and discutient fomentations are applied, and a proper compression is kept on the part. When such aneurisms grow large, then the means here proposed can have no effect in making a cure, and the only method left is to apply a tourniquet nearer the heart than where the tumour is, so as to stop entirely the circulation in the part; to make an incision, and lay bare the artery in the middle of the fore part; to open the cyst, and evacuate its contents; to tie the artery above, and likewise below where it is dilated, to prevent bleeding from any anastomosing branches that may open into the artery farther from the heart than where the first ligature is made.

It may not be amiss in making these ligatures, where the situation of the dilated artery will admit of it, to follow the directions given by my father[1] for performing the operation in the false aneurisms of the arm, viz. to take hold of the artery with the thumb and fore finger of the left hand, pinching it towards the back part, and drawing it gently outwards at the same time, and then to push the needle close upon the nails, so as to shun any nerves that may lie near the artery; after having made the ligatures it is to be treated as any other wound.

This operation can almost only be done in the extremities and in the branches of the temporal artery. When indeed the tumour is situated in the neck, and the swelling does not extend much upwards or downwards, an operation may be attempted; for we know that an animal will live after one of its carotid arteries is tied. However, the difficulty of making a proper compression, and the danger of cutting those parts, will deter most cautious surgeons from attempting the operation when the aneurism is situated here.[2]

[1] See Edinburgh Medical Essays, vol. iv, art. 17.

[2] An aneurism of the carotid artery appeared some time after a wound of the neck

1760. When an aneurism is so situated in any of the extremities as to admit of an operation, I would not advise the surgeon to proceed immediately to the amputation of the extremity, as is directed by many, provided there be no carious bone or other disorder that requires it; for we find, by repeated operations that have been performed for false aneurisms in the arm, that, although the trunk of the humeral artery be tied, yet the lateral branches are capable, for the most part, of being so much dilated as to carry on the circulation and nourish the arm. The same thing may happen in the lower extremities when the crural artery is tied. And, therefore, where the aneurisms are situated anywhere below the middle of the arm or thigh, the surgeon ought only to tie the artery above and below the aneurismal sac, to open the cyst and evacuate its contents, and to treat it otherwise like an encysted tumour, and wait to see what nature will do; having, as Mr. Sharp advises, a tourniquet and proper instruments and dressings for amputations ready, in case it should prove requisite to proceed so far.

All aneurisms in the extremities will not admit of such operations; for if they be situated either in the groin, and ascend high towards the abdomen, or if they protrude from below the clavicle, it may be unadvisable to attempt any operation.

Part II.—*Of false or spurious aneurisms.*

The *false* or *spurious* aneurisms are of two kinds: the one, where the blood is diffused through the cellular membranes; the other, where it is contained in a cyst or bag. Both proceed from the bursting or wounding of some particular artery, or of a true aneurism; the one is called the *diffused*, the other, the *encysted*.

1. In the first, the blood is often diffused in great quantity through the cellular membranes, and sometimes has a strong pulsation, as happened in that case related by Severinus,[1] where there was a great quantity of blood extravasated among the muscles of the thigh; at other times the pulsation is but weak

with a sword; a surgeon attempted to cure it by operation; but not being able to make a sufficient compression, the patient died of an hemorrhage immediately. Harder. Observ. Pract., observ. 86.

[1] M. Aurel. Severn. de Effect Medicin. lib. 1, par. 2.

or scarce to be perceived. The only cure in such cases, where the artery is large, is to apply a tourniquet, and make such a compression as to stop the circulation in the part, to lay bare the artery and put a ligature round it, both above and below where it is wounded or ruptured, and to make incisions into the cellular membranes for the evacuation of the extravasated blood. 1760.

An old man who had been blooded in the basilic vein, was thought to have an obstinate thrombus at the part where the puncture had been made, and was allowed to use the arm freely. After some weeks, all that arm and a considerable part of the fore arm, swelled suddenly to a great size. This was treated as a tumour of the inflammatory kind, by bloodletting, emollient fomentations, &c., till Mr. Monro, surgeon to his majesty's military hospitals in North America, was consulted, who immediately knew it to be a diffused aneurism, and performed the operation just now described, taking out of the cellular substance, in which the large vessels and nerves of the arm lie, several pounds of coagulated blood. For six days after the operation everything had a very favorable appearance; but at last a gangrene came on the patient's buttocks, which continued to spread, notwithstanding the use of the bark and other proper remedies, till it put an end to his life.[1]

Where the artery is but small, such a compression kept on the artery as will stop the circulation in it, and incisions made through the skin and cellular membranes to allow the extravasated blood to be evacuated, may sometimes be sufficient.

This species is most likely to happen where the wound or hole in the artery is at first considerable; for it generally makes a rapid progress. It may, too, sometimes be occasioned by the sudden bursting of the sacs, either of the true or encysted aneurisms, without any rupture of the skin.

2. In the other kind, or the *encysted* false aneurisms, the blood from the artery is collected in a cyst formed by the cellular

[1] The diffused aneurism of the thigh mentioned above, from Severinus, was occasioned by a gun-shot wound; after forty days, an incision was made into the thigh, and six pounds of grumous coagulated blood taken out; the artery was tied both above and below the aperture through which the blood was discharged, and in six weeks the patient had the full use of his thigh and leg, and was perfectly cured.

1760. and other membranes, and aponeurosis, which happens to lie above the artery, drove close together.

This species of aneurism most commonly begins after a wound or puncture; where either the coats of the artery have been quite cut through, but the hemorrhage has been stopped by means of bandages and compresses till the lips of the external wound were firmly united; or where the coats of the artery were so injured, though not cut through, that they were not able to resist the force of the blood, but gave way after the external wound was healed. This kind is most likely to happen where the hole in the artery, or the injury done it, is at first but small; for its progress is commonly slow and gradual. It most frequently comes after bleeding at the arm.

Such aneurisms were commonly reckoned among the true ones, and were thought to take their rise from some of the coats of the artery being cut through, and the others being distended into a cyst; but later experience has shown, that in general such aneurisms as follow bleeding, even though they have not appeared till some time afterwards, are of the false or encysted kind. For, in most of the cases where the operation has been performed for this kind of aneurism, after opening the cyst, and removing the grumous or polypous concretions, the artery has been found lying in the bottom of the cyst with a small hole in its side,[1] which could not have happened had the cyst been formed of the proper coats of the artery. The case, however, of the true aneurism related above, which followed a wound of the arm, and was under the care of Mr. Hawkins, shows the possibility of true aneurisms following such accidents.

This kind of aneurism may not only proceed from external wounds, but likewise may be occasioned by violent strainings and efforts of the body rupturing particular arteries; or by pus, or other acrid matter, eroding or destroying the tone of their coats, as seems to have been the case in that aneurism of the aorta of which Dr. Pringle has given an account above.

We not only meet daily with instances of ruptures of arteries

[1] The artery was found in this state in all the cases of such aneurisms related in the Edinburgh Medical Essays, vol. ii and iv; in Memoirs of the Academy of Surgery at Paris, vol. ii; in De Haen, Ratio Medend. par. 4, cap. 2; in two or three cases where I was present at the operation; and in all the cases I have found related by the authors I have looked into.

from violent strainings of the body, and have several histories related of aneurisms proceeding from such cases, but find that the large veins, and even the heart itself, may be burst. In dissecting a body at Paris, with Dr. Drummond, physician to the Royal Infirmary at Edinburgh, we found the pericardium vastly distended with blood; and, upon searching for the vessel which had discharged it, found a hole in the right ventricle of the heart, near the apex, capable of admitting the little finger; but we could not afterwards learn the history of the person. 1760.

Ou the 28th of October, 1749, a soldier of the regiment of dragoon-guards, about twenty-three years of age, of a strong make, and seemingly in good health, after assisting to lift some very heavy boxes into a waggon that was going from Berwick to Belford, was seized with a kind of a fit, attended with a giddiness, sickness, and inclination to vomit, and was immediately carried to his quarters; his countenance looked bloated, his breathing was not much altered, except that it was sometimes interrupted with spasms, which seemed to throw him into great agonies; he complained of a sense of cold, and there was a total cessation of the pulse of both the heart and arteries. On the 29th he was much in the same way, complained of a pain in his left side, and of a sense of something rising in his throat, but was able to walk about the room, and had some stools. On the 30th, in the morning, he still remained in the same way, but died suddenly that day.

Upon opening the body, the pericardium was found immensely distended with blood, the heart was squeezed and contracted to a small size, and just above the right auricle the sinus of the vena cava was ruptured about the length of an inch.[1]

The encysted spurious aneurism appears first in form of a small beating tumour, which gradually increases in its size; in the beginning it may be made to disappear by pressure, but afterwards, when the blood was concreted in the cyst this cannot be done: when the tumour is once greatly enlarged, the pulsation often ceases, in the same manner as in the other species of aneurism; and in this kind the coats turn thicker as the swelling

[1] This history was given to me by Dr. Thomas Young, of Sheffield, soon after the accident happened, in the same form as sent to him by the surgeon of the regiment who attended the patient.

1760. enlarges, in the same manner as happens to all encysted tumours.

When these false aneurisms are small, we may attempt at first to cure them without any operation, provided the tumour can be made to disappear by pressure.

To effectuate this we ought to endeavour to moderate the force of the blood by bleeding and a cooling regimen, at the same time that such a compression is kept on the part by means of proper compresses and bandages as prevents the blood from flowing into the cyst; and this compression is to be continued not only till the tumour disappears, but likewise for some time after, otherwise there will be danger of a relapse; and if it has come after bleeding at the arm, the patient ought not to use his arm freely for a considerable time afterwards. M. Foubert in the second volume of the 'Memoirs of the Academy of Surgery,' at Paris, gives two or three instances of cures of aneurisms from bleeding being made in this way; and we have the case of an old woman, related by De Haen,[1] where the same attempt was made; but they were not able to remove the tumour.

However, after two months it had lost its tremulous motion, and only a hard immoveable lump, which seemed to cover the orifice of the artery, remained; it gave no uneasiness, and the woman afterwards had the free use of her arm.[2]

Where such aneurisms are large, and of long standing, this method can have no effect.[3]

Mr. Foubert says, that under such circumstances pressure only exulcerates the skin, and makes the bag or cyst open sooner, and perhaps suddenly, when the patient has no proper assistance near to stop the hemorrhage which necessarily follows. Bleeding, and a low regimen, by lessening the force of the blood, may prevent their rapid growth, but cannot be expected to make a cure. In such cases no complete cure can be made

[1] De Haen, Ratio Medend, par. 4, cap. 2.

[2] A surgeon of eminence, whose veracity may be entirely relied on, told me of a practice (scarce heard of in this country) which they have in Portugal of keeping ice constantly applied for a considerable time in order to discuss such tumours; and assured me that a young gentleman, son to a Lisbon merchant, told him that he himself had been cured by this means of an aneurism which had come after bleeding in his arm; and the gentleman's father confirmed the account given by the son.

[3] Mém. de l'Acad. de Chirurgie, tom. ii, 4to edit.

without an operation; and, where the tumour is so situated as to admit of this, it ought to be performed. 1760.

In doing this operation a tourniquet ought to be applied between the tumour and the heart, so as to put an entire stop to the circulation in the part; the cyst is to be opened, and its contents evacuated; a ligature is to be made above, and likewise below the orifice in the artery, to prevent bleeding from any anastomosing branches, and then the wound is to be treated in the common way. When such aneurisms are the consequence of bloodletting of the arm, the directions for shunning the nerves, as I have already mentioned, when describing the operation for the true aneurism, ought to be followed.

On some occasions the artery, after being laid bare, may be raised from the nerve by a probe introduced into the hole of its side, as is also advised by my father.[1] This precaution of shunning the nerve, if possible, ought never to be omitted; for in the cases related in the 'Commentaria Boneniensia,' and in two where I knew the nerve was tied in with the artery, the patients had not so free use of their arms as those had in whom the nerve was shunned. After the artery is tied, the wound is to be filled with soft lint, and proper compresses and bandages applied, and a suppuration is to be promoted.

It has been found that, although the trunk of the humeral artery has been tied, and there has been no pulsation in the wrist immediately after the operation, yet in one, two, three, or four days the pulse has returned, and the patients have recovered the free use of their arms.

It may, perhaps, be of use here to observe, that after the operation for the encysted spurious aneurism, where the opening into the cavity of the artery is small, and consequently the two ligatures are near to each other, there is less chance of an hemorrhage than there is after the operation for the true aneurism, where the ligatures are at a greater distance; for the longer the artery is between the two ligatures, the greater number of lateral branches arise from it, and the greater chance there is of their anastomosing with the branches which have come off from the trunk of the artery above or below the diseased part. Bandages, therefore, applied so tight as to stop the

[1] Med. Essays, vol. iv.

1760. blood from returning freely may cause it to regurgitate by any branches that come off from the diseased part, and communicate with those which arise from the artery above, and by this means occasion an hemorrhage, which will stop of itself on loosening the bandages, as seems to have happened once in the case related in 'Medical Essays,' (vol. ii, art. 15.)

As surgeons have been afraid of a mortification following the tying the trunk of the humeral artery, it has been proposed to cure such aneurisms without making any ligature, by laying the cyst open, evacuating its contents, and then, by means of compresses and bandages, to stop the bleeding till the orifice in the artery and the external wound are healed. Hambergerus, in the year 1732,[1] gave an account of a case cured by these means in the preceding year. Dr. Trew,[2] in the year 1748, gave another; and since then we have had several such related in the 'Memoirs of the French Academy of Surgery,' (vol. 2,) by M. Foubert and M. Morand, which were cured in the same way; and in one or two of them the agaric was used with success.

We are certain that wounds in arteries can be cured in the same manner as those made in veins, as we daily see happen in bleeding at the temporal artery; and Mr. Middleton, surgeon-general to his majesty's army, told me that about twenty years ago he had been twice called to stop hemorrhages from arteries of the arm which had been opened by mistake for veins; that in both he had stopped the bleeding by means of compresses and bandages applied above the humeral artery, and had cured both without making any ligature.

Part III.—*Of the different arteries which have been found dilated into aneurismal sacs, or ruptured.*

Having thus taken a general view of aneurisms, it may not be improper, before we leave the subject, to inquire in what parts of the body the different kinds have been observed.

From the histories we have of aneurisms, it is not easy to determine exactly what were true ones; for, although hundreds of authors mention them, yet the accurate histories of them are but few.

[1] Commerc. Literar. Norinberg, 1732. p. 107.

[2] Ephemerid. Nat. Curios. vol. x.

Most authors, till of late, only tell us that they found a cyst filled with blood, which had a pulsation during the patient's life; sometimes adding, that the cyst was a dilatation of the aorta or some other vessel: and most of the later writers content themselves with describing the external appearance of the aneurismal sac, without having dissected its coats, to determine in what state they were. But since, from the account of an aneurism of the aorta given by Haller, and from the history of the dissection of four of the aneurismal sacs in the case of J. Parker, we are fully satisfied of the existence of true aneurisms (in the strictest meaning of the words), I may take the liberty of classing under this head all those aneurisms where the coats of the sound artery are said to have been continued with the substance of the aneurismal sacs. All the arteries of the body certainly may be dilated into aneurismal sacs, when subjected to the causes capable of producing them. 1760.

Authors mention true aneurisms in the brain, but I have met with no account of any within the skull in such books as I have consulted. Indeed, in the 'Acta Haffniensia,'[1] there is mention made of an aneurism in the head; but the head was not opened after death, nor is there any proof of the disease being an aneurism; it seems rather to have been a suppuration within the skull. Aëtius, Fernelius, Paré, and a great many other authors mention aneurisms being frequent in the neck; but Heister[2] very justly remarks that this has not been found conformable to observation. Aëtius[3] himself seems to have pointed out from whence this mistake has probably arisen; for he says that dilatation of the vessels there produces that sort of tumour called bronchocele. In practice we daily meet with tumours which go by this name which have a strong and evident pulsation resembling that of aneurisms, for which I have more than once mistaken them, till I examined them more narrowly. These tumours are generally produced by a swelling of the thyroid gland, which is supplied with a large artery on each side; and when they become large, they likewise often press more or less on the carotid arteries, and are affected by their pulsations.

[1] Vol. i, art. 78.

[2] Institut. Chirurg. vol. i, cap. 13, not. d. 429.

[3] Art. Medic. Princip. Aëtius Tetrab. 4, Serm. 3, cap. 13.

1760. But although aneurisms of the neck are not frequent, as many of the older authors allege, yet they have been sometimes seen in this part, as the observations, related by M. Littré, in the 'Memoirs of the Academy of Sciences,' and by Dr. Dod, in the 'Philosophical Transactions,' of processes from the dilated curvature of the aorta protruding up towards the throat, and the cases of aneurisms of the carotid artery, related by Haller and Mangetus,[1] and of one by Harderus,[2] which appeared some time after a wound in the neck, evidently show.

The subclavian and axillary arteries have frequently been distended and enlarged into aneurismal sacs. Van Swieten[3] gives an account of a large one in the right subclavian artery, the first symptoms of which had appeared after a severe blow on the breast. Not only the aorta but the right subclavian artery was dilated in the case related in the 'Hist. de l'Academ. des Sciences, 1700,' and in the one mentioned by Guattani, (ibid. 1750.)

Panarolus Romanus[4] gives an account of the axillary artery being dilated; and, in the case of Thomas Cook, the axillary artery opened into a large cyst, and seemed originally to have been a true aneurism. Although true aneurisms of the arm are so much talked of, and most authors, till of late, mention those which have followed bleeding or wounds of the arm as true ones, yet I have not, in them, met with one accurate account, where the aneurismal sac was found to be a dilatation of the artery; so that the one narrated above, which appeared in the fore-arm some time after a wound with a small sword, where Mr. Hawkins performed the operation, is the only well-vouched one I know of. For all the cases mentioned in the 'Medical Essays,' and in the 'Memoirs of the Academy of Surgery,' and in other books, were false encysted aneurisms, excepting one, which was of the mixed kind, in which M. Morand[5] says, he not only found the artery perforated, but likewise dilated to double its natural size.

[1] Opuscul. Patholog. Obs. 4; Manget. Biblioth. Chirurg. lib. 1, p. 88, vol. i; ibid. p. 80.

[2] Observ. Anat. Pract. obs. 86, p. 324.

[3] Comment. in § 176, Boerhaav. Aphorism, tom. i, p. 288.

[4] Pentacost 2, obs. 11.

[5] Mém. de l'Acad. de Chirurg. vol. ii, 4to.

The number of cases related of true aneurisms of the aorta near the heart, are almost equal to, if not greater than, those observed in all the other parts of the body together. We have cases of this kind in the 'Philosophical Transactions;'[1] in the 'Memoirs of the Academy of Sciences at Paris;'[2] and in the other collections of this kind in the different parts of Europe; besides those given by Riverius,[3] by Severinus,[4] by Bonetus,[5] by Ruysch,[6] by Lancisi,[7] by Le Dran,[8] by Haller,[9] and an infinite number of other authors, in most of which the aorta had been found dilated at its curvature; in some to an immense size, capable of holding one, two, or more pints, with its coats; in some, firm, hard, cartilaginous, or even bony, not much thicker than natural; in others, thicker at one part and thinner at another; in others, two or three times the natural thickness of the aorta. 1760.

Many of them protruded either forwards towards the sternum, or upwards, on the inside of the clavicles, towards the neck, in the form of a pouch or oblong tumour; others pointed towards the back. Most of them at last burst, and the patient died of the hemorrhage. The one mentioned by Maloet, burst into the trachea arteria, and suffocated the patient; and we have the case of one which burst into the cavity of the thorax related by Mangetus;[10] some of them so disturbed the animal functions, and stopped the circulation, as to put an end to life before they broke. And, in the case related by M. Le Dran, the patient's life seems to have been sooner put an end to than otherwise it would have been, by a pressure made injudiciously on the external tumour; from whence M. Le Dran takes occasion to observe that, in such cases, external pressure does not assist

[1] No. 265, by M. La Fage; No. 402, by Dr. Dod.

[2] Littré, in the Memoirs for 1707 and 1712; Morand, in ditto for 1721; Maloet, in ditto for 1733; by a Surgeon, in the Hist. of ditto for 1700; Guattani, in ditto for 1750.

[3] Observ. cent. 4, obs. 3.

[4] De Novissim. Abscess. cap. 34, 35.

[5] Lib. 4, § 2 de Tumor. p. n. § 7.

[6] Obs. Anat. Chirurg. Cent. obs. 37 and 38.

[7] De Aneurism. Prop. 21 and 22.

[8] Obs. de Chirurg. vol. i, obs. 40.

[9] Opuscul. Pathol. Obs. 18.

[10] See his Biblioth. Chirurg. vol. i.

1760. the cure, and is made at the expense of the parts below; that it fatigues the patient, and often hastens death.

From hence I think that Dr. Freind[1] and Dr. Douglas[2] are certainly in the right, when they observe that the curvature of the aorta is more frequently dilated than any other vessel of the body, owing probably to the force of the blood, and the resistance it meets with being greater at this part than at any other, and to this vessel being more apt to be gorged with blood, and overstrained, whenever there is a stop put to the free circulation in any of the large vessels by any violent effort of the body.

The inferior parts of the aorta, and the large vessels within the abdomen, are not exempted from such accidents. Lancisi[3] quotes a case from Fontanus, of an aneurism of the aorta situated immediately above the iliacs. And we have a like one in the 'Histor. Morbor.' Uratislav. 1701. (p. 28.)

Severinus[4] mentions one of the cæliac artery. The pulmonary vessels too have been found dilated; for Ambrose Paré[5] gives the case of an aneurism or dilatation of the arteria venosa, where the internal coat was degenerated into a bony nature. The intercostal arteries have been found distended into large cysts, if authors have not mistaken the false for the true aneurisms. Ruysch[6] says he has seen one of the intercostal arteries distended to the size of a hen's egg, and wonders how such a small vessel could be so much dilated; but adds, that he has seen this happen three or four times. The arteries of the thigh may certainly be dilated; the case of J. Parker is a plain proof of this, besides many others related by authors. Mangetus[7] gives an account of a large aneurism in the middle of the thigh, which came after a violent strain.

De Haen[8] says that Boerhaave was consulted by a student for

[1] Hist. Medicin. in Vita Pauli.

[2] De Peritonæo.

[3] De Aneurism. prop. 38.

[4] De Novissim. Abscess. cap. 34, § 5.

[5] Oper. de Tumor. cont. Natur. lib. 6, cap. 23. Blancard calls this the pulmonary vein; Castelli, the artery.

[6] Thesaur. Anatom. 9, No. 5.

[7] Bibliothec. Chirurg. lib. i, p. 30.

[8] Rat. Medend. par. 4, cap. 2.

a large one of the knee, which then had no pulsation. Boer- 1760.
haave advised him never to allow it to be opened; but he, neglecting this advice, suffered for his folly. The arteries of the leg have been found enlarged. We have an account of one of these arteries being greatly dilated in Mangetus's 'Bibliotheca Chirurgica.'[1] The case related by Dr. Freind was certainly a true aneurism in the beginning, though it had degenerated into the mixed kind before the patient died;[2] as was likewise the one quoted by him from Van Horne, where the artery was found dilated to six times its natural size at the part where it had burst.

False aneurisms, both diffused and encysted, have followed wounds and external injuries in all the parts of the body, and it is needless to be particular in relating cases of them. In the 'Medical Essays,' in the 'Memoirs of the French Academy of Surgery,' and in other books, we have vast numbers of cases which followed bleeding at the arm. Tulpius[3] mentions one, which followed a wound between the thumb and forefinger, which was cured by compression.

Thomas Bartholin[4] gives an account of a large one, which came after a blow on the left side of the head, which was cured by opening the cyst and tying the ruptured vessel.

I saw a small one on the temple cured by the same means. Albinus[5] gives an account of one of the penis, from its being suddenly and inadvertently bended when erected, and afterwards treated injudiciously by emollients; and we have, in the 'Miscellan. Curios. A. N. C.,' 1764, the case of one in the thigh from a ruptured artery.

M. Foubert, in the second volume of the 'Memoirs of the Academy of Surgery,' tells us that he had an opportunity of dissecting the arms of two persons whom he had cured of the spurious encysted aneurism of the arm, without making any ligature; and says, that in both he found a little hard knot, and the aponeurosis of the arm growing firmly to the artery at the part where it had been opened. Upon opening the artery on

[1] Biblioth. Chirurg. lib. 1, p. 93.
[2] Hist. Medicin. in Vita Pauli.
[3] Observ. lib. 4, obs. 17.
[4] Observ. et Epistol. cent. 3, epist. 53.
[5] Lib. 3, Anotat. Academ.

1760. the opposite side, he observed the little hole of the artery firmly plugged up with a piece of coagulated blood, upon removing of which, he saw the aponeurosis grown firmly to the outer side of the artery.

W. HUNTER.[1]

1761. In a former paper upon the aneurism I took notice of a species of that complaint, which, so far as I know, had not been mentioned by any author, viz. where there is an anastomosis or immediate communication between the artery and vein at the part where the patient had been let blood, in consequence of the artery being wounded through the vein; so that blood passes immediately from the trunk of the artery into the trunk of the vein, and so back to the heart.

If ever this case happens, we are to suppose, that in the operation of bleeding the lancet is plunged into the artery through both sides of the vein, and that there will be three wounds made in these vessels, viz. two in the vein and one in the artery; and these will be nearly opposite to one another, and to the wound in the skin. This is what all surgeons know has often happened in bleeding; and the injury done the artery is commonly known by the jerking impetuosity of the stream whilst it flows from the vein, and by the difficulty of stopping it when a sufficient quantity is drawn.

In the next place we must suppose, that the wound of the skin, and of the adjacent or upper side of the vein, heal up as usual; but that the wound of the artery, and of the adjacent or underside of the vein remain open, (as the wound of the artery does in a spurious aneurism,) and by that means the blood is thrown from the trunk of the artery directly into the trunk of the vein. Extraordinary as this supposition may appear, in reality it differs from the common spurious aneurism in one circumstance only, viz. the wound remaining open in the side of the vein, as well as in the side of the artery. But this one circumstance will

[1] Further Observations upon a particular species of Aneurism. By William Hunter, M.D. Read August 24th, 1761.—Medical Observations and Inquiries; London, 1761.

occasion a great deal of difference in the symptoms, in the tendency of the complaint, and in the proper method of treating it: upon which account the knowledge of such a case will be of importance in surgery. It will differ in its symptoms from the common spurious aneurism, principally thus: The vein will be dilated or become varicose, and it will have a pulsatile jarring motion, on account of the stream from the artery. It will make a hissing noise, which will be found to correspond with the pulse, for the same reason. The blood of the tumour will be altogether, or almost entirely fluid, because kept in constant motion. 1761.

The artery, I apprehend, will become larger in the arm and smaller at the wrist than it was in the natural state; which will be found out by comparing the size and the pulse of the artery in both arms at these different places: the reason of which I shall speak of hereafter. And the effects of ligatures and of pressure upon the vessels, above the elbow and below it, will be what every person may readily conceive, who understands any thing of the nature of arteries and veins in the living body. The natural tendency of such a complaint will be very different from that of the spurious aneurism. The one is growing worse every hour, because of the resistance to the arterial blood; and if not remedied by surgery, must at last burst. The other, in a short time, comes to a nearly permanent state; and, if not disturbed, produces us mischief, because there is no considerable resistance to the blood that is forced out of the artery.

The proper treatment must therefore be very different in these two cases, the spurious aneurism requiring chirurgical assistance, perhaps as any disease whatever, whereas, in the other case, I presume it will be best to do nothing. If such cases do happen, they will, no doubt, be found to differ among themselves in many little circumstances, and particularly in the shape, &c. of the tumefied parts. Thus the dilatation of the veins may be in one only, or in several, and may extend lower or higher in one case than in another, &c. according to the manner of branching, and to the state of the valves in different arms: and the dilatation of the veins may also vary on account of the size of the artery that is wounded, and of the size of the orifice in the artery and in the vein.

Another difference in such cases will arise from the different manner in which the orifice of the artery may be united or con-

1761. tinued with the orifice of the vein. In one case, the trunk of the vein may keep close to the trunk of the artery, and the very thin stratum of cellular membrane between them may, by means of a little inflammation and coagulation of the blood among its filaments, as it were, solder the two orifices of these vessels together, so that there shall be nothing like a canal going from one to the other; and then the whole tumefaction will be more regular and more evidently a dilatation of the veins only.

In other instances, the blood that rushes from the wounded artery, meeting with some difficulty of admission and passage through the vein, may dilate the cellular membrane between the artery and vein into a bag, as in a common spurious aneurism, and so make a sort of canal between these two vessels.

The trunk of the vein will then be removed to some distance from the trunk of the artery, and the bag will be situated chiefly upon the under side of the vein. The bag may take on an irregular form, from the cellular membrane being more loose and yielding at one place than at another, and from being unequally bound down by the fascia of the biceps muscle. And if the bag be very large, especially if it be of an irregular figure, no doubt coagulations of blood may be formed, as in the common spurious aneurism. Most of the above-mentioned varieties I have already seen in examining and comparing two cases that have fallen under my observation.

I formerly gave a short account of the first of them, and with caution and diffidence, as the case was then entirely new to myself, and appeared incredible or incomprehensible to some others. I shall now relate it, with the addition of what has happened to the patient from that time, and confirm my opinion of it by another case, which is now before us, and about which any person in town may easily procure the testimony of his own senses.

Case I. About fourteen years ago, a young lady in the country was bled in the basilic vein of the arm, by a surgeon, who was unfortunate enough to wound the artery through the sides of the vein. He was instantly sensible of the misfortune by the violence and saltus of the stream that gushed from the vein. At the time of the accident, and for a great while afterwards, every method that could be suggested was taken for preventing or curing an aneurism by compression.

But these proved ineffectual; and as she was told that the aneurism, which had acquired a considerable bulk, would sooner or later burst, and that she might thereby lose her life if she did not submit to the operation, she came to town for advice. 1761.

The appearance was very particular, and so different from anything of the kind I had ever seen, that it engaged both my attention and curiosity, and made me examine it with care, in a variety of different ways. The veins at the bending of the arm, and especially the basilic, the vein that had been opened, were prodigiously enlarged at that place, and came gradually to their natural size, nearly at about two inches above, and as much below the elbow. When emptied by pressure, they filled again almost instantaneously; and this happened even when a ligature was applied tight round the fore-arm, immediately below the affected part. Both when the ligature was made tight, and when it was removed, they shrunk, and remained of a small size, while the finger was kept tight upon the artery, at the part where the vein had been opened in bleeding. There was a general swelling or fulness at the affected part, and in the course of the artery, which seemed to be larger, and to beat stronger than what is natural, all the way down the arm. There was likewise a pulsation in the dilated veins, corresponding to the pulse of the artery; and there was a hissing sound, and a tremulous jarring motion in the veins, which was very remarkable at the part that had been punctured, and became insensible at some distance both upwards and downwards.

Though such a case had never before entered into my thoughts, I was so well convinced, by the symptoms, of its arising from a communication between the artery and vein, that I gave an opinion to that purpose, and therefore advised her to do nothing while there should be no considerable alteration. I explained my notions of her case, that she might at any time better judge of its tendency, and guard against any pressure that might obstruct the return of the blood in the veins, and thereby aggravate the complaint. She followed this advice rather than what had been given by others; not from having a better opinion of it, but because it promised her a respite for some time, at least, from an operation which was terrible to her imagination. The consequences have been hitherto very agreeable to the opinion,

1761. as will appear by the following extract of a letter she wrote, Sept. 14, 1761, in answer to her friend in town, who had written to her upon the subject:

"I am very sorry to hear I have a fellow-sufferer in the case of my arm. The best comfort I can give the person you mention is, that it is now about fourteen years since I met with the accident. I do not find that it is much worse than when you saw it; though I think the veins that lie over the artery are rather more enlarged. But I have never attempted to do anything to it; nor do I find any uneasiness from it, more than that I cannot sleep on that side without feeling such a sensation as if all my blood was centred in my arm,[1] and now and then little pains about the wounded part in very hot weather, but not to last long.

"There is no congealed blood at the wounded part, for when I hold my arm up to my head the blood entirely returns, and the veins are as empty as they would be in my other arm. This is the best account I am capable of giving you.

"I wish it may give any satisfaction to the person who has been so unfortunate as myself. You know Mr. Hunter's advice to me was, not to do anything to it; which I have satisfied myself with, and have never attempted anything.

"I should be glad to know if this person has the same pulsation and noise that you have felt in mine, and whether it is exactly the same."

Surely we might venture to conclude that this is neither a true nor a spurious aneurism, if we knew nothing of the case but the two facts mentioned in the letter, viz. the disappearance of the tumour when the arm is held up, and its having continued so many years in the same state nearly.

Case II. Thomas Brookhouse Cheshire, at present a servant in the laboratory at the Middlesex Hospital, was bled in the arm about five years ago by a person who was reputed a good bleeder, though not of the profession. He says he felt at the time as if the lancet had gone too deep, and suspected that he was hurt; but the bleeding was easily stopped, and for the

[1] No doubt; because the vein is then somewhat compressed by the weight of the body.

first two days he observed nothing uncommon, except that his arm was black and blue down to his wrist. On the third day he observed a swelling, almost as large as it is now, at the part where he was bled. He thinks it very little altered since that time. His arm appears to him to have as much life and strength as ever, and he uses it as freely as the other, even in laborious employment. He is rather of a thin habit, so that the appearances in the arm are very distinct. The trunk of the brachial artery is considerably enlarged all the way down the arm, and its pulsation so strong, that it is apparent to the sight. A little above the bending of the arm the artery makes a remarkable serpentine turn, which raises up the skin, and by the force of its pulsation looks as if it was a beginning aneurism. But, notwithstanding the size and the force of pulsation of the brachial artery be much more considerable than in the other arm, the artery at the wrist is much smaller, and its pulsation much weaker. Whence it is evident that the disorder has brought on a great disproportion in size between the dilated trunk and the shrunk branches of the artery in the diseased arm. At the place where the puncture was made a bag rises up, projecting as much as if there was a large nutmeg under the skin. This bag is filled entirely with fluid blood, disappears under pressure, and has a strong pulsation. Its deepest part is manifestly united with the artery, and from that to its most prominent point its direction is a little inclined towards the inner condyle of the joint. Over the inside and most prominent part of this bag the basilic vein runs, and is so firmly united to it, and blended with it by communication, that it is difficult to determine whether the bag be a sinuous dilatation of a part of the vein, or if it be an adventitious cavity between the artery and vein formed in the cellular membrane; though I am more inclined to believe the last. Its communication, however, both with the artery and vein, is undoubted, as will appear by what follows. The basilic vein is very much enlarged, beginning to be so where the puncture was made in bleeding, and continuing so a considerable way up the arm. 1761.

When the arm hangs down, and more especially when a little pressure is made near the axilla, the extension of the vein is very apparent, and makes a considerable external swelling. But when the arm is held up, so as to give the returning blood

1761. the advantage of running downwards, the vein subsides, and no swelling whatever appears, except just at the punctured place, where the bag continues nearly as much dilated as when the arm hangs down. There is a remarkable tremulous motion (as well as a considerable pulsation) both in the bag, and in the dilated vein, as if the blood was squirted into it through a small hole. It is like what is produced in the mouth by continuing the sound of the letter R in a whisper. It is strongest at the very place where the vein was punctured, and becomes gradually less perceptible from that part upwards. It is even very apparent to the sight. It is entirely stopped by pressing the trunk of the artery any where above, or by pressing the bag or the vein at the punctured part; and there the very point of the finger is of sufficient breadth for that purpose. These compressions instantly stop the tremulous motion, and it instantly returns again when they cease. It is the same when the arm hangs down, and when held up, and when loose, or when girded by a ligature below the punctured part. This motion is not only felt, and seen distinctly, but heard too, if the ear be held near the part; and if the ear touches the skin the sound is much more loud and distinct. It is a hissing noise, as if there was a blast of air through a small hole, and interrupted, answering precisely and constantly to the stroke of the heart, or diastole of the artery. It stops immediately when the trunk of the artery is compressed, and returns instantly when the artery is free. The patient is so sensible of the noise, that it often keeps him from falling asleep, when the arm happens to be near his head, and then he commonly puts it down by his side in bed that he may go to rest.

There is no symptom of any blood being extravasated or coagulated about the part; for when the artery is firmly pressed by the finger at or above the punctured part, and the bag and vein are emptied by pressure, there is hardly any more thickness or fulness than in a natural state.

When the trunk of the artery has been compressed, and the blood pressed out of the bag and dilated vein, they both become full again the instant that the artery is left free. When a ligature is bound very tight round the arm, a little below the elbow, and by that means the pulse at the wrist entirely stopped, the bag and the dilated vein continue as much swelled, and the

tremulous motion continues as strong as before the ligature was applied. 1761.

In this state, if the bag and vein be quickly emptied by pressure, they do not remain empty, but fill again instantaneously; and this experiment succeeds in the same manner when repeated any number of times successively. But while the ligature remains upon the fore-arm, if the trunk of the brachial artery be compressed without touching the adjacent vein, instantly the tremulous motion ceases, and the bag and swelled vein subside; and if they be completely emptied by pressure, they remain empty till the artery be set at liberty, and then they both fill again as quickly as if they were blown up artificially. This experiment likewise succeeds when repeated a number of times successively; and if you look with attention while the compression is taken from the artery, you can trace the blood rushing first down the artery, then across the bag, and last of all flying upwards in the vein; though indeed the succession of these motions is so quick that it is difficult to distinguish them, and, therefore, when less curiously attended to, the three several parts seem all to be filled by one instantaneous jerk. While the ligature remains tight upon the fore-arm, if you apply another tight ligature round the middle of the arm, taking care to have the dilated part of the vein pretty full of blood, you will then be sensible that when you press the bag the blood returns into the artery and distends it; and when the pressure is taken from the bag the artery empties itself and grows flaccid; so that, by repeated and successive pressure, you can make the blood that is intercepted by the two ligatures undulate sensibly from the artery to the bag, and vice versâ.

All these observations and experiments were made and repeated before the members of the Society, and other gentlemen of the profession; and I am persuaded that nothing more is wanted to establish this new and useful observation in surgery, but an opportunity of examining one such case after death.

I shall not take up the reader's time with inquiring by what name the disorder should be called, whether aneurism, or varix, or both, or neither, as it is obvious that every surgeon would naturally reckon it a species of aneurism. But, as it will serve to elucidate the subject, it may not be amiss to put the following questions upon the second case.

1761. 1st. Why is the pulse at the wrist so much weaker in the diseased arm than in the other? Surely the reason is obvious and clear. If the blood can easily escape from the trunk of the artery directly into the trunk of the vein, it is natural to think that it will be driven along the extreme branches with less force, and in less quantity.

2d. Whence is it that the artery is enlarged all the way down the arm? I am of opinion that it is somehow the consequence of the blood passing so readily from the artery into the vein, and that it will always so happen in such cases. That it is not owing to any particular weakness in the coats of the artery, like that in a true aneurism, naturally and constantly tending to rupture, but is rather such an extension as happens to all arteries in growing bodies, and to the arteries of particular parts, when the parts themselves increase in their bulk, and, at the same time, retain a vascular structure. It is well known that the arteries of the uterus grow much larger in the time of utero-gestation.

I once saw a fleshy tumour upon the top of a man's head, as large nearly as his head; and his temporal and occipital arteries, which fed the tumour, were enlarged in proportion. I have observed the same change in the arteries of enlarged spleens, testes, &c., so that I should suppose it will be found to be universally true in fact, and the reason of it in theory seems evident. Now, in this very singular case, though at first sight the contrary perhaps would appear to be more rational, I presume that the derivation of blood to the arm by the wound of the artery has been the cause of the dilatation of that vessel; and that, in the living body, an artery will as certainly become larger when the resistance to the blood is taken off, as it will become smaller when it is compressed, or as it will shrink and become a solid cord when the blood is not allowed to pass through it at all. These effects of partial and of total compression of the arteries in living bodies, I could prove by many facts that have come within my own observation. Perhaps the explanation which I have given of the dilatation of the artery by the derivation of blood may seem obscure or inconclusive. It is difficult, indeed, to conceive the reason of many things that happen in the operations of nature; and we are very liable to err when we philosophise. Yet, with a just sense of the weak-

ness of our own reason, we may venture to make conjectures where we cannot give clear demonstration; as we may see the truth of a proposition, without being able to trace all the principles upon which it depends. In order to conceive how, or why, the trunk of the artery will become larger, in consequence of an immediate and free communication with the trunk of the vein, let us take another view of it, thus:—Suppose, that instead of a simple aperture, there was a large branch added to the artery, of the same diameter as the aperture, and that it ramified, in the common way, through some adventitious vascular part, a wen, for example, and terminated in corresponding veins, and that these ended in the common trunk of the basilic vein; everybody must see that in this case the trunk of the artery would dilate till it became proportionable in capacity to its branches; for till then the trunk would be the narrowest part of the canal, the part where there would be most resistance, and therefore the yielding coats of the artery would give way, till the just proportion was established between the trunk and all its branches. 1761.

These two cases, I apprehend, are similar as to the principal point, but differ in some particulars. In the case of an aperture. the resistance to the blood is diminished; thence it will move with more celerity, the trunk of the artery will be less enlarged, and the branches will shrink a little. But in the case of an additional branch, the resistance I presume would be as great as before, the celerity therefore would not be increased, the old branches would continue of the same dimensions, and the trunk would therefore increase still more.

3d. Why does the artery in this case make a serpentine turn, instead of running straight down the arm as usual? I am persuaded this is a natural consequence of its dilatation. The coats of arteries are elastic, and therefore whatever distends, must at the same time lengthen them, and thereby produce serpentine turns. I observe that this happens constantly in injecting the vessels of dead bodies; and I have often had opportunities of observing the same thing happen from the stroke of the heart in the arteries of living animals. In a snake or viper it is very apparent in an artery that runs along the outside of the lungs, which is thrown into serpentine windings, every time that it is dilated by the action of the heart. The arteries of

1761. the uterus are more convoluted in the last months of utero-gestation, than they were before conception; so far is the common observation from being true, that the uterine arteries have naturally a serpentine course to admit of the enlargement of that organ in pregnancy, without stretching the arteries.

In morbid bodies, I have seen many instances of the arteries having become serpentine in consequence of being enlarged and lengthened. Among other things of the like nature, in my anatomical collection, there is an aorta of a woman, which I found preternaturally dilated from its beginning at the heart to the passage between the crura of the diaphragm. From being enlarged, it was become so long that it could not run straight down the back as usual, but made gentle windings all the way.

Molinellius[1] has given us a very curious proof of this doctrine, though, in my opinion, he did not understand it. He dissected the arm of a surgeon, who, many years before his death, had the operation for the aneurism performed upon him by Valsalva. The trunk of the artery, which had been tied, was entirely obliterated, so that the circulation had been kept up by the collateral branches; and the branch of communication that passed from the lower part of the brachial to the upper part of the radial artery was not more remarkable for its largeness than for its numerous serpentine convolutions. Both these circumstances are strongly expressed in the figure that Molinellius has given, and likewise in his account of the dissection of the arm. He has endeavoured indeed to explain to us the cause of the convolutions of the artery: "Tot vero lunatis," says he, "atque inter se invicem oppositis ejusdem rami flexibus non alias fuisse causas putaverim, quam quæ amnes, haud absimili ratione, intorquent ac sinuant," &c. But in this article surely his philosophy is rather plausible than correct.

The facts, I apprehend, will be found to be thus: A river becomes longer because it digs a winding channel for itself, whereas an enlarged artery becomes winding because it is lengthened, and therefore cannot preserve its straight course.

[1] Comment. Bonon. tom. ii, part. al. p. 74.

WHITE.[1]

York; 8th June, 1769. Dear Doctor,—In obedience to your desire, that your pupils would communicate any material or uncommon appearance which might occur in their practice, I have sent you a case of a disease, which, I am apt to believe, is not very uncommon. You have greatly obliged the world in being the first discoverer of its true nature; no one before seems to have made any probable conjecture towards it; for which reason I flatter myself that this communication will be acceptable. 1769.

A young man, about twenty-eight years of age, footman to a gentleman in this city, came to me to be bled: this he desired me to do in his left arm, saying, that the vein in his right arm had been cut through as he imagined, and could never be opened since. I immediately desired him to show me his arm, which he did. The basilic vein was enlarged to three times its usual size, and throbbed violently. On applying my finger to it, I was sensible of a certain tremulous motion and thrilling noise, not only in the part immediately diseased but up the arm, in the course of the vein to the axilla: I instantly recollected your paper on the aneurismal varix, in the 'Medical Observations,' and found it evidently to be the same disease. The brachial artery is much enlarged; its pulsation evident from the axilla to the affected part; the pulse at the wrist of the diseased arm is sensibly weaker than in the other.

On pinching up the diseased vein, the coats of the artery are distinctly felt through it; and I am so sensible of the part where the hole by which the artery and vein communicate is situated, that I am certain I could run a pin through it. When the humeral artery is compressed, the thrilling noise ceases, but returns again with double force upon taking off the pressure. I could not perceive either the thrilling or any pulsation in the median or cephalic vein, though they are both of them enlarged. On applying my ear to the tumefied basilic vein, the pulsation,

[1] Two Letters on the Varicose Aneurism, from Mr. W. White, surgeon at York, to William Hunter, M.D., F.R.S., and by him communicated to the Society.—Medical Observations and Inquiries, vol. iv, 1771, p. 377.

1769. tremulous motion, and noise are distinctly perceived. He is very sensible of the thrilling noise himself, especially on resting his head upon the hand, or when he chances to lie upon it with his head in bed. It was caused by bleeding about ten years ago. Being ill, he got some person to do the operation that used to bleed for a trifle in a country village. He remembers that it hurt him very much; so that he says it must have been done with a broken or rusty lancet. His arm, for a large space about the puncture, grew quite black, and he was obliged to have it fomented for some time: it at length healed, came to its natural colour, but has been ever since in the way above described.

If you desire to be better informed of any particular of the case, I will readily endeavour to do it. I am, &c. W. WHITE.

P.S. The young man, I believe, will be in London in the beginning of next winter, as his master intends to reside there; so that, if it be agreeable to you, I can perhaps give you an opportunity of examining him yourself.

1770. York; 30th November, 1769. Dear Doctor,—The young man with the varicose aneurism is at this time servant in a family residing in York. I sent this afternoon to desire to see him at my house; he accordingly came, and I sent for Mr. Brown, a surgeon of eminence, and near neighbour of mine, to observe the case. The patient has a remarkably large system of blood-vessels; his veins in general lie superficially along his arms, so as to appear very blue and exactly defined. In consequence of which, the disorder was amazingly evident, and perceptible upon the slightest touch of the diseased vein. The peculiar kind of thrilling motion was very distinctly felt for some distance, both above and below the hole of communication. The place of communication was so easily perceived, that I am confident I could introduce the point of a needle exactly through it into the artery: it is surrounded with a part more prominent than the rest, being, I suppose, the cicatrix formed by the contact of the vein with the artery. The stream of blood propelled at every pulsation into the vein is distinctly felt with the finger.

The diseased vein is considerably enlarged, though not more so now than when I first saw it. I cannot perceive that the

pulsation of the artery in the wrist of the diseased arm is at all weaker now than in the other arm. 1770.

He has some thoughts of going to London in the spring; if he does, he promises to inform me; at which time I shall not fail of procuring you a sight of him.

If these few observations prove satisfactory, it will be a great pleasure to, &c., W. White.

ARMIGER.[1]

Queen Street, Cheapside, 30th November, 1770. If you think the following history of a varicose aneurism worthy the attention of the Medical Society, your communicating it will afford me a particular pleasure.

Mary Stevens, aged twenty-three, applied to me last November, on account of a swelling in the bend of her right arm, which she discovered within a few days after being bled by a female operator, about a month before I saw her. At first glance I perceived the basilic vein (and that only) pretty uniformly tumefied, about three inches in length, with a very strong pulsation in it. On touching the tumour very lightly, I felt a tremulous thrilling motion, most distinguishable at the place where the vein had been punctured, and gradually decreasing towards each extremity of the tumour. By making a strong pressure with my finger on the cicatrix of the vein, the pulsation and thrilling entirely ceased. I immediately recollected the cases I had read in the 'London Medical Observations' of that particular kind of aneurism, where a free communication had been preserved between the punctured vein and artery; and from every experiment I have made am fully convinced of the certainty of it in this case; for on compressing the humeral artery anywhere above the tumour, the pulsation and thrilling entirely cease, and the vein becomes flaccid; but is instantly filled with a gush from the artery as soon as the

[1] A Letter from Mr. Thomas Armiger, surgeon, to William Hunter, M.D. F.R.S. on the Varicose Aneurism, communicated with a Postscript by Dr. Hunter.—Medical Observations and Inquiries, vol. iv, p. 382.

1770. pressure is taken off. A tight ligature applied below the tumour does not prevent either the pulsation, thrilling, or distension of the vein. The size of the tumour is considerably increased by compressing the vein only above its enlargement; and much more so when the arm is raised than when it is hanging down.

In this case the humeral artery is not perceptibly dilated, and the pulsation, both in this and the radial artery, differs very little from that in the other arm, owing, I imagine, to the basilic vein alone being dilated, and that to no very great extent. When the patient lies down on her right side she feels a numbness, and sense of fulness, from the shoulder to the fingers' ends of that arm, and hears both the pulsation and thrilling, if she reclines her head upon it; which I never could discover, unless my ear or hair touched the tumour, or the communication between them was kept up by some intermediate body.

I have frequently seen the young woman since the accident, and have not found the tumour to increase these last four or five months; but have put her into a way to guard against the consequences which would arise, if it should by any means (as she is a servant) burst; though, from all the histories of this case yet known, I hope little danger is to be apprehended. I remain, &c. THOMAS ARMIGER.

W. HUNTER.[1]

Dec. 3d, 1770. Gentlemen,—On Sunday se'nnight Mr. Armiger was so obliging as to give me an opportunity of seeing the subject of the preceding history, in company with Dr. Crell, professor of chemistry at Helmstad, Mr. Hewson, &c. We were all satisfied that the case was clearly and exactly what Mr. Armiger has described. In making various trials by ligature and compression, there was a very distinct phenomenon, which demonstrated to the eyesight the communication between

[1] A Postscript on the preceding case of the Varicose Aneurism, by William Hunter, M.D. F.R.S., addressed to the Medical Society.—Medical Observations and Inquiries, vol. iv, 1771.

the artery and the vein more distinctly than in the other two cases of the varicose aneurism which I had seen. When a ligature was applied tightly round the arm, a little below the tumefied part of the vein, to prevent its receiving the refluent venous blood in the ordinary way of the circulation, and then a strong compression made upon the artery a little above the tumour: in this state, I say, when the blood was pressed up by the fingers along the vein, there was no appearance whatever of any disease in the part; and upon taking off the pressure from the artery in this last state, the vein swelled out almost instantaneously, by the gush of blood thrown into it from the artery. So far this case was like all others of the varicose aneurism that have been hitherto known. But the peculiar circumstance was this, that when the gush of blood came from the artery against the inside of the empty and collapsed vein, which was covered at that place with a very thin skin, it raised or pushed out that particular part of the vein before the rest was sensibly filled, exactly as if it had been pushed out by throwing some small body against it from the inside; and that first push of the arterial blood was always precisely at the cicatrix, where the vein had been opened in bleeding. This appearance we all saw again and again, distinctly and satisfactorily. 1770.

You have now the pleasure, gentlemen, of seeing in your own collection five unquestionable instances of a disease which was not so much as imagined to exist; and I have the satisfaction to find that the opinion which in the first case was formed of the nature of the disease, the prognostic which was made, and the treatment which was recommended, are supported by all the experience which we have yet had.—W. H.

BAILLIE.[1]

It is of consequence to remark singular appearances of disease in the body, even if they should not obviously lead to 1789.

[1] Of uncommon Appearances of Disease in Blood-vessels. By Matthew Baillie, M.D. F.R.S. and Physician to St. George's Hospital. Read September 15th, 1789. —Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge; London, 1793.

1789. any useful observations in practice; because they open a more extended view of the operations of the animal economy, point out more clearly the resources of nature, and render the invention of the mind more generally fitted to assist, when her efforts would otherwise be ineffectual. It is in this point of view that I think the following remarks upon some uncommon appearances of disease in blood-vessels may not altogether be unworthy of notice. Two of the appearances which I shall describe, are certainly very rare, and the other, by no means common.

It is known to every person who is acquainted with the animal economy and pathology, that the blood coagulates, under certain circumstances, in the vessels of the living body. One case in which it coagulates is, when a ligature has been made upon a vessel, and the blood is prevented from flowing through it at that part, as in the artery of an amputated limb. Another case in which it coagulates is, when a vessel is dilated at any part into a sort of bag, so that the blood there moves slowly, and, as it were, out of the course of the circulation. The coagulum begins to be formed at the greatest distance from the current of blood; or, in other words, close to the sides of the dilated bag at the greatest distance from the cylindrical cavity of the artery. It is very rare that a coagulum is formed in an aneurismal artery, until it is so considerably enlarged beyond its ordinary size, and the blood is a good deal removed from its natural course of circulation.

It is still more rare that the coagulum fills up the whole cavity in which it is formed, so as to prevent the circulation altogether through that part of the vessel. Were this last circumstance often to take place, it would frequently become the natural cure of aneurism, and supersede the very painful means of a doubtful operation. It sometimes happens, however, that nature deviates from the ordinary course of diseased operation, and forms a coagulum so complete, as to fill up entirely the cavity in which it takes place, without there having been any previous stoppage to the circulation by a vessel being rendered impervious, and where a vessel is not much enlarged beyond its ordinary size. I had an opportunity of observing this in the carotid artery of a man who was brought, about two winters ago, to Windmill street, for dissection. The whole of the

arterial system in this man had a tendency to aneurism, the natural structure being in many places changed, and the diameter of the arteries being somewhat enlarged beyond their natural size. There was, however, no part dilated into a bag or sack, containing a coagulum, except, as I shall immediately explain, in the carotid arteries. In the right carotid artery, just before it divides into the external and internal carotids, I found an oval uniform swelling, about an inch and a half in length, and the diameter of the artery was scarcely enlarged to more than twice its ordinary size. The swelling was firm, giving the same resistance to the feeling as a healthy absorbent gland; and, if it had been felt through a thin layer of muscle, would certainly have been mistaken for one of a large size. I mention this comparison, to give a more distinct idea of the tumour. When I cut through the coats of the artery, I found its cavity completely filled with a firm coagulum of blood, which had not the appearance of blood being recently coagulated after death, as in the beginning of the pulmonary artery, but had the appearance of an old aneurismal coagulum. 1789.

The coagulum adhered everywhere so firmly to the inside of the vessel, that in separating it, the inner coat was, in many places, peeled off along with the coagulum. In cutting into this substance, I found it consisting of distinct layers, as in a common aneurism. There was no part of it which had the appearance of being recently formed, and therefore, there cannot be any doubt of its having existed for a considerable time before the man's death. It is obvious, then, that in this case, a coagulum had been formed in the carotid artery, undergoing the same process as in aneurism, and that the tendency to aneurism had remedied itself. The whole cavity being filled up with the coagulum, there was no circulation whatever at this part; hence the cause of further dilatation was removed, and there was no danger of the rupture of the vessel, which is the principal danger in this disease.

A few cases only have been related by authors of aneurisms being cured without any chirurgical operation, and even some of these have been suspected not to be authentic.

Two cases have occurred lately to Mr. Ford, surgeon, de-

1789. scribed by him in the 'London Medical Journal,' about which there can be no doubt. Mr. Home has offered a very ingenious explanation of such cases, founded on observations made by Mr. Hunter on the state of arteries in mortification, viz. that it is probable the blood coagulates in the artery above the seat of the aneurismal bag, so as to render it then impervious. This explanation, although it accounts sufficiently for the case to which it immediately refers, yet is not applicable to all cases where aneurisms undergo a natural cure. In the one which I have related, there was no coagulum of blood formed, except in the dilated part of the artery; no steps whatever towards mortification had taken place, so that the natural cure depended entirely on the coagulum formed where the artery was enlarged. The blood here had coagulated much more readily than in proportion to the dilatation of the artery, so that the whole cavity was filled up before it had enlarged to any considerable size.

Wherever there is a disposition in the blood to coagulate greater than in proportion to the enlargement of the artery, the coagulum will at length fill up the whole cavity of the dilated part, and produce a natural cure of aneurism. This state of the blood, or rather of the coagulable lymph, may arise from some connexion or sympathy it may have with the diseased structure of the artery, but it is perhaps impossible to determine this with certainty.

We may remark, that in the left carotid artery of the same person, exactly before its division into the external and internal carotids, a dilatation and coagulum were formed; but the dilatation had more the shape of a common aneurismal sack, and the coagulum did not entirely fill up the cavity of the vessel. There was only, however, a small canal for the current of blood, and I am inclined to think that the whole cavity would very soon have been filled up, so that on this side also, there would have been a natural cure for the aneurism. From the situation of the two carotid arteries, I shall just beg leave to observe, that it is not improbable a person might live without circulation through a part of the main trunks of both carotid arteries, so that if it should become absolutely necessary in any chirurgical operation, they might be taken up by ligature. Mr.

Hunter, in his Lectures upon Aneurism, has mentioned nearly the same opinion.[1] 1789.

[1] This opinion is in some measure confirmed by an experiment made by Valsalva, where he tied up both carotid arteries of a dog, which lived for two and twenty days afterwards, and might have continued to live but that he was killed for the purposes of dissection. In two other experiments of the same sort the dog lived a much shorter time; in one instance three days, and in another six. Vide Valsalv. Opera, Cura Morgagni, Epist. 13, p. 507. It would require a great many experiments to ascertain the common event of such an operation; but, from what has been said, it appears very obvious that it is capable of succeeding, and it could never be proposed by any person of common understanding except as the only means left of saving a patient's life.

PART II.

TREATMENT.

PART II.—TREATMENT.

AËTIUS.

ON DILATATION OF THE VESSELS.

Sixth Century.

As regards the treatment, it is well known that those aneurisms which occur in the neck or head are considered by surgeons to be past all remedy. For as soon as the aneurism is laid open, so large a quantity of blood and of vital spirit escapes, that the patient frequently dies in the hands of the surgeon. But surgeons treat aneurisms at the bend of the elbow in the following way.—The course of the artery, from the armpit down to the elbow, along the inner side of the arm, is first marked out; a simple incision is then made, in a longitudinal direction, for three or four fingers' breadth below the armpit, along the inner aspect of the arm, in that part where the artery is most distinct to the touch; the vessel being then gradually exposed, by dividing and separating the parts that lie above it, and being drawn up with a blunt hook, is properly tied by two ligatures, and divided midway between them. The incision is next to be filled with powdered myrrh, and suitable dressings spread with ointment are to be applied. The tumour in the cavity or bend of the elbow may then be safely laid open, without the fear of an effusion of blood. Having emptied out the coagula, the artery whence the blood flowed is to be sought for, and when found, being drawn up with a hook as before, is to be tied and cut across; this wound is then to be filled with powdered myrrh,

[1] Aëtius, Contractæ ex Veteribus Tetrabiblos; fol. Basiliæ, 1542. Sermo 3, cap. 10.

Sixth Century. so as to favour the formation of pus. To aneurisms of the neck, a plaster made of cypress, to be described below, among the discutient remedies, may be applied with advantage.

PAULUS [ÆGINETA].

Seventh Century. We must not attempt to cure large aneurisms affecting the armpits, the groins, the neck, or other places, on account of the great size of the vessels in these situations. But we can treat those that occur in the extremities, the limbs, or the head, in the following way.—If the tumour have arisen from a dilated artery, we must make a straight incision through the skin, the sides of which being drawn asunder, it is to be continued in the same way as has been recommended for the dissection of vessels, and the artery having been cleared of the surrounding parts, is to be exposed with the same scalpels with which the membranes have been divided. A needle being then passed under it, the artery is to be tied with a double ligature, having previously been punctured in the middle; suppuration must then be promoted until the ligatures fall out. But if the aneurism is occasioned by the rupture of the artery, all that can be done is to take it up, together with the skin, between the fingers, and then to pass a needle, armed with a double thread, below the part that is to be included in the ligature. After the needle has been passed through, the noose of the string is to be cut off with a pair of scissors, and thus the tumour, being included between two ligatures, is to be tied on both sides like a staphyloma. But if we are afraid that the strings do not surround it, another needle, likewise armed with a double thread, is to be passed through that part which is compressed by the first ligature, and the noose being then cut off we may tie the tumour in four divisions; or, the tumour being opened in the centre, we may, after it has been emptied, remove the skin, except that which is ligatured, and laying on a compress dress it with medicaments spread upon lint.

[1] Pauli Æginetæ Opus de Re Medicâ; Coloniæ, 1533, fol. lib. 6, cap. 37.

PARÉ.[1]

If the aneurisms be of considerable size, and are situated in the armpit, groin, or other parts where there are large vessels, they cannot be cured, for, on cutting into them, so large a quantity of the blood and vital spirit escapes that the patient dies. This I have sometimes seen, and lately in a priest of St. Andrè des Arts, by name Jean Mallet, living in the house of Monsieur de Thou, first president. This priest had an aneurism, about the size of a walnut, upon the shoulder-joint, and I advised him, as he valued his life, not to have it opened; but on the contrary to use the ointment of balo, and compresses dipped in the juice of mulberries and house-leeks mixed with fresh cheese and other cooling and astringent things, and to apply a plaster to prevent its rupture, with a thin plate of lead, and to wear short sleeves, so that his pourpoint might serve as a ligature to compress the tumour with. Also to avoid everything that might render the blood more liquid, and even to abstain from singing with too loud a voice at St. Andrè, as he was accustomed to do. He followed my advice for a whole year; but, notwithstanding this, the tumour increasing in size, he went to a barber, who, thinking that his aneurism was only a species of abscess, applied a caustic over night in order to open it. On the following morning, the opening was made, and a large quantity of blood escaped; at the sight of which being greatly alarmed, he cried to the president's wife to send for me in order to staunch it, telling her at the same time that I had advised him not to have it opened, but before I could reach him, he had expired. I, therefore, would advise the young surgeon not to open aneurisms, provided they be not very small, and situated in parts that are not very important; in which case he may divide the skin above them, and, separating the artery, pass a seton-needle armed with a strong thread under it, and allow the ligature to fall of itself. Nature will then generate flesh, which will block up the artery. Aneurisms that occur in internal parts are

1582.

[1] Les Œuvres d'Ambroise Paré; Lyon. 1641. Fol. liv. 7, chap. 34.

1582. incurable, happening frequently in those that have had the pox, and been several times sweated for it, by which means their blood has been very greatly heated, and rendered thin; which occasions that which is contained within the arteries to escape, and to dilate the body of the vessel, sometimes to the size of the fist. Which I have seen in the body of a man named Belanger, a master tailor, living on the bridge of St. Michel, near the sign of the Cock, who had an aneurism of the pulmonary artery (l'artère veineuse), of which he suddenly died, in consequence of the artery bursting whilst he was playing at ball. On dissecting him, I found a large quantity of blood effused within the thorax, the body of the artery dilated to the size of the fist, and its lining membrane quite ossified. This I exhibited shortly afterwards at the School of Medicine, when those who saw it were greatly surprised; and on this account, I keep it in my museum as a monstrous thing. This Belanger, whilst he lived, had a very strong pulsation in all his arteries, and said that he felt an extreme heat of the body, and often fainted. Monsieur Sylvius, the Lecturer on Medicine, had ordered him to discontinue his wine, and only to drink boiled or pure water; he chiefly lived upon fresh cheese, and the same was applied in the form of a poultice to the seat of the pain. In the evening, he took pearl barley mixed with barley flour and poppy seeds; occasionally refrigerant clysters were administered, or simply bruised barley. And Belanger told me that, from no other physician had he received so much benefit as from Sylvius.

GUILLEMEAU.[1]

1594. With regard to the treatment, the simple ligature of the artery is of service, more especially if the aneurism be somewhat large; but those which are of any considerable size, and particularly if situated in the neck, armpit, or groins, ought not to be tied, as it is impossible to find and expose the trunk of the artery, for, on incising them, such an abundance of blood and vital spirit escapes, that the patient is often left dead in the surgeon's hands.

[1] Les Œuvres de Chirurgie de Jacques Guillemeau; Paris, 1612; fol. p. 699.

The aneurism that occurs in the bend of the arm may be cured, as may be seen by the following case. Monsieur de Maintenon begged of me to go and see the son of Monsieur de Belleville, in whose arm a small aneurism had formed after bloodletting, and which had, in the course of time, attained the size of the fist; and the blood contained in which having become grumous, a certain degree of putrefaction was occasioned in the tumour, as might be seen by the skin having changed to a black and livid colour, and being even disorganized and ulcerated. In order to guard against the great flow of blood and loss of spirits that might ensue if the opening became larger, I proposed to the physicians and surgeons the only remedy that was left, namely, to ligature the artery above the aneurism, which was at the bend of the arm,—to which all agreed, and which was successfully done, in the presence of Messieurs Drouet, Doctor in Medicine, and Beauvais, surgeon of Anet, who had come to attend the patient. 1594.

I first of all marked out on the skin the course of the artery, along the upper and inner side of the arm, as it descends from the axilla to the bend of the elbow; and then, at a distance of three fingers' breadths above this part (the bend of the arm), following the mark that I had made, I made a simple incision, in a longitudinal direction, through the skin, which was, as it were, separated from the artery, where it can be felt, and having thus exposed the vessel, I passed under it, by means of a large curved needle, a small string, and then tied it with a double knot. This having been done, all the grumous and coagulated blood contained in the tumour was removed, and its walls were then washed with spirits of wine, in which I had dissolved some Ægyptiacum, in order to correct the putrefaction which had already begun in this part. A month after this the patient was perfectly cured, without having his arm in any way crippled, at which I was exceedingly astonished. If in any other external part the surgeon meets with a similar aneurism, he may with safety expose the trunk of the artery towards its root and upper part, and ligature it in the same way, without any further ceremony.[1]

[1 Si en quelque autre partie extérieure il se presente au chirurgien pareil anevrisme, il peut seurement découvrir le corps de l'artère vers sa racine et partie supérieure, et la lier de mesme façon, sans autre cérémonie. L. C. p. 699.]

SEVERINUS.[1]

1643. I shall now relate the fifth case of aneurism that has been cured by me, as reported by Francisco de Natali, a most learned doctor of medicine, to which I have added some observations of my own.

The most learned physician, Marcus Aurelius Severinus, was sent for by Anselmo Pagano, a nobleman, whom he found labouring under a very large tumour of the upper part of the right thigh, near the groin, for which he had for four months been under the care of many different physicians, without, however, deriving any benefit, but, on the contrary, the case grew daily worse; for, although the tumour was at first no bigger than a filbert, beating strongly, so as to raise up two or three layers of bed-cloths, and whatever else was lying upon it, yet it grew to such a size that it lost its pulsations (as the patient informed me), and became as large as a winter-gourd, with an unequal surface, marked by three prominent bumps. Severinus being called in about this time, found it livid and threatening to become gangrenous, and having several ulcers scattered around it. The lividity descended as low as the great toe, and the whole of the foot had lost its sensibility. The patient was also labouring under many serious symptoms; his nights were sleepless, his eyes heavy as if comatose, or labouring under fever accompanied by cerebral symptoms; the urine was turbid, the strength much reduced, the whole limb was deprived of motion, and the patient suffered so much pain in the foot that he was unable to stand, and was always crying out to the bystanders to change the position of his thigh in order that he might have some rest.

On weighing all these circumstances in his mind, Severinus gave an unfavorable prognosis, and ordering the patient, on the evening of that day, which was the 28th of January, 1641, seven grains of nepenthes quercet., in order to procure sleep and allay the pains, determined upon adopting a different plan of treatment; for the other physicians having fomented the tumour with lenitive oils, he ordered poultices of meal, and

[1] Marci Aurelii Severini de Reconditâ Abscessuum Naturâ; 4to, Francofurti, 1643.

other strengthening things, to be applied. The part was so much strengthened by the poultices, and by frictions with oil of mastic, that the lividity was removed, only a small part, to the extent of about four fingers' breadths, being left at the summit deprived of sensation. On seeing this, he immediately, on the 1st of July, ordered a purge of ten grains of antimony, prepared in a peculiar way, which acts both upwards and downwards; bringing away upwards the superfluous phlegmatic and viscid humours, and carrying off downwards the more acute humours, such as green glairy bile; other things, to increase and support the strength, were also given. The fever immediately abated, the tumour very sensibly decreased, the patient obtained sleep, and, in fine, all the symptoms were removed or lessened. And as there was considerable œdema, extending from the tumour down to the foot,—baths, that possessed a strengthening and drying property, were ordered, by the daily use of which the tumour was sensibly diminished, although, from the weakness of the part, and the want of a proper temperature in it, the humours collected to a greater extent than was natural. 1643.

After this had been continued for three days, nature began the separation of the dead part; which being perceived, Severinus applied, on Thursday, July 4th, several cauterizing irons to the parts that were affected with necrosis; this was repeated morning and evening for five days, until the necrosis was destroyed, and the eschar being removed, a fleshy membrane perforated at many points became visible, the tumour being filled with grumous and black blood. Accordingly, on the 9th of the same month, he applied a broad cauterizing iron, and another one above this, and having burnt the parts in all directions, a poultice was laid upon them. On the following day, he introduced four cauterizing irons, and having in the evening removed more than a pound of blood, he again applied a poultice, and in the night, some fetid blood escaped from the opening. On the following day, the 11th of the same month, he employed four broad and thick red-hot irons which were immediately quenched, as if they had been plunged into water, and in the evening, on lifting up the poultice, he took away with a large spoon more than two pounds of blood. On the following morning, he again introduced the irons, and extracted a quantity of grumous and fluid blood, which had a very offen-

1643. sive smell, growing worse daily; and in the same evening, he removed with the spoon more than two pounds and a half of the same kind of blood. He then introduced into this large wound several astringent powders, such as burnt vitriol, verdigris, sal ammoniac and alum, above all of which he applied tents dipped in the unguentum Ægyptiacum, a poultice of a very concocting quality being laid above all. In this way, the patient was dressed every twenty-fourth hour, an immense quantity of putrid and very fetid blood being removed at each dressing. On the 17th of the same month, he removed with the forceps a piece of bloody flesh, like a sponge, of about a pound in weight; after which he continued the same dressings, but more sparingly. On the following day, the discharge of putrid blood diminished, and nothing was to be seen but putrid flesh and the cords of the veins and artery, together with the fibres of the putrid muscles and tendons, which gave out a most abominable odour: having extracted a great part of this, and seeing less of it on the following morning, he wished to apply a mundificative. On the next day, a lotion composed of wine, honey, spirits of wine, salt, and Ægyptiacum, being used, a nerve, about three inches in length and some putrid flesh were removed; the wound appeared tolerably clear. The mundificative was then applied, and on the following day, the whole wound appeared clear, and the bone exposed to the extent of one inch in breadth and three in length.

Severinus then, by means of a reed, blew in catagmatic powders against the bone and the whole surface of the cavity; which was of such immense size, and the quantity of charpie required to fill it was so great, that he ordered it to be dressed with the finest tow, of which not less than half a pound was required for each dressing. As it became filled up with flesh, he prepared tents made of cotton; he particularly dressed the bone with the catagmatic, as has been said, and for three days applied tents dipped in medicated wine. On the 23d, he washed the wound with aqua gurgitelli, and in order to heal the bone, he placed over all an ointment made of rectified oil of wax, and of gum elemi to an extent equal to that of the bone; a mundificative, composed of honey, turpentine, and the above-named powders, was then applied upon tents, and a small quantity of barley meal being added to another portion of it, a

poultice was made which was applied externally; which dressing caused a copious suppuration; but on the 24th, the bone being observed to be somewhat blackened, and the flesh having become cleaner and redder, and the sinus filled up, there was less occasion for the tents; the same dressings were applied then, and on the following day. On the 26th, it became necessary on account of the great discharge to dress the bone twice a day, which plan was continued until the 2d of August, when, as the whole limb from the knee downwards was excessively painful, and the tendons of the bone were affected with spasm, it was softened and rubbed with oil of earthworms, oil of wax, turpentine, and cock's fat. But on the 3d, the discharge was in such enormous quantity that it became necessary to apply dry pledgets of charpie and pieces of sponge, in order to suck it up. The patient being kept upon a strict diet, the pain abated, and some of the centaurium minus being added to his lotion, the wound immediately assumed a more healthy appearance, and the granulations began to spring up. On the 4th and 5th, tents dipped in the above-mentioned mundificative were applied, but in the evening, these were used dry. 1643.

[It would be tedious to continue the relation of this case: by the end of August the wound had healed up, and before the end of the year the patient was able to walk perfectly well, sometimes requiring the support of a stick, but frequently walking without one.]

Jacob, the son of the commander of the halberdiers of Campania, seventeen years of age, or thereabouts, and of a bilious complexion, was wounded in the right thigh at about eight fingers' breadth below the groin, by the discharge of a musket loaded with one bullet only. The ball entered between the rectus, gracilis, and vastus externus muscles, and passed out on the opposite side through the triceps. The wound necessarily occasioned much laceration of the parts, and especially of the great artery, whence there occurred a very copious flow of arterial blood; to arrest which Joannes Trullius, a celebrated lithotomist and surgeon, was called in; who, on his arrival seeing that the wound had been attended to by a surgeon-barber, left it un- 1646[1]

[1] M. A. Severini de Efficaci Medicinâ, libri 3; Francofurti, 1646; fol. p. 50 et seq.

1646. touched until the following day; when he found, after the bandages were loosened, that the hemorrhage had been checked, but that the part had swollen very considerably and was pulsating, so that the pulsations lifted up both hands when laid upon the tumour. Having immediately suspected that an artery was wounded, he pointed out the difficult and dangerous nature of the case; on which account he wished that some other skilful surgeon might be associated with him in its treatment by the parents. Ferranti was therefore called in, and he likewise thought badly of the wound. They agreed in ordering the application of astringents and refrigerants; and having directed the patient to remain quiet, they left the wound untouched for several days, although occasional bleeding to the extent of three or four ounces took place from it, but stopped immediately of its own accord. The fever, pain, and pulsation thus increasing from day to day, they became much alarmed, and called in other surgeons, so that by consulting together they might give the patient some assistance. The majority of them were for leaving the case to time and nature, but Joannes Trullius ordered the wound to be dilated, so that the artery might be sought for, which opinion was rejected. Having therefore recourse to the plan that has already been mentioned, and having bandaged the wound, they delayed from one day to another until the seventeenth, when the blood bursting forth as before, I was called in, in order to give my true and candid opinion as to what I thought of the case. Everything then that had been done having been mentioned, I found that the wound was free from all unhealthy action, and that the swelling and pulsation had subsided; as not only the persons just mentioned, but also the assistants, and especially a certain barber-surgeon, Hieronymus by name, who was constantly in attendance in order that he might be ready to arrest the flow of blood, if there were any occasion for it, asserted. We were all, therefore, unanimously of opinion that the plan of treatment which appeared to be agreeing with him should not be changed; and that therefore the same remedies that had before been applied to the wound should be continued; besides that, in order to keep up his strength, he should be allowed to drink wine freely. The blood continued by these means to be restrained for thirteen days, at the expiration of which it again burst forth

and then stopped spontaneously. On the thirtieth day, the wound having been uncovered, we found a soft tumour, which we hoped would suppurate, (for the suppuration once having been established, the flesh would be formed anew, and the injured vessel would be healed by its growing up underneath, as frequently happens); but the event turned out contrary to our hopes. 1646.

As the patient's strength diminished, the fever increased; and as his face as well as the other parts of his body grew thinner daily, we had a sad affair to deal with; nor did there appear to be a chance of recovery in any other way (if indeed there were any) than by dilating the wound, so that the artery might either be stitched up, or ligatured, or burnt with caustic; or the flow of blood be arrested in some other way. Before doing this we sent for the father, and pointing out to him the precarious condition in which his son was, and his inevitably speedy death, told him that there was indeed one remedy left, but that the result of this was doubtful and uncertain; not so much so after the performance of the operation, as during the very operation itself from the bleeding that would necessarily ensue, the patient's strength being now worn out and prostrated. On hearing this, the father departed sorrowfully from us, and, as it were, consented by his silence. Having then got ready everything that was necessary we undertook the operation. We first sought for the artery near the groin, and following it a little below this, a hard compress was applied over its course, and the thigh was bound up with a tight ligature in the same way as when some part of it is to be amputated; so that the vessel being rendered narrower by the pressure might pour out a smaller quantity of blood during the operation. This having been done, we marked the part of the skin that was to be cut with ink, and Joannes having made an incision along the part that was marked, a large quantity of grumous blood, weighing at least six pounds, immediately appeared; this mass of blood being quickly removed, the artery was sought for, on finding which the hemorrhage was arrested by powerful pressure with the fingers, Joannes Trullius pressing strongly on the groin; we had now the artery plainly in view, which I separated from the accompanying vein and tied, first in the upper, then in the lower part, the same precautions having been taken that are attended to in varices. The artery was torn to about a third of its diameter, a portion being left,

1646. which, on the day after the application of the ligature was divided by Joannes Trullius, lest perchance it should draw the ends together before they sloughed. The further progress of the case was like that of a simple wound, and it was completely terminated in six weeks : Ferranti, Serroni, and many others being in attendance.

There are many wonderful circumstances in this case; but three of them are peculiarly remarkable: The first of these is, that the blood could be preserved out of the vessels during forty days without becoming putrid. The second is, that the blood had so separated the muscles from one another, that on the removal of the coagula the artery was immediately seen as plainly as if the muscles had been dissected, which facilitated the operation very greatly. Whence being instructed by this case, I would recommend that we should not always have immediate recourse to operation, but should practice this rather late than early, after all our other measures had been first employed; unless, indeed, hemorrhage compelled us to have recourse to manual procedure. The third circumstance deserving of note is, that nature nourished the limb after the artery had been ligatured, in the same way as if it had been supplied by the sound vessel, so that it neither became smaller in size nor weaker in strength.

WISEMAN.[1]

1676. All aneurismas are difficult of cure. Those which are large, and arise from arteries deep in the muscles, to which you cannot make your applications, are incurable; and if they be unadvisedly opened, the patient is in great danger of his life.

But if the aneurisma be in such a part as is capable of bandage and application of medicaments, the cure is feasible, or the disease may be palliated to the ease of the patient.

The cure of an aneurisma consists in the timely application of proper medicaments, and bandage to restrain the blood, and

[1] Several Chirurgical Treatises by Robert Wiseman, &c. London, 1692. 2d ed. fol.

keep it within its proper channel; or by escharotics or the actual cautery you may destroy it. 1676.

But if it lie where you may take it up, the cure is then best performed by dividing it. The medicaments proper to restrain it in its motion, and agglutinate the vessel, are bol. Armen., sang dracon., thus, aloe, far. volat. gypsum; also the juices of plantag. burs. pastoris, millefol. vincæ pervincæ, pilosellæ, lamii, and such like. The compounds may be made of some of the foregoing powders with some of the aforesaid juices, or mixed cum aceto et albumin. ovorum.

In the first appearance of the tumour, if it arise from an internal case, you shall endeavour, by the application of some of the aforesaid astringents and bandage, to restrain the growth of it; but if it be in a place incapable of bandage, you must content yourself with the application of empl. cæsaris, or such like. If it be near the trachea arteria, the patient may wear beaten lead or gold upon it, covered with sarsenet or the like. You are to be well advised before you attempt the cure by opening it. If by putrefaction the blood burst forth suddenly upon you, the life of your patient is then in danger, and it will become you to be quick in the application of good restrictives and bandage, till you have time to consider what to do; and be sure to provide against the next eruption; for till it break of itself you are not to open it; and then you may attempt the stopping of the flux by such means as have been or hereafter shall be proposed.

If the aneurisma happen by puncture in letting blood, the chirurgeon ought to permit the vessel opened to bleed freely; but if it doth not bleed well, let him immediately loosen the bandage, and apply a compress dipped in his majesty's stiptic, or, for want of it, in oxycrate. Let it be held firmly upon the aperture by a servant, whilst the chirurgeon openeth a vein in the other arm, and maketh revulsion by a large evacuation to fainting, if it may be permitted.

The while let your astringent powders be applied to the wound, with good restrictive emplasters over them. The upper part of the arm to the axilla is to be defended by cloths wrung out of oxycrate. Then with a roller with two heads take two or three turns upon the diseased part, and roll upward (his arm being bowed the while); and, for more security, take a turn

1676. about the neck, and return back with your bandage gradually to the part affected, fastening it on the outside; then make the expulsive bandage from the hand upward. These ought to be made to the ease of the patient, who, being thus dressed, must be put into his bed, and his hand placed upon his breast. Contemperating juleps, emulsions, opiates, &c. ought to be prescribed him, and his diet, &c. to be regulated as is proposed in the chapter of the Wounds of the Veins and Arteries. Having made this bandage well, you are not to be over-hasty in opening it again; for this first dressing haply secures your patient. For the great mischief happening in these aneurismas proceedeth from the ignorance of the bloodletter, who, not considering the error committed by him in letting blood, binds up the arm carelessly, and the next day, upon the patient's complaint, not discovering the cause of the tumour, foments and embrocates it, thereby making way for the blood to empty itself into the interstices of the muscles; whereupon the whole arm swelleth: in which case a laced sleeve and glove may be of great use. When this method fails, it may be necessary that you prepare for deligation of the artery.

The manner of doing it you may see in the chapter of the Wounds of the Veins and Arteries. I shall also show it in one of the following observations.

1. I have had many brought to me with swelled necks, upon suspicion that they were troubled with a species of king's evil, called bronchocele; but the pulsation of those tumours showed them to be aneurismas, and the most difficult to treat; they, by reason of their situation, not being capable of bandage. In which cases I commonly proposed the wearing of a cap of beaten lead, made of many sheets laid upon one another, and covered with silk or sarsenet, which, with ribands, were made to fasten about the neck with much ease; or, if they would have emplasters, I applied some of a mixture of unguent. sumach with empl. cæsaris, or such like.

Where aneurismas have affected parts capable of bandage, I have sometimes palliated them; but when they would not be so quieted, I prosecuted the cure as followeth:

2. A man of about forty years of age, having some time been troubled with a large soft tumour on the inside of his right leg, about his gartering, desired my advice. It was without pain,

inflammation, or pulsation, but soft from its first appearance, and 1676.
was bigger or lesser according as he walked much or little; which
gave me suspicion it might be an aneurisma. I applied empl.
cæsaris over it, caused a laced stocking to be put on it, let him
blood, and advised to purging, regulation of diet and exercise,
&c. by which it was kept quiet some time. But he, growing
more secure, neglected the rules prescribed him; whereupon
the tumour increased, and burst forth one night in a flux of
blood. I was sent for, and found much extravasated, but the
opening itself was stopped with a clot of grumous, blood. I
dressed it up with restrictives and compress wrung out of oxy-
crate. Then I made revulsion by venesection and deligation of
other parts. I also prescribed opiates, &c. to calm the ferment
in the blood. By this, and my way of dressing, the blood was
for some days tolerably restrained; but as the opening grew
bigger the effusion was greater. Upon which consideration I
had provided some trochisci de minio, of several sizes, also some
pulv. sine pari Jo. Arden. I put in some of the former, and
applied my restrictives and bandage over the tumour; and as
often as the blood burst forth I continued that way of dressing,
hoping by those escharotics to destroy the artery. Afterwards,
the orifice growing larger, I filled up the abscess with the pulv.
sine pari upon dossils, and applied restrictives and bandage as
before. The patient grew daily weaker; but from this latter
dressing the bleeding was restrained till the fifth day, when I
was necessitated to open it, by reason of the excoriations made
in many places about it by the escharotics: nor was it then
much. The opening being large, I applied the escharotics to
more advantage, and dressed the excoriations with unguent.
album camphorat., continuing my empl. è bolo and bandage.
From that time the bleeding was stopped, I suppose by con-
suming the artery; yet for some while there came away much
stinking clotted blood. While I endeavoured to keep the blood
within the abscess, it insinuated between the muscles, making
the calf of the leg hollow to the very tendon: therefore, after
I was secured of the bleeding, I made way for the easy dis-
charge of matter, and deterged the abscess with mundif. para-
cels. To the excoriations I continued the use of epulotics, and
nourished my patient with good broths, caudles, &c. by which
he received strength apace. The sharp humours being evacu-

1676. ated with his blood, the abscess incarned by the application of the common sarcotics, and he was cured in less than a month, recovering also the perfect use of his leg.

