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 artery 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.

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 ARTERY 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

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SURGEON TO THE LONDON HOSPITAL.

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Received January 12th—Read March 23rd, 1875.

Before narrating the case which forms the basis of the present paper, it seems desirable to give a brief sketch of the views and observations which previous authors have placed on record concerning the affection which is now generally termed, but with doubtful propriety, Intra-orbital Aneurism.

On the 1st of November, 1809, a paper by Mr. Travers was read at this Society, with the title, "A Case of Aneurism by Anastomosis in the Orbit cured by the Ligature of the Common Carotid Artery." This is generally believed to be the first instance of intra-orbital aneurism of which any

record exists, and it was described by Mr. Travers as aneurism by anastomosis, because he recognised in it a strong resemblance to some of the cases of that affection which had been brought under the notice of the profession by John Bell not many years before.[1] In 1812 Mr. Dalrymple communicated to this Society the second observation in a paper which, following the views of Mr. Travers, he headed, "A Case of Aneurism by Anastomosis in the Left Orbit cured by tying the Common Trunk of the Left Carotid Artery."

In 1823 Mr. Guthrie, without questioning the pathology of his predecessors, recorded, in his 'Operative Surgery of the Eye,' with unfortunate brevity, a case in which symptoms existed on both sides resembling those exhibited unilaterally in the cases of Mr. Travers and Mr. Dalrymple, and in which he found after death, *in each orbit, an aneurism seated on the ophthalmic artery*.

M. Roux's partially successful case, which occurred in 1829, appears to have been only incidentally recorded at the time, and to have escaped the notice of observers in this country until it was reproduced nearly thirty years later in the pages of M. Demarquay. Warren's successful case of ligature of the common carotid for a similar affection after

[1] Mr. Travers states that his case bore also a strong resemblance to the case "communicated by Mr. Freer, of Birmingham, whose patient, refusing assistance, expired of hæmorrhage" ('Med.-Chir. Trans.,' vol. ii). At the present time it is difficult to recognise a likeness between Travers's case and that of Freer. The latter ran its course in a few months, the eye protruding and suppurating within a few days, whilst Travers's case had commenced more than four years previously to his seeing it, and had not made any rapid progress. Middlemore also places Freer's case under the head of "aneurism by anastomosis." But Freer himself described his case as one of "fungus hæmatoides," and he figures a growth as large as an adult fist sprouting from the left eye. Mr. Nunneley also regarded Mr. Freer's case as one of fungus, and believed that it was to Freer's case that Middlemore alluded in the following passage:—"I have only seen this affection once, and then the patient was not under my own care; no operation was performed for his cure, and he died, as I think, in consequence of the omission of that assistance which the improved state of surgery has placed us in a condition to bestow on persons suffering from this most distressing disease." (Middlemore on 'Diseases of the Eye,' vol. ii, p. 618.) Compare with Freer's case, plate 18 in 'Heister's Surgery,' vol. i, p. 431.

failure of local treatment occurred in 1830, and was published in 1837 as a case of aneurism by anastomosis. "In the same year, at a period previous to the first operation," Warren had met with a case of pulsating tumour of the orbit of traumatic origin, and had "tied the carotid artery without an alleviation of the disease." In 1839 Mr. Busk communicated to this Society the account of a case under his care in 1835, which had resulted from a fracture of the base of the skull, and which he had cured at the beginning of 1836 by tying the common carotid artery. Mr. Busk added the prior case of a boy under the care of Mr. Scott in 1834 at the London Hospital, in whom protrusion and pulsation of the eyeball supervened after an injury to the head occasioned by a fall into a ship's hold. Five weeks later, the occurrence of profuse arterial hæmorrhage from the nose rendered it necessary for Mr. Scott immediately to apply a ligature to the right common carotid artery. Pulsation ceased, the eye retired into the orbit, but vision previously lost was not regained. Mr. Busk's paper embodied some forcible arguments against the generally received view that the cases of Travers and Dalrymple were examples of aneurism by anastomosis, and, adducing the observation of Guthrie, advanced the opinion that his own case, and most likely also the cases of Travers and Dalrymple, were really instances of ordinary aneurisms affecting the ophthalmic artery within the orbit. The paper had a marked influence on the views of subsequent observers, and, whilst many adhered to the pathology of Travers, not a few echoed the arguments of Mr. Busk, and designated their cases as "aneurisms of the ophthalmic artery."[1] It was in 1835 that M. Baron pre-

