

## **The treatment of aneurism / by W.H. Van Buren.**

### **Contributors**

Van Buren, W. H. 1819-1883.  
Bryant, Thomas, 1828-1914  
Royal College of Surgeons of England

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E [library@wellcomecollection.org](mailto:library@wellcomecollection.org)  
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# REATMENT OF ANEURISM.

BY

W. H. VAN BUREN, A.M., M.D.,

PROFESSOR OF THE PRINCIPLES AND PRACTICE OF SURGERY IN THE BELLEVUE  
HOSPITAL MEDICAL COLLEGE, NEW YORK, CONSULTING SURGEON TO THE  
NEW YORK HOSPITAL, TO THE BELLEVUE HOSPITAL, ETC.

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EXTRACTED FROM THE TRANSACTIONS OF THE  
INTERNATIONAL MEDICAL CONGRESS,  
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## THE TREATMENT OF ANEURISM.

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IN seeking for information concerning the medical and surgical treatment of aneurism, we find by far the most ample experience in the records of English surgery. Breschet, in his well-known memoir on aneurism, published in Paris in 1832, frankly admits that the pathology of this disease had received more attention in England than in France, because of its greater frequency in that country.<sup>1</sup> The greater frequency of aneurism in the British Islands than elsewhere still exists; and, unless we accept the suggestion that it is the result of the more general use of beer and spirits in those countries, I must follow Breschet in ignoring its cause. Although our own country has been singularly prominent in the boldness and success of operations upon the great arteries for aneurism, yet the disease is not so frequent here as in England, and at the same time spirit-drinking is very common. On the continent of Europe, where the consumption of spirits is less general, aneurism is comparatively rare. In connection with the etiology of the disease it is to be remarked that the weight of opinion in favor of syphilis as a cause of aneurism is noticeably less than formerly.

In the very able lectures on the treatment of aneurism delivered in 1872, 1873, and 1874, by Mr. Timothy Holmes, as Professor of Surgical Pathology in the Royal College of Surgeons of London, he states that, in collecting his materials, he addressed letters to more than thirty hospital surgeons throughout Great Britain and Ireland, and that he received notes of no less than three hundred and thirty-seven cases of aneurism, in reply, covering ten years of practice. Mr. Holmes complains, moreover, that the pathological museums of London alone are so overstocked with material that it is difficult to master their contents, whilst the bulk of published matter outruns the best efforts of any one inquirer to keep up with it. Such recent and ample supply of material bearing on our subject leaves little scope for further research, and the evident ability shown in its collation and digestion gives these lectures great value. Since Guthrie lectured on this subject from the same chair more than forty years ago, we have had nothing more judicial and authoritative. I shall, of necessity, draw largely from them in this report.<sup>2</sup>

The purely medical treatment of aneurism, more especially of internal aneurism, has risen into greater importance within the past ten years. Mr. Jolliffe Tufnell, of Dublin, has fairly and ably demonstrated the posi-

<sup>1</sup> Mémoires de l'Académie de Médecine de Paris, t. iii.

<sup>2</sup> It is to be regretted that Mr. Holmes's eighteen lectures "on the medical and surgical treatment of aneurism in its various forms" are only accessible in the pages of the journals in which they were reported at the time, without any copies of the drawings, or tables, or pathological preparations by which they were illustrated. They are too valuable to the profession not to be reproduced in a more permanent form.

tive value of absolute repose in the horizontal position, conjoined with greatly restricted diet, omitting entirely the frequent bleedings which had brought the so-called treatment of Valsalva into disfavor. Mr. Tufnell's successful results certainly justify the systematic enforcement of his method, especially in cases of thoracic and abdominal aneurism, which we are too much in the habit of regarding as incurable. "The method I advocate," says Mr. Tufnell, "is the imitation of nature's cure; the production artificially of that consolidation which in isolated cases has from time to time occurred spontaneously." The recumbent position is the secret of cure, *but it must be steadily maintained*. It places the same check upon the circulation in internal aneurism which in external cases is produced by mechanical appliances. Three months of horizontal position with eight ounces of solid food and six ounces of fluid as daily allowance were the measures with which he cured Doyle, a hackney coachman of thirty-five, with an abdominal aneurism as large as an orange.<sup>1</sup> Tufnell's method is legitimately derived from the principle so ably illustrated by the Irish surgeons when they established the value of compression as a remedy, the principle originally demonstrated by Hunter, that to produce coagulation in an aneurismal sac it is only necessary to slow its current of blood, not to arrest it entirely; and, in the judgment of the writer it is destined hereafter to play a prominent part in the therapeutics of aneurism.

The aid of drugs has been also invoked in the medical treatment of aneurism for the purpose of slowing the action of the heart and favoring coagulation; digitaline and ergotine have been used by Albertini; and Langenbeck has made trial of ergot in subcutaneous injection. Acetate of lead has also been used internally. I have met with little evidence in their favor. A case of orbital aneurism is reported by Dr. Holmes, of Chicago, which got well after six weeks' use of tincture of veratrum viride in doses of five minims, with a fluidrachm of extract of ergot, suggested by the late Professor Brainard.<sup>2</sup>

In a recently published work Dr. Balfour brings forward further evidences of the value of potassium iodide in causing solidification of internal aneurism.<sup>3</sup> This remedy has been tested by the profession, and there are favorable reports of it.<sup>4</sup> In many instances, however, the recumbent position and restricted diet have been employed at the same time with the iodide. In aneurism in a syphilitic subject its use would be indicated. Pretty certainly the iodide in such a case would increase the number of the red globules of the blood, as Keyes has observed to be the case under the use of small doses of mercury, and, possibly, also, its fibrinating power.<sup>5</sup> Until we gain more accurate knowledge of the caus-

<sup>1</sup> The Successful Treatment of Internal Aneurism by Consolidation of the Contents of the Sac. By Jolliffe Tufnell, F.R.C.S.I., etc., President of the Royal College of Surgeons of Ireland, etc.; 2d edition, London, 1875.

<sup>2</sup> Amer. Journ. of Med. Sciences, July, 1864.

<sup>3</sup> Clinical Lectures on Diseases of Heart and Aorta; London, 1876.

<sup>4</sup> See case of cure of aortic aneurism in a woman of thirty-five, attributed to doses of iodide of twelve to fifteen grains three times a day for several months, by Dr. T. M. Matthey of Texas, in Amer. Journ. Med. Sci. for January, 1875, and others. Mr. Annandale, Edinburgh, from "repeated observation," bears testimony "to the value of the iodide in relieving the symptoms and promoting coagulation in this disease." Brit. Med. Journ., Oct. 30, 1875, p. 550.

<sup>5</sup> On the Effect of Small Doses of Mercury in modifying the number of the Red Blood Corpuscles in Syphilis, a study of Blood-counting with the Hématimètre; by E. L. Keyes, M.D., etc.; New York, 1876.

which modify the quality or quantity of its fibrin, the mode of action of drugs in favoring coagulation of the blood must remain obscure.

The *ligature*, as applied by Hunter, maintains its character in a general way as the most prompt and certain of the surgical remedies for aneurism, and, when not employed in the first instance, it is always held in reserve as a final resort in all cases to which it is applicable; but safer methods of cure are constantly being sought for in order to escape the dangers which are still inseparable from the use of the ligature, viz., hemorrhage, gangrene, and inflammation of the aneurismal sac.

The ligature of carbolized catgut prepared by Professor Lister's method offers the best promise, at this time, as a preventive of secondary hemorrhage. Bickersteth, of Liverpool,<sup>1</sup> Pemberton, of Birmingham, Heath, Maunder and Holmes, of London, besides Professor Lister himself, certain of his colleagues of the Royal Infirmary of Edinburgh, and others, have recorded evidence that the carbolized catgut ligature is competent to constrict an artery for a sufficient time to bring about the consolidation of an aneurism without causing ulceration of its coats. After this duty has been accomplished the substance of the ligature then softens into a mass which is, as it seems, capable of serving as a nidus for cell-growth, and, having excited no suppuration whatever, the catgut becomes finally identified with the surrounding tissues.<sup>2</sup> Thus, after such a ligature has been applied, both of its ends may be cut off and the wound closed as for quick union. This latter result is more likely to be attained, according to Professor Lister, when the operation is done under carbolized spray, and the wound dressed according to the antiseptic method. The Edinburgh surgeon expresses his readiness to ligate the innominate artery by this method, believing confidently that the vessel will be obliterated with greatly diminished risk of suppuration and ulceration, and with increased chances of rapid consolidation of the wound.<sup>3</sup> A double surety would be thus obtained against secondary hemorrhage.

It is proper to state, however, that some instances have been recorded

<sup>1</sup> An Introductory Address on Recent Progress in Surgery, delivered at the Liverpool Medical Institution, Liverpool, 1871, p. 20.

<sup>2</sup> Observations on the Ligature of Arteries on the Antiseptic System, by Joseph Lister, F.R.S., etc., *Lancet*, April 3, 1869, p. 451. More recently, Professor Lister's statements have been confirmed by Mr. Fleming, Lecturer on Physiology in the Glasgow School of Medicine, in a very conclusive series of experiments on dogs and rabbits, reported in the *London Lancet*, May 27, 1876, p. 771. Mr. F. says: "The results of these experiments show that a gradual softening takes place from without in, the catgut breaking down and becoming infiltrated with cells, probably leucocytes. This part of the process takes from five days to about twenty, varying with the specimen of catgut, the tissue amongst which it is situated, and the age and vitality of the animal. Next the pultaceous mass into which it has been converted, begins to metamorphose, and is soon permeated with blood channels, and ultimately may be described as a cast of the catgut, in a kind of granulation tissue freely supplied with bloodvessels, which in many of my sections are very fully injected.

"If, then, we admit these conclusions, we can easily account for the different results obtained by the use of catgut in different hands. We see that it is in reality merely a temporary ligature, because when in the softened stage we cannot consider it to have any constricting effect.

"Whether, then, this temporary condition lasts long enough to produce embolic occlusion of the vessels, depends upon the sample of catgut and the vitality of the patient.

"In conclusion, my experiments seem to demonstrate that an aseptic, dead, foreign, animal body may under appropriate conditions become, by a process of softening, absorption, and re-deposition, changed into or replaced by a living, vascular, and comparatively highly organized, animal structure."

<sup>3</sup> Holmes's Lectures on the Treatment of Aneurism, ut supra, *Lancet*, June, 1872.

in which the catgut ligature has become prematurely soft, and pulsation has returned in the aneurism; and in which, when the wound has not united, secondary hemorrhage has occurred.<sup>1</sup> The answer has been made that in these cases of failure the catgut may not have been well prepared, and that the necessary details of the antiseptic method were possibly neglected.<sup>2</sup>

Meanwhile, those who, like Mr. Maunder, lack confidence in the catgut ligature, have reverted to the use of carbolized silk, which was employed by Professor Lister before he adopted the catgut; and it has been found in several reported cases to answer the same purpose. There is no danger that the carbolized silk ligature will give way, but Lister had reason to suspect that it might provoke suppuration, and therefore preferred the catgut.<sup>3</sup>

The problem is to discover a mode of preparing catgut ligatures so that they shall possess first the right amount of strength and durability when exposed to soakage in the tissues, and at the same time that their very desirable quality of disappearing by blending with the tissues shall not be impaired. Professor Lister has just announced to us that he has reason to believe that he has succeeded in solving this problem, which has cost him so much labor. By this event surgery will have secured a great triumph over the danger of secondary hemorrhage after ligature of the great arteries for aneurism.