3. Some years since I was desired to give a visit to a man lying in my way to Whitehall. He had a large white tumour possessing the fore part of his right thigh, of few months' growth; it was soft from the first appearance, and observed by the patient to be bigger and lesser at one time than another.

I considered the swelling, and concluded it an aneurisma. That there was no pulsation to be felt in it, was because it lay deep amongst the muscles, in which case the pulse is frequently intercepted. There lay a gummy emplaster upon it, and an attempt had been made to open it by caustic; but it not penetrating deep enough, the eschar separated without reaching near the cavity. I declared to the patient my thoughts, viz. that the swelling proceeded from blood poured forth of its vessels, either by erosion from within or by some outward cause, as by riding, &c., and advised him not to permit the tumour to be opened, desiring that, if his chirurgeon should persist in the suppurating or opening of it, he would send to me to meet him.

Some few days after the patient sent me notice that his chirurgeon had been with him, and resolved to open it; whereupon, I took the next opportunity to speak with the chirurgeon, and went along with him to his patient; where I endeavoured to persuade him that the swelling arose from blood, and withal proposed a palliative cure by a laced trowze and some good restrictive. But the chirurgeon declared himself positively for the opening of it. I, seeing his resolution, replied, "Since you are so opinionated, you may (if you think good) make a trial of the tumour by thrusting a small lancet directly into the middle of it; and if, upon pulling out of the lancet, it appear mattery, you may lay it more open; if it appear bloody, you may more easily cure it than one made by a caustic." He readily assented to the trial, and the patient rejoicing in the proposal, he attempted it with a lancet; but not thrusting it deep enough to reach the cavity, I took the lancet, and, passing it into the same opening he had made, thrust it directly down into the cavity, and pulled it out bloody, but not one drop followed it. The chirurgeon not being therewith satisfied, I wished him to pass a small

probe down into the opening. He did so; and I also made a search with the same probe, and felt the cavity large and full of liquids, which was certainly blood, the probe coming out bloody. I persuaded the patient to keep his bed till that puncture should be agglutinated, and advised the chirurgeon to be careful in the cure of it. We dressed it with a pledget of liniment Arcæi, with emplaster and bandage; to the use of which medicine I left them, not doubting of their care in healing up so small a puncture. 1676.

About ten days after, walking near the door in a dark evening, weary and desirous to rest myself, the thoughts of this poor man inclined me to go into the house. I inquired of the landlady if he was within. She replied, He is dying: that upon his rising out of his bed the blood had burst forth excessively; that the chirurgeon had for some days endeavoured to stop it, but had since left the patient, and a neighbour woman had applied a poultice to it; and that the chamber stunk so extremely as it would poison me to go into it. I went up, and found the room scattered with stinking bloody cloths, and the poor man languishing in his bed, which was not cleanlier. I sent presently away for the chirurgeon, and in the while made rollers and compresses, and sent for some yeast and wheat flour. The chirurgeon being come, we spread a mixture of them upon cloths, and armed several tents with the same. Having thus prepared our dressings as the time would permit, we took off the bloody ones, and held the orifice close while we cleansed the thigh from the poultice and blood; then stopped the orifice with a tent proportionably, and applied our agglutinatives over, with compress and bandage wrung out of oxycrate. We rolled the member moderately straight, then laid him clean, and caused a mess of caudle to be given him, and encouraged him with hopes of recovery. The chirurgeon pleaded for himself, that he thought the patient had been dead.

Three or four days after we dressed him again, and found him much recruited in his spirits, he not having bled one drop; and indeed the emplasters adhered as close to the skin as we could desire. After we had taken out the tent, abundance of grumous blood issued forth; we cleansed it away, and shaked into the abscess about a drachm of merc. præcipitat.; and though we had then choice of medicaments, yet we applied the same as

1676. before, and continued that method of dressings till the blood was converted to matter.

Then we slit open the orifice, and dressed it as a sinuous ulcer. After some days, observing that the matter could not discharge while he kept his bed till the abscess was full to run over, we caused him to rise out of it; but that little he was up he swooned; wherefore we put him to bed again, and allowed him stronger nourishment, and by a seton-needle made way for the discharge of matter to more advantage. The abscess being well disposed to cure, I left him again to his chirurgeon, who cured him.

This experiment of opening aneurismas by punctures is not to be imitated, unless it be in such cases as this, where both patient and chirurgeon are so incredulous.

4. Some years since, while I dwelt in the Old Bailey, I was consulted in the case of a man who in his letting blood was pricked in the artery. The artery did not bleed outwardly, but discharged itself between the muscles. The tumour, being mistaken for a puncture of a nerve or tendon, was fomented with discutients, whereby I found it much enlarged; and not only the inside but the outside of the arm swelled above and beneath the elbow, with a pulsation in those remote parts. I caused an emplaster to be made of some of the restrictives set down in the method of cure, cum ol. ros. myrtill. and aceto, and applied it over the arm to the axilla with compress and bandage. I then let him blood, and disposed him to rest with an anodyne draught, and prescribed him emulsions and cooling juleps, with such a diet as might incrassate his blood.

A day or two after I strengthened the former bandage by a laced sleeve and glove, by which, for some time, much of the blood was returned back into the artery, and the arm seemed in a hopeful way of recovery; but through irregularity the arm swelled again, and the patient grew weary of us, and gave ear to every prattle; and so it happened that an empiric was commended to them, as having an excellent medicament to stop bleeding. He was fetched, and undertook the cure, and removed the patient nearer his lodging, where he treated him; but he being ignorant in making the bandage, or possibly not thinking it so necessary, the arm swelled, and the tumour on the inside of the arm being soft and prominent, he concluded it a bag of

matter, (as he called it,) and applied a few bruised herbs to it, 1676.
which eat into the skin, and made way for the blood to burst forth abundantly; insomuch, that a neighbouring chirurgeon was sent for, and he called others, who together made a shift to stop it at that time.

But his arm gangrened, so that within a few days after they prepared for the cutting it off. The patient's relations, being acquainted with the accident, sent me to them. I saw it amputated, and the patient put into his bed. We slit up the arm, and laid the artery bare. It retained its natural shape and smallness, not one jot dilated; nor was the aperture considerable which had been made by that accident, but by reason of its constitution continued open, as I have seen a hole punched in leather, whereby it was capable of receiving the blood, if it had been timely returned; but that being omitted, the extravasated blood forced amongst the interstices of the muscles up to the axilla, and on the outside of the arm down beneath the elbow, in which places we found a quantity of stinking grumous blood.

5. A man being much afflicted with a tumour in his right arm, occasioned by the pricking of an artery in letting blood, having tried the endeavours of several of our profession unsuccessfully, some whereof had proposed the taking off this arm, at the last I was sent for, and met Mr. Arris and Mr. Hollier there. Mr. Gardner was his chirurgeon.

The tumour was large, much inflamed, and painful, with little or no pulsation; but the accident which gave rise to the tumour enough confirmed it an aneurisma.

My opinion was, that a tumour so inflamed was not capable of such bandage whereby they might hope to return the blood back into the artery. Nor indeed was it reasonable to suppose that such a putrefactive heat, as seemed to be inclosed in that swelling, was capable of being thrust back or retained long there, without making its own way by a gangrene; and of what danger such an eruption might be to the patient, if a chirurgeon were not at hand, I left to their consideration.

Then in order to the removal of the tumour there were but two ways, viz., amputation of the arm, or cutting into the tumour and making deligation of the artery—which latter I commended to them. They assented to the deligation, only the

1676. patient desired a day or two to prepare himself. We applied empl. è bolo, with a moderate bandage, to restrain the increase of the tumour the while. The fourth day after we met again, and, having all things ready, the patient was placed in a chair towards the light. I took off the dressings, and made a ligature four fingers' breadth above the tumour, on which Mr. Hollier made a gripe. Some other held the hand and lower part of the arm, whilst I made incision down the length of the tumour. That done, I threw out the grumous blood with my fingers, and cleansed the wound with a sponge. Then desiring Mr. Hollier to slacken his hand, upon which the artery discovered itself by the blood spurting out, I passed my needle under the upper part of the artery, and tied that, and cut off the end of the ligature.

Near the wound made in the artery by letting blood there was a cartilaginous body formed, which hindered my coming to the artery; I cut it away, then passed my needle and made a second ligature.

We dressed it up with pledgets, spread with the common digestive ex. terebinth. dipped in pulv. galeni, and applied empl. diachalcit. malaxed with ol. ros., and rolled it up to the ease of the patient, then put him into his bed, and prescribed him an anodyne draught to take that night. The next day I visited him, and found him in much ease; he had slept well with half the draught that was designed him, and was not troubled with those fainting fits which he had been subject to before the operation. The third day we took him out of his bed to dress his arm.

In taking off the dressing we found all safe, and the lips of the wound tending to digestion. Mr. Hollier, who held the arm above, seeing no blood flow from the wound, for experience' sake griped it harder; upon which the blood of a sudden dropped from the fleshy parts and capillaries in great drops, as if it had been pressed out of a sponge.

I wondered at the manner of its bleeding, not minding what he had done; but he, slackening his hand, it ceased as soon, which may show the ill consequence of over-hard binding in the dressing of wounds, ulcers, &c. We dressed the wound with the digestive as before, and so continued it till the wound was well digested. From that time we dressed it with sarcotics,

rubbed the loose flesh with the vitriol-stone, and hastened the cicatrizing of it with aq. medicamentos., &c. I saw the ligature fall off, and the wound cicatrizing, then left it to his chirurgeon, it being at that time indeed almost cicatrized. The patient made me a visit a while after, and showed me that he could use that arm as well as the other. What more concerns an aneurisma you may see in the chapter of the Wounds of the Veins and Arteries. 1676.

MOREL.[1]

OBSERVATIONS ON THE CURE OF ANEURISMS.

Although aneurisms can neither be made to suppurate nor to end in resolution, yet attempts are sometimes made to cure them by means of suppuratives and resolutives; this is on account of the absence of those signs by which they may be recognized, the largest being often without that pulsation and pumping by which the others are usually marked. This is an observation that is made by Paré, and which has lately been confirmed in the person of Mademoiselle de Longueil, who had a very hard tumour at the bend of the arm, which had been considered by many skilful persons to be of a scrofulous nature, but which was nevertheless found to be an aneurism, when I opened it in the presence of two very experienced surgeons. 1681.

Several authors have stated that it was possible to cure recent aneurisms by the simple application of the compress and bandage; but not one says that he has ever done it, and it is even very rare to meet with surgeons who have tried this plan. As far as I am concerned, I have several times been desirous of satisfying my curiosity on this point, and I have always had the good fortune to succeed, taking care only to moisten the compresses with a styptic, as has, within the last two months, been done in the case of one of the servants of M. Jusol.

Since the successful employment of ligatures of the vessels in

[1] Observations sur la Cure des Anevrismes, par M. Morel, Maistre Chirurgien de l'Hôpital de la Charité et Juré à Paris.—Journal des Nouvelles Descouvertes, par Nicolas de Blegny. tom. iii; Paris, 1681.

1681. amputation of the members has been generally recognized, most authors have advised the same practice in the operation for aneurism; but with this reserve, that they have considered it useless, or even dangerous, for the large arteries; which has so intimidated many surgeons, that even at present, when surgery appears to have attained the very summit of perfection, many of the most celebrated have abandoned the ligature for a button of vitriol, for the graduated compress, for the constant application of the finger, or for some similar means.

But experience having taught me that the separation of the eschar produced by the vitriol is often followed by a fatal hemorrhage, that compresses rarely produce the desired effect, and that the application of the finger is as inconvenient to the patients as fatiguing to those obliged to practise it, I have, after much reflection, preferred the means that almost all the others have rejected; and I have so happily practised it a great number of times, that I am too convinced of its utility not to exhort all surgeons to uphold the honour of the profession in so satisfactory a way.

As the hospital of La Charité of Paris has been the place in which I made these observations, they may be said to be less liable to suspicion, as they have been made publicly in the presence of several physicians and surgeons, who can certify as well as I can that the ligature divides the vessel, sometimes on the third, but, at latest, on the fifth or sixth day, without any effusion of blood; and that the trunk of the axillary artery may even be ligatured above its principal bifurcations when the aneurism is situated there, without fearing the mortification of the limb, and without any accident, as I have shown to M. de Blegny, and to several other surgeons, friends of his.

ROYER.[1]

Sir,—I have seen in the last number of this Journal, the essay of M. Morel on Aneurism; I suppose that he thinks

[1] Lettre à l' Abbé Bourdelot, &c. &c. Par M. Royer, &c.—Journal des Nouvelles Descouvertes; Paris, tom. iii, 1681, p. 120.

every one knows what an aneurism is, and how it is produced, as he gives no definition of it, and as he merely contents himself with mentioning the plan of treatment that he has learnt by experience. I consider an aneurism to be a soft tumour receding on pressure, full of blood, and produced by an incision, rupture, or at least dilatation of the tunics of the artery. Aneurisms have, I believe, often been treated by suppuratives and resolutives, but this can only have been done by surgeons who were entirely ignorant of the nature of the tumour, as it is as little capable of suppuration as of resolution, which might easily have been determined by examining, if it were situated on an artery, sufficiently large to produce an aneurism; if the pulsation, which is always found in them when small, was evident; if it disappeared on pressing with the fingers, returning again immediately on their removal; if the skin retained its natural colour; and finally, if on compressing it, a slight noise could be heard at the bottom of the tumour, which only happens when the opening into it is small. These, it appears to me, are the signs that usually accompany small aneurisms; in the larger ones, that is to say, in those that have attained an extraordinary size, no pulsation is ever found, and when they are in this state, and occur upon the trunks of arteries, it is dangerous to attempt any operation. 1681.

With regard to the cure of aneurisms, by (as he proposes) the mere application of compresses and a bandage, I have no doubt but that it can be accomplished; for in 1665, being at Poutoise, a country girl, thirteen or fourteen years of age, was brought to me, in consequence of the artery at the bend of her arm having been punctured twelve or fifteen days before whilst she was being bled. On examination, I found a pulsating tumour, as large as a hazel nut; and not doubting but that it was an aneurism, I thought that, as it was recent, I could still cure it by means of a bandage. I accordingly applied a compress ten or twelve times doubled, into which I had placed a piece of tin, about the size of a fifteen-sous piece; above this another compress, but somewhat larger; and lastly, a third, still larger than the other two. I then applied the form of bandage, that M. Fournier calls *Rhombus ad medium membrum,* which is the one usually employed after venesection; only with this difference, that I tied it so tightly that, on the

1681. following day, the whole arm was swollen, and fearing a more serious accident would happen than the one I was endeavouring to remedy, I loosened my bandage somewhat, pressing the compresses forcibly with my fingers; I then contented myself for eighteen or twenty days with keeping down inflammation. At the expiration of this time, I undid the bandage, and removed the compresses, and no longer finding a tumour, but on the contrary, a depression in the skin, I applied a bandage lightly, and sent the girl home. With regard to the operation by incision, I have no doubt but that the axillary artery may be ligatured before its bifurcation, since I know that the part does not become atrophied, and that the blood finds other passages by which to supply the fore-arm.

Moreover, I am not surprised, if, after having employed buttons of vitriol, hemorrhage should follow the separation of the eschar; but I am astonished that the same hemorrhage does not occur, if, as Monsieur Morel assures us, the vessel is divided by the ligature at the expiration of three days. The public would have been obliged to him, had he explained the reason of this, as it would always repose confidence in the opinions of a man of his merit and reputation.

With regard to you, Sir, who possess as much knowledge of surgery as of medicine, and who have not despised the former, any more than did those great men of past ages, who took delight in it on account of the certainty they found in its operations; if you would but give yourself the trouble to write something, you would clear up a subject that you alone are capable of withdrawing from the confusion and obscurity in which it is enveloped. Sacrifice, then, I beg of you, an hour of that time which is so precious, in order to give us all the information on this subject, that we may hope for; and believe me that no one recognizes more than I, the merit of a man to whom medicine owes some of her most brilliant observations, and surgery some of her most remarkable experiments.

BOURDELOT.[1]

You have given me much pleasure, Sir, in asking me my opinion on the nature of aneurism. You have heard me speak about it on one occasion, and you expressed your satisfaction when I conferred with M. Langroot, your uncle, a very skilful and learned surgeon, who has served long in the army. I always ask his advice on the surgical subjects that are proposed at our academy. He is a good observer. I also had a long conversation about it with M. Morel; after which I wonder that he should have written so briefly upon the subject. It is either because he thinks of nothing but seeing plenty of patients, or else that he has, perhaps, not attended to what I told him, which has often happened to different surgeons to whom I have spoken. I can, however, assure them that it is not my fault, but there are a few people who pay much attention when a closely reasoned conversation is addressed to them. The best things that may be said only enter their ears, and I will answer for it, are seldom carried home. Those who have more particularly spoken to me upon this subject, have been M. Fourbier and the late M. Pinprenelle, who bandaged skilfully; but the source from which I have derived most information has been my own private experience; for I had the artery at the bend of my right arm punctured, where it passes under the median vein, although I had told the surgeon that it pulsated there. On seeing my blood flow by jerks, I took away three platters full, applied plenty of compresses, and remained quiet for a long time; the skin soon healed, and the external cicatrix was quickly formed; but there did not fail to appear some time afterwards a small tumour, which gradually increased without my being able to arrest its growth. Very thick compresses soaked in styptic waters had no effect upon it. I have since discovered the reason. The virtue of the water could not penetrate the five integuments. The object here is not to array one quality against another, as to warm a part 1681.

[1] Lettre de l' Abbé Bourdelot, &c., à M. Royer, &c.—Journal des Nouvelles Descouvertes; Paris, 1681, p. 127.

1681. that has been cooled, or to strengthen one that has been softened and relaxed. In this case, we must resist the impulse of the artery which is constantly acting from within outwards upon the two edges of a wound that it separates, and gives the arterial blood an opportunity of entering into an opening or burrow (clapier) which is formed first like that opening in a causeway that is called a rénard. If we wish to keep this opening closed by means of ordinary compresses, the following accidents happen: the compress binds tightly when the arm is extended, but becomes loosened when it is bent, and in a quarter of an hour the wound in the artery enlarges and opens again, not being compressed.

If a ligature be applied very tightly in order to compress the artery, the circulation in all the superficial veins of the arm becomes arrested; the arm and the hand assume a red and afterwards a livid hue; the whole of the fore-arm becomes heavy and cold, and, at last, gangrene may supervene from arrest of the circulation; besides this, the bandage and compresses frequently occasion violent itching, which causes the artery to open the wound again when the part is scratched or the bandage untied. I have provided for all these accidents, preventing the strangulation of the veins, the itching and also the alternation of tightness and laxity in the bandage during the flexion and extension of the arm. Of this I will speak by and by; let us, in the meanwhile, inquire into the nature of an aneurism. In general, it is a tumour produced by arterial blood, sometimes occurring in consequence of the ebullition of this fluid destroying the vessel. I saw at Bourbon a lady of Picardy, who had five or six of them; they were chronic; her disease got worse at Bourbon. It would have been better to have ordered her the styptic rather than the warm bituminous waters, and she should only have lived on fish. Many internal aneurisms are occasioned by the ebullition of the blood. I have found several of them on opening bodies; amongst others, in that of the Count of Chasteau-Vilain Duke d'Atrie, who was believed to have two hearts; certainly he had two pulsations in the chest, and he was said to have two hearts. The second was nothing but an aneurism, but a very large and fleshy one. I had the honour of attending him for more than six years, at Rome as well as at Paris, near the St. Sulpice, where he lived. Vociferation some-

times gives rise to aneurisms in the chest and throat; for the artery may, in consequence of great efforts, be distended and burst. I saw a master of the school at Sens, by name Grand Jean, a very strong man, whose left arm became red and livid, with varicose veins, in consequence of his having endeavoured to pull the clapper of a bell with the left hand alone. The smaller arteries easily suffer in the same way; their terminations having only a simple membrane like the veins. I have seen this in Sir Kenelm Digby, who was one of my friends and a good philosophical chemist, and whose curious receipts have been dedicated to me by Tressel, who published them in Paris. The veins and arteries of his (Digby's) legs became varicose in consequence of his having attempted to kick open the gate of a park, through which the king of England, whilst hunting, wished to pass. It is probable that with this effort the middle tunic of the arteries gave way, and that consequently the vessel becoming dilated, the swelling extended in a longitudinal direction. 1681.

But the commonest and best known kind of aneurism is that which happens in consequence of the artery being punctured during venesection. This kind of tumour is not in the artery. It is formed by the impulse of the blood driving that fluid out of the vessel. The surgeon on perceiving what has happened, bandages carefully the man whose artery he has punctured, he then rubs the compress with the white of eggs, and strengthens it by means of a piece of money; in this way the five teguments unite and become consolidated in the course of a few hours; but the two lips of the wound in the artery being always acted upon by the pulsations, cannot reunite or become consolidated so soon; more particularly, as they are of the same substance as this nervous, tendinous, and, in some parts, white and cartilaginous vessel. The blood which passes out of this wound makes a small hollow in the membranes and other neighbouring parts; for all the parts of our body are joined together, and it becomes necessary to tear them whilst dissecting them. This internal hollow makes an external swelling, which continues to increase and to widen by the continuance of the movement and by the quantity of the blood; but principally because the wound opens more and more, and the blood by escaping from its natural situation forms certain filaments which become attached to one another, and give rise to a tissue similar to that of a bird's nest; which is covered

1681. by another tissue of spongy flesh like that of the spleen, the exterior being harder aud drier than the interior. This always happens in the human body; those parts that suffer most always enlarging the most, as may be seen in the feet of couriers and in the hands of hatters.

The cyst of this tumour is a spongy and filamentous flesh; it pulsates in the beginning whilst it is small, because the impulse of the blood is directed straight against the bottom of the sac; but when the tumour becomes large, the force of the impulse is deadened by passing across a kind of lake. This blood may be pressed back into the artery, and on entering the tumour it occasions a dull noise. On considering the nature of the tumour, I do not know what use resolutives and suppuratives can be. These last may certainly open the skin by softening it, but this skin serves as a containing bandage, and is very necessary on this account.

The light that I have thrown on the formation of this tumour exhibits the uselessness of many questions. Juillet, who is very inquiring, denies that an artery is double. He says that it only possesses one membrane, which may be divided into twenty pellicles or more. The body of the artery is strongly formed and difficult to break. With regard to the cyst of the aneurismal tumour, it appears to be of a porous texture, like the stuff of which felt or beaver hats are made. I have had plenty of time to think about the formation and progress of aneurisms, as mine acquired the size of a hen's egg. I cured myself in the course of a year by applying a round pad, the straps attached to which passing above and below the elbow, were connected to a buckle at the inside of the arm near the smooth part of the pad. These straps, which had small holes to allow them to be tightened or loosened, left an empty space for the return of the blood through the veins, forming a kind of bridge. The pad pressed deeply upon the artery, occupying but little superficial space. I prevented it from occasioning any itching, by soaking it in salt water in which burnt alum had been dissolved. There need be no fear of compressing the artery too much; the two sides of which can never unite whilst the tumour exists. There is always a passage open from the artery to the tumour; but even if, by the powerful compression of the pad, the body of the artery were to become obliterated at this spot, and could thus occasion

a deviation of the arterial blood from its usual course to the fore arm, there would be nothing to fear. The distribution of the blood would take place equally. There are so many arterial branches in the arm that can take upon themselves the functions of the trunk, that these being in a short time enlarged by the quantity of the arterial blood and by the constant pulsations, other means of carrying on the circulation will be found. If necessary, nature can even make small arteries, or dilate those that are so small as to be imperceptible, being not larger than hairs, which enlarge and dilate, as may be seen in those people who have very large tumours in the neck or elsewhere; which have all the veins and arteries that are necessary for their growth and nourishment; and as may also be observed in those patients who have been treated by skilful physicians for loss or diminution in the liver and other viscera. These losses can be repaired, as I shall show in a particular treatise. This neotorism, or reproduction of parts, shows the great resources that nature has implanted in living bodies; thereby distinguishing them from the artificial machines that diminish in power every day. 1681.

I may be asked what becomes of the cavity that contained the blood, when the aneurism is completely cured; the part being restored to the same condition as before the wound was made. I answer, that it disappears, being squeezed like a sponge by the pad. That which is squeezed out of it flows into the arteries; nevertheless, the small veins and arteries, which had formed in its substance, as in a wen, being pressed upon, do not distribute the blood any more; so that the substance of the cyst being no longer nourished, wastes and disappears. This is seen on divers other occasions; amongst others, in large wounds with fungous granulations, on applying plenty of pledgets to which, the cicatrix became so small as scarcely to be perceptible. But the entire resolution of a tumour may best be seen in persons who have had hemorrhoids, *Quibus podex dehiscebat tanquam crude bovis.* This part, enlarged to a great extent, resolves itself, and occupies its natural situation, when the pain, irritation, and unhealthy ulcerations have been removed.

My arm, at the spot where the tumour was, is as if there had never been anything the matter with it. I have felt during two years a sort of hard swelling and cicatrix in the body of the artery, in the situation of the wound. I thought that it

1681. would always remain hard, as the artery is of a nervous and firm tissue; but it has entirely disappeared. *Ne quidem superest cicatrix.* The pad had left a hollow at the bend of my arm, but in three or four months this hollow was filled up. I believe that the small arteries and veins of the fore-arm, which had taken the place of the wounded artery, and which had become enlarged, afterwards retracted and disappeared, allowing the blood to pass by its ordinary channel; the canal of the artery becoming free and open. There is here an important remark to make: Monsieur Mery, surgeon of Vatan, who is of great service at the Hôtel-Dieu of Paris, and makes many curious observations, has told me that the small arteries, when near one another, join by anastomoses, and that the same occurs with the veins, as may be seen in the arm. This observation is important; but he deduces a wrong conclusion from it, namely, that the arteries do not open into the veins, and that anastomoses only take place of artery with artery, and vein with vein. Whenever he pleases I will show him the contrary. He will see sufficiently large pulsating arteries pouring all their blood into veins that do not pulsate. The veins and arteries of which he speaks as opening into other veins and arteries have the same office, and one often performs the functions of the other; of which the following case is a good example. His highness the Prince received a bullet-wound at the passage of the Tolus, in Holland. The ball grazed the radial artery in the right arm. The incisions which were made in the wound, and the cicatrix, obliterated this artery in such a way that the blood was obliged to take another course. An artery enlarged three fingers' breadths below, near the elbow, which became of such a size that it could be seen to beat, and it is there that the pulse is felt when his highness is ill. The same thing that happens in the veins of the arm may be observed in the arteries in this situation. I have many observations on this subject, which deserve a separate treatise. This one is already sufficiently large. I will say nothing of the consolidation of an artery that has been ligatured after the operation. M. Morel assures me that it occurs in a few days. We must believe him; but if one can be cured by the application of the pad, where is the person with common sense who would allow his arm to be opened by an extended incision, and to have the artery exposed and ligatured by

a long and painful operation, which exposes the patient to he- 1681.
morrhagic convulsions and to death? The best plan is to have recourse to the pad, which every one can employ; and perhaps those who are said to possess milder and more certain escharotics than others, have had the address to have recourse to astringents and a compressive bandage. This is the opinion of our assembly, with which you appeared to coincide. I think that you will have the same deference for all the propositions that I have now advanced. I have always found much discernment in you, &c. &c. Continue with the same ardour, and you may be assured that on all occasions I will prove to you that I am, &c. &c.

SAVIARD.[1]

ON AN ANEURISM CAUSED BY A WOUND OF THE CRURAL ARTERY.

In the month of November, 1688, a person of the name of 1688.
Du Chêne, at that time valet-de-chambre of a person of quality, and who is at present living in the faubourg Saint Germain, rue Sainte Marguerite, at the ville de Londres, was brought to the Hôtel-Dieu, in the ward for operations, in order to have a sword-wound dressed, that he had received at the inner and upper part of the thigh, and which had been followed by a very large aneurism.

Monsieur Bottentuit, who was then taking his degrees in surgery, had the care of him; but as this patient was strongly recommended, and as his wound was of much importance, he requested the advice of Messieurs Morel, Bessiere, and several other master-surgeons, in order to know what to do in such a case.

The examination of the wound, of its situation, of the tumour bywhich it was surrounded, together with the violent and deeply-seated pulsation, easily enabled us to conclude that it was an aneurism, caused by the puncture of the trunk of the crural

[1] Nouveau Recueil d'Observations Chirurgicales, par M. Saviard; 12mo, Paris, 1702; obs. 63.

1688. artery, or else of the commencement of one of its first branches immediately after its division; but the greatest difficulty consisted in devising a means of succouring the patient, whose life was placed in great danger, in consequence of this wound.

The operation for aneurism was, nevertheless, the only means of cure that could be attempted; but several dangerous consequences were to be apprehended in undertaking this operation; namely, in the first place the patient might die of hemorrhage before the wound in the artery could be discovered, and the vessel ligatured above this; secondly, if the trunk of the artery were ligatured, supposing it to be punctured, as might be suspected from the situation of the wound, the whole of the lower extremity would probably become gangrenous, from the interruption of the supply of that blood which would be necessary for the maintenance of its vitality.

Nevertheless, all these considerations did not prevent the operation being determined upon, however small the chance of success might be. For this the patient was prepared by having the sacrament administered; whilst on our side we got those things ready that were necessary for the operation; namely, a quantity of astringent powders, made of boiled turpentine, powdered resin, sifted plaster, and fuller's earth; also an astringent ointment to spread upon the plaster, composed of finely-powdered bole Armenian, white of eggs, oil of roses, and vinegar, a quantity of linen rags to fill up the cavity, and charpie to soak up the blood and fluids, graduated compresses to compress the artery, and circular compresses, and two large bandages, at least four fingers' breadth in width, and three yards long, so as to be able to pass them alternately round the body and the wound; without which the thigh cannot be securely and firmly bandaged, as it diminishes from above downwards.

The dressings being thus prepared, the operation was commenced first of all by guarding against hemorrhage, by means of a ligature called the tourniquet, which was applied to the upper part of the thigh. This tourniquet is nothing more than a hempen or silken cord about an inch in width, two turns of which are put round the part that it is wished to compress, and the last turn of which is tightened by means of a piece of rounded wood four or five inches in length, which is passed underneath it, and which is turned round like a winch by an assistant;

care being taken to place first of all a piece of pasteboard under the knot, so that the skin may not be pinched up; the compression being thus rendered less painful. 1688.

When the operator thought that the tourniquet was sufficiently tightened, he opened the aneurismal tumour, and removed all the blood that had been effused in very large quantity into the interstices between the muscles, whence there resulted a large cavity, which facilitated very greatly the success of the operation; for this large cavity gave him the opportunity, after the tourniquet had been loosened, of perceiving the wound in the artery, which was seen to be considerable, by the escape of the blood, which was, however, for the most part suppressed by tightening the tourniquet.

The hemorrhage having thus been arrested, a curved needle, armed with a double waxed thread, was passed under the artery; one part of the thread was then drawn above and the other below the opening, where they were firmly tied in a surgeon's knot. No small compresses were put upon the trunk of the vessel below the knot, as is sometimes done, as it was thought to be of much importance to ligature so large a vessel very tightly, which we could not have been sure of doing if a small compress were interposed; as this, by imbibing humidity, lessens in size, and thus causes the ligature to loosen.

It having been ascertained, by the loosening of the tourniquet, that the blood had been arrested by the ligature of the vessel, a considerable quantity of astringent powders, commonly called the dry digestives, was thrown into the wound; the cavity was then filled up with pieces of linen, until these reached above the level of the surrounding parts; so that, in this way, the bandage compressed the artery more effectually. A large astringent plaster, which surrounded the whole of the upper and middle part of the thigh, was then applied, and, above this, compresses, soaked in aromatic wine, with which the whole of the leg was also covered, so as to warm the parts, and reanimate what spirits were left, after the sudden occlusion of so large a vessel. Finally, a bandage was applied, and after the patient had been put to bed, the thigh was raised on pillows; and assistants, who relieved one another, compressed the part of the vessel that had been ligatured for twenty-four hours.

The first dressing was not touched for thirty hours, and then

1688. it was removed very carefully, only taking that portion of it out of the wound that separated readily; that which was in the deeper part was left, and we contented ourselves with wiping off the fluids; fresh powders were then sprinkled in, and the remainder of the dressings was applied as at first.

Those dressings that were as if glued to the bottom of the wound did not separate until the fourth time it was dressed, and the ligature remained until fifteen days after the wound had been incarned. The patient was perfectly cured in six weeks, without any accident of importance having supervened; and since that time he has been in perfect health and strength, and has made several campaigns with the army.

This observation is one of those which show that one sometimes succeeds by not abandoning patients in the most desperate diseases, when one conducts one's self according to the laws of good surgery, and according to the rules of prudence, which ought always to guide us in the exercise of so important and difficult an art. The late Monsieur Bottentuit, our colleague, deserves therefore much praise for having acted so wisely in so delicate and difficult a case.

ANEL.[1]

1714. By what I am about to relate the importance of this cure may readily be seen; and it is easy to come to the conclusion that my opponent has been induced to speak of it through envy and jealousy, as he has spoken, at page 40, of another great cure that I accomplished in Rome. " E in Roma far comparire guarigione d'aneurismo quella, che per attestato di chirurgo primario di quella cittá, non fù che una semplici ligatura di picciola arteria."

Who are the surgeons that have attested, as he says, that the artery which I ligatured at Rome was only a small vessel? I defy him to produce their names, or to confirm what he has advanced. It is, on the contrary, very easy for me to give him the lie, as the very surgeon to whom the patient belonged was

[1] Suite de la Nouvelle Méthode de guérir les Fistules Lacrimales; ou Discours Apologetic, dans lequel on a inseré differentes pièces en faveur de la même Méthode inventée l'an 1713. Par Dominique Anel. Turin, 1714; 4to, pp. 249-261.

not only present when I performed the operation for aneurism, 1714.
but, what was more, he made some verses in my praise on the subject of the fortunate result of my operation; and he even mentioned in the title-page of these sonnets the names of several celebrated professors who did me the honour to be present. M. Lancisi, the chief physician to the Pope, also speaks favorably of the case, in a letter written to Monsieur Fanton, and the patient himself, before leaving for Jerusalem, where he now is in the capacity of missionary, wrote me a letter, in the most expressive terms, to thank me for having saved his life. The following are the letters of M. Lancisi, and of the patient, and the sonnet I have spoken of, which I do not insert here out of mere vanity, but in order to confound my opponent.

"Rome, May 22d, 1710.[1] Sir,—This letter will be delivered to you by M. Dominique Anel, a Frenchman by birth. This traveller has shown, during his stay at Rome, that he is very learned in anatomy and surgery, and most skilful in operations, and that the dexterity of his hands is incomparable, by the facility with which he tied the artery in the arm of a poor friar, who was on the point of death in consequence of a true aneurism, which was every moment ready to burst; this I myself saw. The friar is now cured, and enjoys perfect health. I was surprised to find that the cicatrix was of such small extent, so that it is scarcely perceptible, and does not, in the least, interfere with the movement of the arm. You will favour me much by receiving this skilful person amongst the number of your friends, and by receiving him well, as it pleases me to see that those who are endowed with great virtues, and possess superior talents, are esteemed by those who are as talented as yourself. Knowing you as well as I do, it appears useless for me to inspire you with such sentiments, as I am aware that you do everything in your power to favour those who excel in science and art; and that, consequently, you will not refuse your esteem to M. Anel. Should he give you a copy of a book that he has written and printed at Amsterdam, you will send it to me, by the first opportunity, with one of your dissertations. I await them with impatience. In the mean while, farewell. I am, sir, yours, &c., Lancisi."

[1] Letter from M. Lancisi, First Physician of the Pope, &c. to M. Fanton, &c.

1714. "Livorno, June 3d, 1711.[1] My very dear friend and benefactor,—Hearing that you were at Genoa, I write you this letter, to give you some news about myself. Before leaving Rome I went to see M. Du Faux, to whom I announced my departure for Jerusalem, and begged of him to inform you of it, which he promised to do. Being at Livorno, I inquired whether there was a post to Genoa, and hearing that there was one, I could not fail to satisfy, in some measure, my duty and my obligation to you, the remembrance of which it is easy for me to preserve, as, every time that I bare my right arm, I see a mark which vividly recalls to me the recollection of him who gave me life by snatching me from the arms of death. Wherever I have been, I have not failed to praise your skill by relating my disease and your operation, which strikes every one with astonishment and surprise. I am not able to remain silent about it, nor to forget the danger I was in, and still less the ease with which you delivered me from it. I should much wish to go to see you, but the dangers of the seas, and the exorbitant charge of the sailors, will deprive me of the pleasure of embracing my very dear benefactor. In the meanwhile, with this letter, I express to you the sentiments of my heart, promising you that I shall not omit to recommend you daily to the Lord in my prayers, of which you may rest assured. I finish by embracing you, and by kissing that fortunate hand which has given me life. I remain, with all the attachment possible, Sir, yours, &c., Father Bernardino de Bolseno, Missionary."

The author of the following sonnet is M. Joseph Chiesa, surgeon of the patient, and of the monastery of Aracœli, the same whom I have already mentioned, and who was opposed to me before the operation.

[The sonnet is here omitted, as it consists of nothing but the praises of Anel.]

I have written a very detailed and argumentative history of this case; I have also made some observations concerning the difficulties that certain professors threw in my way before I accomplished the cure. I shall publish here some passages of this observation. I say, that I begged him (the

[1] Letter from the Rev. Father Bernardino of Bolseno, 'Mineur Observatin,' at present Missionary at Jerusalem, to M. Anel, &c.

surgeon) several times to do it, but he answered me that it was 1714.
an operation that was not practised at Rome, and he cited several
authors who forbid its ever being performed. Seeing his repugnance and the evident danger of the patient, I asked him if he was of opinion that, being able to save this friar, we should abandon him in his mischance. I begged of him at the same time not to be offended at my performing the operation, as he did not wish to undertake it; he then gave me his consent, and even promised me that he would be present, and would procure the patient's assent to it. Relying on his word, I only thought of providing all that was necessary for it, whilst he, on his side, did the very contrary of what he had promised; for instead of encouraging the patient he did all in his power to intimidate him; which, however, was without effect; for having perceived that he was opposed to me, and being informed of it, I took steps to counteract his intrigues. With this view, I called into consultation the most celebrated professors of surgery in Rome, namely, Monsieur Du Faux, surgeon of his Holiness, Maria Seguini, first surgeon of the hospital of the Holy Ghost and of several other hospitals, Vittorio Mazini doctor, and first surgeon of the hospital of St. James for Incurables, and Saulier, surgeon of Casal Montserrat, in order to determine with Monsieur Chiesa, N. N., and myself, whether the operation should be performed or not. The day and hour having been fixed they all came, with the exception of Monsieur Maria Seguini, to the infirmary of the convent of Aracœli. It was on the 30th of January, 1710, that I performed this operation on the friar in the presence of the above-mentioned gentlemen, who were all of my opinion, except Mr. N. N., who, when he saw that I had prepared the necessary dressings and instruments, asked me with an appearance of vexation if I had absolutely determined on performing the operation. I begged of him then to have a little patience, to examine the patient again with attention, and to recollect that we were there assembled to save the life of a man who was in great danger of losing it very shortly, unless we afforded him the best assistance of our art. I begged of him to second our good intentions without prejudice or jealousy; but seeing that he made more noise and became less tractable, I desired him, once for all, not to prevent me from doing what he either would not do, or did not know how to do himself. This did not stop

1714. him, he did everything in his power to disconcert us and to frighten the patient; finally, he left us, threatening the friars never to enter their convent again.

This occurrence, which might have caused the patient to lose courage, as it took place in his presence, only served to redouble it, for he gave me his arm with much firmness, saying to my opponent as he was going away, 'May God guide you.' I then took off the bandage and the dressings that we had applied some days before. When the tumour was uncovered, I perceived that the aneurism had continued to increase, being much larger; that the small opening of which I have already spoken had enlarged,[1] and that the aneurismal sac could be seen exposed at the bottom of this hole. The surgeons that I had called into consultation having observed these circumstances, and having also noticed with me the extreme peril that the poor friar was in, and not knowing any plan that would more quickly and effectually free him from the danger to which he was exposed, than the one that I had so often proposed, coincided with me in opinion. I accordingly began my operation, and performed it in the following manner.

Having made myself master of the blood by means of a tourniquet, I made an incision in the integuments without touching, in any way, the aneurismal sac; I then sought for the artery, which I found situated below the nerve, which is not common. I took every precaution in separating it from this, and having lifted it upon a hook I ligatured it as near to the tumour as possible. The artery having been tied, I loosened the tourniquet; when a small muscular branch, which I had divided in dissecting the vessel bled, and compelled me immediately to tighten the tourniquet and to tie the artery again a little higher up. The tourniquet being loosened I saw no more bleeding, nor any pulsation in the tumour. I then applied the proper dressings and a bandage.

The operation being finished the patient was put to bed; I ordered him a good diet, which he continued very regularly until the cure was completed; he was bled the same day in the other arm, which bleeding was repeated three times. I caused Monsieur Saulier, the surgeon, to remain with him, and to sleep

[1] [I have been unable to find this reference in any of Anel's works.]

every night in his room, which he did not leave until the liga- 1714.
tures had separated. I took the precaution of having him watched
by this surgeon in case any bleeding or other accident should supervene; and although, God be praised, nothing happened, yet I would advise all those who intend performing this operation, to take the same precaution.

On the morning of the following day I visited the patient, and found him sufficiently quiet, without fever or change of any kind. I sought for the pulsation of the artery at the wrist of the arm on which I had operated, and found it very distinct; which gave me ground to hope, seeing myself so well seconded by nature, which in a single night had made a new channel by which the blood was conveyed from the arm to the fore-arm, and even to the extremity of the hand.

Having then no fear of mortification, I devoted the whole of my attention to prevent fever and hemorrhage. I left the first dressing seventy-two hours without touching it. The third day I dressed the wound with a compound digestive. I also fomented the arm with red wine, to which I added a quarter of camphorated spirits; and only dressed the patient once in the twenty-four hours. By continuing this plan the cure was happily accomplished without any accident. The first ligature separated on the 17th day of February, 1710; and the second, on the 27th of the same month, without the supervention of the least hemorrhage. On the 1st of March, in the same year, this friar not only left his room, but went even to the church of Saint Laurent, in Damasco, which was at the distance of an Italian mile from his convent. On the 5th of March, the wound was perfectly cicatrized. A month after the operation had been performed, the patient used his arm just as before the accident, without the least weakness or pain. The pulsation of the aneurismal tumour disappeared as soon as the artery was tied above it, which ought to happen in accordance with the laws of the circulation of the blood. However, in accordance with the general opinion, this pulsation should have continued; because it is said, that when the operation is performed, the artery should be tied as well below as above, on account of the anastomoses of the branches of the arteries; by which the blood passes into that portion of the trunk that has given way; and that the blood having entered the trunk, refills the tumour, and causes

1714. bleeding by returning from below. If all this were true, the pulsation should have continued, and this tumour would not have disappeared unless the ligature had been applied below it; nevertheless, without having done so, the tumour collapsed in such a way that it would have been impossible to have ascertained the spot where the aneurism had existed.

Reflections. The attack of hemorrhage that came on a long time before the operation, only occurred on the fifteenth day after the venesection; for as the lancet had merely divided the external coats of the artery, the internal ones remained entire, and, not being supported by the power of the external tunics, were not capable of withstanding by themselves the reiterated impulse of the blood; so that by yielding to the violence of the current of this fluid, they dilated little by little, and successively, so long as their elasticity would allow them to extend and dilate; but when this dilatation became extreme, the coats being unable to expand any further, or to resist the impulse of the arterial blood, yielded to its efforts, and at length gave way. It was at this moment that the aneurism degenerated from a true to a false one, and then the first bleeding occurred. We must now explain how this last aneurism has again degenerated from a false to a true one.

When the bleeding was checked by the use of astringents, and by the pressure of a bandage, the skin and the integuments that were divided over the aneurism, and by which the blood escaped at the time of the hemorrhage, began to reunite. The reunion of these parts, together with the compression of the bandage, had caused the external tunics to have as much disposition to reunite as the internal ones had to separate; when the aneurism was not as yet supported by a degree of compression sufficient to resist the impulse of the blood in the way that I have already described. So that from the day of the venesection to that of the operation, we see that three kinds of aneurism have occurred in the same artery of the same arm. The first, which followed immediately after the bleeding, was a true aneurism, in which the external coats of the artery were divided and the internal only dilated. The second, which occurred at the time of the hemorrhage, was a false aneurism, depending on the rupture both of the internal and external tunics of the artery. The

third and last was a true aneurism, like the first, with this difference only, that in this one, just the contrary to what was met with in the first, occurred; the internal coats being divided, whilst the external one had reunited, and thus formed by its dilatation the aneurismal sac. 1714.

The first kind can be cured by compression and by astringents, provided that it be perceived at an early stage.

The second kind is very difficult, not to say impossible of cure, whatever means might be employed, without having recourse to operation.

With regard to the third kind, it was impossible, in the bad condition in which I found it, to cure it without the operation for aneurism, which I accordingly performed; and the success of which was as great as could be desired, as may be seen by this account.

With regard to the mode of doing the operation, I performed it in a different way to what authors describe, which I have seen good surgeons adopt, and which I have myself had recourse to several times; for instead, as is customary, of applying the ligature above and below the aneurism, I only practised it above. Besides, the aneurismal sac is usually opened, but I did not touch it at all; not doubting but that the blood contained in it would be dissipated, being at liberty to pass on towards the extremity; that the sac, being once empty, would not fill again; that the layers of membrane that formed it would not fail to collapse; and that thus the tumour would disappear: all which happened as I had thought.

In this way the operation was less tedious, and much less painful; besides, my incision was not half the usual length, hence there was a smaller cicatrix. If I had opened the aneurismal sac, and tied it below, the cicatrix could not have been exactly at the bend of the arm, and might have prevented extension being perfectly performed; which I have seen happen to several patients, who have been maimed by this operation, in consequence of the situation and extent of the cicatrix.

My opponent states that I had pretended, at Rome, to have cured an aneurism, which several of the first surgeons of that town had certified was but the simple ligature of an artery. It may now be seen whether any belief can be given to what he has advanced; as, on the contrary, M. Lancisi, M. Du Faux,

1714. M. Mazini, M. Saulier, and M. Chiesa surgeon to the patient, who were present at the operation, all certified that the disease was an aneurism—that I performed the operation for the cure of an aneurism at the bend of the arm—and that the patient was cured.

LANCISI.[1]

1728. In order that the treatment of this kind of aneurism may be proceeded with methodically, its different stages must be distinguished. If the physician be sent for at the commencement of the disease then one or more bloodlettings may be had recourse to, so as to diminish the mass of the circulating fluids; mild solvents, together with pleasant diluents, such as decoction of borage, of wild lettuce, and the like, with nitrum stibiatum, may be administered, and, at the same time, a strict diet must be maintained; and in proportion as the patient has indulged in immoderate eating and drinking, so ought he, for a longer time, to be put upon a spare diet. In this way the very skilful Severinus (De Novissimis Abscessibus, cap. 7, schol. 8) states that he cured Charles the Ninth, who was labouring under an aneurism, from too large a quantity of blood.

Nor are there wanting cases of similar diseases, which, when they have existed for a certain length of time, have become incurable; but which, in their earlier stages, might have been remedied by strict diet, by fasting, and by change of air.

If a surgeon undertake the treatment of a confirmed aneurism that has become true, it will be sufficient for him to direct his efforts to prevent the blood from becoming too abundant; and to guard against any commotion in the præcordia and brain, which, by rupturing the cyst of the aneurism, may occasion sudden death. For this consequence may happen in those old aneurisms, even if they be false, that arise from a superabundance of blood. And there are many cases mentioned by medical men

[1] On the Treatment of Aneurisms depending on the distending power of a Superabundance of Blood. Joh. Mar. Lancisi De Aneurysmatibus Opus Posthumum. Romæ, 1728; and in Lauth's Collection, prop. 42.

of persons who have suddenly died, and in whose bodies there has been found, either a plethoric turgidity of the vessels of the brain and præcordia, or else an effusion of blood into some of the cavities. 1728.

The fluids may most effectually be prevented from accumulating, if, at stated times, for instance in the spring and autumn, the body be reduced by bloodletting; the indication for which should not depend upon the mere habits of the patient, nor on the opinion of the medical man, but on the earliest symptoms of an increased quantity of blood, which consists in a slowness in its movements, oppression about the chest, and heaviness, heat, or pain in the head. But I have frequently seen persons, who, being desirous of avoiding one kind of ill, have, from the too great loss of blood, incurred a worse one, such as cachexy or dropsy. So true is it that prudence is the best quality of a medical man.

Moderation in diet, also, which should rather incline to a low than to a moderate one, will be the best preventive, as we have already stated, against distension of the vessels. All bodily exercise should likewise be avoided in this form of aneurism, lest it add to the already dilated condition of the arteries. We think is so much the more necessary that the patient should be particularly attentive in keeping a spare diet, and that he abstain from all salads, acrid and acid things, as we have found that false aneurisms may, by the addition of acrid substances, easily and gradually be changed into true and fatal ones.

Nor should we despise vulnerary decoctions, which may be ordered for several days after the venesection, in order that the vessels and fibres may be strengthened as far as lies in the physician's power.

MACGILL.[1]

The aneurism is a disease which chirurgical writers pretend to describe with great exactness, and to relate the several symptoms by which the different species of it are distinguished; while the particular histories of this malady, handed down by 1733.

[1] An History of the Operation for an Aneurism of the Arm, successfully performed by Mr. John Macgill, Surgeon in Edinburgh.—Medical Essays and Observations, Edinburgh, vol. ii, 5th edition, 1771.

1733. observators, are so few and inaccurate, that of late the nature, seat, and symptoms of at least the true kind have afforded matter of dispute which can only be determined by a number of observations. In the following case I had a good opportunity to remark exactly the progress, phenomena, and structure of what was judged by all the physicians and surgeons who saw it to be a true aneurism; and therefore believe an account of it will neither be unacceptable to you nor improper to be inserted among the other papers of your collection.

James Forrest, coachman, forty years of age, a hale strong man, being thrown from the coachbox, broke the bones of his right leg into a great many small pieces; and a gangrene coming soon on, there was a necessity to perform the amputation in the country place where he then was. The third day after this operation he was let blood of by a young surgeon there, who opened the basilic vein of the right arm. The patient felt a very sharp pricking pain while the small incision was made with the lancet, and four days after he observed a tumour about the bigness of a small cherry at the wound, which he believed to be the common one of coagulated blood called by surgeons thrombus, and therefore did not mention it to the gentleman who performed the amputation.

On the twelfth day after his unfortunate fall, he was carried to town and received into the infirmary, where the cure of his stump went on as well as could be wished, without any accident or symptom to retard the cure. After he had been eight days in the hospital, he told the physician and surgeon then attending that he had some uneasiness from a swelling at the bending of his elbow. When it was examined, a tumour appeared, of an oval form, as big as a small hen's egg, situated behind the basilic vein. The skin over this tumour was of a natural colour, no pulsation could be felt, and it adhered as firmly to the tendon of the biceps muscle as ganglions commonly do to tendons. Two days after, a pulsation exactly synchronous to that of the arteries was distinctly seen and felt. When the tumour was strongly pressed, it seemed to be less, but could never be made to disappear. There was scarce any pain at this part, either in moving his fore-arm or when the tumour was handled.

A consultation of several physicians and of all the surgeons

who attend the infirmary being called, the disease was unanimously determined to be a true aneurism; but the patient being still weak, it was resolved to try the effects of artful compression, and to delay the operation till the patient had strength enough to undergo it, unless the tumour seemed before that to be in hazard of bursting. Graduate compresses, wet in oxycrate, were therefore applied, with the proper bandage, which at first had an exceeding good effect in diminishing the tumour, but it soon after began again to increase; and then several machines, such as that with a screw for the fistula lachrymalis, M. Petit's tourniquet, &c., were used, but without any success; on the contrary, the tumour still increased and the skin began to inflame, and a small suppuration was brought on the most prominent part of it. By laying aside these more forcible machines, and returning to the use of the former compresses and bandage, after covering the small superficial ulcer with white ointment, the inflammation went off, and the ulcer cured. The tumour was now all firm and hard, scarce yielding at all to pressure except at that prominent point where it was soft, and where only the pulsation could be felt when the fore-arm was bended. When the member was extended, no pulsation could be observed anywhere in the tumour. 1733.

The patient was not yet sufficiently recruited, and therefore the operation of the aneurism was still delayed; but to prevent any danger from the sudden bursting of the aneurism, the tourniquet was kept constantly applied to the patient's arm.

In the beginning of January, 1733, the patient was judged to be strong enough to suffer the operation, and the tumour increased so fast that there was great danger of the teguments yielding suddenly, and therefore the operation was not to be delayed any longer. This happening to be the month of my attendance, I was of course to perform, but previously brought all the surgeons of the hospital together to examine the state of the tumour and to determine the method to be followed in operating.

The tumour was of a very great bulk and height, its base extending internally as far as the internal condyle of the humeral bone; and externally it had pushed the tendon of the biceps flexor cubiti as far as the cephalic vein: it ascended about three inches along the internal side of the biceps, and descended

1733. as far below the joint of the elbow, being also considerably prominent forward.

Being uncertain whether this tumour was formed without the artery, or if it was the body of the artery dilated, we determined to do the operation in the most cautious, though more tedious way, viz., by dissection; having also all the instruments and dressings for an amputation ready, in case there was no hope of success from the operation of the aneurism.

Having applied the tourniquet in the common way to prevent any hemorrhage, the skin was pinched up about the middle of the tumour, and cut with a bistoury; then a small directory being pushed into the fatty cellular membrane, first upwards, then downwards, and to each side, I cut upon it with a bistoury, and thus made a crucial incision on the whole extent of the tumour. After which, I dissected the four angles of the teguments from the tumour with a convex-edged scalpel, stitching a cutaneous artery that would otherwise have been uneasy to me. The tumour, thus laid bare, appeared covered at its upper part with a thin cellular membrane; but below, it seemed to have a very strong tendinous-like coat, which we soon discovered to be no other than the aponeurosis of the biceps muscle; after separating with my fingers the adhesion this had to the tumour below it, I cut it through to the lowest part of the aneurism, which now was all bare and full in view. The coat of it was only a very thin tender membrane, which appeared eroded, as well as the firm substance it contained, at that prominent soft part, where, as I mentioned before, the pulsation was only to be felt. In endeavouring to separate the tumour from the adjacent parts with my fingers, its tender membrane was easily torn in several places; and therefore, without insisting on such a separation, I opened the membrane from one end to the other, when several ounces of a blackish gray-coloured liquor, like to coffee made of half-burnt beans, ran out, and several pieces of coagulated grumous blood, and of polypous concretions, fell down to the floor. What remained was one large polypus-like substance that weighed six ounces, below which some spoonfuls of that blackish liquor, mixed with pretty pure blood, were taken out with a sponge. There were no bridles or fleshy beams stretched transversely from one side of the cavity to the other; but the humeral artery, involved in all its coats, came fully in view. About

the middle of the bare part of the artery, we saw a hole, large enough to receive the surgeon's largest probe, without any retorted lips, or other sign of the interior membranes having been extended through the exterior, but exactly of the same appearance, as if it had been made by an oval sharp-pointed instrument. After, by unloosing the tourniquet a little, we had made sure of what we saw, being the wounded artery, one of the gentlemen, who assisted me, put in a strong probe by the orifice, and with it raised the artery, so that I easily passed the aneurism needle with proper thread behind the artery, both above and below the orifice, without engaging the nerve or vein within the thread. I made the two ligatures in the common way, the patient complaining much of pain while I tied the superior threads; and then untwisting the tourniquet, only some few drops of blood oozed out at the aperture in the artery; and the other common dressings and bandages were applied. 1733.

The polypous lump we took out was very hard and firm on the side next to the skin, except where, I said already, it was eroded in the middle; but turned softer in a lamellated way as it approached the artery, till it degenerated gradually into mere coagulated blood.

During half an hour after the dressings were applied, the right hand remained cold and scarcely sensible, but gradually then recovered sense and heat. Next day, that hand was a little swelled, and on the second day, became so big, as to oblige me to take off the thick compress that was pressed on the humeral vessels by the exterior bandage; after which, and fomenting the hand with warm water and brandy, the swelling decreased.

On the fifth day after the operation, the dressings were removed, and the wound began to suppurate in a very right way, and was cured entirely before the end of March, without any accident; unless that, on the 22d of January, blood made its way through all the dressings: it had come out from the hole of the artery, but stopped as soon as the dressings were removed; and no hemorrhage ever happened afterwards. In the time of the cure, the hand often became œdematous, and sometimes a gentle erysipelas attacked the skin of it, but soon yielded to an embrocation with the aq. mindereri, or to aq. calcis, with some brandy. The threads with which the artery had been tied, did not come out till the middle of March.

1733. We never could feel any pulse below the elbow since the operation. The member is weak, but he can perform the motions of the fore-arm, hand, and fingers. He still complains of a numbness and difficulty of motion in the thumb and fore-finger more than in any of the rest, though it is now two months since the wound was skinned over.

The pulse, after some months more, returned to the wrist; but the numbness and feebleness of the thumb and fore-finger remained.

A. MONRO.[1]

1733. By the distribution of the humeral artery [in fig. 1,][2] it would appear that the artery, which is in hazard of being hurt by the lancet in bloodletting of the arm, is for ordinary the trunk of the humeral artery, and that the lancet must pierce the tendinous aponeurosis of the biceps muscle before it touches the artery. To be still more assured of this, I pushed pins into the arms of several bodies at the ordinary place where the basilic vein is opened, and where the cicatrices of the former venesections were seen; and, allowing the pins to remain there, I dissected the parts till I saw what has been above asserted to be true.

Sometimes, when the median vein is opened lower than ordinary, the radial artery may be hurt; but then its wound must be so near its rise from the trunk, that it is impossible to make any ligature on the radial artery above the aperture; and therefore, seeing the humeral artery must be tied, if the operation of the aneurism is performed, the consequences will be the same as if the humeral artery had been wounded.

In all patients, then, whose vessels are distributed in the common way, without any considerable anastomosis between the hu-

[1] Reflections on the Aneurism occasioned by Bloodletting, by A. Monro.—Medical Essays and Observations, Edinburgh. Vol. ii. Edinburgh, 1771. 5th edition.

[2] [Fig. 1 represents the ordinary distribution of the brachial artery. Fig. 2 represents the Inferior profunda, apparently rather larger than usual, anastomosing with the posterior ulnar recurrent artery. Fig. 3 represents the high division of the brachial artery; and, fig. 4 a double brachial artery.]

meral artery and its large branches in the fore-arm, it is in vain to expect that any pulse should be felt at the wrist immediately after the operation of the aneurism has been performed; and, at the same time, the want of a pulse there needs not make the surgeon go on precipitately to the amputation of the member, because the numerous small anastomoses may be sufficient to keep life in it, and may possibly be gradually enlarged so much as to restore vigour and strength to it, and even to make a perceptible pulse at the wrist. 1733.

When the operation of the aneurism is performed at the bending of the elbow to one who has the anastomoses, [represented in fig. 2,] the humeral artery must be tied, but the pulse at the interior side of the wrist will continue, and probably that on the exterior side will soon be restored, because the blood may have the short retrograde motion, from the insertion of the anastomosing tube into the ulnar artery, to the place where the radial artery begins, without any great diminution of its momentum.

Those who happen to have such a division of the humeral artery [as is represented in fig. 3,] can only have the radial artery hurt in venesection, and, after the operation of the aneurism, will have a stronger pulse than formerly in the interior side of the wrist, but will probably want it in the exterior side.

If the vessels anastomose, [as in fig. 4,] you will readily see that the anterior branch only being hurt, the operation of the aneurism may be performed without interrupting entirely the course of the blood either in the radial or ulnar artery; and therefore the pulse may still be felt in the common place on both sides of the wrist.

I have very little to add, by way of remarks, on the history related by Mr. Macgill, having, in the account already given of the formation of aneurisms, prevented any explanation of the principal phenomena.

I may, however, observe, that in that history we can trace the gradual formation of the polypus, and, from the mixture of the deeper-coloured parts of the blood then squeezed out with some of the dissolved cellular membrane, may understand how a liquor, like to coffee made of half-burnt beans, could be collected within this aneurism.

If the common notion of the true aneurism being a sac

1733. formed by the dilated muscular coat of arteries has not had its rise from theory only, I would suspect that the first asserters of it, seeing the pleura covering an aneurism in the thorax, or the tendinous aponeurosis of the biceps here in the arm adhering firmly to such a tumour, mistook them for the muscular coat of the artery. I have an argument for this suspicion, which seems very strong to me, whatever it may do to others, who are less liable to mistake one thing for another; it is this, that notwithstanding my theory and dissections had brought me to think true aneurisms to be, at least, a very uncommon disease, yet, when I saw Mr. Macgill lay the tendinous aponeurosis bare, I was ready to have renounced my opinion, being persuaded it was the muscular coat of the artery, till he most dexterously prosecuted the aponeurosis to its rise from the biceps, and so fully convinced me of the mistake into which I should most readily have been led, without discovering it, if the operation had been performed in the more speedy way of laying the whole tumour open by one incision.

HEISTER.[1]

1744. If a true and small aneurism arise in the knee, of such a character that the blood can be forced back into the artery, we may try whether, by exerting pressure upon it by means of a plate, and proper straps and bandages, for several months, it may not be compressed to such a degree, that, as happens in the arm, the coats of the aneurism may so contract and grow together as not to be able to enlarge again; or else, if this cannot be effected, and the tumour, on the removal of the bandages and compresses, always returns, I would recommend that, in order to avoid a greater evil, and a dangerous operation, the patient should wear the compressing apparatus for the rest of his life; as many do, with advantage, who suffer from hernia, in order to prevent a prolapsus of the intestines and omentum; for otherwise the aneurism may return, and, acquiring a larger size, will become

[1] Dissertatio Med. Chirurgica de Genuum Structurâ eorumque Morbis Laurentio Heistero. Helmstadii, 1744. And in Haller's Disputat. Chirurgicæ, tom. iv.

dangerous to the patient. A bandage of this kind was of especial use in the case which Mellius describes (Ars Medica Chirurgica, tom. i, p. 115. Venet. 1721.) 1744.

But sometimes, even by these means, the tumour cannot be obliterated, especially in men who are obliged to walk about much, and, more particularly, if it become so large in consequence of neglect that it cannot be returned; or if it be an aneurism in which the blood and serum have passed into the interstices between the muscles, fat, and skin, the coats of the dilated artery having given way, as happened in the case described by Van Horne, a hundred years ago, namely, in 1644; and in a similar case which the President (Heister) saw in a girl of Halberstadt, in whom a tumour extended from the ham to the middle of the thigh, and who suffered most violent pains in the same way as the patients did whom Van Horne and Mellius mention. There was not, as we learn from Van Horne and Mellius, a single one of the Venetian physicians or surgeons who cared to undertake, or even to recommend, in this case of popliteal aneurism, any operation with the knife; and the principal physicians of this city also determined that the knife afforded no chance of success. Nor can I recall to mind any case of this kind that has been cured by operation by the more modern physicians or surgeons.

Nevertheless, as this operation can be performed on the arm, as the President and many other modern surgeons are well aware of, I do not think it is impracticable in this situation, if it be done in the same way as in the arm. The tourniquet having been adjusted and tightened, and the patient laid prone on the belly, the popliteal artery should be sought for, the parts covering it having been divided, and a thread being passed round the vessel, above the rupture, should be tied so tight, that, on the tourniquet being slacked, no blood may escape from the seat of disease; the wound must afterwards be dressed and healed, in the same way as in an aneurism of the arm.

I have no doubt but that there will be many who will exclaim that this operation cannot succeed, and that the patient must die of gangrene. But, as the President has already shown,[1] there

[1] In Compend. Anatom. tom. ii; and also in his Dissertatio de Arteriæ Cruralis Vulnere periculosissimo. Vide Haller, Bibliotheca Chirurgica, tom. v, and Bibliography.

1744. are often, in the arm, two large and nearly symmetrical branches given off by the brachial artery; or, at least, close to the larger there is a smaller one, given off from the side of the vessel, which Verheyn has very correctly delineated in plate 38, and which anastomoses, by its extreme branches, with the ramifications of the arteries about the elbow; whence it follows, that after the ligature of the brachial, the parts below the elbow do not necessarily become gangrenous, but that the blood is rather conveyed through the large branch, or, when this is absent, through the small lateral artery of Verheyn. He (Heister) also thinks that the same would happen in the thigh and leg; for, as is evident from dissections, nature has, in this respect, established a great similarity between the arm and the leg, as may be seen, though it is very rudely and imperfectly delineated, in Vesalius's plates, in the third book; and much better in Verheyn's 'Anatomy,' plate 38, fig. 2, letter B. But even if this small branch or branches were occasionally absent, which, however very rarely happens, as the all-wise Creator of our bodies has foreseen all things, and gangrene of the leg were in such a case to come on, the limb might be amputated: and were the operation properly performed, the life of that patient, whom, as we are told in Horn's epistle, the Venetian physicians left to his fate, might have been preserved. And, indeed, the President has fully determined to undertake this operation for aneurism in the neighbourhood of the knee, if a case of this kind should fall under his care; or even such a one as he saw at Halberstadt in 1728, and which is as follows.

[Here follows a case of popliteal aneurism in a girl, about twenty years of age, which proved fatal, but which does not present any points of interest.]

MOLLINELLI.[1]

1745. This memoir is divided into two parts, the first of which contains the relation of five cases of aneurism. The first four of these are cases that have been treated by different surgeons.

[1] Mollinelli De Brachii Aneurysmate e Læsâ in mittendo Sanguine Arteriâ. De Bononiensi Scient. et Artium, &c. Commentarii, tom. ii, par. 1, 1745, p. 178.

The first by a very eminent foreign surgeon; the second and third by Mollinelli himself; and the fourth by Valsalva. Mollinelli received the report of this case from Morgagni, which renders it more interesting. The fifth case contains the account of the dissection of the arm of a man whom Valsalva had cured of an aneurism. I shall omit all these cases; for the remarks that follow, although deduced from them, can yet very easily be understood without them. A knowledge of the circumstances that prove any given thing not being always necessary, in order that we may correctly understand the thing proved. 1745.

I shall, therefore, as I have said, proceed at once to the second part of the memoir, in which Mollinelli adduces certain important circumstances, by which he endeavours to subvert some commonly received opinions. Authors lay it down as one of the principal rules in the treatment of aneurisms, that when the artery is to be tied, the nerve should first be seized and drawn well on one side, lest it be included in the ligature together with the vessel. This they consider a very important circumstance to be attended to, although it renders the operation much more tedious and difficult; which, however, it is very desirable should not only be, but also seem to be capable of as rapid performance as possible, so that a dread of its difficulty might not oppress the mind of the surgeon.

The following circumstances prevent Mollinelli from attending implicitly to this rule. He says that he has seen three men in whom, although the nerve was ligatured, yet everything went on favorably; and that, as he has actually seen this with his own eyes in these cases, it admits of no doubt. There is also reason to believe that it happened in another, namely, in the patient that Valsalva treated, in whom it is most probable that the nerve was tied. He does not, however, deny, that those in whom the nerve was ligatured suffered great pain, and complained of the loss of the use of the hand; but he says that neither languor, nor convulsions, nor any accident that threatened the life of the patient or the safety of the limb followed; but that sense and motion were recovered in the hand and arm so completely, and in so short a time, that the ligature of the nerve did not appear to be of the least consequence.

As this happened in all the patients whose cases Mollinelli relates, although they were of different ages and temperaments,

1745. and no dossil (splenium) was interposed between the nerve and the ligature, which remained, in two of them, for several days, and in one for some weeks, and was in all exceedingly tightly applied, it appears very evident that this is a safe mode of treatment, and that ligatures of this description need occasion no alarm. Provided, therefore, the nerve be not irritated, those who forbid its being ligatured appear to have taken unnecessary pains about it; and Thibaut did right, who, it is said, neglected this rule. If this be true, it confirms the opinion of Mollinelli; although we would rather that it were confirmed by very carefully conducted observations, than by the authority of any one man.

Mollinelli does not deny that many objections may be made to his opinion on this subject; and these he exposes, as those philosophers do, who, when they cannot refute the arguments that are brought against them, at all events do not pass them by in silence. The following is the principal objection. If this nerve can be ligatured without inconvenience, how is it that certain others cannot be tied, as, for instance, the trunk of the par vagum, without death ensuing? Why do those animals in which these are tied tightly, and then loosened immediately, die more quickly than if they be completely and at once cut across?—as was first stated by Valsalva, and afterwards confirmed by the observations and by the authority of Morgagni. Mollinelli answers, that the force of this argument is lessened if we consider that those nerves that Valsalva tied belonged to the head, the most noble part of the animal, and to which no other, or scarcely any others, are conveyed, besides those that he rendered useless by ligaturing them. That, on the contrary, the nerve that is tied in the arm during the operation for aneurism is distributed to the fore-arm and hand, less important parts, and which are supplied by other large nerves, so that, when one is destroyed, the part is not altogether deprived of nervous influence. Nor, indeed, does Mollinelli altogether assent to this reasoning, which diminishes, but does not destroy, the force of the argument. For, in the first place, although the nerve that is ligatured in the operation for aneurism may be said to be distributed to less important parts, which will not be much injured by its ligature, still they will suffer some injury; and more especially, if, after its ligature, the size of the other brachial

nerves which ought to supply its place be not increased. Then, 1745.
again, the nerve that is tied in the arm during the operation for aneurism is kept ligatured, as we have already stated, for a long time, whilst Valsalva only compressed his for a very short period; therefore, although the ligature of the par vagum may be injurious from particular circumstances, yet that of the brachial nerves may be proportionately prejudicial, from the greater length of time that it is applied to them.

After Mollinelli has adduced the arguments on both sides of the question, he concludes that reasoning is of no value when opposed to fact; and that the fact that the nerve may be tied, together with the artery in the arm, without any bad consequences ensuing, is proved by the most unimpeachable cases. But, as this does not happen equally with other nerves, what conclusion should we come to?—that all nerves have not the same form and texture, but that each is peculiar in this respect? or, that the blood-vessels in the arm, having been ligatured together with the nerve, that the ligature on this account is less injurious? It is better to explain the cause in any way than to oppose the fact; for the one is most certain and evident, the other dark and obscure. Wherefore Mollinelli does not feel implicit confidence in the deductions that are made by many from these experiments of Valsalva, in order to explain the phenomena of paralysis, and of other diseases; for if there be not absolute identity of form and structure in the nerves, the same reasoning is not applicable to all.

ALBERTINI.[1]

[Several pages of very valuable matter, but which is altogether 1748.
foreign to our subject have been omitted.]

I shall now say a few words concerning the plan of treatment by which (if their entire removal cannot be accomplished) at least

[1] Hippolyti Francisci Albertini Animadversiones super quibusdam difficilis Respirationis vitiis a læsâ Cordis, et Præcordiorum Structurâ pendentibus. De Bononiensi, Scient. et Art. Instituto atque Academiâ Commentarii. Bononiæ, 1748.

1748. the progress of the diseases that have just been spoken of may be arrested and their symptoms mitigated. It cannot be denied that our treatment should be principally directed to the solids and fluids which are at fault, in order that the tendency of the solids to liquefy may be diminished, and the disposition of the fluids to solidify may be increased—that the morbid condition of the humours may be corrected—the disordered structure of organs remedied—and, lastly, that if any abnormal formation should have taken place in any part of the body, or any depraved or redundant fluid have flowed there, it might be removed and dissipated. It must nevertheless be confessed that the treatment of these cases is exceedingly obscure, doubtful, and dangerous. For, as yet, neither the practical observations of others, nor the precepts that have been deduced from them, have supplied us with the means of discovering the plan that should most generally be adopted in diseases of this kind. Hence we may, with good reason, fear that we are not unfrequently, as it were, compelled to do more harm than good in these affections. For the patients, their relations, their friends, and even not a few medical men, when they see the languor, the difficulty of breathing, and the deadly oppression continuing for many days and even weeks, beg, entreat, urge, and request those who are in attendance to set to work to devise remedies, to order things that may be of advantage, and to replace the old by a new plan of treatment. It is of no use then to say with Ballonius, "turpius esse videri nocuisse, quam non profuisse," or to complain with Hippocrates, "neque ei, qui in periculo constitutus est, satis sunt quæ possumus, verum etiam quæ non possumus, expetit."

And, indeed, if the saying of Hippocrates "equidem vehementer hunc medicum laudem, qui parum peccat," is applicable in any, it certainly is so in these diseases, in which a mistake may very easily be committed. It is the more easy to do so as we are scarcely ever able to form a correct and distinct idea of the nature of the organic lesion. And it would be the more serious, as this very lesion occurs in those organs that are the most necessary to life, and which are in a constant state of motion, namely, the heart, and adjoining vessels and parts, which are the principal instruments of the circulation, and without which life cannot continue. And besides, it is only by the greatest care and attention that the action of the fluids upon

the solids can be checked precisely when necessary; and that 1748.
the power of the solids reacting upon the fluids may be extended
and strengthened, so that the solid itself may either nearly return to its natural condition, or, at least, may not recede from it; and that thus the progress of the sickness and the succession of those diseases that we have mentioned above may be provided against. Therefore, as we and our very dear friend, and whilst he lived the companion of our studies, Antonio Maria Valsalva, found these diseases in dead bodies more frequently than we had previously imagined, we began, after having considered the nature of the lesions, to think that perhaps a plan of treatment might be devised that would be useful, safe, and efficacious, provided that the patient would not complain of being kept about forty days in bed, during which time one or more venesections should be had recourse to, clysters be administered, wine be abstained from, and such a quantity only of food and drink taken as would be sufficient to support life; and this should be given not merely in two separate portions in the course of the day, but at three or four distinct intervals; so that the small quantity taken might in no way distend the blood-vessels. And as diseases of this kind either indicate or create an impure state of the blood, we thought of some remedy that might correct this, either in whole or in part; as, for instance, some of the vulnerary herbs, or those means that have been already mentioned; but we determined principally to have recourse to the milk cure or diet in those patients who could bear it. Having determined upon this, we agreed to make trial of it upon the first patient that should present himself to either of us, and who might be willing to submit to this plan. Accordingly as the first case occurred to Valsalva, he was the first person to put this mode of treatment and of diet into practice. As this case terminated as favorably as we could have wished, the same treatment was had recourse to in many other patients, both by us and by other medical men, friends of ours. And we found, that by these means, several young persons whose diseases had not as yet become chronic, were either in a great measure, or entirely restored to health; and that those who were older in years and were labouring under complaints of longer standing received this benefit, that the rapid progress of their disease was more or less completely arrested, and that their death was retarded for a considerable

1748. time; provided only that the primary disease had not made such progress as to have passed into those secondary affections that we have already spoken of.

Moreover, if men advanced in years, who are not affected by any disease in its later stages, and women of every age, would but adhere sufficiently strictly to this plan of treatment, they might prolong their life to a greater age than even Antipater, the physician, of whom Galen speaks. For, besides those cures that have already been related, a knight, in whose body we found the right auricle and the pulmonary artery very much dilated, and the pericardium most closely adherent to the heart, together with hydrothorax, prolonged his life by these means from the sixty-fifth to the seventy-fourth year of his age. We have likewise seen a woman, who was labouring under a true polypus, with an aneurism of the trunk of the aorta, the interior of which was everywhere covered with bony incrustations, preserved in this way from her sixty-first to her eighty-second year. Another woman, a fellow-citizen of ours, still lives, and by no means in great discomfort, who has for eleven years presented the symptoms of an aneurism near the heart, with wasting of the body, a very troublesome cough, and dyspnœa on moving and lying down, together with œdema of the lower extremities.

As these cases, and others of a similar kind, afford by no means a doubtful testimony as to the value of the proposed plan of treatment in the diseases that have been mentioned, these deserve to be attentively studied by medical men: in the first place in order that their diagnosis may be more accurately determined—that is, principally in relation to their very earliest commencement, and not so much to their nature and advanced stages; and secondly, that in the treatment, that plan and those means may be adopted which experience shall have shown to have succeeded best in the majority of cases. For, indeed, if there be any department of medicine in which serious errors are more frequently committed, it is in the diagnosis of diseases, as we have learnt from the attentive and daily practice of medical and anatomical investigations. Mistakes are committed the more readily in proportion as the diseases are accompanied either by uncertain signs or by analogous symptoms; and they differ according as they require a different plan of treatment and different remedies. We see this daily in the affinity there is, with regard

to the use of Peruvian bark, between continued fever of an intermittent and of a remittent character; which also happens in many other diseases. Wherefore Hippocrates justly says, "Optimis medicis similitudines imponunt et difficultates pariunt." Hence it is not to be wondered at, when we consider the latent manner in which the diseases of the heart and neighbouring parts that have already been mentioned arise provided some sudden and powerful external cause do not come into operation, that many medical men, of no little celebrity, have unsuspectingly treated those severe pains of the arms and chest (which generally either precede or accompany these organic diseases) by solvent medicines or decoctions of drying woods; by which foolish plan these affections have been rendered more quickly fatal, as has been proved to us by dissection. 1748.

If, therefore, the signs by which these diseases may be known, not only after they have advanced to maturity, but when they are in their earliest stages, can be more clearly established, such knowledge will be most useful both to the physician and to the patient. To the physician; as he would become a better judge of the different kinds of disordered respiration, and would be able to distinguish between those that admitted of cure and those that did not; and by establishing properly the diagnosis, prognosis, and treatment, would be able to maintain not only his own reputation, but also the dignity and honour of the profession. Hence, even unto this day, honorable mention is made of Vesalius, who, being called two hundred years ago from Belgium into Germany, and guided by his anatomy, in which he was most skilful, explained to the physicians that a large tumour in the back of a nobleman, near the vertebræ, was an aneurism, and was therefore incurable; which, in the space of two years, was confirmed by the dissection of the body. To the patient this knowledge also will be useful; for it is preposterous to say that he cannot be cured, merely because the nature of his disease and the cause of difficulty in his breathing are known. Although he may not be freed from his complaint, he will, at least, be the better for the alleviation of the symptoms, and for the postponement of a fatal termination. But if he be young, and his disease be not of very long standing, he may be very greatly relieved, provided he does not refuse to submit to the plans of treatment that we have proposed, and to adopt either entirely,

1748. or nearly so, the sober regimen that Ludovicus Cornelius mentions he had recourse to; and which, as several of our countrymen have adopted, we hope will also be put in practice by foreigners. For we can easily believe that that will be useful abroad which is of service at home. Formerly with us we never, or at least very rarely, heard the names of structural disease of the heart or of the præcordia mentioned in cases of difficult respiration. And it is only since very numerous examinations of dead bodies have been made that these things are heard of or found in the living.

FOUBERT.[1]

1753. The division of aneurisms into true and false has been established and admitted by all the authors who have treated of this subject; but they have not distinguished two kinds of false aneurism, which occasionally occur, especially in the arm after bloodletting: one is primary, the other consecutive.

I call that a false primary aneurism, which, at the moment of the venesection, gives rise to an extravasation of blood along the course of vessels in the cellular tissue, that sometimes extends from the opening in the artery up the arm into the axilla, and which requires prompt attention.

It is well known that the fatty cells being distended by effused blood often give rise to a considerable swelling accompanied by œdema, in consequence of the difficulty which the blood experiences in returning on account of the compressed state of the vessels; sometimes these distended cells form separate tumours. The œdematous swelling occasions some difficulty in extending the fore-arm, and thus causes the artery to lie as it were at a greater depth; lastly, inflammation, which occasionally threatens gangrene, sometimes comes on, as the consequence of a bandage that has been put on unskilfully, or of irregularly applied compression.

I call that a false consecutive aneurism which only occurs several

[1] Mémoire sur differentes Espèces d'Anevrisme Faux. Par M. Foubert.—Mémoires de l'Académie Royale de Chirurgie, tom. ii, 1753.

days after bloodletting, in consequence of the compression, which may have been applied at first, not having been continued sufficiently long; or from those precautions which are necessary for its maintenance not having been had recourse to; whence the clot which had formed in the wound in the artery has escaped, and the blood has been effused into the sheath which surrounds the bundle of vessels; raising up the aponeurosis of the biceps and the neighbouring parts. 1753.

This kind of false aneurism may present the signs of a true aneurism, or of one by dilatation, although it is formed by the escape of the blood out of the vessel. It first of all gives rise to a small tumour, which gradually increases in size, and which, little by little, acquires a bulk in proportion to its duration, and to the quantity of blood that is extravasated; this tumour is round and circumscribed without any change in the colour of the skin, and may be almost entirely made to disappear on pressure.

It is usually the consequence of bloodletting in the arm, and the following is the way in which it is formed: When the bleeding from the artery has been stopped, the wound on which compression has been exercised reunites; the integument, the fat, the aponeurosis of the biceps, and the sheath of the artery cicatrize; the incision in the artery itself, however, does not close up, but leaves a round opening in which a coagulum forms. If the compression be continued sufficiently long to procure a complete consolidation of the coagulum, the patient will be radically cured. But if the arm be allowed to be moved before the coagulum have acquired a sufficient degree of solidity to ensure the adhesion of the sheath to the aponeurosis, the clot will escape from the opening, the blood will introduce itself around it, and will remove it from the situation that it occupied, and the reiterated impulses of the artery will separate the parts in the neighbourhood of the aperture in the vessel. This separation will give rise to the aneurismal swelling, which seems to disappear when it is compressed, in consequence of the fluid blood passing again into the artery. This tumour, as it becomes larger and older, will form bloody or polypous layers, which become very hard, more particularly those near its summit.

This explanation is proved by a large number of facts that I have obtained from the operations that I have had occasion to practise in cases of aneurisms of this description, and from the

1753. dissection of those who had been cured of this disease by compression. In my dissections, I have found, on opening the artery behind the injured part, a round aperture completely filled up by a very solid coagulum; and, on dissecting attentively the anterior aspect of the vessel, I have found in the opening a plug formed by a clot, in such a way that the artery, the sheath, and the aponeurosis were united by one cicatrix. In the operations that I have performed, I have found a pouch, which was more or less solid according to the duration of the disease; this pouch was formed externally by the aponeurosis, and internally by a mass of several layers of blood, the more external of which have a greater consistence than the internal ones, doubtless on account of this substance having been for a longer time exposed to the impulsive action of the blood, and to the resistance of the surrounding parts. After having evacuated the fluid contained in these pouches, I have seen the artery isolated to the whole extent of the tumour, and have found a round aperture by which the blood had escaped; which I easily discovered by loosening the tourniquet, so as to allow a jet of blood to flow.

Several years ago, I communicated to the Academy some facts, which serve as the foundation of the doctrine that I have just explained; new observations have only served to confirm it. The following is the plan of treatment that I employ, and which has reference to the relative periods that the disease has existed.

When the tumour is small and recent, I cure it by means of methodical compression. But if it be of long standing, and compression be had recourse to, the skin may ulcerate, and the sac giving way, the patient may die before any assistance can be afforded him. The operation is, therefore, absolutely necessary, though not immediately so as in false primary aneurism; but it may be delayed until the tumour acquire a certain size when it will be easier.