[1] Through a singular error M. Demarquay affirmed in his treatise on tumours of the orbit that the rupture of the ophthalmic artery diagnosed in Mr. Busk's case had been verified at a later date by an autopsy; whereas Busk's patient was alive and well when he last came under observation. I find the same statement echoed by Dr. Noyes in his table of cases of ligature of the carotid for pulsating tumours of the orbit ('New York Medical Journal,' 1869, p. 666).

Among subsequent observers M. Petrequin, Mr. Curling, M. Bourguet, M. Legouest, Mr. Zachariah Laurence, M. Aubry, Professor Gioppi, Dr. Morton,

sented to the Société Anatomique at Paris a specimen of *aneurism of the internal carotid artery in the cavernous sinus, which appeared to have been ruptured* in that situation, and to this condition he attributed the varicose state of the orbital veins, the exophthalmos, and bellows murmur which had been noted during life. The observation was so brief that it naturally escaped notice, and failed to make any impression on pathological opinion.

In 1839 two well-known cases occurred in Paris, those of Jobert and Velpeau. In Velpeau's case, which was seen by Mr. Erichsen, both orbits were affected with a pulsatile tumour following a blow on the nape, and no less than three different accounts have been given of the effects of compression of the carotid, rendering it difficult to determine which account should be accepted.[1] It is at least certain that the

and Dr. Schmid, of Odessa, diagnosed their cases as examples of aneurism of the ophthalmic artery.

[1] The following are the different accounts which have been given:—Mr. Erichsen ('Science and Art of Surgery,' vol. ii, p. 89) says—"In a very interesting case which I saw in Velpeau's Wards in 1839 both orbits were affected, and as pressure on the right carotid arrested the pulsation and bruit in both, that artery was tied. But though the disease was cured in the left orbit by this operation, and temporarily arrested in the right, it reappeared in the latter situation, and was eventually cured here by the ligature of the left carotid." The statement that the left carotid was tied would appear to be a mistake. Velpeau proposed to tie it, but the patient would not consent (see Delens' 'De la Communication de la Carotide Interne et du Sinus Caverneux,' p. 57). Velpeau himself (in his 'Leçons Orales,' and art. "Orbite" in the Dictionary in thirty volumes) states that pressure on the right carotid arrested completely the bruit and pulsation in the left orbit, allowing them to remain in some degree on the right side, whilst pressure on the left carotid stopped the bruit and pulsation on the right side only. The contemporary account published in the 'Bulletin de Thérapeutique' of 1839 does not sustain the account of the *crossed effects of compression of the carotids* so strongly insisted on by Velpeau. It merely states that the bruit ceased at once on compression of the carotid of the corresponding side, and a most remarkable circumstance was that it ceased on the left side almost as completely as on the right by the sole compression of the right carotid. M. Carron du Villards says—"In the patient operated on by M. Velpeau, who was affected with two exorbitisms produced by a presumed rupture of the two ophthalmic or orbital arteries, compression of the right carotid suspended the pulsation in the two orbits; whilst that exercised on the left carotid produced no result, even in the corresponding orbit"

effect of ligature of the right carotid practised by Velpeau was the immediate cessation of pulsation and bruit on both sides. At the end of three months the symptoms returned on the right side; and as pressure on the left carotid caused them to cease entirely, Velpeau recommended ligature of that artery, but the patient would not consent. The cure remained permanent on the left side. Velpeau mentions a second case which occurred about the same time, but it does not appear to have been recorded. All that Velpeau says of it is, that the affection was on one side only, and that the patient referred it to a blow on the nape.[1]