*The employment of pressure upon an artery previous to its ligature* has been heretofore regarded as a means of averting the danger of gangrene, which, according to Norris, causes 12.2 per cent. of all the deaths after ligature of large arteries for aneurism.<sup>4</sup> As early as 1820, Todd, of Dublin, had practised compression as a preparatory course prior to operation "in order that mortification of the limb might be prevented by allowing some progress to be made in establishing the collateral circu-

<sup>1</sup> My late colleague, Dr. Krackowizer, used a carbolized catgut ligature upon the primitive iliac artery for aneurism at the German Hospital, New York, and pulsation returned in the tumor within twenty-four hours, rendering it necessary to reopen the wound and apply another ligature. Similar cases are recorded by Dr. E. Watson, of Glasgow, in the Glasgow Med. Journ., May, 1870, p. 340; by Professor Spence, of Edinburgh, in the Lancet, June 5, 1869; by Mr. Holden, in St. Bartholomew's Hosp. Reports, vol. viii. p. 187; by Mr. H. L. Browne, Lancet, May 6, 1876; and by Mr. Maunder, in Surgery of the Arteries, London, 1875, p. 147, where the results of ten cases of "antiseptic" ligature are detailed, some of which are favorable, and others the reverse.

<sup>2</sup> It is only fair and just to Professor Lister that when the remedy he has proposed is under judgment, the conditions under which he employs it, and on the strength of which he recommends it, should be strictly complied with.

<sup>3</sup> Careful microscopic examination of the tissues around a loop of prepared silk which had successfully obliterated an artery, after rapid healing of the wound, in one of the lower animals, has shown as a rule the persistent presence of portions of the substance of the silk, which have been found in several instances surrounded by granulation tissue in process of organization along with some pus corpuscles, proving that silk does not become entirely blended with the tissues, and does not so readily lose its identity as the properly prepared catgut. Lister, *ut supra*.

In a recently published clinical lecture at the Royal Infirmary, Glasgow, Dr. Eben Watson describes a patient in whom he had tied both external iliacs for inguinal aneurism at an interval of nine months. Both operations were done under carbolic spray, carbolized silk ligatures applied, and then cut off. The wounds healed well, and the ligatures were never heard of. Dr. W. gives evidence for his belief that they became encapsulated. He prefers them to catgut, which, for reasons derived from his own experience, he considers less safe than silk. Lancet, Aug. 12, 1876, p. 213.

<sup>4</sup> Contributions to Practical Surgery, Philadelphia, 1873. In one hundred and eighty-eight cases of ligature of large arteries for aneurism, gangrene occurred in thirty-one, and was the cause of death in twenty-three.

lation."<sup>1</sup> This idea has been effectively disputed recently, by Mr. Holmes, who, controverting certain conclusions arrived at by Mr. Jonathan Hutchinson, asserts that the larger experience contained in his (Holmes's) collected table of hospital cases leads to precisely the opposite conclusion, viz., *that the mortality from ligature, after compression has failed, is 10 per cent. greater than when the Hunterian operation has been performed at once.*<sup>2</sup>

Mr. Clement Walter tied the external iliac, at St. George's Hospital, for inguinal aneurism, after six weeks' trial of pressure, both distal and proximal, as well as flexion, without avail, and the patient died in four days with incipient gangrene.<sup>3</sup> It is well known, also, that pressure, especially if intermittent, or irregularly applied, is liable to provoke inflammation of the sac; and that it is possible, in rare instances, for pressure itself, alone, to occasion gangrene, as in a case recently reported by Dr. Oscar H. Allis, of Philadelphia.<sup>4</sup> These facts should teach us, when it is decided to try compression, to use all possible means to command prompt success, and, these failing, *not to prolong unavailing efforts.*

The prestige acquired for the Hunterian operation by the brilliant successes of Astley Cooper, Abernethy, Travers, Mott, and others, caused the ligature to be regarded, during the first half of this century, as the remedy above all others for all forms of aneurism, wherever its application was possible; and it continued to be so regarded, in spite of its really high mortality, until the feasibility of a safer cure by compression was established by the Dublin surgeons. After it became an established fact that the disease was safely curable by compression, numerous other devices were proposed to attain the same end to the exclusion of the ligature, and of compression also; some of greater, others of less promise, but mainly of a bloodless and safer character. These methods, after a few remarks on compression, I propose to enumerate.

Meanwhile, it seems to me profitable to ask ourselves how far English and American surgeons may have carried a partiality for Hunter's operation to excess, and tied arteries for aneurism in cases in which other methods might have offered a better chance for life? That this has been the case in some degree we have the authority of Syme, of Edinburgh, undoubtedly one of the greatest operators of his day. Towards the close of his life, this surgeon formally raised the question as to the applicability of Hunter's operation to axillary and iliac aneurisms, after having advocated it, as he states, for thirty years. After a series of operations upon the greater arteries, unequalled in brilliancy and success, he felt himself justified in asserting that "aneurisms of the popliteal, femoral, and carotid arteries alone are proper subjects for ligature by the Hunterian method," and that all other aneurisms are more safely treated

<sup>1</sup> Practical Remarks on the Treatment of Aneurism by Compression, with plates of instruments, etc., by Jolliffe Tufnell, M.R.I.A., etc. etc., Dublin, 1851, p. 24. Tufnell here quotes Todd, who adds, "at the same time *not altogether without hope* that by diminishing the current of blood in the trunk of the artery so as to favor coagulation of the blood in the sac, a cure without operation might be effected." This is interesting as showing that the idea of cure by compression was still fairly in view at this early period.

<sup>2</sup> Lecture iv., part i., 3d series, Lancet, July, 1874. The probability of this conclusion had been already demonstrated by Dr. J. Ashhurst, Jr., in his System of Surgery, Phila., 1871, p. 543.

<sup>3</sup> St. George's Hospital Reports, vol. vi., 1871-72.

<sup>4</sup> In a robust colored man of 50, with a recent popliteal aneurism, a cure was effected on a second attempt at compression in thirteen hours. Gangrene appeared in the foot and leg on the next day, and the patient died in eight days. Dr. Allis states that he has found one other case of gangrene after pressure. Trans. Path. Soc., Phila., 1874, vol. iv. p. 117.



by the old operation of laying open the sac.<sup>1</sup> After careful study of his very interesting cases, it is difficult to refuse a large share of assent to Syme's conclusions. Even if we cannot admit his premises, which have been shown to be untenable by Holmes and Henry Lee, and refuse to return formally to the "old operation," preferring to trust to the medical treatment of Tufnell, or to the promises held out by galvano-puncture, coagulating injections, the manipulation of Fergusson, distal ligature in one of its new applications, or even to some form of compression—which Syme, through what Holmes calls a "strange prejudice," so singularly undervalued—nevertheless, the terrible mortality of the Hunterian operation in subclavian, axillary, and iliac aneurisms demonstrates clearly that the Edinburgh surgeon was right in raising the question of its applicability to these cases. "The Hunterian operation on the innominate," says Holmes, "and upon the first part of the subclavian, gives twenty-eight cases, in only one of which did the patient survive, and then after repeated attacks of hemorrhage—a ghastly record of death and blood."<sup>2</sup> The ligature of the second and third parts of the subclavian for aneurism is also very unpromising; Mr. Poland gives us twenty-one cases, of which only nine recovered.<sup>3</sup> In consequence of the pushing up of the clavicle by the growing tumor, ligature of the subclavian in its third portion for aneurism is often difficult, sometimes impossible, and always dangerous. Dupuytren abandoned it on one occasion, after persevering for an hour and a half, asserting that it was the most difficult operation he had ever undertaken; and Liston punctured the aneurismal sac in carrying his ligature around the vessel, and lost his patient.<sup>4</sup> On the other hand, in two cases of rapidly advancing axillary aneurism, Syme limited himself to dividing the tissues at the root of the neck so as to permit a finger to be introduced to compress the artery against the first rib, and then he laid open the tumor in the axilla and tied the vessel as it entered and again as it left the sac, and in both instances saved his patient. In two cases of axillary aneurism of a still more desperate character, he succeeded in saving the patients by amputation at the shoulder-joint after the ligature had failed; and Mr. Spence adopted the same mode of procedure, at least with temporary advantage, in a case of subclavian aneurism.<sup>5</sup>

Now, granting that Syme has demonstrated that laying open an aneurism is a safer and more certain mode of cure than the Hunterian ligature in these localities and others similarly situated, where pressure can be momentarily effected between the tumor and the heart, does not this success also prove that it is feasible to attempt a cure, perhaps at an earlier period, by galvano-puncture, or coagulating injections?—for it is in cases in which the circulation can be thus suspended that these novel and ingenious remedies offer the best prospect of successful application.

<sup>1</sup> On the Treatment of Axillary Aneurism, *Med.-Chir. Trans.*, vol. xliii. p. 142. See also another paper in vol. xlv. of the same Transactions.

<sup>2</sup> This includes thirteen cases of ligation of the innominate, and fifteen of the subclavian. Holmes, *ut supra*, Lect. iv., part ii., 1st series, 1872.

<sup>3</sup> Statistics of Subclavian Aneurism, by Alfred Poland, *Guy's Hospital Reports*, vols. xv., xvi., xvii.

<sup>4</sup> Surgeon Otis, of the U. S. Army (in *Medical and Surgical History of the Rebellion*), gives 76 per cent. of deaths for ligature of the subclavian outside of the scaleni, mainly for hemorrhage or traumatic aneurisms after gunshot wounds, however. In my table of eighty-six cases of the same operation for all causes, the deaths were nearly 40 per cent. *Contributions to Practical Surgery*, Phila. 1865, p. 194.

<sup>5</sup> See Mr. Poland's paper in *Med.-Chir. Trans.*, vol. lii. p. 277.

In thirty-two cases of ligature of the primitive iliac, tabulated by Dr. Stephen Smith, of New York, the operation was done for aneurism in fifteen, in which ten died, and one only, Mott's patient,<sup>1</sup> was permanently cured.<sup>2</sup>

Whatever value, therefore, may be ultimately assigned to the operation of Hunter elsewhere in the arterial system, it seems clear that, in these localities at least, it has proved neither safe nor reliable, and cannot be so regarded in future.

For gluteal aneurism, the Hunterian operation is equally unpromising. Holmes, who studied this subject thoroughly two years ago, succeeded in collecting but twelve cases in which the disease was considered spontaneous, and for which the internal or common iliac had been ligated; of these five, or nearly half, died.<sup>3</sup> On the other hand, there were twenty-one cases in which the affection was pretty certainly traumatic; in two of these the Hunterian operation was done—one of them the case of Dr. Bigelow, of Boston—and both ended fatally. To these I can add an unpublished case I witnessed in the Bellevue Hospital, New York, some years ago, in which ligature of the internal iliac was undertaken, but the patient died within a few days, as was supposed, from wound of the iliac vein. There are several other cases on record in which the same cause of death is noted, showing the difficulties which attend the ligature of this vessel.