It is not easy to know whether it is the trunk or a branch merely that is wounded; this can only be ascertained when the artery is examined after the tumour has been opened and the clots removed. If it be very large, it is probably the trunk, and it is desirable not to apply a ligature, for the patient may be cured by methodical compression, the principal point of support of which should be on the opening in the artery; of this I have several proofs. I have succeeded with chewed paper, and with

charpie; but now-a-days, as the good effects of agaric whether from the oak or the beech,[1] is known, it will be as well to prefer it to either of the other applications. 1753.

With regard to the operation: the patient being seated on a chair of the proper height, and having given his arm to be supported by assistants, I apply the tourniquet as for an amputation, and divide the integuments in the usual way. After having opened the tumour, I divide it to its whole extent, cutting down to the fluid blood, as if an abscess were being opened; I then remove as much as possible of the blood and layers of coagula, which form a species of cyst; and, having in this way laid bare the artery, and exposed the opening into it, I pass, if it be a branch, a curved, pointed and sharp needle under it, in such a way that it enters by the side of the vessel that looks towards the internal condyle of the humerus, taking care that the string includes a certain thickness of parts with the artery, so as to make the ligature more secure; I have remarked that, in this way, the nerve, which may otherwise be tied, is avoided with greater certainty. A single ligature placed a few lines above the opening in the artery suffices, and has often succeeded; nevertheless, I would advise that a second one be applied below; the threads are to be retained in the usual way.

I fill the wound with dry charpie, which I support by long compresses and a containing bandage; taking care not to tighten it too much, for fear of putting an obstacle in the way of the circulation; I carefully examine from time to time the state of the fore-arm, which ought to be covered with compresses soaked in warm spirits of wine, which should often be changed in order to maintain the temperature.

This dressing should not be touched until forty-eight hours after the operation; and the separation of the charpie, which usually takes place in ten or twelve days, must be waited for, as well as that of the ligatures, which is generally somewhat later. When the ligatures have separated, the wound is to be filled with soft pledgets rolled in powdered resin, and the cure is usually completed in a very short space of time.

[1] I have a proof that the agaric of the beech is as good as that of the oak, and that the introducer of this remedy used it in his experiments. It is important to be aware of this, for the agaric of the oak is very scarce, whilst that of the beech is very common, and is that of which amadou is made.

1753. The views concerning this species of false aneurism that I have exposed in this memoir, are confirmed by the following cases:

Case I. In the year 1740, I performed this operation on a young man, whose arm was so œdematous and swollen by the extravasated blood, that I was not able to extend the fore-arm sufficiently in order to operate with ease. Several cavities amongst the fatty cells were filled with coagula, and it was difficult to find the artery. I was several times obliged to loosen the tourniquet in order to see the blood escape, and thus discovered the seat of the disease; whilst dilating the wound, I took care not to cut the collateral branches, and not to puncture the vessel in any other part. The blood was stopped by ligatures. Seven or eight days afterwards, whilst the patient was being dressed, a fit of coughing came on, which caused the upper ligature to separate, and the blood to escape in great abundance; as I had left the tourniquet on, I was less embarrassed, and passed a needle under the vessel, which fortunately arrested the hemorrhage. The patient was perfectly cured in six weeks.

II. In the year 1732, I was sent for to see a man, who had been bled about two months previously in the right arm; the surgeon, having perceived that he had punctured the artery, had taken every possible precaution in order that the accident might not be attended by unpleasant consequences. On the fourth day, he was obliged to remove the dressings, as the bandage had become loose; he now found in the situation of the puncture a small round aneurismal tumour, about the size of a hazel-nut. A bandage was reapplied, and kept on for ten days, when, on the arm being examined, no tumour was found, the surgeon consequently thinking the patient cured, allowed him to use his arm; he soon repented, however, for the patient made an effort which caused the tumour to reappear, at first as large as a small walnut, but it soon acquired the size of a hen's egg. The disease was in this state when I was consulted; the tumour could be made to disappear almost entirely by compression, and a pulsation, resembling that of a true aneurism, could be felt in it; the colour of the skin was not changed. I performed the operation in the presence of MM. Malaval and Bagieu. The artery having been laid bare, I caused the tourniquet to be loosened in order to expose the opening in it, and without any dilatation, I applied two ligatures in the way I have already explained, and after having

covered the opening with a small compress, I filled the wound with dry charpie, and applied suitable dressings. I took the precaution of leaving the tourniquet on the arm without tightening it; two days afterwards, I carefully changed the compresses only; the pulse was not as yet perceptible. On the fourth and fifth days, the natural temperature returned, and the pulsations at the wrist could be felt. Finally, on the fourteenth day, the ligatures separated with the charpie, and the wound was granulating. The patient was cured in thirty days, without any difficulty in the movements of the arm being left. 1753.

III. In 1733, a man, from five and twenty to thirty years of age, came to consult me for an aneurismal tumour in the right arm, as large as a hen's egg, which had formed in the course of four or five months, in consequence of bloodletting; this tumour had the same characters as those of the preceding one. I accordingly recommended an operation, which succeeded perfectly.

IV. In 1737, a young man was bled in the arm, the result of of which was a false aneurism, of the same description as the preceding ones. I operated upon him with the same result as in the former cases, and he was cured in twenty-three or twenty-four days.

At La Charité, I have several times performed this operation for aneurisms of this description, and I have cured them all in a month or five weeks at most.

The following are two very interesting cases, one of a secondary, and the other of primary aneurism; both of which were cured without operation.

V. In 1732, I was sent for six leagues from Paris to visit a man about seventy years of age, who had been bled the day before by a country surgeon, who had punctured his artery. The surgeon stopped the blood by the application of compresses, a piece of lead and a very tight bandage. At first I did nothing more than loosen the bandage, otherwise the fore-arm would have mortified; I then had the patient brought to Paris and took off the dressings; as the arm had suffered a good deal from the first bandage, I contented myself with applying another, which did not compress it so forcibly. Seven or eight days afterwards, on examining the wound occasioned by the bleeding, I found a small aneurism, forming a tumour about as large as a hazel-nut. I now made a more methodical compression with chewed paper,

1753. graduated compresses, a bandage, and an instrument which differed from that called the *ponton*, inasmuch as it only compresses the tumour and the elbow, leaving the anastomosing vessels at liberty. No swelling came on, and the pulse soon became perceptible at the wrist. Eight days afterwards, on removing the dressings I found no tumour, but nevertheless continued the same dressings: at the expiration of forty days the patient appeared to be cured, and I allowed him moderate exercise.

Some months afterwards he had an attack of apoplexy and died; being informed of this, I requested permission to examine the arm, which was granted me. I accordingly removed the bundle of vessels for four fingers' breadths above and below the spot that had been diseased. This preparation I took to the Academy at a meeting at which M. de la Peyronnie presided; he appointed the Petits, father and son, to examine it with me, which was accordingly done in the following way. The artery was separated from the other vessels, taking care, however, to preserve a small hard point that could be felt in the situation of the cicatrix, which appeared to be formed from the aponeurosis of the biceps, the sheath of the vessels and the wound in the artery, all of which were very firmly adherent to one another. The artery having been opened from behind we found at the situation of the puncture a round hole which corresponded to the hard mass, and which was filled up by a very solid coagulum; outside the opening this was expanded like the head of a nail, by which means the parts were united and cicatrized. It is probable that the cure of these diseases always takes place in this way, and that long-continued compression may heal such wounds.

VI. In 1748, I saw a man upwards of seventy-five years of age, who had been bled for retention of urine. He told me that his surgeon had already visited him twice for the purpose of stopping the bleeding; that the arm was very painful, which he attributed to the bandage being too tightly applied, and which he begged me to loosen. On examination, I found the arm much swollen from the bend of the elbow to the armpit, and the forearm livid in consequence of the tightness with which the bandage had been put on. It was easy to perceive that the artery had been punctured: I accordingly sent for the surgeon, who agreed with me that it was so; I therefore untied the bandage and re-

moved everything that had been put upon the wound, pressing my thumb firmly upon it so as to separate the clots that had formed between the opening in the artery and that in the skin, and into the depression that it thus made I placed a pledget of chewed paper, that had been squeezed into a tolerably hard mass; this was supported by small graduated compresses, and several turns of a moderately tight bandage. I then directed the surgeon to keep this dressing in its place with his fingers, whilst I went home to fetch the instrument that I use for the purpose of maintaining the compression, and which I will describe at the end of the memoir. 1753.

There still remained a very considerable quantity of extravasated blood, which extended from the wound up to the armpit, and which gave rise to a round swelling in the course of the vessels by which the skin was much stretched. I accordingly enveloped the arm, and even the fore-arm in cloths soaked in spirits of wine, in which camphor and sal ammoniac had been dissolved. It was a long time before the pulse could be felt. In the course of eight or nine days I removed the dressings in order to apply them anew, and I was much pleased with the state of things; no tumour had formed between the wound of the artery and that of the skin, but there was merely a kind of contusion around the puncture; I accordingly took care in my next dressing to make the compressing apparatus somewhat softer, but sufficiently hard to complete the cure. The arm, however continued swollen, and although the skin was less tense, the blood that had been extravasated along the vessels had reduced it, and given rise to an abscess that it was necessary to open. Indeed about three weeks after the accident I made an incision into it, and removed some black blood, which had a very offensive odour; but everything was going on well about the wound, which had assumed a cleaner aspect and appeared disposed to cicatrize, when some unfavorable symptoms connected with the urinary complaint showed themselves, and the patient died before cicatrization was complete.

I caused the bundle of vessels to be removed by the surgeon who attended him, in order to examine what had taken place about the opening in the artery, when I found that the trunk of the vessel had been punctured several lines above its division; that the wound was round, and filled by a clot that had formed

1753. a small callosity sufficiently solid to enable us to have hoped for a cure if another disease had not supervened.

It only remains for me to give a description of the instrument that I made use of for the purposes of compression, and which has been mentioned in this memoir. It is composed of an oval iron hoop, at one end of which is a plate guarded by a small cushion, and at the other a hole, through which works a screw, having at its end another pad of a larger or smaller size, according to the size of the wound and the bulk of the part, and which is intended to compress the point at which the artery has been opened. It will be seen that this instrument unites the advantages of that of Scultetus with those of the *ponton*, invented by the Abbé Bourdelot. The large diameter of this hoop being opposite the side of the limb that it is not intended to compress, enables the freedom of the circulation to be maintained. I have caused three of these instruments to be constructed of different sizes: one for the arm, another for the leg, and a third for the thigh; this last one is divided into two parts, which are joined together by two screws, so as to enable it to be applied more conveniently, and to give more or less space as may be required, according to the size of the thigh.

MORAND.[1]

1753. By a natural feeling, the idea of losing one's blood gives rise to a blind dread, of which the infant who is just beginning to speak and the strongest-minded man are equally susceptible. This dread cannot be said to be chimerical; it will be found that three fourths of those who lose their life in battle have perished from hemorrhage; and in the greater operations of surgery this accident is always the most to be feared.

It is therefore not surprising that surgery should have exerted itself against this danger, and that different plans should have been devised for arresting hemorrhage. I shall apply this word in the course of this memoir merely to those bleedings

[1] Sur un Moyen d'arrêter le Sang des Artères sans le secours de la Ligature. Par M. Morand.—Mémoires de l'Académie Royale de Chirurgie, vol. ii, p. 220.

that occur from arteries; for in general those from the veins (unless it be the larger trunks) are easily stopped by slight compression; and many of them would naturally cease, in consequence of the patient fainting, by which means the circulation of the blood being suspended, a clot is formed at the point at which the vein is opened. If to this be added the inaction of the wounded limb, the mode in which these hemorrhages of the extremities are suppressed will readily be understood. 1753.

It cannot be denied that we are under obligations to modern surgeons for the means they have devised for arresting the flow of arterial blood; but nevertheless it must be confessed that they have only extended those means that the ancients had invented; for these were well acquainted with the principal ones now in use; and it will be easy to point out what is, in this respect, due to one or other of them.

There are four principal means of arresting hemorrhage; viz. compression, the application of styptics, cauterization, and the ligature of the vessels.

This advance from the simple to the more complicated has been pointed out by nature itself. A child that has cut itself compresses the wound with its handkerchief; a wounded man, who reasons, places in the first instance his finger upon the vessel; and all the applications that are made to it afterwards, such as compresses, pads, and instruments, merely perform the same office as the end of the finger, the action of which should be supplied by dressings properly applied.

Compression is, perhaps, one of the subjects on which modern surgery has thrown most light. This depends upon the reasoning that necessarily followed the discovery of the circulation; and no instrument employed for the arrest of hemorrhage is perfect, unless, whilst preventing the escape of the blood from the wound in the artery, it diminishes at the same time the movement of the artery itself above the wound, without interrupting the course of the venous blood.

As an example of a cleverly-contrived compressing instrument, we may cite the one that Scultetus has described in his 'Arsenal of Surgery,' in order to arrest the circulation in the radial artery, and which M. Petit improved, and employed successfully in the femoral, in a person of distinction, whose case is known to the whole world.

1753. In order not to increase the number of topical applications, I include styptics and astringents in the same category, and of these I shall give no details. I will merely observe that the ancients have left us a great number of them of every kind; so much so, that when, at the present day, we wish to give anything new on this point, we run the risk of having been forestalled by the older surgeons.

Some surgeons employ successfully a particular kind of astringent into the composition of which arsenic enters; the same preparation, or at all events one quite similar, is described by Haly.

In 1735, several surgeons employed in the army of Italy, having informed the Academy of the good effects that were obtained by pieces of alum, with which they smeared the flesh close to the divided artery, even in cases of amputation, I was commissioned to inquire into the pretended secret, and I found it printed in the 'Observations' of Pierre Borel, physician of Castres, cent. 4, observ. 50.

Where neither compression nor astringents could stop the bleeding, the ancients employed, as a more powerful means, the cauterization of the divided vessel, comprising with it a portion of the surrounding soft parts; and thus the blood being thickened, and the vessel frizzled by the action of the fire, a crust of greater or less thickness, called an eschar, is formed, which blocks up the opening in the vessel, and prevents a recurrence of the hemorrhage. But the separation of this eschar, which is sometimes too speedy, occurring before the artery is cicatrized, occasions a recurrence of the bleeding in such a way, that it becomes necessary, for the safety of the patient, to ligature the vessel above it.

Common sense has, no doubt, suggested this means, all the others being insufficient; and it was practised long before the discovery of the circulation of the blood; Hippocrates, Galen, and Avicenna mentioning it.

Paré is considered to have been the first who applied it to the amputation of the limbs. His plan having been attacked, he modestly defends it, in a part of his works termed the 'Apology.' He takes great pains to refer its origin to the ancients, and he cites, in addition to the authorities that I have mentioned, Guy de Chauliac, Hollier, Calmeteus, Celsus, Vesalius, De Vigo, and others; he considers, however, its application to amputations as

so happy and useful an idea, that he looks upon himself as inspired by the Almighty, for having first of all practised it— those are his words. The ligature would indeed be the safest plan of arresting any hemorrhage, even were it from the crural artery, provided all that was necessary to preserve life, or to save the limb, was to oppose a barrier to the escape of the blood. 1753.

But let us suppose that the main branch of an artery is wounded, and that the hemorrhage is arrested by the ligature of the vessel; in interrupting the course of the blood at the opening, it will equally be cut off from all the parts that it ought to supply, and hence the great danger of mortification.

This danger will necessarily exist in the case of a ligature being applied to the brachial artery, in consequence of a wound with a lancet, or any other instrument; and it is this that always makes the success of the operation for aneurism doubtful, until the collateral vessels, which leave the trunk of the artery above the ligature, have established a new circulation in the parts that have been deprived of their blood from the ordinary channels.

The discovery, then, of a means of arresting the blood, without being obliged to ligature the vessel, in this and in similar cases, is a useful one, and its history is interesting.

The means alluded to is a topical application, that M. Brossard, surgeon of La Chatre, in Berry, proposed in the year 1750, relating, at the same time, two cases in which it had been successfully employed; one on a trooper of the regiment of La Rochefoucault, who had had the radial artery, and the tendon of the muscle of the same name, cut across by a sabre wound that he had received in the right fore-arm; the other case occurred in a labourer, whose leg had been amputated.

M. de la Martinière, who is incessantly occupied with the progress of surgery, required some proofs of the efficacy of the remedy, that he might himself be witness of. It was accordingly employed in three amputations; one of which was performed at the Hôtel Royal des Invalides, by M. Bouquot the younger, at which I was present, and two at the Hospital of La Charité, by M. Faget the elder; the bleeding was arrested by the remedy without the application of a ligature to the vessels.

Nevertheless, a very simple argument would appear to lessen the value of these experiments. A surgeon does not undertake

1753. the amputation of a limb without being able to apply a ligature, and if he knows how to do it he is sure of being able to arrest the flow of blood. How many amputations are there not performed in the army by many different surgeons? It is not usually in consequence of hemorrhage that these patients die.

In order then to establish the reputation of this application, it became necessary to try it in such a case as that of an aneurism, in which the utility of a remedy that causes the ligature to be dispensed with is more strongly felt, for the reasons that I have already adduced; and this remedy is the more important in consequence of aneurism being one of the dangers of bloodletting. But the operation for the cure of aneurism being fortunately of but rare occurrence, it became necessary to wait for an opportunity, which did not present itself until the month of December 1750.

An officer in the service of the Prince of Conty was sent to me by H. S. H. to be treated for an aneurism of the right arm; having had the artery punctured by a sword wound three months previously. The tumour was nearly as large as two fists, and the skin was as distended as it could be without giving way.

After having blooded the patient twice, and kept him upon a strict diet for a few days, I performed the operation on the last day of the year, in the presence of M. de la Martinière, and a numerous assembly of surgeons. Having applied a tourniquet, as usual, I laid the integuments and the aneurismal tumour open, by a very large incision. I then removed the clots and the fluid blood contained in the sac, and exposed the wound in the artery, which was in a longitudinal direction, and from which the blood spirted freely; the vessel was found to have been dilated to twice its natural diameter. After having attentively observed the opening in the artery, and tightened the tourniquet, M. Brossard laid his remedy upon the wound in the vessel, and begged of me to apply over this a proper bandage.

It is useless to relate the precautions that I thought it necessary to take, in order to second the effects of the remedy; they do not differ from those that are usually taken after applying a ligature: I will also suppress a detail of the dressings and of the diet, with which every one is acquainted, but will merely say that the pulse, which was interrupted at the wrist for nearly twenty hours, reappeared at the expiration of that time,

that the patient experienced no bad consequences, and that he was cured in a month, with a firm cicatrix. 1753.

I have twice performed this operation with a ligature, and the patients have been cured; but in one the pulse was not perceptible until the fifteenth, and in the other until the seventeenth day; and until this time, which is always looked forward to with the greatest anxiety, one cannot be certain of saving the arm. The difference in favour of this application is striking. This cure made the fortune of the remedy, and also of the surgeon, who was liberally recompensed by the King, on condition of disclosing his secret to M. de la Martinière, and to those that he should appoint.

It is an agreeable task for the Academy to manifest to the public a new proof of its zeal, in hastening to communicate to it this application. It is a fungous excrescence called agaric, of the species described by botanists in the following terms:

Agaricus pedis equini facie. (Instit. R. H. 562.)

Fungus in caudicibus nascens, unguis equini figurâ. (C. B. Pin. 372.)

Fungi, called in Tragus' work Igniarii, because amadou is made from them. (943.)

Although this agaric grows on different trees, as the oak, the beech, the ash, the fir, the birch, and the walnut, M. Brossard is of opinion that that which grows upon old oak-stumps is the best; he recommends it to be gathered in August or September, and to be preserved in a dry situation.

In preparing it for use, the white hard bark should be removed with a knife down to the fungous substance, which feels soft to the touch, like chamois leather; this substance is again separated from the tubular and hard part that constitutes the base of the agaric; it is then divided into pieces of different sizes, which are beaten with a hammer, so as to soften them, and to enable them to be readily separated by the fingers.

The opening in the artery is then covered by a piece of this amadou somewhat larger than itself, and so applied that the side opposite to the bark is downwards; above this is laid another larger piece, and above the whole a suitable bandage.

I have called this preparation amadou as it is composed of that substance, with this difference, that in order to render it inflammable, it is boiled, dried, beaten, boiled again in a solu-

1753. tion of saltpetre, then dried, and, lastly, blackened with gunpowder.

I do not know whether this property of the agaric has been known to botanists, although I have consulted them about it; they had only observed it in the lycoperdon or puff-ball, a species of mushroom, called by John Bankinius, "fungus maximus rotundus pulverulentus, dictus Germanis Psofist." (J. B. 888.) He says that he had employed it advantageously in several cases, in order to arrest hemorrhage. "Ad compescendas sanguinis effusiones etiam periculosissimas multorum cum præsenti salute."

It is with the powder of lycoperdon that M. de la Fosse, farrier to the king's stables, also made, last year, some successful experiments on horses, the thighs of which he amputated, and in which he arrested the hemorrhage without a ligature. He communicated an account of these operations to the Royal Academy of Sciences, which approved of them.

I will only say on this subject, that, independently of the astringent powder furnished by the lycoperdon, we read in Clusius that it is the custom in Germany to keep some of these fungi dried, emptied of their powder, and hung up, in order to be used in cases of hemorrhage; which would lead us to think that we might prepare, from the fungous substance of the lycoperdon, an astringent amadou as from agaric.

I anticipate that an objection, which would appear to diminish its utility, will be raised against the plan of treating aneurisms by means of these applications, namely, that the flow of blood from a wounded artery may be stopped by compression alone without ligaturing the vessel. This I am aware of, and have done so successfully, having twice been sent for immediately after the artery had been punctured in bloodletting, and I am informed that latterly M. Faget, the elder, cured an aneurism by these means.

But the astringent agaric is not less important in these cases, for a reason that must naturally escape the attention of those who do not belong to the profession, namely, the difficulty of applying compression in such a way that one might be certain of arresting the flow of blood, without running the risk of intercepting the circulation. There is not an experienced surgeon who would not confess that there is less skill required for the ligature

of an artery in the extremities, than for the employment of methodical compression, so as to offer a complete barrier to the escape of the blood through a wound in the artery, still, however, allowing a sufficient circulation for the maintenance of the vitality of the part to go on. I am, therefore, induced to prize a remedy capable of arresting the blood, and which it is only necessary to support by a moderate compression, which any one can apply without possessing a superior degree of knowledge. 1753.

I will add (and this is my final conclusion,) that this application is an additional means of arresting the blood, and one cannot increase their number to too great an extent.

A judicious surgeon will have occasion, though his life may be a short one, to employ all the different plans for arresting hemorrhages according to the different situations of the arteries; the choice of the means depends upon the knowledge that results from a correct theory.

If an artery be wounded in an œdematous part, compression cannot be applied, nor can astringents be employed, as they cannot be supported by a compressive bandage; the actual cautery or the ligature must, therefore, be had recourse to.

If the wounded artery be parallel to a bone that has a broad surface, the compression will be more sure, as there is a point of support; it is thus that external hemorrhages from wounds of the head are arrested.

If the artery under the tongue be wounded, instruments will be useless, as the movements of the tongue will cause the point of support to shift its position; the ligature is therefore preferable.

It is the same with wounds of superficial arteries; the movements of respiration, of the spine, and of the arms do not allow us to calculate upon a point of support; hence the ligature has even been applied to the intercostal arteries, and this is an improvement of modern surgery. The late M. Gerard did it with a common needle, and M. Goulard of Montpellier, an associate of this Academy, has invented a needle expressly for this operation.

After the extirpation of a fungous excrescence of the nose of a large size and extraordinary shape, I stopped the bleeding by the application of a red-hot iron to the wound.

For the arrest of hemorrhage occurring from a number of ves-

1753. sels that have been opened at the same time, in such a part as the gullet or the cavity of the nostrils when a polypus is removed, astringents only can be used, and iced water generally suffices for this purpose.

In wounds of the glans penis or frænum, in which it is difficult to apply a bandage, the bleeding may usually be arrested by compressing the part for a few minutes between the fingers.

In the deep incision that is made during the operation for fistula in anô, a button of vitriol introduced as high as the bleeding point will to a certainty succeed.

In the operation for stone, when the blood seems to come from the bottom of the wound, it will be necessary to make use of a canula surrounded by a roll of linen, which has been soaked in a solution of vitriol.

In general, in wounds of the extremities, either compression or ligature may be had recourse to, and in those in which a ligature would be attended by inconvenient consequences, as in the particular instances that I have mentioned, the application of amadou possesses great advantages.

It only remains for me to explain how the astringent agaric acts, and on this point I will hazard a conjecture that I do not think is unreasonable; but in order to make myself understood, I must mention a few general facts concerning the stoppage of the blood.

The opinions of M. Petit on the formation of a clot, have been published in the Memoirs of the Royal Academy of Sciences. As it appeared to me that M. Petit attributed too much to this cause, in explaining the cessation of hemorrhagy, and as he did not take into consideration the changes that occur in the divided artery, I presented a memoir to the Society, from which it appears that the operation of these two causes concur in effecting the arrest of the bleeding. Every means employed by art with this view only assists nature.

The formation of a clot is the effect of the stoppage of the blood in a vessel, the walls of which being more or less nearly approximated to its axis, retard or interrupt the course of the fluid; and the application of a styptic accelerates it in proportion to its strength. The astringent agaric has some of the characters of a styptic: it is porous, insipid, somewhat elastic, and does not furnish any juice.

Nevertheless, of the three amputations in which it has been employed, one having proved fatal, from circumstances with which hemorrhage and the remedies employed had nothing to do, and the state of the stump having been examined in the dead body, some inferred, from the fact of a clot of six or seven inches in length being found in the artery, that this might have been the effect of too powerful a coagulation which influenced the whole mass of liquids. 1753.

But a little reflection will remove the inferences to the disadvantage of this application that might be deduced from this fact; the same thing has been observed in horses, to which the powder of licoperdon had been applied, which has no more of the characters of a styptic than the astringent agaric. As M. Petit explained the entire cessation of the hemorrhage by the formation of a clot, the only point to be argued would be the greater or less length of the clot formed after the application of this remedy. We should be forgetful of the principles of science, if we did not agree that this difference is explicable by the laws of Physiology; it depends on the different proportions between the serous and fibrinous parts of the blood, relatively to the character of the blood itself, or to the effects of the disease.

Everything then would lead us to believe that the astringent agaric has no such action on the blood as to cause it to alter its consistence. I think that it offers to the opened end of the vessel a very fine and elastic spongy tissue, that the serous portion of the clot is attracted by it, that by these means that portion of the clot, which occupies the axis of the vessel, becomes more quickly united to the sides of the wound, and that the fibres which have a natural tendency to contract, do so the more effectively as they suffer less opposition on the part of the fluid.

It is in accordance with this theory that some experienced surgeons give the preference to certain substances, such as dry charpie, hare's down, or tree-moss, for the suppression of hemorrhage; and do not make use of those powders, such as resin, Armenian bole, and dragon's blood, which merely form a kind of hard varnish in the neighbourhood of the opening in the vessel, and which, as they do not imbibe humidity, cannot become adherent. If these principles be once established, it must naturally be supposed that a small piece of fine sponge will produce the same effect; but whatever may be substituted

1753. for the astringent agaric, it, at all events, has given proof of its efficacy, and it may always be said with truth that it has given rise to a valuable idea, or, at all events, that it has revived it; for it is not impossible that it may have been indicated in several works and have subsequently been neglected.

Since this memoir was read to the Academy, M. Magron, surgeon at Toul, has stated that, for a long time past, he has been in the habit of using the agaric of the oak for the purpose of stopping hemorrhages on various occasions.

MM. Rochard and De May, surgeons, the first at Meaux, the second at Angoulême, have written to say that since the remedy has been made public they have several times successfully employed it in amputations of the leg.

The employment of so useful a remedy cannot be too much facilitated, and those who have extended our experience on the subject deserve our praises.

M. Poyet, house-surgeon to the Hôtel-Dieu of Paris, has communicated to me the experiment that he made upon the crural artery of a dog, with what is called the yellow or white amadou; that is to say, the kind that is brought from the provinces in which it is prepared before it has been blackened with gunpowder.

By the recommendation of this intelligent and zealous surgeon, I have caused it to be applied to the arteries that were divided in the amputation of a leg at the Invalides, where the experiment succeeded perfectly well.

At the end of the year 1751 experiments were made on dogs with agaric of the oak, that had already been used once, but which had subsequently been washed and dried; with the agaric of the beech and birch; with the powder of the licoperdon supported by pieces of the spongy part of the same fungus; with these pieces alone; with common amadou; and with small pieces of very fine sponge. The result of these experiments has been that the agaric of the oak that had already been used did not succeed so well as the new; that the other agarics, the powder of licoperdon, the spongy part of the licoperdon, and common amadou, had about the same success; that when these different preparations were not supported by compression they failed, and that common sponge appeared at first to produce the

same effect, but that it did not continue to do so. The details 1753.
of these experiments are to be found in a periodical publication printed at Paris, under the name of 'Journal Œconomique,' for the months of April and June, 1752, but the author is not mentioned.

MORGAGNI.[1]

Before I conclude writing about aneurisms, which Valsalva 1761.
found by dissection to be much more common in the aorta than he had imagined, I do not think that I ought altogether to pass over in silence that, being distressed by the great frequency of so fatal a disease, he began to consider how, by checking it in the beginning, its increase and progress might be arrested. This plan of treatment has been mentioned by Hippolyto Francesco Albertini,[2] the companion of his studies; and if you read his account you will agree with me, that no person ever executed so carefully what Hippocrates directed concerning internal varices of the veins, of which I have spoken above, when he says, "but it is of use to such persons, if you undertake to cure them in the beginning, that blood be taken from the veins in the hand and that the diet be as dry as possible, and little apt to generate blood." But the utility was equal to the severity of the plan. For as to what Hippocrates adds, "for if they are cured in the beginning of the disease, the veins in the side again subside into their places and become low;" the same thing happens in the arteries if the same treatment be had recourse to in time. Nor did Valsalva ascertain this merely from the absence of pulsation and of those other signs that accompany an aneurism in its early stages, but he determined it by actual observation. For a nobleman, whom he had cured in this way, having afterwards died of another disease, he found the artery, in which the aneurism had begun, contracted again to its natural size, but, as it were, callous in the places that had been affected. It is true that Valsalva omitted to write down this like many other cases

[1] Joh. Baptista Morgagni de Sedibus et Causis Morborum; fol. Venetiis, 1761, liber 2, epist. 17, art. 30.

[2] Vide p. 237.

1761. during the latter years of his life; but he communicated it to several persons, and, in particular, to that excellent physician John Antonio Stancario, a man most deserving of credit, from whom, when I came from Bologna in 1728, I myself heard what I have related, and what I shall subjoin.

When Valsalva had taken away as much blood as was necessary, and had done what Albertini has since described, he ordered the quantity of meat and drink to be diminished more and more every day, until only half a pound of pudding was taken in the morning, and in the evening half that quantity, and nothing else except water, the weight of which was also regulated, and which he medicated with what is called quince-jelly, or the lapis osteocolla ground down into a very fine powder. After the patient had been sufficiently reduced by this method so that he could scarcely raise his hand from the bed, to which, by Valsalva's direction, he was confined, the quantity of aliment was day by day increased, until the strength that was necessary to enable him to get up had returned. And Stancario also added, that he has successfully treated a young nun in this way, and that on the first days that she rose from her bed the pulsation returned, but that this need not alarm one, for it soon disappeared entirely; and will not return if the patient will consent to live with moderation. For a young doctor, who would not conform to this, was so far cured by Valsalva in this way that the pulsation was removed; but in vain, for it soon returned again, and with it the disease which carried off the patient. You may, if you please, add these things to what Albertini has said on the same subject, and, at the same time, observe how different from Valsalva's plan, who only allowed water to be given under proper restrictions, is the advice of those who recommend patients affected with this disease to drink warm water from the baths; and, on the other hand, how nearly that method of cure approaches to Valsalva's, which was successfully employed by Bernardino Genga,[1] and which John Maria Lancisi found to be of service in arresting internal aneurisms in their earlier stages. So that if Hippocrates, as has been hinted at above, had not, in some measure, pointed out the way, this plan might seem to have been transferred by Valsalva from external to internal aneurisms.

[1] Anat. Chirurg. lib. 2, c. 24.

But I am not ignorant that there will be many to whom the method of cure, as recommended by Valsalva, will be more intolerable than the disease itself; especially at that time at which alone it can be of service; for as the inconvenience is then but slight, and as the danger, which is not as yet imminent, is unknown to the patients, they continue to flatter themselves until the disease has attained such a height, that neither the severest and most constant uneasiness, nor death itself, which is constantly impending, can any longer be relieved or avoided by any remedies that may be employed. Those who would not submit to a restriction in their diet whilst it might be of use are sometimes compelled, like the woman whose case I have already mentioned, to suffer extreme hunger, which would be more likely to prove fatal than to be of service in so reduced and weakened a state of the body; and on account of this very debility, venesections, which had they been practised in an early stage might have been very useful, are now injurious. On the other hand, it is well known to physicians that this plan of treatment may be of use in the beginning in retarding the progress of an aneurism that is already formed, but which is not too far advanced. 1761.

I saw an old woman at Bologna, who had been taken into the hospital on account of a severe inflammation of the eyes. As I saw that her pulse was full, hard, and vibrating, and that the carotid arteries beat strongly, especially the left one, which was dilated, not far from the larynx, into an aneurism as large as a walnut, I inquired whether this was a recent or an old complaint; and received the following account. That the tumour first occurred about nine years ago, after she had very greatly fatigued herself by labouring incessantly for two days. Having shown this to two eminent physicians, they both pronounced it to be an aneurism, but each advised her a different mode of treatment: for one ordered her to lose blood every alternate month; whilst the other advised her not to be bled, but rather to adopt a spare diet and other remedies of that kind; giving as his reason, that he had known a patient whose aneurism had burst at the very moment that he was being bled. Which, whether it happened accidentally, the coats of the aneurism being already thinned and half torn through, and a laceration being actually at hand, or whether this rupture was perhaps

1761. somewhat accelerated by the increased impetus of the blood upon the already weakened parietes of the aneurism whilst it was flowing from the vein, whatever the cause may have been, it is an additional reason why, when there are signs of a rupture at hand, an active treatment is to be employed by the physician; for besides the case that occurred to Ballonius, I am acquainted with another instance that will be presently related; nevertheless, that very useful remedy, bloodletting, should not be omitted in the early stages of an aneurism that is increasing. And, indeed, it was very useful to the woman whose case I began relating, although she practised it too frequently. For having followed altogether the advice of the first physician, as she disliked the other plan recommended to her, although the first one would doubtless have approved of it, she committed many errors in her diet and mode of life, eating whatever fell in her way or her appetite suggested; she, however, lived with the disease in her neck for nine years, although palpitation of the heart occasionally came on. But it would have been dangerous to have imitated this woman, unless for any one who might generate blood as quickly as she did. For, besides the quantity of blood that she lost every second month, she brought up so much blood in a fit of coughing, the year before I saw her, that, although reduced to the greatest extremity, yet she did not become cachectic, but even, as I have said, laboured, after a time, under an inflammation of the eyes.

LAMBERT.[1]

1761. The case of the aneurism was indeed curious, and I am in hopes will prove useful; but I must not be too sanguine in its favour till I have seen the effects of such an operation confirmed in several instances; till then I would not be fond of saying anything of it in print, except you think that, as few of these injuries fall to any single man's share in the ordinary course of

[1] Extract of a Letter from Mr. Lambert, surgeon, at Newcastle-upon-Tyne, to Dr. Hunter; giving an account of a New Method of treating an Aneurism. Read June 15th, 1761.—Medical Observations and Inquiries; Lond. 1761.

business, it would by that means afford a larger field to put others upon the trial, so as to introduce the method sooner. If this be your opinion, I have no objection to your giving any short account of it you may think proper. The history of it was thus. 1761.

I had very carefully attended to the cure of three aneurisms, for which the operation was performed by my late worthy friend and colleague, Mr. Hallowell. In one of them, after the operation was performed in the common way, by a ligature above and below the aperture in the artery, such violent pain, swelling, and inflammation came on, as to threaten a gangrene.

Bleedings, fomentations, poultices, &c. mitigated these symptoms, and a plentiful suppuration ensued; the wound gradually healed, and the patient was discharged from the hospital with a weak arm, and a pulse much weaker in that wrist than in the other.

This case, in particular, made me turn my mind to the operation for the aneurism, and made me wish to see it done with some alteration in the method, so as to make less disturbance in the circulation of the part. I recollected all that I had seen or read of the effects of styptics, of pressure, and of ligatures, in the cure of hemorrhages. I considered the coats and motions of arteries, and compared their wounds with the wounds of veins and other parts. I reflected upon the process of nature in the cure of wounds in general, and considered in particular how the union of divided parts was brought about in the operation of the hare-lip, and in horses' necks that are bled by farriers. Upon the whole, I was in hopes that a suture of the wound in the artery might be successful; and if so, it would certainly be preferable to tying up the trunk of the vessel.

I communicated my thoughts to Mr. Hallowell, Mr. Keenlyside, and some other friends of the profession. A case of an aneurism from bleeding occurred, and fell to Mr. Hallowell's lot. I recommended the method I have hinted. He put it in execution June 15th, 1759. Everything was done in the usual method, till the artery was laid bare, and its wound discovered; and the tourniquet being now slackened, the gush of blood per saltum showed there was no deception. Next two ligatures, one above the orifice, and one below, were passed under the artery, that they might be ready to be tied at any time, in case

1761. the method proposed should fail. Then a small steel pin, rather more than a quarter of an inch long, was passed through the two lips of the wound in the artery, and secured by twisting a thread round it, as in the hare-lip. This was found to stop the bleeding; upon which the arm was bound up, the patient put to bed, and ordered to be kept quiet, &c. as usual in such cases. The wound was first dressed on the fourth day, viz. June 18th. It looked well for the time, and continued to heal, without interruption, in a kindly manner. The pin came away with the dressings June 29th; that is, on the fourteenth day; and on the 7th of July every part was healed, except what was kept open by the two ligatures, which remained loose in the flesh, like two setons. These were therefore removed. In a few days after this the wound was completely cicatrized, and July 19th the patient was discharged from the hospital perfectly well, and with a pulse in that arm nearly as strong as in the other. Indeed, the pulse was very little altered immediately after the operation; it was weakened in a small degree, as might be expected, from the diameter of the vessel being straitened; but it was so strong and equal, that we had not the least doubt of the blood's continuing to circulate freely through it.

If it should be found by experience that a large artery, when wounded, may be healed up by this kind of suture, without becoming impervious, it would be an important discovery in surgery. It would make the operation for the aneurism still more successful in the arm, when the main trunk is wounded; and by this method, perhaps, we might be able to cure the wounds of some arteries that would otherwise require amputation, or be altogether incurable.

BURCHALL.[1]

1765. Manchester; February 1st, 1765. Isaac Ashton of Rowland, in Derbyshire, a stout healthy man, twenty-five years of age,

[1] An Aneurism in the Thigh perfectly cured by the operation, and the Use of the Limb preserved; communicated by Mr. Burchall, surgeon, of Manchester. Read April 22d, 1765.—Medical Observations and Inquiries. Vol. iii, 1767; p. 106.

was admitted a patient under my care into the Manchester Infirmary on the 28th of February, 1757, for an aneurism of the femoral artery, occasioned, a little more than three months before, by the following accident: sitting with his wife, he unluckily took up a pair of sharp-pointed scissors, and attempting to cut a flaw, or what the good women here call the step-mother's blessing, from the root of the nail of one of his fingers, he dropped the scissors, and suddenly clapping his knees together to prevent the scissors falling to the ground, forced the point into his thigh, and wounded the artery. A small quantity of blood instantly spurted out from the punctured vessel; the bleeding was soon stopped, and the external wound healed up in a day or two; after which, a small tumour formed in the thigh, which growing gradually larger and somewhat painful, Mr. Barker, of Bakewell, a surgeon of eminence, was sent for, who, having tried various remedies to no purpose, and finding the tumour still growing considerably larger and more painful, directed him to take the advice and assistance of the surgeons at Manchester. From this account of his own case, and from examining the tumour, I immediately concluded it to be an aneurism, and on the 4th of March following I performed the operation. After having secured the crural artery above, by the tourniquet, I made an incision the whole length of the tumour, at least seven inches; and having cleared away the grumous clots of blood to the quantity of a pound or more, I ordered the tourniquet to be slackened, on which the blood immediately gushed out of the punctured vessel with great impetuosity, and plainly discovered from whence it came. I instantly directed the tourniquet to be made tight; then soaked up the remaining part of the blood from the denuded artery, with a sponge dipped in warm water, which laid in view the puncture, about as large in diameter as would admit of a crow's quill. 1765.

I then passed a needle threaded about half an inch above, and again below the orifice of the wounded artery. I filled the wound with lint, and covered it with large pledgets, spread with yellow basilicon, and a gentle easy bandage over all.

March 6th, a slight hemorrhage ensued, which obliged me to take off the dressings. I perceived that the upper ligature was too slack; I therefore passed the threaded needle as before a little higher than the first, and included a small bit of plaster,

1765. rolled up as a compress within the ligature, for fear of cutting the artery; and, by way of farther security, did the same below, and dressed all up as before. Not the least hemorrhage appeared afterwards, the wound digested very well, the injured part of the artery sloughed off with the ligature in a short time; the external wound was healed up in six weeks, and the patient discharged perfectly cured on the 17th of April following.[1] —JAMES BURCHALL, surgeon.

GUATTANI.[2]

ON POPLITEAL ANEURISM.

1772. The fortunate and auspicious result of the ligature of an aneurism at the bend of the arm, practised by me some time since, made me most desirous to undertake the same operation in the ham; the more so that, as this disease occurs with greater frequency in this region, presenting much greater difficulties and dangers, a far greater benefit would be conferred upon mankind if the wished-for result were obtained. Having, therefore, made many different experiments upon dead bodies, and having beforehand examined the anastomoses of the collateral arteries, which have been very fully described by the celebrated Winslow, and which I found to be in a manner the same in the knee as in the arm, where I think they have been set up by nature as

[1] For the satisfaction of the public, it is thought proper to subjoin an abstract from the minutes of the Medical Society. "January 13th, 1766; Dr. Hunter favoured the Society with the sight of Isaac Ashton, of Derbyshire, now in London, who had an aneurism in his thigh, and recovered the use of his limb after the operation. From the appearance and the situation of the cicatrix, and of the varicose superficial veins in that limb, as well as from the account the patient himself gave of the symptoms, particularly of the coldness of the limb, for some time after the operation, the Society had no doubt that the great artery itself had been tied, and that the vein which attends it had probably been included in the ligature, notwithstanding all which, they had the pleasure of seeing that he walked well, and that the limb was nearly as strong and serviceable as the other, which confirmed them in their opinion, that the publication of this case would be useful."

[2] De Externis Aneurysmatibus manu chirurgicâ methodice pertractandis, &c. &c. Opus Caroli Guattani. Romæ, 1772.—And in Lauth's Collection, pp. 100-98.

a bulwark and defence against this very disease, I undertook the operation for popliteal aneurism, in a man of a moderately sanguine temperament, who was verging on his forty-fifth year. 1772.

Case I. The aneurismal tumour extended from the middle of the thigh to the middle of the calf of the leg, and rising upwards, expanded laterally to a considerable extent; no movement was communicated to it by the pulsations of the artery, and although the integuments were not much discoloured, yet thy could not, in the least, be separated or drawn away from the subjacent muscles, but made a common mass with them. After having sufficiently examined these circumstances, I readily came to the conclusion that this was a spurious aneurism, on which a very violent fever, and severe pains, especially aggravated during the night, had at length supervened.

On the appointed day, after the proper precautions had been taken, I made a deep longitudinal incision into the tumour, and, having removed all the coagulated blood, discovered such a laceration of the artery, that I could not ligature the upper and healthy portion of it, until I had opened a way for myself, by means of the finger and the scalpel, through the thigh itself. On proceeding to ligature the lower part of the artery, I found, to my surprise, that it adhered, in the form of an aponeurotic expansion, to the thigh-bone, in the same way as we sometimes see the aorta connected to the vertebræ, which prevented my applying this second ligature with sufficient accuracy. Nevertheless, the tourniquet being unscrewed, no blood flowed from the upper ligature, and but little from the lower one, although the arteries of the muscles, which were necessarily divided in so long a dissection, gave me much trouble, by pouring out a considerable quantity of blood; this I arrested by pressure alone, not only because this would prevent the necessity of ligaturing each individual artery, but also because it could be more readily accomplished; and indeed, it did not appear that the patient's strength would have been sufficient to have carried him through so long and serious an operation as would otherwise have been necessary. The large cavity of the tumour having then been filled with dry charpie, and proper pads being applied to the lower ligature, I rolled a circular bandage round the affected part, and then, having finished the operation, a

1772. tourniquet was left loose and slack, but in a position, so that it might immediately be tightened, if there was any necessity for it. On the following day, although the tourniquet had scarcely been tightened, the limb was seized with an incurable gangrene, which carried off the patient about the middle of the day after that.

Observations. On attentively considering the causes of so unfortunate a termination, many unfavorable circumstances present themselves to me, and it appears reasonable to suppose, that if these could have been removed, the ligature of the popliteal aneurism would have been attended with all that success that we could have wished for. Hence there was little cause why I should be discouraged about the very speedy death of the patient; nay, rather, this very circumstance gave me the greater desire, and made me much more eager to perform the operation again. I knew that the result of the application of the ligature would be successful, provided the tumour could be separated from the surrounding parts, and insulated, so that the sound and healthy artery might be laid bare both above and below, just as had happened to me in cases of this kind at the bend of the arm. In order to do this, the aneurismal tumour should neither be of too long standing nor too large; no difference, however, need be made between the true and the false varieties of the disease, since even the false may possess the same properties as the true, in consequence of the cellular membrane fulfilling, as sometimes happens in cases of this kind, the duties of a proper sac.

The adhesion, therefore, of the aneurismal tumour to the integuments, on account of which it (the tumour) could not be separated from those tissues without opening the sac to its extreme points, was the first inconvenience that occurred to me in this case. The second was occasioned by the very great length of the rupture in the artery, which, as it required the deeper parts to be more freely laid open, compelled the surgeon to divide several of the muscular branches, the bleeding from which either disturbed the progress of the operation, or, at all events, rendered it much more tedious. I shall, therefore, pass by in silence the difficulty that the patient would have experienced in supporting, during a length of time, the very copious flow of pus from so large a wound; and also the fact that se-

veral of the collateral anastomoses were cut off, on account of the necessity that there was, in this case, of putting the ligature high up on the artery. The third difficulty that occurred to me was the mutual cohesion of the artery and of the thigh-bone, which not only altogether prevented the separation of the entire sac from the other parts, but even would have occasioned the denudation of the bone, and might have given rise to caries of it; whence the surgical treatment of the case would have been rendered much more tedious and difficult, and less certainly successful. The fourth inconvenience arises, in cases of this kind, from the depth at which the artery that is to be tied is buried; this happens partly from the size of the tumour, and partly from the flexed condition of the knee, and from the rigidity occasioned by the pain that is suffered. Hence the passage of even a very curved needle, and the ligature of the artery, is rendered exceedingly difficult and inconvenient, the more so if it be determined to separate the vein and nerve, and to exclude them from the noose; in which way I should advise all surgeons to perform the operation. 1772.

In recommending the ligature of the artery alone, without the vein and nerve, I do not think that I depart in any way from what is reasonable and right; although I know full well that many high authorities, amongst whom I may mention the celebrated Mollinelli, are of opinion that the separation of the vein and nerve from the artery, in the operation for aneurism, is of but little, if of any, moment. But indeed, I am in nowise induced to alter my opinion, even by Mollinelli's very excellent observations on aneurisms of the arm; which, unless I am deceived, would rather induce one to embrace than to reject my advice. For, if we consider attentively the symptoms that followed the two operations related by him, we shall find them to have been much more serious and dangerous, not only than those which supervened on an operation performed by me at the bend of the arm, but than those even which occurred in a case of popliteal aneurism, which I shall relate by and by. If attention, also, be paid to the time that elapsed before the patients were restored to health, it will be found that a very great difference exists between Mollinelli's observations and mine. In Mollinelli's patients, three whole months elapsed before a cure was accomplished; but of mine, the one who laboured

1772. under aneurism at the bend of the arm was restored to health after scarcely more than thirty-three days had elapsed; and, what is more remarkable, the one affected with popliteal aneurism had perfectly recovered his former state of good health by the fiftieth day. Can it now be supposed, that if the pernicious effects of such an operation are not to be sought for in the ligature of the nerve and vein, that they can arise from that of the artery alone? There is certainly little occasion to show the absurdity of this; for nature has sent off from both sides of the trunk of the artery, many branches united by anastomoses, so that, although the ligature of the main vessel may oppose it, yet a sufficiently free communication is nevertheless afforded to the fluids by means of these collateral branches. Hence, we must look to the state of the nerve as the cause of the severe pain and entire loss of sense and motion; and it appears reasonable to suppose that the arrested circulation of venous blood could not have much influence in preventing too great a swelling of the limb and in keeping off gangrene.

Neither do I forget that there are several professors of surgery who teach that the upper portion of the artery only is to be ligatured, and who are in nowise solicitous about the lower, thinking, probably, that compression is sufficient to arrest the flow of blood from this. But they are most egregiously deceived, in much the same way that I myself was in the case just related. For the blood that I mentioned as flowing from the lower ligature was, without the possibility of a doubt, the same that had been carried by the collateral ramifications to that end of the artery that had been insecurely tied. Though it cannot be denied that these branches are, in a natural condition, but very small and by no means individually fit to carry a large quantity of blood. As, however, they are exceedingly numerous, they can, counterbalancing their small size by their numbers, furnish a quantity of blood that is by no means despicable, as any one can ascertain by a very easy experiment; for if a ligature having been applied, the trunk of the artery be punctured below it, as I have often done in the arm, and warm water be then injected by means of syringe, into the upper portion of the vessel, it will immediately be seen to gush forth from the puncture that has been made in it. In the cases in question, the trunk of the

artery having, for a considerable time, been lessened in size by the aneurism, and the free course of the blood through it having been checked, that fluid passes almost wholly through the collateral branches, which gradually become dilated, and acquire an increase in size. In this way they may, by their number and increased size, convey such a quantity of blood to the lower part of the artery, that the ligature becomes unable to resist its impulse. For, although compression and ligature may arrest the hemorrhage, yet, when this is to be accomplished by the aid of bandages, the whole circumference of the limb would be so influenced by them, that there would be no vessel left capable of performing the necessary functions, the collateral arteries, and all the veins, being so squeezed together as to interrupt the course of the blood. Unless I am deceived, the rapid gangrene that carried off our patient arose partly in this way, and partly from the ligature having been applied too high upon the artery, by which means many of the collateral anastomosing branches were cut off. It certainly, therefore, appears necessary, that in order to prevent the occurrence of gangrene, the ligature should be applied to a lower part of the vessel. 1772.

II. Neglecting, therefore, no means of observation, wherever they might occur to me, and reconsidering carefully all those circumstances that I have just mentioned, I resolved to make a new trial with regard to the popliteal aneurism; only undertaking, however, the cure of a case in which the qualities and conditions that have just been enumerated might be found; accordingly, on the 29th of April, in the year 1756, it happened that a grave-digger, a Roman, of the name of Andreas Boturri, was admitted under my care into the Hospital of the Holy Ghost. He was in the twenty-fifth year of his age, of a moderately sanguine temperament, of a slender habit of body, and was marked by several syphilitic scars. In considering the operation in reference to this case, I was the more willing to undertake it, as the patient seemed eagerly to seek it. The fortunate termination of the operation, in this case, as well as the desire with which I was inflamed that it might be generally adopted, and be firmly established in surgery for the good of the public and for the advance of the art, have induced me to publish the whole history of it, the more so as I do not know that any one had at that time performed it, if we except Johannes Trullius,

1772. whose case will be found given in full further on, and Saviard. But as the aneurism in Saviard's case was situated above the middle of the thigh, and owed its origin to a wound; and as the surgeon himself was in doubt whether it occupied the main trunk or one of the principal branches of the crural artery, it may be looked upon as differing very widely from my case of popliteal aneurism. And indeed it would appear more probable that one of the branches, rather than the trunk of the crural artery, was in this case affected with aneurism, both because the principal arteries branch off at this spot, and because a ligature placed so high upon the crural artery would either impede the cure, or at least give rise to inconveniences of a kind that Saviard does not mention in his history of the case.

The patient informed me that his disease began with slight pains in the ham, which he had observed to become more acute, especially when in the course of his occupation he was obliged to lift heavy weights, as tombstones or coffins; and in a short time he became cognizant of the existence, in his ham, of a small tumour, which little by little increased until its size equalled eight fingers' breadth. The pulsation in it was but slightly perceptible; it was hard, resisting to the touch, but of an oval figure, and had not as yet contracted any adhesion to the integuments which were moveable, or to the thigh-bone; the patient suffered from agonizing pains, which were accompanied by high fever and considerable tumefaction of the whole limb. I, therefore, thought of making a serviceable beginning by allaying the pains, lessening the fever, and diminishing, as far as was in my power, the size of the whole limb and aneurismal tumour. With this object I first opened a vein, and having abstracted a tolerable quantity of blood, I applied a moderate sized pad in a longitudinal direction to the crural vessels, as high up as the groin, and confined it with a tolerably tight bandage. By these means, and especially by repeated venesection, by a strict regimen and by clysters, I succeeded in lessening the irritation about the tumour, so that I determined to proceed to the operation on the 10th of May, which I performed in the following manner:

The patient's bed having been moved into the centre of the ward for surgical diseases, and placed for me as usual in such a way that the surgical pupils could see well and thus derive

the greatest advantage, the patient was placed on it in the prone position, and the leg and thigh being fixed by the help of proper assistants, I carefully applied Petit's tourniquet to the upper part of the limb so as to arrest the flow of blood in the crural artery. The knee-joint then having been flexed to a greater extent than it was in consequence of the disease, I made with a curved scalpel an incision in a longitudinal direction, about ten fingers' breadth in length through the integuments, dividing the fatty tissues as well; so as to insulate as much as possible the aneurismal sac, which resembled exactly a goose's egg in shape and size; on seeing the great sciatic nerve pass over the middle of it, I took every precaution to leave it, as well as the crural vein, untouched and uninjured. Afterwards, being guided by the tumour itself, I laid, by the assistance of the curved scalpel and my fingers, the sac open to either end, where I found the artery perfectly healthy; then passing under it a curved needle designed for this operation, and armed with four waxed threads, I applied the first and highest ligature to the artery close to the tumour. I then availed myself of the same plan and the same rules in applying the lower ligature; but in order to do this it was necessary for me to draw aside the origins of the gastrocnemius muscles, and to divide many of the fibres of the soleus, it being always my intention to tie the artery alone, avoiding other parts, which I was, indeed, under divine Providence enabled to effect. 1772.

The aneurismal sac being then divided lengthways, and its cavity emptied of the grumous blood which it contained in large quantity, and of several polypous layers which were very firmly adherent to it, I ordered the tourniquet to be slightly loosened, but, as not the smallest drop of blood escaped from either ligature, I desired it to be moderately tightened again, so that the force of the arterial blood, acting not only against the upper ligature, but also against the collateral arteries, might be restrained, for some of these (collateral arteries) being unable to transmit immediately so large a quantity of blood acquire an increased temperature, and become intensely painful. Having then filled the large cavity of the sac with the finest and softest lint, and having arranged the limb on proper cushions, and strengthened it by the application of cloths dipped in tonic liquids, I bound it moderately tight with a circular roller carried up to the tourniquet, which enabled me to compress a very long pad that I had laid

1772. in the course of the crural vessels, by which means I could more effectually and safely restrain and retard the flow of the blood in them. I was also careful not to tighten the turns of the roller too much, especially about the knee, in order to avoid compressing the collateral arteries and the veins, although the inequalities and tuberosities of the bones protect to a certain extent these ramifications. The patient being then laid in the supine position, and the affected thigh so placed that the ham might rest upon a pillow, I ordered his bed to be carried back into its former place.

There is no reason why any difference should be made in the diet of patients of this kind, and in those who have suffered any of the other great operations; one and the same has been adopted, and always will be adopted by me—my rule being to give every third hour a cup of broth, sometimes simple; at other times made of veal or fowl with, at the most, some thin crusts of the whitest bread soaked in it.

On finding, in the evening, that the patient was feverish, I ordered a quantity of blood to be abstracted, by which the fever having been wonderfully lessened, he passed by no means an unquiet night, particularly as there was not much pain in the affected part. On the following morning, however, I found that the tumefaction of the whole limb was greatly increased, and that the toes were somewhat cold. In order to obviate these inconveniences, I slackened the tourniquet a little, and placed cloths, soaked in decoction of vulnerary strengthened with spirits of wine, upon the limb. For, according to my opinion, the necessity for removing the bandages, whether these be too tight or too loose, cannot be dispensed with in a more useful way than by the application of the tourniquet, which can, in a very easy manner, be loosened or tightened as occasion may require.

On the forenoon of the fourth day, as I perceived that the whole of the dressings that had been applied were everywhere loose, I, at length, ordered them to be removed, which being done, I was filled with inexpressible pleasure, on examining attentively the whole of this very large wound, to see that it was suppurating in a healthy manner; in order to encourage which, and to make it useful to me, I introduced, on the softest charpie, a digestive made of Venice turpentine, the yelks of eggs, and oil of hypericum, and having soaked cloths in decoction of vul-

nerary, I applied them, by means of a containing bandage, to the affected part. 1772.

Pursuing this plan of treatment, we reached, without accident, the eleventh day, on which the lower ligature separated spontaneously; and, continuing it, on the twelfth day the upper ligature came away with the putrefied sac, leaving the ulcer perfectly clean. This, however, was ten fingers' breath in length, and nearly of the whole width of the sac that had been removed, and, on account of the increased swelling of its lips, it had a greater depth than the aneurismal sac. In a word, this ulcer was of such a kind, that at its sight all were filled with horror.

By an abundant, continuous, and mild suppuration, which, in my opinion, is indeed the true specific that quickly and safely dispels diseases, we arrived, step by step, at the seventeenth day, on which, as no more blood escaped, I removed the tourniquet altogether; and, in order that the patient's strength might fully suffice for so very abundant a suppuration (which must constantly be looked to in chronic diseases, and in those in which a large quantity of pus is poured out), I allowed him a little more nourishment, but, nevertheless, administered to him every day a glass of the decoction of vulnerary.

Whilst the ulcer was favorably progressing in this manner, the patient was, on the twenty-second night, suddenly seized with a very great difficulty in breathing, which continued for some moments, and was accompanied by such a degree of anhelation and anxiety, that he could not speak, nor indeed utter a single word, and, at daybreak, a certain alteration was moreover observed, not only in the pulse, but also in the appearance of the ulcer. These symptoms, the patient himself confessed, arose from his having eaten too much bread and other things that happened to come in his way.

On persevering constantly in the plan that I had adopted, I perceived that the edges of the ulcer, and the whole limb, were free from tumefaction, and that the pus which flowed from the sides had the healthiest appearance, yet, that a thin and limpid fluid exuded, in a copious manner, from the bottom of the ulcer, which I knew would interfere with the healing of it. Wherefore, as I determined that this should, on account of the patient's strength, be stopped, and considering all balsamic and drying medicines as useless, being mindful of the forty-first ob-

1772. servation in the 'Centurion' of Ruysch, I made up my mind to employ compression, which I practised by means of dry and very soft charpie, retained by lateral pads and a containing bandage; and, in order to obtain a favorable result I directed that it should by no means be removed until after the expiration of two, three, or four days, according to the greater or less quantity of fluid that flowed from the wound.

By these precautions I was not only pleased to see that the discharge nearly ceased, but also to find that the whole of the bottom of the ulcer had filled up, and that the wound, having assumed a regular oval figure, was so narrowed, that, on the 25th of June, the cicatrix being entirely closed, the patient desired to leave the hospital, from which he walked home, without the aid of a stick or of any support, but on his own feet, though limping somewhat. From that time he has always been able to perform the duties of his office without difficulty, and possesses still his ordinary powers to a high degree, no inconvenience being left except a slight halt.

Observations. From the fortunate and favorable termination of this operation, I think that I may conclude (being led on to hope by its example), that those means of cure will likewise be discovered which are applicable for those cases in which I perceive, sufficiently well, that the result of this operation will even as yet be exceedingly doubtful. In the meanwhile, I may propose the following question for solution:—whether, in those popliteal aneurisms that do not possess the required qualities, it would be more useful to have recourse to amputation of the thigh, than to leave the patient solely to the powers of nature; as examples are not wanting of cases of aneurism which were gradually and spontaneously cured without any surgical assistance, the patients being restored to their former state of health. I myself can report three cases of this description.

III. The first occurred in a man, on whom my very celebrated predecessor, Pietro Ciasconi, was about to perform amputation, but the patient refusing to submit to it, left the hospital. After a lapse of twenty years he fell under my observation, being then an old man, and, as I understood, perfectly cured of the aneurism. On wishing to see, and on carefully examining the part, I found no scar in the ham, which indicated that either a rupture or suppuration had taken place in it.

IV. The second case occurred in a coachman. This man 1772.
was affected with an aneurism in the ham, but the surgeon thinking it merely to be an abscess, opened it with a bistoury. On discovering his mistake, he endeavoured to stop the flow of blood with a compressing bandage tightly applied; nevertheless, in a few days he found that suppuration had commenced, which he assisted to the best of his judgment, and thus brought the case to a termination; so that the patient, being restored to his former good state of health, returned to his old employment, which he continued for full five years from that time, at the expiration of which period he died from an attack of fever. A most studious and skilful surgical pupil of the hospital, remembering all that had formerly occurred, dissected the ham, and found the artery, [just as is shown in fig. 2, plate 1,][1] which I had drawn from nature. Here, indeed, a most convenient opportunity presented itself for observing the increase in the size of the collateral arteries, in the same way that the very accurate Mollinelli correctly represents in his most beautiful plate; for this very reason I keep constantly under my observation a certain soldier, whose case of popliteal aneurism I am about to relate.

V. The third case is that of a soldier, who was brought, in the month of February, 1746, that is, before I departed from Rome for Paris, from the citadel of St. Angelo to the Hospital of the Holy Ghost, in order that I might ligature a formidable aneurism of the ham, by which (the pain being excruciating) he had almost been driven to despair. But as I found it of equal, if not of larger size than the one first described by me, from which I had received much instruction, I proposed amputation of the thigh. This, however, he refused to submit to, and left the hospital for his own home, and I departed for France. On returning to Rome two years afterwards, and inquiring about him, I was informed that he was still alive, and that, as he limped, he was obliged to walk with a crutch, but that, nevertheless, he travelled about through different villages, selling fancy goods. Having at length, after some time, found him out, I discovered a sufficiently large tumour filling up the

[1] [The artery is obliterated, being converted, in the situation of the aneurism, into a membranous expansion.]

1772. whole of the ham, and projecting somewhat beyond it, but no longer painful, and of its natural colour, though hard, and resisting to the touch. In the meantime the patient had perfectly recovered his former strength. Being henceforward engaged for several years in the same business, he travelled through nearly the whole of the ecclesiastical states, and returning to Rome, at length came to me, both to relate all that had happened to him, and to ask my advice. He told me that, whilst in a certain city of the Papal States, the tumour gave way, and that a mixture of pus and blood being discharged, a cicatrix formed after several weeks; but that not the least of its former hardness was left in it, and that after he had returned to his accustomed duties the tumour opened again in two places, from which blood only flowed. He also said that these openings were sometimes closed and sometimes continued open; until, all the swelling having been removed, the affected part became firmly cicatrized; some rigidity of the joint only being left, by which he was, indeed, rendered lame, but to so slight an extent only, that he walked without a stick. A few years after this a purulent opening formed, and a fistulous aperture, connected with caries of the bone, made its appearance; and he continues to the present day in this state.

With regard to amputations, I have had four cases in which I have not hesitated to practise it, on account of large popliteal aneurisms; but they have all had an unfavorable termination, although the temperament, the age, and the strength of the patient all promised me a successful result. Of these four patients, two died (although the ulcer was perfectly healthy) on account of the occurrence of unexpected and fatal convulsions; in the one on the seventeenth, and in the other on the twenty-seventh day. These convulsions, as is always the case, commenced in the lower jaw, and then extending to the neck, to the back, to the chest, and, at last, to the whole of the trunk, destroyed the patient, by arresting respiration.

An equally fatal and most common symptom, namely, hemorrhage, carried off the remaining two. This occurred in both on the night succeeding the operation. Much fever, as is customary, was lighted up after the limb was removed; but after a time this ceased; having, however, again come on during the following night, it so wore down the patients' strength, that

on the close of the fourth day they both expired. I must not, 1772.
however, forget to mention here that I employed every care
and precaution in the treatment of these patients; for when,
in the first case, I found that the hemorrhage had been arrested
on the morning following the operation, being very much afraid
lest I should remove those clots of blood that arise from the
cut vessels, and which, it is well known, close them up, I thought
it better to abstain from loosening the dressings that had been
applied; but on the return of the fatal hemorrhage in the other
patient, I immediately removed, without any hesitation, these
dressings. I was, however, greatly amazed at seeing the liga-
tures of each vessel firm and immoveable, and not the least
drop of blood flowing from them. This being the case, nothing
was left me to do but to replace the dressings which had just
been removed. Who, after the precaution that had just been
taken, would not have considered it sufficiently evident that
this patient would have been safe from the return of a fatal
hemorrhage? This I also looked upon as certain; but, never-
theless, I was greatly deceived in my opinion; for on the third
day, an enormous flow of blood having occurred during the pre-
ceding night, his strength failed entirely, and he shortly died.

Observations. As these four amputations terminated unfa-
vorably, it might appear advantageous to annex some serious
remarks, which, indeed, I would readily do, were I not obliged
to confine my observations to the limits of a very short disser-
tation. I will, therefore, only at present consider the cause of
this fatal occurrence, which may be referred to three principal
heads. In the first place, to those internal causes that give
rise to aneurism, amongst which it appears to me that syphilis
does not occupy the lowest rank, as I have always found very
evident signs of it in patients of this kind. Secondly, to the
time when the amputation of the thigh was practised, which
was after the patients had suffered for months, and even years,
from sleeplessness, from distress of mind, and from the most
excruciating pains, which had continued with scarcely any in-
termission. Thirdly and lastly, to the almost entire want of
fibrinous matter in the circulating fluids, which was occasioned
both from its having been nearly wholly removed and carried
out of the body by the numerous venesections that were neces-
sary, as also from whatever was left having been consumed in

1772. forming and increasing the polypous concretions of the hard aneurismal tumour.

From all this it is most easy to understand that the nervous system should of itself, independently of what may have been occasioned by the ulcerated surface of the amputated thigh, have become more irritable, and have been rendered at the same time far more sensitive, as well as disposed to the occurrence of convulsions, from which the first two patients died. Nor does it appear more difficult to understand the causes to which so ready and unexpected a recurrence of the fatal hemorrhages is to be referred; for this, if I mistake not, depends upon that quality of the blood which is always met with in patients of this kind, before they are submitted to surgical operation. For this fluid is so broken down, so thin, and so watery, that being agitated by the violent impulse of an accession of fever, it transudes without difficulty through every one, even the narrowest, of the cut vessels, occasioning frequent and irremediable hemorrhages; as the very celebrated Sharpe, in his excellent 'Treatise on the Operations of Surgery,' at page 119 of the French edition, informs us.

In conclusion, we may conclude from these four amputations that this operation does not afford such a protection that we may with good reason hope to relieve patients labouring under aneurism by its means. As, therefore, I have already shown that the ligature is to be avoided whenever the popliteal aneurism does not possess all the conditions that I have already enumerated, and as I have likewise proved that some patients, after having been given over to nature alone, have been restored to perfect health, it appears to be reasonable to conclude that in cases of this kind, which are in nowise fit for the ligature, the amputation of the thigh should not be attempted, but the patients should rather be left to the powers of nature alone.

Other observations. But my observations and inquiries have not terminated here; for I endeavoured to carry them out in such a way that I might be enabled to add to the surgical means that ought to be adopted in this very dangerous affection; and also to instruct my mind, which I wished entirely to devote to the service of patients labouring under this disease, in which, as if it were incurable, surgeons and physicians have renounced all treatment, and have only agreed on the prognosis.

On considering the different varieties of aneurisms, which differ both in their nature and in the situations in which they may occur, many plans of treatment occurred to me as being worthy of trial. When, indeed, I reflected upon those aneurisms that occur in the limbs, I was led to suspect that, by keeping the patient quiet in bed, by weakening his whole body, by restraining the flow of blood in the artery leading to the affected part, and lastly, by gradually compressing the aneurismal tumour by means of bandages, not only might its increase be prevented, but in the course of time, being little by little, and spontaneously, converted into a serosity, and being rendered fit for the transmission of red blood, the entire resolution of the tumour itself might sometimes be accomplished. 1772.

Methodical bandaging, which from day to day could be made to compress the affected part more and more strongly, appeared to me to be the only means able to fulfil all the indications that have been adduced. But as, in accomplishing this, very many obstacles occurred to me, which I thought might interfere with a successful result, I remained in doubt whether to abstain entirely from attempting it, or whether it might not be advisable sometimes to practise it. Nevertheless, in order that I might be induced to undertake and accomplish it, the coachman of his eminence Cardinal Herba, at that time the Master-General of the Hospital of the Holy Ghost, came to me, in the year 1757, whilst still in suspense, and uncertain whether to begin the practice or not, with a spurious aneurism in the upper part of the crural artery, not far from Poupart's ligament, which pulsated, was about the size of an apple, and of which I will give a very faithful account in the proper place. As, therefore, in this case no means occurred to me more likely than immediate bandaging, to check, if not to arrest entirely, its very rapid increase, I directly, without any hesitation, had recourse to it.

The successful result of this bandaging, and the honour that I obtained for the obliteration of the artery, not only in the cases that will be described farther on, but also in another aneurism of the groin, most worthy of notice, which I perfectly cured, in the year 1762, first by opening it, and then by compressing it with a bandage; which being then employed in the way that will appear from the history of that case, dispelled those fears

1772. that I had previously entertained. These circumstances, I say, induced me to resolve upon adopting this kind of bandaging, even in cases of popliteal aneurism, on the first opportunity that might present itself.

VI. In consequence of the frequent occurrence of this disease, it happened that, about the end of the month of August, in the year 1765, Antonio Valena, a porter by trade, was brought to the Hospital of the Holy Ghost, and placed in No. 2 ward, amongst the patients confided to my care. This man was of a sanguineous and fatty temperament, and about forty years of age; he was affected with a false popliteal aneurism, of about the size and figure of a large goose's egg, which was hard and resisting to the touch in every part; he at the same time suffered from fever, pain, and a strong pulsation and swelling of the leg and foot.

As the swelling of the limb had increased, I did not consider it right to undertake what I had proposed until the severity of the symptoms had been diminished, lest the operation should turn out badly, and occasion danger of gangrene of the limb. I therefore ordered the patient to remain for some time quiet in bed, to be placed upon a strict diet, and to be bled several times.

These preliminary measures were so useful, that not only did the increase of the aneurism cease, but also, towards the close of the month of September, the pain in it had almost entirely disappeared, the strength of the pulsation had sensibly diminished, and the swelling of the leg and foot gone down not a little. As I could then, however, assign no reasonable excuse for not accompanying the Pope in his journey to the country, I thought it best to leave the aneurism, as it had progressed so favorably, until my return, which happened on the 26th of October. On my return then to Rome, finding that the tumour remained in the same state, but that nearly the whole of the tumefaction of the leg and foot had been removed, I determined immediately to have recourse to compression by means of bandages, which I accomplished in the following way:

Having first, for several days, applied at sundry times cloths wetted with diluted wine, I began by covering the whole extent of the tumour with lint of a proper kind, and laid two oblong pads crosswise over its centre, in such a manner that the upper

extremity of each should embrace the knee at its superior, and their lower ends at its inferior part; another oblong pad similarly moistened with diluted wine was stretched out in a longitudinal direction along the course of the crural artery up to the groin; I also moistened all the cloths with which I completely covered the whole surface of the knee and of the thigh. I then took a strong and long bandage, three fingers' breadth, and not more in width, and having commenced its first turn above the centre of the tumour, I carried it crosswise above and below it, in the way that is usual when this joint is to be bandaged, rolling it as often round the tumour as there was occasion, so that it might be properly covered and compressed. I continued this compression in the same way in a longitudinal direction as far as the groin, and in order to make it safe, I did not complete it without making a double turn round the body. The chief precaution that I employed was not to constrict the parts too much the first time; and I was most careful to obtain an equable compression of the limb, by causing every turn of the roller that was made to cover somewhat more than half the width of the preceding turn; which, indeed, is always to be attended to in every occasion in surgery, when bandaging is indicated. 1772.

These things having been done, I ordered the patient to be bled to a sufficient extent, and enjoined him to be put upon a strict diet, to keep his mind tranquil, and to maintain the affected limb perfectly at rest; and finally, I directed that spirits of wine should be allowed to drop from a height upon the tumour enveloped in the bandages. I left this compress untouched as long as it appeared to be of service. It should, if it has been properly applied, last at least eighteen or even twenty days.

When I was obliged to remove it, I adopted the following precautions. In reapplying it, I was always careful that the new compress should be somewhat tighter than the old one. I had, besides, recourse to moderate venesections more particularly as often as either the leg or foot swelled; which venesection, for the most part, saved me the necessity of renewing the bandage, if by chance it was applied somewhat more tightly than could be borne by the patient. Lastly, I used wine and water, and not spirits of wine, to moisten the pads and cloths in order to prevent the skin from becoming too hot; which, were it to occur, would retard not a little the progress of the cure.

1772. By this patience and assiduity in the treatment pursued, I observed with pleasure that, although the tumour still continued to be hard, and to pulsate, it daily decreased more and more, to such an extent, indeed, that exactly in three months, calculating from the first day of the compression, I saw, with the greatest delight, the patient leave the hospital, having been restored to perfect health, which my colleagues also, as well as several young men who were actively pursuing their surgical studies there, witnessed. For nothing was left in the situation of the ruptured artery, except a certain callosity, which was scarcely as large as a good sized bean; and although almost immediately after leaving the hospital, he was obliged to perform the duties of a porter, in order to obtain a livelihood, and was therefore constantly moving about, carrying heavy weights, and unable to take any care about his diet, yet he suffered no inconvenience, if a certain degree of swelling of the leg and foot be excepted, which gave him but little trouble. Besides this, in the year 1766, when he was attacked by the fever which was then raging, and laboured under a double tertian, he returned to the hospital, where he perfectly recovered the health that he had lost without the affected limb having suffered any disturbance from the movement of the blood, increased as it was by the fever. As therefore neither walking, nor labour, nor an increased circulation in consequence of fever, could in any way excite the ham, it seems reasonable to suppose that the fluids had regained full liberty of moving in the vessels of the joint.

VII. Another aneurism of the same kind was perfectly cured by a similar plan of treatment. It occurred in a person of the name of Damiano, a bastard, by trade a sexton or grave-digger, about forty-one years of age, of an ordinary stature, and of a sanguineo-melancholic temperament, who was admitted to No. 5 bed amongst my patients on the 17th of August in the year 1767. The size of this aneurism was greater than that of the one just described. It was attended by severe pain, fever, a strong pulse, and swelling of the leg and foot, but was still not very hard, possessing, on the contrary, a certain degree of softness. When the patient was asked in what way this tumour arose, he answered that it was from a violent effort that he made during the last week but one in the Lent of that year: for whilst he was moving the chair of the Holy Confession from one part of the church to the other, he felt as if something gave way in the ham, occa-

sioning pain, but of so little severity, that he was able to continue his accustomed labours until Pentecost. From that time until the period of his being brought to the hospital, being ignorant of the nature of the tumour, though he had observed its increase, he had used no remedies to alleviate the pain, except some very common ones. 1772.

It was therefore sufficient during the first eight days to order the patient to remain in bed, to observe a strict diet, and to be bled twice. By which means all the symptoms were alleviated, and the tumour became still softer. I then, having for some days applied cloths moistened with wine and water, proceeded to employ a moderately compressive bandage; which, of necessity, required to be reapplied; and, in the first days of the month of November, when I again rearranged it, I found that the pulsation in the artery had altogether disappeared, and that the tumour had been rendered perfectly flaccid. But nevertheless, I did not cease to apply the bandage to the affected part in the same way that I have mentioned in the foregoing observation; and everything went on so favorably that the patient, restored to his former state of good health, left the hospital on the 28th of December, suffering from no inconvenience except a trifling degree of lameness.

Observations. It may be here remarked that the aneurism of which we now speak, having been treated on the same plan, had an equally successful termination as the preceding one; although it differed sensibly from it, not only in possessing, from the very beginning, a certain degree of softness, and indeed, in becoming perfectly soft long before it was cured, but also, because its pulsation had entirely ceased before the expiration of the forty-five days that preceded its cure, whereas in the former case of aneurism the hardness as well as the pulsation continued uninterruptedly until it got completely well. On sending for the patient two months after he had left the hospital, in order that I might again examine him, I found nothing in his ham, except a small hard tumour, which being about the shape and size of a chesnut, resembled somewhat an exostosis. At that time, Damiano limped but very little indeed.

VIII. During nearly the whole of the month that preceded the departure of Damiano from the hospital, Piedro Javina, another of the chief surgeons of the hospital, my colleague, and,

1772. without question, the very best of all the recent pupils of that charitable establishment, had a similar case of aneurism committed to his care. He, however, determined to have recourse to the bloody operation; namely, the ligature of the artery itself, in the same way that I had performed it in the case of the gravedigger, Andrea Boturri. For as Javina was assistant-surgeon to me at that time, he had not only witnessed that operation, but had materially assisted in it with his own hands. Before he undertook this one, however, having followed the custom of our hospital, of consulting his colleagues in the more serious cases, he communicated his intention to me, and in consequence of my exhortations he determined, without the least hesitation, to have recourse to compression by means of bandages. Which plan of treatment terminated favorably in this patient as in the two former ones. For within the fortieth day the hardness as well as the pulsation had almost disappeared, and nothing was left except a flaccid tumour, which also, by degrees, gradually disappeared, although, before it had entirely vanished, the patient wished to leave the hospital; keeping, however, his knee bound up by the same bandages. When, however, he by chance came to the hospital, in the course of a few weeks, we were much pleased to find him entirely freed from the aneurism and restored to perfect health; although his leg appeared sensibly swollen, which probably arose from the fact of his being unwilling to submit himself to the quiet and attention that his disease required.

IX. I now also saw, with very great pleasure, that the Roman surgeons adopted this method of treating such aneurisms. For the surgeon Seghio, having met with a similar aneurism of the ham, in the person of Nicolas Scarpa, a servant and a Roman, thirty-four years of age, of a sanguineo-bilious temperament, and being most desirous to learn, and most anxious to verify by experience and deep study whatever he thought could serve to illustrate or to advance the art of surgery, (the eminence that he attained in which may be judged of by the fact that he was appointed surgeon to the most excellent Marquis Albeterri, lately the most noble ambassador of the invincible King of the French to the Apostolic Seat,) did not indeed hesitate to order this very same plan to be put in practice. As did also Joseph Flajani, a most distinguished pupil of the Hospital of the Holy Ghost,

who a few months before had left the hospital, and who, as my assistant, had been an eyewitness of the case just related. Seghio, therefore, and Flajani, having only spent three months in the treatment, sent this very Nicolas Scarpa to me, in order that I might examine him, which I willingly did, and ascertained that he was entirely cured of and freed from his aneurism by the good effects of external pressure, which they had practised by the help of bandaging, exactly after my method; I found nothing the matter with him except a trifling swelling of the integument and cellular tissue, which had probably arisen from the fact of Nicolas having been at once compelled to return to service in order to support his family; but by continuing the pressure of the bandage, which I knew he would do, there appeared to be great hope that he would at length also be cured of this affection. 1772.

X. To this place also belongs the history of another case of aneurism which ought to be made public, as it illustrates in a very remarkable manner the circumstances that we are now treating of. This aneurism occurred to a surgeon, certainly sufficiently skilful, but who considered my method of treatment to be entirely useless, and that its good effects were altogether attributable to rest of body. He, therefore, kept his patient, who was labouring under popliteal aneurism, in bed for five months, but altogether in vain; for the disease continued to be of the same size and to possess the same pulsation, and derived no other benefit from the quiet in bed than a less rapid increase in size. The surgeon, at the expiration of these five months, discontinued the treatment that had been begun and left the patient to his fate. I will not indeed deny that in this way the aneurism might not only have become lessened in size, but might also have been perfectly cured. But as a complete cure by these means was very doubtful and uncertain, or at least would have been exceedingly tedious, as happened in this wretched patient who, after a lapse of five months, was left with the same aneurism, it appears to me to have been an extreme degree of perverseness and obstinacy of mind not to have adopted my plan of treatment, the very successful results of which had become sufficiently confirmed by experience.

But at length, eight months more having elapsed since this patient had been left by this distinguished surgeon, that is, six-

1772. teen months from the time that he first became cognizant of the tumour; namely, on the 6th of May, 1769, when I went to the Hospital of the Holy Ghost, I found amongst my other patients, this one, in No. 7 bed. He was a man of a sanguine temperament, tall, and possessing great strength of body, Paul Marta by name, in his forty-first year, and employed as a servant.

Having received from the patient himself and from others the history of the case that has just been briefly related, I proceeded to examine the aneurism which was in the right ham, and to which I observed a bandage had, by the advice of several surgical pupils who had observed the utility of my plan of treatment, been very properly applied; this the patient himself had been instructed to do by these pupils. Although this was not sufficient to arrest the progress of the aneurismal tumour, yet it prevented the patient's death. For the tumour had become so large as not only to fill up the whole cavity of the ham, and to stretch lengthways from the middle of the thigh to the calf, but also to extend to the whole of the lateral and external parts of the knee. It was of the natural colour of the skin, and firm to the touch; the pain did not distress the patient except for a few hours, and then it was not intense, but still a very strong pulsation could be felt in every part of it, a phenomenon that is not of very common occurrence in large aneurisms that are equally resistant to the touch in their whole extent, and which are of long standing; for in these it is for the most part exceedingly obscure.

Although this aneurism was so large and of such long standing, yet I most willingly prepared to put my plan of treatment into practice. Therefore, with the consent of that very intelligent man, Sigismund Toncius, chief physician of the patients in my department, and of the very learned resident physician Joseph Matthæus, who had been eyewitnesses of many cases of this kind, I ordered the patient to be put upon a strict and regulated diet, and having bled him freely by opening a vein, I proceeded to what had become familiar to me, the application of a bandage; which was gradually tightened. This I continued from the calf and ham up to the groin; then I was, both on account of the pain as well as of the swelling of the leg and foot, compelled to repeat the bloodletting, which I am always in the habit of ordering in these cases, from the arm; nor did

I omit to have sometimes oxycrate and sometimes spirits of wine, sprinkled or dropped upon the part. 1772.

Continuing this plan of treatment, namely, applying the bandages, renewing them as there seemed occasion, and practising venesection now and then, I was pleased to see the tumour so diminish in size, that I entertained the greatest hopes that it would shortly be cured, even if the pulsation continued constantly in it. But I will narrate an almost incredible circumstance, which nevertheless is most true, and to which the whole household of the hospital can testify. When the patient knew that this plan sufficiently ensured the safety of his life, he determined, in order not to be in future compelled to procure a livelihood, to obtain a constant residence in the hospital; and to endeavour to prevent, as far as was in his power, the perfect cure of the tumour. With this view he began, I being in ignorance of it, to eat indiscriminately all manner of things, at all hours, and to obtain wine through the means of his friends, as well as to walk about the hospital in order to procure fresh quantities of these things from the other patients.