M. Gendrin published in 1841 the account of a remarkable case which he met with in 1835, and in which the post-mortem appearances point to the *rupture of an aneurism of the internal carotid in the cavernous sinus*. Dr. Dudley, of Lexington, tied the common carotid in 1841, and M. Herpin in 1844, for pulsating tumours in the orbit.[2] In none of the previous cases which had been submitted to ligature, eleven in number, had a fatal result occurred, but this series of successes was broken by M. Petrequin's case in 1845. Ligature failing, galvano-puncture was tried without avail. Unfortunately no post-mortem examination could be made. In 1851 Gervasi cured a case described as aneurism by anastomosis of the right eye by ligaturing the carotid. Mr. Haynes Walton tied the right common carotid artery successfully in a girl, aged four months and three weeks, for an affection of the right orbit, which was considered by all the surgeons who saw it as a case of "aneurism by anastomosis,"[3] and Brainard cured a pulsating tumour which had returned after ligature of the carotid by

('Annales d'Oculistique,' 1858, tome xl, p. 126). This last account is readily explicable on the supposition of a communication between the right carotid and the cavernous sinus; the other accounts are not so intelligible, but it is of little use to speculate on the subject (as Dr. Delens does) in the uncertainty produced by different statements.

[1] 'Leçons Orales,' t. iii, p. 437.

[2] Mackenzie cites Dr. Dudley's case as an example of true aneurism. Demarquay regards it as an instance of aneurism within the orbit, which had become diffuse by rupture of the aneurismal sac.

[3] Mr. Walton referred to the cases of Travers, Dalrymple, and Warren, as

injecting a solution of lactate of iron. Then followed the first case of Mr. Nunneley, and the case of Mr. France, Ophthalmic Surgeon to Guy's Hospital. In 1853 M. Aubry met with a remarkable case, not published till 1864, in which all the symptoms of an intra-orbital aneurism existed, and which he had an opportunity of examining after death. By injecting the arteries and dissecting them he ascertained that there was *no arterial lesion whatever, but the ophthalmic vein and its branches were enlarged, and had formed the bossy vascular pulsating tumours observed during life. The ophthalmic vein was as large as the little finger, with very thin walls. The cavernous sinus was greatly dilated, and freely communicated with the varicose ophthalmic vein, but terminated behind in a cul-de-sac, the communication with the inferior petrosal sinus being cut off.*

In 1854 Mr. Curling communicated to this Society a paper entitled, "A Case of Traumatic Aneurism of the Ophthalmic Artery, consequent on Injury to the Head, cured by Ligature of the Common Carotid Artery." Mr. Curling supported the views of Mr. Busk, and conjectured that in his own case the ophthalmic artery had been wounded by a spiculum of bone detached by a fracture of the base of the skull.

Dr. Van Buren also tied the carotid artery successfully in a similar case, and the patient remained well when seen a year and a half afterwards.[1]

Mr. Critchett tied the carotid artery for an affection described at the time as aneurism by anastomosis of the right orbit.

The patient went on uninterruptedly well for several weeks, when attacks of hæmorrhage from the orbit occurred, and resulted in death four months after the operation. In all probability the case was one of malignant disease.

In the following year M. Bourguet cured a traumatic case

instances of aneurism by anastomosis in the orbit, and to those of Guthrie, Scott, and Busk as aneurisms of the ophthalmic artery, Scott's case being regarded as diffuse aneurism ('Oph. Surg.,' p. 258, *et seq.*). In his recent edition he has adopted the views of Mr. Nunneley.

[1] See Dr. Noyes' article, 'New York Med. Journ.,' 1869, p. 664.

by injecting the perchloride of iron after the failure of galvano-puncture; and Mr. Hussey met with a case of doubtful character, the nature of which he was unable to ascertain, because an examination of the body could not be obtained. M. Nélaton's first case, occurring in the same year, marks an important advance in our knowledge of the pathology of the affection. The patient had received a thrust in the *left* lower eyelid from the ferrule of an umbrella, and exhibited all the symptoms of an intra-orbital aneurism on the *right* side. By acuteness of reasoning, and by experiment on the dead body,[1] M. Nélaton diagnosed a wound of the right carotid in the cavernous sinus. The patient died of arterial hæmorrhage from the nose, and the diagnosis was confirmed. The *body of the sphenoid bone was fractured, and the right internal carotid was found torn across in the cavernous sinus. The sphenoidal sinus communicated with the cavernous sinus on the one hand, and the nasal fossæ on the other, and through this communication the hæmorrhage had taken place.*