In summing up his conclusions concerning gluteal aneurism, Holmes hardly shows his usual surgical acumen. He says: "The old operation by laying open the sac and tying the vessel, is a desperate business, and in spite of the really considerable amount of success which has attended it, no prudent surgeon could contemplate it without repugnance." Now, if the success of the old operation in gluteal aneurism has been "really considerable," as could be readily shown if time permitted, is not this conclusion rather sentimental than surgical? The affection is undoubtedly, in the great majority of cases, traumatic in its origin, and the treatment demanded is that of a wounded artery, whenever practicable. Syme succeeded by laying open the sac, following the lead of John Bell in his famous case of the leech catcher. Mr. Bickersteth, of Liverpool, and others, have been also successful in a similar mode of procedure. The source of fatal delay in quite a number of cases has been the fear of uncontrollable hemorrhage, and lack of power to command it. This risk, in the hands of a less confident and skilful operator than Syme, is a great drawback, and it is certainly very desirable to find some safe mode of commanding the circulation in this locality. Lister's aortic clamp, as used by Syme in the case in which he successfully attacked an iliac aneurism by the old operation, is not free from danger of crushing the intestines and causing congestion of the kidneys, as proved by Mr. Bryant's fatal case at St. Bartholomew's.<sup>4</sup>

I have a suggestion to offer which seems to me feasible and effective,

<sup>1</sup> Phila. Journ. Med. and Phys. Sciences, vol. xiv. p. 176.

<sup>2</sup> Amer. Journ. Med. Sciences, July, 1860.

<sup>3</sup> Lectures, ut supra, June, 1874.

<sup>4</sup> This was an attempt to cure an aneurism of the aorta very near the diaphragm by means of distal pressure. Holmes's Lectures, ut supra.

Mr. Geo. Pollock, in trying the rapid pressure treatment with Lister's compressor upon the aorta with chloroform for two hours and ten minutes, and again with ether for an hour and a quarter, was obliged to desist on account of faintness on each occasion. The attempt was also followed by hæmaturia which lasted for several days. He did not succeed. Trans. Clin. Soc. London, vol. vii. 1874.

and which I shall put in practice if I encounter one of these rare cases. In explorations of the rectum, after stretching the sphincter ani, where several fingers or the whole hand, after the suggestion of Simon, of Heidelberg, have been introduced into the bowel, I have been struck with the facility with which the great arteries of the pelvic cavity could be felt by the fingers, and compressed against its bony walls; and I am confident that either the external or internal iliac or their common trunk could be thus easily commanded long enough to render it a safe operation to lay open a gluteal aneurism and secure the artery involved, if external to the pelvis. All that is necessary is a reliable assistant with a small hand, who is somewhat familiar with the manœuvre.<sup>1</sup>

If, possibly, a gluteal aneurism should take its origin within the pelvis, emerging through the sciatic opening, this fact might be also ascertained by rectal examination, as already advised by Holmes; and at the same time, carrying the exploration a little further, the feasibility of commanding the circulation through the tumor by digital pressure from the rectum could be determined. In this latter event, to attempt a cure by *distal* ligature would involve less risk to life than the operation of tying the internal or primitive iliac.

I would therefore venture the conclusion, in view of the uncertainty of diagnosis of gluteal aneurism and its generally slow progress, together with the great probability of its traumatic origin and the ascertained difficulty and risk to life of the Hunterian operation, that its employment, in this variety of aneurism, is of doubtful propriety.

Ligature of the external iliac for inguinal and femoral aneurism, in ninety-seven cases collected by Norris, gave twenty-six deaths, or a mortality of about twenty-seven per cent., a comparatively good result, and equal to that attained by compression; so that judging from mortality alone, there is little choice in these localities between the two methods.

According to Holmes's table of cases, the same general conclusion will apply to popliteal aneurism.

Owing to the number and size of the branches given off by the common femoral artery, relapse of aneurism has occurred quite frequently at the groin after obliteration of the external iliac artery, whether by ligature or compression, and this is an argument in favor of the old operation in this locality. It is certainly to be preferred in cases of relapse, and after the failure of flexion, to ligature of the primitive iliac, as Mr. Annandale, of Edinburgh, decided in a case which he has treated successfully within the year by laying open the sac.<sup>2</sup>

The *distal* application of the ligature for the cure of aneurism, as proposed originally by Brasdor, and executed successfully half a century later by Wardrop, after having been for a long period regarded with distrust, is again finding favor. In the well known case of Lambert, it produced a cure of an aneurism confined to the root of the primitive carotid.<sup>3</sup> At the suggestion of Dr. Cockle, of London, Mr. Christopher Heath, in a case of aneurism of the arch of the aorta involving the origin of the left carotid, recently ligated the latter vessel, and the operation

<sup>1</sup> I have since learned that this idea had already been conceived and placed on record by Dr. Frank Woodbury, Resident Physician at the Pennsylvania Hospital. *Am. Journ. Med. Sciences*, Jan. 1874, p. 131.

<sup>2</sup> Double femoral aneurism treated with success by rapid compression; return of one aneurism; ligature of external iliac, unsuccessful; cure by laying open the sac. *Lancet*, April 22, 1876, p. 297.

<sup>3</sup> Wardrop, on Aneurism, London, 1825, p. 36.

was followed by shrinking of the aneurismal tumor and decided benefit in relief of symptoms.<sup>1</sup> Mr. Annandale, of Edinburgh, tied the right carotid in a case of aortic aneurism, in March, 1875, and, as I recently learned from him, his patient is still living, and the disease is apparently arrested.<sup>2</sup>

After having failed in four cases of subclavian aneurism, the *distal* ligature has at last been crowned with success in the hands of Prof. Toland, of San Francisco, California. In January, 1874, a miner presented himself with an aneurism as large as his fist, extending from the inner border of the left sterno-mastoid to the anterior border of the trapezius. Two ligatures were applied to the third portion of the subclavian; they came away on the twentieth day. Pulsation in the tumor was perceptibly lessened immediately after the ligature, and gradually decreased up to the sixth week from the date of the operation, after which no pulsation or bruit could be discovered.<sup>3</sup>

Of innominate aneurism there are instances enough on record in which benefit has followed the obliteration of one or both of the branches of this great trunk to warrant Holmes's conclusion that "there are some cases of this disease in which the distal operation is not only allowable, but imperative." Although there are only three cures reputed certain (the cases of Fearn, Evans, and Morrison), of the forty-three he has collected of distal ligature for supposed innominate aneurism, yet the favorable consequences of the operation recognized in studying the individual cases leave a far more favorable impression on the mind than this bare statement would convey. In several of the unsuccessful cases, for example, decided relief to dyspnoea, and to other symptoms, followed ligature of the carotid.

In fact, in a case in which operative interference is decided on, our present experience points to ligature of the right carotid in the first place, as the most judicious course; and to the subsequent consideration of the question of tying the subclavian, and at what part of its course.

Any tendency to spontaneous obstruction of either branch of the innominata should be most carefully sought for, as this "would be a first and grand step towards a cure of the disease."<sup>4</sup> Since Holmes wrote, the double simultaneous ligature, which has never yet succeeded, has been done on a Hottentot in South Africa by Mr. Frederic Ensor; the patient survived more than two months, and died from bursting of the sac.<sup>5</sup> And in another case by my colleague Dr. R. F. Weir, of New York, whose patient did not survive so long.<sup>6</sup>

<sup>1</sup> Dr. Cockle, "Med. Soc. Proceedings," vol. i. p. 5, and Heath, "On the Treatment of Intrathoracic Aneurism by Distal Ligature."

<sup>2</sup> British Med. Journ., Oct. 30, 1875. The patient was a man of sixty-two.

<sup>3</sup> Western Lancet, July, 1874. Abstract in Amer. Journ. Med. Sci., Oct. 1874.

<sup>4</sup> Surgery of the Arteries. Lettsomian Lectures of the Medical Society of London, 1875, by C. F. Maunder, Surgeon to the London Hospital, p. 25. He refers in this connection to the striking case of Dr. Herbert Davies, in the London Hospital Reports, 1864, vol. i. p. 50, in which the subclavian and its branches were already occluded, so that ligature on the carotid would have completed the cure.

<sup>5</sup> Lancet, Feb. 6, 1875.

<sup>6</sup> In a most interesting case, published within a few days, of an aneurism of the aorta projecting at the root of the neck on the right side and simulating innominate aneurism, Dr. S. Fleet Speir, of the Brooklyn City Hospital, Brooklyn, New York, obliterated the right carotid by his invaginating "constrictor," and forty-eight hours later applied a silk ligature upon the third portion of the right subclavian. Immediate shrinking of the aneurismal tumor and relief to symptoms followed each of the operations; but inflammation of the sac, taking its origin at the subclavian ligature, with subsequent hemorrhage from this

If the promise offered by the carbolyzed catgut ligature of Lister, or by the methods of Howard or Speir, be fulfilled, we shall be justified in applying these to the subclavian in the first part of its course. When this can be accomplished successfully, the distal treatment of aneurism of the innominate and also of the aortic arch—in certain cases—will be established as a more hopeful resource to which the sufferer from these formidable affections will be entitled, hereafter, when milder means have failed.

It will be more profitable, perhaps, in connection with the distal treatment of subclavian aneurism, to refer to the recent case in which Prof. Warren Stone, of New Orleans, succeeded in curing a traumatic aneurism involving the second division of that artery by distal pressure applied by the fingers upon its third portion where it crosses the first rib. Its interest will justify a glance at the details of this unique case, for it not only illustrates further the value of the distal treatment of aneurism by ligature, but also that of compression. A healthy man of twenty-five was wounded, in April, 1874, by a pistol ball which entered immediately above the left clavicle, near its inner extremity, and passed downwards and backwards, lodging under the skin at the posterior margin of the scapula. There was great pain, and partial paralysis of the arms, showing lesion of the brachial plexus of nerves, but only a trifling amount of hemorrhage. At the end of six weeks an aneurismal tumor the size of an egg had formed at the cicatrix of the wound, and was steadily increasing. It was attributed to a bruise of the artery at the summit of its convexity. Digital compression by a relay of competent assistants was begun on the 15th of June, 1874, and continued for thirty-nine hours, when the skin began to suffer, and the patient was exhausted. The tumor was reduced to one half its original size, was much harder, and feebler in its pulsations. It continued to diminish and to grow harder from month to month. About the middle of March, 1875, all pulsation had disappeared, and up to the present date it has not returned. The tumor is now as hard as a marble, and quite as small.<sup>1</sup>

This is the only recorded case I have been able to find in which a subclavian aneurism has been cured by distal pressure.

Since the Dublin surgeons re-introduced compression as a remedy for aneurism, and established its value on a permanent basis, it has steadily

point, produced a fatal result in the fifth week. At the post-mortem examination the aneurismal tumor, which sprang from the aortic arch by a narrow opening, was found filled entirely by a "solid mass of coagulated fibrin." The "constrictor" had obliterated the carotid successfully, and the wound had closed perfectly by quick union. See Archives of Clinical Surgery, New York, Sept. 1876, p. 96.