It must appear evident to every one, that amongst so many errors no successful treatment could be adopted. Wherefore, when after the lapse of some time I heard of it, I endeavoured in every possible way to prevent his committing these acts of imprudence, but in vain. And what is more, I also discovered that he loosened his bandages as soon as they had been applied. This was the reason why I was very often obliged to reapply them, especially to the groin; nor was he driven to do this, either by pain or swelling, as he suffered no further inconvenience from either of these after the first preparatory measures had been practised.

My desire to bring this treatment to an end induced me to bear his trickery and deceit for a very long time; the rather that, if these were not in the way, a certain utility might appear to have been derived from my method. But indeed in the month of March, in the year 1770, when I could no longer submit to his negligence, I dismissed him from the hospital, and told him that it was in his power, if he wished it, to obtain his health perfectly, and that it was sufficiently evident to himself in what manner he ought in future to behave, knowing so well the reason why his cure was retarded.

1772. On leaving the hospital he desired to go out alone, being only supported by crutches, which I did not wish, as I was anxious that he should either be carried, or, at least, be accompanied home by some one; but he wished to be at liberty, so that he might again practise a new fraud upon me. With this view he had scarcely gone forty paces from the hospital, when, as some of the hospital servants were looking on, he threw himself upon the ground, hoping that they would fly to his assistance, as he fell. Pretending that his right hip was bruised, he was carried by them to the hospital, where I allowed him to remain for a few days, but at the expiration of these I again sent him away, accompanied, however, by a young surgeon; nor did I again hear anything of him at that time. But two months having elapsed since his departure, as I was going through the Claudian way, I saw him sitting at a door with his knee bandaged and supported on a cushion; he seemed, however, to be in good spirits and in perfect health; and on my asking him about his aneurism, he told me that it was better.

Observations. The state of the aneurism when the patient left the hospital was as follows: The tumour did not exceed two inches in length or breadth; it was firm to the touch, and felt tense, in the same way that it always does towards its decline. The pulsation, indeed, had not only not been lessened to any appreciable degree, but even, on the tumour being left to itself, had become continuously stronger.

I think that it may be stated, without the possibility of a doubt, that the errors he had committed in his diet and especially the tricks he had practised in relaxing the compressing bandages, were the chief reasons why our patient did not recover his health perfectly, the more so because I had made the trial, that if the compression of the groin were for a time neglected, the aneurismal tumour would again manifestly enlarge. It also appears reasonable to suppose that a longer time would have been required in this aneurism on account of its great size, before the polypous mass of blood could have been dissolved, which might also happen in the first place, in consequence of the size of the artery corresponding to the extraordinary bulk of the body. Secondly, from the large opening in the artery itself, which, as I should conjecture from the tumour, and the pulsation that continued in it, could scarcely have been less than the one shown in the first

figure of plate 1.[1] Thirdly, the sac of the aneurism, which, according as it is larger, requires a longer interval of time, either to be altogether removed [as in figure 2, plate 1,] or to be narrowed, [as is shown in figure 3, plate 1,] or to grow together into a hard shapeless mass, [as in cases 1, 2, and 4.] Fourthly, perhaps there might be caries of the subjacent bone, corresponding to an opening in the artery, as I have shown in the relation of the cases, the existence of which caries is not made evident to us, except by suppuration or the opening of the body after death. 1772.

XI. I also met with another case of popliteal aneurism amongst the patients of the hospital, which, although false, hard, and pulsating, was not accompanied by any bad symptoms. For the patient did not suffer much from pain, the pulse was not very quick, there was but little tumefaction of the leg and foot, and his gait was not much affected, probably on account of the tumour being but small, not exceeding the bulk of a moderate sized apple. On finding the disease in such a favorable condition, I hoped that the employment of my usual plan of treatment would be attended with a good result, but I was deceived. For after he had only staid a few days in the hospital, though I pointed out to him the great danger that he was in from the disease, still he wished, much against my will, to leave, in order to get married. But what was the result? Not long afterwards I was informed that he had died of gangrene of the affected limb.

XII. I think it is my duty to publish another case of popliteal aneurism, which, although it terminated unfavorably, yet is very instructive to the surgeon. And I wish that all writers, following the example of the divine Hippocrates, would confess their errors, and would relate all those cases, the termination of which had not answered their hopes and expectations. What additions would not the art of sugery have received had this been done!

A certain shoemaker, who had scarcely passed his forty-fourth year, of a melancholic and acrid temperament, and labouring under the venereal disease, presented himself among my patients in ward No. 7. I found him suffering from an aneurismal tumour of the ham, which was far larger than a

[1] [An opening of about the same diameter as the popliteal artery.]

1772. goose's egg, and was besides exceedingly hard; it was attended with constant and most severe pain, strong fever, and a violent pulsation; but I was most of all distressed by the great tumefaction of the foot and leg, which was far greater than what had occurred in the other aneurisms. This was so extensive and so hard that it did not in the least appear to yield to the pressure of the fingers. Although it was sufficiently evident to me that his condition was such that it would be most difficult to practise the new plan, nevertheless, strengthening myself with a vigorous and resolute determination, I undertook, without hesitation, the treatment which was preliminary to the compression. However, after a lapse of twenty days, when neither the firm tumefaction of the leg and foot, nor the popliteal aneurism itself, had received any relief from this, nay rather, when the size and the pulsation of the tumour had increased somewhat, I determined, as I thought it would be in vain to have recourse to any other measures, to make a trial of careful and moderate compression. The bandage could now, in consequence of several bleedings that were practised at the same time, be easily borne by the patient, which was satisfactory, as by reason of the aneurism it might be necessary to continue it for a long time. But, as the hardness and tension of the swelling of the leg and foot increased daily to a greater extent, fearing lest the limb might be seized with gangrene, I ordered all constriction and compression to be removed from it as quickly as possible. The bandages having therefore been taken off, I, as well as many who were present at my visit, ascertained that the wished-for effect had been produced on the aneurism, for the tumour appeared to be much effaced, and the pulsation was lessened to a surprising degree. The fear of gangrene, however, constantly occupying my mind, I thought it best, as the aneurism had now been left to itself, to allow it to remain perfectly at liberty. But what was the result of this? In a short time the swelling increased again, and all the other symptoms became so severe that, in the course of a few days, the aneurism having burst, the patient necessarily died.

Observations. This case has appeared to me to be sufficiently useful, not only in proving the efficacy of this kind of bandaging, but also in showing that, even in such a very difficult case as this, compression is by no means to be neglected. For it might

perchance happen that gangrene did not supervene, or, if it had at length occurred, who would venture to assert that it might not have been subdued by proper scarifications, or by the other means that the surgeon is acquainted with? The tumour having been dissected, it was plainly seen that the popliteal artery had been torn to the extent of three inches. 1772.

The case related by Joannes Trullius, a very celebrated Roman surgeon and lithotomist, of a spurious aneurism of the thigh, occasioned by a bullet-wound, which Marcus Aurelius Severinus has reproduced in his work on Medicine and Surgery, has reference to this subject; I shall, therefore, without altering a word, transcribe it here, the more so as he was, if I mistake not, the first who put in practice the precept of Galen about the ligature of the crural artery. [Case XIII is omitted, as it will be found at page 191.]

ON ANEURISMS OF THE GROIN AND OF THE CRURAL ARTERY.

XIV. Passing on now to those aneurisms which have their origin in the groin and the crural artery, I shall, at the very outset, adduce the one contained in the case already mentioned, which was situated in the trunk of this artery, just after it had passed Poupart's ligament. This aneurism occurred in the person of Joseph Luberti, a Roman, of a sanguineous temperament, and in his thirty-fourth year, who had often been affected with the venereal disease, and was employed as a coachman. When he came to me for the purpose of asking my advice, I found a nearly spherical tumour, equalling in size a large apple, unaccompanied by pain or discoloration of the part, but so remarkable from its very evident pulsation, that it was most ready and easy for me to recognize in it the undoubted signs of an aneurism. Nevertheless, I did not neglect inquiring very diligently of the patient concerning everything by which I could learn how this swelling had been occasioned. He accordingly told me, that about a year ago, whilst riding a horse that was not sufficiently broken in, he fell under him, and received contusions in several parts of his body from the weight of the animal, and that he had since then experienced a constant and uneasy sense of pain in the part in which the aneurism appeared; whence it seems reasonable to suppose that it was

1772. occasioned by this fall upon the ground, the artery having been either contused or ruptured.

All my solicitations were fruitless, and I begged the patient in vain to submit himself, without any delay, to a most careful treatment. I could only obtain from him permission to apply slight compression, by means of bandages, to the affected part. But I, to tell the truth, intended this merely to be adopted, lest at some future period, the disease having increased to too great an extent, all opportunity for more useful treatment should have passed by. As the patient, during the first few months, until he had learnt to apply the bandage correctly with his own hands, came to my house whenever it was to be renewed, I always tightened it gradually, and thus brought the matter, beyond my expectation, to such a state, that although he insisted upon eating whatever he chose, and would not remain sufficiently quiet, not only did the tumour no longer increase, but it was indeed perfectly evident that it had diminished in size. The benefit derived from this treatment, which would have been very great had the patient been tractable, only tended to make him bolder, and induced him, as he thought but lightly of the disease, to abstain altogether from coming to me for nearly three years. But, to be candid, the assistance of the most eminent Cardinal Herba also added to the benefit of the compression; for when he learnt from me that the disease under which his coachman laboured was most dangerous, and that he could not any longer continue his laborious duties without the certainty of its proving fatal, he immediately and most kindly dismissed him from his service, with this arrangement, however, that he would continue to pay him every month the whole of his wages.

But the three years already spoken of having now elapsed, his eminence Cardinal Herba suddenly departed this life, to the inexpressible sorrow of the good, and Joseph consequently losing his pension, thought of procuring another master, in which he succeeded as he wished. But fearing lest his new master should inquire of me the condition in which his disease then was, and in order that I, being mistaken, might in nowise injure his prospects, he came to me, after this long interval of time, pleased and cheerful, and carrying a stick in his hand, in order to ask my assistance and to recommend himself to me. I therefore again examined his aneurism, and found that Luberti had con-

tinued up to this time to compress it by means of the bandage. 1772.
On uncovering the tumour, I saw with much surprise that it was almost flattened, and that it had become greatly diminished in circumference. But as the pulsation had not ceased in it, I advised him, as his disease was going on favorably, to give himself up entirely to treatment, so that he might recover his health perfectly, and in the meanwhile to relinquish entirely his duties as coachman, they being most injurious to him; I told him besides that if he acted otherwise he would certainly die.

I exhorted Joseph in vain to do this, promising him that his new master should be informed of nothing by me. He however entered upon his employment with so much spirit, that whenever he met me whilst he was driving, he appeared, as if in jest, to mock me. But it was only allowed him to boast of and to show off his good health for a few months, for the tumour having become irritable, increased beyond bounds, and becoming very painful, with much fever, compelled him in a short time, though very unwillingly, to betake himself to bed. There was not wanting a surgeon sufficiently bold to advise the ligature of the artery, as the only and safest treatment to submit to; and this he was willing to have done not only against my advice but also against that of several most skilful surgeons. I was soon after told by a certain knight that the operation had been performed, and he likewise informed me that the surgeon, in order to restrain the very profuse hemorrhage, had tightly bound up the affected part with bandages; I immediately predicted that the patient would die on the third or fourth day after the operation from gangrene of the limb, which indeed happened, as I was informed by his sister's son, Joseph Stephanori by name, also a coachman.

Observations. This operation, if we except its unfavorable termination, besides that it enabled me to employ this treatment in those aneurisms in which, on account of the absence of the circumstances that have already been mentioned, the ligature of the artery could not be had recourse to, also appears to be most deserving of publication on account of the very great diminution that occurred in the size of the disease from simple compression, although many proper and necessary precautions had been omitted: I would therefore be induced to hope that

1772. this kind of aneurism might be cured in the same way as those of the ham, both by the gradual employment of compression as well as by repeated bloodletting, conjoined with perfect rest and a regulated mode of life; the more so as we cannot ligature the artery in this situation any more than we can in the ham, both on account of the difficulty of separating the iliac from the neighbouring parts, in order to accomplish which it would indeed be necessary to penetrate into the cavity of the abdomen, as well as from the impossibility of applying the tourniquet, so as to guard against too great a hemorrhage, which would be likely to occur not only from the trunk of the vessel, but also from the numerous large branches that are given off from it immediately after it has passed Poupart's ligament. For if this flow of blood were to take place during the performance of the operation from so extensive a surface, the surgeon would be compelled to desist, and to bind up the part most tightly with bandages and compresses, unless he would wish to witness the result of his temerity.

Two difficulties, and those indeed by no means trifling ones, and which the case that has just been related did not in the least tend to solve, perplexed me much. One of these consisted in the possibility of the transmission of that quantity of blood through the trunk of the artery that was necessary for the supply of the limb, for it appeared evident to me that I could never make such a degree of compression as would be sufficient to intercept the flow of blood through the artery without also preventing a sufficient quantity from reaching the limb. The other difficulty was that I had a great suspicion that the fortunate and successful termination of this aneurism depended, in some measure, perhaps, upon its originating from external violence, as has been said, and that, on this account, perhaps, it could be more readily influenced by compression. But the aneurism described in the history of the following case removed entirely all these doubts from my mind, although it was cured by an entirely different plan of treatment.

XV. In the month of August of the year 1762, I was sent for by Felix Morellus, a goldsmith, fifty-five years of age, and whom I had treated thirty years before, whilst labouring under a venereal bubo in the left groin. He sent for me in order to take my advice as to whether a tumour in the right groin, which, accord-

ing to the opinion of almost all the other surgeons was about to suppurate, should be opened or not. 1772.

I received a most accurate account from the very illustrious physician Amici, and also from the most skilful surgeon Maximinus, both very celebrated professors in this town, from which I learnt that Morellus had suffered, since last Christmas, pains which were at times slight, at others sufficiently severe, in the right groin; they extended to the hip-joint, and made him halt during the whole of the winter until the spring; but he did not notice anything else at that time than that the affected part began to swell.

As Felix Morellus, however, on the day consecrated to the body of the Lord, which in that year happened on the 9th of June, was going to the church of St. Peter, in order that he might enjoy the sight of the progress of the pompous procession, he was suddenly seized with such an excruciating pain in the affected part that he was obliged to return home as quickly as possible, and to betake himself to bed, which he had not since then been able to leave, both on account of the violence of the pain as well as of the acuteness of the fever; and although the most eminent professors did not leave a stone unturned, in order to improve his miserable condition, yet they could afford him no relief, and all their endeavours were not only in vain, but the disease increased daily, so that the unfortunate Morellus was almost rendered hectic, and was kept constantly confined to his bed. His limb became so contracted that it could no longer be extended. A large tumour also formed about the hip-joint; which was the seat of constant pain. Besides this, pressure made by the fingers detected a most evident fluctuation in the groin, which extended from the bones of the pubes to the crista ilii, but was unaccompanied by any pain, hardness, or tension; and the fluid which formed the swelling was thin and near the skin, indeed it appeared to be immediately beneath it.

When I found the patient in this condition, I did not dare to assert that a laudable or purulent suppuration would take place; for more than two months had now elapsed, and the intensity of the disease visibly increased, nor did it ever remit, as it usually does when the suppuration is finished, as Hippocrates himself teaches us, Sect. 2, Aphor. 47; but, on the contrary, it was rather observed to increase daily: and although no pulsation

1772. was perceptible at this time, yet I suspected an aneurism, and disclosed my thoughts to his medical men. But they did not in the least doubt but that if a few days were allowed to elapse before the incision that had been agreed upon was made into the tumour, the disease would show itself to me more clearly and distinctly; nor indeed did they desist during the whole of this time making trial of every remedy that would be likely to be efficacious.

The bloodletting was therefore repeated several times, a large quantity of Peruvian bark was administered to the patient, and poultices were applied to the affected part both to soften and to cool it, and to deaden the pain; other remedies also that might inflame or dry it up were had recourse to, the fluid in the part being thin and very near to the skin. But when fifteen days had elapsed, and these measures produced no change except that another suppuration appeared further back, about four fingers' breadth from the great trochanter, we determined at length to make an opening in the groin and to have everything in readiness to arrest the bleeding, if by chance the result should correspond with my opinion.

But before the incision was made into the tumour, I thought it was of considerable consequence to inform both my colleagues, the patient, and his relations, of what I proposed to do, lest, seeing the blood burst forth, they might become alarmed; especially the patient, to whom I gave promise that I would devise a sufficiently efficacious means of arresting any hemorrhage that might occur. I also told him that the opening was to be made with a scalpel, in the most projecting and thinnest part of the tumour; so that, if any kind of fluid besides blood were to flow out, I might more easily and quickly enlarge the incision to as great an extent as might appear necessary; but that when pure blood began to flow, I should allow it a free exit until the whole of the bag containing it was emptied; and would permit it to flow more abundantly, if the patient's strength would justify my doing so. I would then check it by powerful compression; nor indeed was there any doubt but that it would cease, as long as the external pressure was applied to the opened artery, and acted upon it: and thus, at length, the cavity of the tumour having suppurated healthily, and being in this way well digested, the patient would be restored to good health; and, moreover,

that this was the only means of recovery that presented itself. 1772.

The unfortunate Morellus assented to all this with composure; and therefore, having got ready everything that we considered necessary to arrest the flux of blood; namely, pads of different sizes and shapes, long bandages, sufficiently strong, and properly made, and also brass basins, in order to receive the fluid that would be discharged, we set ourselves earnestly about executing what we had determined upon.

The tumour being then pressed with both hands, so as to force the fluid contained in it towards the part that was to be incised, namely, the most projecting point, where the skin was thinnest, and as near as possible to the extremity of the crista ilii, Maximinus passed most adroitly a curved bistoury into its cavity. But immediately, contrary to the expectation of all, fluid blood gushed forth with violence. This accident, although plainly foreseen by me, terrified the bystanders exceedingly, if for no other reason, at all events, for this—that they saw the blood gushing forth with great force through the incision made by the surgeon's knife. But I, animating the patient, and holding a brass basin to receive the blood, allowed so large a quantity to flow, that having filled the first, I was compelled to take another vessel; nor did I stop the blood until its colour, from being pale, became brighter, and the patient appeared to be about to faint.

The further flow of blood was then arrested by Maximinus pressing his thumb on the opening. I then, by applying pads in a graduated series, and supporting them with strong bandages, prevented the blood from breaking out again. In the meanwhile the patient did not only not faint, but the pain and fever almost entirely left him. He had some nourishment given him immediately, which was repeated as often as necessary, until the thirteenth day, without the occurrence of any bleeding or other bad symptom, and without the bandages being changed.

At the expiration of this time the bandages were applied anew, and on removing them for this purpose, we found nothing flow from the opening, except a little pus, which proved that the ruptured artery was now almost closed, and that no more blood could escape from it. We therefore carefully attended to the suppuration, and, although this was not very copious, yet it was

1772. necessary to make a counter-opening, at the upper and inner part of the thigh, which we were pleased to see cicatrized with the rest, by the 9th of November.

Observations. Behold how this case removed the two doubts that troubled my mind; for as the compression made on the external iliac was so great that it was impossible to increase it, and was such as not to allow the smallest drop of blood to pass through that vessel, for I compressed it so closely that the whole of the blood by which the limb was to be nourished was carried through the internal iliac alone; and as this aneurism, although produced by an internal cause, was cured by the employment of pressure, it appeared evident to me that compression was sufficient for the cure of any kind of aneurism, whether it were produced by an external or an internal cause.

The patient himself calculated the quantity of blood that escaped from the opening in the tumour to amount to twelve pounds, and probably this was not far from the truth; for, besides being very skilful in his own business, he was exceedingly well acquainted with the mechanical arts. There cannot be the least doubt that the artery, having in the beginning been ruptured, remained open; for the blood that flowed last was the brightest and reddest, and before this change took place in it the patient did not experience the least faintness. The quantity of blood that escaped was also too great to be contained in the cavity of the tumour, and the force with which it began to flow continued to the very last. All these circumstances plainly prove that the last blood that flowed had come directly from the circulation through the vessels.

I cannot indeed state positively what artery was ruptured but it is most probable that it was the external iliac, because it would be capable of being compressed, and because I have always found it lacerated in many cases of this kind.

I also permitted a brighter blood, brought from the general circulation, to flow, not only for the reason that I have hinted at above, namely, of emptying entirely the cavity of the tumour, but also in order to weaken the circulation itself, so that the impetus of the blood against the part of the artery that was opened might be diminished, and that the arrest of the blood might thus more easily be accomplished.

I might, indeed, in puncturing the swelling, have used a grooved needle (*acum barbettianum*), as is usual whenever it is wished to ascertain the nature of a fluid contained in a tumour, particularly if it is suspected to be an aneurism, in which there is no pulsation, which indeed constitutes the most certain sign of all; as I did some time ago, in order to convince a certain physician, who mistook an aneurism occupying the fore part of the neck for an abscess, without any bad consequences following this puncture. But in this case I did not wish to use the grooved needle, as I had determined to evacuate the whole of the extravasated blood, in order that I might employ the only resource left in surgery, namely, compression. But this cure was so perfect and permanent, that after a few months Morellus was enabled to lay aside his stick, and no inconvenience was left beyond a slight lameness, as the whole body of students of the Hospital of the Holy Ghost can testify, to whom the patient, when restored to perfect health, exhibited himself. 1772.

XVI. In the beginning of the month of March, in the year 1767, I was sent for to see Peter Principi, a Roman, thirty years of age, whom I found in bed, labouring under a violent fever, accompanied by a very severe pain, which was occasioned by an aneurismal tumour of the right groin, stretching forwards under Poupart's ligament. This was of its natural colour, hard, firm to the touch, equal in size to a large quince, and pulsating very strongly. The whole limb up to this part was affected by a tensive and painful swelling, and was so contracted that it could by no means be more extended.

By the employment of several bloodlettings, and the application of a compressive bandage to the tumour, I was enabled to lessen very considerably not only the pain and fever, but also the swelling so materially, that I was obliged every day to tighten the bandages more and more.

For an entire month I continued to hope to effect a cure; but suddenly I lost all hope, the patient being seized again during the night with such excruciating pains, that he was obliged, though most unwillingly, to cut his bandages off; the consequence was that, on the following day, I found the tumour of such a size that there did not appear to be any chance left of reapplying the bandages; nor from that time did all the care and attention that he received in the hospital, whither he was

1772. carried, appear to avail him in the least, except in relieving the pain, and restraining the too great size of the tumour, which increased daily more and more, occupying the whole of the hypochondriac region as well as that of the right groin, and extending to the middle of the thigh; it continued thus hard and pulsating for four weeks, at the expiration of which our patient died.

After a lapse of twenty-four hours we obtained permission to inspect and examine the aneurism; for which purpose, having opened the lower part of the belly, such a quantity of coagulated blood presented itself to us as to extend upwards to the whole length of the psoas muscle, and downwards to the middle of the thigh. Having then removed the whole of the coagulated blood, and following the direction of the common iliac artery, we found, scarcely at the distance of an inch from where the internal was given off, an aneurismal rupture in the external iliac, which for a distance of four fingers' breadth extended towards Poupart's ligament, where the artery assumes the name of crural.

Observations. Here I would particularly refer to a certain circumstance, which is not only of consequence in illustrating the prognosis and treatment of these diseases, but also of some little moment in explaining certain effects, which will be noticed in the course of this section. It is therefore to be observed, that, in this case, the rupture of the artery was internal, that is, that it arose in those tunics which look towards the subjacent bone, and that this was affected by a very well marked caries.

From the circumstance, therefore, that the artery was ruptured internally, where it would meet with considerable resistance from the subjacent bone, and not externally, where no resistance would be offered to it, and likewise on this account, that the caries that was found was not superficial but deep-seated, so that in length, breadth, and depth, it would be about equal in size to the thumb, we may conclude—Firstly, that this caries had arisen long before the artery had given way, as I have observed in very many aneurisms, which may either burst at a considerable distance from the bone, or may even remain entire, as may be seen in fig. 2, plate 3,[1] which represents a large aneu-

[1] [This plate contains the representation of a clavicle that has been much curved and rendered carious by the pressure of an aneurism of the arch of the aorta.]

rism of the arch of the aorta. Secondly, that this caries is a serious obstacle to a favorable termination of the treatment, the hope of which encouraged us during a whole month. For an artery that lies opposite a caries will be compressed unequally by the bandage against the bone; it is therefore reasonable to suppose that the pressure of the bandage in this aneurism would rather have hastened than retarded the rupture of the vessel. Thirdly, an occurrence of this kind should serve as a general rule to guide us in aneurisms of other parts, and especially in popliteal aneurisms, in which I have several times verified it. If, perchance, an aneurism in these situations does not get well, the cause of this will not always be found in a defect of the method I employ, but rather, perhaps, from the existence of caries in the bone. Fourthly, hence it likewise happened, that the blood, making a passage for itself under the whole length of the artery, passed beyond Poupart's ligament, and occupied nearly half of the thigh, lacerating the capsule of the hip-joint to such an extent, that the thigh-bone was dislocated; and, at length, the artery itself being carried forwards by the coagulated blood, was compressed against the peritoneum, the muscles, and the skin itself, to such an extent, that being deprived of its naturally cylindrical figure, and being compressed in an extraordinary way, it became unable to convey the blood towards the limb. 1772.

This case excited in me the greatest desire to study the course of the whole crural artery. Beginning, therefore, where the aneurismal rupture had ended, and making a longitudinal section of the artery, I found its cavity to be smaller than natural, more particularly as it extended towards the ham, before reaching which I found it altogether closed up. But on examining it more closely, I found that so much of the cavity of the artery was left as would admit an Anel's probe, although with difficulty on account of the folds that the internal membrane had formed whilst the artery was contracting. But, after passing the ham, the artery dilated again, as may be seen in fig. 3, plate 1, which is drawn from the original which is still in my possession.

Such a narrowing of the popliteal appeared to me to show very clearly that the crural artery could not have received, from the external iliac, the blood that was sent to the limb, on

1772. account of the pressure exercised on it by the coagula in the aneurism. Had it been otherwise, the popliteal could never have been narrowed to so great an extent; for the artery, after it had passed the ham, again assumed its proper size, showing plainly that this was altogether maintained by the blood from the arteries of the leg, by that blood, indeed, which necessitates the employment of a second ligature in this operation, as it is ordered to be performed at the bend of the elbow and in the ham.

Having applied a ligature to the external iliac, and having injected, by means of a syringe, water of a yellow colour into the internal iliac, I now found a circuit sufficient to nourish the limb, without any assistance from the external iliac: for, having removed the foot, I saw the yellow-coloured water that had been injected flow out of those arteries that creep round the ankle-joint. But the narrowing of the popliteal artery induced me to make another experiment, in order to learn whether, both the external iliac and popliteal having been tied, a fluid injected into the internal iliac would equally find its way out by the arteries that have just been mentioned, as I had seen done when the external iliac alone was ligatured. I therefore tied this one only, and having injected the fluid as before, it flowed out sufficiently copiously; the popliteal being then also tied, I saw indeed the water escape, but much more slowly and sparingly.

From this very sensible difference we may, I think, conclude, that the internal iliac, after the external has been ligatured, associates with itself the popliteal artery, in order to transmit the blood through the whole limb. It therefore appears that the crural artery, before assuming the name of popliteal, receives blood from the branches of the internal iliac by means of the collateral vessels; and hence, that it was this blood that kept open the narrow channel that was found in the popliteal artery. The very celebrated Winslow has already mentioned several facts deserving remembrance, concerning the anastomoses of the internal iliac artery. These experiments, however, show sufficiently clearly that the branches of the internal iliac, communicating with those of the crural both before and behind the ham, constitute a circuit which is fully sufficient to nourish the limb without the external iliac.

We may obtain another most evident proof that the external

iliac is not altogether necessary for the support of the limb, from the case that has been communicated to me by Peter Javina. I was an eyewitness of the case when it was in the Hospital of the Holy Ghost, and, on that account principally, insert it in this treatise. From this it clearly appears that the external iliac was so injured by the suppuration of an aneurism of the groin, that it divided into two, although the patient continued to live for the number of days that will immediately be mentioned, and even then did not die of gangrene. 1772.

XVII. "On the 12th of October 1763, Peter Antonio Ferrari, a cook, forty years of age, was received into the Hospital of the Holy Ghost; when I visited him for the first time on the following morning, I found him to be of a cachectic habit of body, labouring under a slow and continued fever, and affected with a true aneurism, exceeding a large fist in size, which arose three weeks ago in the left groin, and had extended upwards and downwards, namely, towards the abdomen and hip.

"The tumour, which at that time was in some degree circumscribed, and pulsated violently, was the seat of continual pains, which were especially severe during the night, from which circumstance (as he informed me that he had received no external injury,) it appeared evident, from the very numerous scars, that it had been occasioned by the venereal disease. Though bloodletting, and the application of sponges soaked in cold wine and water, somewhat lessened the pain in the tumour, yet it, as well as the pulsation, soon increased violently; but these, as the tumour continued daily to increase to a larger size, began to be lessened, and, at length, on the 19th of October, disappeared entirely, with a great flattening of the swelling, an extension of it half-way down the hip, and a previous sense of something having given way.

"The œdema which had previously affected the extremity of the foot only, and that but slightly, increased to such an extent, with total loss of heat, sense, and motion, that the vitality of the whole limb was in considerable danger of being lost. But by continually and carefully applying cloths, folded four times and soaked in warm camphorated spirits of wine, I succeeded in restoring the part almost entirely in the course of forty hours, the œdema being very considerably reduced.

"Meanwhile, the tumour rose higher and higher, with a gan-

1772. grenous swelling in the groin, which at length burst, at day-break on the 31st of October; and when I found the patient in the morning, bathed in a fetid ichorous fluid, I cut away and removed the bandages and pads, that had been applied to the part during the preceding eight days, in order to serve as a precaution lest, unfortunately, bleeding should have come on. The exceedingly thin covering of the tumour having given way, there was poured forth from this gaping swelling a large quantity of very black blood, partly in grumous coagula, and partly dissolved in a fetid serum, but of fluid blood (which I very greatly feared) not one drop flowed.

"The patient then having been cleansed of the filth with which he was covered, I filled the cavity of the aneurism with the softest lint, and having applied cloths dipped in cold wine and water, surrounded the limb with a roller, which was renewed every second day. By these means, the common integument, as well as the aneurismal sac, with the vessels, nerves, and membranes attached to it, having become completely gangrenous, separated of their own accord in eight days. This having been done, the pectineus, iliacus, and lower part of the psoas, the sartorius, and, lastly, a portion of the triceps muscles, were seen denuded, and cleared from sloughs, forming a kind of triangular space, which appeared red and smooth, being bounded posteriorly by the sartorius and triceps, and extending from the ligament of the groin to the point where these two muscles cross; the crural vessels and nerves that should have passed through this space, being entirely destroyed by sloughing.

"When things had gone to this length, it was not even allowed to you, most celebrated man, who, induced by the novelty of the case, came of your own accord to visit the patient, to see this without wonder!

"As it was necessary to empty the abdomen of the fetid ichor that was continually draining down upon the external sore, I passed a scalpel, guided by the forefinger of my left hand, through the cavity which was then open under the ligament of the groin, and cut the ligament itself, the abdominal muscles, and the skin, with a sufficiently free incision, and thus laid open the internal cavity of the aneurism, so as to clear it of its thicker sloughs, and to be enabled to apply proper dressings, which only consisted of dry lint; after this the cicatrization advanced most

prosperously on all sides, with every hope of a speedy re- 1772.
covery.

"But the patient being exhausted, notwithstanding he was fed on the strongest soups, became more and more emaciated, so that he at length died of marasmus, on the 27th of November.

"The abdomen having been opened on the following day, all the viscera were found healthy except the mesenteric and some of the lumbar glands, which were somewhat larger and harder than usual. But when I had dissected the left common iliac artery from the peritoneum, and laid it open to the point where it divides into the two smaller iliacs, namely, the external and the internal (which is also called the hypogastric), I found that the mouth of the external iliac (the hypogastric artery remaining pervious) was blocked up by a very hard and conical plug of lymph, nearly six lines long, formed of coagulated lymph, and moulded into this shape by the walls of the vessels to which it adhered, on removing which, and passing a very slender probe down into the artery, that vessel was found to be almost impervious.

"I then prolonged the division of the integuments, and of the abdominal muscles into the cavity of the aneurism, namely between the peritoneum and the psoas, and iliacus internus muscles, from which that membrane had been torn away, the blood having burst from the ruptured aneurismal sac into the cellular substance of the peritoneum. Having then cut the artery across, about two inches from the lower part of the plug, I found it to be adherent to the psoas muscle, of about four times its natural diameter, of an oval figure, as hard as ligament, and impervious; at its lower end there were hung as it were fringes and rags of the aneurismal sac.

"I found that this oval part of the iliac artery was so stuffed up with a polypous substance, of variable density, that the texture of its coats was altogether destroyed, and it appeared to be transformed into a uniform mass, resembling a sponge soaked in wax.

"The bones of the ilium and pubes also, where the external iliac artery passes out of the abdomen in order to become the crural, and likewise in the groin where the aneurism arose, were affected with so extensive a caries, that the cancellous structure was blackened and laid bare to a great extent.

1772. "Lastly, the lower part of the crural artery, which contained no clot, was closed about the middle of the thigh, by the thin and fringed extremity of the sartorius muscle, to which it slightly adhered."

But let us return again to the dissection of the body. As during the life of the patient I had suspected, from the character of the pulse at the wrists, from the palpitation of the heart, and from the difficulty of breathing, that some disease might exist in the heart itself or in the arch of the aorta, I was anxious to inspect these parts, and on doing so I found an aneurism of the whole of the arch of the aorta. For this part of the vessel was more than double its natural size, and had at its upper part a dilatation, or rather a hernial tumour, that was equal in size to a large hen's egg. The arch of the aorta and this hernial tumour having both been opened, the internal surface appeared somewhat rough and uneven, but still there did not seem to be any opening in it, its thickness was however diminished by at least a third, so that its speedy rupture might have been anticipated.

I have committed nothing more of this dissection to paper than the figure of the popliteal artery, which being rendered narrower, was, in my opinion, the thing that appeared most worthy of consideration. But, as far as the rest is concerned, I have had a much more important case, the history, dissection, and drawing of which I will here briefly insert.

XVIII. The young man the subject of this observation was eight and twenty years of age, of a sanguineo-bilious temperament and moderate stature, and some time since suffered severely from itch. He came to the French Hospital, at the time that I was beginning my inquiries concerning aneurism, with two tumours, one in each groin, each about the size and shape of a common apple; and although they were not painful, and of the natural colour of the part, yet they pulsated so strongly, that it was most easy for me to ascertain them to be two aneurisms, although I found an emollient ointment of calestanum applied to both, from which I concluded that they had been considered by the surgeon to be two venereal buboes.

At that time I could give the patient no better advice than to betake himself to bed, which he accordingly did; but after a certain time these two aneurisms began to improve in consequence of rest, of bloodletting, the application of pads moistened with

astringent decoctions and confined by tapes, and of a better- 1772.
regulated diet. This being the case, and the patient wishing probably to change his mode of life, and suffering no pain, desired to leave the hospital, although the pulsation continued very perceptibly in both tumours.

As I could not detain him any longer, I proposed to him, if his disease were to increase, to return again; and accordingly, after a lapse of about two months, he did so. At this time both aneurisms were found much increased in size, but the left one appeared by far the largest, and being a spurious one, had raised up the whole of the left hypochondriac region into a tumour, which was soft to the touch. But the right aneurism, being a true one, remained circumscribed and hard. In both the pulsation was very evident. All the care and attention that I could bestow were in vain; for in less than a month the patient died, the aneurisms having burst internally.

After twenty-four hours had elapsed, I proceeded to examine the tumours, and found everything as it is represented in plate 2, in which the whole extent of the aorta and the heart itself are delineated, so that some small aneurisms arising in that artery, together with a peculiar one of the subclavian artery, might be shown.

Observations. It may be as well to observe that, in publishing this plate, my chief intention was to show how the tendency to aneurism could manifest itself in one subject in more places than I could have thought possible; and, indeed, the great forethought of nature may be seen in the aneurism of the right internal iliac, in which the coagulated blood was kept perforated in such a way, that a free and safe passage might be left through the diseased artery; so that, in case the aneurism increased very considerably, the limb might receive its due supply of blood without difficulty. Internal aneurisms may sometimes be adduced as examples of this foresight of nature; for as they do not always prevent the patient living for a considerable length of time, and as in the meanwhile they lose all the symptoms with which they were attended, they give rise to the false opinion that the medical attendants have been altogether mistaken in asserting their presence, as I will by and by exemplify by a case.

The spurious aneurism of the left external iliac artery may

1772. be considered as singular, on account of the very large opening in the vessel, which is represented in the second figure of the same plate.[1] The aneurism of the right subclavian is also remarkable, more particularly so on account of a small depression that existed above it, and which had almost penetrated into the vessel; so that it alone might have occasioned the unexpected and sudden death of the patient. Lastly, it is evident, both from this as well as from the preceding observation, that as so many aneurisms occurred in the same subject, in such very different situations, we never can be certain, whenever they are produced by an acrid or corroding humour, that there is only one single aneurismal tumour in the body; and we can never prevent, after having cured an external aneurism, an internal one from carrying off the patient; for these internal aneurisms are more rapidly fatal than the external ones, the artery being more speedily destroyed by them; as happened in an aneurism of the internal iliac, as may be seen in the third figure of the same plate, where a small aneurismal tumour may be observed which had not had time to expand to a larger size. This aneurism was likewise thought to have been a venereal bubo. This mistake, which is very often committed, has induced me to advert more particularly to it, so that in future surgeons may endeavour to guard against its occurrence; for such errors have frequently happened. Even in my own time one surgeon has opened an aneurism with the actual cautery, another with caustic, and a third with the knife; as was lately done in Rome by an unskilful surgeon, in a case of aneurism at the bend of the arm; and in one situated in the ham, by a priest, an empiric, who attended to external diseases. In both cases the patient died in the course of a few hours.

If the surgeon who opened the aneurism at the bend of the arm, which he believed to have been an abscess, had known anything of Morelli's case, he would either not have opened it at all, or would, perhaps, have tried the plan of treatment that I adopted. If, likewise, the priest, and the patient afflicted with popliteal aneurism, had put greater faith in the opinion of the surgeon who had told them the true nature of the disease, the unfortunate accident that occurred would not have happened.

[1] [This opening is represented as being about two inches and a half in length. The aneurism of the subclavian artery is about the size of a large cherry.]

ON ANEURISM OF THE UPPER PART OF THE LEG.

I have also endeavoured to discover some means of curing 1772.
those aneurisms that occur in the upper part of the leg, in one or other of the three arteries that are met with in this situation, namely, the anterior tibial, the posterior tibial, or the peroneal; as also those that occupy the extremity of the popliteal before it divides into these three vessels; and although I have made the trial four times, I have never succeeded as I could have wished. I have not, indeed, made the attempt to ligature the artery at the two extremities of the sac, on account of the difficulty of separating the vessel affected by the aneurism from amongst such large muscles, and of removing the tumour entire from the neighbouring parts, without at the same time wounding healthy vessels. Nor did I venture to have recourse to the ligature of these arteries, after having first opened and then emptied the aneurismal sac; for the depth of the muscles and the large tumour that I always found (for patients of this kind never apply early to the surgeon,) render the plan of tying the two orifices of the vessel which communicate with the aneurism too difficult of execution. The only plan that I have tried has been compression gradually applied, not only in the hope that I might obtain an equally fortunate result in this case, but, at least, that I might excite an inflammatory action in the circumference of the aneurismal tumour, and thus obtain its suppuration, as a consequence of that inflammation.

XIX. One case only occurred to me which in the beginning seemed fully to answer to the first object proposed, but it then so changed the course it had commenced, that, after a very great lapse of time, when the patient's strength was completely broken, it advanced to suppuration, which having quickly assumed an unhealthy character, carried off the patient, who was about twenty-four years of age, of a delicate make, and unfit for any operation that would occasion either suppuration or loss of blood.

XX. Another aneurism like the preceding one, as far as situation was concerned, but differing very widely from it in its progress, presented itself to me at the Hospital of the Holy Ghost, where I found amongst my patients, on the 15th of February, 1770,

1772. a young man, a Venetian, thirty years of age, of a melancholico-sanguine temperament, by name Benedict Antonio Bartoli, a servant. In this case the aneurism was situated in the upper part of the calf, near the ham, resembling in size and shape a hen's egg, hard and unyielding to the touch, but having a sufficiently distinct pulsation. As the weight, swelling, and uneasy sensation both in the tumour and in the tendo-achillis were much increased by walking about, he had been obliged to take to his bed. Although he attributed his complaint to violent movement of the joint, yet he confessed that he had laboured under the venereal disease. The precise situation of this tumour, as I have stated above, was uncertain, and did not admit of the application of a ligature; wherefore, as the patient was very strong, I determined, in order to fulfil the two indications that have already been mentioned, to have recourse to compression. Having, with this intention, first resorted to proper bloodletting, and having ordered the patient to be put on a very strict diet, I allowed him to remain a few days quiet in bed, in order that the œdema which had occurred about the leg and foot from walking, might be removed. I then applied a compressive bandage, carrying it from the upper part of the calf to the groin. But although the compression was very moderate, it occasioned such severe pain, that, notwithstanding bleeding was again had recourse to, I was obliged to loosen the bandage.

Finding, however, that either no pressure at all, or at all events but a very slight one, was exercised by this bandage, I reapplied it after a few days, as I had done in the first instance. This, although by no means very tight, nevertheless occasioned not only a return of the severe pains, but also a swelling of the whole limb, with such excruciating and spasmodic pain in the sole of the foot that the patient was obliged to loosen and cut it off during the night, which he afterwards passed quietly enough. But notwithstanding this, I did not omit to put him upon a strict regimen, and to have recourse to proper bloodletting and compression; but in vain, as the symptoms that have been mentioned constantly recurred, especially the severe spasmodic pain in the sole of the foot, which the patient was unable to resist or struggle against.

In the meanwhile the tumour increased considerably; and

when, on the 18th of April, it had become painful and inflamed, 1772.
I thought that the compression might be removed, and I therefore applied merely a linen cloth spread with rose ointment and tied on with a containing bandage. By these means all those symptoms that had occasioned the pain disappeared in the course of a fortnight, and the patient also was freed from the fever that had supervened. But at the very time that I hoped that I should at length see him freed from all pain and somewhat at ease, suddenly spasmodic pain of a most severe character returned towards night in the sole of the foot, and was not alleviated except by bloodletting, although this had no effect in checking the increase of the tumour. Being then, on the 15th of July, seized with a double tertian, which, as was the prevailing character at the time, was of a putrid and malignant nature, he died on the 17th of the same month.

At the expiration of twenty-four hours I proceeded to the examination of the tumour, not only in order to inspect the nature of the aneurism, but also, if possible, to ascertain the cause of the spasmodic and unusual pain which I had never before met with in cases of this kind. The tumour was therefore most carefully separated, and the direction of the vessels and of the crural nerve left precisely as they appeared, somewhat out of their natural situation, as may be seen by the 5th plate,[1] which was drawn from nature, and by which the reader may learn everything.

Observations. On the tumour being laid open, it was found to be a spurious aneurism, although it had appeared to have been a true one, for the expansion of the artery scarcely exceeded the third part of the sac, and the remainder of the tumour was formed by layers of coagula contained in a kind of cyst formed by the cellular membrane and muscles. The aneurism, therefore, though a spurious one, could have been insulated sufficiently to have ligatured it, had not its situation made me afraid. But this case increased this fear not a little; for, in order to have performed the ligature of it, it would have been necessary at the same time to have tied the nerve and vein, and, what was more important, three branches would have been de-

[1] [This plate represents an aneurism of the popliteal artery of about the size of a large orange, with the corresponding nerve stretched over it, and spread out to three or four times its natural breadth.]

1772. stroyed by the lower ligature, by which, through the means of the collateral vessels which communicated with them, the circulation of the blood in the inferior parts should have been kept up. The plan of opening the tumour was much less practicable, because in this case it could not have been done without necessarily dividing the nerve which was expanded over it.

The situations that have hitherto been described are not those alone in which aneurisms may arise; they may do so wherever arteries ramify, which the surgeon should always bear in mind whilst treating tumours. In proof of the truth of this it will suffice to publish two cases which are quite recent, as they came under my observation during this very year, 1770.

ON ANEURISMS OF THE HANDS AND FEET.

Case XXI. The first case occurred in the month of March, in the person of a groom, Joannes Parisius by name, a Roman, forty-five years of age, of a sanguineous temperament, a great wine-drinker, and now the horsekeeper of the most excellent Marquis Angeli Gabrielli. He showed me a tumour which had arisen some months before in the palm of the right hand, in that part which is called by the Greeks hypothenar. It was circumscribed, rose to the height of a common-sized apple, was indolent, and of the natural colour of the skin, if the circumference be excepted, at the base of which a violent tint was observable. It was tense at the summit, did not pulsate, and resisted the pressure of the fingers like a drum. The skin covering it was perfectly callous. In order that the concurrence of all these phenomena might not confuse my mind, I thought it would be better for me to take time about it, and therefore told the patient to come often to me, which accordingly he did for about three months; at the expiration of which, as I found that the tumour was increased in size and gave signs of fluctuation to the fingers, the skin covering it being much thinned, I thought it better not to defer the treatment any longer, and therefore sent him to the Hospital of the Holy Ghost in order that he might be placed amongst those patients who were entrusted to my care. After four days, on finding that the skin threatened to give way, I thought it better to open the tumour longitudinally with a knife, so as to see what it contained; but I had

scarcely touched it with the point of the bistoury before the blood burst forth from the wound with such violence as to cover me and many of the bystanders. As I saw the flow of blood continued copiously in a current, I immediately cut through the whole of the tissues in which the blood was contained, and compressed the wounded artery with my thumb, until, having applied a tourniquet round the middle of the arm, I succeeded in securing the patient from a return of the bleeding by the employment of dry dressings, of pads, and of a compressive bandage which I ascertained to be properly applied by gradually and slowly loosening the tourniquet. 1772.

No blood appeared again until the evening of the following day, an interval of forty-two hours, when, in consequence of the patient having imprudently moved his hand, a fresh hemorrhage occurred; and when assistance reached him rather too tardily, the loss of blood had been such that the extreme unction had been administered to him. As, in consequence of this occurrence, the patient became more cautious, no more bleeding took place, and in twenty-six days the wound was healed.

Observations. It would be difficult for me to say from what artery this aneurism arose, whether from the first branch that the ulnar usually sends off from the palmar arch to the hypothenar, or from the superficial palmar arch itself. The very copious hemorrhage would lead me to incline to the palmar arch; for the branch that is given off to the hypothenar appears to be too small and narrow to be able to pour out so large a quantity of blood.

Two practical conclusions can be deduced from this case of aneurism; namely, in the first place, though the opened artery was supposed to have been small, yet twenty-four and then thirty-six hours elapsed before we could consider it to be properly and effectually closed. In the second place, generally speaking, in tumours the skin is not, for many reasons that are now well known, to be left until it sloughs in order to avoid an incision; and this must never be done in tumours of a doubtful character, such as this one was, of the nature of which I confess I was entirely ignorant; for if this tumour had given way of its own accord during the night, the patient would have died suddenly and instantaneously.

XXII. The second case was related to me on the 16th of

1772. May 1770, by a pupil of mine now practising as a surgeon at Longiano, in order that I might give an opinion upon it. He was bleeding a young countrywoman in one of the largest of the veins that ramify about the tarsus and metatarsus, and had obtained the proper quantity of blood from it, the flow of which was easily arrested. No further bleeding took place until the following day. The patient thought that the cause of its occurrence then was a blow that she received on the wounded vein whilst in the fields. This flow of blood was, however, soon arrested by the application of the bandage; but in the course of a few days she observed in the situation in which she had been bled a small tumour of about the size of a hazel-nut, which was fluctuating, indolent, and of the natural colour of the skin. But what caused the surgeon most uneasiness was, that it had a sensible pulsation, by which it was recognized to be an aneurism. He further stated that, although he had employed several remedies, it remained in the same state. This case, however, clearly shows that, although on the dorsum of the foot there are only some very small branches of the anterior tibial artery, yet that it is possible for them, when wounded, to become aneurismal; and therefore that the surgeon who bleeds should be careful even in these cases, and should disregard the common opinion that there is no danger.

[Here follows a series of five cases of internal aneurisms, chiefly of the aorta, but which, as they contain nothing of interest, and could not be understood without reference to the plates that accompany them, have been omitted.]

ON ANEURISMS AT THE BEND OF THE ARM.[1]

Case I. A certain youth, of the name of Didacus Pagani, formerly a lacquey in the service of the most illustrious Marquis Angelo Gabrielli, about twenty-one years of age, and of scorbutic temperament, was sent by his mother, in the month of November 1744, as he was out of place, to Velitra, to sell herbs. But being there attacked with fever, he was, by the orders of

[1] Historiæ duæ Aneurysmatum quorum alterum in brachio per chirurgicam operationem sanatum, in femore alterum paucas intra dies lethale fuit, &c. &c., curâ et studio Caroli Guattani. Romæ, 4to; and in Lauth's Collection.

his physician, bled by a barber in the left arm; by which means 1772.
the fever was so reduced that he did not hesitate to return to
Albano, which was his native place.

Having there applied to a medical man, he told him, amongst other things, but as if he considered it of no consequence, that he had found in the left arm, at the spot where he had been bled, a small tumour, which pulsated, and which was about the size of a hazel-nut, but was unaccompanied by pain, and was of the natural colour of the parts. The medical man, however, perceiving at once the nature and danger of the disease, advised him to go without delay to Rome in order that he might be properly treated. A surgeon who saw him was of the same opinion.

When the patient, therefore, heard that he was labouring under an aneurism, he went, as soon as he arrived in Rome, to his old master, who pitying the misfortune of his servant, directed him to go to me in order that I might restore him to health. I found him to be of a bad habit of body, suffering from continual feverishness, and having in the left arm a tumour which was observed to pulsate violently and to exceed a nut in size.

As I was particularly desirous, not only to rescue from death this young man, whom I knew very well, and whom I had many times cured of the venereal disease, but also to comply with the wishes of his master, whom I always had a great desire of pleasing, I ordered him to be brought to the Hospital of the Holy Ghost, in order that he might get rid of his fever and recruit his strength before undergoing the operation.

He therefore entered the hospital towards the close of November, and as soon as he was cured of his fever I took care that he had plenty of the best food, and that he took exercise both in the hospital and out of doors, so that he might gain strength the more readily. And as I found that his health had improved, as much as his temperament would allow, I determined to operate about the beginning of February. In the meanwhile the tumour had attained the size of a hen's egg.

The operation. I accordingly proceeded to operate in the following way: I first took care that the room in which I intended to operate should, as the weather was very cold, be artificially warmed; I then made the patient sit down in an old-fashioned

1772. chair, that is to say, one, the arms of which were neither crooked nor twisted, and managed so that the light coming into the chamber should fall upon the back of the chair, where I placed the patient in order that I might see better. He had on his shoes and stockings, and was covered with a bed-gown.

Having thus placed the patient, I extended his arm upon that of the chair, and ordered one of my three assistants to support and steady the shoulder, another the elbow and hand, and the third the head and trunk. I then lightly encircled the arm with a bleeding tape, in such a way that the knot might be tied away from the artery, opposite to it.

I then placed, both under the knot and under the tape, in the situation of the artery, a piece of pasteboard, so that when the bandage was tightened the piece placed over the artery might cause the vessel to be equally compressed, whilst that under the knot would prevent the integuments falling into folds and thus occasioning pain.

A small stick was then introduced between the knot and the pasteboard, so as to act as a tourniquet and tighten the tape in such a way as to interrupt entirely the flow of blood; which could be done by twisting the stick one turn and a half. I entrusted this to the most skilful of my assistants, so that he might tighten or loosen it as occasion required.

Having then slightly flexed the patient's arm, and having raised the integuments, I made an oblique incision from below upwards and inwards towards the internal condyle. The integuments being then drawn aside, I did not find the tumour free, but enveloped by membrane and muscle. I had thought that it would have been necessary to have divided the tendinous expansion of the biceps, but I only found a few scattered fibres stretched across from one part of the tumour to the other.

In order to set the tumour entirely at liberty, I thought that it would have been sufficient to have divided these fibres and the remaining membranes, which confined it anteriorly towards the tendon of the biceps. Wherefore I enlarged the incision with the scalpel to such an extent that I could introduce the index-finger of my left hand, which was a great assistance to me in dividing the membranes; which, being unable to do with the finger, I accomplished with the knife. In this way, I exposed the artery both above and below the tumour, endeavouring by

every means to avoid leaving any stretched fibre by which the contraction of the biceps might be impeded. 1772.

I also continued to separate the tumour posteriorly until I encountered the large nerve that accompanies the artery, and until I had so far disengaged it from the surrounding membranes and muscles that I could ligature the vessel both above and below.

I then took a blunt needle, somewhat curved, with an eye near the point, and threaded with three strong waxed ligatures, and having introduced it beneath the already separated artery and carried the threads across, I withdrew it. With one of the ligatures I tied the artery above, with the other below the aneurism, so as to leave it between the two; but I left the third thread so that it might be used if one of the others either gave way or did not compress the vessel tightly enough.

Having done this, I opened the tumour longitudinally with a scalpel, and found in it polypous concretions of the same kind that are usually met with in other aneurisms. I then emptied the sac, and ordered the assistant to loosen the bandage by untwisting the stick, in order to be more certain that no blood escaped by the ligatured artery; and although not a drop flowed. yet I tied the vessel above the tumour with the third thread, so that the patient might be rendered more secure against the most dangerous of all the symptoms that could occur, namely, hemorrhage. After I had seen that the artery was completely closed, I ordered the same assistant to tighten the bandage again by twisting the stick, in order that I might dress the wound more conveniently; which I did in the following way:

I filled the cavity of the aneurism and the whole of the wound with a mass of dry charpie, and then covered the parts and also the elbow-joint with tow dipped in white of egg and spirits of wine; I next laid a small square thick pad upon the wound, and above this another one of less thickness but of larger size, and lastly, above this again a linen cloth four times folded, which formed a slender and oblong compress; this I applied transversely to the joint, and above this, also in a transverse direction, another linen cloth split at the extremities, and so long as to make a turn and a half round the limb; I then tied up the arm with a bleeding bandage of double the usual length.

Before completing this bandaging, I took a piece of paste-

1772. board, about three fingers' breadth wide, and sufficiently long to cover the whole tract of the artery, and placed it between the axilla and the seat of the operation with a pad upon it corresponding to it in width and length; and, by the aid of a linen cloth, which enveloped the whole of the upper arm, I continued the bandaging in the same way as after bloodletting; lastly, taking a much longer and broader bandage, I placed one extremity in the axilla, the cavity of which I filled with pads retained in their place by making turns of the bandage above and beneath the shoulder, in order to compress the artery so as to lessen the force of the arterial blood before it reached the ligature. I also bandaged up the whole of the hand and fore-arm and kept the elbow fixed at an obtuse angle.

I then ordered the patient to be taken back to bed, the bandage, however, having been left which I had used to compress the arm with; the limb was so arranged by the help of cushions that it might remain on a level with the body and be somewhat flexed; I then moistened all the bandages with tepid spirits of wine, those more particularly about the elbow-joint, and directed the assistants to repeat this tepid spirit bath every hour, and to give the patient some broth every third hour so as to nourish him moderately; he was also directed to be let blood and to have his bowels opened by means of a clyster.

About this time the patient began to complain of some pain in the affected part, but he gave no signs of discouragement or depression of mind; as he was during the operation so was he after it. Moreover, as the assistants were about opening a vein, as had been directed, they found that blood exuded from the affected arm; but, without fearing this in the least, they tightened the tourniquet, as I had directed, (for it was on this account that I left the bandage,) and applied another roller so as to bind up the arm somewhat more tightly, by which means they succeeded in arresting the hemorrhage. After this, blood was drawn from the right arm and an emollient clyster administered.

The pain having then ceased in the affected part, the tourniquet was again loosened. On revisiting the patient I found his pulse much disturbed and that he was very restless, on which account I ordered him, unless things improved somewhat, to be bled again in the evening. I found that the temperature of the hand of the affected limb was the same as that of the sound one,

and that there was no swelling of it; the patient could also move the fingers sufficiently well, although he stated that the limb was very tightly bandaged. 1772.

He informed me, on the following morning, that he had passed a sleepless night, both on account of the too great constriction of the limb, as well as of the very strong pulsation at the point where the artery was ligatured; and indeed his pulse was more disturbed than before. As no blood had been taken away on the preceding evening, the patient having appeared to be better, he was immediately bled in the vena salvatella, and a clyster was administered: I took off the bandage that had been last applied and loosened the others, which having been done, the patient felt much relieved and the pulsation of the affected part, especially, remitted very considerably, nor did anything now occur in the hand or arm; I therefore did not alter the diet and medicines that had been ordered.

On the next day I found the patient somewhat weakened, but almost free from pain, and refreshed by sleep. The motions were however liquid, and more frequent than customary, which gave me considerable uneasiness, as in every surgical disease, so more especially in an operation of so much consequence, a relaxation of the bowels is always a bad sign. Wherefore I ordered him at mid-day and in the evening, instead of his simple broth, a light bread pudding having given beforehand, some absorbent powders, so as not to check altogether the action of the bowels, but merely to offer some obstacle so as to lessen any future bad consequences.

But as it did not seem probable that this hemorrhage could have occurred so early in consequence of the operation merely, I doubted not but that the patient had committed some imprudence, and accordingly on inquiry I learnt that he had eaten very voraciously, in order to escape the attention of the bystanders, eight ounces of bread and some biscuits that he had obtained, and also that he had drunk a glass of wine.

On the fourth day I found him feverish, the bowels were more regular, and he had passed a good night, but still he suffered a great deal of pain in the wound. Wherefore I ordered all the bandages to be loosened, the wound however being left untouched. On the fifth day all the bandages having been removed, and the wound uncovered, laudable pus in moderate quantity was dis-

1772. charged, the lips of the wound appearing neither inflamed nor swollen, but the ligatured end of the artery was of a black colour. I then dressed the wound with a piece of the finest lint covered with a digestive ointment and Spanish oil, as it is called, and surrounded this with a piece of linen smeared with digestive ointment only, and so large as to include not only the wound but the shoulder, and the whole of the joint. Then tying up the arm in the bandages that had been taken off, I placed it in its former position; by which means the patient expressed himself as being altogether free from pain. Fomentations of spirits of wine were then, as before, used to the elbow and hand, which preserved their temperature, and had not swollen at all.

On the sixth day I found the patient feverish; his bowels were relaxed and he had passed a bad night; on the wound being uncovered there was a considerable discharge of pus, which, however, was of a healthy character; I therefore ordered that the wound should be again dressed in the evening, in the same way as before. Towards night, however, although the discharge was as great as it had been in the morning, fever came on again, the patient was restless, began to complain of tightness about the chest and of pain in the affected part, so as to require bloodletting, which, however, was not practised.

On the seventh day he was much better; the oppression about the chest appeared to be chiefly owing to a rheumatic cold that he had caught in consequence of not being sufficiently covered up in bed, and which lasted until the following day.

On the eighth day I found the wound discharging so copiously that the ligatured artery could now be separated from the surrounding parts; the pus appeared well concreted. The size and temperature of the fore-arm were quite natural, but the motion of the thumb and index-finger was not so free as it should have been. A small deeply-seated pulsation could be felt at the wrist, the fever continued, and the bowels were still disturbed; I accordingly ordered him in future to take every morning the decoction of vulnerary.

On the ninth day I found the patient free from the fever and the oppression of the chest. The wound was suppurating healthily, but whilst it was granulating the pain was very great. The pulse in the healthy limb was strong; there had been three motions, and those not at all liquid, during the preceding night.

On the following day, that is the beginning of the tenth, I found the patient refreshed by sleep, there had been only two stools which were solid; he was altogether free from fever; and on uncovering the wound it was also found to be improved, for the discharge and the colour of the pus were perfectly healthy and the pain had lessened. I therefore ordered that the same plan of treatment and the same kind of diet should be continued. 1772.

On the eleventh day the patient was still better, had no fever, and had slept well. The wound, whilst it was being uncovered, pained slightly, although the granulations and discharge were of the best kind.

On the twelfth day, as he complained of being hungry, I allowed him to mix an egg, morning and evening, with his potage. Everything was going on most favorably, and the diarrhœa had now ceased entirely.

On the thirteenth day, pus of a thicker kind and of a greenish colour was discharged in greater quantity; the patient however declared that he had done nothing except eat some crust of bread with the egg that I had allowed him to mix with his potage, but which he had, without my knowledge, been in the habit of boiling; as his bowels had been confined for three days, an emollient clyster was ordered, which, however, as the fever returned in the evening, the patient refused to have administered.

[Things continued in much the same state until]

The seventeenth day, when the bowels were opened twice; but some disturbance of the pulse continued, and pus, though of a healthy quality, flowed in too great abundance from the wound. On inquiring into the cause of this copious discharge, I found a sinus under the integuments running up towards the bend of the arm. Thinking that this could be removed by compression, I determined not to dilate it.

[The patient continued to improve until]

The twenty-first day, when the fever had entirely ceased; the bowels were still, however, relaxed, and had acted five times, occasioning very severe pain about the anus after the motions; to relieve which cooling liquids were injected, and the patient was ordered to resume the absorbent powders, but to leave off the decoction of vulnerary, which he had taken daily since the ninth day. I applied pitch ointment to the wound, and although the sinus appeared to be filled up, I still continued the same bandage.

1772. On the twenty-fourth day the wound had narrowed; I therefore applied tutty ointment to it, and ordered a better diet, both in the morning and evening, consisting of four ounces of bread and a little red wine, which always has a tendency to arrest the action of the bowels. I also directed that his porridge should be made with flour that had been kneaded, as is customary in our hospital.

By these means, continued for several days, the patient was at length, on the thirty-third day, restored to perfect health, and the arm and hand were capable of performing every kind of movement, although the pulsation of the artery was scarcely perceptible. In order to determine more accurately the temperature of the patient, we applied a thermometer, at regular intervals of time, alternately to each arm; and found, as often as the experiment was made, that the mercury stood four degrees higher when the instrument was applied to the sound than when it was to the diseased arm. The patient then left the hospital and returned home perfectly cured.

Anatomical and practical observations. The symptoms that accompanied this operation and the entire restoration of the health of the limb have induced me to make some anatomical and surgical observations upon it. It is an established and well-ascertained fact, determined by experiment, that all muscles are deprived of sense and motion if the artery that supplies them with blood be either divided or tied; as also happens if the nerve be removed or cut across; besides this, since the free circulation of the blood distributes heat to the extremities, if this be interrupted, the temperature of the parts must also be diminished. Lastly, the flow of blood to any part being arrested, the pulsation of the arteries ought then to cease entirely.

From all this it would appear that, after the operation had been performed, the patient's arm should have been deprived of sense, motion, and heat, and that no pulsation should have been perceptible at the wrist. But it happened altogether otherwise; for, after the operation, the arm and hand preserved their normal temperature, nor was sensation or motion diminished in any part, if the thumb and forefinger be excepted, in which they were not altogether so freely and easily performed. The radial artery also was still felt to pulsate, though feebly, at the wrist.

As all these circumstances appeared clearly to indicate that there exist other routes besides the main trunk of the artery by which the blood can be carried to the arm and hand, I determined to examine them, lest a want of knowledge of these might be at a future period an obstacle to any one wishing to undertake this operation. 1772.

But although I have most carefully investigated this subject, and have attentively examined four arms, yet I have not as yet been able to throw any light upon it. For although I found in each arm almost the same ramifications of the arteries, yet I could not discover any anastomoses, notwithstanding that I laboured with my whole industry in following out their ultimate and smallest branches. I told, as I was accustomed to do, the fruitless result of these investigations to the most illustrious and distinguished President Antonio Leprotti, the chief physician to the Pope, a most ardent anatomist, and to whose extraordinary skill and science all my knowledge of anatomy (such as it may be) is owing, for I learnt from him the best way of dissecting the human body; he also allowed me to gain that knowledge in his very rich and well-selected library without which I should never have been able to have verified on the body the very recent and beautiful discoveries of the anatomists, and gave me a large quantity of instruments, so that, with their assistance, I might undertake these anatomical investigations. He therefore, as I was about to say immediately put into my hands the second volume of the 'Medical Observations of Edinburgh,' in which I found, with the greatest pleasure, the very excellent and most complete observations of Macgill on the operation for this kind of aneurism, and the very learned explanation of Dr. Alexander Monro annexed to it 'on the Coats of Arteries, their Diseases, and particularly in the formation of an Aneurism,' in which four plates are given, the second of which (by the very celebrated Cowper) and the fourth plainly show the anastomoses; the first only exhibits the course of the main trunk and its distributions.

I did not think that I could exhibit these anastomoses in any way but by injection, which accordingly I did in the following manner. Having divided the integuments over the spot where the tumour usually arises, and having found the artery, I ligatured it there, so that the fluid being forcibly injected and pass-

1772. ing into the ramifications of the trunk with a certain degree of impetus, might, by the aid of the anastomoses, find its way into the larger vessels below the ligature, which indeed happened; for those arteries which divide in numerous branches in the muscles being ligatured, the injection was scarcely thrown into the axillary artery before the principal trunk below the ligature appeared so distended, that my assistant, who was most skilful in anatomical dissections, immediately cried out, "the ligature has given way, for the fluid has passed beyond it!" Then explaining it to him, I eagerly directed my attention to discover the anastomoses, and found them beautifully developed.

Other observations. Although in the very many arms, injected as well as uninjected, that we have examined, we have never as yet found a double humeral artery, still it may be as well to observe that this has been seen, not only by Dr. Alexander Monro, as is shown by his third plate, but also by the very celebrated Heister, who has pointed out to us how both the divisions of this artery may continue separate from one another till they reached the hand; and he also represents the anastomoses of these branches at the apex of each finger. This distribution of the artery, if it sometimes happen, must be more useful for the performance of the operation than the others that have already been described, as must appear evident to every one that attends to the subject.

In all the injections that have just been mentioned, before the coloured liquid was thrown into the axillary artery the vessel was ligatured at the point where an aneurismal tumour would have arisen in consequence of a puncture during venesection; and this, as has been said, was done with the intention that the injected fluid could be made to pass more readily into the collateral ramifications. It may also be stated here that when the coloured injection was thrown in without a ligature having previously been applied, it exhibited equally well the collateral branches, with their anastomoses, just as in the former experiment.

It is particularly to be observed that aneurism of the arm is especially apt to arise when, in bleeding, the basilic vein is chosen rather than the cephalic or median; for the brachial artery usually runs beneath it, on which account we should always feel whether any pulsation can be perceived under it, or under

or in the neigbourhood of the median. The surgeon then should always, before he bleeds, examine and ascertain by the touch under which of these three veins the artery lies, and rejecting that one, have recourse to another, if he can do so conveniently. 1772.

Indeed I have often pierced the basilic vein with a needle at that spot where blood is generally drawn, and then leaving it sticking in, I have dissected the part in order to ascertain where, after the vein was transfixed, the point of the needle would be found; which was, for the most part, in the artery itself, and sometimes near that vessel. I did not indeed make this experiment in order to ascertain with certainty whether the artery lay under the basilic vein, for this I had already determined, but that I might discover the distance that intervened between the point that was punctured and the giving off of the principal branches; so that it might accurately be determined for how long, whilst the aneurismal tumour was increasing, there might be a passage for the blood through the lateral ramifications to the inferior part of the limb; and for how long it might be safe to have recourse to the operation. Having then, as I said, made the experiment, I found that the point at which the puncture in bleeding is usually made was about two fingers' breadth from those collateral branches of the artery that serve to keep up the anastomosis.

Hence this interval ought never to be altogether filled up by the aneurism before having recourse to the operation, lest on tying the artery above and below the tumour, we destroy the superior or inferior anastomosing branches; for it is very evident that if these were destroyed, the arm and hand would be deprived of blood to such an extent that symptoms would occur which could not be remedied in any way except by the amputation of the limb. If indeed any one branch, arising either from the radial or ulnar artery, were destroyed, those parts would be deprived of sense and motion that are supplied by it with blood. This happened to the patient of Dr. Macgill, in whom, as he himself confessed, there was, two months after the operation, no pulsation perceptible at the wrist; the motion of the thumb and first finger was very much impaired, and the diseased limb not only remained weak, but was also affected by a certain degree of numbness, all of which continued except the absence of pul-

1772. sation, which was observed by Macgill to reappear at the wrist to a certain extent after the lapse of some months. These accidents did not indeed happen to our patient, for at present he suffers from no other consequences of his disease than a somewhat feebler pulse than natural. On considering, then, the whole train of symptoms that affected Dr. Macgill's patient after the operation, and from which ours was free, it is, I think, easy to conclude that in the former (the tumour having been allowed to attain too great a size before the operation was performed) the whole space that lies between the situation of the injury and the collateral arterial branches was so filled up by the tumour, that one of the inferior anastomosing vessels was either cut off during the operation or else destroyed during the suppuration; whence the circulation of the blood could not be properly performed through all the vessels of the limb.

Conclusion. But as I think that all these accidents may be avoided, it is particularly to be wished that, at least, this useful result might emanate from my observations, namely, that we must not delay the performance of this operation, lest, besides other mischief that might result therefrom, one of the inferior anastomosing branches might be ligatured, whence these inconveniences that we have been adverting to might result. After having, first of all, attended to those measures for checking the increase of the tumour that have been proposed by authors, I would recommend invariably that the operation be proceeded with after as little delay as possible; which advice not only receives weight from the structure of the arteries, but is also most strikingly confirmed if the cases of the two patients be compared with one another.

ON THE FALSE ANEURISM OF THE ARM.

The aneurism that has just been described is not indeed the only one that occurs at the bend of the arm, for it belongs to the variety that is called by surgeons true aneurism, but there is also a very different and more common kind, occurring in the same situation which is called false. Wherefore I think that it may be interesting and agreeable to those who practise phlebotomy, if I likewise point out the diagnostic signs of this, as well as the safest and simplest plan of treating it, without the

necessity of having recourse to any dangerous operation. This plan, although it has not yet received the attention that it ought, still appears to me to be very safe, and of the greatest importance. But although cases of this kind are frequently met with, both in the transactions of modern societies as well as in the writings of the ancient physicians, not even excepting Galen, yet I pass all these by in silence, except only that one which Bernardus Genga, formerly my very celebrated predecessor at the Hospital of the Holy Ghost, published in his 'Surgical Anatomy;' and I refer to it chiefly on this account, that the case of Genga resembled my own, inasmuch as it followed the same course. 1772.

For in bleeding in the basilic vein, according as the lancet be introduced to a greater or less depth, it not unfrequently happens that the artery is wounded more or less deeply. But if the point of the instrument does not penetrate to the cavity of the vessel, but only pierces two or three of the arterial coats, an aneurism will be formed. For the resistance being diminished at the point that is wounded, the arterial blood, striking constantly against the membranes that are still entire, gradually so distends them that they protrude like a hernia, and, sooner or later, form an indolent tumour, which will not only be of the natural colour of the part, and of a round or oval figure, but will also possess a sensible and sufficiently strong pulsation, which symptom, although it is the least equivocal of all in this kind of aneurism, does not always appear directly, but only after some days, or weeks, or months, as happened in the case that has just been mentioned; which may serve as an example for diagnosticating and curing aneurisms of this kind, if my plan of bandaging and compression do not suffice.

Whenever the vein is transfixed, and the lancet has penetrated into the cavity of the artery, this accident will be rendered evident by those symptoms that Galen mentions when he says: "Sanguis autem flavus, et tenuis, et fervidus statim ejaculatur, idque cum quodam veluti saltu." This constitutes another kind of aneurism, which is called false or bastard (spuria vel notha), and which I shall now treat of. It is, however, to be observed, that the brachial artery is not always found in the same situation; sometimes, indeed, and that most frequently, it lies directly under the basilic vein, sometimes a little more anteriorly, towards the median vein, and, lastly, it is oc-

1772. casionally met with between the basilic vein and the internal condyle of the humerus; as Bernardus Genga states that he found it in a case which afforded him the opportunity of devising a new and, in my opinion, the safest method of closing the artery. There is a small branch that is not always met with, but which occasionally arises from the upper part of the brachial artery, and crosses the basilic vein at that spot, where it is generally punctured during bloodletting; as happened to a certain knight, which induced the surgeon, who thought the case to be incurable, to withdraw into a monastery, and to give his name to a religious order.

It is moreover to be observed, that the increase in the force and quantity of the blood is not sufficient evidence that the surgeon can, with certainty, conclude from it that he has punctured the artery, as happened in a case to which Genga was sent, in order to treat an imaginary wound of the brachial artery. He immediately saw that the jerking of the blood might happen from the extreme vicinity of the artery, which, by communicating its own pulsations to the vein, made the surgeon, the patient, and all the bystanders think that the artery was wounded, more particularly so, as the blood that escaped was thin and dissolved.

Therefore, as the force and jerking of the blood, together with its bright colour and thinness, are very equivocal signs of the artery being punctured; and as compression of the basilic vein, made about a finger's breadth below the wound, in order to interrupt the course of the blood, cannot, on account of its free communication with other veins, be a more certain sign of this accident, the surgeon ought immediately to try the effect of compressing the brachial artery itself; for if he find, on applying his thumb to it, at about a finger's breadth above the wound, that the force and jerking of the blood, either entirely or in a great measure ceases, he may consider this as an unequivocal proof of the artery being wounded. I have said, either entirely or in a great measure, for this reason, that some blood may be supplied to the wound from below by means of the collateral arteries, as is clearly shown in the plates of aneurism of the arm.

But as, in this experiment, some obscurity may happen from the collateral arteries, it will be the safest plan of all, if the surgeon, whilst his assistant is compressing the wound, should apply

a ligature like a tourniquet to the upper part of the arm, as is customary during amputations. The object of this ligature is to arrest the flow of the arterial blood; but I need not describe it here, as an account of it is given in every treatise on operative surgery, and its application will assuredly have been learned by all surgeons before they undertake to bleed a patient. 1772.

This ligature having been properly tightened, the compression will, especially if it be made on that part of the arm where the vessels pass, with certainty arrest the course of the blood, and will afford most conclusive proof of the artery being wounded; and it can also serve for making that kind of bandage which Bernardus Genga most happily devised, and most successfully employed, in order to heal up the wound; and which, if it be applied immediately, with some additions that have been made by me, appears to be a most certain means of safety. I therefore advise all phlebotomists that they should by no means despond under these circumstances, but should apply themselves with alacrity, when the life of a man, or at least the safety of a limb, is at stake; and do not let them flatter themselves, or be led away by the hope that they can cure the wound without the mistake they have committed being detected. For accidents of this kind can never be concealed, unless perchance it be, as sometimes may happen, that from the very beginning the wound in the artery may be healed by the bandaging that is adopted in bloodletting. But this can never be relied upon, unless the small arterial branch that has already been mentioned were present, which it is not difficult to diagnose from the very small stream of blood that escapes, whilst in the meantime no increase of motion will be perceived in the trunk of the brachial artery.

Genga's bandage will be of very considerable assistance, if it be immediately applied; for this great advantage arises from bandaging the arm, and employing pressure on the wounded artery, before the blood has escaped from the vessels, that it does not prevent the wound from coalescing; nor will the blood effused through the cellular tissue occupy the whole of the interstices between the muscles of the arm, stretching up to the axilla and the pectoral muscles, as happened to a certain woman (Case II), who was in this way suffocated; or as was observed in a man, in whom, from continual fomentation with spirits of wine, and constant flexion of the arm, such a degree of rigidity

1772. occurred in the tendon of the biceps, that it could in no way be relieved so as to enable me to apply a ligature to the artery, which I attempted to do twenty-seven days after the accident had happened. Nothing was left then but the amputation of the arm. When, therefore, I clearly ascertained that I could not apply a ligature to the artery, on account of the contraction and rigidity of the tendon of the biceps, I determined upon the amputation of the limb, which I immediately undertook, with the assistance of Peter Javina. When we examined the state of the wound in the artery at my house, we found the greatest difficulty not only in discovering, but also in ligaturing the vessel; for this artery no longer remained in its accustomed place, but had been entirely removed from it by the coagula, which had pushed it upwards to the inner side of the skin, and the fat covering the effused and coagulated blood at the bend of the arm; the whole of which had been raised up into a tumour.

Indeed I rejoiced greatly, on this account, that I had not attempted the operation of ligaturing the artery; for if it were so difficult to find the vessel after the arm had been amputated, it would have been very much more so, as we both agreed, in the living subject. Wherefore these two conditions, namely, insuperable rigidity of the tendon of the biceps, and a change in the situation of the brachial artery, may be added to the other inconveniences that may arise, if that safest of all plans of treatment, the application of Genga's bandage, be omitted.

The patient in question, who was of a moderate temperament, and by no means tall, had passed his sixty-fifth year, and went on so favorably until the fourteenth day, that the bone was covered with healthy flesh, and the wound was so contracted as not to exceed an inch in width. But on this day, towards evening, he was attacked by a double tertian fever, and although that most excellent physician Michaelis employed every means that could be of use, yet he died on the twenty-first day of his disease, on the seventh from the accession of the fever, without, however, the wound having undergone any change. Thus this patient died, without doubt, of the fever only, and not of the amputation; for here those causes of death could not have come into operation, which we mentioned as influencing the four amputations that were practised on account of popliteal aneurisms; for those arose from an internal disease; whereas this aneurism of the arm was

occasioned solely by a faulty bloodletting; and, indeed, in another patient, whose arm I cut off for the same disease, the restoration to health was most speedy; for the amputation of the affected member is best in those cases of aneurism that arise from an external cause, and may be safely practised in them. 1772.

Observations. But before I describe the application of the bandage invented by Bernardus Genga, it may be as well to make a remark here, which I think is of very great utility, and on which I believe its fortunate effects chiefly depend. As the vein is usually cut during bleeding in one of three ways, viz. either longitudinally, obliquely, or transversely, the artery must also be wounded in the same direction; for its incision necessarily corresponds to that of the vein. It is, however, a general precept in surgery, that we must endeavour, in all those wounds that require to be united, to bring the edges in apposition in a direction corresponding to that of the wound; for unless this be done the union of the divided parts cannot be obtained. Hence it is likewise a general rule so to place wounded parts that possess the power of flexion and extension that they may correspond exactly with the direction of the wound, by which means they may adhere together. For example, if the tendon of the biceps be wounded in a longitudinal direction, the arm in this case, both as respects the skin and the tendon, should be extended, and not placed at an obtuse angle; for when extended the lips of the wound will be kept together; whereas, if placed at an obtuse angle, they would mutually recede. If, on the contrary, the wound were oblique or transverse, the bent position of the arm would keep its edges in contact. Wherefore a wound of the brachial artery will also require these different positions, which will appear equally evident if the experiment be made on a dead body, although the artery may then be empty, the impulse of the arterial blood in it be wanting, and its natural elasticity diminished. But another consideration occurs here; for if the arm be bandaged whilst extended, its flexion will relax the apparatus, and diminish the power of the compression. The practice that prevails amongst surgeons of placing a bandaged arm at an obtuse angle will, unless we pay attention to it, lead us into this error.

As amongst a good many cases, in which the brachial artery has been wounded during bleeding, I have only seen several patients

1772. restored to health solely by the application of bandages, which compressed the affected part I was led to inquire why this did not always happen, more particularly as the surgeon always employs compression, and places the arm at an obtuse angle. But I think that I have discovered the cause of this, in the distinctions that have just been made, and for the reasons that have been given, as well as by having it proved in four cases of aneurism that have lately occurred to me; for although in all of them the shape of the cicatrix was longitudinal, and neither oblique nor transverse, yet in each the same treatment was adopted.

For it was not only the wound of the integument that was so, but also that of the artery, which I examined carefully, in the woman who has just been mentioned as having died suffocated, and in whom the tightest compressive bandage, continued uninterruptedly for six days, was altogether useless; for when I saw her the arm was placed at an obtuse angle. After I had amputated her arm I found a wound of the kind that is mentioned above in the integuments, and a similar one would have been found in the artery, if the length of time had not converted it into an oval aperture, as may be seen in a portion of the vessel that is still preserved by me at home. The cicatrices in the two other cases of aneurism, which were carefully observed by me, had the same direction. I shall briefly speak of these immediately, as several remarkable circumstances worthy of observation occurred in them.

Therefore, as in the four cases of aneurism that have just been mentioned, a longitudinal cicatrix was always found, and as not one of them was cured by the customary plan of bandaging and of placing the limb, contrary to what we have not uncommonly observed in others, I am the more easily induced to propose what I believe to be a real and not an imaginary distinction, and to assert confidently that the surgeon may always learn from the direction of the external wound in the integuments what will be that of the one in the artery; and therefore, if he find the direction of the wound of the integuments to be longitudinal, he should bandage the arm and place it in an extended position; but if he observe that the wound in the integuments be oblique or transverse, he should act differently, and having bandaged the arm, bent at an obtuse angle, maintain it in that position.

III. The first of the two cases of aneurism that have been alluded to above happened in a young man, a shoemaker by trade, twenty-seven years of age, who was bled on the 15th of August 1769, in the basilic vein of the right arm, and whom I found, on the 26th of October, amongst my patients at the Hospital of the Holy Ghost. On examination, I found a longitudinal cicatrix in the situation of the basilic vein, and at the same spot a small tumour of a spherical shape and about as large as a cherry, it was altogether free from pain, of the natural colour of the parts, but pulsated violently, and was accompanied by a sufficiently strong hissing noise. This tubercle, on being compressed by the fingers, disappeared immediately, but likewise returned instantly on being left to itself. On touching it, it also became evident that the hissing was occasioned by the blood passing forcibly through the narrow opening in the centre of the tumour. 1772.

The patient told me that as soon as the vein had been opened the blood flew out with such violence, that, in order to check it, it became necessary to apply to the wound two very hard pads, and to compress them with a tight bandage; but on the third day the surgeon was obliged, on account of the great swelling of the arm, to loosen the fillet, and, finding the wound healed, he left the limb at liberty. When, however, after a few days, the patient perceived an unusual pulsation in the seat of the wound, he determined, as I have just said, to go to the hospital, where I immediately employed compression; this I did by first applying two long and square pads crossed like an x, so that, as the centre of each corresponded to the aneurism, this might be properly compressed. I then moistened these pads with spirits of wine, and covered them with cloths, which enveloped the whole of the joint and which were split at their extremities in order that they might be the better applied. Having then applied a bandage in the way that is usually adopted after bloodletting, I completed the compressing apparatus. This being done, I applied another thick pad from the bend of the elbow to the axilla, in the course of the vessels, so that the current of the blood in the brachial artery might be moderated; and then, having moistened other cloths with spirits of wine, and surrounded the whole shoulder with them, I covered up the pads and tightened the compressing bandage to such an extent as not

1772. to arrest the circulation completely. The arm was placed in an extended position, the patient was compelled to submit to a proper diet, and was bled to a sufficient extent; the whole of the bandage was then soaked with spirits of wine or wine and water.

After eight days' time I renewed the bandage, having first taken away a moderate quantity of blood, which was again done by me after another interval of ten days. And, although the tumour appeared at this time to be entirely removed, yet I continued the same plan of treatment for forty days; at the expiration of which, as it was evident that the tubercle, although left entirely to itself did not reappear, I merely applied a bleeding bandage; the pulsation and hissing however still continued, though but very feebly.

The patient then left the hospital, and although he lived intemperately and returned to his laborious occupation, in order to perform which he was obliged to leave off all kinds of bandages, yet he nevertheless continued in the same condition until the month of February 1771. When, on examining his arm again, I found a small tumour arising about two lines distant from the cicatrix in the basilic vein, and about the size of a small pea. There was however a very great difference in the morbid pulsation and dilatation, which before only affected the tumour but which were now felt in the trunk of the brachial artery. I therefore can plainly foresee that it will, at some future period, be necessary to have recourse to the ligature of the vessel.