The year 1856 was signalised by the successful application of digital compression in an idiopathic case by Professor Gioppi, of Padua.[2] Mr. Nunneley's second case of ligature

[1] M. Nélaton, endeavouring to account for the mechanism of the lesion, supposed that the ferrule of the umbrella, penetrating by the wound of the left inferior eyelid, had traversed the body of the sphenoid and wounded the right internal carotid, in the cavernous sinus. He even succeeded in reproducing that injury by driving a spike of wood obliquely across an incision made in the lower eyelid. The extremity of the spike passing across the body of the sphenoid, penetrated into the right cavernous sinus, and there compressed the carotid artery. M. Nélaton therefore concluded that there was an aneurism of the right internal carotid in the cavernous sinus. He excluded the idea of aneurism of the ophthalmic artery because that would have compressed the optic nerve at the level of the optic foramen. M. Nélaton's specimen, showing the wood driven from the left side to the right carotid artery in the cavernous sinus, is preserved in the Musée Dupuytren. Mr. T. Holmes, in a note to his 'Lectures on Aneurism,' observes, "I once assisted Mr. Prescott Hewett in a similar experiment, and with an equally successful result, and I produce a preparation in which a pair of scissors is thrust from the lower eyelid on one side into the cavernous sinus on the other, puncturing the internal carotid. The third nerve has just escaped." ('Lancet, 1873, vol. ii, p. 144.)

[2] Gioppi described his case as an aneurism of the ophthalmic artery, and

occurred in the same year. In 1857 Dr. Gurdon Buck tied the right common carotid artery in a traumatic case, effecting only partial improvement. After his discharge from the hospital in New York the patient went to sea, and coming to England was seen at one of the London hospitals. Returning to Dr. Gurdon Buck's care in February, 1859, he submitted to ligature of the left carotid, and in the course of a few months he got rid of the disease, vision being abolished. This case is regarded by Dr. Noyes as the case which was seen by Mr. Poland at the Moorfields Ophthalmic Hospital.[1] Dr. Buck's case is specially interesting as being the first (excluding McGill's and Ullman's cases) in which both carotids had been tied for the affection under consideration. An interesting case also was that of Dr. Halstead, who tied the left

supported his view by reference to the cases of Guthrie, Busk (whom he called Burk), Scott, Curling, and Bourguet. He cites a pathological observation of Carron du Villards who found accidentally an aneurism of the ophthalmic artery before entering the orbit, as well as the case of Rosas. The cases of Travers, Dalrymple, Roux, Guthrie ("1834"), Velpeau, Jobert, Herpin, Walton, and Brainard, he calls arterial telangeiectases. Triquet, who reported Herpin's case in 1852, is cited by mistake as having had a case of his own (see 'Annales d'Oculistique,' 1858).

[1] Dr. Noyes ('New York Medical Journal,' March, 1869, p. 664) gives the history of Dr. Buck's case, and states that the case had not previously been published. Comparing Mr. Poland's account of the case which he saw with the particulars of Dr. Buck's case, we notice some discrepancies, but these are readily explicable when it is remembered that Mr. Poland had lost his detailed account, and wrote from "scanty notes" eked out by memory. That Mr. Poland's case was not Dr. Van Buren's case is quite clear. Dr. Noyes was assured by Dr. Van Buren that his patient's *left* carotid was tied for aneurism in the *left* orbit, whilst Mr. Poland's patient was affected on the *right* side, and had a scar over his *right* carotid. There is, therefore, no room for Mr. Poland's suggestion that Dr. Van Buren wrote *left* instead of *right*. Mr. Poland states that his patient told him he had been treated by Dr. Mott; but this is certainly either a mistake of the patient or an error arising out of the loss of Mr. Poland's manuscript. To the same accident, and to the fact that Mr. Poland had read and transcribed Dr. Van Buren's case, we may fairly attribute the coincidence in the two accounts. If Dr. Buck's case was the case seen by Mr. Poland (and there seems to be no doubt of the matter), the patient must have attended at Moorfields in the latter half of 1858, or early in January, 1859. Mr. Poland gives no date, but his article was received by the editor in February, 1860 (see 'Royal London Ophthalmic Hospital Reports,' 1859–60, vol. ii, p. 219).