<sup>1</sup> A case of traumatic aneurism of the left subclavian artery treated successfully by distal compression, by Warren Stone, M.D., Professor of Surgical Anatomy, Charity Hospital Med. Coll., New Orleans, from the New Orleans Medical and Surgical Journal, July, 1875. In a private note, under date of May, 1876, Dr. Stone kindly adds the following details to the published case: "I examined the patient a few weeks ago in company with my friend Dr. Choppin. We found a mere remnant of the tumor, with not a particle of pulsation in it. But there was evidence that blood had found its way through the main trunk of the artery (probably by way of the subscapularis), for, by pressing it against the first rib, radial pulsation was arrested, as on the other side of the body." Dr. Stone also adds this interesting fact, since published by Dr. S.: "In Dr. Smyth's successful case of ligature of the innominate—which was also traumatic in its origin—notwithstanding all direct current was cut off, as well as the distal flow through the carotid and vertebral, the sac eventually filled again (taking ten years it is true), suppurated, bled, and caused the patient's death. Post-mortem examination showed that it was principally supplied by the subscapular branch of the axillary."

advanced in the favor of the profession, and has attained new methods and a wider range of application. At first the process was slow, intermittent, painful, accomplished only by mechanical contrivances, and uncertain in its results. Now, thanks to our countryman, Knight, of New Haven, and to the Italian surgeon, Vanzetti, who have taught us the advantage of accurate compression by the fingers, and thanks also to the American discovery of anæsthetics, we are often able to cure aneurism by compression in a few hours. The method has been extended from the femoral, to which it was at first confined, to the largest arteries; where the ligature has failed, it has succeeded; an aneurism of the abdominal aorta has been cured in five hours by compression applied to that vessel; another in ten and a half hours; and an iliac aneurism in five hours of aortic compression—all under anæsthetic influence.<sup>1</sup> The fatal case of Mr. Bryant, of St. Bartholomew's, of rapid aortic compression, in which the patient died of peritonitis,<sup>2</sup> and a similar case of Mr. Maunder, at the London Hospital, in which death occurred suddenly at the fourth hour, apparently from the effects of chloroform,<sup>3</sup> warn us as to the direction in which danger lies. Nevertheless, Mr. Holt has cured an abdominal aneurism at the Westminster Hospital, London, after fifty-two hours' pressure under chloroform.<sup>4</sup>

At first employed only indirectly upon the artery between the aneurism and the heart, compression has also been applied with advantage directly to the aneurismal tumor, as in a successful case of subclavian aneurism, recorded by Mr. Poland,<sup>5</sup> and another of femoral aneurism, cured by Dr. Buckminster Brown, of Boston.<sup>6</sup> In a solitary instance a subclavian aneurism has been cured by digital compression applied to the artery on the *distal* aspect of the tumor—the case of Prof. Stone, already cited; and, in not a few instances, both indirect and direct pressure have been used conjointly in the same case.

Perhaps the most remarkable cure of subclavian aneurism by pressure, is the case published last year by Dr. Tiffin Sinks, of Leavenworth, Kansas. A pistol ball at close range perforated and comminuted the clavicle, and, according to the best judgment of the surgeon, entirely divided the subclavian artery at the commencement of its third portion. The profuse discharge of arterial blood which the surgeon, who was present, saw welling up in a column of three-eighths of an inch in diameter to the perpendicular height of an inch, caused profound and death-like syncope; but the patient, a robust man of forty-six, unexpectedly rallied, and had no return of bleeding. The cylindrical opening through the bone, with its projecting spiculæ, seemed to have fixed the clot which formed during the syncope so firmly that it acted like a stopper, and the result was the formation of a circumscribed aneurism at the seat of injury. Although the pleural cavity slowly filled afterwards in consequence of internal leakage, showing that it also had been opened by the bullet, this ceased after a few days, and the pleural effusion was slowly

<sup>1</sup> An account of a case of aneurism of the abdominal aorta, which was cured by compression of that artery immediately above the tumor; by Wm. Murray, M.D., etc., Phys. to the Dispensary, Newcastle-on-Tyne, and Lecturer on Physiology, etc., *Med. Chir. Trans.*, vol. xlvii. Mr. Moxon cured a case in ten and a half hours, using Lister's aortic compressor under chloroform. *Med. Chir. Trans.*, vol. lv., 1872. Mr. Claudius G. Wheelhouse cured an aneurism of the external iliac by Lister's instrument applied to the aorta, in five hours, under ether. *Trans. Clin. Soc.*, vol. vii., 1874.

<sup>2</sup> Holmes's Lectures, *ut supra*.

<sup>3</sup> *Surgery of the Arteries*, *ut supra*, p. 11.

<sup>4</sup> *Trans. Clin. Soc.*, vol. vii. p. 56.

<sup>5</sup> *Med. Chir. Trans.*, vol. lii. p. 277.

<sup>6</sup> *Boston Med. and Surg. Journ.*, Oct. 21, 1875.

absorbed. The compound fracture went on to consolidate, and, strangely enough, the external wound closed entirely without any suppuration, which is ascribed to the fact that no compresses or plugs were at any time applied to it. Eventually a time came when diminution of the general swelling allowed pressure to be applied to the artery just at the outer border of the scalenus, by which the pulsation of the aneurism could be controlled. By the judicious use, at first of intermittent and later of permanent pressure at this point, conjoined with temporary pressure by a mass of lead modelled from a plaster cast of the parts, applied to the tumor itself, all swelling and bruit finally disappeared, so that at the end of three months the patient was able to take a trip to New York on business.<sup>1</sup>

In the form of *acupressure*—by needles, or by metallic wire, what Dr. Pirrie, of Aberdeen, styles “metallic pressure, removable at pleasure”—this remedy of systematic pressure has been subjected to various modifications for the purpose of curing aneurism. In one form it has been applied successfully as a wire compress to the carotid, and again, to the femoral, by Mr. Dix, of Hull, England.<sup>2</sup> Mr. George H. Porter, of Dublin, laid bare the innominate, and compressed it by an instrument of wire resembling a miniature lithotrite, hoping to obliterate the calibre of the artery without dividing its coats; but they ulcerated under the chafing and pressure, and the patient bled to death. I have seen the preparation from this case, and also the instrument. With the latter in a modified form, Mr. Robert Perssé White, of the Meath Hospital, has since cured an inguinal aneurism by compressing the external iliac.<sup>3</sup> Mr. W. Stokes, of the Richmond Hospital, has also applied Mr. Porter’s instrument, as perfected by himself, to the abdominal aorta so effectually as to stop accurately the current of blood through that great vessel without injury to its coats, but the patient perished from shock and incipient peritonitis.<sup>4</sup> Mr. Bickersteth, of Liverpool, has also failed in an attempt to obliterate the innominate by means of an apparatus of lead wire and caoutchouc.<sup>5</sup> The so-styled “constricting ligature” of our countryman, Dr. B. Howard, in which a loop of silver wire is applied around an artery so loosely as not to cut through its coats, may also be regarded as a variety of “metallic compression.” It is not removable at will, for the wound is closed over it as for quick union, with the belief—founded on experiment—that the little loop will be tolerated by the tissues, and become encysted, and that the inclosed vessel, which is not so tightly constricted as to cause ulceration of its coats, will nevertheless become permanently obliterated.<sup>6</sup>

<sup>1</sup> Medical Herald, Leavenworth, Kansas, Aug. 1875, p. 15.

<sup>2</sup> Two cases of aneurism, one of the carotid, and one of the femoral artery, treated by the wire compress, by J. Dix, M.R.C.S., etc. etc., in Brit. Med. Journ., August 28, 1875. Mr. Dix cuts down upon the artery, and introduces a strand of flexible iron wire beneath it in the usual way by the aneurism needles. Each end of the wire is then threaded to an ordinary needle, and brought out through the tissues by the side of, but clear of, the wound, which is then closed entirely as for healing by first intention. A piece of cork is then placed between the two points of emergence of the wire, and pressed down firmly upon the artery, and over this cork the wire is tightly twisted until the circulation is stopped. At the end of six or seven days the wire is withdrawn.

<sup>3</sup> Dublin Medical Press, November 24, 1875, p. 428. In this case, the artery is stated to have been compressed one hundred and sixty-two hours, and yet there was no ulceration nor hemorrhage.

<sup>4</sup> Dublin Quarterly Journ. Med. Sci., August, 1869.

<sup>5</sup> Holmes’s Lectures, ut supra.

<sup>6</sup> An Essay on the treatment of Aneurism by a new method, with experiments upon the closure of arteries. By Benj. Howard, M.D., late Prof. of Clinical Surgery, etc., from Transactions of Amer. Med. Association, 1870.

Dr. S. Fleet Speir, of New York, has also devised an ingenious artery compressor which can be applied upon the continuity of an artery, so as to divide the middle and inner coats, and then to invaginate the external coat of the artery within the tube of the constricting instrument to a sufficient extent to roll up the two inner arterial tunics into an impassable barrier equally efficient with that produced by the method of torsion. After this, the instrument is withdrawn, and the wound closed. This ingenious device has been successfully applied to the carotid three times, to the femoral and the brachial, each, once; in each instance it has caused obliteration of the artery, and, as Dr. Speir informs me, has in four cases caused a cure of aneurism.<sup>1</sup>

On the whole, the results of compression by metallic wire have not been very satisfactory in any of its modes of application, so that, at the time he wrote, Mr. Holmes felt justified in asserting that, for his part, whether Mr. Lister be right or no in saying that, with the carbolized catgut ligature properly applied, the ligature of the innominate will be found a safe proceeding, he, Holmes, would much prefer tying that vessel on this method to making any attempt at acupressure.<sup>2</sup> But, although he alludes to a case in which he used a wire ligature successfully, Mr. Holmes does not mention B. Howard's method.<sup>3</sup> In my judgment, we cannot afford to ignore this method of employing silver wire, for, in case the carbolized catgut ligature should in the end prove unreliable, it seems to me that Howard's suggestion, and the invaginating constrictor of Speir, hold out the best remaining promise of occluding an artery without dividing its coats.

But the most interesting case of metallic compression has occurred since the date of Holmes's lecture: it is that in which Mr. Arthur Ferguson McGill, of Leeds, succeeded in consolidating an aneurism of the left subclavian artery by means of a pair of ordinary artery forceps applied to its first division for ten hours. Unfortunately, in consequence of the anomalous position of the vessel, the pleura was wounded, and through this accident he lost his patient.<sup>4</sup> In this case the efficacy of

<sup>1</sup> See Arch. Clin. Surg., ut supra, pp. 96, 106, and 115; also New York Med. Journ., vol. xv., 1872, p. 175, "Successful application of Dr. Speir's artery-constrictor," by Dr. Chas. A. Hart; New York Med. Record, March 1, 1873, p. 102, and March 15, 1873, "The artery-constrictor, with cases, by Dr. Speir."

<sup>2</sup> Holmes's Lectures, etc., ut supra.

<sup>3</sup> Holmes says of this case, in which he tied the femoral artery for popliteal aneurism with silver wire, that it was "thoroughly satisfactory," the wound healing, though not without suppuration, in less than a fortnight. Nothing was seen of the ligature; and he believes that it "buried itself in the tissues of the vessel, and in all probability without having divided the continuity of the latter;" Lect. iii., Part i., 1st series, June, 1872. He also speaks of an experiment upon an ass, in which the carotid was obliterated and not divided, and adds a caution about not tying the wire too lightly, lest it cause ulceration.