IV. As there was but little difference between the case of aneurism just related and that which occurred to me on the 19th of April, in the present year, 1771, in the person of the very illustrious Joseph Morelli, twenty-four years of age, who was sent to me by Joseph Paoletti, a surgeon of Prænestum, I shall omit any detailed account of it, and only state that this Morelli was bled in the left arm on the 21st of January, that for twenty-five days the aneurismal tumour did not increase much in size, at which time it was not larger than a common bean, and lastly, that the basilic vein became varicose; in everything else this case resembled perfectly the one just described. I brought this patient to the French Hospital in order to show him there to the surgical students; and after I had applied the proper bandage in their presence, I sent him back to Joseph Paoletti, the surgeon of Prænestum, that he might continue the

same treatment. From him I have lately learnt that after 1772.
Morelli had continued this plan for a whole month, he recovered his health perfectly and entirely.

Observations. It cannot be denied that these two cases of aneurism differ from those two species of the disease, to which all aneurisms have, since the time of Paulus Ægineta, been referred by surgeons. For besides the hissing and the abnormal pulsation of the tumour, which were not at all dependent upon the brachial artery, the entire disappearance of this very tumour when compressed by the fingers, without the blood forming a swelling anywhere else, was certainly not one of the ordinary symptoms, either of a true or of a false aneurism. And can it indeed be supposed that the blood could be made to return so speedily by the mere pressure of the finger into the very artery whence it had flowed? This, indeed, does not appear very probable. But if it do not re-enter the artery, what, I would ask, becomes of it? Is it effused into the cellular tissue? By no means, for it would certainly show itself in it were it so.

Besides this, how can the very small increase of the aneurism during seventy-five days be explained? How could the varicose affection of the basilic vein be understood? How, in fine, can the constantly fluid condition of the blood in the tumour, and its not coagulating into a hard mass, be accounted for, whether we consider it as belonging to true or to false aneurisms?

Various experiments that I made on these two arms, the details of which, for the sake of brevity, I shall not mention, led me to the belief that in either case the wound of the basilic vein and that of the brachial artery lying under it united in such a way, in the form of an anastomosis, that the blood passed from the opening in the artery into that in the vein, and mixing with the venous blood, made a shorter circulation. And hence, the reason why the aneurism increased so slowly, why the blood remained fluid in it, and why the tumour almost disappeared entirely by the pressure of the finger alone. For, unless I am mistaken, all these circumstances may be considered as depending upon the blood passing directly into the vein.

This very unusual kind of aneurism plainly shows how true and just were the remarks already made by me, about bandaging and placing the arm according to the direction of the wound. For if the healing of a wounded artery depended solely upon a

1772. strong and powerful compression, this ought certainly to have been accomplished in both these cases in which the compression was so forcible as to occasion a union between the wounds in the two vessels, so as to make but one opening instead of two; and above all, to give rise to such immense tumefaction of the arm as to compel the surgeon, after three days, to loosen the bandages.

If then Genga's bandage be applied immediately after blood-letting, proper attention, as we have stated, being paid to the direction of the wound, and if the injured arm be kept perfectly at rest, in a proper position, and the patient be put upon a moderate diet and bled occasionally, a perfect union of the wound in the injured artery may always be accomplished.

There is now nothing more left for us than to explain the bandage that has been so much praised, and which I shall call Genga's, not that it resembles exactly that which Bernardus Genga employed, but because he first of all invented a bandage of this kind. The phlebotomist, therefore, after having ordered one of the bystanders to compress with his fingers the bundle of the axillary vessels, tells another to do the same, by applying his thumb to the wounded artery; if he have not a modern tourniquet he makes one after the ancient fashion, with the fillet that has been used in bleeding, as has been already explained by us when speaking of the operation for the other kind of aneurism.

Having then prepared the necessary dressings, he begins to bandage singly with a small roller all the fingers of the hand of the affected side; then he applies a longer and a broader one equably to the hand and arm up to the elbow; having first, however, laid pledgets dipped in spirits of wine or wine and water on the part; intrusting it then to an assistant, he will, after having removed the tourniquet, continue the compression and the bandaging up to the axilla, nearly in the same way that I have mentioned when speaking of the shoemaker's case. In the case, however, at present under consideration, the pads should be somewhat harder, and moistened with astringents, such as the white of egg, vinegar, spirits of wine, or with strong red wine and such other things as Bernardus Genga employed with success; the bandage is also to be made tighter and more compressive. Instead of a longitudinal pad to place upon the

vessels and along the arm, Genga used a piece of wood as thick as the finger, enveloped in lint, in order that it might accommodate itself more readily to the part that was to be compressed. The bandage having now been finished up to the armpit, Genga, in order to make it more secure, placed above the whole apparatus another long and broad roller, which he applied in the opposite direction, namely, from the axilla to the hand. He placed the arm at an obtuse angle, but this chanced to be the position that best suited him, as, according to expectation, the cure was effected. For if the wound of the artery had been vertical and not oblique, the same effects would probably have happened that we observed to occur in the two cases of aneurism that have just been related; namely, that the thick, soft, and yielding skin at the bend of the arm would have healed, but not the artery. Besides this, either wine and water, or some other defensive, should be poured upon the arm twice a day, so that the apparatus might be rendered stable and firm; venesection is also to be repeated when necessary, being begun on the very day of applying the bandage, if this be at first somewhat tighter than usual. The apparatus should not be renewed for at least twelve or thirteen days. And although the wound might now appear to be perfectly cured, it will be better to continue the bandaging for eight or ten days more, so that the union of the artery may be rendered safer and stronger. And lastly, after the arm has been bandaged, as after venesection, for a few weeks, from which no inconvenience can result, the patient may be allowed his usual liberty. 1772.

A REMARKABLE ANEURISM OF THE THIGH.

V. A man, thirty-seven years of age, of a lax and languid habit of body, who had from boyhood worked as a tinsmith, was, from the nature of his employment, accustomed to pass a considerable time both in workshops and cellars; he was besides immoderately addicted to venery, and had been affected with syphilis. He also frequently employed himself in birdcatching, exposing himself without regard to the state of the weather. From these different causes he had for several years suffered from pains which he thought were of a gouty nature.

At length, towards the end of October in the year 1742,

1772. whilst lifting a heavy weight, his right foot slipped and he endeavoured to support himself on the left; but on attempting to do so he was seized with such a violent pain in the hip that he could not avoid falling to the ground. Proper treatment was had recourse to, and although he did not improve much during the winter, yet the pain ceased during the spring and summer; but it returned in the beginning of the following November, the accessions coming on again in the thigh as well as in the leg.

An apothecary having been sent for, prescribed fomentations, ointments, and other remedies of this kind in order to allay the very severe pain, and then, as he saw a little above the middle of the thigh a hard and by no means small tumour, he advised the case to be given over to a surgeon. Instead of a surgeon, however, the patient consulted a friar, who stating that the disease was of little consequence, undertook without hesitation to cure it by means of a plaster made of elder-flowers and leaves. But as the complaint, notwithstanding this, increased in severity, his opinion about it changed and I was called in on the 10th of November.

On examining and feeling the thigh, I found a hard, raised, circumscribed, unequal pulsating tumour, of the natural colour of the skin. Wherefore, not doubting in the least that this tumour was an aneurism, I told the bystanders that it was a serious and dangerous disease, and begged them to consult some other surgeons. I, however, ordered a proper diet for the patient, and applied spermaceti cerate to the tumour.

Accordingly, on the 12th of the same month, the very distinguished Jo. Victorius Masini, formerly my much revered preceptor, was called into consultation, who agreeing perfectly and entirely with me as to the nature of the disease, ordered that on the following day the bowels should be opened by a gentle aperient, and that on the next day to that the patient should be bled to ten or twelve ounces from the right arm. All this was done according to his wish, without any delay, and besides, instead of the spermaceti cerate, the juice of nettles and of the hypocystus was applied to the part; which plan of treatment would have been persevered in if intolerable pain had not supervened; on which account it was discontinued, and the whole thigh rubbed with rose and marshmallow ointment.

But on the 15th of November, the pain increasing towards

three o'clock in the morning, before four, the whole thigh was swollen and the pulsation and pain became so intense that the patient knew not how to turn. About four o'clock he suddenly heard a noise in the most swollen part of the thigh, resembling the sound that is produced when new cloth is torn; and at the same time that he heard this snap, he was seized with an excruciating pain which continued for an hour and then lessened. About nine o'clock another snap occurred in the same place, but slighter than the first, the pain of which soon ceased. Lastly, after four more hours a third snap was heard, but slighter than the former ones. 1772.

On visiting the patient I learnt all this, and found the thigh increased to double its natural size, with a painful distension, and the affected part so hard and tumid that no pulsation could be felt. I therefore thought there was nothing more to be done than to allay the tension with rose and marshmallow ointment, which being accomplished, I had recourse to the juice of nettles and hypocystus. But the pains increasing again, I was again obliged to have recourse to the same ointments; the pain sometimes increasing and occasionally lessening, though the tumour always remained the same.

But on the morning of the 19th of November, immediately after I left the patient he began to be racked with such intolerable pains that it was thought that he must die; at the expiration of an hour, however, the pain abated somewhat. In the evening I found that the tumour had extended four fingers' breadth towards the upper part of the sartorius, rectus, and vastus internus muscles, and that it pulsated and appeared to bubble in such a way that I thought it must contain air as well as a collection of humours. On the following day although the pain had somewhat abated, I found the patient much reduced in strength. My first care therefore was, that he should have the sacrament administered, and I then ordered some bruised houseleek mixed with vinegar to be applied. Although this was of some little benefit, yet in the evening of the same day as the pains increased much in severity, the patient, of his own accord, removed the houseleek, and had recourse again to the ointments, but without any good effect, for he passed a restless night with delirium, and felt, besides the severe pains, a swelling rise several times from the thigh towards the chest. At daybreak,

1772. although the pain was less, yet the cadaveric expression of his countenance and his very feeble pulse announced the approach of death. A sudden tremor of the thigh then came on with other convulsive movements, and in three-quarters of an hour the patient expired. The apothecary, who was present, examined the thigh immediately, and found it of a yellowish colour; resisting to the pressure of the fingers, and equally swollen as before.

Post-mortem examination, with remarks. The ignorance of its cause, says Cicero, makes us wonder at an unexpected occurrence; and indeed it appeared an unusual occurrence that an aneurismal tumour situated in a part so little necessary to life should in so short a time have occasioned the death of this unfortunate person; for it is a well known fact that very many patients affected with tumours of this kind in the most noble parts, as in the commencement of the aorta, for example, or in its curvature, or in the cæliac or right emulgent artery, which I have often seen, may have their lives prolonged for many months and even years. But as all wonder ceases when the cause is ascertained, I determined to open the body, which was accordingly done at the expiration of twenty-four hours from the time of his death.

The contents of the lower and middle belly being first examined, I found the following things worthy of remark. The ilium was here and there slightly inflamed, the upper part of the liver was marked by three gangrenous bands which penetrated its substance to the depth of two fingers' breadth; the lower part was somewhat reddened; the cartilaginous appendices of the sternum were ossified; the cavities of the heart were entirely empty of blood, with the exception of a small coagulum in the left ventricle; and lastly, the foramen ovale was so open as to admit easily the introduction of a quill. All the other parts were found in their natural condition.

In order to examine thoroughly all the disease that was to be found in the thigh, I began the dissection within from the os ilium, following up the artery to the groin, where I removed it from the surrounding membranes, which appeared gangrenous, and which were in apposition with the inflamed spots of the small intestine. Having then cut through the integuments of the groin and Poupart's ligament (under which the vessels that are distributed to the limb pass,) and having again found

the artery, I cut, whilst separating the vessels from the sur- 1772.
rounding parts, into the tumour that has been mentioned.

On dissecting this carefully, I found a quantity of coagulated blood, the weight of which amounted to three pounds and a half. This coagulated blood extended under the sartorius muscle and between the vastus internus and a portion of the triceps in the direction of the vessels almost from the groin to the knee. On removing it, and wiping out the cavity of the tumour, I saw for the third time the artery, in which I found a laceration two fingers' breadth in length.

It is quite evident that this was sufficient to occasion a very speedy death, but it is not equally clear why an artery that was almost straight, deeply seated, and surrounded by very strong muscles, could so readily be ruptured. In order to determine this, I continued the dissection of the vessel for two fingers' breadth more, (in which part it appeared sound and healthy,) and found it forming another tumour about the size of an egg. On opening this tumour, I found the blood so coagulated and concreted in it as to prevent entirely the passage for any more from the heart.

On removing also the blood from this, it appeared evident that in the second aneurism corrosion had taken place in two situations; in one, the external membrane of the artery remained alone uninjured, the others being destroyed; in the other, the corrosion had by no means extended so deeply. Between these spots a kind of septum intervened, so placed as to perform the functions of a valve. Besides this, the internal coat of the portion of the artery, that, though not as yet dilated, was near to both tumours as well as the lining membranes of both these, could readily be torn into the smallest shreds as if it had been touched with caustic, which gave me a very good opportunity of examining the fleshy fibres of the muscular membrane, which I had never before seen so distinctly.

I think that it is clearly proved from all this that the artery was ruptured above in consequence of the lowermost tumour; and that hence death ensued with very great rapidity. For as the inferior tumour would entirely intercept the passage of the blood through the artery in the direction of its axis, it would occasion that fluid, impelled by the whole power of the heart, to act on the sides of the vessel, distending and tearing them;

1772. and there is no doubt that the other symptoms that occurred were owing to a greater or less quantity of blood forcing its way into the interspaces between the muscles and adjacent vessels.

It may scarcely be necessary to remind the reader that the crural artery first descends in a straight line from the groin under the sartorius muscle, and having traversed the space bounded by the vastus internus and triceps, passes together with its vein under the tendon of the triceps, about five or six fingers' breadth above the knee, and beyond which it takes its course together with the vein under the ham, the gastrocnemius and the soleus muscles, until it reaches the foot.

Let us now consider a man, lifting a heavy weight with his hands, slipping with one foot, and making every effort to support himself on the other. What, I say, will happen to him? The bundle of vessels will be dragged upon with great violence, the gastrocnemius and soleus muscles will swell up as well as the triceps —the tendon of which being powerfully stretched in this position of the body, will compress the artery and veins passing under it, and will thus prevent the blood reaching the lower parts of the limb; besides this, the abdominal muscles acting powerfully, the artery, as it passes under Poupart's ligament, will be forcibly compressed both by it and by the tendons of the oblique muscles. The further progress of the blood being arrested or interrupted by this compression, it is wonderful what a strong degree of pressure acts upon the sides of the artery, which, if they be weak and lax, as they were in this patient, in consequence of the congenital constitution of the body, of the syphilis that he had contracted, from his employment, and of other deleterious circumstances, may be distended to such a degree that they can no longer be restored by pressure to a normal condition.

Observations. This aneurism of the thigh will, unless I am much deceived in my surgery and anatomy, fully confirm what I have already endeavoured to prove, namely, that the passage of the blood takes place through the collateral inosculating vessels whenever there is any obstacle in the trunk of the femoral artery; hence it is believed that the crural artery was ruptured so rapidly and completely, in consequence of its collateral vessels not having as yet attained such a size as to com-

pensate for the want of passage through the main artery, which was completely blocked up by the rapid coagulation of the blood: from this the utility of my plan of compression is evident; and had I known it at that time, I should certainly not have failed to have employed it; for had the course of the blood through the femoral artery been checked by these means, the vessel, being strengthened by the bandages, would have withstood the laceration until time had been allowed for the collateral branches to expand and dilate somewhat; and in the meanwhile the coagulated blood could have been dissolved, and might have returned to its former fluidity; and lastly, the artery might either have been obliterated, as is shown in fig. 2, or have been very greatly narrowed, as in fig. 3. 1772.

BROMFIELD.[1]

The partial dilatation of an artery, producing what is called an aneurism, by some is thought a case which requires the amputation of a limb above the diseased part of the artery, in order to prevent a fatal hemorrhage, and is recommended to be done early to prevent a caries of the subjacent bones, which is no uncommon thing when the tumour comes in contact with the bone. I cannot say that these reasons are sufficient for me to recommend the operation in cases of this kind, not only from the want of success in general where I have known it done, but from the observations I have made on living subjects, where several aneurisms appeared in the different parts of the arteries in the same subject; and also on examining the bodies of those who have died after the operation of amputation had been performed; for the aorta in one subject, I observed, was unequally dilated in several places; in others, branches of the arteries in different parts of the body were formed into aneurismal bags. From these remarks I think we may conclude that, in general, the arterial system is diseased; consequently, if we should take off a limb, and make a ligature on the artery, above that part 1773.

[1] Surgical Observations and Cases, by William Bromfield, Surgeon to her Majesty and to St. George's Hospital. London, 1773, p. 303.

1773. of it which was evidently dilated, we might, if the patient survived the operation, be likely to bring on an aneurism in some other of the vessels, should they happen to be diseased, much sooner than if the amputation had not been performed, as, in future, the remaining arteries, in general, must contain a greater proportion of blood. This objection of mine cannot be supposed to take place where external violence has suddenly given rise to a tumour of this kind, and nothing in the habit of the body otherwise forbids the operation, no more than I should dissuade from performing it where the principal trunk of an artery had been divided by an accident.

The injecting the parts of dead bodies having discovered that, in particular subjects, the branches sent off from the principal trunks of arteries have, now and then, formed anastomoses with other branches that have gone off lower down; and from observing, likewise, that after the operation for the aneurism has been performed, where the artery had been unfortunately wounded in bloodletting, that the lateral vessels have become dilated, in time, sufficiently to carry on the circulation in that limb. From these observations the most extravagant propositions have been by some suggested, viz., that the tying of the principal trunks of the arteries of any of the extremities, when wounded, may be done with a fair prospect of preserving the limb. I once saw an attempt of this kind in a true aneurism, situated in the ham, on which I shall make no further remark than that the patient died; and I dare believe that the embarrassments which occurred, as well as accidents in the operation, will deter the operator from making a second attempt, should a similar case offer for his assistance.

LESLIE.[1]

1774. A young man, about fourteen years of age, plunged a penknife, about three inches long, into the inside of his thigh, where the femoral artery begins to make its curve to form the pop-

[1] An account of the operation for the Aneurism being performed upon the femoral artery with success. By Mr. Charles Leslie, Surgeon at Cork. Communicated to Dr. Monro.—Medical and Physical Commentaries, Edinburgh, 1774.

litea. The blood at first flowed with great violence, but, from the smallness of the wound, as the blade of the penknife was very narrow, it quickly insinuated itself into the cellular membrane all around. From the pressure made by his companions who were present, it soon became grumous, and completely corked up the orifice. At this time he was twelve miles from any proper aid, and was under the direction of an apothecary, who, ignorant of what had happened within, treated it for ten days as a superficial wound. 1774.

But, being alarmed at its not healing, and observing a pulsation in the part, he brought him to the town of Cork, and put him under the care of Mr. Dacut, an ingenious man in his profession. He, suspecting the mischief, called for my assistance, and, upon examination, there remained no doubt of its being an aneurism. I recommended that the operation should be immediately performed. But the parents, who strongly objected to the cruelty of such a cure, in a case which to them seemed trifling, put it off from day to day for three weeks. During all this time I repeatedly affirmed that the coagulated blood, which then acted the part of a cork, would soon disengage itself, and that he might lose his life for want of timely assistance. The event proved the truth of my prognostic: for about the end of the third week after I saw him, as he was dressing the sore, the clot of grumous blood flew out with violence, and the blood from the artery almost reached the top of the bed in which he lay. As he had been directed to keep a tourniquet upon the leg, to guard against such an accident, it was immediately tightened, and the flux of blood by that means stopped.

Every help was now called for, and it was the general opinion that the limb should be amputated, without exposing his life to any further hazard. I strongly objected to this step till every other means of taking up the artery had failed.

From my being the proposer of such a trial, it fell to my lot to go through the operation. I could not promise success; but as I had frequently performed the operation in the arm, I set about it boldly, determined, if possible, to succeed. I made the external incision from six to eight inches long, lest a first attempt with the needle should fail. After discharging the grumous blood, and several pieces of the cellular substance in a

1774. putrefied state, I discovered the wound in the artery. I passed a large crooked needle above the opening, and another an inch higher. Upon tying the first, I found I had secured the vesssel so as to prevent any loss of blood. The other thread was left to guard against accidents. To prevent any discharge from recurrent vessels, I passed a third ligature below the wound, and secured it also. The tourniquet was then loosened, and everything promised so well that the wound was dressed up. Every precaution was however taken, by proper compresses, and a slight application of the tourniquet, to lessen the force of the blood in the vessel. But, in half an hour, a fresh alarm was given, and the flux of blood appeared as great as at first. Amputation was again urged. Encouraged, however, by the hopes I had conceived from the first attempt, as my patient's strength was yet unimpaired, I insisted on another trial. It was agreed to. Upon removing the dressings I found that the first ligature had cut through the adjacent parts, which, from the operation being so long delayed, had become putrid, and unable to make sufficient resistance.

By this means the pressure of the ligature upon the vessel was removed. I now resolved to take a fresh firm spot higher up, and, from the size of the aperture in the first operation, I had little more to cut. However, to make sure of it, I took up the vessel three inches at least above the former ligature.

Securing everything as before, I left the tourniquet at liberty, and the wound without any bandage, for an hour. At the end of that time, finding everything to my wishes, I dressed all, and settled the patient to rest.

From this moment, except the pain brought on by the operation, he never experienced any inconvenience. A slight swelling indeed in the leg and foot, with an inability of movement, continued for some weeks. But the wound healed kindly, his strength of limb gradually returned, and at present he feels not the least defect.

POTT.[1]

That kind of dilatation of the arterial tube which is called a true aneurism is sometimes found in the middle, sometimes in the upper part of the thigh, and sometimes in the ham. 1779.

The general characteristic marks of this distemper are a circumscribed tumour, small at its first appearance, but gradually increasing, and for some length of time having a pulsatory motion and feel exactly correspondent with the patient's pulse at the wrist; this pulsation, arising from the motion of the blood from the heart through the artery, is very easily seen and felt for some length of time; but as the tumour becomes gradually larger, the pulsation in it becomes more and more obscure to the touch, and in length of time, when either the artery is dilated to a very considerable size, or has burst, and has shed part of its contents, the motion becomes in some cases so obscure as hardly to be felt at all, or at least not without very diligent attention. When it has got into this state, whether it be femoral or popliteal, the lower part of the limb becomes, by the pressure of the extravasated blood, and by the obstruction to the circulaiton through the dilated artery, considerably loaded and swollen, unfit for use or motion, and generally very painful.

This is the state, or very nearly the state, in which we most frequently see it, especially among the labouring poor, who generally neglect it until it renders them lame, and incapable of following their employment; and when it is got into this state it requires immediate attention.

In what manner is this disease, when got to this point, to be treated? or how is the cure of it to be attempted? for if something be not done, the limb will become mortified, and the patient will perish.

If a man was to answer from theory, he would say that the skin is to be divided, the extravasated blood to be cleared away, and the artery to be tied above and below the dilatation; in short, that what is called the operation for the aneurism is to be performed. Sorry am I to find myself obliged to say

[1] Remarks on the Necessity and Propriety of the Operation of Amputation in certain Cases. By Percivall Pott. London, 1779, 8vo.

1779. that, as far as my observation and experience go, such operation, however judiciously performed, will not be successful, that it will not save the patient's life.

In both these aneurisms, the femoral and the popliteal, it most frequently happens that the artery is not only dilated and burst, but it is also distempered some way above the dilatation, particularly in the popliteal. This may very probably be one reason why the ligature is in general so unsuccessful. The want of collateral branches of sufficient size to carry on the circulation is another very powerful impediment. Whether these may be allowed sufficient to frustrate the attempt by the operation, I will not take upon me to say, but certain I am that it does not succeed; I have tried it myself more than once or twice; I have seen it tried by others, but the event has always been fatal; excessive pain, a high degree of symptomatic fever, great tension of the whole limb, rapidly tending to gangrene, and ending in mortification both upwards and downwards, have destroyed all those whom I have seen, on whom the operation of tying the artery has been practised.

Nor have I ever seen any other operation than that of amputation which has preserved the life of the patient.

To this an objection has been made by some, which, if it was founded in fact, would be a very valid one. It has been said that the aneurism in the thigh, or ham, is very seldom the only one which the patient labours under, and that he most frequently has the same kind of dilatation either of the aorta or of some of the larger vessels within the body. This is urged as a reason against amputation in this disease; they who maintain this opinion very justly observing, that it cannot be of any use to cut off a patient's leg for a femoral or a popliteal aneurism, who will, in all probability, be destroyed very soon by the same kind of disease in another part of him.

If the datum was true, the inference would be just; but it is not. When I say that it is not true, I mean that it is not constantly, or necessarily, or even generally so, as I can, from repeated experience, affirm, having several times performed the operation of amputation for both these on people who have lived several years after, without any symptoms of the same kind of disease in any other part of them. Indeed, the determination for an operation, when a popliteal aneurism is arrived to the state

which I have just described, is hardly to be called a matter of choice; it is, indeed, a matter of absolute necessity. When the swelling from the extravasated blood is become so large that the pulsatory feel of the artery is rendered very obscure, the whole limb below is exceedingly loaded and swollen, the return of the fluids, both by the veins and by the lymphatics, so very difficultly executed, that the patient gets little or no rest from the constant pain, and if some relief be not obtained, and that speedily, from the art of surgery, gangrene and mortification are the inevitable consequences. 1779.

The means of relief are two, and two only: the operation of amputation, and that of tying the artery above and below the diseased part.

The operator, undoubtedly, may make his choice between them, and follow the dictates of his own judgment and his own experience; but it must be worth his while to observe that, for the success of the latter, a free circulation through all the inferior part of the limb seems to be a very necessary circumstance; and that, when the load and pressure and obstruction are become so great as even to threaten gangrene and mortification, which is frequently the case, such free circulation is not much to be expected; but, on the contrary, all the evils arising from a very obstructed one, and that through distempered parts.

There is another kind of complaint affecting the leg, removable (as far as my experience goes) by amputation only, which is one reason why I mention it in this place, and to which I might add another reason, that it either derives its origin from a burst artery, or, at least, is always accompanied by it.

I know no name to give it, or under what class to range it, but will describe it in the best manner I can.

It has its seat in the middle of the calf of the leg, or rather more toward its upper part, under the gastrocnemius and soleus muscles; it begins by a small hard deep-seated swelling, sometimes very painful, sometimes but little so, and only hindering the patient's exercises; it does not alter the natural colour of the skin, at least until it has attained a considerable size; it enlarges gradually, does not soften as it enlarges, but continues through the greatest part of it incompressibly hard, and when it is got to a large size it seems to contain a fluid, which may

1779. be felt towards the bottom, or resting, as it were, on the back part of the bones. If an opening be made for the discharge of this fluid, it must be made very deep, and through a strangely distempered mass. This fluid is generally small in quantity, and consists of a sanies mixed with grumous blood; the discharge of it produces very little diminution of the tumour, and in the few cases which I have seen very high symptoms of irritation and inflammation come on, and advancing with great rapidity and most exquisite pain, very soon destroy the patient, either by the fever, which is high and unremitting, or by a mortification of the whole leg.

If amputation has not been performed, and the patient dies after the tumour has been freely opened, the mortified and putrid state of the parts prevents all satisfactory examination; but if the limb was removed without any previous operation, (and which, as far as my experience goes, is the only way of preserving the patient's life,) the arteria tibialis postica will be found to be enlarged, distempered, and burst; the muscles of the calf of the leg to have been converted into a strangely morbid mass, and the posterior part of both the tibia and the fibula more or less carious.

WILMER.[1]

1779. It hath been incontestably demonstrated that the principal arterial trunks of the leg and arm may be tied in the operation for the aneurism, and the circulation of the blood afterwards carried on by the collateral anastomosing branches.[2] It hath been said, and indeed upon the evidence of reason and expe-

[1] An Aneurism of the popliteal artery, with some remarks on Aneurisms in general. —Cases and Remarks in Surgery, &c. By B. Wilmer. London, 1779, p. 171.

[2] Paré was the first person who secured the bleeding vessels after amputation with a ligature; but this method was recommended long before. Thus Galen says, "Quippe de genere obturantium quodammodo est, et vinculum ipsis vasis sanguinem fundentibus circumpositum, ipsique nostri digiti, dum ea committunt et constringunt." (Meth. Med. lib. 5, c. 3. Charter, tom. x, p. 107, &c.) From the time of Galen to Ambrose Paré, surgeons were used to restrain hemorrhages from the larger arteries with the actual cautery.

rience, that this operation will succeed best when a due degree of pressure upon the tumour hath been previously made, by which the collateral branches will be gradually dilated, and the new road for the blood opened before the old one be rendered impervious. The recommendation of the use of pressure as a proper preparative for the operation, must, however, be received with limitation, as there are some species of the spurious aneurism where it cannot be supposed to take place. 1779.

Till within these very few years it was an opinion generally received amongst surgeons in England that if the principal arterial trunk of the arm or thigh was tied, the parts below the ligature must necessarily mortify, from an interception of the blood which should nourish them. Whenever, therefore, an aneurism had its seat in the crural or humeral artery, (above the flexure of the elbow-joint,) nothing but amputation was thought of. Some very eminent surgeons have declared their opinion that whenever the operation for the aneurism hath succeeded in the bend of the arm, the artery had divided above the part (a variety sometimes observed) and a branch only had been included in the ligature.

Anatomists have discovered, by their injections, that the whole body is an anastomosis of vessels, and by this wise disposition of our machine, whenever the vascular system of any particular part is obstructed, the circulation will be carried on by the collateral vessels. It seems to have been reserved for modern surgery to prove that even the trunks of the humeral and crural arteries may be included in a ligature, and, notwithstanding the great impediment to the circulation of the blood, which must be the result of the operation, the parts below will neither in general mortify nor be deprived of their use.

The change which takes place in the mode of circulation of the blood after the operation for the aneurism, has sometimes occurred from some particular disease of the arteries. I have seen an injected preparation (the history of the person it was taken from I cannot recollect) where the cavity of the crural artery was obliterated the length of two or three inches, and in which the collateral branches were so wonderfully dilated, that the progress of the circulation might very well be supposed to have been carried on without any great hinderance.

Mr. Antrobus, of Liverpool, hath recorded a case in which

1779. the patient's foot was mortified, and a separation took place, accompanied with good digestion, two inches above the ankle. The leg was amputated at the usual place below the knee, and when the tourniquet was slackened, there was no afflux of blood from the divided arteries, nor any pulsation to be perceived in their extremities.[1] In this case it appears, that after the principal arteries had been, by disease, rendered useless, the circulation was carried on by the collateral branches with sufficient force to produce a good digestion, at a considerable distance below the sound part of the large vessels.

I have been myself witness to a case nearly similar to that related by Mr. Antrobus, where no hemorrhage happened from the principal arteries, either at the time of amputation or afterwards, although nothing more styptic than dry lint was applied to the stump; the digestion and cicatrization of the wound went on without interruption.

The first account of the crural artery being tied, we meet with in Severinus. The case was a spurious aneurism, and the ligature was made upon the artery so near the groin, that amputation could not have been performed. The patient was young, and perfectly recovered the use of the limb.[2]

Some few years since Mr. Burchall, of Manchester, tied the crural artery with success, for an aneurism. This operation was performed in the Manchester Infirmary, on the 4th of March 1757. The patient was discharged cured on the 17th of April following, and the limb was found nearly as strong and as serviceable as the other, when he was afterwards examined by the Medical Society of London.[3] From the circumstances of this well authenticated case, there can remain no degree of doubt but that the trunk of the crural artery was tied in the operation. Since the publication of Mr. Burchall's case, the crural artery has been tied by Mr. Leslie of Cork, in a spurious aneurism, and with success.[4]

In all controverted points of surgery, the most certain rule to direct our conduct will ever be found to arise from a com-

[1] Med. Observations and Inquiries, vol. ii.

[2] Marc. Aurel. Severin. de Effic. Med. lib. 1, part 2, p. 51, &c.

[3] Med. Observations and Inquiries, vol. iii, p. 106.

[4] Med. Comment. Edinb. vol. ii.

parison of the events of a given number of similar cases, treated in different methods. 1779.

Thus in twelve patients where the crural artery hath been tied, a certain proportion of this number will probably die: and in the same number who suffer amputation, it cannot be expected they should all recover.

If now, for example, four out of the twelve who have had the crural artery tied should die, and only three of those who have undergone amputation, it will be an argument in favour of the propriety of the former practice; because those who survive from this method have their limbs preserved; and if the ligature fails and the parts below should mortify, the patient may have some kind of hope of escaping at last by amputation.

As far, therefore, as the success of a few cases can obtain, the surgeon will be authorized to recommend the operation for the aneurism of the crural artery, in preference to amputation.[1]

Although it be certain there is a natural provision for the maintenance of the collateral circulation in general, when any of the principal arterial trunks are, by disease or accident, rendered inadequate to the purpose; yet it may be deserving attention to inquire, whether we may not be deprived of this advantage on account of some local peculiarities of the system. In the thigh, the crural artery, at its superior part, detaches some very considerable branches, which are destined for the nourishment and support of the numerous large muscles of the limb; and these vessels anastomose with others from the inferior part of the trunk, in a sufficient degree to afford at least a probable supposition that the circulation might be continued after the principal artery had been, by ligature, rendered impervious. But, in the ham, the popliteal artery seems very much deprived of these advantages; very few ramifications are here made, and those that anastomose with others from above the joint are in a situation to be obstructed in their dilatation, by the pressure of the adjacent tendons and ligaments, rendered irritable by the operation, by the projection of the epiphysis of the tibia, and

[1] It is, I fear, much more to be wished than expected that surgeons would candidly acquaint the public with their ill success as well as with their more fortunate practice; a proper line of conduct might then be had by comparing the events of particular cases.

1779. the condyles of the os femoris, communicating resistance to every salutary effort of expansion.

Should the operation for the aneurism be attempted in the ham, the situation the patient must be in will be particularly embarrassing to the surgeon; if the leg is extended, to put the tumour and the artery upon the stretch, the tendons forming the hamstrings will very much impede the future processes of the operation; and if the leg is placed in a state of flexion, there will be still more objections to the position. The mere difficulties attending any operation in surgery may perhaps appear not to be sufficient reasons to decline it; and by the adventurous and intrepid operator it may be conceived that honour and reputation are to be acquired in proportion to the danger he hath incurred. But when to the difficulties attending any operation, is added the extreme hazard the patient must sustain, even from the most adroit performance of it, it surely becomes a subject deserving the attention of the most dexterous operator, and well worth the consideration of the most scientific and best informed practitioner.

With regard to the case of which we are now speaking, (the aneurism of the popliteal artery,) there is not, that I know, a single case upon record, where the operation for the aneurism hath succeeded. It hath been done several times within these few years, in our public hospitals, but I have not heard of any one case where it answered the intended purpose. In a conversation I had, two years since, with a very ingenious surgeon of London,[1] upon this subject, he acquainted me that he had lately performed the operation and with great hopes of success; but unfortunately, on the second or third day after a profuse hemorrhage ensued, of which the patient died before he could get to his assistance.

Whilst the minds of surgeons of the first eminence are wavering with respect to the propriety of operating for the aneurism in the ham, every case upon the subject, recorded with fidelity, should be well received by the public; and, with a view to assist in clearing up a doubtful part of our profession, I shall close these remarks with the following case:

In the year 1774, J—— J——, by trade a blacksmith,

[1] Mr. H——r.

perceived a small tumour, deep seated in his left ham. After 1779.
it had continued some time he showed it to an eminent surgeon, who gave him such directions as he thought necessary. The disease increased every day, and he applied for my assistance about a year after the commencement of his complaints. The tumour was then become very painful, and so large as to occupy all the space betwixt the hamstrings, and to descend downwards within the heads of the gastrocnemius muscle. Applying my hand upon it, I discovered a very strong pulsation, and no doubt seemed to remain of its being an aneurism of the popliteal artery.

In consultation afterwards with Mr. Harrold, and Mr. Parrott (a very eminent surgeon of Birmingham), in consideration of the difficulty of performing the operation for the aneurism in this part, and of the very uncertain nature of the event, it was strongly urged to the patient to suffer amputation. The man desired he might have time to consult his friends upon the subject, who lived at a considerable distance. They, in answer, requested he would come to them, as some surgeons in the neighbourhood had proposed to cure him without the loss of the limb.

He went to them, the operation for the aneurism was done, and the patient died on the third day.

MURRAY.

OBSERVATIONS ON ANEURISMS OF THE THIGH.

§ 1. I think it may be concluded from what has been said, 1781.
that the branches of the femoral artery have numerous and very extensive inosculations, producing thereby a singularly complicated network of vessels. And it cannot be denied that a great variety occurs in the distribution of the larger vessels of the inferior extremities; several of these inosculations being sometimes wanting; but I have ascertained, by very careful dissections, that if certain arteries be either absent, or are smaller

[1] In Aneurysmata Femoris Observationes, &c. &c. Adolpho Murray. Upsaliæ, 1781. (Sectio secunda, Particula secunda.) And in Lauth's Collection.

1781. than usual, that the others are either increased in number, or have much larger and more extensive anastomoses. I have seen a thigh that is preserved amongst the preparations of the Academy, in which the anastomoses between the external circumflex and external articular, and between the nutritious and superficial perforating branches, are as large and wide as a pigeon's quill. It cannot therefore be denied, that these branches may not only alternately do duty for one another, but may also very easily supply the place of the main trunk, if it be injured. A circumstance that I have twice seen in the dead body would appear to confirm the truth of this statement. For being about to inject the arteries of the lower part of the abdomen with fine injection, I thought it better to tie the femoral, in order that the wax might not, by traversing so long a course, become cooled; but, as it happened that this vessel divided higher up than usual, I merely ligatured the superficial femoral; and having finished my injection, I found, that not only the branches of the profunda were filled by it, but also the whole of the superficial femoral, as if it had not been subjected to the least constriction. Whence it is evident, that the anastomoses between these arteries is so free, that in the living body the blood may readily pass from the trunk of one into that of the other. This thigh, on being dissected, presented no preternatural distribution of the vessels by which this occurrence could be differently explained. It has never fallen to my lot to see a double superficial femoral artery, as Gooch[1] states he has three times observed; and the evidence of which appears to him to be so much the more probable, as he does not believe it possible, without this arrangement of the vessels, that the branches of the profunda could of themselves be sufficient to carry on the circulation after the superficial femoral had been ligatured. I would not dare to impugn the accuracy of the observations of so celebrated a surgeon, if, on considering that he discovered this variety whilst examining the extremities of the arteries that had been cut across in an amputation of the thigh, the suspicion did not arise in my mind, that the operation having been performed higher up than the point at which the femoral passes into the adductor muscle, the second perfo-

[1] Philosoph. Transact. tom. lxv, p. 37.

rating artery being somewhat longer and larger than usual, might have been mistaken for a second superficial femoral. 1781.

But the experiments of George Martin,[1] of Gooch, and of Revans, on a dog, whose femoral artery was tied in the middle of its course, together with the vein and nerve, the animal being perfectly cured by the twelfth day, without the least injury to the limb, confirm me in my opinion that it is so decreed throughout the whole of the animal economy, by the admirable goodness and wisdom of the allwise Providence, that the trunks of those arteries that are, on account of their superficial situation, exposed to external violence, have, as it were, a vicarious action with others that are more deeply seated, and which are most closely connected with them. Numerous experiments that have been performed, both in the upper and lower limbs, favour this opinion. Is it then inconsistent to attribute to the thigh that degree of perfection which it certainly requires on account of its great bulk? But even if we admit the existence of such narrow communications between the two arteries of the thigh, as not to allow, in a healthy state, the free passage of the blood, still we can perceive such an arrangement in the distribution of the profunda artery, that its branches may very readily be dilated, and thus be fitted for the reception of a larger quantity of blood. For as the profunda artery, which frequently is of larger size than the superficial femoral, immediately divides into many large branches, which, after a short course, again subdivide, the diameter of these divisions must certainly much exceed that of the main trunk, and thus each individual ramification is prepared to undergo a smaller amount of expansion from the impulse transmitted to it, and is fitted to sustain a much greater degree of force without injury. And indeed, when we consider that these are everywhere surrounded by a soft and yielding network of cellular membrane, it appears most probable, that not only double the usual quantity of fluid may readily be distributed amongst so many arteries, but that even these may, if necessary, be so quickly and gently dilated, that the blood may be returned, with scarcely any delay, by a new route to the trunk itself below the ligatures.

It may be concluded from all these arguments, that there

[1] Commentaria in Eustachii Tabulas, p. 253.

1781. can scarcely be any doubt but that the trunk may, however it has been injured, be obliterated by ligature or compression in the upper third of the thigh, or even somewhat below this, near to where it passes through the adductor, but whilst it is still very near to the skin, and before it has given off many branches; or that it may even be obliterated in the ham, and that still the nourishment of the limb may be kept up. Many either deny altogether the possibility of an operation in the first-mentioned situation, or think its result so very doubtful that they prefer the amputation of the limb, lest mortification should affect the otherwise healthy body; but Guenault, Heister,[1] Masotti, Sue,[2] and a few others, who had a better, but still not a very accurate knowledge of the anastomoses of these arteries, endeavoured to prove, by sufficiently powerful arguments, that the safety of the limb, and of the patient, was not directly compromised by the trial of milder means. The highest authority in medical matters, the very illustrious Haller, after having examined the articular branches, thus expresses himself about the popliteal artery: "Whence it appears that the popliteal artery may be ligatured or cut across between the two condyles, if an aneurism should require such a procedure, with a good hope of saving the leg and foot after its division." We can scarcely expect that the branches of the internal iliac artery, namely, the obturator, the sciatic, the posterior iliac (gluteal), and pudic, all of which we know inosculate with the profunda, could undergo such a degree of dilatation, that, if the femoral be tied above its first division, they would suffice for the supply of the limb. It would appear, however, from the experiments of Guattani,[3] that if water, coloured yellow and warmed, be injected into the internal iliac, a large quantity will pass into the arteries of the thigh, and if these be cut across, it will flow abundantly out of the smaller branches. I fear, however, lest a thicker fluid, like blood, would have much greater difficulty in traversing these vessels, or that a portion merely of the vital fluid being with difficulty transmitted, this would be insufficient to afford nourishment to the limb.

§ 2. What theory renders probable experience fully confirms,

[1] Haller. Diss. Chirurg. tom. v; and page 232.

[2] Journal de Médecine, tom. xlvi.

[3] Epicrisis ad Casum, 16; and page 306.

namely, that greater doubt need not be entertained of the favorable termination of an operation in this part of the body than in the arm. I will briefly adduce some examples to show that this artery may be obliterated without any detriment to the limb. And I shall first of all relate the most recent case, published by Acrel,[1] which is remarkable on many accounts, and in which we see a fresh proof of his courage and prudence. A soldier, of a scrofulous habit of body, and much debilitated by long-continued tertian fever, accidentally wounded the femoral artery with a knife, at the inner part of the thigh, about seven inches below Poupart's ligament, whence the blood gushed forth with such violence, and in such quantity, that he nearly fainted. A medical man having been called in bound up the limb with compresses and bandages, so as to arrest the further flow of blood, and in this way succeeded in preventing a recurrence of the hemorrhage until the twelfth day. As the puncture bled again on the third and fifth days after this, and as on the twentieth day an aneurismal swelling, having a very distinct pulsation began to appear, and which, after a lapse of eight more days, threatened a rupture, the patient was persuaded to submit to operation, which Acrel, on account of the size of the tumour, and the quantity of blood that was effused, performed by ligature, and not by compression. An incision having been made, the wound was cleared of the coagulated and very fetid blood by which it was filled, and the artery having been exposed as far as the spot at which it was to be tied, it appeared like a sausage, having a diameter of eight lines, and being dilated to an extent of more than a hand's breadth in length; the upper ligature was then applied. But as the surgeon was tying the lower end of the artery, that vessel unexpectedly gave way above the upper ligature, and the blood burst forth with such violence that, in less than a minute, at least four pounds had been lost. In this fearful emergency, as the hemorrhage could not be arrested either by the application of a fresh ligature, or of a tourniquet, he compressed the artery firmly in the groin with his thumbs, and thus stopped the bleeding; and then, having placed pieces of sponge upon the ruptured vessel, he was compelled to have recourse to compres- 1781.

[1] Kongl. Vetenskaps. Acad. Haudl. 1777, p. 83.

1781. sion. The result of this, the whole cavity of the wound having been filled up with the sponge, was most anxiously looked for. In the hope of increasing the compressing power, an iron plate, adapted to the shape of the thigh, and having a steel ball on its concave surface, was applied in such a way that the ball might forcibly press upon the ruptured artery. And thus, as neither a return of the hemorrhage nor any other inconvenience was to be dreaded from the compressed and ligatured artery, Acrel began to entertain the hope of effecting a perfect cure. For the last piece of sponge having been removed on the eighteenth day, the wound, which was suppurating healthily, filled up so rapidly, that at the expiration of seven weeks it was firmly cicatrized. During the treatment a very violent pain of the foot and great toe, which lasted about twenty days, excited some alarm, and more particularly so, as after an attack of inflammation, apparently of a gouty character, this toe became gangrenous and carious. But as the whole of the rest of the limb preserved its natural colour, and as two phalanges having been removed the disease did not extend any further, it appeared probable that this mortification had not been occasioned by a defect of nourishment, but rather that it was the result of a severe injury that had happened to the part some years before, and in consequence of which its structure had been very considerably modified. At the expiration of two months the patient left the hospital well and strong.

Another case similar to this has been reported in the 'Edinburgh Medical and Physical Commentaries.'[1] A surgeon of Manchester, of the name of Burchall,[2] has also published an instance of the ligature of the femoral artery without any bad consequences resulting.[3] I shall very summarily relate a case of spurious aneurism which was cured by Leber, who ligatured the artery, and which is reported by De Haen[4] and Plenck,[5] as it agrees with the preceding ones in the mode of its formation. On the twenty-seventh day after the infliction of the wound the patient was brought to the hospital, being pale, exhausted, and

[1] [Vide p. 348.] [2] [Vide p. 266.]

[3] [Murray reports these cases at some length, but, as they have already been given in this work, they are here omitted.]

[4] Rat. Med. tom. vii, p. 1.

[5] Plenck's Sammlungen und Beob. tom. ii, p. 37.

feverish, with a weak pulse, a frequent cough, and much anxiety. 1781.
It was found that the external wound had healed, but that the whole of the limb down to the foot was cold and œdematous. An incision having been made, and the aneurismal sac, which contained about five pounds of blood, having been emptied and wiped out, the operator applied a ligature to the upper extremity of the artery. But a violent hemorrhage having come on after the lapse of a few hours, he applied compression to the other extremity of the vessel by means of a piece of sponge, as the blood appeared to flow from it in the greatest abundance. Things went on in this way, if anything somewhat improving, until the eighth day; when the whole wound became gangrenous, in consequence of the blood that had been effused between the muscles putrefying and thus contaminating the fluids and the neighbouring structures. In order to support the patient against this terrible disease many powerful remedies, and, amongst others, an enormous and almost unheard-of quantity of Peruvian bark, were administered internally and applied externally for several months; by which means, the gangrene, which appeared sometimes to be checked, and, at others, to make fresh ravages, was at length so completely arrested that the very large ulcer that was left began to contract and gradually became firmly cicatrized, the patient being restored to perfect health and being able to use his foot as well as before. It is impossible for any one to pretend that this gangrene could in this case have arisen from defective nutrition. For the occurrence of the secondary hemorrhage, which was occasioned by the surgeon neglecting to apply a ligature to the lower extremity of the artery, and the return of the temperature of the limb, which was reestablished on the second day, gave a very evident proof of a free and uninterrupted circulation being established through the collateral vessels.

The description of a case that occurred to Johannes Trullius, a celebrated surgeon and lithotomist of his time, as reported by Marcus Aurelius Severinus,[1] affords an example of a lacerated wound of the femoral artery, produced by a bullet, being so perfectly cured, by the application of a ligature, that nothing but a recollection of the pain and danger suffered was left behind; it

[1] De Medicinâ Efficaci. Francofurti, 1646; lib. 1, part 2, p. 51; and page 191.

1781. also shows very clearly what may be expected from nature in such a wound as this, which was, for several reasons, so very serious. For a leaden bullet passing through the thigh had destroyed two thirds of the femoral artery; and a large quantity of effused blood, exceeding six pounds in weight, had separated an aneurism, that had formed, from the surrounding parts, so that the vessel lay, as it were, in the midst of a large coagulum. A ligature was passed above and below the tumour, and neither this nor the very extensive separation of parts, occasioned by the blood having remained forty days effused without however presenting any signs of putrefaction, gave rise to any difficulty in the formation of the anastomoses.

Guattani, who is very justly celebrated for his ability as a surgeon, has generally so little faith in the use of ligatures, in the treatment of femoral or popliteal aneurism, that he asserts that the operation for aneurism which was successfully performed by Saviard was undertaken on some branch, and not on the main trunk, of the femoral artery. He also shows, by very convincing arguments, that aneurisms of the groin do not admit of this plan of treatment. For it would be necessary to make so extensive an incision, in order to expose the trunk of the artery, which is here very deeply situated, that the cavity of the abdomen would be opened. And as there would not be sufficient room for the application of a tourniquet, and as nothing is to be expected from the small superior anastomosing vessels, he thinks it better, in so doubtful a case, to have recourse to compression.

It would appear from the fourteenth case, related by this author, that this opinion is a correct one. For a groom, who had received many wounds in the warfare of Venus, suffered from a true aneurism of about the size of an apple, which appeared near Poupart's ligament, and which he attributed to a violent effort. As Guattani thought it would be rash to have recourse to any active treatment in an aneurism situated so dangerously as this, he recommended the constant use of bandages and rest. By attending to this advice, although the patient did not live very regularly, the tumour was, in the space of three years, reduced to so small a size that hope was entertained of a perfect cure. But the patient becoming tired of so quiet a life, betook himself to his occupation, in consequence of which, in the course of a few weeks, the tumour returned to such an ex-

tent that, fever at the same time coming on, he was obliged to keep his bed. A surgeon having been sent for, boldly undertook the operation, and endeavoured to check the hemorrhage by compresses; but the patient, being seized with gangrene, died on the third day. 1781.

The following remarkable case, however, would appear to lead to a different conclusion. A tumour arose in the fold of the groin; it was preceded by very severe pains, was soft and indolent, did not pulsate, but afforded a sufficiently distinct subcutaneous fluctuation; concluding from these symptoms that it was an abscess, it was determined to open it. But Guattani immediately perceiving his mistake, from the great quantity of blood that gushed forth with violence, (a large collection having filled up the space between the pubes and the ilium,) attempted to arrest the hemorrhage, as far as lay in his power, by forcibly compressing the artery. This was so successful, that the dressings having been removed on the thirteenth day, no more bleeding took place from the wound, which quickly healed up. It would appear that the femoral artery was divided above the groin, for had it been otherwise the attempt would not have succeeded so well.

§ 3. From the cases that have just been related, we may conclude that the femoral artery may be obliterated, when affected with aneurism, either by ligature or by powerful compression. But there are not wanting cases of recent wounds of the same vessel, unaccompanied by aneurism, that have been cured by compression properly applied without any ligature being requred. I shall only relate two of these for the sake of illustration.

The first I shall take from Heister.[1] A shoemaker of Helmstadt wounded himself accidentally with a knife, six fingers' breadth, above the knee; arterial blood flowed in great abundance from the wound. A variety of remedies having been tried, in order to arrest the hemorrhage, but in vain, Heister checked it by means of a tourniquet; he then filled the wound with scraped lint soaked in alcohol, and placed lycoperdon upon this; above this again, he placed a number of thick graduated compresses, and laid a longer one on the course of the femoral artery; and lastly, bandaged the thigh tightly from the wound up to the

[1] Haller. Disput. Chirurg. tom. v.

1781. groin. At the fifth dressing, in order that the wound might be more accurately compressed and the formation of a secondary aneurism be prevented with greater certainty, an oval metallic plate was laid upon the compress that was nearest to the wound, and was worn for two months until cicatrization had been accomplished. The tourniquet also (which he recommends in similar cases to be tightened to such a degree that the patient perceives, not indeed a violent pain in the spot, but a moderate constriction and a slightly painful sensation,) was left on for the first month, and the cure being at length completed, he applied for some length of time a leathern pad provided with a plate of iron in the part corresponding to the wound, upon which it was kept tightly fixed by means of straps and buckles. By these means the artery was completely obliterated.

The next case is reported by Jussy, in a French Medical Journal.[1] The artery being wounded with a knife, a violent hemorrhage took place, which was temporarily arrested by the pressure of both thumbs and by the application of a tourniquet until the vessel could be firmly compressed by thick compresses and a bandage, by which means a cure was effected in the course of a month. During the treatment Petit's tourniquet was used in order to moderate but not suppress the course of the blood. I cannot say whether in this case the channel of the artery was kept pervious or not.

§ 4. I shall now relate some cases from Guattani and Masotti, in which the popliteal artery has been successfully ligatured or otherwise obliterated. False aneurisms are very rarely met with in the ham, but true and mixed ones are of common occurrence in this situation, and sometimes acquire a very large size. Matanî describes an aneurism in the ham which contained sixteen pounds of coagulated blood.

[Some cases are then related from Guattani, but as these have already been given in another part of this volume, they are here omitted.]

Masotti[2] states that both plans (compression and ligature) are serviceable; but that as the œdema, which is a common

[1] Journal de Médecine, tom. xlii.

[2] Masotti Sull' Aneurysma del Poplite; Firenze, 1772. Cavalini Istorica Collegione di Casi Chirurgici, tom. ii, p. 120.

symptom of this disease, is apt, if the compression as recommended by Guattani be employed, to give rise to fatal suppuration; upon the whole he recommends the use of a ligature. In order, therefore, to diminish the very severe pains from which those who labour under this disease suffer, and to prevent the adhesion of the tumour to the subjacent artery and vein, and its greater increase, by which several anastomosing branches might be destroyed, he ligatures the vessel in all favorable cases. Amongst others, the case related at page 531 shows clearly that his expectations were well founded; but this one must here give place to another, which corroborates in the strongest manner my opinion about the anastomoses of the vessels. 1781.

A countryman, whilst making a violent exertion, was seized with a sudden pain in the left ham, which was followed by an aneurismal tumour. As the patient was most anxious to get some relief, the disease increasing daily, the surgeons recommended amputation of the limb. But being strongly opposed to this, he preferred trusting to chance, and the inflammation continuing to increase, pus formed in the neighbourhood of the aneurism in such quantity, that the skin gave way, and it escaped externally. But the pus was of so ichorous and acrid a character that, by its continued excretion, not only the cellular tissue of the ham, but also the artery, without however any hemorrhage occurring, and at last the nerve were destroyed. The suppuration, however, diminishing gradually, the ulcer after a while healed, the leg being preserved, although paralysed. It is, indeed, surprising that the whole of the aneurismal sac could have been removed by suppuration, without the occurrence of any hemorrhage, and without any means having been taken to prevent such an accident. There can be no doubt but that the coagula must have compressed the artery to such an extent that, its channel being altogether blocked up, the blood must have been transmitted to the extremity of the limb through collateral vessels.

§ 5. I have thus endeavoured to prove by, as it were, living examples, the number of which may be greatly increased by those who have more opportunity of consulting medical works, that the diseases of this artery have not, as many pretend, invariably a fatal termination. There are many who, following the path of ignorant surgeons, urge that, if the main artery be

1781. wounded, the thigh must be amputated, lest the part, being deprived of its nourishment, perish. But experience, the teacher of the wise, directs us to reject, or, at all events, to defer so cruel a resource, and also that the operation by which the dilatation of the vessels may be assisted should not be put off too long, or even should at once be had recourse to.

As those circumstances that I have pointed out in the first section will serve as a general outline of the plan of treatment to be adopted, and as the cases that have been related elucidate this more fully, I shall now merely answer the question, in what cases compression of the limb, as employed by Guattani, is to be preferred to ligature of the artery? Those who suppose that the vessels are filled by the pressure *a tergo* believe that the cure is most safely commenced by applying a proper degree of compression to the whole limb, and then, if the disease require it, obliterating the artery either by ligature or by pressure. But if we consider the case more attentively, it will appear that, although compression of the vessel may be safely undertaken at once in some cases in which the disease affects the femoral artery, yet that in other cases the application of a ligature is to be preferred to compression of the limb, and in others again compression to ligature. So also, occasionally, an equable and slight pressure, and at other times one that acts directly upon the aneurismal tumour, is the most serviceable. In a very recent wound of an artery, no aneurism having as yet been formed, proper bandaging is from the first to be employed; and there are thousands of cases that prove that arteries punctured by the lancet readily heal in this way. Nevertheless, it is better to have the instruments that are necessary for the ligature of the artery ready, as the case may occur in which it becomes expedient to have recourse to them. The obliteration of the tumour may also, as experience has proved, be successfully attempted in partial true, and more particularly in those false aneurisms which have not long lost their character as true ones, by means of a more powerful compression, either by bandages or by proper apparatus. But very large true and false aneurisms of the thigh and ham require a more moderate and but gradually increased compression by means of bandages. For as they commonly arise in this situation, as we have already shown, from an internal cause, depending on the structure of

the vessels themselves, and as not unfrequently the subjacent 1781.
bones are much corroded, and acted upon by the ichorous pus, the slightest pressure cannot be borne without much increase of pain, and the tumour enlarging, may give way; or else disappearing in one part, may show itself in another. But in this case also all operation will but serve to hasten the fatal termination that is already rapidly approaching. It is more rarely that obliteration of a true aneurism not occasioned by external violence can be accomplished. Both plans may be adopted with equal success in popliteal aneurism, and if the case sometimes turn out badly, the cause of this must be sought either in some disease of the fluids, occasioned by the protracted nature of the complaint, or by caries of the bones or long-standing disease of the veins. The celebrated Pott found the trunk of the artery for some distance from an aneurismal tumour so weakened, and so destitute of its normal cohesion, that a ligature would probably be useless. But if, after collating all the arguments, a comparison be instituted between the two plans of treatment, ligature will, in every kind of aneurism, be found to have been more successful than compression. For in this situation the artery can easily be exposed, and it will rarely in recent cases be found diseased; a ligature, the action of which may afterwards be assisted by pressure, may then be passed round the vessel, which in cases of false aneurism is not dilated, as near to the lesion as possible; by which means all, or nearly all, the anastomosing branches may be preserved, and a very small part only of the artery being destroyed, the vessel may speedily and effectually be obliterated. But if compression of the limb be employed, the most fortunate termination of which will be, that the main trunk continues pervious, it may happen (the whole of the sac and ham being filled with coagula) not only that the cavity of the vessel may be obliterated, but that the collateral branches, which are so necessary to the support of the limb, suffer the same lot, and that thus all chance of success is done away with. But if a true aneurism, in which Richter disapproves of compression of the vessel, should have attained such a size, that it becomes probable that the articular arteries are included in the tumour, and if it should have afforded unequivocal signs of suppuration or of caries, it would be hazardous to have recourse to ligature. In every aneurism

1781. that is false and recent, we ought to proceed at once, with as little hesitation as possible after the skin has been cut, to find the artery, under which a double ligature should then be passed both above and below the tumour; and if there be a fear of putrefaction, the vessel may be obliterated by the employment of stronger compression.

§ 6. Although of all operations none require greater hesitation than those by which we intend removing a limb, yet the cases nevertheless occur in which these must be had recourse to;[1] for the collateral vessels being destroyed, inflammation, suppuration, and, what is worse, caries being excited, the whole of the limb being distended with enormous effusions of blood, and being so sensitive that the slightest touch cannot be borne, the only hope that is left lies in its removal; so also if, after the application of the ligature, an incurable gangrene be excited either by the defect of nutrition, by the irritation, or by the œdema that occurs, the limb must be amputated. But independently of other reasons that I shall not mention, it may be observed that there is but a small chance of the operation proving successful, as the patient usually does not consent until all the humours have become perfectly vitiated and corrupted; whence it happens, as the cases related by Guattani and Bromfield[2] show, that the patient dies miserably either of hemorrhage from the surface of the wound, of gangrene, or of spasms of the whole body.

Whence, as the uncertainty in the result of many of these cases has often deterred surgeons from undertaking a safe and proper means of cure, they have thought it best to leave those to nature alone that are very severe, without having recourse to any remedy. And we find that that relief has been afforded by a benign nature which could never have been expected from art, as in the very interesting cases related by Rommelius, Guattani, Masotti, and Deslandes;[3] for these show that several patients who would neither submit to amputation nor to operation, or else on whom the surgeon refused to operate on account of the serious nature of their disease, have been perfectly cured, after a certain

[1] Pott's Remarks on that kind of Palsy, &c. 1779.

[2] Chirurgical Observations and Cases, p. 304.

[3] Journal de Médecine, tom. xiv. Ephem. Natur. Curios. Dec. 2, p. 385.

time, by low diet, by repeated venesection, and by rest, without the occurrence of any suppuration or sensible change in the condition of their disease. It is not therefore surprising that Valsalva[1] recommended this mild plan, and that afterwards Benevoli, Guattani, and De Haen practised it with success. 1781.

HOME.[2]

To Dr. Simmons. Sir,—In consequence of your request, I send you an account of Mr. Hunter's method of performing the operation for the popliteal aneurism, which you will please to insert in the next part of the 'Medical Journal,' if you think it deserving of a place in that publication. I am, Sir, yours, &c. EVERARD HOME. 1786.

The common method of operating in cases of popliteal aneurism having, in many instances, proved unsuccessful, the operation itself has been condemned by some of our most eminent surgeons. If we consider the cases in which it has been performed, and where the patients have died, we shall probably find that in all of them the artery has been diseased at the part inclosed by the ligature, and had either sloughed off or had been cut through where it had been tied, so that the sides of the artery, though brought together, had not remained a sufficient length of time in that situation to unite by the first intention, and the patients lost their lives from the consequent hemorrhage.

The femoral and popliteal arteries are portions of the same trunk, presenting themselves on different sides of the thigh, and are readily come at in either situation; but where the artery is passing from the one side to the other, it is more buried in the surrounding parts, and cannot be exposed without some difficulty. In performing the operation for the popliteal aneurism, especially when the tumour is large, the ligature is com-

[1] Morgagni de Sed. et Caus. Morb. epist. 17, art. 30; and page 261.

[2] An account of Mr. Hunter's method of performing the operation for the Popliteal Aneurism, communicated in a letter to Dr. Simmons by Mr. Everard Home, Surgeon. —The London Medical Journal, vol. vii, 1786, p. 391.

1786. monly applied on the artery at that part where it emerges from the muscles. This will be too limited a space, should it prove diseased for some way higher up; and if the artery should afterwards give way from any of the causes above mentioned, there will not be a sufficient length of vessel remaining to allow of its being again secured in the ham. To follow the artery up through the insertions of the triceps muscle, to get at a portion of it where it is sound, becomes a very disagreeable part of the operation; and to make an incision upon the fore part of the thigh, to get at and secure the femoral artery, would be breaking new ground, a thing to be avoided if possible in all operations.

From these considerations, suggested by the accident of the artery giving way, which happened several times to Mr. Hunter, he proposed, in performing this operation, that the artery should be taken up at some distance from the diseased part, so as to diminish the risk of hemorrhage and admit of the artery being more readily secured, should any such accident happen. The force of the circulation being thus taken off from the aneurismal sac, the cause of the disease would, in Mr. Hunter's opinion, be removed; and he thought it highly probable that, if the parts were left to themselves, the sac, with the coagulated blood contained in it, might be absorbed, and the whole of the tumour removed by the actions of the animal economy, which would consequently render any opening into the sac unnecessary.

The operation was first performed in this way at St. George's Hospital, and the result which I have here annexed does credit to Mr. Hunter's observation; and so far as one case can establish a general practice, it seems to be an improvement of considerable importance.

A. B., about forty-five years of age, a coachman, was admitted into St. George's Hospital in December 1785, with a popliteal aneurism, which he had perceived for three years, and had observed it gradually to increase during the whole of that period. It was so large as to distend the two hamstrings laterally and make a very considerable rising between them; the pulsation was very distinct, and could be felt on every side of the tumour. That leg and foot were so much swelled as to be a great deal thicker than the other, and were of a mottled brown colour; the swelling was not of the œdematous kind, but felt firm or

brawny, being a consequence of the extravasation of coagulating lymph, so that the leg retained its natural shape. 1786.

Mr. Hunter having determined to perform the operation, a tourniquet was previously applied, but not tightened, that the parts might be left as much in their natural situation as possible; and he began the operation by making an incision on the fore and inner part of the thigh, rather below its middle, which incision was continued obliquely across the lower edge of the sartorius muscle, and was made large to give room for the better performing of whatever might be necessary in the course of the operation; the fascia which covers the artery was then laid bare for about three inches in length, and the artery being plainly felt, a slight incision, about an inch long, was made through this fascia along the side of the vessel, and the fascia dissected off, by which means the artery was exposed. Having disengaged the artery from its lateral connexions by the knife, and from the parts behind it by means of the end of a thin spatula, a double ligature was passed behind it by means of an eyed probe, and the artery tied by both portions of the ligature, but so slightly as only to compress its sides together; a similar application of ligature was made a little lower; and the reason for passing four ligatures was to compress such a length of artery as might make up for the want of tightness, as he chose to avoid great pressure on the vessel at any one part. The ends of the ligatures were carried directly out at the wound, the sides of which were now brought together and supported by sticking plaster and a linen roller, that they might unite by the first intention.

The limb was found, some hours after the operation, not only to retain its natural heat, but to be even warmer than the other leg. The second day after the operation the brawny firmness of the leg was considerably diminished; it was become soft, loose, and a good deal smaller, and the aneurismal tumour appeared to have lost more than one third of its size.

Nothing could show more plainly the action of the absorbents than the change the leg underwent in so short a time. The diminution of the tumour probably arose from the fluid blood which it contained having passed into collateral branches, or the tibial artery.

The fourth day, on the removal of the dressings, the edges

1786. of the wound were found united through its whole length, excepting where prevented by the ligatures; there was neither pain nor tumefaction in the part, but the aneurismal tumour was much the same as on the second day.

On the ninth day after the operation there was a considerable discharge of blood from the part where the ligatures passed out; a tourniquet was therefore applied on the artery above, which stopped the bleeding; and although the tourniquet was taken off a few hours after no blood followed. The head of a roller was now placed upon the wound, in the direction of the artery, and over that the tourniquet, which was not tightened more than was thought sufficient to take off the impetus of the blood in that portion of the artery.

On the tenth day appearances were much the same, only that between the compress and the knee there appeared a little fulness like an approaching inflammation. On the eleventh day this was gone off; and on the fifteenth some of the ligatures came away, followed by a discharge of matter, and the tumour in the ham was lessened. On the seventeenth day, the parts surrounding the aneurismal tumour were more reduced and pliable, so that it became distinct.

About the latter end of January 1786, six weeks after the operation, the patient went out of the hospital; the tumour at that time being somewhat lessened, and rather firmer to the feel. He was ordered to come to the hospital once every week, and, in the meantime, to make some degree of pressure by applying a compress and bandage, with a view to excite the absorbents to action, which in this, as in most cases, had a good effect.

About the middle of February the tumour had decreased, and was become still firmer. March 8th, the wound, which had cicatrized, broke out again, and the patient was taken into the hospital. About the 8th of April, some remaining threads of the ligature came away, and an inflammation appeared upon the upper part of the thigh. In the middle of May, a small abscess broke at some distance from the old cicatrix, at which opening some matter was discharged, but no pieces of ligature were observed. Several small threads were, at different times, discharged at the old sore, and the swelling subsided; but the thigh soon swelled again to a greater size than before, attended

with considerable pain. In the beginning of July, a piece of ligature, about an inch in length, came away; after which the swelling subsided entirely, and he left the hospital the 8th day of July; at which time there remained no tumour in the ham, and he was in every respect well. 1786.

This mode of performing the operation, being in itself evidently more simple, and in every respect less dangerous than the method commonly practised, it is unnecessary to enumerate all the circumstances in which it deserves the preference: but, before I conclude, it will be proper to observe that Mr. Hunter now rather disapproves the application of a number of ligatures, in the manner practised in the above case, as these cannot come away without producing ulceration on that part of the artery which they inclose; a tedious process when the ligature is not drawn tight. Neither do I believe he would again be inclined to heal up the wound by the first intention, but rather to allow the cut surface to inflame and suppurate, by which he would have it more in his power to come at the artery, should that prove necessary; and probably, by means of the dressings, he might make a gentle compression to assist the ligatures.

It will not be improper here to observe, that surgeons have laid too much stress on the necessity of large collateral branches being present, to ensure the success of this operation: this must have arisen more from their anatomical knowledge than from observations made from practice; since we find that the trunk of the femoral artery may be taken up in any part of the thigh without producing mortification of the limb. In one patient affected with aneurism, whose limb Mr. Hunter examined after his death, though there was great reason to believe that the artery had been obliterated above the great muscular branch, the limb had been very well nourished.

Since the above account was drawn up, this mode of performing the operation has been practised, in a case of aneurism of the femoral artery, by Mr. Birch, surgeon to St. Thomas's Hospital; and as the operation, in that instance, was not attended with success, the failure might by some be attributed to the mode in which it was performed, and the above account might be considered as a partial one; to do away these objections, I requested Mr. Birch to favour me with the particulars of the case, that my account of the consequences of the opera-

1786. tion might be more complete; and although it was disagreeable to me to ask for the recital of an unsuccessful case, I was well assured that Mr. Birch was too disinterested, and too anxious to promote the improvement of his profession, to make the least objection to the case being laid before the public; and I have since been fully confirmed in my opinion by his ready compliance with my request.

I have given the case, with the dissection of the body after death by Mr. Cline, exactly as they were communicated to me by Mr. Birch.

Case. "John Lewis, a negro, aged forty-three years, received a blow on the anterior part of the right thigh. About a month after he perceived a small tumour, which gradually increased, and his own expression was, that he could feel it *thump, thump*.

"As the tumour enlarged, he came to London for advice, applied at St. Thomas's Hospital on Thursday, the 26th of October last, and was directly admitted. On examination, I found a large tumour, extending within two inches of Poupart's ligament upwards, and occupying two thirds of the thigh; a pulsation could be felt, and there was no doubt of the disease being an aneurism of the femoral artery.

"I directed seven ounces of blood to be taken from the arm, and an opiate to be given at night. The patient rested well, and the next day a consultation was held, in which it was proposed to perform an operation, and endeavour to pass a ligature round the femoral artery, giving the patient the chance of nourishing the limb by the arteria profunda, and other anastomosing vessels.

"On Friday, the 3d of November, it was determined to perform the operation. Mr. Cline undertook to compress the artery as it passed through Poupart's ligament, which he easily effected with a hard compress in the shape of a T, with a broad basis.

"It was agreed, previous to the operation, that an incision should be carried in a semilunar form round the upper part of the aneurismal sac, in order to make room for the longitudinal incision necessary to dissect down to the artery. This was accordingly done, and the integuments raised so as to make room to feel for the pulsation of the artery. Some portion of cellular membrane, and some lymphatic glands, were necessarily dissected

and removed; with my fingers I then separated the muscular fibres, and tore away the connecting parts, till the artery could be plainly felt in pulsation. It was then necessary to divide a part of the fascia covering the artery, which was done by carrying the back of the knife on Mr. Cline's nail, while his finger pressed upon the naked artery; after which the finger and thumb could surround and compress the vessel. An eye-probe, armed with a strong flat ligature was then pushed through the cellular membrane and carried under the artery. This being effected, we had such command of the vessel as to be able to strip it down, and pass another ligature somewhat lower. 1786.

"This last ligature was then tied, the first being left loose to secure us against accident.

"The threads being separated and secured, the wound was lightly dressed, the tumour left in its natural situation and the patient put to bed, with the loss of only four or five ounces of blood during the operation. No pulsation could be perceived in the tumour after the ligature was tied.

"On Saturday, November 4th, he had slept well, was easy, and there was sufficient warmth in the extremity to assure me of some circulation.

"On the 5th the discharge from the wounded lymphatics was so abundant as to make it necessary to remove the superficial dressings. The tumour was rather softer to the touch, and the skin about the apex of it began to shrivel.

"The discharge of lymph continued till the 9th, and then the wound began to digest, affording, however, a very small quantity of pus. The tumour grew thinner at one point, and seemed as if disposed to ulcerate the integuments. This day I passed a bleeding ligature round the leg, just below the knee, and the veins tumefied sufficiently to have bled freely, if they had been punctured.

"10th. He was feverish in the evening.

"11th. He had stools from some laxatives I had directed, and was better.

"12th. The tumour was very thin in one part, and a fluctuation evidently to be felt. The limb was warm and moveable, but the patient was feverish and delirious at night. A decoction of bark, with a sedative bolus, were directed for him, but he would not take them.

1786. "13th. The wound looked florid, and afforded good pus. The patient was feverish and delirious; the tumour was threatening to burst. This day he took his medicines.

"14th. He became sensible, but was languid and hot; the tumour burst, and discharged serum and grumous blood; he fainted; the dressings were not disturbed; he slept composedly; fainted again about six o'clock in the evening and expired. I saw him at seven, when the limb was still warm; I removed the dressings, and found a small stream of fresh arterial blood which had issued from the wound.

"It appears probable, that if the patient had applied for relief before the tumour was so much enlarged, the operation might have succeeded, as we should then have been able to have tied the sound artery so much lower down. J. Birch."

"*Dissection.* The body was examined the morning after the patient's death. The integuments in the middle of tumour were mortified. The blood contained in the tumour was very putrid, and the greater part of it fluid; it appeared to be dissolved by putrefaction. Water, injected by the external iliac artery, escaped freely from the wound at the ligature, where the artery was open, and appeared to have ulcerated at that part.

"In dilating the artery from the ligature to the heart, its internal surface appeared of a bright red. This appearance lessened at the curvature of the aorta, yet it was very evident in the semilunar valves.

"The arteria profunda, which passed off from the femoral artery rather less than half an inch above the ligature, was also inflamed within. There were near two inches of the femoral artery between the ligature and the aneurismal sac, the internal surface of which was of the usual white colour; from this a membranous-like substance could be peeled off that seemed to be coagulable lymph.

"The opening where the artery passed out of the aneurismal sac was near three inches below the part where it entered. In opening this part of the artery, from the sac to the ham, it appeared quite sound, and of its natural colour. H. Cline, Green Street, Leicester Square, November 30, 1786."

Some time since I sent you an account of a new mode of performing the operation for the popliteal aneurism, by Mr. Hunter, at St. George's Hospital. The man having lately died of a fever, afforded an opportunity of ascertaining the consequences of the operation, and the state of the parts after the recovery, which, being all taken together, render the case very complete and satisfactory; and the case being published in the 'Medical Journal,' I send you the following account as a continuation of it. 1787[1]

The man was thirty-five years old at the time he underwent the operation, which was in December 1785. In July 1786, he was perfectly well, and returned to the driving of a hackney-coach, which was his employment. From exposure to the weather, more particularly at night, he became subject to repeated attacks of cold, and, in March 1787, was seized with a fever of the remittent kind, which carried him off. During all this time, the limb on which the operation had been performed was not at all affected.

He died on the 1st of April 1787, and leave was procured, with some trouble, and considerable expense, for Mr. Hunter to examine the limb seven days after death, at which time it was entirely free from putrefaction.

The cicatrix on the anterior part of the thigh was scarcely discernible, but the parts under it felt hard. The ham had no appearance of tumour, and was, to the eye, exactly like that of the other limb; to the feel, however, there was a solid tumour filling up the hollow between the two condyles of the thigh-bone.

The femoral artery and vein were taken out above the giving off the branch called profunda, and a little lower than the division into the arteriæ tibiales and interossea, a portion of these branches being preserved. The arteries and veins that were pervious being injected, the whole was carefully dissected, and the following is an account of the appearances.

The femoral artery was impervious from the giving off the profunda, as low as the part which was included in the ligature, and at this part there was an ossification, for about an inch and

[1] Supplement to the account of Mr. Hunter's method of performing the operation for the Popliteal Aneurism, inserted in the seventh volume of this work [vide antea], communicated in a second Letter to Dr. Simmons by Mr. Everard Home, Surgeon, F.R.S.—London Medical Journal, vol. viii, 1787, p. 126.

1787. a half along the course of the artery, of an oval form, the run of which was solid, becoming thinner towards the centre, and not bony but only ligamentous: below this part the femoral artery was pervious down to the aneurismal sac, and contained blood, but did not communicate with the sac itself, having become impervious just at the entrance.

What remained of the aneurismal sac was somewhat larger than a hen's egg, but more oblong, and a little flattened, extending along the side of the artery below for some way; the blood pressing with greater force in that direction, and distending that part, so as in some measure to give the appearance of a separate bag. The sac was perfectly circumscribed, not having the smallest remains of the lower orifice from the popliteal artery. Whether this arose from the artery being pressed upon by the inferior portion of the sac, as appears to be the case in common, or was in consequence of the sac contracting after the operation, I will not pretend to determine. It contained a solid coagulum of blood, which adhered to its internal surface. The coagulum, having a section made of it, appeared to be composed of concentrated lamellæ, uniform in colour and consistence.

The popliteal artery, a little way below the aneurismal sac, was joined by a small branch very much contorted, which must have arisen either from the profunda or the trunk of the femoral artery. About two inches below the sac the popliteal gave off, or divided into the tibials.

The profunda was of the usual size, but a good deal ossified for some length after leaving the femoral artery: the two tibials, where they go off from the popliteal, were in the same state.

The trunk of the femoral vein, where it passed along the side of the tumour, must have been obliterated, for at this part it appeared to send off three equal-sized branches, passing over different parts of the aneurismal sac; these must have been dilated branches, none of them having the course which the trunk of the vein should have pursued.

These appearances throw some light on the changes which took place in the limb after the operation. A ligature being made upon the femoral artery impeded the passage of the blood into the sac so much as to allow it in some measure to collapse, and its contents to coagulate, which rendered the opening of the artery into the sac impervious; so that not only a stop was

put to the increase of the tumour, but it must of necessity have become gradually more solid and smaller, in consequence of absorption, till reduced to the size met with in the dead body. The material consequences taken notice of coincide with the idea Mr. Hunter had formed prior to the operation. 1787.

The conclusion to be drawn from the above account appears to me a very important one, viz., that the simply taking off the force of the circulation from the aneurismal artery is sufficient to effect a cure of the disease, or at least to put a stop to its progress, and leave the parts in a state from which the actions of the animal economy are capable of restoring them to a natural one. In confirmation of this account, that the cure of an aneurism depends on taking off the force of the circulation, I shall mention a case that recovered without any assistance from art, and which I consider to have got well upon the same principle. This case was more particularly under the care of Mr. Ford, surgeon, in Golden Square, who will, I hope, lay a particular account of it before the public. I mean to notice it no further than by endeavouring to account for the recovery, which may be explained by Mr. Hunter's observations on mortification.

The aneurism was in the femoral artery, and the swelling appeared upon the anterior part of the thigh, a little above the middle, extending upwards, as it increased in size, nearly to the brim of the pelvis. Every attempt towards a permanent compression of the artery above the tumour, just as it passes over the brim of the pelvis, proved ineffectual; the tumour enlarged to a very considerable size, a great degree of inflammation and swelling took place in the sac and common integuments, and mortification appeared to be taking place in the skin which lay over it. While in this state, the pulsation, before very evident in every part of the tumour, was no longer to be felt, nor even in the artery immediately above it, so that the steps preceding mortification had certainly taken place, the blood in the artery above having coagulated.[1] And this circumstance was sufficient

[1] In those patients who die in consequence of mortification of any part of the body, the artery leading to that part is found always completely stopped up for several inches in length by a firm coagulum: this must take place prior to the mortification, and seems intended, for the wisest purposes, to prevent hemorrhage. (Taken from Mr. Hunter's Lectures.)

1787. to prevent the absolute mortification coming on; for the artery above becoming impervious, put a stop to the dilatation of the sac and all its consequences.

From the time the pulsation stopped, the swelling and inflammation subsided, although exceedingly slowly, and the tumour diminished, becoming more firm and solid, and at the time of writing this paper is very much reduced in size, and to the feel resembles that found in the ham of the patient who is the subject of this paper.

Having in my former paper taken notice of an unsuccessful case, in which this mode of performing the operation for the aneurism was in some measure adopted, at St. Thomas's Hospital, I feel myself more particularly called upon at present, to do away any censure that may have fallen upon this operation from an unsuccessful case at St. Bartholomew's Hospital, which has been the subject of medical conversation. I shall mention the operation, at which I was present, and give the result as briefly as I am able.

The aneurism was in the ham, and the operation was performed by Mr. Pott in the following manner: An incision was made above the tumour, through the integuments, in the direction of the thigh between the two hamstrings, for about five inches in length; he then dissected down to the vessels at the upper end of the incision, which being there deep seated, it proved both tedious and difficult. Having come down to the vessels, a double ligature was passed, and the two portions tied separately at nearly half an inch distance. The depth of the incision made it difficult for any but the operator, and those immediately assisting him, to see what was included in the ligature, and no doubt was made at the time of its being anything but the artery. The wound was dressed up in the common way.

The second day after the operation a pulsation was felt in the tumour, which afterwards enlarged so much that Mr. Pott amputated the limb.

On dissection, the aneurism did not appear to be in the artery which was included in the ligature, but was supposed to be in an anastomosing branch.

I shall not go further into the operation than as it applies to Mr. Hunter's mode of performing it, which leads me to the following remarks: That from analogy the pulsation should not

have been felt in the tumour, had it been either in the trunk of the artery or in an anastomosing branch, if the popliteal artery above was rendered impervious; and if the branch diseased went off from the femoral artery above the ligature, the pulsation should have continued after the operation, and should have been rendered more violent by it, which does not appear to have been the case; and farther, that the taking up the artery in the ham was taking it up under every disadvantage respecting the future success of the operation, either from the artery itself being diseased, or the tumour being so contiguous to the violence done in the operation, that the whole sac most probably would be affected by the consequent inflammation, which seemed in some measure to have been the case, as I understood two abscesses were formed close to the sides of the sac.—Green Street, Leicester Fields; May 23d, 1787. 1787.

HOME.[1]

The popliteal aneurism being a disease which frequently occurs, and generally proves fatal, unless some means are taken to prevent it, we cannot be surprised that it has attracted the attention, and called forth the exertions of the ablest surgeons in this country, to discover some method of cure. 1793.

Experience has shown that all the modes hitherto practised are exceedingly precarious, being rarely attended with success, and the death of the patient being commonly a consequence of a failure of the operation; a circumstance which has led some surgeons of great eminence to prefer the amputation of the limb in all such cases.

Mr. Hunter, who has repeatedly performed the operation for the aneurism, finding that it in general fails, and having likewise observed that the removal of a limb so high up, from a person in health, seldom succeeds in preserving life, (and when it does, leaves the patient disabled,) was excited to consider this disease with more than ordinary attention. The result has been a mode of practice that appears to possess many advantages

[1] An account of Mr. Hunter's method of performing the operation for the cure of Popliteal Aneurism. By Everard Home, Esq. F.R.S. Assistant-Surgeon to St. George's Hospital.—Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge; London, 1793, p. 138.

1793. over those hitherto recommended, and to be an improvement in the practical part of surgery; at least, it is from this idea being strongly impressed on my mind that I am induced to communicate it to this Society, as Mr. Hunter is too much engaged to permit his taking that task upon himself.

An aneurism is a preternatural dilatation of a portion of an artery, and in general it is a very small part of the arterial coats which is thus affected. The dilatation is commonly on one side only, and, when once begun, gradually enlarges, from the force of the heart propelling the blood against the dilated part. Thus in time a sac is formed, which being in some measure out of the direct course of the circulation, the blood, where it is at the greatest distance from the channel of the artery, coagulates, and forms layers, or strata, upon the inside of this sac. As the enlargement of the sac depends entirely on the force with which the blood is acted on by the heart, it does not, as at first, continue to swell out at right angles from the side of the artery, but is increased in a diagonal line between that and the course of the artery itself, from the force of the blood being applied in that direction; so that the sac is protruded along the outside of the artery, and, by its pressure upon it, obliterates, in many instances, the lower orifice, which communicates with the artery, and produces a total stagnation of the blood in the sac.