carotid artery successfully at the beginning of 1858. Both eyes were affected, but severer symptoms existed on the left side. In the same year M. Carron du Villards met with a case which was not submitted to treatment; Dr. Scaramuzza cured a patient affected idiopathically by means of intermittent digital compression; Hirschfeld reported a traumatic case in which, after death, a *small hole obstructed by a clot was found in the internal carotid artery in the cavernous sinus,* and two cases of ligature proved fatal. In Mr. Bowman's case all the signs of "intra-orbital aneurism" were present, and, on post-mortem examination, the careful research of Mr. Hulke *failed in discovering any arterial lesion. The cavernous sinus, the circular, transverse, and petrosal sinuses, were filled with clot softening in the centre, and the enlarged ophthalmic vein was plugged at its opening into the cavernous sinus.*[1] In Mr. Nunneley's case, a woman sixty-five years of age, *the left internal carotid artery was found enlarged in the cavernous sinus and surrounded by clot. The ophthalmic artery and its branches were enlarged.* In 1859 Mr. Corner, Surgeon to the Poplar Hospital, tied the right common carotid artery successfully in a traumatic case. The bruit persisted for twelve years and then ceased. Mr. Nunneley tied the carotid for the fourth time in an idiopathic case. Five years later the patient dying with symptoms of apoplexy, Mr. Nunneley found *an old aneurism of the ophthalmic artery at its origin from the internal carotid.* Previously to the occurrence of this case Mr. Nunneley had communicated a paper to this Society on "Aneurisms of or within the Orbit," in which he related his first three cases of the

[1] Mr. Hulke in his report of the case says that the majority of cases on record were not aneurism by anastomosis. There were two distinct series of cases. Of twenty-one cases known to Mr. Hulke the largest set consisted of true or diffused aneurisms, as shown by the suddenness of the attack, often after violence, &c.; the smaller set were aneurisms by anastomosis or erectile tumours. Mr. Bowman's case belonged to neither category ('Royal London Ophth. Hosp. Rep.,' April, 1859). Dr. Delens suggests that Mr. Hulke may have overlooked a small wound of the internal carotid, but Mr. Hulke assured Mr. Holmes that this could not have been the case (see Mr. T. Holmes's "Lectures on the Surgical Treatment of Aneurism," 'Lancet,' 1873).

affection. Having contended strongly against the belief that the cases previously recorded as such were really cases of "aneurism by anastomosis," he expressed his opinion that "some, if not the majority, were false circumscribed or diffused aneurism resulting from rupture of the vessel, rather than from dilatation of its diseased coats;" that in some the ophthalmic artery in the orbit was the seat of the disease; and that in some, as in his own third case, the carotid artery at its bend within the cranium was affected. Mr. Nunneley appears to have been unacquainted with the observations of Baron, Gendrin, Nélaton, and Hirschfeld, but his views indicate a decided advance in pathology, and had some influence in limiting the area of the doctrine of "aneurism by anastomosis."[1]

This doctrine was also combated ably and strongly by M. Demarquay, in a series of articles on intra-orbital aneurisms published in the 'Gazette Hebdomadaire for 1859,' and republished the following year in his "Traité des Tumeurs de l'Orbite." M. Demarquay divided the cases of intra-orbital aneurism into two categories, the *traumatic* and the *idiopathic*. The traumatic cases he regarded as dependent upon a rupture of the ophthalmic artery followed by an effusion of blood and the formation of a diffuse aneurism which he called a *primitive diffuse aneurism;* whilst, in the idiopathic cases, he supposed that there existed first of all a circumscribed aneurism of the ophthalmic artery, which was suddenly ruptured and became diffuse at the time of the commencement of the symptoms, and this form of aneurism he called *consecutive diffuse aneurism*.[2]