<sup>4</sup> A case of left subclavian aneurism, treated by temporary compression applied directly to the artery in the first part of its course, with remarks; by Arthur Ferguson McGill, F.R.C.S., surgeon to the Leeds Public Dispensary, Med.-Chir. Trans., vol. lviii. p. 338, London, 1876. A woman of 35, with a left subclavian aneurism, had already been very decidedly benefited by four applications of galvanic needles, but she had resumed a laborious occupation and the tumor began to grow again, and the pain of the shoulder and arm which had been relieved by the galvano-puncture returned. The tumor had extended above the clavicle into the neck, and was approaching the surface. She was too poor to spare the time to try Tufnell's medical treatment, and refused amputation of the shoulder, which had been proposed in consequence of its partial success in Mr. Spence's case. Mr. McGill had no confidence in the distal ligature without amputation, and makes no mention of distal compression. He, therefore, proceeded to cut down upon the artery in the usual way, failed to find it in its usual place on following down the inner border of the scalenus anticus, but discovered it after a tedious search at the depth of his finger, "apparently through a layer



rapid pressure by a metallic substance applied directly upon an artery is indisputable, for the subclavian, in its first portion, was certainly obliterated without division of its coats, and, therefore, without danger of subsequent hemorrhage; and it may be fairly assumed that the aneurism would have been permanently cured, but for the fatal wound of the pleura.

This brings us to consider the propriety of attempting the ligature of the left subclavian in the first part of its course. Holmes briefly passes it over as an operation not likely to be again undertaken on account of its great difficulty, the danger of wounding the pleura, and, perhaps, because Sir Astley Cooper once relinquished an attempt to tie this artery through fear of wounding the thoracic duct. But Rodgers accomplished the ligature of the artery at the New York Hospital safely, without wounding either thoracic duct or pleura. Unfortunately, his ligature of silk cut through the walls of the artery, and his patient died in the third week from secondary hemorrhage. McGill, hoping to obliterate the artery by employing metallic compression in place of the silken thread, and thus to surmount this danger, felt justified in repeating the operation; and he succeeded in his object of safely obliterating the artery and avoiding the danger of hemorrhage; but, less fortunate than Rodgers, the anomalous position of the vessel led to the perforation of the pleura, and this accident caused the death of his patient.

Now, is the danger of wounding the pleura in this operation so unsurmountable as to forbid its repetition? This question must be answered, for if, in the future, it becomes certain that we may trust the carbolized catgut ligature (or even Howard's constricting loop of silver wire) to safely obliterate an artery without dividing its coats, then the risk incurred in laying bare the left subclavian would be the only remaining obstacle to its successful ligature. I feel confident that others will undertake this operation, under the lead of Rodgers, as McGill has done; and as neither of these excellent surgeons had any trouble from the thoracic duct, we have only the danger of wounding the pleura to provide against, and the other intrinsic difficulties of the operation.

My late valued friend, Dr. Charles E. Isaacs, after Dr. Rodgers's operation in 1845, "in order to improve our knowledge as to the relations of the pleura to the parts at the root of the neck," examined in a series of years no less than one hundred dead bodies most carefully in reference to this point of anatomy. He found that the pleura rises higher above the clavicle than is usually recognized by anatomists, averaging in his 100 cases nearly an inch and a half at its highest point, whilst in 23 out of the 100 it rose to two inches and upwards; and that both subclavians within the *scaleni* muscles are in contact throughout their whole length with the pleuræ. The reason why the pleura has not been more fre-

of pleura" which, in passing the needle around the vessel, was perforated. He then effected compression of the artery by means of a pair of ordinary torsion forceps, stopping effectually all pulsation in the tumor, and closed the wound. Three hours later the pulse was 130; respiration 44; and the air was rushing in and out through the wound as she breathed; but the artery was effectually compressed, and when, ten hours after its application, the compressing forceps was withdrawn in consequence of the patient's feeble condition, so that the wound could be entirely closed, the tumor was solid and pulseless. She died on the sixth day from intra-thoracic inflammation, just as death occurs from a perforating chest wound. The pleura contained a pint of bloody serum. The aneurism was filled with a hard firm clot; in fact it was cured. "The artery had been compressed just before the origin of the vertebral; it was patent, and in a perfectly healthy condition." (p. 341.)

quently wounded in tying the right subclavian in its first division is, he thinks, because the vessel is nearer the surface, and can usually be seen.<sup>1</sup>

Now, the surgeon, as he approaches the first division of the left subclavian from above and in front, as it rises almost perpendicularly from the aorta to arch over the dome of the pleura, unless he fully recognizes the facts brought out by Isaacs, and systematically pushes the serous membrane out of his way, just as we are compelled to raise the peritoneum in approaching the primitive iliac, must incur great risk of perforating it; but an accurate anatomist, keeping these relations of the pleura always in view, may, as Rodgers did, accomplish the operation safely.

In cases where an aneurism is seated near a joint, so that its pulsation can be arrested by maintaining the limb in a flexed position, this simple device continues to be successfully employed, as another variety of compression, under the designation of "the method by flexion," or "position." It has been used most frequently at the knee-joint for popliteal aneurism, but Dr. Gurdon Buck, at the New York Hospital, extended its application to a case of inguinal aneurism which he cured by flexing the thigh upon the pelvis. This was a case of relapse, such as is liable to occur in this region, the aneurism having returned sixteen months after a cure by compression. Pressure upon the external iliac did not arrest the returned pulsation; the vessel in fact had been obliterated. Its ligature, therefore, was out of the question, and the old operation seemed to be the only alternative, as in the similar case of Mr. Annandale already mentioned. Buck had observed, however, that extreme flexion of the thigh arrested the pulsation in the tumor, and he decided to employ this method. In about a fortnight solidification was nearly complete, and an entire cure shortly followed.<sup>2</sup> In a case of femoral aneurism treated first by compression, without result, and finally by ligature of the external iliac, Dr. Gay, amongst other devices to arrest the circulation, tried flexion of the thigh upon the abdomen, which controlled it completely; but it was abandoned in six hours on account of the pain. The parts had become tender under the previous digital and instrumental

<sup>1</sup> Isaacs, "on the extent of the pleura above the clavicle," in Transactions of the New York Academy of Medicine, vol. ii., part i., New York, 1857. Isaacs ascertained that in 100 subjects the pleura averaged 1.42 inches above the upper margin of the clavicle on the right side, and 1.23 on the left. It averaged higher in the male than in the female—1.53 to 1.40. In 23 cases it rose to two inches and upwards above the clavicle, and there were only 5 out of the 100 in which the pleura did not project above its superior margin. The sternal or internal aspect of the pleura of the right side extended across, even to the left of the median line, in 11 cases, from half an inch to an inch and a quarter. A similar disposition of the parts was never observed on the left side. The pleura rises higher in long-necked people; in bull-necked subjects the reverse is the case. In the 23 cases in which the pleura rose two inches above the clavicle, 14 were on the right, 5 on the left, and 4 only on both sides. In these cases the subclavian was high in the neck, and in many of them this artery in the third part of its course rested upon the pleura for a very considerable extent. He asks if the symptoms of wound of pleura and collapse of lung in operations at the root of the neck have not been falsely attributed, in some cases, to entrance of air into the veins? Erichsen states that thoracic inflammation was the cause of death in 9 out of 22 cases of extra-scalene ligature of the subclavian arteries, and that it was not the pneumonia which so often follows great operations, but inflammation attacking the pleura and pericardium in preference to the substance of the lungs, looking as though the complication arose from causes essentially connected with the disease or operation. Isaacs thinks that one of these causes is probably the unrecognized proximity of the pleura, which he shows exists in one case out of every four. He also speaks of "the curious fact that the top of the pleural sac is not always dome-shaped, but sometimes forms cul-de-sacs extending upwards, and sometimes laterally into the recesses at the root of the neck." (p. 18.)

<sup>2</sup> Amer. Journ. Med. Sciences, January, 1870, p. 69.

pressure.<sup>1</sup> In the case of a Japanese of 40, who was too fat for compression of the external iliac, and unwilling to submit to ligature, Dr. Stuart Eldridge, of Yokohama, succeeded in curing an inguinal aneurism by this method. He devised an apparatus consisting of a jacket and thigh-sheath connected by copper wire, in which the thigh was kept flexed on the pelvis for twenty days, at the end of which time pulsation had permanently ceased. The patient was seen six months later, and there was no return of the disease.<sup>2</sup> Dr. Edward T. Caswell, of Providence, R. I., reports a case of double popliteal aneurism in which genuflexion short of completely arresting the circulation cured both tumors. At the end of six weeks, during which time the man had resumed work, one of the tumors suddenly returned (evidently by rupture), and, after failing with ordinary compression, it was necessary to tie the femoral. There was subsequent suppuration, and discharge of clots.<sup>3</sup> In April of the same year Dr. Montgomery cured a traumatic aneurism at the bend of the arm by simple forced flexion of the forearm upon the arm for twenty-four hours.<sup>4</sup>

From these facts we may infer that this method is still in favor, and certainly gaining in extent of application, for heretofore it has been confined to aneurisms at the knee and elbow; and also that, when tried, it should precede compression by ordinary means, which are liable to leave the parts tender. It is well to remember, also, that Theodore Maunoir, of Geneva, who reported the first case of cure by the method of flexion, in 1858, demonstrated that the position need not be forced or painful, but that, as in ordinary compression, a very moderate obstruction to the circulation may effect a cure.<sup>5</sup>

To conclude the subject of pressure, it is evident that digital compression is steadily gaining ground and taking the place, wherever it is applicable, of pressure by means of mechanical appliances; and also that the process known as "rapid compression," under anæsthetics and anodynes, is increasing in favor.

Still, we must not forget that the old method by moderate and intermittent pressure has also from time to time effected striking cures, and these in localities—as, for example, upon the primitive carotid—where it cannot be safely replaced by more permanent or rapid pressure. The following cases of orbital aneurism are in point: that of Galezowsky, who cured a traumatic case in an adult female by digital compression applied to the carotid, for an hour or so every day at first, and afterwards at longer intervals, for several months.<sup>6</sup> In Scaramuzza's case of idiopathic orbital aneurism a cure followed digital compression, employed very cautiously on account of aortic disease, for not more than five minutes at a time, and afterwards for eighteen days, twenty or thirty minutes every day in five or six turns—the total period of compression being only seven hours and twenty minutes.<sup>7</sup>

I have noticed amongst hospital surgeons of experience a tendency to allow intelligent patients to manage pressure for themselves, by means of bags of shot, or of sand, or by a mass of lead modelled to the part, and gradually increased in weight. At St. Thomas's Hospital, in London, I saw a man in Mr. McCormac's ward with a subclavio-axillary aneurism, who was successfully controlling its pulsations by a buckskin bag of shot,

<sup>1</sup> Amer. Journ. Med. Sciences, January, 1875.

<sup>2</sup> Ibid., October, 1875, p. 444.

<sup>3</sup> L'Echo Médicale, Neufchatel, Switzerland, September, 1858.

<sup>4</sup> Gazette des Hôpitaux, 1871, p. 237.

<sup>5</sup> Ibid.

<sup>6</sup> Ibid., April, 1875.

<sup>7</sup> Archives Générales, 1858, t. xii. p. 731.

to which he had given a peculiar shape; and Prof. Tilanus, at the principal hospital of Amsterdam, showed me a weight of three kilogrammes, by which, he said, several cases had been treated in this way.

If time permitted, the subject of *orbital aneurism* might occupy us profitably. Mr. Rivington, of the London Hospital, has lately made a very thorough study of this curious and obscure affection in connection with a case which he finally cured by ligature of the carotid.<sup>1</sup> Dr. Morton, of the Pennsylvania Hospital, by his unusually rich experience, has also added to our knowledge of this subject. His last published case illustrates the great difficulty that often attends its diagnosis—already shown in the cases recorded by Bowman,<sup>2</sup> and by Aubrey, of Rennes,<sup>3</sup> in both of which, with unmistakable symptoms of aneurism—such as pulsation, bruit, and protrusion of the eyeball—no arterial lesion whatever was found after death. In Dr. Morton's case, with all the characteristic symptoms of orbital aneurism, except pulsation in the protruded globe, symptoms sufficient to warrant the diagnosis of aneurism of the internal carotid in the cavernous sinus, and ligature of the carotid, no trace of aneurismal disease was found after death on the day following the operation.<sup>4</sup> It is to be noted that in each of these cases ligature of the carotid produced immediate relief of the symptoms.