If the coats of an artery are examined in the commencement of this disease, the first appearance is a loss of the natural lustre and transparency of its internal membrane; that becoming opaque, afterwards thicker, acquiring a leather-like appearance; and when the sac becomes larger, the coats retain no longer a resemblance to those of an artery, but have more that of a membranous bag, communicating laterally with the artery by a rounded orifice, (of different sizes,) the margin of which resembles the internal membrane of an artery in a thickened state; but beyond that, gradually degenerates into a membranous substance.

The popliteal aneurism, which we are at present to consider, is the disease above mentioned, affecting the trunk of the popliteal artery, which runs down between the two hamstrings of the thigh. From the situation of the tumour, on whatever side of the artery the dilatation is produced, it will be distinctly felt in the hollow between the hamstrings, and will be readily as-

certained by a pulsation to be felt in every part of the tumour; 1793.
it seems to be one of the most frequent situations of aneurism;
and though it may be difficult to ascertain whether it occurs so commonly as in the aorta itself, it is certainly found oftener in this artery than in any other branch which the aorta sends off. This circumstance, as far as I know, has not hitherto been accounted for, and what is rather curious, in many recent instances of this disease, the patients have been coachmen and postilions.[1] The popliteal aneurism has been in general supposed to arise from a weakness in the coats of the artery, independent of the presence of disease; if this were true, we might reasonably conclude, that, except in the part preternaturally dilated, the vessel remained in a sound state, which would naturally suggest the mode of practice generally recommended, viz. opening the sac, tying up the artery above and below it, leaving the bag to suppurate, and afterwards heal up like any common sore.

Mr. Hunter finding an alteration of structure in the coats of the artery previous to its dilatation, and that the artery immediately above the sac seldom unites when tied up in the operation for the aneurism, so that as soon as the ligature comes

[1] Morgagni and his friends found aneurisms of the aorta more frequently in guides, postboys, and other persons who sit almost continually on horseback, which is attributed to the concussion and agitation. (Vide Letter 17, art. 18.)

When we consider the popliteal artery as affected by the different positions of the leg and thigh, and the obstruction which the circulation must inevitably meet with in that artery when the limb is bent, we see a probable reason why it should be more liable to disease than any of the other ramifications of the aorta, especially when it is found that aneurisms in the aorta itself are most frequent at the curve of that artery. If this observation is allowed to have any weight, the reason will be evident why the disease should occur more frequently in coachmen and postilions; for their knees being almost constantly in a bent state from the necessary exertions of their bodies in their different occupations, and from the violent motion of their horses and carriages, the circulation must often be considerably increased; while the branches immediately below the popliteal artery will be in some measure obstructed by the action of the gastrocnemii and solei muscles in steadying the body in the stirrup or against the foot-board of the carriage.

The unfavorable circumstances respecting the popliteal artery do not in common life seem of themselves capable of producing disease but when increased to a great degree, as in the occupation of coachmen and postilions; they at the same time, from want of sufficient exercise, have their legs weaker and less healthy than the rest of the body; and the cases to be mentioned appear still further to prove that these circumstances may produce such a state of the artery at this part as to dispose to the formation of aneurism.

1793. away the secondary bleeding destroys the patient, was led to conclude that a previous disease took place in the coats of the artery, in consequence of which it admitted of dilatation capable of producing aneurism.

But not satisfied with the experiments on frogs, given by Haller in support of the opinion that weakness alone was sufficient to produce the dilatation, he resolved to try the result in a quadruped, which, from the vessels being very similar in their structure to those of the human subject, would be more likely to ascertain the truth or fallacy of Haller's opinion. That the experiment might have as much as possible the chances most likely to produce aneurism, the carotid artery, as being near the heart, was selected for that purpose.

Mr. Hunter having laid bare the carotid artery of a dog for above an inch in length, removed its external coat, and afterwards dissected off the other coats, layer after layer, till what remained was so thin that the blood was plainly to be seen through it, left the dog to himself. In about three weeks the dog was killed and the parts examined, when it appeared that the two sides of the wound having closed upon the artery, the whole of the surrounding parts were consolidated, forming a strong bond of union, and the artery itself was neither increased nor diminished in size.

This experiment appeared very conclusive, as the coats of the artery were weakened to a much greater degree, without dilatation, than can ever happen from accident in the living body, independent of morbid affection. But it was objected, on the other hand, that the parts, having been left to themselves, immediately closed upon the weakened portion of the artery, and, being cemented together by the coagulated blood, effectually secured it against any dilatation. To try the force of this objection I made the following experiment.

I laid bare the femoral artery of a dog, about two inches below Poupart's ligament, for about an inch in length, and dissected off the coats till the hemorrhage from the vasa vasorum was considerable, and the circulating blood was distinctly seen through the internal membrane of the artery. The hemorrhage soon stopped by exposure, the surface was wiped dry, and afterwards covered with a dossil of lint to prevent the sides of the wound from uniting. The dog continued very well, and the

wound healed up from the bottom; after six weeks the dog was killed, and the artery was injected that it might be examined with greater accuracy. It was not perceptibly enlarged or diminished, and its coats at this part had recovered their natural thickness and appearance. 1793.

The results of these experiments confirmed Mr. Hunter in his opinion that the artery, in cases of aneurism, is in a diseased state, and led him to believe that the disease often extends along the artery for some way from the sac, and that the cause of failure in the common operation arises from tying a diseased artery, which is incapable of union, in the time necessary for the separating of the ligature.

The femoral and popliteal arteries are portions of the same trunk presenting themselves on different sides of the thigh, and are readily come at in either situation; but where the artery is passing from the one side to the other, it is more buried in the surrounding parts, and cannot be exposed without some difficulty.

In performing the operation for the popliteal aneurism, especially when the tumour is large, the ligature is commonly applied on the artery at that part where it emerges from the muscles. This mode of performing the operation will be found inadequate if the disease of the artery extends above the sac; for if the artery should afterwards give way there will not be a sufficient length of vessel remaining to allow of its being again secured in the ham. To follow the artery up through the insertion of the triceps muscle to get at a portion of it where it is sound becomes a very disagreeable part of the operation; and to make an incision upon the fore part of the thigh to get at and secure the femoral artery would be breaking new ground, a thing to be avoided, if possible, in all operations.

Mr. Hunter, from having made these observations, was led to propose that in this operation the artery should be taken up in the anterior part of the thigh, at some distance from the diseased part, so as to diminish the risk of hemorrhage and admit of the artery being more readily secured, should any such accident happen. The force of the circulation being thus taken off from the aneurismal sac, the progress of the disease would be stopped; and he thought it probable that if the parts were left to themselves, the sac, with its contents, might be absorbed, and the whole of the tumour removed, which would render any opening into the

1793. sac unnecessary. Upon this principle Mr. Hunter performed the operation at St. George's Hospital.

The patient was a coachman, forty-five years of age; he was admitted into the hospital in December 1785, with a popliteal aneurism, which he had first perceived three years previous to his admission, and had observed it gradually to increase during the whole of that period. It was so large as to distend the two hamstrings laterally and make a very considerable rising between them; the pulsation was very distinct and to be felt on every side of the tumour. The leg and foot of that side were so swelled as to be much thicker than the other, and were of a mottled brown colour; the swelling was not of the œdematous kind, but felt firm and brawny, probably from the extravasation of coagulated lymph; the leg retained its natural shape, excepting that it was larger. Previous to performing the operation, a tourniquet was applied upon the upper part of the thigh, but not tightened, that the parts might be left as much in their natural situation as possible.

The operation was begun by making an incision on the anterior and inner part of the thigh, rather below its middle, which incision was continued obliquely across the inner edge of the sartorius muscle, and made large, to give room for the better performing of whatever might be thought necessary in the course of the operation. The fascia which covers the artery was then laid bare about three inches in length, after which the artery itself was plainly felt. A slight incision, about an inch long, was then made through this fascia, along the side of the vessel, and the fascia dissected off; by this means the artery was exposed. Having disengaged the artery from its lateral connexions by the knife, and from the other adhering parts by the help of a thin spatula, a double ligature was passed behind it by means of an eyed probe. The doubling of the ligature brought through by the probe was cut so as to form two separate ligatures. The artery was now tied by both these ligatures, but so slightly as only to compress the sides together. A similar application of ligature was made a little lower. The reason for having four ligatures was to compress such a length of artery as might make up for the want of tightness, it being wished to avoid great pressure on the vessel at any one part. The ends of the ligatures were carried directly out at the wound,

the sides of which were now brought together and supported by sticking plaster and a linen roller that they might unite by the first intention. 1793.

The limb was found, some hours after the operation, not only to retain its natural heat, but even to be warmer than the other leg. The second day after the operation the brawny firmness of the leg was considerably diminished; it was become soft, loose, and a good deal smaller, and the aneurismal tumour had lost more than one third of its size.

Nothing could show more plainly the action of the absorbents than the change the leg had undergone in so short a time; the diminution of the tumour probably arising from the fluid blood which it contained having passed into collateral branches or into the tibial artery.

The fourth day, on the removal of the dressings, the edges of the wound were found united through its whole length, excepting where prevented by the ligatures; there was neither pain nor tumefaction in the part, but the aneurismal tumour was the same as on the second day.

On the ninth day after the operation there was a considerable discharge of blood from the part where the ligatures passed out; a tourniquet was therefore applied on the artery above, which stopped the bleeding; and although the tourniquet was taken off a few hours after no blood followed. The head of a roller was then placed upon the wound, in the direction of the artery, and over that the tourniquet, which was not, however, tightened more than was thought sufficient to take off the impetus of the blood in that portion of the artery.

On the tenth day appearances were much the same, only that between the compress and the knee there appeared a little fulness, like beginning inflammation. On the eleventh day this was gone off, and on the fifteenth some of the ligatures came away, followed by a small discharge of matter, the tumour in the ham being lessened. On the seventeenth day the parts surrounding the aneurismal tumour were more reduced and pliable, so that it was distinctly to be felt.

About the latter end of January 1786, six weeks after the operation, the patient went out of the hospital, the tumour at that time being somewhat lessened, and rather firmer to the feel. He was ordered to come to the hospital once every week, and,

1793. in the mean time, to make some degree of pressure, by application of a compress and bandage, with a view to excite the absorbents to action, which in most cases has a good effect.

About the middle of February the tumour had decreased, and was become still firmer. March the 8th, the wound, which had cicatrized, broke out again, and the patient was taken into the hospital. About the 8th of April, some of the remaining thread of the ligature came away, and an inflammation appeared upon the upper part of the thigh. In the middle of May a small abscess broke at some distance from the old cicatrix, at which opening some matter was discharged, but no pieces of ligature were observed. Several small threads were, at different times, discharged from the old sore, and the swelling subsided; but the thigh soon swelled again to a greater size than before, attended with considerable pain. In the beginning of July a piece of ligature, about one inch in length came away, after which the swelling went off entirely, and he left the hospital the 8th of July, at which time there remained no appearance of tumour in the ham, he being in every respect well.

After leaving the hospital, the man returned to his usual occupation of driving a hackney-coach; and being, from the nature of his employment, much exposed to cold, in March 1787, he was seized with a fever of the remittent kind, which carried him off. He had not made any complaint of the limb on which the operation had been performed, from the time of his leaving the hospital.

He died on the 1st of April 1787, fifteen months after the operation; and leave was procured, with some trouble and considerable expense to examine the limb, seven days after death, at which time it was entirely free from putrefaction.

The cicatrix on the anterior part of the thigh was scarcely discernible, but the parts under it felt hard. The ham had no appearance of tumour, and was to the eye exactly like that of the other limb; there was, however, a solid tumour perceptible to the touch, filling up the hollow between the two angles of the thigh-bone.

The femoral artery and vein were taken out above the giving off the branch called profunda, and a little below the division into the arteriæ tibiales and interossea. The arteries and veins that were pervious being injected, the whole was carefully dissected.

The femoral artery was impervious from its giving off the arteria profunda as low as the part included in the ligature, and at that part there was an ossification for about an inch and a half along the course of the artery, of an oval form, the rim of which was solid, becoming thinner towards the centre and not bony, but ligamentous. Below this part the femoral artery was pervious down to the aneurismal sac, and contained blood, but did not communicate with the sac itself, having become impervious just at the entrance. 1793.

What remained of the aneurismal sac was somewhat larger than a hen's egg, but more oblong and a little flattened, extending along the artery below for some way; the blood pressing with greater force in that direction, and distending that part so as in some measure to give the appearance of a separate bag. The sac was perfectly circumscribed, not having the smallest remains of the lower orifice into the popliteal artery; whether this arose from the artery being pressed upon by the inferior portion of the sac, as appears to be the case in common, or was in consequence of the sac contracting after the operation, I will not pretend to determine; but it contained a solid coagulum of blood, which adhered to its internal surface. A section made of this coagulum appeared to be composed of concentric lamellæ, uniform in colour and consistence.

The popliteal artery, a little way below the aneurismal sac, was joined by a small branch, very much contracted, which must have arisen either from the profunda or the trunk of the femoral artery. About two inches below the sac, the popliteal gave off, or divided into the tibiales.

The profunda was of the usual size, but a good deal ossified; for some length after leaving the femoral artery, the two tibials, where they go off from the popliteal, were in the same state.

The trunk of the femoral vein, where it passed along the side of the tumour, must have been obliterated; for at this part it appeared to send off three equal-sized branches, passing over different parts of the aneurismal sac; these must have been dilated branches, none of them having the course which the trunk of the vein should have pursued.

These appearances throw some light upon the changes which took place in the limb after the operation. The ligature upon the femoral artery impeded the passage of the blood into the

1793. sac so much as to allow its contents to coagulate, and render the opening into it from the artery impervious. By this a stop was only put to the increase of the tumour; its reduction to the size met with in the dead body must have been the effect of absorption.

The conclusion to be drawn from the above account appears a very important one, viz., that simply taking off the force of the circulation from the aneurismal artery is sufficient to effect a cure of the disease, or at least to put a stop to its progress, and leave the parts in a situation from which the actions of the animal economy are capable of restoring them to a natural state.

In confirmation of the cure of aneurism depending on taking off the force of the circulation, I shall mention a case of aneurism that recovered without an operation, and in which the mode of recovery depended upon the same principle.

The aneurism was in the femoral artery, and the swelling appeared upon the anterior part of the thigh, a little above the middle, extending upwards nearly to Poupart's ligament. An attempt was made, by compressing the artery above the tumour, by means of an instrument somewhat resembling a steel truss, to give the blood in the sac a chance of coagulating, and by that means, to put a stop to the progress of the disease. But, from the pain which it occasioned, every attempt to make a permanent compression on the artery proved ineffectual. The tumour increased to a very considerable size, a great degree of inflammation and swelling took place in the sac and common integuments, and mortification appeared to be coming on the skin. While in this state no pulsation could be felt in the tumour, or the artery immediately above it, so that the steps preceding mortification had taken place,[1] which put a stop to the dilatation of the sac and all its consequences. From the time the pulsation in the sac stopped, the inflammation and swelling subsided, although very slowly; and as the tumour diminished it became firm and solid, and the patient got perfectly well.

It appears from these cases that surgeons have laid too much stress upon the supposed necessity of large collateral branches,

[1] On examining the bodies of those who die in consequence of mortifications, the artery leading to the mortified part is completely stopped up with a firm coagulum for several inches in length; this must precede the mortification, and seems intended to prevent hemorrhage. (From Mr. Hunter's Lectures.)

to ensure the success of this operation ; an opinion which must have arisen from anatomical knowledge, rather than observations made from practice. 1793.

The second time Mr. Hunter performed this operation, was upon a trooper, about forty years of age. A tourniquet having been loosely applied upon the thigh, the operation was begun by a longitudinal incision through the integuments, and the artery and vein were exposed, as in the former case, but not taken up with a number of ligatures, for nothing appeared to have been gained by such practice, and the bad effects of it were obvious in the progress of the cure ; they were included in one strong ligature, sufficiently tight to prevent the pulsation in the sac without injuring the coats of the vessels. The ends of the ligature were brought out at the wound, which was in this case dressed from the bottom. The advantages proposed by this treatment were, to be able to see the progress of the cure, and to come readily at the artery, if any unfavorable circumstance occurred, since the abscesses in the former case were suspected to have arisen from the mode of healing.

After the operation the superficial veins of the leg became exceedingly turgid and numerous, and the limb, although warm, became rather less so than the other, particularly the foot.

The next day the leg was swelled, and the heat twelve degrees lower than the other ; the second day it exceeded the other five degrees, and on the fourth day the two limbs were equally warm : the patient was free from fever.

On the fourteenth day the ligatnre came away, and the tourniquet was loosely applied, as a precaution against bleeding ; the sartorius muscle was a good deal enlarged, and covered the passage down to the artery, so as to prevent the matter having a free discharge, a good deal being confined behind it, and with difficulty squeezed out at each dressing.

On the nineteenth day there was an hemorrhage from behind the muscle, the swelling of which rendered it nearly as difficult to come at the vessel, as if the parts had healed by the first intention : the bleeding was stopped by applying pressure, after having lost about ten or twelve ounces.

On the twentieth there was a slight bleeding, which was readily stopped ; yet, five hours afterwards, the femoral artery gave way, and he lost about one pound of blood before the

1793. tourniquet was applied. The artery was laid bare, and tied a little higher up, the patient being very weak and low. In this state he continued till the twenty-third day without bleeding, when it bled again from a small vessel. On the twenty-sixth, a considerable hemorrhage having taken place, he became faint, then delirious, had vomiting with hiccough, and died the same day.

Upon examining the limb, sinuses were discovered both upwards and downwards, in the direction of the artery and sartorius muscle, besides smaller ones in different directions.

In this case, the bad consequences and death of the patient do not appear to have arisen from the operation, but were entirely the result of the mode of treatment afterwards, as will appear from the following cases.

The third patient operated upon by Mr. Hunter was a postilion, thirty-five years old. Compression upon the femoral artery was attempted, but the pain was so great that it could not be continued. In performing the operation only one ligature was used, and the parts healed by the first intention.

On the seventh day after the operation the first dressings were removed, and a good deal of matter came out by the side of the ligature. On the fourteenth day the ligature came away, and in four weeks the wound healed.

The sac in the ham, from being chafed previous to the operation, burst at this time, but healed up like any other sore, and at the end of three months he was perfectly recovered.

Mr. Hunter's fourth patient was a coachman, thirty-six years old. The tumour in the ham was not very large, and situated lower down than usual, the whole leg being swelled, and the veins turgid. The pain he complained of was exceedingly violent, but being in a very bad state of health an operation was not thought advisable, and gentle pressure on the tumour was attempted; but, from the pain it occasioned, the operation was had recourse to as the only chance of saving his life, although, from the irritable state in which he then was, even that seemed a forlorn hope.

In performing the operation, the vein was not included in the ligature, but in other respects it was similar to the former. Immediately after the operation the limb was benumbed, and continued so for some time, which was singular, as the nerve had not been included. It became, on the same day, four or

five degrees hotter than the other leg, and continued so for the first fourteen days, when the temperature became the same as that of the other limb. 1793.

The sixth day the first dressings were removed, and the skin was united everywhere, except at the passage of the ligature. It remained in this state till the twenty-first, when the cicatrix inflamed and ulcerated, with a sloughy appearance, and hardness of the thigh.

On the twenty-ninth day the ligature came away; the sore now put on a better appearance; suppuration took place where the hardness had been in the course of the artery, and the parts became softer, the discharge gradually diminished, and in the seventh week the wound was healed.

But it did not continue so; for in three days an inflammation took place, and an abscess formed, and burst at the cicatrix, which also healed up.

About the end of the tenth week he was attacked with a very severe remitting fever, which lasted fourteen days, and left him much reduced; but in the fourteenth week he was so far recovered as to leave the hospital, and go into the country, for the recovery of his health.

The fifth patient upon whom Mr. Hunter performed this operation was Joseph Caswell, aged forty-two, a man not accustomed to horse-exercise, or any mode of life which could in the least assist in producing the disease. The aneurism was in the ham of the left leg.

In performing the operation, the artery alone was included in a strong single ligature, and the wound was healed by the first intention, leaving a passage for the ligature. The local inflammation was extremely small, and consequently attended with little sympathetic fever. The ligature came away the eleventh day, and in five weeks he went into the country, able to walk with a stick, the wound being perfectly healed.

In this case the heat of the two legs was carefully examined twice a day, from the second to the ninth after the operation, and the limb operated upon was uniformly colder than the other.

He came to town six months after the operation, and said that the left leg was fully as strong as the right, but, when exposed to cold, he was more sensible of its effects upon that leg. About two months after the operation he had a violent pain in

1793. the upper part of the left foot, similar to what is felt when a nerve is pressed; this lasted for about six weeks, and afterwards went entirely off. As no nerve was included in the ligature, this affection probably arose from the nerve in its passage through the consolidated parts being deprived of its natural freedom. There was a small tumour, the remains of the aneurismal sac, very distinctly to be felt in the ham, but without pulsation, and to the feel perfectly solid.

The following case was operated upon by Mr. Lynn, surgeon of the Westminster Hospital, in the same manner as above mentioned; and the account of the operation is given in his own words.

"Samuel Smart, a hackney-coachman, twenty-five years of age, had a popliteal aneurism, for which I performed the operation in the following manner: I made an incision down to the femoral artery, a little below the middle of the thigh, and having separated the artery from the contiguous parts, I passed under it, by means of an eyed probe, a broad ligature, which was tied so as to cut off all communication with the tumour, and the lips of the wound were brought together, and retained by sticking plaster, and the patient put to bed; this leg was rather colder than the other, and ordered to be fomented. The next day he was free from pain, and the limb was warmer than the other.

"On the fourth day the dressings were removed, and the parts were found united, except at the ligature.

"On the thirteenth the ligature came away, and in the course of the month the whole was healed, and the patient soon afterwards perfectly recovered.—Wm. Lynn."

This operation of Mr. Hunter's having succeeded in the first instance, surgeons of different hospitals were led to adopt it, but with some variation, according to their own judgment, and the circumstances of the respective cases. These I did not introduce in the order in which they took place; for not being performed exactly in the same manner, they would have interrupted the regular series of those cases above related. But I shall now give them either in the words of the surgeons who performed the operations, or as correctly as I can, from having myself been an eyewitness; and although they were not attended with success, that circumstance will not be found to affect the propriety of the mode of performing this operation which has been recommended above.

In a case of aneurism of the femoral artery, the operation was performed by Mr. Birch, surgeon to St. Thomas's Hospital, who relates the history. 1793.

[See p. 378, where the case is given at length.[1]]

Mr. Cline, surgeon to St. Thomas's Hospital, performed the operation for the popliteal aneurism in the following manner, at which I was present; and although not exactly as recommended by Mr. Hunter, it was very nearly so. The particulars of the case I have not received from Mr. Cline, but have taken them from my own observation, and the information of gentlemen who attended the patient, and were present at the examination after death.

The patient was a sailor, who came into St. Thomas's Hospital to undergo the operation for the popliteal aneurism.

Mr. Cline made a longitudinal incision on the anterior part of the thigh, and having laid bare the artery, passed, by means of a tin instrument, a double tape, about one inch broad, behind the artery, the two pieces of tape lying one over the other; the piece of tin which conducted the tape was cut off, and a cork, nearly an inch long, was laid upon the artery, and confined to its situation by means of the upper tape, producing in this way a sufficient pressure upon the vessel included between the ligature and cork to stop the circulation, and consequently the pulsation in the tumour in the ham; the other portion of tape was left loose. The intention of securing the artery in this way was to compress the sides of the vessel together, and produce an union without ulceration.

The patient went on very well, and the ninth day the tapes were removed, and everything seemed to be going on very favorably, when the patient was attacked by a fever (which was supposed to be caught from another patient in the same ward), of which he died. Upon examining the state of the limb after death, it was found that ulceration had taken place through the whole extent of the artery included in the tape, and sinuses were formed both upwards and downwards, in the course of the thigh, to some distance.

[1] [Although this case is repeated verbatim in the original memoir, the Editor has thought it unnecessary to reprint it here.]

1793. I cannot conclude this paper without observing, that it is seldom, in giving an account of a new operation, we are able to collect materials sufficient to render it so satisfactory as the present, having in our possession not only the successful and unsuccessful cases, but also an account of the appearances after death, under both circumstances, so that the causes of failure are rendered evident in those instances in which it did not succeed, and the means that are likely to ensure future success are clearly pointed out.

The operation is in itself simple, it requires but a short time in the performance, and produces little, if any, affection of the constitution. But its advantages are more clearly seen by contrasting it with the common mode of operating for the popliteal aneurism. This is by exposing the sac in the ham through its whole extent, laying it open, scooping out the blood, searching for the two orifices leading into it, and taking up the artery with a ligature, both above and below the sac. When this operation is over, there remains a large deep-seated sore, composed of parts not perfectly in a natural state, and in a most disadvantageous situation, which sore is to suppurate, granulate, and heal; a process that is not soon performed, and which must leave a stiff knee for some time afterwards. Yet this is considering the operation in the most favorable view, since there is always risk, from the artery being diseased so close to the sac, of the patient dying from the secondary bleeding; and when that does not happen, there is still some danger of not being able to support the constitution during the healing of a large sore, under circumstances so very unfavorable.

It is in comparison with this operation, the only one before in use, that the present improvement is to be considered, and it is in this view that I have thought it deserving the attention of the Society.

I cannot close this account without inserting the following case, in addition to those already stated, in favour of this operation. I have received it just time enough to give it a place, as the paper was in the press before it came to hand, and feel myself obliged to Mr. Earle for his readiness in communicating it.

Hanover Square, March 10th, 1792. Sir,—At your request I send you some account of the following case, and am, your most obedient servant, James Earle.

John Smith, about fifty years of age, was received into St. Bartholomew's Hospital on account of a fever. After having been under the care of the physician some time, he complained of a swelling and pain in his left leg, for which I was desired to visit him. He said, about six months before, he had fallen from a scaffold, that his leg was caught between the rounds of a ladder, which broke his fall; that he felt immediately pain in the upper part of his leg; soon after it began to swell, and had gradually increased to its present size. On examination, there appeared a large hard swelling under the heads of the gastrocnemii muscles, reaching up to the bend of the leg. A pulsation was plainly to be felt in it, and there was no doubt of its being an aneurism. 1793.

It was now increasing very fast in size; the tumour, by its pressure, caused exquisite pain, all the lower part of the leg was loaded with œdematous swelling, and it became absolutely necessary to perform some operation to prevent a mortification taking place.

Having noticed with much satisfaction the success which attended Mr. Hunter's method of tying the artery in the thigh, in a similar case, I decided in favour of that operation; but as, in the present instance, the artery appeared to be in its natural and perfect state in the ham, and in its whole course, till it reached the dilatation below the knee, I preferred taking it up in that part rather than to tie it in the middle of the thigh, under the sartorius muscle; though it lies there more superficial and more easily to be got at; because I thought the chance of the circulation being carried on was equal, if not greater, and if it should fail, and symptoms should occur to create a suspicion of an impending mortification, there might be an opportunity of removing the limb above the ligature, which would be impracticable if the artery was tied in the middle of the thigh.

Jan. 28, 1792. The patient being laid on his face, and the tourniquet loosely applied, I made an incision about five inches long, in the direction of the artery, within those tendons which compose the inner hamstring. I then gradually separated the cellular substance; in doing this, the nerve was exposed, which ran in its usual course, external to the artery, and much more superficial. In finding the artery, some difficulty occurred on account of the tumefaction of all the parts affected by their

1793. vicinity to the aneurism, and from the imperceptibility of pulsation in the artery till it was actually laid bare: however, having discovered it in its usual situation near the bone, and in its natural undilated state, I passed a ligature round it, about two inches above the tumour. I now again examined, and being convinced that the artery was included above in the ligature, I gradually made it tight, till I felt a pulsation above it and none below, when I desisted, concluding that any pressure beyond this degree would be useless and dangerous.

I will just observe here, that I found the common aneurismal needle with a handle very inconvenient, and would recommend in this case, where the artery lies so deep, a blunt semicircular needle, with the eye about half an inch from the end, without any handle.

The wound was closed in the usual manner, and the edges brought together by sutures. On the following day the man was free from pain, the tumour much less tense or hard, and the whole leg greatly unloaded. No perceptible alteration in the heat of the limb could be remarked; when the current of blood was obstructed in the superficial veins by pressure, on its removal they immediately again became turgid; and, in short, every appearance indicated a continuance of perfect circulation.

On the 15th day succeeding the operation the ligature came away, the limb was soft and unloaded, and the incision nearly healed; at the distance of six weeks there remains a small tumour, with some perceptible fluctuation. The patient cannot perfectly extend his leg, but is able to walk with the assistance of crutches.

DESAULT.[1]

1796. [After speaking of Anel's operation Sabatier proceeds thus:] Desault has operated in the same way in a much more remarkable case, inasmuch as it was for an aneurism of the

[1] [Not having been able to meet with a more detailed report of this case, which is one of the greatest interest, the Editor has been compelled to content himself with the abstract that is given above, and which is taken from Sabatier's 'Médecine Opératoire.' Paris, 1796.

From the following remark by Maunoir it would appear that little importance was

popliteal artery. This tumour had acquired the size of a turkey- 1796.
hen's egg. The patient was thirty years of age, of a sanguine and irritable temperament, and of a restless disposition; he suffered violent pains in the leg and foot, and more particularly at the anterior and inferior part of the tibia. After proper preparation Desault operated. He made an incision fifty-four millimetres (about two inches) in length at the upper part of the tumour, laid the artery bare, separated it from the nerve and tied it. The dressings were simple. Three hours after the operation the patient experienced a slight sensation of cold in the leg, which lasted a short time; the symptomatic fever was not severe. On the sixth day Desault tied a ligature of reserve, that he had placed under the artery, above the first one. The state of the wound and of the patient was such as to promise a speedy cure. The tumour was diminished to half its size, and the œdema of the leg had disappeared. There was nothing to wait for but the separation of the ligature, which occurred on the eighteenth day. On the following day the wound discharged a tolerably large quantity of matter mixed with blood, and the tumour disappeared almost entirely; an evident sign of the rupture of the aneurismal sac. After this nothing was left but a fistulous opening which healed in a few days. The aneurism was cured, but some unfavorable symptoms supervened which appeared to have been the effect of the obliteration of the principal artery of the limb, and which caused the death of the patient a long time afterwards.

attached to it at the time, even by Desault himself: "J'ai demeuré," says Maunoir, "deux ans chez Desault, et je ne me rappelle pas l'avoir jamais entendu parler de cette opération. Elle n'a été consignée nulle part; et, en général, il me parait qu'on la cité sans la connaître, et d'après des relations fort vagues." (Note to p. 50 of the Mémoire Physiologique et Pratique sur l'Anévrisme et la Ligature des Artères; Génève, 1802.) From the observations by Sabatier, as reported in the text, as well as from those that Deschamps makes on the same subject, there cannot be the slightest doubt that Desault merely performed Anel's operation on the popliteal artery; that is to say, the popliteal artery was ligatured *immediately* above the aneurismal sac, which was left untouched; and from Maunoir's remark it would appear that he did not attach much importance to this departure from the usual mode of procedure, and most certainly did not look upon it as involving a new principle in the treatment of aneurisms. On a reference therefore to the statement of contemporary writers, and on an examination into the details of Desault's case, there cannot be the slightest doubt left that with John Hunter rests the merit of having been the first surgeon who tied the artery at a distance from the aneurismal sac.]

1796. This operation was performed at the end of June 1785. Some time afterwards, that is to say, on the 12th of October of the same year, John Hunter treated an aneurism of the ham in a different way.

[Here follows an account of Hunter's operation, for which see the preceding article.]

DESCHAMPS.[1]

1797. The only resource that the ancients possessed in wounds of the principal arteries of the extremities was the amputation of the limb.[2] Modern surgeons being better acquainted with, and having more confidence in, the resources of nature, have not altogether despaired of preserving the wounded part, and success has sometimes crowned their endeavours.

It was supposed that the compression of an artery had this advantage over the application of a ligature, that its canal was preserved, and that the course of the blood was not interrupted in the injured vessel; the lips or edges of the wound in it uniting together. But experience has proved that permanent compression obliterates an artery at the part that is pressed upon, and as far up as the point at which it receives communicating branches;[3] this advantage is therefore altogether imaginary. But the ill effects that result from compression are positive; for it is either insufficient, or else it is not possible to protect the neighbouring parts from its influence, and the least pressure

[1] Observations sur la Ligature des principales Artères des Extrémités, à la suite de leurs Blessures, et dans les Anevrismes, particulièrement dans celui de l'Artère poplitée, dont deux ont été opérés suivant la méthode de Jean Hunter, Chirurgien Anglais. Par le citoyen Deschamps; Paris, 1793. And also at the end of the fourth volume of the Traité Historique et Dogmatique de l'Opération de la Taille; Paris, 1796-97.

[2] Fabricius, Paré, Paulus Ægineta, and others, even Galen, were aware of the possibility of ligaturing arteries at their origin; but they give no particular instructions about the ligature of the principal wounded arteries, of which they relate no instances.

[3] The observations made by M. Petit have proved that this effect of compression was not constant; but the opposite conclusion has been arrived at by some of the most accurate observers, more particularly by Valsalva, Mollinelli, Morgagni, &c.; Petit's observations must therefore be regarded as an exception to the general rule.

suffices to arrest the course of the blood in those smaller collateral vessels that ought to carry on the circulation. We cannot expect any success from operation unless the course of the blood be perfectly free. 1797.

The first examples that we have of the ligature of the principal arteries are those that have been afforded us by M. A. Severinus[1] and by Saviard.[2] It may be seen by the first observation how much the exposure and ligature of the artery was dreaded, as the proposal to do it was universally rejected; and it was not until after the recurrence of several attacks of hemorrhage that the exhaustion of the patient compelled this step to be taken. It cannot be doubted but that the compression, especially after the tumour had been opened, was methodical.[3] The precaution of employing compression at the groin, in order to master the blood during the operation, and that of separating the vein from the artery before applying the ligature, can leave no doubt as to the anatomical knowledge of the surgeons who had the care of the patient.

The observation by Saviard is an instance of the ligature being the only resource that is left us in a case of wounded femoral artery; and notwithstanding the loss of blood that was feared during the operation, and the dread of not finding the opening in the vessel, as well as of not being able to arrest the gangrene that might follow the application of the ligature, the operation was attended with the most complete success.

On referring to Heister,[4] we find a case of wounded femoral artery cured by compression.

After Saviard, the first cure of a wounded femoral artery in France is due to M. Sabatier. This skilful surgeon employed compression; several attacks of hemorrhage occurred, but he succeeded in arresting the bleeding, and the patient was cured.

In the 'Journal de Médecine,' for November, 1775, is reported a case of wound of the femoral artery which was cured

[1] De Medicinâ Efficaci, and page 188.

[2] Obs. 63, and page 213.

[3] It is well known that the compression of the artery is more effectual in proportion as it is directly and immediately applied to the vessel.

[4] Inst. Chirurg. part 2, sect. 1, cap. 13; idem, Ephem. Natur. Curiosor. vol. vii, obs. 32.

1797. by permanent compression applied in the course of the vessel by means of Morel's tourniquet; which it is said did not interfere with the free course of the blood in the parts below the seat of compression.

M. Desault, at that time principal assistant-surgeon at the Hospital of La Charité, ligatured publicly in that institution the femoral artery, and the operation had all the success that was to be expected from so skilful a surgeon.[1]

If to the cure that was performed by M. Sabatier by means of pressure, and even to that which M. Jussy, the surgeon of Besançon, obtained by the same plan, we oppose the numberless cases in which compression of the principal arteries, and even of those of a second class, has had no success, it would be difficult not to conclude that the ligature is preferable.

In true as well as in false aneurisms, provided in the latter some time has elapsed between the wound of the artery and the operation, the obstruction that the blood meets with in the wounded vessel causes it to pass in larger quantity than usual into the small collateral arteries; which acquiring an increased diameter, are already prepared to carry the blood into that part of the artery that is below the wound, when the operation is determined upon. But when the operation follows close upon the lesion of the vessel, the smaller collateral branches do not afford the same advantages; it is therefore more than ever necessary to avoid compressing them in any way, and to allow the greatest freedom to the passage of the fluids.

Case I. *Wound of the brachial artery.* On the 11th of April 1791, René Pienoir, twenty-five years of age, a servant of M. Beausons, rue du Mont Parnasse, in parrying a knife that was thrust at his chest, was wounded at the anterior and superior part of the middle of the arm, towards the external border of the biceps. From the position of the arm, the blow, which was given from above downwards, inflicted a wound that was directed from below upwards. The wounded man walked a little way, but being weakened by the loss of a large quantity of blood, fell to the ground in a state of insensibility. An igno-

[1] Although the patient died on the fifteenth day, the operation did not the less succeed, for the artery was obliterated and the patient's limb was saved.

rant student, who was not aware of the danger of the wound, 1797.
bled the patient, and laid on the part compresses dipped in a spirit lotion. The arm swelled somewhat, and things remained in this condition for eight days.

On the eighth day a copious hemorrhage occurred, in consequence of a slight attack of coughing; a surgeon, who was sent for at about four o'clock in the morning, recognizing the importance of the wound, begged of me to see the patient. The blood was arrested for the time.

At eight o'clock in the morning I saw the patient, with M. Boyer, the assistant-surgeon to La Charité. I found the arm enormously swollen from the armpit to the bend of the elbow, and the fore-arm ecchymosed as far as the wrist. We easily recognized the symptoms of a false aneurism following a wound of the brachial artery. We agreed to meet again the same day, at eleven o'clock, in order to proceed with the operation, which was urgent.

Everything being ready at the appointed hour, I introduced a probe into the wound; when its direction from below upwards towards the axillary artery caused us to fear that this vessel was wounded high up, and that we might find it necessary to have immediate recourse to amputation at the shoulder-joint. The importance of the case determined me to have a consultation upon it. At five in the afternoon we saw the patient, with M. Sabatier, and we proceeded with the operation in the following way.

I made an incision about five inches long in the course of the artery, extending from the tendon of the pectoral muscle to the inferior third of the arm. I then opened the aneurismal sac, and cleared out the coagula which it contained; the interior having been washed and wiped with a fine sponge, the compression that had been made upon the axillary artery above the clavicle was removed. The pulsations of the vessel were now very distinctly felt, but not a drop of blood escaped. We spent more than a quarter of an hour in examining the state of things, and during the whole of this time the artery did not bleed in the least. One of us thought that the main trunk could not be wounded, as it was not probable that so large a vessel would not bleed. The others persisted in their opinion that the brachial artery was opened, there being none other in

1797. this situation that could furnish so large a quantity of blood as the patient had lost. In this state of uncertainty we determined upon employing compression in the interior of the wound, upon the course of the artery, having previously placed a ligature of reserve upon it; but the great difficulty was to know the exact spot that had been wounded. I accordingly enlarged the wound made by the knife, and carried my finger towards the upper part of the brachial artery, where I determined to apply the ligature; which I did five or six lines above the spot that corresponded to the point of my finger.

For the purpose of applying the ligature, I used a needle resembling that invented by Goulard,[1] for the ligature of the intercostal arteries, but the curvature of which was adapted for the situation of the operation I was about to perform. The needle having been passed under the artery and the bundle of nerves, I introduced a waxed thread of three twists into the eye at its point, and then, on withdrawing the instrument, the ligature followed. The whole course of the artery in the wound was then dressed with agaric, and the wound itself with charpie, supported by an eighteen-tailed bandage, tightly applied, but not sufficiently as to interrupt the pulse at the wrist, which could be felt without any difficulty. Proper drinks were then given to the patient, and a well-informed pupil was left with him.

The following night was quiet enough; but towards four o'clock in the morning bleeding to a small extent occurred, which stopped, however, of itself; this happened twice, but to an inconsiderable extent, in the course of this as well as of the following day, which was Wednesday; but on Thursday morning it occurred to an alarming degree, the bed being soaked through with black and fetid blood, and the dressings exhaling an insupportable stench. At ten o'clock in the morning I saw the patient, with M. Boyer; we removed the dressings, and left in the wound the charpie and the agaric that adhered to it; one portion of the charpie, that was introduced into the stab that had been made with the knife, was removed. There was no bleeding, and the patient was dressed in the same way as after the operation. There was less swelling of the arm, the tem-

[1] Mémoires de l'Académie des Sciences, 1740. Garengeot, vol. ii, p. 431, and Dionis, vol. ii, plate 1.

perature of which was diminished, and the pulse also was weaker. 1797.
At noon the bleeding recurred with violence, but was immediately checked by the pupil in attendance. I went directly to the patient, removed the dressings, and cleared out the wound, in the hope of finding the opening in the artery, or the point from which the blood escaped. My hopes were disappointed, not a drop appeared.

The patient was now exhausted, and I could no longer count upon compression, I therefore determined upon having recourse to the ligature of reserve, in the hope that it might be so placed as to be of service; but as soon as the artery was tied the bleeding burst forth impetuously. It was easy to perceive that the ligature had been placed below the wound in the vessel, which I could not see; this was, however, so far an advantage to me, that it enabled me to find out whence the blood escaped. The hemorrhage being then stopped by compression on the axillary artery, a ligature was passed under the vessel, and the course of the blood entirely arrested. The patient immediately lost all sensation and heat in the limb. The quantity of blood lost during this operation did not amount to more than two or three spoonfuls, but the patient was already quite exhausted. Half an hour afterwards he had a fainting fit. Some minutes after this again he recovered consciousness, but a storm, accompanied by several claps of thunder, which now came on, made such an impression upon him in the critical condition in which he was, that he died three hours after the operation.

On opening the body, MM. Sabatier, Boyer, and I found that the brachial artery had been wounded in a longitudinal direction, at its external and posterior aspect, to the extent of two lines, opposite the inferior border of the tendon of the pectoralis major, and above the origin of the superior profunda arteries; that the ligature of reserve had been placed about four or five lines below the opening, and that the upper one was about fives lines above.

II.[1] *Wound of the femoral artery.* On the 9th of May 1791, a joiner wounded the femoral artery at the inferior third

[1] [The Editor has condensed this case, which occupies ten octavo pages in the original; for although it is one of considerable interest, yet it is somewhat foreign to the subject of aneurism.]

1797. of the thigh, with a sharp pair of scissors. Copious hemorrhage ensued, and the patient was carried to an hospital. The artery was wounded at the part where it passes through the adductor magnus. An incision was made in the direction of the wound, and after much difficulty the vessel was exposed. A ligature was then passed below, and another above the point that was wounded. The wound was filled with charpie, and lightly bandaged, so as not to interfere with the collateral circulation. On the seventh day after the operation secondary hemorrhage supervened, in consequence of the soft tissues that had been included in the upper ligature, together with the artery, having been cut through. A ligature was therefore passed above this one, by which means the bleeding was checked. On the following day, and the day after that again, there were fresh attacks of bleeding, by which the patient was excessively reduced. Another hemorrhage having supervened, the presse-artère (for a description of which vide postea) was invented and applied with success. And after much trouble from sloughing, &c. the patient left the hospital cured, three months and seven days after the infliction of the wound.

III. *Wound of the popliteal artery.* The same day (the 9th of May 1791), that the patient, whose case has just been related, was brought to the Hospital of La Charité, a servant, of the name of Etienne Repasses, forty-one years of age, was admitted for a stab in the ham with the point of a sabre.

The wound was situated at the posterior inferior and external part of the thigh, and penetrated to the popliteal artery. There was a circumscribed aneurismal tumour, about the size of a large turkey's egg, and having a strong and visible pulsation. The leg was much swollen, especially about the calf. The state of the patient was rendered still more alarming in consequence of a catarrhal affection, which had come on rapidly the day after the wound, accompanied by much fever, oppression, and sleeplessness: the expectoration was very abundant, and suspicious in appearance. The operation could not, consequently, be had recourse to at present, we therefore contented ourselves with applying a bandage methodically on the foot and leg, and graduated compression on the femoral artery. The pains in the wounded part were not very severe for some time; but they, as

well as the swelling of the leg, increased from the fourteenth to the twentieth, though the aneurismal tumour did not appear to undergo any change. On the 20th of June, the condition of the patient, as far as the chest was concerned, appearing improved, and the fever, as well as the quantity of the expectoration, being diminished, I determined on performing the operation, which was accordingly done on the same day, in the presence and by the advice of MM. Chopart, Pelletier, Boyer, and several others. 1797.

The patient having been laid upon his belly, I cut down upon the tumour in the direction of the artery, dividing first of all the skin, and afterwards the cellular tissue, with all the precautions necessary for not implicating the nerve, which I carefully sought for.[1] The skin and cellular tissue having been divided to an extent of six fingers' breadth I found the nerve, by the side of which, towards the internal part of the ham, I continued the dissection until I had penetrated into the aneurismal sac. Then separating the nerve with the fingers of the left hand, I opened the sac upwards and downwards.

I next removed all the clots, and having washed and sponged out the whole of the interior of the sac, could then observe its extent, and the situation of the wound in the artery, which could readily be seen; it cut the vessel completely across. The state of the parts was such, that the end of the finger could readily be introduced into the artery where it was divided. I loosened the tourniquet, and the free escape of the blood confirmed me in my opinion as to the situation of the wound. We observed that this was not at the deepest part of the sac, as commonly happens, but that it was somewhat to the outside, in consequence of which the application of the ligature was easier. I employed the same needle, in the same way and with the same ease as before, passing a waxed thread under the artery, about four lines below the wound in it; the thread was then tied with a common knot.

I then applied the upper ligature at nearly an equal distance

[1] It is not a matter of indifference to include the nerve in the ligature when it is the only one that conveys sensation to the part. The median nerve may, as Valsalva, Mollinelli, and others have observed, be tied with impunity; but it would not be the same with the whole bundle of brachial nerves or with the nerve that is here mentioned.

1797. from the wound in the artery, passing at the same time, under the vessel, a ligature of reserve. I seized, as in the preceding case, the two extremities of the ligature with the right hand, and drawing them towards me, pressed with the left forefinger upon the artery between them, so as to arrest the blood, and to make certain of having included the artery in the noose. I then tied the ligature very tightly with a common knot, and caused the tourniquet to be loosened, when the blood appeared in small quantity. I next tightened it again, my fingers being introduced to the very bottom of the wound. One of the assistants placed his finger on the knot, in order to prevent its slipping, whilst I made a second one, which I tied upon the first, with all the strength that my fingers pressing upon the arterial tube were capable of. We waited a moment to examine matters, the tourniquet being loosened, when the blood appeared again. As the two knots were now tied it was impossible to tighten the ligature any more.

Some of the surgeons present proposed that the ligature of reserve should be tightened; others recommended the instrument, or serre-artère, that had succeeded in the preceding case: to this advice I inclined. I had recourse to the ligature of reserve, in order to pass the flat band, without, however, removing the ligature of reserve. I cut away the ligature that was already tied, passed the band into the serre-artère, and, at the first trial, the bleeding was stopped, and did not recur. I tightened the string on the serre-artère, and arranged the instrument as in the last case. The wound was then filled with charpie, and the whole of the dressings were supported by a moderately tight bandage.

At noon on the same day the leg was nearly of its natural temperature, but the foot was cold and insensible; warm spirituous fomentations were employed uninterruptedly. In the evening the foot appeared to me not quite so cold; which I might have attributed to the hot linens that constantly enveloped it, if sensibility had not returned to a certain degree. This sensibility was more distinct on the following day and the day after that, but still the foot became cold whenever the hot linens were removed; it was not till the following day that the toes acquired a little warmth; on the next day they were in their natural state.

On the 23d of June, the third day after the operation, I removed the compresses and only left the charpie, which, being soaked by an abundant and fetid suppuration, separated of itself on the following day. 1797.

On Monday, the 27th, as the ligature appeared somewhat loosened, I tightened it a little. The dressings consisted, as in the former case, of charpie inside the wound and of pledgets spread with a mixture of balm of Arcæus and of cerate. The suppuration was abundant and healthy, but notwithstanding all the internal remedies that had been used the fever had not diminished; the chest continuing to be somewhat affected.

On Saturday, the 2d of July, the twelfth day after the operation, observing that all the parts included in the noose of the superior ligature were divided, I removed the serre-artère, as well as the band that was attached to it. Two days afterwards the lower ligature became so loose as to enable me to pass a grooved director into its noose, and to divide it. The sensibility and temperature of the part were natural, but the swelling of the leg had not diminished. A deep and painful swelling in the gemelli and soleus muscles terminated in an abscess, the pus of which emptied itself into the wound; in the lower angle of which I made an incision in order to make the communication easier.

About the 20th of July, a month after the operation, the patient was attacked with an obstinate diarrhœa; irregular shiverings, vomiting and fainting fits then came on, the pus became fetid and serous, and he died on the 28th of the same month, the thirty-eighth day after the operation.

I have thought it better to enter into some details about these different operations, and their consequences; as detail has been too much neglected by the small number of those who have written on aneurism and the wounds of arteries.

The first two observations prove that there are cases in which the artery being wounded at its posterior part does not allow any blood to escape during the operation; and that from this circumstance merely we must not conclude that the vessel is uninjured, when the situation and direction of the wound are such that no other vessel capable of furnishing such a quantity of blood can be punctured; and that the precise situation of the lesion in the vessel being unknown, it is impossible to apply the ligature with certainty. An accidental occurrence having, in the first obser-

1797. vation, enabled me to ascertain this, the same might, in similar cases, be employed with the success that attended it in the second instance.

When after the puncture of an artery, the blood escapes freely and does not accumulate in the wound, as in the second case; the artery continues to be surrounded with cellular tissue, and it is impossible, without danger, to expose it entirely, it being sufficient to approach as near as possible to it.

It may happen that, notwithstanding all the care that is taken to include the artery in the ligature, it may escape. The precaution of drawing on the strings with one hand, whilst the finger of the other presses upon that part of the vessel that is included between them, would however afford a certain proof of the ligature being properly applied; and were it not so, any worse or more painful effect than the pressure of the end of the finger could not result. This plan would have been of the greatest assistance to me in the first case. The wound of the vessel, indeed, was above the superior profunda artery, and consequently too high to enable us to hope for the preservation of the arm; but as the patient was not then exhausted there remained one resource, namely, amputation at the shoulder-joint.

The ligature of the principal arteries that are deeply seated is often attended with difficulty, for the following reasons:—In the first place, in order to tighten the ligature sufficiently it is necessary that the power that acts be sufficiently near the knot; this can only be done by the extremities of the fingers, which cannot exercise sufficient force. The plan of twisting the string round a pair of forceps is not more certain. 2d. The reaction of the parts included in the ligature, and the spasm of the muscles[1] acting from the centre to the circumference upon the whole circle of the noose tends to separate it, and it is found to be loosened when the second knot is made. The wax with which the string is covered would, in some degree, oppose this separation; but the moisture with which it immediately becomes endued destroys this advantage. The utility of the double or surgeon's knot is imaginary; this indeed is sufficiently tight not

[1] In the second case I observed that each time the ligature was tied the muscles became convulsed, and this convulsive condition was observed at the subsequent dressings.

to give way before the other is applied, but as the second knot cannot be made directly upon the first the ligature may slip. 1797.

The precaution of pressing with the finger on the first knot, especially at a considerable depth, does not make it any the safer, as the ligature may slip under the finger without the surgeon being aware of it. 3d. The necessity of drawing the ends of the ligature transversely to the artery increases the difficulty, the lips of the wound only affording a very limited space; this space would be of greater extent if the strings could be drawn in a longitudinal direction, corresponding to that of the artery; but if this were done the knot would be still more faulty, for the ligature would assume an oblique direction upon the vessel, and when left to itself would become slack.

From these considerations it is not surprising that some difficulty should be experienced in arresting entirely the flow of blood through the artery,[1] when the surrounding parts are included in the ligature with it. And cases have occurred in which it has not been possible to stop the bleeding. In an operation for aneurism of the popliteal artery, a surgeon, much accustomed to operations, could not tie the artery sufficiently tightly, and it was necessary to have recourse to amputation.

The greater the number of parts that are included in the ligature, the less will be the circular compression upon the artery; and in proportion as the necessity for this pressure is greater, the parts surrounding the vessel will be sooner divided;[2] and the string becoming slack will not exercise a sufficient degree of constriction upon the arterial tube; and if this loosening of the ligature occur before the vessel is obliterated, hemorrhage must ensue. We know that there is no precise time for this obliteration, in the second case that is related it had not taken place on the seventh day. At the same time there was in one of the hospitals of Paris a patient whose brachial artery was punctured,

[1] Provided the artery be not diseased in any way, but is simply wounded.

[2] The ligature is less firm in proportion to the quantity of parts that are included in the noose. This opinion, which is founded upon reason and experience, is opposed to the advice that has been given by several authors to include the surrounding parts with the artery in order to support it and to ensure its division. The safest ligature is that in which the artery alone is included. The plan recommended by Paré, and uniformly adopted in the amputations of the extremities, is a proof of it.

1797. and in whom hemorrhage occurred several times, notwithstanding the application of the ligature.

The double knot that it is necessary to make has this inconvenience, that when it becomes slack it is impossible to untie the string in order to tighten it. A ligature of reserve is then of the greatest use; but this should be followed by another in case of accident. All these ligatures of reserve would be useless if the artery were divided by the string, wholly or in part; it being necessary in such a case to place another ligature above the old one.

There are consequently cases, rare ones it is true, in which it is impossible to make one's self master of the bleeding, and others in which it is absolutely necessary to tighten the ligature. It is in cases of this description that we are obliged to have recourse to mechanical means, which, by increasing our power, will supply the defect of those that have been given up by nature, which are always to be preferred when they will suffice. Such is the instrument that I made use of, and which has the advantage of enabling us to tighten the ligature if it become slack.

A skein or band of threads appeared to me to be preferable to a waxed string folded several times, for the reasons that have been adduced, as well as that it presented a larger surface, and was therefore less likely to divide the artery quickly. This was also the opinion of the celebrated Professor of Edinburgh.[1]

In the second case I yielded to the advice of one of the surgeons present, who proposed placing a small compress upon the artery, between it and the ligature. I disapprove, however, of this kind of compress as being useless and dangerous; for as it does not surround the vessel, but only guards it at one point, it is no better than if it did not protect it at all. Besides, far from adding to the firmness of the ligature, it is injurious to it; for as the linen of which it is composed becomes wetted it is lessened in size, the noose consequently becoming loosened. Finally, as this compress remains a long time in the wound, it is soaked in the first discharges, which are always of a bad quality, and which become worse the longer they are retained; its constant contact with the neighbouring parts is also injurious. Might not the local inflammation, and the gangrenous eschar,

[1] Edinburgh Medical Essays.

which occurred at the inferior angle of the wound, where the compress was situated, be in this case attributed to it, as the rest of the wound did not fall into this condition, but was always in a most favorable state? However this may be, I think, with Saviard, that it ought not to be employed in the ligature of arteries. 1797.

On an aneurism of the popliteal artery, operated upon according to the plan of John Hunter, the English surgeon. On the 21st of last June, I had the honour to present to the Academy of Surgery a man named Jean Baptiste Galimar, a hackney coachman, thirty-four years of age, who had been operated upon, at the Hospital of La Charité, for an aneurism of the popliteal artery, according to the plan of Mr. John Hunter.

Before submitting to the Society the details of this operation, I took the liberty of stating a few of the more important facts that have gradually led to the adoption of the plan that I employed.

The common mode of operating for aneurism, as described by authors, and practised up to the present time, consists in opening the tumour, and removing the blood, coagula, and lymphatic concretions that it contains, and, finally, in ligaturing the artery above and below the opening in it, but as near as possible to a healthy portion of the vessel. The dangers of this operation vary according to the particular artery, to the state of the parts surrounding it, and to the size of the tumour; the difficulties are in proportion to the depth at which the artery is situated.

Obs. 4. Jacques Guillemeau, in the tenth book of his 'Surgical Operations,' states, that in a case of aneurism at the bend of the arm, which had supervened on bloodletting, he incised the skin above the tumour, passed a needle, threaded with a small string, under the artery, and tied this vessel with a double knot. After this he opened the tumour, which was on the point of sloughing, cleaned out the interior, and applied some topical remedies: the operation was so successful that the patient was not crippled in his arm.[1]

Francis Thevenin, a long time after Guillemeau, appears to have copied his operation, which he gives. Besides this, he

[1] Vide p. 185.

1797. describes a peculiar plan, which consists in tying the artery above and below the tumour, and then opening this.[1]

In the 'Treatise on Fistula Lachrymalis,' by Anel, printed at Turin in 1713, is mentioned a case of aneurism at the bend of the arm, following venesection, which I cannot refrain from quoting here.

[Here follows an abstract of Anel's case, which has been given in full at page 216.]

John Hunter has published, in the 'London Medical Journal,' for the year 1786, a case in which a popliteal aneurism was operated upon according to his method, an abstract of which I will now give.

[Here follows an abstract of Hunter's first case, which will be found in full in Sir Everard Home's Memoir.]

It may be seen, by what I have just stated concerning these different modes of operating for aneurism, that Anel, as well as Guillemeau, employed the ligature above the tumour, but that their operations differed, inasmuch as Anel did not meddle with the tumour itself; and that Hunter's plan differs from Anel's, inasmuch that the latter, as well as Guillemeau, ligatured the vessel *immediately* above the aneurism, whilst Hunter tied it at a *considerable distance above this*. Hunter has employed this plan since 1786, and it appears to be pretty successful in his hands.

It must be observed, that for the parallel between these different plans to be exact, it would be necessary that Guillemeau and Anel had operated for popliteal aneurism, or that Mr. Hunter had operated for aneurism of the brachial artery at the bend of the arm.

Obs. 7. M. Desault is the first in France who has operated for popliteal aneurism according to Anel's method; but it would appear that the circumstances which accompanied the disease were not very favorable to the success of the operation, as the tumour gave way, and the patient, several months afterwards, died of the consequences of his disease, complicated with caries of the tibia.

To my knowledge this is the only case that had been operated on according to this plan, at least, if there have been any other instances of it they have not been successful.

[1] Fran. Thevenin, chap. 33, p. 56; Paris, 1658.

Obs. 8. The first operation, according to Hunter's plan, that was performed in France, was at the Hospital of the School of Surgery, by our colleague, M. Chopart, on the 28th of March 1792. Several members of the Academy were present, which advantage I also enjoyed. However well acquainted one may be with the manner of performing an operation, one is far from being able actually to do it; it is necessary to have seen it, and I will say further, to have done it, in order to perform it well. M. Chopart, however, left nothing to be desired in the performance of the operation; and if success always depended upon the manner of operating, the patient ought to have been perfectly cured. But it was not in the operator's power to establish collateral vessels that would be able to transmit the blood to the parts below the ligature; these, consequently, being deprived of the vivifying influence of the blood, lost their vitality, sphacelus then occurred in the foot and in part of the leg, and unfavorable circumstances even deprived the operator of the last sad resource—that of amputation. 1797.

Obs. 9. On the 4th of last April (1792), a few days after the operation had been performed at the Hospital of the School of Surgery, Jean Baptiste Galimar, a hackney coachman, thirty-four years of age, was admitted into the Hospital of La Charité. This patient, who was of a strong and vigorous constitution, had perceived, towards the end of last September, a small tumour in the left ham, where it had arisen without any known cause. The tumour made rapid progress, and by the seventh month it had acquired the size of a large ostrich's egg. Its pulsation was distinctly visible; in other respects the thigh, the knee, and the leg were in a healthy condition. The patient only experienced a sense of fatigue in the part, and a difficulty in bending the knee. I prepared him for the operation by diminishing the quantity of his food, which was reduced to three cups of broth per day, with decoction of dog's grass for drink, and a lavement on the eve of the operation, which was fixed for the following Saturday, the third day after the admission of the patient into the hospital.

On the day before the operation was performed at the Hospital of the School of Surgery, by M. Chopart, I assisted, with M. Louis, and several others, at some experiments on a body, in the amphitheatre of the hospital. Several plans for ob-

1797. literating the femoral artery were tried, amongst others, the plate of lead proposed by M. Persy. After several trials it appears that M. Chopart preferred the ligature.

On the eve of the operation that I was about performing at the Hospital of La Charité, I practised on the dead body, in the presence of several surgeons. The confidence that M. Louis appeared to have in the compression of the artery enveloped in a sheet of lead, made me determine upon giving this plan a trial. I accordingly attempted it several times; but whether it was that this means is not in itself a good one, or that there was want of skill on my part, it was rejected by the whole of those present, to whose advice I yielded, and accordingly decided upon having recourse to the ligature. On the following day, the 7th of April, I proceeded to undertake the operation, in the presence of MM. Louis, Chopart, Pelletan, and several other of our colleagues.

The patient having been placed upon the edge of his bed, one of the assistants undertook to compress the femoral artery at its exit from the belly; a bandage rolled up tightly was arranged with this view. I then took a straight bistoury, and made, exactly in the course of the artery, towards the middle of the thigh, an incision about three inches long, in that spot where the femoral is covered, to the extent of four or five lines, by the internal border of the sartorius muscle. This first incision divided the integuments, and a second one exposed the fibres of the sartorius. Two small plates of bent tin were kept at hand; with one of which an assistant was directed to retract the inner edge of the wound, so that I might the more readily raise up the internal border of the sartorius, and expose the sheath of the vessels, whilst the inner edge of the sartorius being drawn from the centre of the wound with the other retractor, I plunged the point of the needle (a plate of which is given) between the sheath of the vessels and the anterior border of the adductor magnus muscle, along which, in this situation, the vessels lie. As I passed the needle in I moved it up and down, in order to facilitate its passage by separating the cellular tissue. I carried it perpendicularly to the depth of three or four lines, and when I thought it had reached the vessels I directed it downwards and from within outwards, and caused it to issue, at a distance of nearly five lines from its entry, near the raised up border of the sartorius, which was, however, not included in it.

The point of the needle had scarcely appeared when the blood issued with some force. The first movement of the assistant who had charge of the compression was to apply pressure to the artery, but the colour of the blood reassured him immediately. As my object was to include the bundle of vessels only, I had passed the needle so near to them as to wound the vein. The blood, however, soon ceased flowing, and the wound having been sponged out, the needle was pushed forwards sufficiently to enable me to see the opening near its point: I then held it firmly whilst I placed the left forefinger on the artery, which could be compressed between the needle and it. The tumour ceased to pulsate, as was observed by several of the assistants; and it was even noticed that when the artery was thus compressed the size of the tumour lessened sensibly; and that when compression was removed it resumed its former bulk, the pulsation also returning. 1797.

Being perfectly convinced that the needle was properly passed under the artery, I introduced a skein of thread, two lines broad, into its eye, so that on withdrawing this instrument I passed a double ligature under the vessels. I then took the four ends of this, and drawing them up perpendicularly to the artery, I placed my finger in the noose that they formed, and, compressing the artery, assured myself that it was properly included in the ligature; a precaution that I had taken in a case of wound of this vessel, which occurred in the same hospital about a year before.

In the operation in question I chose the centre of the incision for the situation of the ligature, so that in case of accident I might place another one above it. The artery having been raised up by the ligature, the ends of which were drawn upwards by one of the assistants, I easily separated it partially from the cellular tissue towards the sides, below the ligature, by means of the handle of the scalpel. The passage of the needle was in this way accomplished with greater certainty and ease. I carried it about six lines below the first ligature, and on withdrawing it passed another double skein of thread under the artery, which I ascertained, in the same way as before, to have been properly included in the noose. The upper ligature was intended to act as a ligature of reserve. I then withdrew the second skein as one sufficed.

1797. With regard to the lower ligature, the two skeins of thread were left; it being intended to tie the artery with one, and to employ the other afterwards if the first one became loose. I placed on the artery a small piece of agaric, on which I tied the threads in a simple knot; but it was only by tightening it with great force that I could cause all pulsation to cease in the tumour; so great was the force employed that one of the surgeons present feared that this constriction might cut the artery through: a second knot was then applied over the first. The ends of the ligature of reserve were put on one side, but it being proposed to tie them together so that they might be known, one end was by mistake tied to that of the actual ligature, whence, as I shall by and by have occasion to mention, some inconvenience arose.

The lips of the wound were brought together by two strips of plaster; a pledget covered with balsam of Arcæus, some small compresses, and a many-tailed bandage put on loosely, were all the dressings that I employed. The leg was laid horizontally on its external aspect upon a pillow of chopped straw, with the knee moderately bent; compresses soaked in camphorated and ammoniated spirits of wine were applied warm to the knee, the leg, and the foot, and were renewed every quarter of an hour. Immediately after the operation the patient took a draught composed of twenty drops of laudanum in four ounces of peppermint water; he continued this in doses of a tablespoonful every hour, and had whey given him for his drink.

On the same day, towards five o'clock in the afternoon, seven hours after the operation, the patient was perfectly quiet and suffered but little. The whole of the parts below the ligature appeared to be of the natural temperature; the toes possessed their usual sensibility, and the patient experienced very little numbness in the leg and foot. On examining the tumour, which was not covered by the bandage, I thought that I perceived an obscure pulsation; this appeared more distinct towards nine o'clock in the evening, and on the following day there could be no doubt about it; nevertheless it was less perceptible than before the operation. I did not consider this circumstance to be disadvantageous. The pulsation being very distinct, I hoped that a sufficient quantity of blood would pass into the artery in order to supply the parts with nourishment; and that the blood

being arrested by the constriction of the vessel, would flow back into the collateral branches, which would be disposed to receive a larger quantity; I therefore determined to leave things in this state for several days. 1797.

On the second, third, and fourth days, the patient continued in a most satisfactory state, not suffering in the least from fever; the pain at the seat of the operation was but trifling and did not disturb his sleep. On the morning of the fourth day the pulsations in the tumour appeared to me a little stronger; I therefore determined upon making use of the lower ligature of reserve. The force that I had employed in ligaturing the artery gave me some anxiety; and I hesitated if I should simply tie the other ligature of reserve or employ the serre-artère which had on two occasions succeeded perfectly. As this instrument flattens the artery and does not constrict it like a common ligature, I preferred employing it. When I wished to separate the ends of the ligature, that had been tied, from those of the ligature of reserve, I found them in such a state of confusion that I could scarcely distinguish them. I soon perceived that the ends of the two had been confounded together; I cut the knot however, and having ascertained which ligature was free, made use of it to pass a fresh band under the artery.

The lips of the wound under the skin were already united to such an extent that I was obliged to divide them with my finger in order to make room for the serre-artère, and to place it, together with a small piece of agaric, directly upon the artery. This was compressed to such a degree that all pulsation ceased in the tumour and did not afterwards return.

From this time the patient experienced a deep and painful dragging sensation in the whole of the internal part of the leg. The foot appeared to be colder than usual, but the numbness was but trifling; all the toes preserving their usual sensibility. On the following morning the temperature had returned, but the dragging sensation continued, and did not disappear until the third or fourth day after the application of the new ligature. I daily expected the artery to give way. Everything was consequently got in readiness; the patient kept constantly in his hand a pad that I advised him to press upon the proper spot as soon as he perceived that the bandages were stained with blood; two assistants were constantly in attendance;

1797. and proper dressings, a fresh ligature, and another serre-artère were prepared and placed by the bedside.

On Thursday, the ninth day after the application of the ligature, at eleven o'clock in the morning, I was informed that the patient was losing blood. I expected this, but the upper ligature of reserve removed all anxiety. I went immediately to the hospital, when I found that, in consequence of the care that the patient had taken in applying the pad immediately to the part that I had pointed out, very little blood had been lost.

The pupil in attendance was soon with him and continued the compression. Everything having been prepared beforehand, I had only to remove the dressings, and having washed and wiped the part, I took the two ligatures of reserve and passed them into the openings in the instrument, on the plate of which I placed a small piece of agaric, and then laid it, thus guarded, upon the vessel. At the first attempt this canal was sufficiently compressed; and the pressure at the groin having been removed, I fixed the strings; the patient was then dressed as usual, and no bad result followed.

The leg and foot continued to maintain their usual temperature and sensibility; not the least swelling was perceptible in them, and the tumour was already considerably lessened in size. On the tenth day after the application of the ligature I allowed the patient some rice soup, and after this his diet was gradually increased. The wound began to cicatrize, and appeared merely to require the ligatures to separate in order to heal perfectly. The first of these separated on the 6th of May. The lower ligatures, which were loose, were removed on the next day. On the 17th of May, the ninth day after the separation of the ligatures, and the fortieth day after the operation, the patient left the hospital perfectly cured.

When the patient was presented to the Academy, on the 21st of last June, the tumour was reduced to a very small size in comparison to what it had been at the time of the operation; his health was very good. The knee-joint continued to preserve its proper movements. By the middle of October the tumour was hardly perceptible; and it was only by examining it attentively that its remains could be distinguished. The patient after having been presented to the Academy returned to his employment of coachman, in which he was every day engaged.

There now remains nothing but a slight swelling of the leg. 1797.
Of the collateral vessels that carry on the circulation, there is one, the pulsations of which are becoming more and more distinct, and which is situated at the left side of the tumour.

This is the second operation for popliteal aneurism that has been performed in France according to John Hunter's plan, and the first one that has succeeded. In this operation, as well as in several others in which I have had occasion to lay bare the larger arteries, I have observed that, for the most part, their pulsation was not very distinct. This peculiarity has fixed my attention.

An artery not only possesses the power of being dilated and of contracting upon itself, but it also possesses a very distinct vibratory movement, which cannot be doubted by any one who has ever touched an isolated artery in the living body. Considering the force with which the principal arteries pulsate, one would think that their movements ought to be more distinct when they are exposed; but this is the contrary of what I have observed on several occasions, when I have had an opportunity of touching them. The following are the cases that have occurred in my practice.

The brachial artery near the axilla, and the femoral in the lower part of the middle third of the thigh, were exposed in consequence of wounds of these vessels. In these two wounds a very singular peculiarity was met with; viz. not a drop of blood escaped. (Vide antea.) Hence, I was enabled to examine their pulsations. That of the brachial appeared to be very distinct; whilst, on the other hand, it required all my attention to distinguish that of the femoral artery; and I was only enabled to do so by compressing it very powerfully. It was the same with the femoral in the preceding case, as well as in that in which M. Chopart operated. But on the other hand, in two operations on the popliteal artery, that I had occasion to perform by laying the tumour open, if a finger were placed on the opening in the artery the pulsations of the vessel were very distinctly perceptible. I observed the same in an operation for the ligature of the posterior tibial and on several other similar occasions.

In the amputations of the larger extremities, the shock of the blood communicates a very distinct impulse to the arteries, this I have observed in all the amputations that I have had occasion

1797. to perform. It is only in those arteries in which the blood circulates freely that I have experienced any difficulty in feeling the pulsation. It is difficult to attribute this momentary weakness in the pulsation of the arteries to any cause except to that spasm which, by suspending, or at least retarding the course of the blood in their canals, renders their movement of diastole, as well as their vibrations, less distinct. Daily experience in surgical operations support this view; it is observed that in a great number of operations the divided arteries do not bleed; but that in six or ten hours afterwards, when the spasm has ceased, an unexpected hemorrhage comes on, which compels us to remove the dressings and to tie or compress the vessel that occasions it.

It is easy to perceive that the same weakness in the pulsations ought not to be observed in wounded arteries, the opening of which is pressed upon by the finger, as has happened in the observations of which I have spoken; for it is known that the force with which arteries are dilated by the blood increases in proportion to the resistance offered to them; it is therefore not surprising that the application of the finger to the opening in the artery should render its pulsation more distinct, in consequence of the increase in the lateral pressure of the liquid by the resistance opposed to it. This happens with regard to the movement communicated to the cut end of the artery in amputations. Hence itfollows, that the power of the blood being increased in these arteries by compression, the effects of the spasm are rendered less sensible in them than in those in which the blood flows freely. In this case, that is to say, in that of weakness of pulsation, there is a very interesting observation to be made, and one which I have not yet been able to attend to, viz. that of examining the patient's pulse, in order to ascertain whether the force of the pulsations was the same as in the case in which I operated. This observation has escaped me; it is a lesson for me and for those who will have occasion to perform the same operations.

On considering the action of a ligature on an artery as large as the femoral, it will be seen that the thickness of its walls will make it a difficult matter to constrict it sufficiently to obliterate its cavity, and that it will require much force to accomplish this; that in consequence of this constriction the artery

will be found broken in its whole circumference; that the cellular tissue surrounding it offers for a time the sole resistance to this constriction; but that, as this soon gives way in consequence of the pressure, the artery becomes exposed, and being broken, cannot resist the impulse of the blood. The flattening of the artery by any kind of instrument has fewer inconveniences; but in order to press the opposite sides of the vessel together, it is necessary that the string which passes under the instrument be of a certain thickness, and be sufficiently tightened. 1797.

In order that the artery be constricted or flattened, it is certain that, for its cavity to be obliterated, (I allude merely to the larger arteries,) the ligature must be tightened in proportion to the number of parts included within it; for if it be not tightened sufficiently, the blood continues to flow, and no practical surgeon is ignorant of the dangers of repeated hemorrhages, however slight they may be; if, on the contrary, the vessel be tied too tightly, we shall run the risk of dividing at too early a period the parts included with the artery, or the vessel itself, if it alone be contained in the noose. Every one has his own opinion about the way in which the cavity of an artery is obliterated; but to speak candidly, we must agree that we do not as yet possess any very accurate practical knowledge on this subject.

Judging from the sufficiently large number of operations that I have had occasion to perform on the larger arteries, I would prefer flattening to constricting them, and I would much rather have recourse to a ligature of reserve than expose the patient to repeated hemorrhages, or to a fatal plugging, which should always be rejected where it is not the only resource left us. I have observed, that when the constriction of the artery is too powerful, it is usually from the eighth to the tenth day that its division occasions the occurrence of hemorrhage; but that as in this case its diameter is much lessened, the ligature of reserve need only be tightened to a very moderate degree, in order to check the bleeding.

I do not think that any just conclusions can be arrived at from the experiments made on animals, on the arrest of the blood in the arteries. Experience proves that, whatever the cause may be, the means which easily stop bleeding in animals have not the same success on man.

1797. It may be seen by the abstract of Mr. Hunter's case, that he employed two ligatures; the first of which being only moderately tightened, would arrest the course of the blood in the artery, which would strike with less force against the second ligature; which, without being tied excessively tight, as I was obliged to do in my operation, would be sufficiently so to stop the further passage of the blood. This is the plan that I would adopt, if I had another opportunity of performing this operation. I will also take very good care not to do as I did, namely, to place two ligatures on the same spot, more particularly when the bundle of vessels alone is included, as in this case the second ligature can only act upon an artery that is already cut, or nearly so, and the division of which it will complete.

Obs. 10. Since the case, that I have just related, occurred, a soldier, forty years of age, has been operated upon by M. Boyer, senior assistant-surgeon of the same hospital, for an enormous aneurismal tumour, that occurred in consequence of a sabre-wound of the femoral artery in the middle of the thigh, inflicted nine years ago. The tumour having been opened to the whole of its extent, and emptied of the coagula and concretions that it contained, the artery was exposed, and two ligatures were placed above and one below the opening in it. The two superior ones, placed five or six lines apart, were tightened in a moderate but firm manner, as was also the one below the aperture; no hemorrhage supervened. A third ligature of reserve was not required. The patient went on favorably, and left the hospital on the 13th of July last, the seventy-fourth day after the operation.

The patient who was the subject of the case related by the celebrated English surgeon died in the course of the following year, in consequence of a disease that had no connexion with the operation. On examining the parts, it was found that the aneurismal tumour was not larger than a hen's egg, but longer and flatter, and contained a coagulum of blood that adhered to its internal surface, and which appeared to be composed of concentric laminæ of a uniform colour and consistence.

Since I have been acquainted with Mr. Hunter's plan of operating, I have been uncertain as to what would become of the six inches of artery between the ligature and the tumour. There is no doubt that the artery, no longer containing any

blood, gradually contracts; its sides approaching the centre, 1797.
and its cavity disappearing entirely, until at last it is reduced to a kind of ligament, or to a useless cord. It is clear that, as the interior of the tumour receives no more blood, that which, at the moment of the ligature of the artery, is in its centre in a fluid state either continues its course, or else coagulates and thickens; that the whole mass of coagula or of lymphatic concretions contained within it, being no longer moistened with blood, becomes indurated; that the most serous portion being dissipated, the parts of which the tumour is composed unite more intimately, and that as it thus diminishes with greater or less rapidity, there finally results a small hard mass of a variable size.

If even several collateral branches were to open into the tumour, as Mollinelli[1] has observed to be the case, they would, being always of an exceedingly small size in comparison to that of the femoral artery, only pour out a small quantity of blood in different parts of the tumour, which not having a continuous route, like that which the femoral contains, would not fail to coagulate even as high up as the collaterals themselves, which would thus be obliterated. But if any collateral branches were to arise from the six inches of the femoral artery that are left between the ligature and the tumour, then this portion of the vessel would remain pervious, and continue to perform all the functions of an artery; and the aneurism receiving blood as before, less it is true immediately after the operation, but after a time in larger quantity in consequence of the dilatation of the anatomosing branches, the operation would be unsuccessful, as the blood would continue to pour into the tumour by its usual route.

These reflections which have probably occurred to others as well as to myself, appear to be confirmed by the anatomical observations that M. Chopart has instituted on the body of the patient he operated upon.[2] The femoral artery was found ob-

[1] Memoirs of the Academy of Sciences of Bologna, et antea, p. 234.

[2] The artery had, in the situation of the ligature, been divided, its ends being separated by more than an inch. Each end contained a clot of blood which was strongly adherent to the internal coat of the vessel. The aneurismal sac contained on its internal side a large clot which was strongly adherent to it; two openings in the sac were observable, one by which the blood entered, the other by which it escaped; they were at a distance of half an inch from one another; the upper aperture was almost

1797. literated below the ligature to an extent of three fingers' breadth; beyond this it regained its natural size. The blood that was received from anastomosing branches flowed through its interior and followed its usual course. It would appear that this circulation only took place in a distinct manner some time after the operation, and after the parts at a distance had ceased to possess vitality, which would probably have been maintained if the circulation had been continued, or at least if the quantity of blood which flowed in the artery below the ligature had been a little more considerable.

This anatomical observation is very interesting; if it were not of very rare occurrence it would diminish most materially the advantages of Hunter's plan, which is, in other respects, very much to be preferred to the old one of opening the aneurismal sac; as it simplifies very greatly the operation, diminishes the necessity of much handling of the parts, as well as the chance of bad consequences and of suppuration ensuing; and, finally, as it does away with the risk of including any important nerve in the ligature.

Obs. 11. My second operation for poplitea aneurism was on Antoine Coustonne, a servant, forty-two years of age, who entered the Hospital of La Charité on the 19th June 1793: the aneurismal tumour was situated on the left limb, and was larger than thatof Galimar, (page 419): no cause could be assigned for it; the patient was pale and of a feeble constitution. The femoral artery was tied about the middle of its course, or rather the isolated compression was practised with the presse-artère.[1] The tumour diminished a little, the leg preserved its natural warmth and sensibility, but a painful swelling of the thigh came on and the patient died in a few days with delirium. On examining the thigh we found the diameter of the artery much lessened below where the compression had been; it was diminished in size, and contained a tolerably solid coagulum; in the centre of it there was no fluid blood observable, and the whole of the cellular

closed by a large clot, the lower one was very apparent. The aneurism was situated between the artery and the bones. The joint was inflamed.

[1] I call this compression isolated, because it only acts on the artery and not on the neighbouring parts.

tissue was infiltrated with pus, which extended into the interstices of all the muscles of this part of the body, up to their attachments to the pelvis. This purulent infiltration was bounded below by the knee. 1797.

Obs. 12. The third operation was performed upon Pierre Joseph Bonaventure, a broker, thirty-two years of age, who entered the hospital of La Charité on the 9th September 1793. The tumour was on the left side,[1] and was of the same size as that of Galimar's; its cause was unknown. The isolated compression of the artery was practised at the same spot as in the former cases. This was quickly followed by painful shootings; and the natural temperature and sensibility of the limb did not return until the third day; gangrenous spots also appeared on the dorsal aspect of the great and the first and second toes, and on the inferior part of the leg; eschars formed in these situations, and the last phalanx of the affected toes separated; portions of the fifth metatarsal bone also exfoliated. With these exceptions the parts preserved their vitality, and the patient left the hospital on the 15th February, four months after the operation. The leg was somewhat bent upon the thigh, and I could never get him to extend it perfectly.

Of the five patients on whom, in the course of nearly two years, the femoral artery has been ligatured, (the only cases that have been operated upon during my time at the Hospital of La Charité,) the operation has not once been followed by mortification of the leg. The subjects of the second and tenth observations left perfectly cured, as did also the ninth; but the twelfth lost the last phalanx of three of his toes. The fifth preserved the heat and sensibility of the parts below the ligature; but died from purulent absorption. In all of them the blood was conveyed in sufficient quantity to the lower part of the limb to preserve its vitality.

In the sixth patient, the subject of Chopart's eighth observation, the ligature of the femoral artery was followed by sphacelus of the leg; thus out of six patients, in whom the femoral artery has been tied in the middle of its course, one only had suffered from mortification of the lower extremity.

Is one, from so small a number of facts, justified in making

[1] In all those patients that I have operated upon or seen operated on by others, I have remarked that this aneurism occurred on the left side. I draw no conclusions from this fact.

1797. a comparison between the ordinary plan of operating for popliteal aneurism, namely, by the incision of the aneurismal sac, and Hunter's method, which consists simply in ligaturing the femoral artery in the middle of its course? No, certainly not; but this number of facts suffices for the establishment of several general principles and precepts: before pronouncing definitely upon the last plan, we must, however, wait for more numerous facts to confirm, or to remove the ideas that have already been formed of the advantages of the new over the old method of treatment, without however losing sight of those cases in which it is not applicable.

In order to throw more light upon this matter, I shall, whilst pointing out the conditions that are necessary in order to secure the success of operations for aneurism in general, and more particularly of that for popliteal aneurism, lay down several precepts that will enable us to arrive at an *à priori* conclusion as to the relative advantages of the two plans of treatment: 1st. Of the operation by opening the sac. 2d. Of Hunter's operation, that is to say, the ligature of the femoral considerably above the tumour, without interfering with the sac.

These precepts are: 1st. To preserve the greatest possible number of those collateral arteries that can influence the success of the operation. 2d. To simplify it as much as possible, and to perform it in the safest manner, with as little unnecessary handling as possible. 3d. To remove everything that can interfere with the circulation of the blood below the ligature, and to employ such means as are most likely to favour the success of the operation.

In considering the first precept, I shall advert to the distinctive characters of the old plan, that by incision of the sac, and those of Hunter's operation; whilst discussing the second, I shall point out the advantages of this last method; and in the third precept I shall indicate those general procedures that can ensure, or, at all events, conduce to the success of the operation; I shall then examine into the circumstances that would induce us to prefer one operation to the other, and I shall finish by pointing out the steps of both.

PRECEPT I.—*To preserve the greatest possible number of collateral arteries.*

As the success of the operation for aneurism depends upon the quantity of blood that the collateral arteries can convey to the parts below the ligature, there can be no doubt that the chance of a favorable result will be in proportion to the number of these arterial branches that may be preserved. On this account surgeons have at all times applied the ligature as near as possible to the opening in the artery. Anel ligatured the brachial as close to the tumour as he could, and Desault imitated him in a case of popliteal aneurism, by which means he hoped to preserve the superior articular branches; which it is, however, doubtful whether he succeeded in doing, unless the aneurism were not very large and was situated low down. 1797.

In the operation by incision these vessels are preserved with greater certainty, as the ligature is applied immediately above the opening in the artery, which is almost always found to be below them. These two plans of operating for popliteal aneurism, especially the last, have the great advantage of preserving the largest number of the collateral vessels.