[1] Mr. Nunneley referred to the cases of Travers, Dalrymple, Busk, Scott, Curling, H. Walton, Velpeau, and Jobert (these two cases being communicated by Mr. Erichsen), Guthrie, and Van Buren; also to cases of aneurism by anastomosis treated by ligature of the carotid by Dr. Wood and Dr. Valentine Mott (see Dr. Wood's article in the 'New York Journal of Medicine,' 1857), and to Dupuytren's case of mixed erectile and cancerous growth, Schmidt's case of erectile tumour, and Freer's case of fungus hæmatoides. He omits all mention of the cases of Roux, Warren, Baron, Gendrin, Brainard, France, Critchett, Nélaton, Hirschfeld, Bourguet, and Gioppi—all of which had been published before his paper appeared.

[2] The evidence brought forward by M. Demarquay in support of his hypo-

Mr. Syme's successful case of ligature occurred in 1860, and was reported at the time by Mr. Joseph Bell, who recognised the distinction between the idiopathic and traumatic cases, and in an able article strongly opposed the doctrine of aneurism by anastomosis.[1] In the same year

thesis was of an inconclusive character. He cited the observations of Guthrie, Carron du Villards, and Giraudet of Tours. The cases of Travers, Dalrymple, Freer, Dudley, Roux, Jobert, and Herpin, he adduced as instances of *consecutive diffuse aneurisms*, and the cases of Busk, Scott, Curling, Velpeau, Petrequin, Brainard, Bourguet, and Gioppi, he ranged under the head of *primitive diffuse aneurisms*. M. Demarquay was more successful in his arguments against the doctrine of aneurism by anastomosis, and he justly referred to the entire absence of necroscopic proofs of the existence of aneurism by anastomosis in the orbit in any single case of intra-orbital aneurism. The weakness of his own theory in the same respect did not escape him, and he therefore brought it forward rather tentatively than positively, but he was strongly convinced of its correctness, and was able to adduce the pathological observations of Guthrie and Carrons du Villards as proving the occurrence of ordinary aneurisms in the orbit idiopathically, and the views of Busk, Curling, Petrequin, Bourguet, and Gioppi, who had all described their traumatic cases as instances of aneurism of the ophthalmic artery. He was also able to quote Mr. Hulke's opinions, and through Mr. Hulke those of Mr. Nunneley, as opposed to the doctrine of aneurism by anastomosis accounting for the majority of the cases of intra-orbital aneurism. Through a singular error, as already mentioned, Demarquay affirmed that the rupture of the ophthalmic artery diagnosed in Busk's case had been verified at a later date by an autopsy; whereas Busk's patient was alive and well when he last came under observation. Gendrin's case was brought forward as a case of phlegmasia of the orbital arteries. The existence of erectile tumours was not absolutely denied, and the cases of Rosas and Haynes Walton were adduced as probable examples of arterial erectile tumours of the orbit. I find neither mention of the cases of Baron Hirschfeld, Nélaton, France, Critchett, Scarramuzza, Van Buren, and Mott, nor allusion to the subject of arterio-venous communications.

[1] In illustration of the pathology of the affection, Mr. Bell referred to the post-mortem examination in Mr. Nunneley's fatal case of ligature, and to the very brief account of Mr. Bowman's case in the 'Lancet' of August 11th, 1860. He thought that an aneurismal condition of the internal carotid might account for the symptoms in some of the cases referring to Nunneley's fatal case, to Dudley's case of endocranial aneurism, and to a case reported by Sir Gilbert Blane, in which dilatations of the internal carotids much smaller than in Nunneley's case produced the most violent symptoms—acute pain, noise, and blindness. Aneurism, true or false, within the orbit he considered to be the cause in Scott's and Busk's cases. In Scott's case he says "there was evidently