Mr. Holmes, as usual, discusses this subject ably in his lectures.<sup>5</sup> In view of the great uncertainty of diagnosis, and the possibility also of a spontaneous cure—such as took place in the cases recorded by France,<sup>6</sup> Collard, of Berne,<sup>7</sup> Erichsen,<sup>8</sup> and I may add also a more recently reported case of Mr. Jonathan Hutchinson,<sup>9</sup> together with the admitted dangers of the operation, he urges delay in resorting to ligature of the carotid. At the same time, whilst reasoning against it, Holmes speaks of the operation in this affection, in his *Surgery*, as “a most successful one;” and it is noteworthy that the delay which he advised in Rivington's case led to more loss of vision, and that the ligature was resorted to, of necessity, in the end.

In a still more recent case of Dr. Greuning, of New York, diagnosed as aneurism of the internal carotid in the cavernous sinus, the operation was promptly and entirely successful.<sup>10</sup>

Mr. Rivington arrives at the conclusion, derived from his very complete collection of cases, that “ligature of the carotid is, beyond question,

<sup>1</sup> A Case of Pulsating Tumour of the Left Orbit consequent upon a fracture of the base of the skull, cured by ligature of the left common carotid subsequently to injection of perchloride of iron, after digital compression and other means of treatment had failed; with remarks, and an appendix containing a chronological résumé of recorded cases of intra-orbital aneurism. By Walter Rivington, etc. etc., Surgeon to the London Hospital. Read March 3, 1875, published in *Med. Chirurg. Trans.*, vol. lviii. p. 183.

<sup>2</sup> *Ophthalmic Hospital Reports*, April, 1859.

<sup>3</sup> *Gazette des Hôpitaux*, 1864.

<sup>4</sup> *Amer. Journ. Med. Sci.*, April, 1876, p. 339.

<sup>5</sup> *Op. cit.*, June, 1873, 3d Lect., 2d series.

<sup>6</sup> *Guy's Hospital Reports*, 3d Series, vol. i., 1853, p. 58.

<sup>7</sup> *Gazette Médicale*, 1866, p. 631.

<sup>8</sup> *Science and Art of Surgery*. Phila., 1873, vol. ii. p. 108.

<sup>9</sup> A pouched aneurism of the internal carotid as large as a bantam's egg was found at the post-mortem examination of a woman of forty, who had died of aneurism of the abdominal aorta. Ten years before, Mr. Hutchinson had seen her with ptosis of the eyelid of this side, dim vision, paralysis of the ocular muscles, except the superior oblique, intracranial bruit, throbbing, and bad headaches. He had diagnosed intra-cranial aneurism, and advised ligature of the carotid, but had been overruled, and spontaneous cure followed. *British Med. Journ.*, April 17, 1875.

<sup>10</sup> *Archives of Ophthalmology and Otolaryngology*, vol. v. No. 1, p. 40.

the means most generally applicable to cases of intra-orbital aneurism dependent on morbid states of the arteries." His cases give forty-six instances of ligature of the carotid in forty-four cases (two being double), and six deaths.<sup>1</sup> With such experience, ligature of the carotid in orbital aneurism will continue to be employed, even though in some degree empirically.

I may record the fact that our countryman, Dr. McGill, of Maryland, was the first to tie both carotids in this disease.<sup>2</sup> Erichsen places his name second on his list of double ligatures of the carotid, for all causes. Dr. Foote, of Cincinnati, also tied both carotids at the same interval of a month, arresting a traumatic orbital aneurism at the second ligature.<sup>3</sup> It is proper to observe, in concluding my remarks under this head, that ligature of the primitive carotid for aneurism *other than orbital*, has proved a very fatal operation, mainly through embolism and interference with the blood-supply of the brain, probably less than half the cases on record having been successful.<sup>4</sup> The evidences, therefore, in favor of compression of this vessel, collected by Mr. Holmes, carry great weight. Of his seven cases, five were cured; and in the two in which compression did not succeed, the ligature also failed.<sup>5</sup>

Galvano-puncture, as a method of treatment for aneurism, can hardly be said to be gaining rapidly in the confidence of the profession, perhaps mainly on account of the intrinsic difficulties which attend the process; but, as has been truly said, it occupies at the present time a more promising position than did compression in the days of Guthrie, who did not hesitate to speak almost contemptuously of the pretensions of the latter. The promise held out by the relief of pain and the arrest of pulsation, which so often follow an electrolytic operation, is not fulfilled with certainty; for after a short interval the pulsation almost always returns. This disappointing result seems to be due to the softness and friability of the resultant clot, which is broken and wasted away by the arterial current. We have learned, however, that this soft clot possesses

<sup>1</sup> Of these 44 cases, 25 were cured—one after subsequent injections (case of Brainard of Chicago; *Lancet*, 1853, p. 162, vol. ii.), 7 received partial benefit, 5 were unsuccessful, and 6 died. Two of these deaths were in patients over sixty years of age, and two others (cases of Critchett and Pétrequin), in patients who survived several weeks, and died eventually from other causes, are not chargeable to the operation.

<sup>2</sup> In a letter to the late Dr. J. Kearney Rodgers, of New York, from Dr. Joshua J. Cohen, of Baltimore (in the *N. Y. Med. and Phys. Journ.*, Sept. 1825, p. 576), it is stated that in this case "an ugly, confused mass protruded beyond the sockets of both eyes," and was increasing every day. The operations were done at an interval of about a month. Dr. McG. found the effect of tying one carotid to be limited to one tumor, and ventured upon the bold attempt (in which he had but one precedent, and probably was not aware of that) of arresting the progress of the other by tying the remaining carotid. Several months after the last operation the patient was doing well, and the tumors subsiding. At this early date there were no recorded examples of successful ligature of the carotid for tumors about the head except the cases of Travers (1809), and Dalrymple (1812), in both of which the disease was supposed to be "aneurism by anastomosis." Doubtless Dr. McGill regarded his case as of the same nature. Cases of soft cancer protruding from both eyes, and doing well some months after ligature of both carotids, are not of probable occurrence, whilst double aneurism has existed in several instances.

Since the above was written, I have seen a note from Dr. Charles McGill, of Richmond, Va., dated June 9, 1876, in which he writes as follows: "In 1823 my brother ligated both common carotids of a woman in Williamsport, Md., for vascular tumors of the orbits. The interval between the tying was about four weeks. The operation was successful, and the woman was still living and in good health in 1861, when I left the State of Maryland."

<sup>3</sup> Reported by Dr. E. Williams, in *New York Med. Record*, April, 1868, p. 75.

<sup>4</sup> Maunder, *ut supra*, p. 44, and *Le Fort. Gazette Hebdomadaire*, 1868, Nos. 28, 30, 35.

<sup>5</sup> *Op. cit.*, *Lect. ii.*, second series, June, 1873.

neither noxious nor irritating qualities, so that the operation, which is better done under an anæsthetic, may be repeated indefinitely.

We owe to Dr. John Duncan, of Edinburgh, the knowledge that inflammation of the sac, the principal danger that attends the process, is not to be feared if there is no cauterizing effect produced by the needles, and that this can be certainly avoided if they are effectually insulated by a coating of vulcanite—a device introduced and perfected by Dr. Fraser and himself. "I have never met with the slightest reaction," says Duncan, "when using insulated needles; and in one case I continued the operation for two hours and ten minutes."<sup>1</sup>

This being the case, the eschars and fatal hemorrhages, and inflammation and suppuration of the sac, which complicated some of the earlier cases of galvano-puncture, can be now surely escaped, and we have only the uncertainty of the result to contend against.<sup>2</sup>

The plan of operating which experience seems to point out as the best, is to insert both the positive and negative needles, thoroughly insulated by means of vulcanite, into the sac; to employ a battery of large electro-motor force; to prolong the operation so that the sac may be occupied as fully as possible by clot; and, finally, to repeat the application as soon as improvement shall have distinctly ceased.

Perhaps the best idea of the value of the electrolytic treatment can be got from Holmes's abstract of the cases of Ciniselli, of Cremona, who has employed it more largely than any other surgeon. In these, twelve in number, there were two relapses after many months of good health, one of which was permanently cured by repetition of the operation, and three other cases in which a cure had been maintained for still longer periods at the time of the report. Of the eight cases which were not benefited, in only one was death caused by the direct action of the electricity, and no harm seems to have followed its use in the others.<sup>3</sup> Abeille cured a case of subclavian aneurism in a woman, having kept a weight of one kilogramme upon the tumor for ten hours after the application of the needles.<sup>4</sup>

The great point in favor of this method is that it may be applied to thoracic and abdominal aneurisms where other surgical remedies are powerless, in combination, for example, with Tufnell's medical treatment. In thoracic aneurism, both Ciniselli and Duncan have certainly succeeded in averting imminent death from hemorrhage where the tumor was already projecting beyond the ribs.<sup>5</sup> In abdominal aneurism no success has been as yet attained. In Keyes's case the manœuvre was accomplished safely, but without apparent result beyond relief of pain.<sup>6</sup> In Dell'

<sup>1</sup> Lectures on Electrolysis, by John Duncan, M.D., etc., Assistant Surgeon to the Royal Infirmary, Edinburgh, Lecturer on Surgery, etc.; *British Medical Journal*, June 28, 1876, p. 621.

<sup>2</sup> See the case of Pétrequin (*Journal de Chirurgie de Malgaigne*, t. iv. p. 246, 1840), and another case in Broca (*sur les Anévrysmes, etc.*, Paris, 1856, p. 342), in which the needles, uninsulated, were applied seven times in one week for an aneurism under the jaw; there was no consolidation, but inflammation and suppuration followed, with secondary hemorrhage, necessitating ligature of the carotid, and free opening of the sac, and other measures to stop the bleeding.

<sup>3</sup> It is proper to note that Ciniselli's mode of operating is probably more liable to irritate and inflame the sac than when insulation by vulcanite is employed.

<sup>4</sup> *Archives Générales*, t. xx. p. 49, 1849.

<sup>5</sup> Lectures, etc., ut supra.

<sup>6</sup> *New York Med. Journ.*, December, 1871, p. 569. Keyes demonstrated, however, that eleven needles could be passed through several layers of peritoneum and convey the current from thirty-two cells (of a Stohrer's battery) without causing inflammation. His needles were insulated by vulcanite.

Acqua's case the aneurism burst during the struggles of the patient under chloroform, and he died on the table.<sup>1</sup> McGill reported a case of subclavian aneurism as greatly benefited after four operations, manipulation having been also employed conjointly with electrolysis after the last application. But relapse took place, and nine months later the woman was subjected to the operation on the left subclavian already reported.<sup>2</sup>

As to galvano-puncture in external aneurisms, Ciniselli cured a popliteal case in 1846—the second recorded example of success by electrolytic treatment, Pétrequin, of Lyons, having cured a small aneurism of the temporal artery the year before.