It is not the same with Hunter's operation, as in it the femoral is ligatured nearly six inches above the part that is ruptured; hence all the collateral arteries between the ligature and the tumour are rendered useless, especially the three superior articular arteries, which it would nevertheless be very important to preserve. As these vessels communicate with the main trunk, they can, at the same time that they carry the blood from the artery into their ramifications, receive that of these ramifications and convey it back into the principal artery. Hunter's operation is consequently attended by two circumstances that might militate against its success; the first is, that the arrest of the passage of the blood in the secondary arteries deprives the parts below the ligature of the means of preserving their vitality; the second is, that it allows the blood, by passing through the collateral vessels into the main trunk, to supply the tumour, and thus to render the operation useless.

Here are, anatomically speaking, two great objections to Hunter's operation, which ought to deprive it of all preference

1797. over the ordinary plan—that of laying the sac open. But let us have recourse to experience, and see whether these articular arteries are really, I will not say indispensably, necessary to the success of the operation, but only of considerable utility in it. And let us also inquire into how far the dread of the blood being carried by the anastomoses into the artery below the ligature, and thus supplying the tumour, is well founded.

I shall not speak here of the success that has attended John Hunter's operation in England, but shall only mention what has occurred under my own observation.

We have had, in Paris, four cases in which the femoral artery was ligatured in the middle of the thigh for popliteal aneurism; these operations have been publicly performed at the Surgical Hospital, and at that of La Charité, no doubt, therefore, can be thrown either upon them, or upon their results. Of these four operations, one only, that by Chopart, has been followed by mortification of the leg. Thus it may be said, that Hunter's operation has been successful in three cases out of four; that is to say, that in these cases, the articular arteries have been rendered useless without any inconvenience; it follows then that the preservation of the articular arteries is not an indispensable necessity, as three cases out of four in which they were obliterated have been cured; they may therefore be looked upon as being merely of great utility, having been, in three out of four cases, destroyed without any bad consequences ensuing.

[Here follows a case by Guèrin, in which the patient died of secondary hemorrhage on the fourteenth day after the operation for popliteal aneurism. It is uncertain whether Hunter's or Desault's operation was performed.]

I have been told that M. Vernet, surgeon-in-chief of the hospital at Caen, has twice performed Hunter's operation, and that in both patients the leg mortified. This is being very unsuccessful, more particularly, when of four operations performed in Paris, three have succeeded. But admitting that the plan of operation adopted by M. Vernet has not been quite perfect, which is possible in an unusual operation, about the details of which we have not as yet much experience, we should then have, of the six patients operated upon according to Hunter's method, mortification of the leg in three, and a cure in the remaining three.

Is the operation then for popliteal aneurism, by laying open the sac, to be preferred to this one on account of a greater proportion of successful cases? No, certainly not; and I would ask, on this point, for the opinion of attentive and trustworthy observers. Several cases of success may be mentioned, such as two or three by Pelletan, one by Desault, and lately one at La Charité; but have the cases of failure been counted? Desault has several times failed; and several years ago, a patient that I operated upon at La Charité had gangrene of the leg; and latterly another case has been attended with a similar result. Generally, in operations, great care is taken to note the successful cases, but the unsuccessful ones are passed by in silence. I can adduce in proof the assertion of one of our most celebrated surgeons, who lately said in public, whilst speaking of this operation, that if he had the misfortune to be affected with aneurism of the popliteal artery, he would rather have his thigh amputated than submit to it. 1797.

Experience has therefore proved that the incision of the aneurismal sac has not been attended by greater success than Hunter's operation, which has even had the advantage in this respect, if we admit those cases that have occurred in England, and which have not been comprised in our calculation. And, in the meanwhile, until a more extended experience will enable us to determine with certainty, we may conclude that the collateral arteries, which are destroyed in Hunter's operation, are of no very great utility, and are certainly by no means necessary to the success of the operation.

With regard to the blood that may flow back from the collateral vessels into the main artery, and thus supply the tumour after Hunter's operation, we need not, if we reflect upon it, and apply our physiological knowledge to it, trouble ourselves much on this point. We recognize, in the action of an artery, three conditions, the first being that of extension, the second that of contraction, and the third being a compound of the two, or being that of vibration. In the first condition the artery is entirely passive, its walls extending in proportion as a larger mass of liquid acts laterally upon them, and separates them from the centre; during this state of extension the mouths of all the collaterals are dilated in the same proportion as the main trunk is, and thus the blood is enabled to pass into them. In the op-

1797. posite condition, the walls of the artery being contracted towards the centre, its diameter, and that of the mouths of the collateral vessels is diminished.

It is easy, on this principle, to understand the rapid dilatation of the collateral vessels above the ligature; for as the walls of the artery are dilated, in proportion as the blood arrested by the obstruction of the ligature acts upon them with a greater force and in a greater mass, the mouths of the collateral arteries must increase in diameter, and receive a larger quantity of blood.

It would appear, from this elastic property of the arteries, that their natural condition is nearly midway between that in which they are when dilated by the pressure of the blood upon their walls, and when they have exerted their action upon this fluid, in order to propel it into their ramifications and collateral branches. It is essential to observe, that the contraction of the walls of an artery does not obliterate entirely the cavity of the vessel, and that, consequently, there is always a column of blood in it, on which the arterial parietes can exert no influence.[1] This column of blood would accordingly remain there, were it not carried along by a fresh quantity of the fluid, which, by separating again the walls of the artery, brings them into action. If the artery be compressed by a ligature, in such a way that the course of the blood is not completely interrupted, the small quantity which passes will be sufficient to separate the walls that touch the column of the blood, and these, when separated, will act upon the whole mass, but with an oscillation proportionate to the quantity of blood that will pass into the canal of the artery beyond the ligature: it will be the same with the blood that will be carried into the arterial trunk by the collaterals. If, on the contrary, the course of the blood be entirely interrupted, the column that is left in the arterial tube will not fail to coagulate; and the serous portion of this coagulum being removed, the artery will become obliterated, as always happens when its function is destroyed.

Whilst admitting a cause that obstructs the passage of the blood, for example in the popliteal artery, at two inches from

[1] In dead bodies this column of blood, or rather coagulum, is found in the artery in question to be about a line in diameter.

its origin, as happens in a case of aneurism, it will not be sufficient that the collateral vessels above the obstacle increase in diameter, and thus receive a larger quantity of blood, it is necessary that this very blood returns into the same arterial trunk whence it passed out, and this by channels destined to carry it, not from the ramifications into the artery, but from the artery into the ramifications. When, in such a case of obstruction in the arterial tube, the blood above the obstacle, which acts with a greater force and in a greater mass, dilates the artery, and consequently the mouths of the collateral vessels, these, by receiving a larger quantity of blood, will transmit it into their ramifications, which anastomose with those of the inferior articular arteries, which will receive this blood, and in their turn convey it into the trunk of the popliteal, below the obstacle. This blood will pass with the greater facility into the lower portion of the popliteal, as this artery, not receiving so large a quantity of fluid as usual, will oppose less resistance to the blood that enters it. The superior articular branches will, therefore, in this case, perform the functions of arteries, and the inferior articulars those of veins, as the first convey the blood from the trunk into the ramifications, and the second, receiving this blood from the ramifications, will re-convey it into the artery. 1797.

Such being the case then, if the femoral be ligatured in such a way that the circulation through it be entirely arrested, the column of blood, which has not been driven out by the contraction of the walls of the artery below the ligature, will remain in the trunk, and in the superior articular arteries, and, consequently, their function will be destroyed. If, therefore, this set of articular branches are the only vessels that communicate with the inferior ones, it is quite certain that the part will be deprived of life; but if other arterial branches, more particularly the second or descending branch of the external circumflex, communicate freely with the inferior articular arteries, the part below the tumour will be supplied by the blood, which will rather be inclined to follow an old route than to make a new one for itself; and before this could have been accomplished, the blood would have had time to coagulate both in the trunk of the artery and in the origins of the superior articulars.

I will anticipate an objection that will not fail to be made to this, namely, that it is difficult to reason against a fact that I

1797. myself have related in my observations. In the patient operated upon by Chopart, the femoral artery was found obliterated below the ligature, to the extent of nearly three fingers' breadth, but it afterwards resumed its natural size; it was divided by the ligature, and the extremities, separated from one another by nearly an inch, were completely closed by coagula. On the sac being laid open it was seen to contain, on its inner side, a large clot, which was strongly adherent. In this sac two openings were observed, one by which the blood entered, another by which it passed out; the superior one was almost completely closed by a large coagulum, but the lower one was distinct and open.

Although I was present at the operation I was not at the opening of the body, and have, therefore, inserted this observation as it was communicated to me. Admitting that it was correct that the tumour, far from increasing, had diminished in size, and that the leg had entirely mortified, it would, if we reflect more deeply upon it than I formerly did, be difficult to understand the occurrence of a consecutive circulation in the trunk of the artery, below the obliteration of the vessel. There is no mention made of recent coagula, of dilatation of the collaterals, and still less of effused blood; solid, and already firmly adhering coagula, are alone spoken of. And the first question would be to inquire what became of the blood that was conveyed into the collateral vessels, which could only be the superior articular arteries? This blood must either continue its course into the branches of the popliteal, or else must remain in that artery. It ought, in the first case, to supply the part, and, in the second, to coagulate so much the more quickly, as the superior opening was almost entirely blocked up by a large coagulum.

Until experience shall have proved the contrary, it may, I think, be concluded, from all that has been said, that Hunter's operation is as safe as the old one—that by incision of the aneurismal sac.

PRECEPT II.—*To simplify the operation as much as possible, and to perform it with the least possible handling.*

Every operation in surgery, by which a portion of the human body is divided or removed, is an act against nature. It is a

true disease that is produced with the intention of curing another. The more serious that this secondary disease is, the greater will be the danger that it will present. Hence flows the principle in surgery, that the dangers of an operation are in proportion to the number and the nature of the parts concerned. 1797.

There are operations that may of themselves, independently of the disease that renders them necessary, become fatal; such as amputations of the larger extremities, that of the arm at the shoulder-joint, the extirpation of voluminous tumours with a broad base, &c. &c. The greater the number of parts concerned in an operation, the greater is the pain that the patient experiences; hence the irritation, inflammation, and congestion; a congestion which sometimes by extending gives rise to a very abundant suppuration. Hence also the effects of irritation, the development of those diseases that the patient is disposed to; hence wasting, metastasis, &c. &c.

The operation for aneurism, by laying the sac open, requires an incision in the integuments of from six to seven inches in length; this is sometimes carried to a depth of three inches in the intermuscular cellular tissue, in order to avoid the crural nerve. In the whole of this extent small arterial branches may be divided, in which case they should be carefully tied. When the sac is opened the coagula and the blood that it contains must be removed; and the surgeon is under the necessity either of washing, cleaning, or rubbing the whole of this enormous internal surface with charpie or a fine sponge; assistants are obliged to separate, and consequently, to drag upon the lips of the wound, in order that the operator may see to the bottom of it. The wound being cleaned out, the gap in the artery is discovered, and it is only after considerable injury to parts that the ligatures can be tied at this depth. If, as Mollinelli observes, any collateral branches should open into the artery between the two ligatures, as one is uncertain about the precise part of the artery that furnishes blood, it becomes necessary to employ compression upon the opening in the vessel and to apply astringents and caustics to it.

A tedious operation, much pain, irritation, and inflammatory swelling, which quickly follow, and which are proportioned to the extent of the disorder, and, after a time, an abundant dis-

1797. charge, a copious suppuration, the contact of air with a wound of that extent, small abscesses which are occasioned by its depth and the proximity of its lips, sinuses that are very difficult of cure, the subsequent swellings that they occasion, secondary abscesses, and finally, the length of the treatment, occasioned sometimes by the cavity that is left by the projection of the flexor tendons in consequence of the limb not being able to be extended; such are the very common results of the operation by incision of the aneurismal sac.

Hunter's operation requires an incision two inches in length in the integuments and *fascia lata;* it is only necessary to raise the border of the sartorius muscle, which is exceedingly thin at that part of the thigh where the operation is performed. The bundle of vessels placed immediately below is easily exposed and taken hold of; the wound has but little longitudinal extent, and has, as it were, no depth; the surgeon has the advantage of operating quickly and safely, and, which is of great advantage, on a part, the structure of which is not changed. The tumefaction that follows the operation is slight, the suppuration is trifling, and the cure is speedy.

This succinct exposition of the two plans of operating for aneurism of the popliteal artery proves readily that the last is far superior to the first, provided always that experience continues to show that the success obtainable by this plan of operating exceeds, or even equals, that by incision of the sac, as it is easier, more rapid, and less painful.

1st. It is easier, inasmuch as the surgeon operates on a healthy part that has undergone no change, the artery presenting itself readily and being ligatured with ease. I have said elsewhere that the convenience of the operator would influence the perfection of an operation; hence an easy plan should always be preferred to a more difficult one; not only because the surgeon finds it to his advantage,[1] but also because this facility is advantageous to the patient on account of the greater readiness with which an easy operation is performed.

[1] A wise surgeon will prefer the safety of his patient to the silly vanity of showing off his skill. He avoids difficulties as much as possible; but when he can no longer do so, he finds in his genius, in his dexterity, and in his firmness, the means of overcoming them; none but a presumptuous man would seek them for the mere pleasure of conquering them.

2d. This plan is safer, because the artery presents itself easily 1797.
to the eye and to the finger of the operator; because the course of the blood can be intercepted in as certain a manner as possible; and because the surgeon is not exposed to those secondary hemorrhages, which leave a doubt as to the manner in which the artery has been tied, as happens in the operation by incision of the sac.

3d. Finally, Hunter's operation is less painful, as the wound is of less extent both in length and depth, as there are fewer parts implicated and consequently less irritation, less inflammation, less tumefaction, and less suppuration.

PRECEPT III.—*To remove everything that can interfere with the circulation of the blood in the parts both above and below the ligature.*

There can be no doubt that the success of the operation for aneurism, whatever be the plan employed, depends upon the maintenance of the circulation below the ligature. At whatever distance from the opening in the artery the ligature be applied, the successful result will entirely depend either upon the number, or on the extent of the dilatation of the collateral branches; either the number or the caliber of which will be sufficient to furnish to the subjacent parts a quantity of blood sufficient to maintain their vitality. The success of the operation will therefore depend on the condition of the collateral vessels.

It is important to observe, that in certain aneurisms this condition fortunately occurs before the operation; so that whatever be the point at which the blood is arrested, the collateral vessels are already dilated and convey it to the parts below. On the contrary, the ligature of the main trunk necessarily entails the death of the parts below the ligature, when this fortunate arrangement of the anastomosing branches does not occur.

There is a mean between these two conditions; that is to say, that the collaterals may either be sufficiently numerous, or else have the disposition to dilate sufficiently so as to maintain the vitality of the limb. It is this disposition that surgery can

1797. favour, by removing everything that has a tendency to interrupt the course of the blood in these vessels.

When an aneurismal sac is opened we observe a cyst, which is formed by the cellular tissue, the laminæ of which are laid close upon one another, and have acquired a degree of consistence proportionate to the age and the size of the aneurism. Immediately below this envelope may be observed a fibrous, a lymphatic, and other layers, which diminish in consistence as they approach the opening in the artery; near the vessel is found a mass of coagula that are more or less solid, and finally, on the artery itself a very small quantity of fluid blood; with a little attention it may easily be seen that this fluid blood is mixed with coagula, and traverses these in order to reach the artery beyond the opening in it. This renders the circulation in the artery slower and more embarrassed, to which the tumefaction of the part also contributes; hence, necessarily follows an increased action of the blood upon the parietes of the vessel above the obstruction; and on this account, the passage of a larger quantity of blood into the collateral arteries, which gradually enlarge for its reception.

It is then, to the difficulty that the blood experiences in circulating through the artery at the ruptured parts, that the dilatation of the collateral vessels above this point is owing; it is this difficulty that establishes a new, or rather a more abundant circulation in the secondary arteries. Whence we may hope that the older the tumour is, the more readily will the circulation take place; and the greater the obstruction the more abundant also will the quantity of blood be. It is on this principle that I treated the patients who are the subjects of the ninth, eleventh, and twelfth observations. By interrupting still more the course of the blood in the artery, I favoured the dilatation of the collateral vessels, and I did not allow any blood to pass into the trunk except what was sufficient to maintain the vitality of the parts below the ligature.

It is easily understood that this plan can only be had recourse to in Anel's or Hunter's operation, and that it is impracticable in that in which the aneurismal sac is opened. Other circumstances then being equal, this will be one of the great advantages of Hunter's operation. It will also be perceived that in order to have recourse to this practice, it is indispensable that

the operator should retard, to any extent that he may wish, 1797.
the course of the blood in the artery, and that he should finally
be able to arrest it completely, which is scarcely practicable by
means of the common ligature.

In both plans the operator will have it in his power to remove all those causes that could interfere in any way with the course of the blood in the collateral vessels; but it cannot be denied that habit often influences our nature, or, at least, reflection. In almost all the operations in surgery in which a cavity is left, it is the custom to fill this up with charpie, either to prevent hemorrhage or to absorb those putrid fluids that precede suppuration; on superficial wounds it is customary to put a mass of charpie, in order, as it is said, to support the part; in both cases the whole is sustained by a containing bandage, generally applied pretty tightly.

If the after-dressing be performed in this way, we shall see, on reflecting upon its consequences; First, that the inflammation will be increased in proportion as the lips of the incision are separated, squeezed, and compressed; and that more or less tumefaction of the circumference of the wound, and a consequent compression of the collateral arteries will result from this inflammation. Secondly, that the compression exercised by the mass of charpie does not only act upon the part touched by it, but extends to a distance, and that the collateral vessels must suffer from it; if, in addition to these circumstances, we also take into account the tight bandage, which acts not only upon the wound but also on the neighbouring parts, it will be seen that this plan deprives us of the assistance presented by the tendency of the arteries to dilate in order to transmit the blood to the parts below the ligature.

Immediately after the operation, in Chopart's case, the wound was completely filled with charpie supported by a bandage tightly applied. In another operation, performed a short time since, the wound was equally filled up, and the dressings kept on in the same way; such also was the kind of after-dressing that I employed in a case of operation for aneurism by incision of the sac, five or six years ago. May not the unfavorable termination of these cases be attributed to this plan of stuffing the wound? In all the operations that I have since performed with success, I have been very careful not to fill the wound with

1797. charpie; I have contented myself with laying merely a small quantity of it between the lips of the wound in order to prevent their union. In this way the patient was dressed, who was lately operated upon at La Charité.

In Hunter's operation, besides the arteries that supply the muscles, and the small collateral branches that arise from the main trunk immediately above the ligature, there is yet an important vessel, namely, the second or descending branch of the external circumflex, which is often of considerable size, descends to the lower part of the thigh, and communicates with some anastomosing vessels from the popliteal; these ramifications, on which the operator confidently calculates, may be destroyed by an imprudent compression, exercised either on the seat or in the neighbourhood of the operation, and which will deprive the subjacent parts of the only means left them for their support.

In the operation for popliteal aneurism by incision of the sac, in which it is of so much importance to allow as much liberty as possible to the circulation of the blood in those collateral vessels that are distributed to the muscles, and more particularly in the superior articular arteries which take their origin from the main trunk, and some ramifications of which are distributed on the posterior aspect of the femur, what bad consequences may not ensue if, after this operation, such dressings are applied as will squeeze the arteries flat and thus interrupt the passage of all fluid through them? More particularly, if to this be added, as has already been said, a containing bandage, even moderately tightly applied, which acts upon the whole circumference of the limb, and which in the twenty-four hours after the operation compresses with a force proportionate to the tumefaction. The swelling will be to a degree and an extent proportionate to the number of parts that have been implicated in the operation, and according as this has been accompanied with more or less pain and irritation.

Is not this compression with dressing and bandage sufficient to destroy that excellent arrangement of the collateral vessels by which, even before the operation, blood can be conveyed to the parts below the tumour? There can be no doubt that this circumstance had influenced considerably the unsuccessful result of this operation; let those operators, once for all, who have not succeeded, reflect upon the kind of dressing that they have

employed, and let them, for the sake of the progress of the art of surgery, have the frankness to avow that this has been the principal cause of their want of success; such an avowal would tend to the advancement of surgery, and would enable us to lay down a rule, attention to which would contribute materially to the success of the operation. 1797.

I have not undertaken the task of endeavouring to establish the relative merits of compression and of ligature of the vessels; it is sufficient to say that this last means will always be preferred by well-informed surgeons, as it interferes less with neighbouring parts, whilst compression chafes, irritates, and destroys them to a greater or less extent. The ligature then should be had recourse to whenever it is practicable; but the surgeon must rely entirely upon it, and discard every other species of compression that does not act upon the artery alone. If in extensive incisions, such as it is necessary to make in operating for popliteal, or any other kind of aneurism, by opening the sac, some arteries of the third or fourth order be wounded, they must be tied. Were the application of a ligature impracticable I would prefer to compression the employment of a button of vitriol, or of some other caustic. The smaller arteries of a moderate caliber need give the surgeon no uneasiness provided he be sure of the means he has employed to arrest the course of the blood in the main trunk.

After having established the distinctive characters of the two modes of operation for aneurism of the popliteal artery; after having pointed out the principal circumstances that must be attended to, in order to ensure the success of the operation, whatever may be the method adopted; and, finally, after having determined the advantages of either plan, I shall consider those cases that would induce us to give a preference to one plan rather than to the other. I shall, lastly, point out several general precepts on the most essential parts of the operation, the steps of which I shall finish by describing.

1st. Supposing that experience continues to prove that Hunter's operation succeeds more frequently than the ordinary plan, or admitting even the equality of the success, yet there are certain circumstances that should induce us to give preference to the operation by incision.

If the tumour appear either to the sight or feel to be divided

1797. into two lobes, if one portion extends up one of the sides of the artery, or if it do not seem to be circumscribed, we may suspect that the aneurismal sac has yielded at one point, and that the blood that it contained has passed out by this opening into the cellular tissue in the neighbourhood; in this case it is impossible for the operator to define the exact limits of the tumour; he may fear that the blood has been infiltrated into the cellular tissue, out of the cyst; and that, consequently, it will decompose.

Hunter's operation should not be had recourse to if the aneurismal tumour be painful, and still less if its exterior be attacked with inflammation, indicative of approaching rupture of the integuments, if the knee or leg be engorged, or if the patient suffer in these parts; for it is almost certain that in these cases the liquid contained in the tumour has already undergone decomposition, and that the cyst is inflamed, or at least in a state approaching to inflammation, and is about giving way, which, were it to happen, would compel the surgeon to empty the sac of the putrid blood contained in it; whence a double operation would necessarily result.

In Anel's case, the aneurism had already given way, and had furnished a considerable quantity of blood; after which the skin had again cicatrized, and lastly opened again to such an extent, that the aneurismal sac was exposed. It was under these circumstances that Anel applied the ligature to the artery, without opening the tumour, which gradually and sensibly diminished to such a degree, that no vestige of it was left. It does not appear to me that this success ought to make us regardless of the consequences of this tendency to rupture in the tumour, for we must not too precipitately deduce general inferences from an isolated fact, and I think that in similar cases we ought to have recourse to incision of the sac.

If the aneurism were of a considerable size, it might be feared that there would remain after the cure by the Hunterian operation a large tumour, that would prove inconvenient to the patient. This is the only inconvenience that could result; for as this tumour would occupy a cavity that is naturally filled by cellular tissue, and is thus, as it were, isolated, it would act but little on the neighbouring parts, and the nerve even would not suffer any dangerous compression; indeed, in consequence

of the diminution that would take place in the tumour after the operation, this nerve would be freer and less compressed than it was before; but still one cannot but feel that the neighbouring parts, without being injured, might suffer a considerable degree of inconvenience. 1797.

It must be left for experience to determine upon this, and to decide whether the tumour would not, though very gradually, be ultimately reduced to a small bulk, as reasoning would lead us to believe; for experience proves that all stagnant fluids, that are not moistened, always have a tendency to dry up by the removal of the more liquid parts, and that at last they become, if I may so express myself, reduced to a parenchyma—to a *caput mortuum*, which must be exceedingly small in proportion to the quantity of fluid absorbed. This should reassure us against the false dread that this aneurismal tumour, being diminished and hardened, would acquire an excited action, and would thus, by a slow fermentation, inflame the sac and neighbouring parts, and thus ultimately oblige the surgeon to open it. Experience has not as yet given us any reason for alarm upon this subject; it has even constantly proved the very contrary; a number of cases of aneurism of the arm having been observed, in which the tumour, after being reduced to a small bulk, has remained so during life, without there being any case to prove that it has ultimately increased in size and suppurated, provided no external cause has come into operation, nor any act of imprudence has occasioned it.

The success of the two operations being equal, Hunter's should be preferred to that of opening the sac, while the aneurism is small, circumscribed, not painful on slight pressure, and provided the subjacent parts are pretty nearly in their natural condition. Should the patient experience a few shooting pains in the leg, a sufficiently common symptom in this disease, these need not be regarded as any contra-indication to Hunter's operation.

2d. It is not sufficient that the circumstances of the case should be favorable for the operation to be successful; it is also necessary that the operator should second these by every means in his power; for it cannot be denied that often, in consequence of the manner of operating, they are not only not seconded, but are even completely nullified.

1797. The most important part of the operation for aneurism is, without doubt, that of arresting the course of the blood in the trunk of the artery with certainty and safety. To the caustics, the actual cautery, and the lateral and direct compression employed by the ancients, has succeeded the ligature, that is to say, circular compression, which, by compressing the artery on the whole of its circumference, forces its walls towards the centre, and thus obliterates its cavity. When the artery is not deeply seated, when its parietes have not any very great consistence, this circular compression is as safe as possible; but it is not the same when the artery is at the bottom of a deep cavity; it is then exceedingly difficult to employ circular compression with certainty; if the walls of the artery are of a certain thickness, it will be almost impossible to pucker them in sufficiently to close the centre of the canal, and thus to obliterate the cavity without rupturing the vessel. The noose of the ligature may be so applied as either to include some of the neighbouring parts as well as the artery, or else the vessel alone.

In the first case, it would be necessary to tie the ligature very tightly before the circular compression could act sufficiently upon the artery; and even then, when the parts comprised within it together with the artery, are divided, the noose will no longer exercise any pressure upon the vessel, and the blood will consequently escape. We must, in order to obviate this, have recourse to a ligature of reserve. If this be applied on the same spot as the first one, there will be the chance of dividing the artery which has already been injured by the former ligature; it will therefore be necessary to apply the ligature of reserve above this point. In the case of popliteal aneurism that lately occurred at the Hospital of La Charité, the ligature slipped on the day following its application to such an extent, that a probe could be passed into the trunk of the artery, in consequence of which it became necessary to employ the presse-artère.[1]

[1] [The presse-artère consists of two pieces; one, a plate, seven lines in length by four in breadth, made of silver, gilt copper, or or-molu, is pierced by two transverse holes, two lines in length by a line in breadth, and separated by an interval of five lines; these are for the passage of the ligature. The other, a stem, about two inches and a half in length, of the same material as the plate, into which it is firmly riveted, is pierced at a distance of twenty-one lines from the plate by a round hole about two lines in diameter. The mode of application is as follows: the ligature having been

In the second case, that in which the artery alone, or the bundle of vessels only, has been included in the noose of the ligature, a less forcible compression will be required, as it is a more direct one; but then this circular compression, by acting directly upon the walls of the artery, will, if these be thick or rigid,[1] cut them across; the surrounding cellular tissue will, no doubt, resist for a time the efforts of the blood, but it will soon yield, and then hemorrhage will occur. 1797.

There can be no doubt but that this was the cause of the hemorrhage that proved fatal to the patient operated upon by M. Guèrin; the artery was ruptured by the circular compression; the cellular tissue was for a time the sole bulwark against the force of the blood, which, at last, finding a passage by the side of the tumour, continued to supply it, and in this way the aneurism was enabled to preserve its bulk, or even to increase in size.

In the ninth case that I have related, I was obliged, in order to interrupt completely the course of the blood, to ligature the artery with such force, that I was afraid it had been cut across. This fear continued to haunt me. I expected every minute that a hemorrhage would occur, and everything was disposed round the patient's bed that was necessary to stop the bleeding; the assistants were upon the alert. The hemorrhage, as I had expected, took place. Had it not been for the precautions I had taken the patient would have perished as suddenly as the subject of M. Guèrin's observation did. In this one, the enlargement of the aneurismal sac, and even its ordinary bulk, must have dragged upon that portion of the artery that was below the ligature, and have produced, between the divided ends of the vessel, the separation that M. Guèrin has observed. Were, however, the tumour emptied, this end being no longer dragged upon, ought to approach nearer to the other. This observation does not in any way lessen the advantages of Hunter's operation. The giving way of the artery in this patient, and in the

passed under the artery, its two ends are brought through the corresponding holes in the plate, and in opposite directions through that in the stem, in which they are tightly fixed by means of a metal peg. The artery is thus compressed between the ligature below and the plate of metal above.]

[1] This state of rigidity, and even of cartilaginous hardness, has not escaped Galen. Meth. Med. lib. 5, cap. 7, De Vulneratæ Arteriæ curatione.

1797. one that I operated upon, cannot be regarded as a consequence of this mode of operating, but must be looked upon rather as a fault of the operator, or as a consequence of the means that we both employed.

I must remark, that in my patient, and probably also in M. Guèrin's, notwithstanding all the force that I could exert in ligaturing the artery, the blood did not cease to flow into the tumour; a proof that the vessel was either not sufficiently tightly tied, or else that it was partly broken through; if this last were the case, it was not surprising that the presse-artère should be of no use in this part of the vessel, as this instrument could not, of course, arrest the hemorrhage until it was placed above the rupture in the artery.

After the reflections that have been suggested to me in several cases, and after an examination of arteries of the second order, in which I have, in dead bodies, examined the effects of a circular ligature, I have come to the conclusion that it would be better to flatten, than to pucker in the vessel by tying it. And it is in order to perform this flattening—this isolated compression of the artery—that I have had the presse-artère constructed. This instrument unites two very important advantages, namely, that of increasing or of diminishing at pleasure the degree of pressure on the artery, and that of acting, with more than a sufficient force, at a distance from the point on which the pressure is exercised.

This procedure appears to have been adopted by some of our most celebrated surgeons. There would necessarily be some who, from force of habit, would continue the old plan; others, from less praiseworthy motives, would decry the operation that I describe, and would only have recourse to it as a last resource; and then, perhaps, when there would no longer be time for it to be of service.

The place to be chosen, and the instrument to be selected for the compression of the artery, do not deserve less attention on the part of the surgeon. The ligature that is employed for the larger vessels resembles a riband, being composed of several threads laid side by side, and then waxed together. It is very rarely that this ligature, when passed under the parts, preserves its shape; it usually assumes that of a cord, and hence it cuts more quickly; besides this, the humidity of the parts se-

parates the threads from one another, and renders them indi- 1797.
vidually more exposed to decay. It may happen that several fragments of thread, when the ligature is applied at the bottom of a deep wound, are left behind, and these, acting as foreign bodies, retard the cure, and may even occasion suppuration and purulent deposits. I know that this accident occurs but seldom, I have only seen it twice in the course of a tolerably long practice; it happened in one of the patients operated upon by Hunter, in which case several abscesses formed in succession, and at different times, pieces of thread were removed from the wound in which they had been left, thereby retarding for a considerable time its complete cure.

It would be as ridiculous to consider this accident as dependent upon Hunter's operation, as it would be that of the division of the artery in consequence of its being too tightly tied; it belongs no more to this operation than to any other; it is a fault of the method, which I have tried to avoid by using a ligature a line and a half in breadth. This riband, made in a single piece, is not likely to rot, or, if any part were to do so, this would follow on withdrawing that which is still sound. Besides, although it is most generally observed that the artery, and all the parts included within the ligature, are divided in such a way that the noose can be withdrawn from the wound, yet it also sometimes happens that these parts resist for a long time the action of the ligature, and thus retard its separation. In such a case as this, the presse-artère will have the advantage of freeing the wound from this foreign body. In using this instrument the riband is not tied in a knot, it need, therefore, only be cut on one side, as near as possible to the bottom of the wound, and thus it can easily be withdrawn; in this way the division of all the parts contained in the noose is avoided, and the cure is hastened.

To the curved round needles that have been employed up to the present time, for the purpose of passing the ligature under the artery, have succeeded, and with justice, the curved flat ones. The old ones had the fault of not forming a regular segment of a circle, for as a third of their length near the eye was straight, their progress through the flesh was rather tardy; on the other hand, the opening for the passage of the thread being in a direction corresponding to the length of the instru-

1797. ment, the ligature necessarily got twisted, whence would result a change in the form of the riband, which would occasion an entanglement that would impede the progress of the needle. The new ones are better constructed; they form a little more than the half of a regular circle, the diameter of which, for the operation in question, should be of about twenty-four lines. These needles are flat, two lines in breadth, a little larger towards the point, the edges of which are slightly cutting; the extremity is pierced by a transverse opening, which receives the riband and does not twist it.

But although this needle is of a better construction than the old ones, yet it cannot be denied that it is difficult to handle, especially when it is intended to pass it under an artery that is deeply seated, such as the popliteal. Its proper size should be such as I have described it. It has two inconveniences: the one is that it is managed with difficulty, and the other that it embraces, notwithstanding all the care on the part of the operator, a tolerably large quantity of parts besides the artery. In the operation performed by Chopart, there was much difficulty experienced in passing this needle under the artery, and recourse was had to the needle that I had employed, and which I had taken the precaution to have about me.

The old needle has this inconvenience, that, owing to the shape of the wound, it becomes necessary to pass it obliquely under the artery, and then, when it has reached the opposite side, to turn it transversely; besides, the oblong eye at its point, placed lengthways, offered the same inconvenience as the ordinary needles. These considerations induced me to cause the needle to be made that I employed in the ninth case. The first time that I used it I found that its blunt point occasioned some difficulty to its passage, I therefore made it sharper, and the neighbouring edges somewhat cutting. This needle has the advantage of being easily passed under any vessel, however deeply it may be situated, and, with care, its small diameter will enable the surgeon to avoid including in the noose anything besides the artery, or the artery and vein, when they are together.

Immediately after the ligature of the artery, Hunter, in the case I have mentioned, brought together the lips of the incision, and kept them in contact by means of an agglutinative plaster;

they soon united, and hence, it is said, resulted that long de- 1797.
tention of the ligature in the interior of the wound, hence the decay of the thread, and all the secondary abscesses. It has been said that I did wrong in following this part of Hunter's operation. But no attention has been paid to the fact, that, as I pointed out in my case, the necessity of dividing the parts that had reunited, I could not have followed him in this. Besides, it would have been impossible to have had recourse to it in the plan that I had adopted for the arrest of the course of the blood through the artery; this circumstance is in no way characteristic of Hunter's operation.

This reproach, which is as insignificant as the cause that has given rise to it, does not appear to me to be just. It is not because the lips of the wound were brought together that the ligature was detained for so long a period that it partly rotted in the wound, and that several secondary abscesses occurred. It is because Hunter applied several ligatures, which were less tightly tied in proportion as they were at a distance from the lower one. It is because the ligatures that were not very tightly applied did not divide the artery, their nooses being retained within the wound, whence they could not be withdrawn until the threads had rotted. He that would repeat such a reproach as this, would cause me to think that he had paid but little attention to the old plan of applying the ligature in amputations of the larger extremities, and that he had never had an opportunity of seeing cases of flap-amputation. Formerly, when, after amputation of the limbs, the needle was carried through the flesh, in order to include the artery, as we are now sometimes obliged to do, how often has it not been noticed that the ligature did not fall till the twentieth or thirtieth day, and that it often delayed the cicatrization in such a way that it became necessary to cut through the noose?

In flap-amputations, the first object of the surgeon, after the operation, is to bring the parts together, and to favour their cohesion, leaving to nature the care of separating the ligature that is deeply seated; which ligature will come away entire, when it has been tied sufficiently tightly to cut the artery, if that vessel alone have been tied, or the parts included with it in the noose, if there have been any.

If, in the operation performed by Hunter, the lips of the in-

1797. cision had been left open, the ligature would not have come away twelve hours sooner, because it was not the union of the lips of the wound, but the parts contained within the noose of the ligature that retained the threads.

The only inconvenience that can result from the immediate union of the lips of the wound after the operation, is the necessity that may occasionally occur of dividing them, in order to apply a ligature of reserve in the event of hemorrhage. This inconvenience, it is true, is of but little consequence in a small superficial wound as the one that results from Hunter's operation, but yet it should be avoided, as it is in our power to do so. This is what I have done in the eleventh and twelfth cases: were it not, indeed, for this fear of being obliged to have recourse to a ligature of reserve, the union of the lips of the wound would be indicated as strongly in this operation as in a flap-amputation; it is easy, however, to perceive that if the presse-artère be employed this cannot be attempted.

The inconveniences that have been spoken of, and which result from the number of ligatures applied by Hunter, induce me to say a few words on this point. Hunter applied four ligatures; it is readily perceived that his intention was to retard the course of the blood in the artery by the superior ligatures, and then to arrest it completely by the inferior one. There can be no doubt, that as the blood would circulate slowly between the ligatures, it would act less strongly upon the last one, that it would coagulate very quickly, and that thus, in three or four days, there would be nothing to fear, even if the lower ligature had ruptured the artery.

It cannot be denied that several ligatures, applied as the operator intends, may present a great additional chance in favour of the operation; but, without regarding the inconvenience of a ligature that has been loosely applied, and which, dividing the part with extreme slowness, would probably occasion the thread to remain a long time in the wound, and would even give rise to several secondary abscesses there,—slight inconveniences in the eyes of a skilful surgeon, who only looks to the means of increasing the safety of so important an operation, on which the life of the patient depends—I would observe that it appears to me to be very difficult, if not impossible, to compress an artery circularly to the precise extent that the operator wishes.

Admitting the possibility of this case, can the stability of the ligature be reckoned upon, when nothing but the artery has been included in it, which stability will, of course, be rendered more uncertain if other parts have been tied in the noose? Should the operator, whilst intending merely to diminish the diameter of the artery, completely obliterate its cavity, either the ligature by which this is done, or the lowest one, becomes useless, and the same will be the case with the one that is not sufficiently tightened. As there is this uncertainty, and as experience has proved that a single ligature suffices in ordinary cases, I think that it will be useless, as far as the success of the operation is concerned, which is only rendered longer and more painful, to increase their numbers. I have said, in ordinary cases, because some circumstances may occur, such as rigidity of the coats of the artery, that may render the application of the ligature impracticable; but in this case, several ligatures would not be more useful than a single one, as they could not act sufficiently upon the canal of the artery to obliterate its cavity. 1797.

In the ninth case, I included within the ligature the whole bundle of vessels, that is to say, both the artery and the vein. Some doubts have been thrown upon the advisability of ligaturing veins, but the experience of all ages, as well as anatomical considerations, will serve to remove this imaginary dread. There are no principal veins as there are main arteries; they are so numerous, and their diameter is so great in comparison to arteries, that the return of the blood is in no way retarded, and I do not think that the surgeon need ever trouble himself about separating the vein from the artery.

Operation for popliteal aneurism by incision of the sac. The patient having made up his mind to the operation, the skin covering and in the neighbourhood of the diseased part should be shaved on the preceding evening, an antispasmodic draught and proper drinks should be prepared, and the instruments and dressings intended to be used during and after the operation should be got ready in the order in which it is intended to use them. These instruments and dressings consist of two or three cloths folded four times, and of some that are merely doubled, of a small handful of charpie, a circular compress to surround the thigh, Petit's tourniquet, two lighted wax tapers of the kind called *rats de caves;* another lighted candle is to be placed

1797. in the room in case of necessity; a straight bistoury, two metal retractors about an inch in width, at least two small and fine sponges soaked and then squeezed dry, a sufficiently large number of pieces of linen rag, two basons of tepid water, a large number of small balls of fine charpie, a pair of dissecting forceps, several single and some double waxed threads, a long probe, at least two curved and flat needles, several ribands composed of waxed threads placed side by side, very fine and well carded charpie, several large and fine linen cloths to wipe the parts, eight or ten fine compresses to cover the ligatures, two or three compresses at least eight inches square, four circular compresses doubled and at least eight or nine inches wide, a fine bandage three yards long and two inches wide, some sharp pins, one or two cloths folded longitudinally and rolled up, a cushion, two feet and a half in length by twelve or fifteen inches in width, filled with straw cut up in small pieces, several small cushions of the same kind, seven or eight inches square, several long bags filled with warm cinders or sand, and lastly, a cradle to support the bed-clothes.

Everything having thus been got ready, the surgeon should proceed in the following way; whether the aneurism be in the right or the left ham, he must place himself to the right of the patient, who should be brought as near as possible to the edge of the bed, on which two square doubled sheets have been spread. Before applying Petit's tourniquet, a small quantity of charpie, sustained by a circular bandage, should be applied as high up as possible in the course of the femoral artery, so as not to be in the way during the operation and the after-dressing; the band of the tourniquet should then be put round the thigh, its pad being applied upon the charpie and the screw on the opposite side, that is to say, on the posterior part of the thigh; the bandage then having been sufficiently tightened, the screw must be acted upon so as to separate the plates of the instrument; the patient is next to be laid upon his belly, the leg being somewhat bent upon the thigh, and supported by an assistant. An intelligent assistant is then to be placed opposite to the operator; it will be the duty of another, perfectly acquainted with the operation, to present the instruments and dressings as they are wanted, so that the surgeon may not have to wait for them; another will have the management of the tourniquet, and others

will hold the tapes, present the sponges and water when wanted, support the patient, and restrain any involuntary movement that he may make. 1797.

The assistants then being arranged, the patient placed in a proper position, and the blood arrested in the artery, the operator, without paying any attention to the most projecting part of the tumour, will make an incision in the direction of and immediately over the popliteal artery, in such a way that the direction of his incision is between the tendons of the biceps, and the semi-membranosus and semi-tendinosus muscles; if the tumour be very large, the incision in the integument should be at least five inches in length. After this incision has been made, the surgeon will be able to recognize the parts situated beneath the skin, and the changes that may have been occasioned in them; sometimes the aneurism projects between the tendons of the biceps and the semi-tendinosus muscles; sometimes the tendon of the semi-tendinosus is raised up and carried towards the external condyle in such a way that the greatest projection takes place between this tendon and that of the semi-membranosus; in this case the tendon of the semi-tendinosus may at the first glance be taken occasionally for the nerve, which is raised up by the tumour, but with a little attention this may easily be recognized. As this tendon has the same direction as that of the semi-membranosus, if the incision be made between them, it becomes necessary to separate the extremities of these muscles from one another, which will increase the difficulty of finding and of cleansing out the sac.

In order to obviate this inconvenience, it will be necessary to separate the tumour somewhat from the semi-tendinosus, and, carrying it towards the inner part of the thigh, to open it between this and the tendon of the biceps; in opening the aneurismal sac, the operator must not forget the nerve that is found at the outer side, generally very near the artery, and which, in certain cases, (rare ones it is true,) being raised up by the tumour, will present itself directly under the edge of knife. The aneurismal sac, opened to the whole of its extent, ceases to act upon the tendon of the semi-tendinosus, which then approaches the semi-membranosus, and hence offers fewer difficulties to the separation of the edges of the wound.

The sac having been opened in the same direction as the

1797. integuments, the operator must remove with his fingers the coagula which fills it, and must sponge out the fluid that it contains; if the blood continues to flow into the wound, the tourniquet should be tightened still more; the edges of the wound should then be separated by means of the retractors, so that the interior of the sac may be more readily cleansed, and the opening in the artery be found without difficulty. If, whilst making the incision into the aneurismal sac, any small arteries should bleed, the surgeon must seize them with his forceps and tie them; this precaution should not be neglected, not so much on account of the blood that might be lost, which can only be in small quantity, as to enable the surgeon to be certain whence the blood comes, in case any is to be seen on the dressings.

The wound having been cleansed, washed, and well sponged out, the operator will readily distinguish the artery by its white colour, and will be able to recognize the opening in it, which is generally of an oval or circular shape, and usually large enough to admit of the introduction of the extremity of the little finger or of a large probe; in order to make more sure of it, it is better to introduce into this opening the point of the probe, which will readily enter; there can then no longer be any doubt as to the position of the artery, which generally occupies the middle of the deepest part of the cavity; sometimes, which I have seen on one occasion, it is inclosed towards one side of the sac and seated rather superficially.

All the small arteries having been tied, the whole circumference of the wound having been then cleansed and dried, the operator will proceed to the adoption of some means in order to arrest entirely the course of the blood in the artery, above as well as below the opening in it; should he prefer circular compression, he must practise it as near as possible to the opening, but still in a healthy portion of the vessel; in order to apply this ligature, the extremity of the probe must be passed into the portion of the artery below the opening. The surgeon will then lift up the vessel with this instrument so as to be able to recognize it and to include it alone in the noose; he will then take a curved needle that has been threaded, pass its point under the artery, and bring it out on the opposite side; the needle should then be drawn through, and thus a double thread be passed under

the vessel.[1] Of these two ligatures the surgeon will take one, with which the artery is to be tied in a simple knot sufficiently tightly to obliterate the cavity; a second knot will help to tighten the first. I do not recommend the application of charpie or of a small compress between the artery and the knot, as they are quite useless. The two other threads may be laid upon the edges of the wound, so as to be used if necessary. 1797.

The operator will then immediately proceed to the application of the upper ligature in the same way ;[2] he must raise up the artery, and will be careful not to include the nerve in the noose. After the thread has been passed under the vessel, the surgeon should draw the ends of it towards him, and, pressing upon the artery with his fingers, cause the tourniquet to be slackened in order to see whether the artery has been wounded by the point of the needle, and to make sure that it has been completely included in the ligature; this being ascertained, the tourniquet should be tightened again, and the ligature of the vessel proceeded with in the same way. A single ligature is not enough here; another should be passed five or six lines above this point in order to be had recourse to in the event of the first one having, by being too powerfully constricted, ruptured the artery; for in this case a second ligature passed with the first would be perfectly useless, and could only constrict the artery still further if it had not been sufficiently so by the first ligature. All the threads that have been used should be twisted separately, and the ligatures of reserve should be placed upon the lips of the wound separately one from the other; the whole should be covered by small compresses laid along its edges.

Both ligatures having been applied as firmly as possible, the operator must again clean out and dry thoroughly the interior of the sac; a small probe should then be passed upwards and

[1] I propose passing a double thread, in order to have recourse to the second ligature in the event of the first one not being sufficiently tightly applied, which will be of but little use in that part of the artery that is merely ligatured by way of precaution.

[2] When the surgeon begins by applying the superior ligature, if, on the tourniquet being slacked, the blood appears, he would be uncertain whether it came from the portion of the canal above or below the opening; this uncertainty cannot exist when he begins by applying the lower ligature. I have therefore recommended this to be done.

1797. downwards in the arterial tube, and, if it do not pass beyond the ligatures, the tourniqnet may be slackened. The surgeon should next examine with the greatest attention the opening in the artery, and if any blood appear here, the ligatures being firm and tight, it must come from some of the collateral vessels in the interval between the two ligatures; a button of vitriol or some slightly caustic liquid, which will be fully sufficient to close completely these small vessels, should then be applied, and in this way all compression, which I entirely disapprove of, however lightly it may be applied, will be rendered unnecessary. A small ball of charpie attached to a thread should be introduced into the opening in order to absorb the superabundant caustic, and a little charpie is to be placed without compression upon this ball.

If, the tourniquet being quite slack, any blood appear to come from the upper part of the artery, recourse must be had to the second ligature, so that the vessel may be tied more correctly, care being taken, as I have already said, to place it above the rupture in the artery. If no bleeding occur, the operator must wait a few minutes before proceeding to the dressings, so as to become positively certain that the course of the blood through the vessel has been properly arrested. The dressings should then be applied in the following way.

The cloth, that was folded four times, and placed under the thigh, having been withdrawn, and the edges of the wound, as well as the whole of the part, having been washed with a fine sponge, and dried, the operator should inclose every one of the ligatures—those that have been used, as well as those of reserve—in small pieces of fine linen, and must lay them upon the edges of the wound. He should then place between the edges a small quantity of fine charpie, just sufficient to prevent their uniting; above this a pledget of the same length and breadth as the wound, covered with a mixture of balsam of arcæus and cerate, and above that again two or three square compresses, supported by circular ones; the whole to be sustained by circular compresses, and a few turns of a roller. These dressings should be applied in such a way that the finger may easily be passed between the skin and them.

The tourniquet having been removed, the patient is to be quietly lifted up, and placed on his back in the middle of

his bed, which should previously have been dressed with a cloth folded square, and with a large towel or napkin rolled up. The thigh is to be laid on its external aspect, supported, as well as the leg, which is to be slightly flexed, upon a cushion, almost in a horizontal position. Small cushions are also to be placed under the thigh in such a way that the whole of the external part of the limb be equally supported; the whole of the leg, from the knee to the extremity of the foot, is then to be surrounded by bags filled with warm sand or ashes; but I prefer compresses soaked in an aromatic liquor, strengthened with brandy, and changed as often as necessary for the maintenance of a moderate temperature. This last means appears to me to be more serviceable, as, by the moisture that is thus imparted, the suppleness of the fibres is maintained, and hence less resistance is offered to the blood in the smaller arterial ramifications; the leg and foot must be protected from the pressure of the bed-clothes by means of a cradle. 1797.

I think that, in order to pass the waxed threads under the artery, the needle mounted upon a handle is to be preferred to the one that I have spoken of, as it can be used with more ease and freedom at the bottom of the wound, taking in few parts besides the artery, and perhaps but it alone. M. Sabatier says that he has used it with success, and appears to prefer it. I think that every surgeon who would not adhere to a difficult procedure will agree with us.

If the surgeon prefer, as I think he ought, for the reasons that I have adduced, the flattening of the artery, that is to say, its isolated compression to the circular constriction, the ligature is to be applied in a different way. The artery having been raised up by the probe, the mounted needle is to be placed under the vessel below the opening in it, and then, instead of waxed threads, the single cord, of which I have spoken, is to be introduced into its eye, and the middle being then withdrawn, this will be passed under the artery. Both extremities of the cord are now to be introduced into each hole in the plate of the presse-artère, and then into the opening of the handle, in such a way that they may cross; this having been done, the plate of the instrument is to be applied to the artery; but before doing this a small piece of agaric, of greater length than breadth, and fixed to a waxed thread, so as to be withdrawn when necessary, is to be placed

1797. between the vessel and the instrument; this piece of agaric should be placed in a longitudinal direction, in order to shield the artery, and to prevent the action of the hard plate. After this has been applied to the vessel, the ends of the cord are to be drawn in opposite directions through the opening in the stem of the presse-artère, so as to compress the artery effectually; the crossed ends of the cord are to be fixed by means of a peg. The same plan is to be adopted above the opening in the artery, where a second presse-artère is to be placed. As the artery is in this way compressed, a second ligature becomes useless; but it may be placed five or six lines higher up, so as to have recourse to it in case of necessity.

In practising the isolated compression of the artery, that is to say, in employing the presse-artère, particular attention must be paid to the manner of arranging the dressings, so that they may not press upon this instrument in such a way as to bruise the parts beyond the vessel; care must be taken to place between the instrument and the tissues a piece of soft charpie; and the wound having been covered up in the way that has been stated, narrow circular compresses will be placed so as to cross and leave that portion of the presse-artère exposed that projects above the surface of the integuments; otherwise the pressure that they would exercise upon the instrument, however slight this might be, would bruise the parts exposed to the action of the metallic plate.

Hunter's plan of performing the operation for aneurism of the popliteal artery. The bed having been properly arranged, and everything necessary prepared, the patient, lying supine, should be placed upon the edge of the side corresponding to the aneurismal tumour; his leg is then to be laid upon its outer side, and a bandage rolled up tightly is to be given in the charge of a strong and intelligent assistant, who, in case of necessity, must apply it to the femoral artery, at its exit from the abdomen. The operator will then make with a straight bistoury, precisely in the track of the artery in the middle of the thigh, an incision through the integuments of two inches in length, in the spot where the femoral is covered by the internal edge of the sartorius muscle to an extent of from four to five lines; a second incision into the cellular tissue will extend through the aponeurosis of the

fascia lata, and expose the fibres of the sartorius; one of the assistants must then pull aside with a retractor the inner edge of the wound, and thus enable the surgeon to raise the inner border of the sartorius muscle sufficiently to expose the bundle of vessels; this muscle should also be drawn away from the centre of the wound by means of a retractor. 1797.

The bundle of vessels having been exposed, the operator must plunge the point of a mounted needle perpendicularly towards the middle of the wound, so as to pass it between the bundle of vessels and the adductor magnus muscle, along which, in this situation, the vessels run; in proportion as the operator passes in the point of his needle, he should move it a little upwards and downwards, so as to separate the cellular tissue, and thus facilitate its passage; the needle should be carried to a perpendicular depth of four or five lines, and when the surgeon thinks that it has reached the level of the vessels, it should be directed underneath them from within outwards, and be made to emerge at a distance of about five lines from the point at which it entered, near to the raised border of the sartorius, which, however, must not be included. After the needle has been passed across, the operator should compress the artery between it and his finger, and then, on the pulsation ceasing in the tumour, it will be clear that the artery is included in the bend of the instrument; the transverse opening at the point of the needle being now fully in view, the surgeon must introduce a cord, which should be greased, in order to make its progress more easy; and must double it to such an extent that it may not slip out of the instrument; then withdrawing the needle by the same route that it entered, care must be taken that the cord does not get twisted; with this view it should be passed singly under the artery, the two ends should then be drawn up so as to raise the bundle of vessels, and the needle be passed again under the artery and vein three or four lines lower down. The vessels should next be compressed between the finger and needle, so as to make sure of the artery being included. A second single ligature is then to be passed in the same way, the first being kept as a reserve in case of necessity.

The two ligatures having been passed under the vessels in the way that has been stated, the two extremities of the lower one should be passed through the openings in the plate of the presse-

1797. artère; the instrument should then be adjusted and the artery compressed, as has been explained whilst treating of the operation by incision of the sac, and sufficiently tightly to arrest the pulsations in the tumour.[1] The after dressings are to be applied in the way that I have already described. When the presse-artère is being used, it is easy to perceive that the union of the wound by the first intention will be prevented.

Whichever kind of operation be adopted, the surgeon must not fail to be upon his guard against the supervention of hemorrhage; everything necessary to arrest it should therefore be arranged beforehand; and assistants should remain with the patient for the first eight or ten days; the tourniquet of Petit, and the roller and hard compress should likewise be placed by the patient in such a way as to be ready at hand in case of accident. These precautions are of the utmost consequence, and should never be neglected.

Having thus given a detailed account of the steps of both operations for popliteal aneurism, it only remains for me to point out the after treatment.

If the patient has suffered from spasm one or two spoonfuls of an antispasmodic mixture should be administered; his drink should consist of clarified and sweetened whey, of veal or chicken broth, or of any mucilaginous fluids; for the first few days after the operation the diet should be restricted to broths, but this may gradually be increased. Bloodletting is rarely necessary, the subjects of this disease being most generally weak and bloodless; if, however, fever be lighted up and the pulse become hard, bleeding must be resorted to. A confined state of the bowels may be prevented by the exhibition of injections.

The first symptom that shows itself after the artery has been tied is a degree of heaviness in all the parts below the ligature; this symptom is very quickly succeeded by a loss of heat, and a diminution and sometimes even a loss of sensation in the whole of the part. The surgeon need not be uneasy about the limb loosing its vitality, provided there remain a little sensibility in the toes; with regard to its temperature, the cushions and linen cloths soaked in the aromatic spirit communicate a fictitious one,

[1] I would propose not to interrupt the course of the blood *completely* in the artery until several days after the operation, which the instrument enables us to do.

which disappears in a few minutes after the limb has been exposed to the air. The day after the operation the sensibility returns, the heaviness diminishes, and by degrees the part recovers its natural temperature; there need then be no alarm about the fate of the patient;[1] in this state of things the shootings that he experiences in the whole extent of the limb need give no uneasiness. 1797.

But this is not the case if there be no sensation in the toes, the shootings and pains are then unfavorable symptoms; however, for the first two days one need not despair of the safety of the patient; but if things have not improved by the end of the third day, there will be every reason to fear the occurrence of gangrene of the leg. This begins by an ecchymosis of the toes; sometimes these alone are affected, and then the patient may recover with the loss of one or more of them. It also happens sometimes, that although the leg be preserved, eschars form on the external aspect of the foot, where the circulation has either not been able to re-establish itself, or has been arrested by the pressure occasioned by the weight of the part on the cushions placed under it. Most generally the whole leg is deprived of vitality, and the gangrene terminates at the knee-joint; then the only means left to save the patient's life is, before it makes any further progress, to amputate the thigh; if this be deferred, for however short a period, it no longer becomes practicable to do so.

On the third day after the operation, and sooner in the summer, the compresses should be changed; that charpie which offers no resistance should be removed from the part; and that which is placed upon the lips of the wound must be covered with the dressing of which I have already spoken. The compresses should then be changed every day, if they be foul, and more particularly the cushion on which the foot rests; particular attention must also be paid to this being soft. In changing the charpie care must be taken not to cram the wound full; a soft pledgit should merely be laid between its lips, if possible, without giving the patient pain; the treatment should, after this, resemble that of deep abscesses.

[1] A case has been related to me in which sphacelus of the whole leg supervened on the fifteenth or twentieth day, which must be of very rare occurrence; it is difficult to explain the cause of this consecutive gangrene.

1797. If a few days after the operation, or on the following day, any blood were to appear, the artery should, if the presse-artère have been employed, be still further compressed by tightening the cord, an advantage that the circular ligature does not present. This instrument has also another valuable property, that of not necessitating the removal of the charpie introduced into the wound, and of not irritating this part by rendering it necessary to separate the edges in order to empty it of coagula, to clean it out, and to introduce the fingers in order to tie the artery again, as the surgeon would be obliged to do if he had employed the common ligature.

The ligatures separate from the tenth to the twentieth day, or more commonly from the twelfth to the eighteenth; this takes place more or less quickly, according as they are more or less tightly tied. If in order to arrest the course of the blood, the presse-artère have been used, the instrument placed below the opening of the vessel may be removed with perfect safety on the fourth or fifth day, as there will then be no reason to fear the occurrence of hemorrhage in this portion of the artery; besides, although the instrument be taken away the string may be left in its place, and need not be withdrawn until several days have elapsed, when the precaution must be taken of cutting one extremity of it as near as possible to the bottom of the wound, so that the other end may be easily removed. If on the twelfth day the string that has been placed above the opening were to appear to be loose, the upper presse-artère could in the same way be removed, care being taken, however, as in the case of the lower one, to leave the ligature untouched until it is removed in the same way as the other one was. When removing these instruments and whilst dressing the wound, the surgeon should see whether the pieces of agaric have escaped; if not, they must be removed together with the instrument under which they have been placed. The same must be done with the little ball of charpie which has been placed on the opening of the artery. The wound having thus been freed from all these foreign bodies, will be healed by the resources of nature, assisted by those of art.

There is one great inconvenience that commonly follows this operation, namely, the permanent flexion of the leg on the thigh. This should be opposed at an early period, the patient not being allowed to keep his leg bent; sometimes, however,

this flexion is quite involuntary on the part of the patient, being occasioned by a swelling of the cellular tissue which surrounds the flexors of the leg, and which often happens after the operation by incision of the sac. An oblong hardness may, in these cases, be observed in the inferior part of the thigh, partly in the course of the artery, and extending to the internal condyle. In this case it is impossible to attempt the extension of the limb; but in other cases, as soon as suppuration is established, the extension of the leg may be commenced, and should be continued until completed. It is easy to perceive that this plan must be easier, when the patient has been operated upon by Hunter's method; for as in this case the aneurismal tumour gradually diminishes, no obstacle will be offered to the extension. 1797.

It follows, from what we have said, that if the facts, especially those that have occurred under our own observation, are not as yet sufficiently numerous to justify us in giving a decided preference in favour of Hunter's operation over that by incision of the sac, yet they are sufficient to authorize the surgeon to have recourse to Hunter's plan, when the circumstances of the case are favorable to success.

[Here follows a short historical sketch of the different operations for aneurism, which is not worth reproducing.]

GUÈRIN.[1]

The memoirs by the citizen Guèrin consist of a collection of cases that have occurred to him, and which constitute a valuable series in reference to the subject of encysted aneurisms. 1797.

These cases, besides being interesting as far as regards the surgical operations that are required in aneurisms of this description, are particularly so, inasmuch as they have enriched the science of surgery with a new mode of treating these cases, namely, by the topical application of refrigerants.

[1] Rapport des Commissaires nommés par la Société de Santé de Bourdeaux pour l'examen d'un Mémoire sur l'Anévrysme, lu par le citoyen Guèrin dans la Scéance du . . . Thermidor, an 4. Lu à la Société de Santé de Paris le 8me Brumaire, an 5. Recueil périodique de la Société de Santé de Paris, tom. i, an 5 (1797).

1797. Case I. Guèrin performed the operation for aneurism of the popliteal artery of the right leg in the month of September 1786, in a way that was much to his credit. The success of this operation had not as yet been confirmed by a sufficient number of cases, and the rules to be followed were not very accurately defined.

The following was his mode of procedure.

The subject of the operation was a girl about twenty years of age, of a sanguine habit of body, and of a remarkably irritable disposition. Excessive indulgence in dancing appeared to have occasioned the disease. The tumour was of a considerable size, and the leg and lower part of the thigh were œdematous. The patient having been placed in a proper position, and an assistant compressing, with the fingers only, the crural artery in the groin, Guèrin made with a straight bistoury an incision through the integuments, which commenced three fingers' breadth above the tumour, and ended about its centre. He exposed the artery, passed two ligatures under it, the upper one of which was to act as a ligature of reserve, and then opened the sac. A considerable and even alarming quantity of blood having escaped, it was found that the assistant employed to compress the artery had, through fatigue, ceased to do so properly; but being told of it, and redoubling his efforts, the circulation was arrested. Guèrin then tied the ligature on a dossil of lint, and all bleeding was stopped.

The wound was then emptied of the coagula that were contained within it; those, however, being left that corresponded to the inferior portion of the artery, which were even supported during the after-dressing by means of hard dossils sprinkled with resin, by which means the necessity of applying the lower ligature was avoided. The remainder of the wound was lightly dressed with charpie. The bandage was only a containing one.

Two hours after the operation the patient had an attack of rigors. The assistant, who had been left in charge of her, attempted to procure a return of the natural temperature by applying warm cloths to the lower extremities.

Hemorrhage then came on, the limb was exposed to the air, and the blood, which had merely transuded the dressings, ceased to flow. This trifling hemorrhage, and a spasmodic retention of the water, which occurred on the same day, and required the introduction of the catheter, are the only accidents that hap-

pened during the treatment. The success of this operation was so complete, that it is sufficient to say that the ligature separated on the twenty-first day, and that the wound was cicatrized in the course of a couple of months. 1797.

This patient, when examined three years afterwards, was found not to have suffered from any unpleasant consequences.

II. "The successful result of my first operation," says Guèrin, "ought, one would think, to have encouraged me to adopt the same procedure in a similar case that some time afterwards came under my care; but I did not do so. The great effusion of blood when the tumour was opened; the dread that I had of secondary hemorrhage; the vague report that I had heard, that Hunter did not incise the sac; and the advantages that I thought would flow from such a mode of operating, determined me, although I was not acquainted with its details, to operate in this case in such a way, that having exposed the artery above the tumour, I might tie it with one ligature, and leave another of reserve. The operation was but slightly painful, and only about two spoonfuls of blood were lost; nevertheless, on the night of the fourteenth day the patient suddenly died of hemorrhage."

The examination of the parts showed that the aneurismal tumour was much larger than at the time of the operation; that the artery was completely divided at the point at which the ligature was applied; and that its two ends, which were fringed and unequally torn, were more than an inch distant from each other, although the leg was in the same position, and at the same degree of flexion in which it had originally been placed. Guèrin thought that this rupture was less the effect of the compression exercised by the ligature than of the traction on the axis of the artery in a longitudinal direction, occasioned by the increase of the size of the tumour; for had the aneurismal sac been emptied, the two extremities of the artery would have been allowed to draw closer together.

III. Towards the end of July 1790, there was received into the Hospital of St. André, a patient of the name of Ternat, about forty years of age, who was labouring under an encysted aneurism of the right femoral artery. The tumour occupied the superior and middle part of the thigh. The disease, the nature of which had been recognized, had been treated by rest, bleeding, acidulous

1797. drinks and low diet; which plan, however, had not prevented the tumour from increasing to such a size that it extended to within an inch of the crural arch.

The skin was red and mottled, and the limb slightly œdematous. As the weather was intensely hot, it was thought advisable to defer the operation, the patient however being carefully watched. Guèrin continued the above plan of treatment, ordering the drinks to be acidulated with *eau de rabel*, in doses of a drachm to the pint, and the tumour to be covered with compresses wetted with lead lotion containing a tenth part of vinegar. The compresses which were merely laid upon the parts were wetted every seventh minute. After several days treatment a manifest change for the better took place; the pains abated, the redness of the skin became less, and the pulsations of the tumour, which evidently did not increase in size, were weaker, nevertheless the operation was performed on the 1st of September. "The patient being placed in a convenient position," says Guèrin, "and the femoral artery being compressed, I plunged a straight bistoury into the upper part of the tumour, and with a single stroke made an incision five or six inches in length in the direction of the artery; this incision divided the aneurismal sac, as well as the external parts. I then separated with my fingers the edges of the wound, and removed in the same way a coagulum that appeared to weigh more than three pounds. I carried my finger into this enormous wound, and found what I had already met with in the body of the patient, whose case has just been related: namely, that the femur was exposed in the whole of that portion of its extent that corresponded to the tumour, being simply covered with a soft but sufficiently dense fibrous substance. To my great astonishment there was no bleeding, either from the arteries or veins. I then introduced the whole of my left hand into the wound, and turning the palm upwards I spread out the fingers so as to increase the number of points of contact, and to determine with greater certainty where the blood would come from when the compression was removed. On doing this, the blood struck with violence upon the palm of my hand, when, by an involuntary movement I immediately closed my fingers and found that I had seized the trunk of the artery. Satisfied with this success I waited a moment in order to ascertain the force with which the blood would be impelled against my fingers."

The artery was tied with the greatest ease, and Guèrin took the precaution of applying a ligature of reserve: he did not tie the lower end of the vessel, but dressed this part of the wound with dossils of lint covered with resin-cerate. The rest of the dressings were very simple, and the many-tailed bandage was applied over all. 1797.

The limb, which was exposed to the air, lost little of its natural temperature; there was no hemorrhage, and the suppurative fever was moderate.

Being obliged on the eighth day to remove the dressings on account of their offensive odour, Guèrin determined, for greater safety, to compress the femoral artery at the groin. Whilst doing this slowly and cautiously, he found that the leg and thigh swelled very considerably; that the skin became of a violet colour, and that blood trickled from all parts of the wound. He judged from the colour of the blood that it was venous, and that the hemorrhage was occasioned by the compression of the vein; and, in fact, when this was discontinued, the bleeding ceased. From this he concluded that the circulation had been re-established in the limb by means of other vessels besides the trunk of the femoral artery. The suppuration was very considerable, and proportional to the extent of surface exposed. Methodical bandaging, injections, and the application of compresses to the posterior and inner part of the thigh prevented the lodgment of matter and facilitated the cleansing of the wound.

On the twenty-first day the ligature separated.

The patient took, during the whole of the treatment, drinks acidulated with the eau de rabel.

On the thirty-fifth day fever came on; the granulations in the wound became pale and flabby and the tongue coated; the patient was accordingly removed to his own home, and these symptoms ceased as soon as he was removed from the influences that had occasioned them; namely, a residence in the hospital.

It was difficult to get the wound to cicatrize properly, which occasioned a suspicion of caries of the femur. With care and patience, however, this was accomplished.[1]

[1] Ternat, the patient whose case is here related, died suddenly on the 8th July 1795. He had, since the operation, enjoyed excellent health, with the exception of an attack of the venereal disease. On opening the body, the cause of death was found to be the rupture of an encysted aneurism of the cæliac artery, the existence of which

1797. IV. At this period, that is to say in the month of August, there was also in the hospital of St. André a patient, by name André Martin, of a strong and almost athletic habit of body.

He had an aneurism of the right subclavian artery about the size of a hen's egg, and complicated with preternaturally strong pulsation in the carotid of the same side, which appeared to be dilated. Notwithstanding the means that were employed, the tumour continued to increase to such an extent that it reached from the interval between the second and third true ribs to the base of the jaw-bone.

The skin was tense, very red, and its rupture appeared to be imminent. There was likewise a very violent burning pain. If ever a patient appeared to be in a desperate state this one certainly did so. Drinks acidulated with *eau de rabel* were administered, and the saturnine lotions were applied to the tumour. In the course of a few days the patient experienced marked relief, the tension of the skin diminished, the heat of the parts abated, the redness was less livid, and it was easy to perceive that there only existed a thrill in the tumour which had become more solid. The patient now experienced some numbness in the arm, which swelled considerably. The improvement, however, continued, and after a month of treatment the tumour no longer pulsated, but was small, circumscribed, and even insensible to the touch, as was ascertained by the repeated examinations of a large number of practitioners.

Bleeding was several times practised during the treatment, which lasted about three months. The patient was kept a long time in the hospital, and when he left, on the 27th of April 1791, it was found that, in the situation of the aneurism, there only remained a firm and insensible tumour, about the size of a small egg; and that the subclavian and carotid arteries pulsated with more violence than natural on the proximal side of

had been suspected for about two months before his death, in consequence of the difficulty of breathing and the palpitation from which he suffered. As we were not permitted to inject the arteries of the thigh, great care was taken in the dissection of the parts. The femoral artery was found to decrease gradually in size until it reached the point at which it was obliterated. Here the artery appeared to be reduced to a kind of ligamentous or aponeurotic structure for more than two inches. Below this the artery was of its natural size, perhaps even a little larger than usual. The articular arteries were sensibly dilated.

the tumour. The patient experienced besides some little difficulty in the movements of the arm, which was rather weak. This man, when examined two years afterwards, was in much the same state; which, however, did not prevent him from following his fatiguing employment, that of carter in the harbour. 1797.

V. Joseph Bernier, forty years of age, of a bilious temperament, was admitted into the Hospital of Saint Andrè, on the 29th Frimaire, year 4, (18th October 1795.) He had in the middle of the right thigh, in the course of the femoral artery, an aneurismal tumour, the vertical diameter of which exceeded six, and the transverse four inches, and which projected at least to the extent of three inches. The skin covering it was inflamed, and its pulsations were so marked, that it was easy to perceive that it was an aneurism; the leg was much swollen. The patient had already been treated at home.

The medical attendants of the hospital were assembled in consultation by Treyran, the surgeon-in-chief. They decided that it was a case for operation. But the success that had attended the application of the lead lotions in one case, that was known to all of them; the importance that was attached to the doctrines of Guèrin; the harmlessness of the means recommended; and the constant attendance of Treyran, who could have operated on the first appearance of danger, caused the consultants to incline to mild measures;—the employment of refrigerants. On the 1st of Nivose the patient was bled, was ordered drinks acidulated with the *eau de rabel,* and had a thick compress moistened with lead lotion applied to the tumour. The bleeding was repeated on the third and fifth.

On the 6th the pains were very severe, the tumour was harder, the pulsations in it were less distinct, the skin covering it less red, and its bulk about the same.

On the 8th the pains were more violent than ever, the swelling of the leg had increased, the patient had an attack of rigors that lasted several hours, and which was the commencement of a severe attack of fever; on the subsidence of which the debility and prostration announced the supervention of typhus.

A second consultation was now held. It was decided that the topical applications should be continued to the tumour; and

1797. that, instead of running the risk of diminishing the patient's strength by purgatives, he should be kept up. With this view, a bolus, composed of quinine and camphor, of each half a grain, and of nitre twelve grains, was ordered to be administered three times a day.

On the 12th the debility was greater; that is to say, the disease had progressed. On the 13th another consultation was held. On the 14th, (the seventh day of the fever,) without any symptoms of a crisis, the patient stated himself to be better. The strength was reestablished, and the pulse gained power.

On the 16th the œdema of the extremity was so great, that it nearly concealed the tumour; Treyran applied to the whole of the limb longitudinal compresses, and a many-tailed bandage soaked in lead lotion, and upon the tumour a thick compress, that was frequently moistened.

On the 17th it became necessary to tighten the dressings, on account of the diminution in the size of the part.

The severe pain had ceased; all pulsation and thrilling had disappeared, and the re-establishment of the patient's strength did not in any way change this state of things.

On the 24th the patient was allowed some nourishment. The tumour had very greatly diminished in size, and appeared to be nothing more than a large knot.

On the fiftieth day its size was reduced to three inches and a half in length, by about two in breadth. The patient was now allowed to walk about, and this exercise appeared to contribute to the diminution of the tumour. On the sixty-eighth day he left the hospital, and was enabled to return to his employment, which was that of a servant.

The tumour was at this time about the size of a goose's egg. The patient is induced from gratitude to come occasionally to the hospital.

At present, the 20th Fructidor, the tumour is somewhat less than this; the articular arteries pulsate sensibly; the patient experiences some numbness in the leg, but suffers from no other inconvenience, except a slight difficulty in moving the limb.

After this, Guèrin relates some imperfect cases of aneurism, the most remarkable of which is that of a man who had an aneurismal tumour on the parietes of the chest, which was, no

doubt, part of an internal aneurism. Lead lotions were applied, 1797.
which produced but little effect; but a sensible diminution of it
was obtained by the application of ice.

In the other cases that are related, Guèrin applied no other refrigerants than lead lotion, with a tenth part of vinegar, and most generally fresh water merely.

It will be seen by the first and third cases, related by Guèrin, that the lower ligature may be completely dispensed with, provided the coagula that are situated near the opening in the artery be preserved, and supported by a firm compress.

Although the second case was unsuccessful, it was not the less valuable, on account of the general principles that may be deduced from it relatively to Hunter's operation.

From the fourth and fifth observations it may be concluded, that it is when the tumour ceases to pulsate strongly, when it becomes firmer and harder, and when the patient experiences a degree of numbness in the part, that this excessive œdematous tumefaction occurs, the cause of which Guèrin believes to be the compression which the hard tumour exercises on the neighbouring vein, as well as upon the artery. It was the third case that led him to this opinion.

Let it be remembered that the limb swelled, that a venous hemorrhage came on whilst compression was being made at the groin; a compression which cannot give rise to any sensible tumefaction, except in those cases in which the arteries distributed to the limb have so accommodated themselves to circumstances, that it is no longer the main trunk that furnishes blood to the extremity.

In consequence of this opinion, Guèrin considers the appearance of such a degree of tumefaction that no operation could be performed to be a favorable symptom, and it was the supervention of this in the fifth case that induced him to give a favorable prognosis.

But the principal fact presented by the third, fourth, and fifth cases is *the cure of very large aneurisms by the application of refrigerants.*

Guèrin states, in the theoretical part of his memoir, that it is probable that the application of refrigerants would have no effect in the early stage of an aneurism, but, on the contrary, that in a very large tumour of this description, in which the blood tends

1797. to decompose, being, to a certain extent, withdrawn from the influence of the circulation and vital forces, refrigerants may be of use in aiding this decomposition; that is to say, the formation of a concrete substance, resulting from the cohesion of the fibrinous parts of the blood contained within the sac. There is also a particular condition which appears to indicate the employment of cold topical applications. This is when the skin is marbled, and particularly when affected with erysipelas, and nearly disorganized, a condition which, in ordinary surgical cases, would call for the employment of these means, and which indicates them more especially in this disease, because by giving tone to the integuments, by increasing the means of resisting the extension which the increase in the size of the tumour occasions in them, they may be enabled to react in their turn upon the aneurism, thus constituting a kind of compression which is preferable to those mechanical means that are usually contra-indicated, in consequence of occasioning an exacerbation of the pain.

Guèrin says, very modestly, that he does not lay much stress upon this explanation of the action of the refrigerants; an action which he designates by the adjoined figure, (this figure is not given,) which, representing an encysted aneurism, explains how the hardened tumour retards and even arrests the circulation in the artery.

If encysted aneurisms be sometimes cured spontaneously; if their cure have been artificially hastened by certain means, such as compression, low diet, quiet, and even exercise, as M. Desault has seen, we may conclude that the new plan proposed by Guèrin augments the resources that may be employed in aneurisms that admit of operation; and, besides that, it essentially constitutes a means of cure which no practitioner will in future fail to employ, in the most rigorous manner, in those aneurisms that cannot be operated upon, as those of the carotid, for example, or of the subclavian artery, the operation for which has been twice attempted lately without success. Deseze, Monbalon, Lapeyre, Jougnet. Bourdeaux, 11th Vendémiaire, year 5.

REFLECTIONS, BY A MEMBER OF THE SOCIÉTÉ DE SANTÉ DE PARIS, ON THE PRECEDING REPORT.[1]

The means that Guèrin employs for the cure of encysted or mixed aneurisms, consist in applying to the tumour compresses, soaked in cold lead lotions; in administering to the patient drinks, acidulated with a drachm of the *eau de rabel* to the pint; in keeping him perfectly quiet; in favouring the action of the refrigerants by a suitable regimen, and, finally, by avoiding all compression. 1797.

I think, with the Société de Santé of Bourdeaux, that this plan ought to be made known to all surgeons, so that due attention might be paid to it, and all the information possible be collected on so important a subject.

But I also think, with the society, that this plan of treatment ought to be properly discussed; and, without in any way diminishing the credit that is due to Guèrin, I may be allowed to say that the measures adopted by him are by no means novel; that many of them have already been successfully practised, then abandoned or forgotten, and finally revived in our own time in a case similar to those that our author has mentioned.

An aneurism, whatever part may be affected by it, is, as is well known, a very serious disease, the cure of which, even when it can be attempted, is most uncertain. Compression and ligature are almost the only means that have, up to the present time, been employed; each mode of treatment has had its successful and unsuccessful cases; but the plan that is most deserving of attention is that one which John Hunter applied with success in London, ten years ago, to a case of aneurism of the popliteal artery, and which consisted in ligaturing the vessel above the tumour, without exposing or opening the sac. I say, the plan that John Hunter applied successfully, and which resembles, indeed, very closely that which Anel employed at Rome in 1710, in a case of false aneurism at the bend of the arm, and which Desault, six months before Hunter, employed in operating on an aneurism of the popliteal artery. And it is

[1] Reflexions d'un Membre de la Société de Santé de Paris sur le rapport précédent. Lués le 18me Brumaire, an 5.

1797. the same plan that Deschamps has since perfected, by substituting for the ligature an instrument, by which the femoral artery may be compressed after being exposed.

In all probability Guèrin was perfectly well acquainted with this, as well as with all the other plans, as he has operated three times on the popliteal artery. But the difficulties that he had to surmount in the first two cases, and the want of success in the third, which was followed by fatal hemorrhage, and, finally, the success that he obtained from the employment of refrigerants, in the treatment of two aneurisms, in one of which, as it was situated on the subclavian artery, no operation was admissible, led him to conclude that this plan was applicable, at least in every encysted aneurism, in preference to the operations that have been put in practice up to the present time.

I think that this surgeon has been led to the discovery of his plan by what he knew of that which Valsalva so successfully employed, and which Morgagni mentions [vide p. 261.] This consists in weakening the patient by bleeding, by the most rigorous diet, and by the strictest quiet.

[Here follows a case by Sabatier, which will be found at page 402.]

I am at present making trial of this plan, in a man, who, for three years, has had an aneurism of the chest, by which the sternum and the cartilages of the true ribs of the right side have been pushed up. There is every reason for supposing it to be an aneurism of the aorta, for I recognize in it all the characters of a disease of this kind. I must not, however, omit stating that the patient was unable to continue the application of the compresses soaked in the cold lead lotion for more than three days. A suppression of the voice, complicated with so violent a cough, then came on, that it would have been dangerous to have persevered in this treatment. He, nevertheless, continues the use of the *eau de rebel* in a decoction of comfrey.

LACOSTE.[1]

"Lacoste was consulted by a rope-maker fifty-two years of age, for a tumour about the size of a small egg, situated on the upper and anterior part of the left thigh, which presented all the characters of a true aneurism of the femoral artery. It had existed a month and a half. Compression, venesection, low diet, cold applications, and acidulous drinks, were used for some time, but in vain. Anel's operation was then, on the 18th Vendémiaire, an 6 (1798), performed, two ligatures being applied, the lower one of which was tied over a dossil of lint. This soon slipped, a few days were then allowed to elapse when the ligature of reserve was tightened. On the nineteenth day after the operation some venous hemorrhage occurred; with this exception, no accident supervened, and the patient was cured on the fifty-ninth day after the operation." 1799.

There can be no doubt from the account given by the author, that in the case in question the femoral artery was ligatured above the profunda, which operation was most signally successful. Hence this case is very interesting, proving as it does the infinite resources of nature—the possibility of the success of the ligature of the femoral above the profunda, in those cases in which it is indispensable—that the communication of the branches of the iliac artery with those of the profunda, is sufficient for the maintenance of the vitality of the limb below the ligature; for in such a case as this the profunda does the duty of a vein, receiving the blood from the arterial branches, in order to pour it into the femoral below the aneurismal sac; finally, it proves incontestably what I have already stated, that the tumour is neither supplied nor increased by the blood from the collateral vessels which is poured into the artery below the ligature; for a vessel of such a diameter as the profunda, so near to the aneurismal sac and directed towards it, that is to say from below upwards, would certainly have conveyed blood into it if that had been possible. . . In this case there is one circumstance that

[1] Rapport des Mémoires et Observations du citoyen Barthélemi Lacoste, Chirurgien à Tonneins, Départment du Lot et Garonne sur un Anévrysme vrai à la partie supérieure de l'Artère fémorale gauche, par le citoyen Deschamps.—Recueil périodique de la Société de Médecine de Paris, tom. v, an 7 (1799) p. 125.

1799. it would have been interesting to have noted; namely, whether, after the cure, the femoral artery continued to pulsate? If it did, there can be no doubt that it continued to receive blood from the profunda, as there is every reason to believe was actually the case, the patient having suffered from no dangerous symptoms from the time that the ligature was applied; which would prove that the blood continued to be poured from the profunda into the femoral artery; had it been otherwise, the slowness and difficulty with which it would have reached the popliteal would have been very great. . . . . Lacoste's case proves also the possibility of the success of a ligature applied only below the aneurism, as Brasdor the elder, according to some, and Desault, according to others, (for there is nothing certain about this,) proposed in those cases in which the tumour was so near to the crural arch that it would not be possible to apply a ligature or to make compression above the sac.

When a ligature is applied in this way, it is easy to perceive that the course of the blood in the arterial tube, and consequently in the tumour, being arrested, that which is contained within it must speedily coagulate as far as the first branch capable of receiving it; the tumour will then quickly be reduced to a small bulk, for the same reason and in the same way as in Anel's plan. It is probably in this way that the spontaneous cures of aneurisms are accomplished, in which, by fortunate circumstances that are not exactly understood, the blood coagulating little by little in the aneurismal sac, gradually closes up all communication between the sac and that part of the artery that it otherwise would continue to traverse; whence follows the obliteration of the artery up to the first branches capable of receiving blood.

It is easily understood that, supposing the aneurismal sac to be about two and a half or three inches from the crural arch, this operation, that is to say the ligature of the artery below the sac, cannot be practised; for if, in this case, the femoral be ligatured, there would be a risk of wounding the profunda, or of including it in the ligature: in the first case hemorrhage would supervene; and in the second the patient would be deprived of these resources that one expects when the profunda is pervious. This precept which, with some slight modifications, may almost be looked upon as a general one, will be applicable to all the

aneurismal tumours which are situated on the principal arteries in the neighbourhood of the trunk, such as the axillaries, carotids, &c. 1799.