Mr. Bowman tied the carotid with partial success for a pulsating tumour of the left orbit after the failure of digital compression. M. Passavant met with a case which followed an injury with a knitting-needle, and which he regarded as an aneurism of the lachrymal artery. The patient was a girl nine years of age. An attempt was made to reach the presumed aneurism by resection of a part of the external wall of the orbit, but it proved unsuccessful, and ultimately the child is stated to have remained in the same state as before. In 1861 Dr. Clarkson Freeman cured an idiopathic case by means of digitalis, cold, and direct mechanical compression of the pulsating tumour;[1] and Mr. Ernest Hart ligatured the carotid artery successfully in a case which he described in the following year as "a case of arterio-venous aneurism of the frontal branch of the ophthalmic artery and its satellite vein." Mr. Hart's able and comprehensive paper in the 'Lancet,' including references to most of the previously recorded cases, rendered the treatment by galvano-puncture, injection of coagulating fluids, and digital compression, better known by discussing the cases of Bourguet and Brainard, and furnishing an abstract of the cases of Gioppi and Scarramuzza.[2]

either a false aneurism or a rupture of an artery in the orbit;" whilst in Busk's case "the small aneurism could be felt." He then adduces Guthrie's case and two cases of aneurism of the arteria centralis retinæ cited by Mackenzie—one with pulsation in the orbit besides loss of sight." Lastly, he says that "obstruction to venous return in the sphenoidal fissure by endocranial aneurism or other tumour may be allowed as a cause, at least in cases where no true aneurism could be found on dissection, and especially in those cases occurring after blows on the head, and in connection with other head symptoms denoting internal mischief." Mr. Bell does not mention the cases of arterio-venous communication (see 'Edin. Med. Journ.,' 1861, p. 1064).

[1] One or two writers have stated erroneously that Dr. Clarkson Freeman's case was treated and cured by *digital* compression of the *carotid*, *e.g.*, Dr. Morton and Mr. Soelberg Wells.

[2] Mr. Hart gave a table of cases of ligature of the carotid for intra-orbital aneurism, 20 in number, of which 3 died, 1 was unsuccessful, 2 partially successful, and 14 successful. His table does not include the cases of Warren, Dudley, Haynes Walton, and Critchett, and he omitted the case assigned by Mr. Poland to Dr. Mott, probably regarding it with Mr. Poland as identical with Dr. Van Buren's case, which he included in his table.

Then followed Dr. Greig's successful case of ligature of the common carotid, and M. Legouest's successful case of ligature of both the common and external carotid after the failure of digital compression. Dr. Holmes, of Chicago, cured a traumatic case by the exhibition of veratrum viride and extract of ergot. Mr. Nunneley tied the carotid for the fifth time in a traumatic case, effecting a cure, and shortly afterwards for the sixth time with temporary relief in a doubtful case, which proved to be a case of cancer. A seventh case was seen, but the patient declined to submit to operative measures. In 1864 Mr. Nunneley's second paper, entitled, "On Vascular Protrusion of the Eyeball," was read at this Society. It contained his three last cases, and the account of the post-mortem examination of one of his earlier cases, at which he had found a circumscribed aneurism of the ophthalmic artery within the cranium. The views which he advocated may be gathered from the following passage from his paper:—"In the great majority of such cases of protrusion of the eyeball there is no disease whatever within the orbit: the seat of it is most commonly intracranial. The protrusion of the eyeball is passive, and the other distressing symptoms are secondary, depending upon obstruction to the return of blood through the ophthalmic vein. That this pressure in the great majority of acute spontaneous cases is caused by an aneurism of the carotid as it emerges into the cranium, or of the ophthalmic artery near its origin, is, I think, now certainly proved. In cases of traumatic origin supervening soon after injury to the head, the cause is most probably effused blood near to or within the cavernous sinus, whilst in those cases in which the protrusion does not come on until some time after the injury, or where the violence has not been so considerable, it may be serum or fibrine, or even pus, the result of suppuration within the sinus." Although Mr. Nunneley's pathological observations were not altogether complete, and although he was seemingly unacquainted with the published examples of arterio-venous communications in the cavernous sinus, he is entitled to the main credit of directing attention away from the orbit to the

vessels immediately behind it, and of throwing effectual discredit on the doctrine of "aneurism by anastomosis." In the following year Dr. Morton, of Philadelphia, reported an idiopathic case, cured by ligature of the carotid, as an "aneurism of the ophthalmic artery;" and, contesting the views of Nunneley, laboured to prove that the generality of cases of intra-orbital aneurism were ordinary aneurisms belonging to the ophthalmic artery. In a second paper published in 1870, Dr. Morton has modified his former views, and taken a more comprehensive view of the subject, and he has given accounts of several other cases which had fallen under his observation.[1]