Broca, in external aneurisms, recommends direct moderate pressure to be applied immediately after the withdrawal of the needles, with the view of its effect upon the tumor in the way of malaxation, or manipulation, as it was employed, in fact, in Abeille's successful case of subclavian aneurism; and this seems to me an excellent practical suggestion. An Esmarch's bandage for example would really offer the best means of effecting distal pressure (which in the leg and forearm is not easy to accomplish) during the operation, and, if it were afterwards carried upwards over the whole limb including the tumor, it might materially assist in preventing the liability to washing away of the clot.

Dr. Duncan says, in his summary of conclusions, that "in external aneurisms electrolysis should be tried, if compression be not available, or have failed; and it is to be preferred to the ligature—at least of the innominate and iliac arteries."

In his address on Surgery before the British Medical Association, in August, 1875, Prof. Spence, of the University of Edinburgh, stated that his colleague Dr. Duncan had had successful results in treating large cirroid aneurisms by electrolysis. There is additional evidence on this point in Dr. Duncan's lecture since published.<sup>3</sup> It is also very generally conceded that for most forms of aneurism by anastomosis, and erectile tumors, electrolytic treatment offers, at the present time, greater advantages than any method of treatment in use.

Manipulation, one of the bloodless methods of treating aneurism, with which the name of Sir William Fergusson is principally connected,<sup>4</sup> has not yet achieved credit for the success which it seems to promise and to deserve. According to Holmes, this method has been practised in five cases of subclavian aneurism, and in two of aneurism of the lower extremity, "with clear evidence of cure in two, and a good advance towards cure in another," and no certain proof of injury to the sac, which is the great danger of the proceeding, in any case.<sup>5</sup> This surgeon has proved by carefully studied preparations and cases that

<sup>1</sup> *Gazetta Medica Italiana, Lombardia*, No. 28, 1870, p. 217.

<sup>2</sup> My colleague Dr. Sands, with the aid of Dr. Guleke, attempted to arrest the progress of a traumatic subclavian aneurism in a young man of nineteen, at the N. Y. Hospital, in March, 1869. He made four electrolytic operations of fifteen minutes each, following Ciniselli's method mainly. The tumor became momentarily firmer, but it continued to enlarge, and finally burst. (Thesis of Dr. Allan McLane Hamilton, New York, 1870.)

<sup>3</sup> *British Med. Journ.*, August, 1875, p. 189. In the same Journal, June 10, 1876, p. 715, Dr. D. says: "There are four recorded cases in which electrolysis has been used in cirroid aneurism, and in three the disease has been cured. In a case in which Syme declined to operate, six applications of the battery effected a cure."

<sup>4</sup> *Med.-Chir. Trans.*, vol. xl.

<sup>5</sup> *Op. cit. Lect. v. Part i.*, 1st series, 1872. I do not think that Dr. Lidell's successful case is among these.

impaction of clot in the distal end of the artery as it leaves an aneurismal sac is naturally (not always necessarily) followed by obliteration, more or less complete, of the sac. The curative effect of the distal ligation is thus explained, and also that of the method we call manipulation. By the latter proceeding a portion of clot is intentionally and by violence detached from the internal wall of the aneurismal sac, and pushed by the fingers, or carried by the current, into its distal outlet, so as to plug it like an embolus. A large proportion of the cases in which aneurism is said to undergo spontaneous cure are doubtless brought about in this manner, and Sir William Fergusson has wisely recognized Nature's lead in proposing it as a remedy.

I think that many cases reach their final cure in this manner after the interference of art, in which the real *methodus medendi* is not recognized, or is referred to some other cause. Take, for example, the cases collected by Mr. Tufnell, at page 89 *et seq.* of his excellent "Practical Remarks on the Treatment of Aneurism by Compression," published in 1851, in which, after a certain amount of contraction and hardening of the tumor, this treatment seemed powerless to arrest pulsation entirely, and the patients, as the disease had ceased to increase, were sent about their business. In every such instance in which the patient was followed up, a final cure was found to have taken place, and it had always occurred suddenly and after some unusual effort, when a new, painful sensation would be felt in the tumor, and presently all pulsation would be found to have ceased. Here, I take it, a fragment of clot had become detached and plugged the distal outlet of the half-cured aneurism.

This method of cure is only applicable to aneurisms in which a certain amount of clot has already formed, and of which the walls present, as yet, no evidence of thinning or softening, so as to endanger rupture by handling. Dr. Bontecou, of Troy, recently tied the external iliac in a case of inguinal aneurism, which had been ruptured by the manipulation of a professional rubber, undertaken for the relief of pain.<sup>1</sup> A prominent medical man of Dublin caused the rupture of an abdominal aneurism in his own person. He had known of its existence for ten years, and it had undergone partial cure. The object of his manipulation was to convince his attendants that it was a mass of hardened feces, for, when he grasped the tumor and drew it away from the spine, its pulsations were arrested. Shortly after they had retired to consult, he was found dying from internal hemorrhage.<sup>2</sup> These examples teach us the necessity of caution.

Manipulation of an aneurism of the innominata or of the primitive carotid might occasion cerebral embolism, and inflammation of the sac is always a possible contingency.

It has seemed to me that in one, if not both, of the remarkable cases of apparently spontaneous cure of subclavian aneurism recorded by the late J. Mason Warren, of Boston, the violence previously inflicted upon the tumors was the real means of cure, by causing fragmentation and distal impaction of organized coagula.<sup>3</sup> And this is also the most probable explanation of the success of Staff-Surgeon Reid in the interesting case of popliteal aneurism in which, after failure of compression by ordinary methods, he effected a cure in fifty minutes by the application of an Esmarch bandage.<sup>4</sup> His patient subsequently died within the year of visceral disease; and, in describing the condition in which he found the

<sup>1</sup> New York Med. Journ., 1876, p. 281.

<sup>3</sup> Surgical Observations, etc., Boston, 1867, p. 424.

<sup>2</sup> Holmes, *ut supra*.

<sup>4</sup> Lancet, Sept. 25, 1875.



cured aneurism, Dr. Reid speaks of the manifest displacement of the fibrinated laminae which it contained, which laminae were probably due to the previous attempts at its cure by compression.<sup>1</sup>

I have been able to find no very recent cases in which the use of *coagulating injections* has led to satisfactory results, except a case ascribed to Plagge, of Darmstadt, who cured a traumatic aneurism, just below Poupart's ligament, by injection of extract of ergot, alcohol, and glycerine, continued daily for three weeks, with an ice-bag applied to the tumor in the intervals.<sup>2</sup> The use of ergot is ascribed to Langenbeck, and the absence of details detracts from the value of the case. In the case of Dr. Dutoit, of Berne, the cure of an aneurism supposed to be subclavian, in a man of 40, is attributed to fifteen injections of a solution of ergotin into the tissues immediately over and around the tumor, at intervals of two or three days. This caused diminution or shrinking of the tumor, and subsequently indirect digital pressure was employed to confirm the cure.<sup>3</sup>

The danger of embolism, of which so many instances have followed the injection of erectile tumors by the perchloride of iron, has apparently inspired a fear of using this drug in the sac of an aneurism; whilst its known escharotic qualities, and the hardness and irritating nature of the magma of iron and blood-salts with coagulated albumen and blood-corpuscles resulting from its use, have deterred surgeons from employing it, through well-founded apprehension of inflammation in and around the sac.

In the case of Lenoir, after a third injection which, like the previous ones, was apparently ineffectual, solidification of the tumor took place unexpectedly, and inflammation forthwith developed itself in the sac, and resulted fatally.<sup>4</sup> Here coagulating injections failed, but inflammation caused consolidation of the aneurism, and unhappily also the death of the patient.

In cases where coagulation by the perchloride has succeeded, the resultant mass takes on an almost calculous hardness, fails to be absorbed, and either becomes permanently encysted, or excites suppuration to secure its expulsion as a foreign body.

The question is pertinent whether the tissues would tolerate any better a clot produced by the *persulphate* of iron.<sup>5</sup> This substance, which is not escharotic, has been used by the late Dr. Isaacs, of New York, and also by Drs. Minor, Hutchison, and Enos, of Brooklyn, with success in injecting varicose veins.<sup>6</sup> In July of the present year, Dr. J. C. Hutchi-

<sup>1</sup> Lancet, Aug. 5, 1876. Dr. Reid says in substance that the portion of the cavity of the aneurism apposite its mouth was occupied by several layers of laminated fibrin. Some of these were partially separated from the others and approximated towards the centre, the interspace thus caused being filled by an amorphous, softer, cheesy coagulum.

<sup>2</sup> Amer. Journ. Med. Sci., April, 1874, from Lond. Med. Record.

<sup>3</sup> Langenbeck's Archiv, Band. xii. No. 3.

<sup>4</sup> Broca, op. cit.

<sup>5</sup> Or subsulphate, as I believe it should be called. I mean the salt of iron which is the basis of Monsel's solution.

<sup>6</sup> I learn from Dr. James M. Minor, and also from Dr. Squibb, of Brooklyn, that in experiments with this salt of iron they have been impressed with its great harmlessness, and even with its healing properties when in contact with the tissues. Dr. Minor has published six cases in which it has been used successfully—one, a pulsating (erectile) tumor, and five cases of varicose veins. See American Medical Times, July 1st, 1860. He employed a Pravaz syringe, and a solution containing four parts of distilled water to one of the salt, which, he thinks now, was too strong, as Dr. Jos. C. Hutchison, of Brooklyn, since informs him that he has used it successfully in a solution of thirty to one, without exciting ulceration in any case. (Private communication of this date.)

son, at the Brooklyn (N. Y.) Hospital, injected a large and increasing aneurism of the abdominal aorta in a sailor of thirty-two, three times, at intervals of two or three days, with thirty minims of a solution containing about half a grain of this salt. Death followed within a fortnight with symptoms of inflammation of the sac (*i. e.*, local tenderness, increased temperature,  $103^{\circ}$ , frequent pulse), and subsequent rupture. There was much stratified fibrine in the sac, apparently recent. (From notes of case as recorded by house surgeon.)

Brainard, of Chicago, cured an orbital aneurism by injecting a solution of lactate of iron, after ligature of the carotid had failed; but destructive inflammation followed.<sup>1</sup> Bourget used the perchloride successfully in what seems to have been a cirroid aneurism following injury, in a boy of twelve, after failure by galvano-puncture.<sup>2</sup> Desormeaux had similar success in an adult.<sup>3</sup> Pétrequin lost a case, but apparently from causes unconnected with the injection.

Embolism has not occurred in any of the cases of orbital aneurism treated by coagulating injections.

Broca records his success in the injection of large vascular trunks of cirroid aneurism of the scalp, where accurate pressure could be made upon the vessel on either side of the portion injected.<sup>4</sup>

Our best hope for the future success of the operation of Pravaz would seem, at present, to depend upon the results of experiments with the persulphate of iron, in solutions of different strength, in cases where accurate pressure can be made on both the cardiac and distal aspects of the aneurismal sac.