DESCHAMPS.[1]

The citizen Albert Brondex, sixty years of age, a man of letters, of a lymphatic rather than of a sanguine constitution, entered the Hospital of La Charité, on the 10th Vendémiaire, in the year 7 (1799). He had at the upper part of the left thigh a circumscribed tumour, about seventeen inches in circumference, which extended to the fold of the groin, and to within a finger's breadth of the crural arch. This tumour was easily recognized to be a true aneurism, of which it presented all the characters. It had existed six months, and at first appeared without any known cause in the course of the femoral artery, at above five fingers' breadth from the fold of the groin. 1799.

As the tumour continued to increase, I assembled, on the fourth day after the admission of the patient into the hospital, nine surgeons in consultation; namely, Allan, Brasdor, Boyer, Corvisart, Cullorier, Mariques, the patient's attendant Pelletan, Percy, and Thouret. After examining the patient, I proposed the ligature of the femoral artery below the aneurismal sac, observing at the same time how difficult it would be to compress the vessel above the tumour in an efficacious manner during the time that the operation lasted, and to extend the incision as far as necessary, especially at the upper part, near where the compression must be employed, so as to expose the vessel sufficiently to apply a ligature between two arteries so near to one another; a loss of blood was also greatly to be dreaded in a cachectic, debilitated patient, sixty years of age. I hoped likewise that the blood, being arrested in the femoral artery by the ligature, would coagulate in the tumour, and thence up to the profunda.

After a discussion that lasted an hour, I took the opinions

[1] Observations et Reflexions sur un Anévrysme vrai de la partie supérieure de l'Artère fémorale, par le citoyen Deschamps.—Recueil périodique de la Société de Médecine de Paris, tom. v, 1799.

1799. of the consultants, three of whom were for the incision of the tumour, and six for the ligature of the artery below it, without implicating the sac.

The patient being prepared for the operation, and the instruments and dressings having been got ready, I immediately undertook it, in the presence of the consultants.

I made, in the direction of the femoral artery, below the tumour, towards the middle of the thigh, an incision about two inches and a half in length. The integuments and the fascia lata having been divided, I intended to raise up the sartorius muscle, which covers the artery in this part of its course, but I sought for it some time without finding it; I then continued the incision a little more forwards, and pushing the muscular fibres towards the inner part of the thigh, I followed the adductor magnus, along which the bundle of vessels lies, and separating the parts, I found the sartorius muscle, pushed inwards. We sought for the artery, which we expected to find in the situation that it generally occupies; but we could not perceive the least pulsation, nor any appearance of the vessel. Several of those present also endeavoured, but in vain, to find it. We then thought it necessary to look for it elsewhere; and one of the surgeons passed his finger towards the bottom of the wound, near the tumour, where it appeared to him that he could recognize the vessel towards the inner aspect of the thigh, under the sartorius muscle, that had been pushed there. I accordingly separated this muscle from the surrounding parts, but in vain; no pulsation being manifest to the fingers, in whatever direction they were carried. It was proposed, in order to examine more clearly the bottom of the wound, to cut the sartorius across; and notwithstanding my repugnance to do this, I consented; but our endeavours to find the artery were equally fruitless. At last we returned to our first idea, that the vessel had not changed its position. A nerve that it is known accompanies the vessels in this situation, and which I had cut, with the intention of saving the patient from the very severe pains that he experienced in the knee every time that I touched it, guided me; I passed the mounted needle under the spot where we were certain the bundle of vessels lay, and for greater security I included in its curve a small portion of the adductor magnus. The ligature having been passed, I pulled upon its two ends,

and pressed the finger upon the parts that it embraced, so that 1799.
the artery being filled with blood became perceptible; but no change and no swelling occurred above the seat of the pressure. By means of the presse-artère the parts were compressed, and above this I placed a ligature of reserve.

The patient did not lose three ounces of blood during the operation; I then placed a very small quantity of charpie in the bottom of the wound; two light dossils prevented the presse-artère from pressing injuriously upon its edges; two or three split compresses were laid upon a pledget spread with balsam of arcæus, which covered the wound; no circular bandage was employed, and the leg and foot were enveloped with bags filled with warm sand. These parts did not undergo the least change in their temperature or sensibility; but the patient was exceedingly fatigued by the length of the operation, which had lasted nearly an hour, and by the violent pain that was occasioned by searching for the vessel in different directions.

The increase of the tumour had been very marked from the 10th to the 14th, the day of the operation, and the pulsations had continued the same. On the 15th and 16th it had nearly reached to the crural arch; our attention was attracted to a violet blush that could be observed on its summit; the thigh and leg preserved their natural temperature; there was but very little pain in the former, which, however, appeared somewhat swollen. On the 16th the first dressings were removed, and the ligature, which had become somewhat loose, was tightened. During the 17th no change took place; the pulse was frequent, small, and compressed. During the night between the 17th and 18th the patient experienced some uneasiness in the thigh, and especially a dull pain in the aneurismal tumour, the size of which increased. I saw him at one o'clock in the morning, and observed a sensible swelling, which was somewhat painful, though not hard, and extended along the external aspect of the thigh; the tumour continued to be circumscribed.

On the 18th, the fourth day after the operation, we examined the patient with all the attention that his case required; the tumour, as I have said, continued to increase in size, the pulsations were felt to the same extent as before, and the thigh and leg were swollen. All these circumstances clearly proved that the ligature placed below the tumour had not pro-

1799. duced the effects that had been expected; I was fully convinced that the artery had been tied, although several of those who were present doubted it. The appearance of the patient was very unfavorable; his pulse was small, compressed, and frequent; his age, and the circumstances that I had dreaded before this operation, were not favorable to the result of a second one, which, however, his situation demanded, if we wished to save him from an inevitable and speedy death. Having carefully weighed these considerations, I decided on opening the aneurismal sac.

On this day, the 18th, at four in the afternoon, I proceeded to undertake the operation, in the presence of the citizens Mariques and Valentine, my colleagues. A narrow, slightly oblong, firm and solid pad, fixed to a handle, so as to present the double advantage of occupying but little space, and of being firmly held by a strong and intelligent assistant, was accordingly prepared, and a second assistant was placed so as to assist, or to replace the first. This pad having been placed upon the artery at its exit from the belly, so as to compress it upon the pubes, I plunged the bistoury into the upper part of the tumour, and opened it down to the bottom. The sac, comprising the skin, which was perfectly healthy, and the superficial lymphatic structures, was a finger's breadth and a half in thickness. A large quantity of liquid arterial blood immediately escaped, and I withdrew a mass of coagula and of fibrinous concretions larger than the fist. The sac having collapsed, a long interval was left between the upper angle of the incision and the pad employed for compression. I therefore continued the incision upwards as far as the hand of the assistant, who was making pressure, so that I might discover the precise situation of the gap in the artery, which I could only see occasionally, being constantly inundated by the blood, notwithstanding the care that was taken in compressing the artery. A long sound was passed into the upper portion of the vessel, which was raised up as high as possible, and which I hastened to ligature, on account of the enormous loss of blood.

Being guided solely by the touch, and taking the artery and the probe between my fingers, I passed the needle under the vessel; having then introduced the ligature I drew its ends upwards, and laying my finger upon the artery between them, the

compression at the groin was removed; no blood appeared; I 1799.
then raised the vessel by means of this noose, and passed a flat ligature under it six or eight lines higher up, in case of accident. I next adjusted the presse-artère and compressed the artery; but as blood was seen to flow from below upwards I applied a ligature, consisting of a waxed string tied with a double knot below the sac. These two ligatures having been applied, no more blood appeared in the aneurismal pouch, which was lightly dressed with soft charpie, and covered with a pledget smeared with the balsam of arcæus; over which I applied several compresses, supported by some long strips of linen which surrounded without compressing the thigh. The presse-artère, which was placed on the first wound having become useless, was then withdrawn.

As I had foreseen at the time of the consultation, the patient, although the artery had been very quickly tied, lost such a quantity of blood that he fell into a state of syncope, from which he did not recover, notwithstanding all the assistance that was given him. His pulse was no longer perceptible, he gradually sunk, and died at midnight, eight hours after the operation.

The body, which was opened on the following day in the amphitheatre of the hospital, in the presence of our colleague Allan and of a great number of pupils, showed:

1st. That the profunda artery, which is usually given off from the femoral at from an inch and a half to two inches from the point at which this vessel leaves the abdomen, arose at a distance of nearly ten lines below this; that as usual it gave off almost immediately the two circumflex arteries; that these vessels followed their ordinary course; that they were of a considerable size; that the trunk of the profunda, before its division, was nearly of the same diameter as the femoral; that the superior articular arteries were also sensibly dilated; that the profunda was adherent to the aneurismal sac in such a way that it followed the sac when raised on a probe introduced through the artery, as may be seen in the preparation, so that it was almost impossible to pass the needle between it and the femoral, without running the risk either of pricking it, or of including it in the ligature.

2d. That the ligature that was applied in the first operation embraced the artery, the femoral vein, and a small portion of

1799. the fibres of the adductor magnus muscle; that in the second operation the upper ligature was placed at about three lines from the aneurismal sac; that it included the femoral artery and a third of the profunda which had been pierced by the needle; that the ligature of reserve placed above this had passed between the profunda and the femoral, which last vessel was alone included; that the inferior ligature included the artery six lines below the sac, and that the vein had been wounded by the needle. It is to be observed, that notwithstanding these punctures, no blood flowed into the incision.

3d. That the artery was lacerated to the extent of from two inches to two inches and eight lines from its origin; that the openings in the sac were funnel-shaped; that the breadth of the centre of the artery could not be precisely determined, its edges being confounded with the cellular tissue which constituted the greater part of the aneurismal sac; that at about an inch below the sac, there was a dilatation or cul-de-sac in the posterior part of the artery, that is to say, a true aneurism in its early stages, the inside of which was smooth, polished, and unchanged; that the remainder of this artery, as well as the right femoral, was in its natural condition.

4th. That the diseased thigh was already affected with an infiltration of pus which was spread over the surface of the muscles of the anterior and external part of the thigh below the fascia lata; that this suppuration was only found between the muscles in the neighbourhood of the first incision.

I present to the Society of Medicine the whole of that portion of the artery in which these operations have been performed. This preparation will be the more interesting to the society, as an examination of the sac, and especially of the aneurism in its early stages, will prove that these are aneurisms by dilatation, notwithstanding the contrary opinions that are entertained, which must, however, yield to such evidence.

Reflections on this case. This case, the only one of its kind, gives rise to very important reflections; some of these I shall submit to the Society. I shall consider them under two heads, as relating to the first and to the second operation.

It was in consequence of my being persuaded of the difficulty of compressing the artery efficiently above the tumour during the operation, and from the fear of a fatal loss of blood, that

I proposed to the consultants to ligature the vessel below the aneurismal sac. I am the first who has been bold enough to undertake this operation, but not the first to propose it. A long time ago the late Brasdor first proposed it orally, but no attention was paid to his proposition. My colleague Corvisart, informed me during the consultation, that Desault had had a favorable opinion of it; and it is well known that this surgeon spoke of it in his lectures. Indeed it is a well ascertained fact, that all our humours when no longer in motion thicken, and that the blood more especially appears to be the one that enjoys this quality to the highest degree. It was therefore probable that if this fluid were arrested in the artery it would coagulate above the ligature, then in the aneurismal sac; and, finally, as high as the first ramification capable of transmitting it elsewhere. 1799.

This is the conclusion that we should come to by mere reasoning upon the subject, but experience has proved the contrary, for the tumour instead of diminishing in size, increased, and dull pains began to be felt within it.

However just such reasoning may appear, it must, before it be applied to practice, be submitted to and be confirmed by the test of experience, otherwise there will be a mistake on the one side or the other; that is to say, either the experiment has not been correctly performed or the reasoning has not been just. Besides, it was proved by the anatomical inspection that the blood was arrested by the ligature that was applied to the artery. Let us now endeavour to penetrate to the source of the error that has misled us, and let us be guided and not discouraged by our want of success.

Let us consider on one side a large aneurismal sac at the upper part of the femoral artery, a considerable quantity of liquid blood, a gap in the artery two inches in length in a patient sixty years of age, and of a lymphatic rather than a sanguine temperament.

On the other side let us suppose an old aneurism of small size in the same situation, that is to say, near the spot where the profunda artery generally arises in a person of the same age, of a sanguine temperament, and otherwise in good health; certainly the circumstances of the two cases being so different, the result of the ligature cannot be the same.

In the first case it is easy to perceive that the cellular tissue

1799. which constitutes the greater part of the sac, being thickened somewhat during the early stages of the aneurism, becomes nevertheless thinner as the tumour increases in size and as the cyst offers less resistance. It is the same with the parts covering it, and particularly with the fascia lata, which can no longer exercise any pressure upon the tumour. It is on this account that aneurisms make but little progress during their early stages; but that when they have reached a certain size they increase with very great rapidity. Let us now reflect on the great quantity of blood which is carried into the sac by an artery of so large a diameter, and in a straight line from the arch of the aorta, and we shall be convinced that the blood being carried by each pulsation into so large a space, partly retrograding in order to pass into the dilated profunda artery which is close by, and being incessantly beaten up, renewed and in movement, will be little likely to coagulate, and the less so if it be not of itself very coagulable.

It would not be the same in the second case that has been supposed. The aneurismal sac, formed in part of cellular tissue and the rest of fascia lata, if it be not elastic, is at least capable of offering a degree of resistance to the accumulation of the blood; it is small, and contains little fluid blood, which will, on this account, be the more ready to coagulate, more particularly if the patient be of a sanguine and vigorous temperament. It can easily be understood that, in these cases, the blood being in smaller quantity and in a more confined space, where it is less liable to be moved, will coagulate with greater rapidity.

Hence we may conclude, that an aneurismal tumour, in this situation, is not susceptible of cure by the application of a ligature below the sac, if this be of a considerable bulk, and have increased with rapidity, more especially if the patient be old, cachectic, and of a lymphatic rather than a sanguine temperament; but we may hope for success in a patient of a good constitution, sanguine temperament, and in whom the disease is of small size, and has not made any very rapid progress. However, experience alone can determine this; but we must, I think, in every case, regard this as the only and last resource to be adopted, when the operation cannot be performed in any other way.

In performing this operation, the surgeon must not be surprised to perceive no pulsation in the artery below the aneurismal

sac. In the case in question our surprise was of short dura- 1799.
tion, and on reasoning upon it we quickly discovered the cause of the absence of pulsation. For the blood, being mixed up with that which is contained in the tumour, does not follow its usual course; and that which is received by the continuity of the artery, below the opening in it, is diminished by the quantity that passes through the collateral vessels, which are increased in size; and it passes through the artery in so small a quantity, and so slowly, that, in consequence of its not acting upon their parietes, it excites no movement of diastole. This must be more particularly the case when the sac contains a large quantity of liquid blood; but when the aneurism is of moderate size, and the gap in the artery but small, the arterial blood must pass in a more direct course, as, in order to get beyond the sac, there is a less quantity of aneurismal blood to displace.

It is also very important to observe, that the branch of the femoral artery is not displaced at a certain distance from the sac; that it preserves its ordinary situation, which I have never seen to vary in all the bodies that I have had an opportunity of examining: in such circumstances, therefore, it must not be sought for elsewhere; and, besides, the nerve which accompanies the bundle of vessels will point it out in a way that cannot be mistaken, by the extreme pain that is occasioned when it is touched. By attending to these circumstances, we may avoid the long and painful search that I made, and which, judging by the purulent infiltration that has been observed, and which it is difficult not to attribute to it, might, by itself, have ultimately caused the death of the patient. The surgeon, knowing that the artery is not displaced, will not fail, if he be a good anatomist, to cut down upon the course of the vessels. If the sartorius muscle covers them, as happens in the natural condition, he should detach its external border, in order to lay bare the artery; otherwise, he must make his incisions a little more anteriorly, with all the precaution that will be suggested by the fear of wounding the artery that is found along the border of the adductor magnus, some of the fibres of which must, for the sake of greater security, be included in the noose of the ligature. If the nerve be so situated that it cannot be excluded, it had better be divided; the surgeon will then accomplish, in a very short time, what occupied me nearly a whole hour.

1799. The want of success in this first operation leads me to the second, which was performed on the fourth day. The incision made in the tumour was as large as the hand of the assistant, employed to compress the artery above the aneurismal sac, allowed; but I applied the ligature too near to the sac, hence two inconveniences resulted; the first was, that I tied the artery in its diseased part; the other, of more consequence still, that I pierced the profunda with the needle. This artery was, as I have shown by the anatomical preparation presented to the society, attached to the posterior part of the sac: the instrument that was introduced into the femoral artery, in order to raise it up, raised, at the same time, the profunda, which could, consequently, scarcely escape being wounded, or included in the noose of the ligature. A little higher up, about eight lines from the sac, I passed the ligature of reserve, between the femoral artery and the profunda; for as at this part they were not united together, I could introduce the needle through the interval between them.

The dangers that would result from a double puncture of the profunda are obvious enough: at first the ligature would exactly fill up the wounds, and thus prevent the escape of any blood; but the pressure of the string would soon act upon that portion of the vessel included within the noose, and then what would there not be to fear from a hemorrhage that might prove fatal before its real cause could be discovered? For, in this case, recourse would immediately have been had to the ligature of reserve, which, being placed upon the femoral, could have produced no effect. Doubtless, the failure of this ligature of reserve in arresting the hemorrhage, would have caused a suspicion of the profunda being punctured; but what a quantity of blood the patient would have lost before recourse could have been had to another ligature! In the report made by me to this society on a former occasion,[1] I had foreseen the difficulties presented by a ligature in this situation, and had consequently recommended the artery to be raised as much as possible, so as to avoid the profunda. I will propose here, for greater security, to introduce into the cavity of the vessel a cylinder, of sufficient

[1] [A Report on a Memoir, by Lacoste, on the ligature of the femoral artery for Aneurism. Vide p. 479.]

size to fill it completely, and which should be curved, so as to enable it to be raised with more precision; the artery being then embraced by two fingers, the needle may be passed with more safety under it, care being taken to act at a sufficient distance from the sac, so as to avoid the union between it and the profunda, and to tie the femoral in a healthy part. 1799.

With regard to puncturing the artery by the needle, in applying the ligature below the sac, I have said, and have several times repeated it, that this is of no consequence: it is better to puncture it than to carry the needle so deeply as to run the risk of puncturing the profunda.

I had foreseen the loss of blood during the operation; this dread did not cease to haunt me from the time that I saw the patient; it was one of the principal reasons that induced me, during the consultation, to propose the application of the ligature below the tumour. I had intended exposing the artery at its exit from the abdomen, passing a ligature underneath, and compressing the vessel during the whole of the operation; then to remove the ligature, and to allow the blood its free course. My colleague Boyer, to whom I mentioned this, thought that such an artery could not, without bad consequences resulting, be exposed to such a degree of pressure. This opinion made such an impression upon me as to induce me to abandon my project; but had I thought it likely that there would have been, as there was, a fatal hemorrhage, I would have run the risk of direct pressure on the femoral artery at its origin.

Enlightened by experience, the following is the plan that I propose, and that I would employ, if I had to operate on a similar aneurism. I would not hesitate to expose the artery at its exit from the abdomen, and would follow it up to the sac; then if, by a lucky chance, as happened in the patient in question, the profunda, which generally arises about an inch and a half, sometimes two inches, from the crural arch, were to come off at ten or twelve lines, or sufficiently near to allow the femoral artery to be tied between it and the sac, I would perform Anel's operation, taking care to use a blunt needle, so as not to wound either artery in passing it between them. I would then leave the sac to nature, if particular circumstances did not require it to be opened.

If, on the contrary, the profunda arose from the femoral

1799. lower down, I should not hesitate to pass under the femoral artery and vein, near the crural arch, a flat ligature, greased, so as to facilitate its passage: I would be very careful not to exercise any circular compression upon these vessels, but I would flatten them by means of a finger placed upon them between the ends of the ligature, which should be drawn up, or, for greater security, by means of the presse-artère, interposing between them and it a soft body, such as a piece of agaric; in this way I would exercise such a degree of compression on these vessels, that the loss of a single drop of blood need not be apprehended. I do not think that this compression would be more injurious than that made by an assistant upon so hard a part as the pubes, which serves as a support. The blood being arrested with much certainty, I should have the full liberty of opening completely the aneurismal sac, of examining its interior thoroughly, of judging of the state of the disease, and of placing my ligatures with so much the more safety and precision, as the blood would not obscure the part on which I had to operate. Both ligatures having been applied with the precautions that have already been pointed out, and in the way that I have indicated in the different essays that I have published on this subject, I would relax for a moment the pressure on the upper part of the femoral artery, and if the blood did not appear, I would remove it altogether. With this view, I would cut the ligature close to the vessels, and then withdraw it; I would then unite the lips of the wound in this spot by means of agglutinative plasters, and whatever dangers might result from this passage of the needle and the ligature, and perhaps from the influence of the atmospheric air, they could never be as formidable as a fatal loss of blood.

The celebrated Desault was so convinced, by his experiments made upon arteries, by means of injections, of the multiplicity of the anastomoses of the last ramifications of the different arterial subdivisions, that I have been assured that he has said that the four principal arteries, at their exit from the trunk, as well as the two carotids, might be ligatured simultaneously with impunity. This statement is doubtless exaggerated, and Desault could not have meant it literally; but it proves, at all events, the confidence that one may have in these anastomoses in every individual case.

The case sent to the society by the citizen Lacoste, would have been a crowning proof of the resources of nature, if the author had entered into more copious details about some of the more interesting points of his observation. Did he ligature the femoral artery above or below the giving off of the profunda? This, which it would have been very important to have observed, he has neglected to do. This uncertainty takes away the greatest part of the interest of his communication, which, in consequence of this omission, has been rendered less useful to science. 1799.

I observed in my patient, that the ligature of the femoral artery had produced no change in the inferior extremity. It was the same with Lacoste's. Did not the profunda, in his case, perform all the functions of the femoral artery, as it did in mine? Is it not then more reasonable to suppose that Lacoste has, without knowing it, tied the femoral below the profunda, than to think, notwithstanding what I said in my report of this observation, that the patient owed his safety to the communications between the branches of the iliac and those of the profunda?

A surgeon should never omit to mention all the circumstances of an operation, more particularly so if it be an important one, as that which appears to be of no consequence to one is of great value to another.

It follows from what has been said, that whenever it is impossible to reach the femoral artery at its exit from the abdomen, it may be ligatured below the aneurismal sac, as the only means of saving the patient's life; provided that there be reason to believe that the opening in the artery is below the profunda, for if it be above this vessel nothing can be of any service, as the blood will continue to pass through the aneurism, in order to reach the profunda artery, and the ligature can thus have no effect, as I have already stated in my report on Lacoste's case.

But whenever the femoral can be ligatured at its exit from the crural arch, it should not be tied below the aneurism, not only for the reasons given in my report, but also lest it should not be successful, as is proved by experience. If the danger of hemorrhage be not completely removed by mediate compression, the vessel must be laid bare, and must be ligatured below the profunda or the circumflex arteries, if these last take their origin from the femoral, and then the surgeon will be at liberty to

1799. open or not the aneurismal sac; but if these divisions cannot be reached it will be absolutely necessary to open the sac, in order to preserve the profunda. In order to effect this, an immediate compression must, as I have already said, be exercised upon the artery until the operation be finished.

The only case that would indicate the necessity of the application of a ligature to the femoral at its exit from the abdomen, would be the one in which the opening in it is above the profunda; but, as in cases of aneurism, the patients seldom consult a surgeon until the tumour has made considerable progress, it will generally extend over the crural arch to such an extent, as not to allow of the artery being exposed at this part of its course. We may thus conclude that the ligature of the femoral artery above the profunda should never, under any circumstances, be practised.

PART III.

BIBLIOGRAPHY.

PART III.—BIBLIOGRAPHY.

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Cent. 3 *et* 4. p. 39. 1712. A case of popliteal aneurism, which being punctured, and dressed with balsamic and styptic liquids, at length suppurated and was cured.

G. Klaunig, *De Aneurismate carotidis (post auris helicem, a vulnere orto) feliciter (absque sectione) curato. Ephemer. Acad. Nat. Curios. Cent.* 3 *et* 4. p. 150. 1712. An aneurism of the external carotid from a sword wound, in a young man twenty-five years of age; when it burst, alum, lint, and styptics were crammed into the sac; erysipelas of the face then came on, and the sac suppurating, the patient was cured. 1712

D. Anel, *Suite de la nouvelle méthode de guérir les Fistules lacrimales.* Turin, 1714. 4to. (Vide p. 216.) 1714*

A. Fackh, *Aneurisma (in ramo arteriæ adscendentis sub clavicula sinistra a violentiori in pilæ lusu commotione ortum, lethale, cum anatome). Ephem. Acad. Nat. Curios. Cent.* 5 *et* 6. p. 128. 1714. The author gives a short account of the pathology and treatment of the disease, but nothing new. 1714

P. Dionis, *Cours d'Operations de Chirurgie.* Paris, 1716. 8me Demonstration. Divides aneurisms into two kinds: those that are occasioned by the dilatation, and those that are the result of a wound or rupture of the vessel. The author confines his observations to aneurisms at the bend of the arm, gives an account of their treatment by compression, and describes the operation of opening the sac; in which case he says that the hemorrhage may be arrested in one of three ways, either by compressing the ends of the vessel by means of chewed paper soaked in some styptic liquid, or by applying a button of vitriol to them, or else by ligaturing them. 1716

D. Nebel, *Aneurisma arteriæ magnæ, et utriusque emulgentis post resectionem testiculi et alterum fere consimile ex lapsu ab equo. Ephemer. Acad. Nat. Curios. Cent.* 9 *et* 10. p. 142. 1717. Two large aneurisms of the abdominal aorta, chiefly remarkable for their large size and their causes. 1717

Morand, *Mémoires de l'Académie des Sciences.* Paris, 1721. Relates the case of an enormous aneurism of the arch of the aorta, which measured thirteen inches in circumference, but which otherwise presents nothing of importance. 1721

R. J. C. Garengeot, *A Treatise of Chirurgical Operations.* 1723

(Translated from the French.) London, 1723. 8vo. Chap. 41. The author divides aneurisms into *true*, by dilatation, and *spurious*, by rupture; enters at some length upon the causes of the disease, which he divides into external and internal. The latter are violent movements of the part, compression of tumours, fractures of bones, and abscesses; with regard to the latter he says, "An abscess near an artery may also be the cause of this disease, not only because it may relax that vessel, but also because the pus corroding the external membrane of the artery or the capsule that contains it, it is no longer able to resist the impulse of the heart with the same force." The external causes are falls, wounds, blows, &c. He gives nothing new in the treatment of these diseases, recommending compression and the ligature of the vessel above and below the tumour, which is then to be opened; but gives long directions for the application of the tourniquet and compressive bandage, in order to prevent the occurrence of hemorrhage.

1724 Marcot, *Sur une Tumeur anévrismale et polypeuse de l'aorte. Mém. de Montpellier.* Tom. ii, p. 39. *Mémoires de Paris,* 1724. p. 414.

1727 P. Dod, *An account of an Aneurism of the aorta. Philosophical Transactions,* 1727. The author believes that aneurisms are formed by the rupture of the internal muscular coat and the dilatation of the external one.

1727 F. Nicholls, *Observations on Aneurisms in general, and particularly on the foregoing one. Philosophical Transactions,* 1727. Entertains the same opinion as the preceding writer.

1728* J. M. Lancisi, *De Aneurysmatibus, Opus posthumum.* Romæ, 1728. Fol. And in 'Lauth's Collection.' Book 2, Chap. 1. On true aneurisms of the arteries. *Prop.* 6. On the structure and uses of arteries. *Prop.* 7. The nature and division of aneurisms from wounded arteries. *Prop.* 8. How it may be known that the wound has extended into the cavity of the artery. *Prop.* 9. On the termination of wounds of arteries. *Prop.* 10. On different plans that have been recommended for treating wounded arteries. *Prop.* 11. On the best mode of treating wounded arteries. *Prop.* 12. On wounds of arteries, with ecchymosis, which we shall prove to be a true aneurism. *Prop.* 13. The different kinds of ecchymosis arising from a

wounded artery. *Prop.* 14. On the plan of treatment to be adopted in recent ecchymosis of the arteries, especially at the bend of the arm, &c. *Prop.* 15. On ecchymosis from a wound of the carotid arteries. *Prop.* 16. Treatment in the other kinds of arterial ecchymosis. *Prop.* 17. How it happens that a spurious aneurism does not occur in the part above the constriction, in an artery, &c. *Prop.* 18. How it happens that if the artery of a limb be ligatured or cut across, motion and nutrition are not impaired. *Prop.* 19. On aneurisms from a wound of the artery, by which the external tunic alone is implicated. (For the remainder, vide pp. 14, 224.)

J. Macgill, *History of the operation for an Aneurism of the arm successfully performed. Medical Essays and Observations of Edinburgh.* Vol. ii. 1771. (Vide p. 225.) 1733*

A. Monro, *Reflections on the Aneurism occasioned by blood-letting. Medical Essays and Observations, Edinburgh.* Vol. ii. 1771. (Vide p. 230.) 1733*

A. Monro, *Remarks on the coats of Arteries, their diseases, and particularly in the formation of an Aneurism. Medical Essays and Observations, Edinburgh.* Vol. ii. 1771. (Vide p. 81.) 1733*

H. F. Teichmeyer et N. T. Emrich, *Disputatio de stupendo Aneurysmate in brachio feliciter curato.* Jena, 1734. (Haller Disputat. Chirurg. tom. v, pp. 195-210.) The aneurism, which occurred at the bend of the arm in consequence of a puncture of the brachial artery during bleeding, was cured by being laid freely open; a button of vitriol was then applied to the mouth of the artery, chewed paper laid upon this, and finally a bandage was tightly rolled round the arm. Secondary hemorrhage came on, which was checked by the application of the oil of dippel and by tightening the bandage. The patient was, after a threatened attack of gangrene of the limb had been got the better of, eventually cured. 1734

Petit, *Observations anatomiques et pathologiques au sujet de la tumeur qu'on nomme Anévrysme. Mémoires de l'Académie Royale des Sciences.* Paris, 1736. (Vide p. 89.) 1736*

F. Ruysch, *Opera omnia Anatomico-medico-chirurgica.* Amstilodami, 1737. *Observationum anatomico-chirurgicarum* 1737

Centuria. Obs. 2. Contains the history of a case of aneurism of the bend of the arm successfully treated in the usual way. *Obs.* 37. That of an aneurism of the aorta, with caries of the ribs. *Obs.* 38. Contains the history of an enormous aneurism of the aorta. The author remarks that pulsation is a very equivocal sign of aneurism, being occasionally absent in old and large aneurisms; he then relates a case of this disease arising in the aorta, and which attained the size of a chair-cushion, and in which all pulsation had ceased for several weeks before it gave way.

1738 A. F. Walther, *Programma de Aneurysmate.* Lips. 1738. (Haller Disputat. Chirurg. tom. v. pp. 189-195.) Refutes the opinion of Freind, who only admits the existence of false aneurisms, and relates the history of a case of true aneurism of the ascending aorta.

1741 L. Heister et J. A. Reinig, *Dissertatio de Arteriæ cruralis vulnere periculosissimo feliciter sanato.* Helmstad. 1741. (Haller Disputat. Chirurg. vol. v. pp. 131-151.) A case of puncture of the femoral artery in a longitudinal direction, about six fingers' breadth above the knee, cured in two months, by the application of bandages and compresses. The authors attribute the saving of the foot and leg to the fact of the blood passing in sufficient quantity through the profunda femoris to maintain the vitality of those parts. On this account the compression was chiefly exercised on the inner aspect of the limb. They deprecate immediate amputation after wounds of the femoral or brachial arteries, and recommend that compression should first be tried; then, if that fail, the ligature of the wounded vessel; and lastly, should gangrene threaten, amputation may be had recourse to as the last resource.

1742 M. A. N. Guenault, *Quæstio Med. Chirurgica. An Vulneratâ crurali arteriâ ab amputatione auspiciendum?* Paris, 1742. (Haller Disputat. Chirurg. vol. v, p. 155.) The author recommends a tourniquet to be applied to the artery, the wound to be laid open, the vessel tied above and below the puncture in it, and, after the ligatures have separated and the part healed, a bandage to be worn for at least a year. He mentions the collateral branches of the femoral and brachial arteries as being capable, when the main trunk is injured, of carrying on the circulation,

and concludes with the remark, *Non ergo, vulneratâ crurali arteriâ ab amputatione auspiciendum.*

L. Heister, *Dissertatio de genuum structurâ eorumque Morbis.* Helmstadii, 1744. And in Haller's Disputationes Chirurgicæ, tom. iv. (Vide p. 232.) 1744*

Mollinelli, *De brachii Aneurysmate e læsâ in mittendo sanguine arteriâ. De Bononiensi Scient. et Art. Commentarii,* 1745 This is an abstract of a Memoir by Mollinelli. It contains a recapitulation of his arguments in favour of including the nerve with the artery in the ligature, as given at page 235. He also makes some observations on the propriety of including a portion of the aneurismal sac in the ligature, together with the artery, or even the sac alone; and does not approve of Anel's operation, which he fears will not in general effect a perfect cure, although he admits that it has the recommendation of being much milder and less painful. He also condemns the treatment of aneurism at the bend of the arm by compression, on account of the uncertainty of its result; and concludes with a short account of the dissection of an arm on which Valsalva had some time before operated for aneurism. (Vide p. 234.) 1745*

J. Z. Platnerus, *Institutiones Chirurgiæ rationalis.* Lipsiæ, 1745. 8vo. Contains a full description of aneurisms, their causes, treatment, &c.; in all of which he follows preceding writers, especially Lancisi and A. Monro. He considers the high division of the brachial artery as of common occurrence, (par. 436,) and advises the surgeon to have recourse to operation in aneurisms at the bend of the arm, and if this fail, to proceed to amputation. 1745

H. F. Albertini, *Animadversiones super quibusdam difficilis respirationis vitiis a læsa cordis et præcordiorum structura pendentibus. De Bononiensi Scient. et Art. &c. Commentarii.* Bononiæ, 1748. (Vide p. 237.) 1748*

A. Leprotti, *De Aneurysmate quodam arteriæ bronchialis, aliisque Anatomicis Observationibus. De Bononiensi, &c. Commentarii.* 1748. 4to. p. 345. The author gives an account of the dissection of a large aneurism which occupied the left side of the chest, compressing the lung of that side; it was connected with the aorta, at the point where the left bronchial 1748

artery usually arises from that vessel, by an opening large enough to admit the finger. This case would rather appear to have been a false aneurism of the ascending aorta than of the bronchial artery, as the author supposes.

1749* A. Haller, *De Aortæ, venæque cavæ gravioribus quibusdam morbis.* Gottingæ, 1749. 4to. And also in 'Opuscula Pathologica.' Lausannæ, 1768. (Vide p. 98.)

1749 H. Petiot, *In clara Lamure Parergon de Aneurysmate animadversiones.* Monspelii, 1749. 4to. Insists upon the possibility of the occurrence of aneurism by simple dilatation of the coats of the artery, in support of which he adduces many examples from the different writers on the disease.

1750 J. J. Weltinus, *Dissertatio inauguralis medica de Aneurysmate vero pectoris externo, hemiplegiæ sobole.* Basileæ, 1750. 4to. And in Lauth's Collection. A case of aneurism of one of the intercostal arteries, occurring in a countryman, forty-five years of age, a few days after he had been attacked with hemiplegia, of which he soon recovered. A swelling was observed on the left side of the chest, three or four fingers' breadth below the clavicle, opposite the fourth true rib and under the integuments. On examining it more closely it was found to consist of three small tumours: the first of which about the size of an acorn, of a globular figure, yielding to pressure, and pulsating synchronously with the pulse at the wrist, was situated immediately on the left of the sternum, and nearly opposite its centre; the second somewhat larger than the first, of a compressed globular figure, was situated about a finger's breadth from it, but more externally, also pulsated violently, and synchronously with the other arteries; the third about half the size of the preceding ones, was situated a little above the first, opposite the third rib, and not far from the sterno-clavicular articulation. If these tumours were pressed upon, great pain and anxiety about the chest, amounting, if the pressure was powerful, to faintness, came on. The patient could not lie on his back or left side; he suffered from palpitation of the heart and dyspnœa on walking quickly or on ascending a hill. The author considers these tumours to be aneurisms of a branch of one of the intercostal arteries. No dissection of the case could be given, the patient being alive at the time the account of it was written.

J. A. Hazon et F. Thierry, *Au tutior faciliorque vulgari detur Aneurysmatis chirurgica curatio.* Paris, 1750. (Haller Disputat. Chirurgicæ, tom. v, pp. 211-24.) The authors describe an instrument proposed by Scultetus and perfected by Vallantius, a physician of Leyden, for compressing the brachial artery. They recommend that the nerve should be ligatured with the artery, as the operation is thereby rendered easier, the necessity for separating the two being avoided; and although violent pain is occasioned at the time, yet this soon ceases, and no paralysis either of motion or sensation is left, as the divided nerve forms a kind of ganglion. 1750

S. Sharp, *A treatise on the Operations of Surgery.* London, 1751. Sixth edition. Contains little of importance. The author does not apprehend any inconvenience from the ligature of the nerve with the artery. And recommends in operations for aneurism that the amputating instrument be at hand lest it should be impracticable to tie the artery. 1751

Foubert, *Mémoire sur differentes espèces d'Anévrismes faux. Mémoires de l'Académie Royale de Chirurgie.* Tom. ii, 1753. (Vide p. 242.) 1753*

Morand, *Sur un moyen d'arrêter le sang des Artères sans le secours de la Ligature. Mémoires de l'Académie Royale de Chirurgie.* Vol. ii, 1753. (Vide p. 250.) 1753*

J. Warner, *Cases in Surgery.* Second edition. London, 1754. Relates a case of aneurism of the humeral artery that presents nothing of interest. Case 14 contains a short history of an aneurism of the posterior tibial, arising from rupture of the vessel in consequence of cramp. The limb was amputated, and the patient did well. In the postscript are some observations on the use of agaric for suppressing hemorrhage of the femoral artery, which it failed to do. 1754

A. Matani, *De Aneurysmaticis præcordiorum morbis animadversiones.* Florent. 1756. 4to. And in Lauth's Collection. Divides aneurisms into true and false—the true are most commonly met with in the arteries near the heart. The author enters at very great length upon the causes of these affections, but gives little worth reproducing. In the treatment he recommends abstinence from meat, and directs the patient to be confined 1756

for some months to a diet of vegetables, broths. &c. He inculcates caution in having recourse to bloodletting in these affections, and advises the blood to be drawn, if it be necessary to do so, from the side opposite to the aneurism. He recommends the use of milk or whey, and of cold drinks, and also of cold applications.

1757 J. Warner, *A remarkable case of Aneurism, or disease of the principal artery of the thigh, occasioned by a fall; to which is prefixed, a short account of the uncertainty of the distinguishing signs of this disease. Philosophical Transactions*, 1757. Makes some judicious remarks on the occasional absence of pulsation and of discoloration of the skin in this disease; and relates a case of false aneurism of the femoral artery, in which there was no pulsation, and which was punctured by mistake for an abscess; the thigh was amputated.

1757* W. Hunter, *The history of an Aneurism of the aorta, with remarks on Aneurisms in general. Medical Observations and Inquiries, London*, 1757. Vol. i. p. 323. (Vide p. 101.)

1757 Roloff, *Description d'un Anévrisme de l'aorte. Mémoires de l'Académie Royale de Berlin*, 1757. p. 160.

1760 J. F. C. Morand, *Observation anatomique sur un Anévrisme de l'aorte. Mémoires de la Société Royale de Paris.* 1760. p. 48.

1760 F. Nicholls, *Observations concerning the body of his late Majesty. Philosophical Transactions*, 1760. In the account of the post-mortem appearances found in George the Second, the author notices the occurrence of a dissecting aneurism of the aorta. He states that the aorta was dilated, and that a transverse fissure existed on its inner side an inch and a half long, through which some blood had lately passed under the external coat and formed an elevated ecchymosis; this he considers the true state of an incipient aneurism of the aorta.

1760 Deslanges, *Sur un Anévrisme vrai guéri par la nature. Journal de Médecine.* Paris, 1760. Vol. xiii. An aneurism of the brachial artery, caused by a puncture during bleeding, which, after it had attained the size of an egg, was cured by the application of compresses soaked in spirits of lavender.

JULLIEN, *Sur un Anévrisme de l'artère spermatique et sur le scrotum devenu squirrheux. Journal de Médecine.* Paris, 1760. Vol. xiii. In consequence of a violent strain, the spermatic artery of the right side was dilated to such an extent that the end of the finger could be introduced into its cavity; fleshy coagula were also found in it. 1760

ELSE, *On Tumours formed by ruptured veins, sometimes mistaken for Aneurisms. Med. Observations and Inquiries, London,* 1767. Vol. iii. p. 169. 1761

LAMBERT, *Extract of a Letter to Dr. Hunter, giving an account of a new method of treating an Aneurysm. Medical Observations and Inquiries, London,* 1761. Vol. ii. (Vide p. 264.) 1761*

BOUCHER, *Sur un Anévrisme énorme. Journal de Médecine.* Paris, 1761. Vol. xiv. The history of a very large aneurism of the right subclavian artery, with the post-mortem examination. 1761

J. B. MORGAGNI, *De sedibus et causis Morborum.* Venetiis, 1761. Fol. (Vide p. 261.) 1761*

W. HUNTER, *Further observations upon a particular species of Aneurysm. Medical Observations and Inquiries, London,* 1761. (Vide p. 160.) 1761*

A. DE HAEN, *Ratio Medendi in Nosocomio practico Vindobonensi.* Lugduni Batavorum, 1761. Cap. 30, *De Aneurysmate.* The author speaks of the frequency of the occurrence of aneurisms, of their great variety; recommends a palliative treatment very similar to that adopted by Valsalva; relates some cases of aneurism both idiopathic and arising from wounds of the artery in venesection; recommends, in external aneurisms, compression of the wound in the vessel by means of chewed paper, agaric, and oil of dippel, and relates a case that was cured by the agaric; examines Foubert's and Morand's opinions on this point, and claims the priority of the use of chewed paper for Hambergeus, the Professor of Medicine at Jena. 1761

BAYFORD, *An account of two Aneurisms in the aorta. Medical Observations and Inquiries, London,* 1767. Vol. iii. p. 14. 1762

DE LA COMBE, *Sur un Anévrisme de l'artère crurale. Journal de Médecine, Paris,* 1762. Vol. xvii. This case was treated by compression, but the tumour bursting, the patient died. 1762

1763 T. Kirkland, *An Essay on the method of suppressing hemorrhages from divided arteries.* London, 1763. Does not think that agaric possesses any peculiar property in arresting hemorrhage, but thinks that it merely acts by adhering to the mouth of the vessel; does not attribute any bad effect to the inclusion of the nerve in the ligature.

1765* J. Burchall, *An Aneurism in the thigh perfectly cured by the operation, and the use of the limb preserved. Medical Observations and Inquiries, London,* 1767. Vol. iii. (Vide p. 266.)

1765 A. Petit, *Observation sur un Anévrisme (à la machoire inférieure) qui a produit des effets singuliers. Mém. de la Société des Sciences de Paris,* 1765.

1765 G. Cleghorn, *The case of an Aneurismal Varix related and described in two letters to Dr. Wm. Hunter. Medical Observations and Inquiries, London,* 1767. Vol. iii. p. 110. An interesting case, agreeing perfectly with the description that Dr. Hunter had already given of the disease.

1768 Nolleson, *Sur un Anévrisme vrai de l'artère poplitée, lequel était compliqué d'une tumeur terminée par suppuration. Journal de Médecine,* 1768. Vol. xxix. Suppuration having come on in the aneurismal tumour, hemorrhage ensued and the patient died.

1769 D. C. J. Trew, *Aneurysmatis spurii post venæ basilicæ sectionem orti, historia et curatio.* Norimbergæ, 1769. 4to. And in Lauth's Collection. The aneurismal tumour having been laid open, balls of chewed paper, soaked in spirits of wine, were tightly applied to the orifice in the artery by means of a bandage; the patient was cured on the twenty-fifth day. The author deprecates the plan of ligaturing the median nerve together with the brachial artery, and points out the anastomoses by which the circulation can be kept up in the limb after the main artery has been tied.

1769 Aurran, *Lettre sur un faux Anévrisme de l'artère cubitale. Journal de Médecine, Paris,* 1769. Vol. xxxi. Compression was first tried unsuccessfully; the ordinary operation was then had recourse to, and the case did well.

1770 Martin, *Réponse à la lettre de M. Aurran. Journal de Médecine, Paris,* 1770. Vol. xxxiv. Recommends immediate recourse to the operation; deprecates the employment of pressure.

E. Sandifort, *De ingenti Aneurismate aortæ externis dis-rupto. Nova Acta Acad. Nat. Curios.* Tom. iv. p. 30. 1770. A case of aneurism of the thoracic aorta: the author enters at some length on the treatment and pathology of these affections, but gives nothing new. 1770

L. Rouppe, *De ingenti Aneurismate spurio, dextro in latere abdominis post lapsum. Nova Acta Acad. Nat. Curios.* Tom. iv. p. 67. 1770. The blood was contained in several distinct sacs separated by membranous partitions. 1770

T. Armiger, *Letter to W. Hunter on the Varicose Aneurism. Medical Observations and Inquiries, London,* 1771. Vol. iv. (Vide p. 173.) 1770*

W. Hunter, *Postscript to the preceding case. Medical Observations and Inquiries, London,* 1771. Vol. iv. (Vide p. 174.) 1770*

J. Aikin, *An Essay on the Ligature of the Arteries,* (*in White's Cases in Surgery.*) London, 1770. Recommends that the artery *alone* should be included in the ligature, as it is quite capable of restraining the impetus of the blood till the natural contraction of the artery causes such an obliteration of its extremity as to render the eruption of the blood impossible. 1770

C. White, *Cases in Surgery.* London, 1770. Gives a short account of the dissection of an arm on which the operation for aneurism had been performed, in which he found the capillary vessels so dilated as to exceed in size the trunk of the brachial artery. 1770

Beaussier, *Observations sur un Anévrisme de l'artère splénique dont les parois sont ossifiées. Journal de Médecine, Paris,* 1770. Vol. xxxii. The splenic artery of a woman, sixty years of age, was found dilated into a tumour of the size of a small nut, the walls of which were ossified. There was another dilatation of the size of a pea at the point where the artery enters the spleen. 1770

D. Monro, *Cases of Aneurisms, with remarks. Essays and Observations, Physical and Literary Edinburgh,* 1771. 8vo. (Vide p. 115.) 1771*

W. White, *Two letters on the Varicose Aneurysm, to W. Hunter. Medical Observations and Inquiries, London,* 1771. Vol. iv. (Vide p. 171.) 1771*

1772 Masotti. *Sul' Aneurisma del poplite.* Firenze, 1772. Relates several cases of aneurism of the popliteal artery, in one of which he tied the artery with success; he employed two ligatures, one above, the other below the tumour. He does not think the operation practicable if the aneurismal tumour extends beyond the space included between the superior and inferior articular arteries; for, as in such a case the circulation cannot be carried on through the medium of these vessels, gangrene must ensue.

1772* C. Guattani, *De externis Aneurysmatibus manu chirurgicâ methodice pertractandis cum nonnullis circa Aneurysmata interna ac tribus aliis rarioribus observationibus, &c.* Romæ, 1772. And in Lauth's Collection. (Vide pp. 268-95, 313-6-8-30-41.)

1772* C. Guattani, *Historiæ duæ Aneurysmatum, quorum alterum in brachio per chirurgicam operationem sanatum, in femore alterum paucos intra dies lethale fuit, animadversionibus et figuris, jam dudum illustratæ.* Romæ. 4to. And in Lauth's Collection. (Vide p. 318.)

1773 J. Verbrugge, *Dissertatio Anatomica-Chirurgica de Aneurysmate, oblata notabile aortæ Aneurysma divulgandi occasione.* Lugd. Batav. 1773. 4to. And in Lauth's Collection. The author divides his subject in the following way: The 1st section contains a description of the heart and large vessels. 2d. The etymology, division, and definition of aneurisms. 3d. The causes. 4th. The effects of aneurisms. 5th. The diagnosis. 6th. The prognosis. 7th. The treatment. 8th. Observations on aneurisms of the aorta. Although this dissertation contains very few, if any, original observations, yet it is exceedingly valuable on account of the very great number of references that the author makes to the works of other writers on aneurism.

1773 C. Asman, *Dissertatio de Aneurysmate.* Gröningen, 1773. 4to. And in Lauth's Collection. Gives a short account of the nature, causes, signs, prognosis, and diagnosis of aneurism, and reviews in succession the different plans of treatment that have been proposed. The author concludes with a detailed account of several experiments that he instituted on dogs, with the view of testing the efficacy of the plan of treatment proposed by Lambert, from which he concludes that Lambert's

method is less safe and certain than that of the ordinary ligature, and more apt to be followed by secondary hemorrhage.

W. Bromfield, *Surgical Observations and Cases.* London, 1773. (Vide p. 347.) 1773*

C. Leslie, *An account of the operation for the Aneurism being performed upon the femoral artery with success. Medical and Physical Commentaries, Edinburgh,* 1774. (Vide p. 348.) 1774*

J. B. Heraud, *Tentamen Medico-chirurgicum de Aneurysmatibus externis.* Monspelii, 1775. This essay contains nothing original, being merely a summary of the opinions of the writers of the last century. 1775

B. Gooch, *Concerning Aneurisms of the thigh. Philosophical Transactions,* 1775. Considers the profunda artery of the thigh to be a *lusus naturæ*, and fears that, when it does not occur, the collateral branches will be unable to carry on the circulation after an operation. 1775

Sue, *Mémoire sur l'Anévrisme de l'artère crurale. Journal de Médecine.* Vol. xlvi. 1776. The author enters at some length into the causes and symptoms of aneurism of the crural artery, on which subjects he gives nothing new. He then reviews the different modes of treatment that have been proposed for this disease, and goes on to prove that the anastomoses of the femoral artery with the branches of the internal iliac, are sufficiently large and numerous to maintain the vitality of the limb after the femoral has been tied. He next relates the different cases reported by authors of the successful ligature of the femoral, and concludes by recommending that operation in preference to amputation in cases of aneurism of the thigh. 1776

Souville, *Observation sur une mort subite occasionnée par la rupture de l'artère stomachique affectée d'un Anévrisme vrai. Journal de Médecine.* Vol. l. Paris, 1778. A soldier, forty-two years of age, had suffered for two years from palpitation at the pit of the stomach. He died suddenly, after making an unusual exertion, and, on examination, the stomach was found filled with blood; there is however no very distinct evidence of the existence of an aneurism. 1778

1779 De Horne, *Observation sur un Anévrisme considérable de l'artère axillaire suivi de la fracture des côtes. Mémoires de Médecine et de Physique Medicale, Paris,* 1779. A case of aneurism occasioned by the abuse of mercurials.

1779 F. V. D'Azyr, *Traitement des Tumeurs anévrismales par compression. Hist. et Mémoires de la Société Royale de Médecine.* 1779.

1779* B. Wilmer, *An Aneurism of the popliteal artery, with some remarks on Aneurisms in general. Cases and Remarks in Surgery.* London, 1779. (Vide p. 354.)

1779* P. Pott, *Remarks on the necessity and propriety of the operation of amputation in certain cases.* London, 1779. 8vo. (Vide p. 351.)

1780 T. Kirkland, *Thoughts on Amputation, &c.* London, 1780. The author proves that amputation is not necessary in all cases of wounds of the larger vessels, which convey blood to the limb; he refers to the cases on record in which the limb has been saved though the crural artery was wounded, and insists on the power of the collaterals in maintaining the circulation.

1781 Testa, *De Re Medicâ et Chirurgicâ.* 1781. Relates several cases of popliteal aneurism. States that Kaysser, a surgeon-major in the army of the Duke of Tuscany, was the first to perform an operation for the cure of popliteal aneurism, in the year 1744, on a soldier, who was cured in four months; he operated again with success in 1746, and also in 1748. The author recommends a plan that differs from those usually adopted, but which, he says, he never tried; it consists in laying the aneurismal sac open, introducing a gum elastic tube into each extremity of the artery, and retaining it there by a ligature, so that the continuity of the canal may be maintained, and the circulation be thus carried on in the limb below the diseased part of the vessel.

1781* A. Murray, *In Aneurysmata femoris observationes, &c. Examini Defert. Petrus Afzelius Arvidsson.* Upsaliæ, 1781. 4to. And in Lauth's Collection. The author first treats of aneurisms generally, then gives a description of the arteries of the thigh, chiefly in reference to the anastomosing and colla-

teral vessels, and concludes with some observations on aneurisms of the thigh, reviewing the different plans of treatment that have been proposed. (For which see p. 359.)

POUTEAU, *Œuvres posthumes.* Tom. ii. Paris, 1783. Recommends the employment of a button of vitriol in preference to the ligature. 1783

H. WATSON, *Account of a large Aneurism of the abdominal portion of the aorta; with some reflections on the artery in its diseased state. Medical Communications, London.* Vol. i. p. 178. 1784. 1784

S. F. SIMMONS, *Account of an Aneurism of the aorta. Medical Communications, London.* Vol. i. p. 118. 1784. 1784

J. HALL, *Case of an Aneurism of the aorta, and in the left carotid artery, which burst into the trachea. Medical Observations and Inquiries.* Vol. vi. p. 23. 1784. 1784

PENCHIENATI, *Recherches Anatomico-pathologiques sur les Anévrismes des artères crurale et poplitée.* And also *Recherches Anatomico-pathologiques sur les Anévrismes des divisions et ramifications des artères de l'épaule et du bras. Mémoires de l'Académie Royale des Sciences de Turin,* 1784-5. 1e Partie. The author gives an historical and a critical account of the subject, followed by a description of the arteries of the thigh and leg, and the anastomoses that maintain the circulation in these parts after the main trunk has been tied. He recommends amputation in cases of popliteal aneurism, as he has only heard of one instance in which the operation for that variety of the disease had succeeded. In the second part, he gives a long and minute description of the arteries of the upper extremity and their anastomoses, but has nothing of importance on aneurism. 1784

T. LAUTH, *Scriptorum latinorum de Aneurysmatibus collectio.* Argentorati, 1785. Contains, 1st. J. M. Lancisi, 'De Aneurysmatibus, opus posthumum.' 2d. C. Guattani, 'De Externis Aneurysmatibus.' 3d. C. Guattani, 'Historiæ duæ Aneurysmatum, &c.' 4th. A. Matani, 'De Aneurysmaticis Præcordionum Morbis.' 5th. Verbrugge, 'Dissertatio Anat. Chirurgica de Aneurysmate.' 6th. Weltinus, 'De Aneurysmate vero pectoris externo.' 7th. Murray, 'In Aneurysmata femoris 1785*

observationes.' 8th. C. J. Trew, 'Aneurysmatis spurii, &c., historia.' 9th. C. Asman, 'Dissertatio Medica de Aneurysmate.'

1786* E. Home, *An Account of Mr. Hunter's method of performing the operation for the popliteal Aneurism, communicated in a letter to Dr. Simmons. The London Medical Journal.* Vol. vii. 1786. (Vide p. 373.)

1787* E. Home, *Supplement to the account of Mr. Hunter's method of performing the operation for the popliteal Aneurism, communicated in a second letter to Dr. Simmons. London Medical Journal.* Vol. viii. 1787. (Vide p. 381.)

1787 Walter, *Sur l'Anévrisme. Nouveaux Mémoires de l'Académie Royale des Sciences et Belles-Lettres, Berlin,* 1787. Contains nothing very original. The author divides aneurisms into true and false; the true arising from simple dilatation, the false from rupture of the coats of the artery. He looks upon aneurism of the popliteal artery as incurable, never having known a case that was operated upon with success; and concludes the essay by relating four cases of aneurism of the aorta which are not of any great interest.

1793* E. Home, *An Account of Mr. Hunter's method of performing the operation for the cure of the popliteal Aneurism. Transactions of a Society for the improvement of Medical and Chirurgical Knowledge, London.* 1793. (Vide p. 385.)

1793* M. Baillie, *Of uncommon appearances of disease in Blood-vessels. Transactions of a Society for the improvement of Medical and Chirurgical Knowledge, London.* 1793. (Vide p. 175.)

1793 Garret, *Observations sur les bons effets du répos absolu et du régime dans les maladies accompagnées des accidens qui caractérisent les Anévrismes internes. Récueil des Actes de la Société de Santé de Lyons.* 1793. p. 111.

1793* J. F. L. Deschamps, *Observations sur la ligature des principales artères des extremités à la suite de leurs blessures, et dans les Anévrismes, particulièrement dans celui de l'artère poplitée dont deux ont été opérées suivant la méthode de Jean Hunter;*

Chirurgien Anglais. Paris, 1793. 8vo. And also at the end of the Fourth Volume of the *Traité historique et dogmatique de l'opération de la Taille.* Paris, 1796-97. (Vide p. 404.)

SABATIER, *De la Médecine Opératoire.* Paris, 1796. Vol. i. p. 351. Contains a most excellent historical and critical account of the whole subject of aneurism. (For Desault's case, vide p. 402.) 1796*

W. LUXMORE, *Case of Aneurism, with the dissection. Memoirs of the Medical Society of London.* Vol. iii. p. 404. 1796. 1796

P. GUERIN, *Rapport des Commissaires nommés par la Société de Santé de Bourdeaux pour l'examen d'un mémoir sur l'Anévrysme lu par le citoyen Guèrin. Recueil périodique de la Société de Santé de Paris.* Tom. i. An 5. (Vide p. 467.) 1797*

P. GUERIN, *Observation sur un Anévrisme faux primitif au plis du bras, guéri par l'action du froid. Recueil des Actes de la Société de Santé de Lyons.* Tom. ii. p. 102. 1797

P. GUERIN, *Mémoire sur l'Anévrisme. Recueil des Actes de la Société de Santé de Lyons.* Tom. ii. p. 331. 1797

GILBERT, *Observation d'un Anévrisme de l'aorte inférieure. Recueil périodique de la Société de Médecine de Paris,* 1797-98. Relates a case of aneurism of the abdominal aorta that proved fatal, by the vessel giving way into the cavity of the peritoneum. The coats of the artery were very much thickened and softened. 1797

SALMADA, *Observations relatives à l'histoire des Anévrysmes. Recueil périodique de la Société de Médecine de Paris,* 1797-98. Relates a case of aneurism of the aorta occasioned by the induration of and the collection of calculi in the pancreas. Also cases of spontaneous cure of an aneurism of the femoral and of the popliteal arteries. 1797

B. LACOSTE, *Rapport des mémoires et observations du citoyen B. Lacoste, Chirurgien de Tonneins, Départment de Lot et Garonne, sur un Anévrysme vrai à la partie supérieure de l'artère fémorale gauche, par le citoyen Deschamps. Recueil périodique de la Société de Médecine de Paris.* Tom. v. An 7. (Vide p. 479.) 1799*

1799 Gilbert, *Observation d'un Anévrisme de l'aorte inférieure. Recueil périodique de la Société de Santé de Paris.* Tom. iii. p. 93.

1799* J. F. L. Deschamps, *Observations et Reflexions sur un Anévrisme vrai de la partie supérieure de l'artère fémorale. Recueil périodique de la Société de Médecine de Paris.* Tom. v. An 7. (Vide p. 481.)

INDEX.

Acrel, case by, 363.
Aëtius, symptoms of aneurism, 4; situations in which aneurism may occur, 4; operation for aneurism, 183.
After-treatment of operation for aneurism, 464.
Agaric recommended for arresting hemorrhage, 253; description of, 255; how it acts, 259.
Albertini, memoir by, 237.
Amadou recommended for arresting hemorrhage, 255.
Amputation of arm for aneurism of brachial artery, 201; unfavorable result of, in popliteal aneurism, 280; question of, in popliteal aneurism, 278; discountenanced, 148, 348; recommended, 353.
Anastomoses of veins and arteries, 212; may occasion bleeding, 272; of internal iliac, 306; of brachial artery, 327; of vessels of the thigh, 359.
Anastomosing branches, importance of, 330; gradually enlarge in aneurisms, 406.
Anel, memoir by, 216; ligatures brachial artery, 220.
Aneurism by effusion, what, 89; by dilatation, what, 89; by dilatation and effusion, differences between, 89; opened by caustic, 185; true, false, and mixed, 106; several in same person, 115, 130, 311; what, 136; true, 137; may occur in any artery, 316.
Aneurism of particular arteries. (*Vide* Artery, &c.)
Aneurisms of brain, 155; of chest, 30; of feet, 316; of groin, 295, 298; of hands, 316; of head, 159; of heart (*vide* Heart); of knee, 159; of leg, 316; of penis, 159; of tarsus, 318.
Aneurism-needles, proper construction of, 452.
Aneurismal sacs, dissection of, 120.
Aneurismal varix, memoirs on, 160, 171, 173, 174; cases of, 107, 162, 164, 171, 173, 339.
Aorta, aneurism of, 24, 27, 32, 45, 47, 53, 98, 99, 101, 122, 132, 145; cured, 31; how it may occasion death, 111; can this be recognized before an external tumour forms, 111; beginning of, principally affected by true aneurism, 111; frequency of aneurism of, 157; may become serpentine, 170.
Apple-juice cures aneurism, 52.
Arm, position of, in wounds of brachial artery, 335; bend of, aneurisms of, 318.
Armiger, memoir by, 173.
Arterial system diseased in aneurisms, 347.
Artery, Axillary, aneurism of, 44, 121, 156.
Artery, Brachial, aneurism of, 92, 149, 200, 201, 207, 226, 230, 246, 247, 248, 254, 318, 338; false aneurism of, 330, 406; division of, 113; branches of, 113; varieties, 230; need not be ligatured below aneurism, 223; both ends to be ligatured, 272; sometimes double, 328; to be operated on early, 329.
Artery, Carotid, aneurism of, 35, 147, 263; may be tied, 178.
Artery, Cæliac, aneurism of, 44, 46, 53, 158.
Artery, Crural. (*Vide* Femoral.)
Artery, Emulgent, aneurism of, 132.
Artery, Femoral, aneurism of, 54, 127, 129, 131, 188, 191, 198, 213, 267, 295, 298, 303, 341, 363, 364, 368, 473; ligatured, 213, 297, 348, 367, 410, 419, 420; ligatured above profunda, 479; on distal side of aneurism, 481; cured by compression, 298, 430, 431; examination of, after ligature, 381; wound of, 348, 409.
Artery, Iliac, aneurism of, 307, 310; cured by compression, 298; external, may be tied, 307; anastomoses of, 306; experiment on, by Lancisi, 43.
Artery, Intercostal, aneurism of, 158.
Artery, Mesenteric, aneurism of, 132.
Artery, Popliteal, aneurism of, 115, 127, 130, 196, 268, 269, 273, 279, 284, 286, 287, 288, 289, 293, 313, 358, 468, 469, 472; spontaneously cured, 278, 383; old operation for, usually unsuccessful, 385; objections to old operation for, 439; operation for, by opening sac, 455; operated on by Hunter, 390, 395, 396, 397; by Lynn, 398; by Cline, 399; by Earle, 400; by Desault, 402; false aneurism of, 410.
Artery, Pulmonary, aneurism of, 67, 186.
Artery, Subclavian, aneurism of, 37, 156, 472.
Artery, Tibial, aneurism of, 130, 313.
Artery, Ulnar, aneurism of, 316.
Artery, below aneurism, change in, 74;

becomes slender and irregular, 74; becomes enlarged in varicose aneurism, 168; becomes serpentine in varicose aneurism, 169; any, may be affected with aneurism, 316; coats of, undergo changes, 386; wounded, does not always bleed; should be ligatured above, 415; does not pulsate when exposed, 425; obliteration of, may be prevented, 429; should be flattened instead of tied, 450.
Arteries, coats of, 81; diseases of, 81; cellular coat of, 82; internal coat of, 82; muscular coat of, 82; tunica cellularis interna, 83; modes in which their coats may be so diseased as to give rise to aneurism, 85; all the coats of, may be dilated, 137; that may be affected by aneurism, 154; anastomosing, enlarge in aneurisms, 406; deep-seated, ligatured with difficulty, 414; should be flattened, 427; collateral, necessity of preserving, 433.
Ascites, a consequence of aneurism, 80.
Asthma causes aneurism of heart, 60.
Astringents may produce aneurisms, 35; use of, in hemorrhage, 258; and cold lotions recommended, 195.
Auricles very subject to aneurism, 62.
Axillary artery, aneurism of, 44, 121, 156; ligature of, recommended, 183.
Baillie, memoir by, 175.
Bandage, Genga's, 340.
Bandaging in aneurisms, 283.
Basilic vein, danger of bleeding in, 329.
Bellini on the cause of aneurism, 23.
Bibliography, 497.
Bleeding in aneurisms, 28; advantage of, in aneurism, 262.
Blood, can it dissolve bone? 109; state of, in true aneurisms, 110; state of, in aneurisms, 281.
Bloodletting in aneurism, 146.
Blood-vessels, uncommon appearances of disease in, 175.
Blows cause aneurisms, how, 23, 24, 26.
Bones, ulceration of, in aneurism, 109.
Bonetus, 59, 65.
Bony deposit in valves of heart and arteries, 63.
Bourdelot, memoir by, 207; cured an aneurism in his own arm by compression, 210.
Brachial artery, aneurism of, 92, 149, 200, 201, 207, 226, 230, 246, 247, 248, 254, 318, 338; division of, 113; ligature of, 113, 220, 407; branches of, 113; both branches of, sometimes tied, 113; cases of aneurism of, treated by compression, 207; varieties of, 230; sometimes double, 328; false aneurism of, 330; wound of, 406.
Brain, true aneurisms of, 155.
Brasdor's operation performed by Deschamps, 481; circumstances that call for, 487; conclusions regarding, 493.
Bromfield, remarks by, 347.
Burchall, memoir by, 266.
Cæliac artery, aneurism of, 44, 46, 53, 158.
Caries of bones in aneurism, 109; consequent upon aneurisms, 142.
Carotid artery, aneurism of, 35, 147, 263; arteries may be ligatured, 178.
Cartilaginous deposit in valves of aorta, 64.
Castelli, 79.
Causes of aneurism, 138; frequently very obscure, 138.
Cauterization of an aneurism of femoral artery, 189.
Cautery, use of, in hemorrhage, 257.
Coachmen very subject to popliteal aneurism, 387.
Coagula in aneurisms, mode of formation of, 94; differences between, 95; consistence of, 96.
Coagulum, formation of, in wounded arteries, 92; in aneurisms, structure of, 110.
Cecchini, 63.
Cesalpinus, case from, 66.
Changes of arterial coats, 386.
Chest, aneurisms of, 30.
Chopart, case by, 419.
Ciasconi, case by, 278.
Circumscribed false aneurism, 106.
Cline, case by, 399.
Clots, gradation of, in aneurisms, 97.
Coats of arteries being ruptured may occasion aneurism, 144; changes they undergo, 386.
Cold applications in aneurisms, 473, 477; particular cases of aneurism in which they are useful, 474.
Collateral arteries, rapid dilatation of, 436; arteries, importance of, 441; importance of not compressing, 444; branches, necessity of preserving, 433.
Compress should not be interposed between artery and ligature, 416.
Compresses recommended, 205.
Compression makes an artery impervious, 42; must not be too tight; 208; use of, in hemorrhage, 257; precaution in applying, 273; utility of, in aneurisms, 283; mode of applying, 284; utility of, in popliteal aneurism, 284; cures false aneurism of femoral artery, 367; obliterates the canal of arteries, 404; interferes with collateral circulation, 404; less useful than ligature, 406; isolated, of femoral artery, 430, 431; of collateral vessels, injurious, 444.
Common femoral, ligatured, 479.
Concretions, bony, in aneurisms, 7; in arteries, 84.
Constriction makes an artery impervious, 42.

Contusions cause aneurisms, 22.
Crural artery, false aneurism of, 213; ligatured, 213; ligature of, 297; aneurism of, 295, 298, 303; cured by compression, 298.
Cure of an aneurism of aorta, 31; natural, of aneurism, 176; spontaneous, of popliteal aneurism, 383.
Debility of vessels favours aneurisms, 45.
Definition of aneurism, 18.
Dekkers, 72.
Derivation of word aneurism, 6.
Desault, case by, 402; operates for popliteal aneurism according to Anel's method, 418; recommended ligature of artery on the distal side of the sac, 487.
Deschamps, memoirs by, 404, 481; cases by, 419, 430, 431; on the old operation for popliteal aneurism, 455; on Hunter's plan of operating for popliteal aneurism, 462; on the after-treatment of operation for aneurism, 464; ligatures the femoral artery on the distal side of the tumour, 481.
Diagnosis of aneurisms arising from contusions, 27; importance of, 240.
Diagnosis of tumours from aneurism, 141.
Diet, spare in aneurisms, 28; advantage of, 262; of patient after operation, 276.
Dietetic treatment of aneurism, 224, 239.
Different species of aneurism, 19.
Diffused false aneurism, 106; aneurism, 148.
Digby, Sir Kenelm, his varicose veins, 209.
Dilatation, cause of aneurism, 5; of coats of arteries, 137; of small arterial branches, 211; of collateral arteries in aneurism, to what owing, 442.
Direction of wounds of brachial artery modify their treatment, 335.
Dropsy, a consequence of aneurism, 80.
Duvet, 83.
Earle, case by, 400.
Emulgent artery, aneurism of, 132.
Encysted aneurism, 148; aneurisms, what, 150.
Eroding fluids cause aneurisms, 33.
Erosion may occasion aneurisms, 145.
Etymology of aneurism, 15.
Examination of the case in which Hunter tied femoral artery, 381.
External iliac may be tied, 307; cured by compression, 298; anastomoses of, 306; experiment on, by Lancisi, 43.
Fabricius, pathology of aneurism, 11.
Fall may occasion an aneurism, 129.
False aneurisms, what, 20, 106; aneurisms, 39, 148; aneurism, mode of formation of, 85; may be cured by pressure, 152; operation for, 153.
False consecutive aneurism, 242; how formed, 242.
False aneurism of arm, 330; mode of formation of, 331.
Fantonus, case by, 45.
Fasting in aneurisms, 224.
Feet, aneurisms of, 316.
Femoral artery, aneurism of, 54, 127, 129, 130, 131, 188, 191, 198, 267, 341, 348, 363, 364, 368, 473; cure of aneurism of, 127, 198; false aneurism of, 191; ligature of, 193, 213, 267, 348, 362, 410, 419, 420; ligatured above profunda, 479; ligatured on the distal side of the aneurism, 481; examination of, after ligature, 381; compressed, 430, 431; wound of, 348, 409.
Fernelius, symptoms of aneurism, 4; aneurism arises from dilatation, 5; diagnosis from varix, 5.
Fibres of arteries, spasm of, 50.
Fibres, longitudinal, of arteries, spasm of, 51.
Fibrine, diminution in quantity of, in aneurisms, 282.
Flajani, case by, 288.
Flat ligature recommended, 451.
Flattening of arteries, 427; of the artery recommended, 450.
Flexion of leg or thigh after operation for popliteal aneurism, how to be remedied, 466.
Fluid, corroding, causes aneurism, 32.
Ford, case by, 383.
Formation of aneurism after venesection, 209.
Foubert divides aneurisms into several species, 242; memoir by, 242; operation for aneurism described by, 245; cases by, 246, 247, 248.
Galen, diagnosis from œdema, 3; symptoms of aneurism, 3.
Gangrene occasioned by dilatation of vessels of heart, 64; of limb, symptoms of, 465.
Genga, bandage devised by, 333.
Genga's bandage described, 340.
Gluttony occasions aneurism, 149.
Gorræus, symptoms, 5; definition of aneurism, 6; diagnosis between those caused by wound and by anastomosis, 6.
Groin, aneurism of, 295, 298.
Guattani, memoir by, 268; recommends the nerve to be excluded, 271.
Guèrin, cases by, 468, 469, 472, 473; memoir by, 467.
Guillemeau, diagnosis, 8; symptoms, 8; on treatment of aneurism, 186; recommends ligature of arteries, 186; ligatures brachial artery, 187.
Haller, memoir by, 98.
Haller's experiments on weakening the coats of arteries, 388.
Hands, aneurism of, 316.

Handling of aneurisms should be avoided, 146.
Head, aneurism of, 159.
Heart, aneurism of, hereditary, 54; prolapsus of, hereditary, 54; increased bulk of, 56; aneurisms of, 57; aneurism of, occasioned by palpitation, 59; occasioned by repercussed blood, 59; caused by mental distress, 60, 66.
Heat of limb increased after operation for popliteal aneurism, 395.
Heister, memoir by, 232; recommends operation for popliteal artery, 233.
Hemorrhage, means of arresting, 251; does not always follow wound of an artery, 413; secondary, when likely to occur, 427.
Hereditary tendency to aneurism of heart, 54.
Hervey, experiment by, 42; case by, 75; discoverer of polypus in aneurisms, 77.
Hiccup in aneurism of aorta, 124.
Hildanus, case by, 64.
Hippocrates, 54.
Homberg, case by, 71.
Home, memoirs by, 373, 381, 385.
Humour eroding, causes aneurism, 32.
Hunter, Wm., memoirs by, 101, 160.
Hunter, John, case operated on by, post-mortem of, 381; refutes Haller's experiments on weakening the coats of arteries, 388; method of performing operation for popliteal aneurism, 373, 381, 385.
Hunter's operation, success of, in France, 434; objections to, answered, 435; for popliteal aneurism, advantages of, 440; where contra-indicated, 446.
Humour, acrid, influence of, 61.
Hypochondriacal persons subject to aneurism, 34.
Hypothenar, aneurism of, 316.
Hysterical persons subject to aneurism, 34.
Ice, useful in aneurisms, 152.
Iliac artery, experiment on, by Lancisi, 43; arteries, anastomoses of, 306; external, may be tied, 307; case of aneurism of, 307, 310.
Impulse, increased, of blood occasions aneurism, 39; of blood, how increased, 40.
Impulses, direct and oblique, of blood, 41.
Incision of sac, when to be preferred, 445.
Intercostal arteries, aneurism of, 158.
Isolated compression of femoral artery, 430, 431; of artery, 450.
Javina, case by, 287, 307.
Jerking stream of blood not always an evidence of the artery being wounded, 332.
Jugular veins dilate and collapse, 69, 77; pulsation, symptom of dilatation of heart, 70, 77; also arises from chlorosis, 70.
Jussy, case by, 368.
Knee, aneurism of, 159.
Lacoste, memoir by, 479.
Lambert, memoir by, 264.
Lancisi, memoir by, 15; letter from, 217; on treatment of aneurism, 224.
Laporte, case by, 47.
Larcheus, case by, 44.
Leber, case by, 364.
Leg, aneurisms of, 313.
Leslie, memoir by, 348; ties femoral artery, 349.
Ligature of arteries, 147; of artery destroys voluntary motion of a limb, 326; lessens temperature of the limb, 326; of brachial artery attended by unusual symptoms, 326; of artery not always followed by loss of sensation and motion in the limb, 326; to be preferred to compression, 406; of deep-seated arteries, difficulties attending, 414; should only include artery, 415; should not be tied upon a compress, 416; directions for applying, 427; inconveniences of, 427; must be tightened in proportion to the quantity of tissues contained within it, 427; preferable to compression, 445; precautions in using, 448; flat, recommended, 451.
Ligatures of reserve recommended, 427.
Limb, temperature of, after operation for popliteal aneurism, 395, 397.
Lynn, case by, 398.
Macgill, memoir by, 225.
Marchetti, case by, 57.
Masotti, opinion of, on femoral aneurism, 368.
Median nerve, how to avoid, in ligaturing brachial artery, 113.
Mellius, 233.
Mercurial preparations occasion aneurism, 37; frictions occasion aneurism, 38.
Mesenteric artery, aneurism of, 132.
Milk diet in aneurisms, 239.
Mind, distress of, causes aneurism of heart, 60, 66.
Mollinelli, memoir by, 234; recommends ligature of the nerve, 235; cases by, review of, 271.
Monro, A., memoirs by, 81, 230.
Monro, D., memoir by, 115.
Morand, case by, 250; memoir by, 250.
Morel, memoir by, 203; recommends ligature of arteries, 204.
Morgagni, observations by, 261.
Motion, voluntary, of limb, destroyed by the ligature of the main artery, 326.

Movements, violent, occasion aneurism of heart, 67.
Murray, memoir by, 359; counteracts Gooch's opinion of the existence of a double femoral, 360.
Natural cure of aneurism, 176.
Neck, aneurisms of, not very frequent, 156; tumours of, mistaken for aneurism, 155; treatment of aneurism of, 196.
Nerve, spasm of, 50; should never be tied, 153, 271; ligature of, recommended, 235; objections to, 236.
Noise in aneurisms, 7; hissing, in aneurisms, 90.
Nutrition, morbid, produces aneurism, 34.
Obliteration of artery may be prevented after ligature, 429.
Operation for aneurism, 146; can only be done in the extremities and temples, 147; of arm, 245; for brachial aneurism, 319; by incision of the sac, when to be preferred, 445.
Operations, danger of, 439.
Osseous scales in internal membrane of artery, 98; in valves of heart, 99; in arteries, cause of aneurism, 100.
Oxycrate recommended, 195.
Pad, utility of, in aneurisms, 210.
Pain in aneurism of aorta, 133; thoracic aneurisms, 241; in aneurisms, 315.
Palpitation a cause of aneurism of heart, 59.
Panarolus, case by, 44.
Paralysis does not occasion aneurism, 38.
Paré, causes of bony concretions in aneurisms, 7; symptoms of aneurism, 7; case by, 63; on treatment of aneurism, 185.
Pathognomonic symptoms of true aneurism, 140.
Paulus, extract from works of, 183.
Penis, aneurism of, 159.
Pericardium, tumour of, 21.
Petit, memoir by, 89.
Pins recommended in aneurisms, 265.
Plethora causes aneurism, 48, 49.
Polypous concretions, how formed, 43; in aneurisms, 77; mode of formation of, 78.
Popliteal artery, aneurism, of, 115, 127; 130, 196, 268, 269, 273, 279, 284, 286, 287, 288, 289, 293, 313, 358, 468, 469, 472; spontaneously cured, 278, 383; old operation for, usually unsuccessful, 385; objections to old operation, 439; operation for, by opening sac, 455; false aneurism of, 410; ligatured, 269, 275.
Popliteal aneurism chiefly affects coachmen and postilions, 387.
Position of arm in wounds of brachial artery, 335.
Postilions very subject to popliteal aneurism, 387.
Poterius, 69.
Pott, remarks by, 351; describes a peculiar disease of calf of leg, 353; recommends amputation, 353; case by, 384.
Presse-artère employed, 412; description of, 448; precautions in using, 462.
Pressure injurious in aneurisms of aorta, 112; in aneurisms, injurious, 146.
Profunda artery, danger of puncturing, 490.
Prognosis of aneurisms arising from contusions, 27.
Prolapsus of heart, 54.
Pulmonary artery, aneurism of, 67, 186; veins, aneurisms of, 68.
Pulsation gradually decreases, and at length disappears, in old aneurisms, 72; in tumours of the throat not aneurismatic, 111; in aneurisms, 141; may cease, 141.
Pulse, irregularity and smallness of, 75; deceptive, 75; in aneurisms of right cavities of heart, 75; condition, of, in dilatation of venæ cavæ and right auricle and ventricle, 76; at wrist, weak, in varicose aneurisms, 168.
Purgatives in aneurisms, 146.
Refrigerants, employment of, in aneurism, 475, 477.
Repercussion of blood occasions aneurism of heart, 59.
Reserve ligatures recommended, 427.
Respiratory movements, when violent, cause aneurism of heart, 67.
Right side of heart, symptoms of aneurism of, 77.
Riverius, 53.
Romanus, 156.
Royer, memoir by, 204.
Rupture of internal coat, cause of aneurism, 10; both coats, 12; arterial coats, 144; right ventricle, 151; vena cava, case of, 151.
Ruysch remarks that all aneurisms do not pulsate, 72.
Sac of aneurisms differ in shape, 108; aneurismal, condition of, 143; anatomy of, 442.
Sacculus of aneurisms, 109.
Saviard, memoir by, 213.
Scorbutic persons subject to aneurism, 34.
Second intention, disadvantages of uniting wounds by, 443.
Secondary hemorrhage, when likely to occur, 427.
Seghio, case by, 288.
Sennertus, symptoms and causes of aneurism, 9; pathology of aneurism, 10.
Separation of ligatures, 466.
Serre-artère employed, 412; advantages of, 427; description of, 448.
Several aneurisms in one subject, 131.
Severinus, 72; extract from, 188; case

of aneurism of femoral artery, 188, 191; recommends postponing the operation, 194; shows that the limb may be nourished after femoral artery is tied, 194.
Situation of aneurisms, 15.
Skin, discoloration of, in aneurisms, 90.
Spasm of arteries occasions aneurism, 50; of longitudinal fibres of an artery, 51; of muscles, prevents application of ligature, 414.
Spine, caries of, in aneurism, 110.
Sponge recommended for suppression of hemorrhage, 259.
Spontaneous cure of popliteal aneurism, 278.
Stancario, 262.
Straining of body may rupture the heart, 151; occasions aneurisms, 151.
Subclavian artery, aneurism of, 37, 156, 472.
Suckling occasions aneurism, 54.
Superabundance of blood causes aneurism, 48.
Suture twisted in aneurisms, 265.
Sylvius, 186.
Syphilitic aneurism, causes and symptoms of, 36; two cases of, 37.
Tarsus, aneurism on, 318.
Temperature of limb lessened by the ligature of main artery, 326.
Thigh, aneurism of. (*Vide* femoral and crural artery.)
Thrill in aneurisms, 90.
Tibial artery, posterior aneurism of, 130.
Tibial arteries, aneurism of, 313.
Tourniquet, description of, 214.
Treatment of aneurisms arising from contusions, 28; of aneurism of chest, 31; of false aneurism, depending on spasm, &c., 52; of aneurism, 146. (*Vide* Part II.)
True aneurisms, what, 20, 106, 137; mode of formation of, 86, 87; rarity of, 88; do occur, 108.
Trullius, Joannes, ligatures femoral artery, 191.
Tumours on arteries, diagnosis of, from aneurisms, 141.
Ulnar artery, aneurism of, 316.
Union by second intention, disadvantages of, when an artery is tied, 443; of lips of incision recommended after operation for aneurism, 454.
Utility of cases, 57.
Valsalva, case by, 235; treatment recommended by, 239; treatment by, 261.
Valves of heart affected with bony deposit, 63; with cartilaginous deposit, 64; ossification of, 99.
Varicose aneurism, 107; case of, 162, 164, 339; memoirs on, 160, 171, 173, 174.
Varieties of brachial artery, their influence on the operation for aneurism, 230.
Varix, diagnosis of, from aneurism, 2.
Veins of heart subject to aneurism, 62; pulmonary, aneurism of, 68; jugular, pulsation in, 69, 77; may be ligatured with safety, 455.
Vena cava, polypous mass in, 100.
Venereal orgasm causes aneurism of heart, 67.
Ventricle, rupture of, 151.
Vesalius, case by, 241.
Vitriol, use of, in hemorrhage, 258; button of, frequently occasions fatal hemorrhage, 204.
Weakening of arteries, Hunter's and Haller's experiments, 388.
Weakness of arteries cause aneurism, 23; innate, of arteries, 47.
White, memoir by, 171.
Willis, 66.
Wilmer, remarks by, 354; recommends amputation in popliteal aneurism, 357.
Wiseman on aneurism, 11; deprecates puncturing abscesses, 200; on treatment of aneurisms, 194.
Wound of femoral artery, 191, 348, 409.
Wounds of brachial artery, direction of, 335.
Zacchias, case by, 26.

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