Closely allied to the use of coagulating injections as a remedy for aneurism is the idea of inserting foreign material into its cavity in order to provoke, mechanically, the deposit of fibrinous clot. The earlier attempts in this direction, inaugurated by Moore, of Middlesex Hospital,<sup>5</sup> London, who employed fine iron wire, and whose example was followed by Domville and Murray, failed in each instance, because the wire produced inflammation of the sac—a result which was no doubt anticipated. Dr. Levis, of Philadelphia, ingeniously substituted an animal substance for the more rigid and irritating metallic wire, and inserted twenty-four feet nine inches of horsehair through a fine needle canula into a subclavian aneurism, in a man of twenty-seven, at the Pennsylvania Hospital in October, 1873. The tumor became hard, and the pulsation in it and in the radial artery, ceased at once. The man died during the month from internal hemorrhage, when it was discovered that the sac of the aneurism had already ruptured previous to the operation, and that a part at least of the walls of the cavity into which the horsehairs had been inserted was formed of lung tissue. Notwithstanding this untoward condition, their presence had caused the formation of hard clot, and obstructed the flow of blood into the axillary artery, solidifying the portion of the tumor which projected above the clavicle, and causing entire cessation of the radial pulse. There were no evidences of inflammation caused by the foreign body.<sup>6</sup>

The conclusion can hardly be avoided, in this interesting case, that if

<sup>1</sup> Lancet, 1853, vol. ii. p. 162.

<sup>2</sup> Gazette Médicale, 1855, p. 772.

<sup>3</sup> Rivington's paper, ut supra, p. 288.

<sup>4</sup> Bulletin de la Société de Chirurgie de Paris, 1859.

<sup>5</sup> Med. Chir. Trans., vol. xlvii.

<sup>6</sup> Translations Pathological Soc. Phila., vol. v. p. 79, 1876.

there had been a true resisting sac to the aneurism, a cure would have followed.

This operation has been repeated by Mr. Bryant, of St. Bartholomew's Hospital, London, who introduced twenty feet—three hairs at a time—into a rapidly-growing popliteal aneurism, “with the effect of causing almost complete consolidation of the tumor. The man survived the operation five days, dying from ulcerative endocarditis, a condition that existed before the operation.” This surgeon considers these results as quite sufficient to justify a repetition of the operation.<sup>1</sup>

If we succeed in getting a preparation of catgut somewhat more permanent than that now in use for ligatures, but still capable of blending ultimately with the tissues, the use of this substance would be still less likely to provoke inflammation or suppuration.

Finally, there is still a variety of aneurism to which experience has taught us that the Hunterian operation is inapplicable; but the lesson is being learned slowly. I refer to the cases in which an abnormal opening has been formed between an artery and vein—what we call arterio-venous aneurism, a term properly used whether any tumor be present or not. This affection is almost invariably the result of a wound, and is characterized by an exaggerated and peculiar thrill<sup>2</sup> often perceptible in the neighboring veins, and also by enlargement in calibre of the arteries involved, and thinning of their walls.

The Hunterian ligature has been wrongly applied to the cure of this affection, as is proved by the occurrence of gangrene or secondary hemorrhage in all the cases in which it has been done in the lower extremity, and in some cases in the upper. Unfortunately it has had the sanction of Scarpa, Hodgson, Physick, and Liston. The rarity of its occurrence explains the delay in accumulating experience enough to reverse this authoritative endorsement. But on the other side we have Dupuytren, Breschet, Mott, and Norris; and, in addition, we have this great fact, which experience has taught us, that this form of aneurism is not usually progressive, so as to threaten life and to justify the use of a remedy attended by risk. This is exemplified in a man of forty, whose case was recently reported to the Clinical Society of London by Mr. Hulke, of the Middlesex Hospital. Three years previously, in Missouri, a Derringer pistol had exploded as the man was putting it in his right hand trowsers pocket, and a bullet had traversed the thigh, wounding both vein and artery at a point about six inches below Poupart's ligament. There was little bleeding at the time, and relief was ultimately sought some years afterwards because the limb was weak and painful, and its surface affected by eczema and ulcers. From the point of injury upwards, the femoral artery and vein were greatly dilated, and the risk in attempting

<sup>1</sup> The Practice of Surgery, etc.; London, 1876, vol. i. p. 435.

<sup>2</sup> Nélaton has the credit of pointing out the fact that, whilst the murmur of an ordinary aneurism can be heard only after the systolic impulse, and is therefore interrupted, the pulsatory thrill of an arterio-venous aneurism is continuous. It is intensified by the systolic impulse, but does not intermit. This circumstance should always arrest attention, as indicating the existence of venous communication. I have not verified the statement of systematic writers that, in varicose aneurism (*i. e.*, where a distinct tumor has formed), the interrupted bruit resulting from the passage of the blood in and out of the aneurismal tumor can be heard distinct from the continuous thrill caused by the opening into the vein. The “rasping bruit” is heard also in cirroid aneurism, but everywhere equally; whilst in arterio-venous aneurism it is loudest at one spot, *viz.*, near the point of communication. There is also less forcible pulsation in the artery below the point of communication in most instances where an artery opens directly into a vein; and a tendency to dilatation of arteries above.

to tie the former above and below the abnormal opening was considered too great. Compression, direct and indirect, was patiently tried and found useless, except in benefiting the eczema and ulcers. Ligature, as for simple aneurism, was seriously thought of, but deferred. Meanwhile the patient received so much relief by wearing an elastic laced stocking reaching from the foot to the groin, that he willingly accepted the advice to content himself with this palliative treatment.<sup>1</sup>

In a recent case, and in a young subject, the probability of a permanently weakened limb would possibly justify an operation as for a wounded artery, as in the cases of Spence and Annandale, of Edinburgh, and the use of an Esmarch's bandage would greatly facilitate such a proceeding. But in an old case, the number and size of the enlarged and tortuous vessels all carrying arterial blood, the enfeebled vitality of the limb, through habitually defective blood-supply, and the thinned walls of the arteries, unite to render all operative interference difficult, and, as regards gangrene and secondary hemorrhage, especially dangerous,<sup>2</sup> as pointed out by Breschet in 1838.<sup>3</sup>

As long ago as 1848 I sought to aid in establishing this point of practice. The late Valentine Mott tied the external iliac artery in a young man from Alabama, for an arterio-venous aneurism in the same locality as in the case just related, two years and a half after the gunshot wound by which it had been caused. The patient had complained of lack of power, and more or less pain in the limb, but mainly of the exaggerated pulsation and continuous vibratory thrill over the course of the vessels. After the operation the limb fell into gangrene at once, and the patient died on the sixth day. I had an opportunity of dissecting the parts, and found two small aneurismal tumors formed out of the adjacent tissues, besides a direct communication between the femoral artery and vein. Impressed by this grave reverse, I collected all the recorded cases within my reach in which arterio-venous aneurism of the lower extremity had been treated by ligature on the Hunterian plan, and found that gangrene, or secondary hemorrhage, had occurred in all of them. In twelve cases, the external iliac was tied in five, and gangrene followed in all; the common femoral in two, and gangrene followed in both; the femoral artery in five, and gangrene occurred in two of these cases, and hemorrhage in all.<sup>4</sup> Subsequently Norris deduced a similar result from the analysis of the cases of Hunterian operation for arterio-venous aneurism in his tables of collected cases of ligature of the femoral and external iliac arteries; and considering this result in connection with the clinical fact that arterio-venous aneurism in most instances tends to lose its progressive character and become stationary—causing only inconvenience, and not danger to life—this excellent surgeon recorded his opinion that sound surgery condemns a resort to operative measures in the treatment of such cases, “so

<sup>1</sup> Trans. Clin. Soc. London, vol. viii., 1875, p. 175. Similar cases of arterio-venous aneurism of indefinite duration, without material progress, must have presented themselves to most surgeons of experience. Norris quotes a case of Dupuytren's of twelve years' duration, and speaks of another he saw in Velpeau's wards in 1835, of twenty years' standing; and still another of “long continuance, which inconvenienced though it did not distress the patient.”—Contributions to Practical Surgery, etc., Phila. 1873.

<sup>2</sup> Prof. Donald McLean, of Ann Arbor, dissected out and tied the popliteal artery and vein in an old case of arterio-venous aneurism (traumatic) above and below the point of communication, but lost his patient. (Private Communication, May 22, 1876.)

<sup>3</sup> Mémoires de l'Académie de Médecine de Paris.

<sup>4</sup> Cases of inguinal aneurism, with remarks. New York Journal of Medicine, vol. ii. (new series), 1848, p. 168.

long as the infirmity can be made at all bearable by the use of compresses, laced bandages, and other like measures."<sup>1</sup>

I regret that my time will allow me to say nothing of traumatic aneurism, especially as there are several most creditable American cases by which its treatment might be illustrated, in which in the neck, and even behind the ramus of the lower jaw—that most dangerous of all localities for a deep punctured wound—the tumor has been laid open and the vessel successfully tied above and below the wound in its walls. I may mention particularly the cases of Prof. Briggs, of Nashville, Tennessee,<sup>2</sup> of Prof. Donald McLean, of Ann Arbor, Michigan,<sup>3</sup> and also the more recent case of Dr. G. E. Frothingham of the same city.<sup>4</sup>

I am conscious that I have already taxed your patience too long with these imperfect notes; and I am equally aware that the extent of the subject has precluded the possibility, in such limited space, of reasoning up to very clearly defined conclusions. The treatment of aneurism at the present day clearly does not consist, as thirty years ago, in a choice between ligature and compression, but it involves judicial weighing of the claims of many remedial measures, the number of which is constantly increasing, and the selection of those which offer the best chances of safe and certain cure; and, where the chances of cure are uncertain, duty requires us to try those remedies which give the best promise of ameliorating symptoms and prolonging life. With the new methods of treatment at our command—to alleviate, if not always to cure—I will venture to assert that, whilst some of the operations on the great arteries sanctioned by distinguished names have failed to fulfil the hopes of their projectors—without any diminution, however, of the lustre of those names—Surgery is, nevertheless, richer in her aggregate resources; for there is no form of the disease which the well-trained surgeon of the present day can truly call incurable, or for which his art does not offer at least some hopeful resource.

Finally, I would submit the following conclusions for the consideration of the Section:—

I. Tufnell's treatment of aneurism by rest, position, and restricted diet offers a valuable resource in thoracic and abdominal aneurism.

II. It should always be tried in innominate, subclavian, subclavio-axillary, and iliac aneurisms, before resorting to measures attended by risk to life.

III. For aneurisms of the subclavian and iliac arteries, the Hunterian operation, with our present means of preventing secondary hemorrhage, is not justifiable.

IV. For reasons formally set forth by Holmes and Henry Lee, the "old operation" cannot properly be formally substituted for the Hunterian operation in these cases, but should be held in reserve for special cases.

V. It is the most safe and surgical resource in gluteal aneurism, if the circulation can be commanded by the hand in recto.

VI. The mode of cure by embolism, aimed at in the method of manipu-

<sup>1</sup> Contributions to Practical Surgery, Phila. 1873, p. 312.

<sup>2</sup> Nashville Medical and Surgical Journal, March, 1871.

<sup>3</sup> Peninsular Journal of Detroit.

<sup>4</sup> This case, which Prof. Gross in Amer. Journ. of Medical Sciences, April, 1876, p. 442, attributes to Prof. McLean, of the University of Michigan, I learn from this gentleman, belongs to Dr. Frothingham; Prof. McL. participated in it only as consulting surgeon.

lation, is a not unfrequent explanation of what is called spontaneous cure of aneurism.

VII. The value of Esmarch's bandage in the treatment of aneurism is probably not fully estimated.

VIII. In view of the promising features presented by the cases of Levis and Bryant, in which horse-hair was introduced into an aneurismal tumor, the repetition of this operation, or the substitution for the horse-hair of Lister's prepared catgut, or other animal substances, may be properly tried.

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