In the same year occurred a case seen by Mr. Erichsen which subsided spontaneously under simple treatment; Szokalski's doubtful case ligatured with partial benefit, and M. Nélaton's second traumatic case. M. Nélaton tied the carotid, but the patient, a girl of seventeen, succumbed on the twelfth day. *A small hole was found in the left carotid artery in the cavernous sinus due to perforation by a detached fragment of bone.* The case related in abstract by M. Legouest was first published at length in 1870 in Dr. Delens very able and exhaustive monograph on communications between the carotid artery and the cavernous sinus; a work which has already exercised considerable influence in modifying current views on the pathology of intraorbital aneurism. In 1866, M. Desormeaux cured a traumatic case by injection of perchloride of iron, and a case under the care of M. Collard subsided under sedative treatment, whilst the patient was

[1] In his first paper Dr. Morton gave a list of thirty-four cases including Mr. Coe's case of intra-cranial aneurism and a case of vascular tumour of the orbit under Mr. Haynes Walton treated successfully by injection, and two cases of aneurism by anastomosis, one under Dr. Wood and the other under Dr. Mott (see 'Amer. Journ. of Med. Sciences,' 1865, vol. xlix). In his second paper he divided the cases of "vascular exophthalmos" into four groups: 1. True aneurisms of the orbit. 2. Diffuse aneurisms of the orbit. 3. Aneurisms by anastomosis. 4. Obstructed venous circulation intra- or post-orbital; and he enumerated what he considered to be their differential characters ('Amer. Journ. of Med. Sciences,' July, 1870, "Orbital Aneurismal Disease and Protrusion of the Eyeball from Venous Obstruction," &c.).

doing light work. Dr. Œttingen, of Dorpat, met with an idiopathic case which he attributed to thrombosis of the orbital veins, and he endeavoured to prove that blocking of the orbital veins, notwithstanding the anastomoses with facial and temporal veins insisted on by Sesemann, would occasion pulsation and bruit.[1] A post-mortem two years later disclosed an *absence of arterial lesion and partial obliteration of the orbital veins*. In 1867 Mr. Zachariah Laurence and Mr. Joseph Bell each tied the carotid successfully in a traumatic case. Mr. Laurence mentions another case under his observation, but I am not aware that it has been recorded. Dr. Foote met with a severe case following a fracture of the skull. The affection existed on the left side. Dr. Foote tied the left carotid, but as the symptoms were not relieved thirty days afterwards, he tied the right carotid. A month later the patient was discharged cured. In 1868 M. Socin tied the carotid in a traumatic case under the care of M. Schiess Gemuseus. At the end of five months the state of matters was much the same as before the operation. Pressure on the right carotid stopped the pulsation and bruit, but no further treatment was adopted. In the same year another fatal case of ligature occurred. The patient, a woman of sixty-three, under the care M. Wecker, was operated on by M. Richet, and died on the second day. *The ophthalmic vein was found very much dilated, and there was very marked atheromatous induration of the inner coat of the carotid artery*. Dr. Zehender published a summary of the results of ligation of the carotid for pulsating tumours of the orbit, and this was abstracted in the following year by Dr. Noyes, of New York. Dr. Zehender gave thirty-one cases: Dr. Noyes added others, and made up a total of

[1] Dr. Sesemann's account of the orbital veins is very different from that ordinarily given. According to him the ophthalmic vein sends a very small quantity of blood into the cavernous sinus, the greater part of the orbital blood flowing out by the facial vein (Reichert's und Du Bois Reymond's 'Archiv,' Heft 2, 1869, and 'Klin. Monat.,' Aug., 1869). M. Sappey finds an absence of valves in the ophthalmic veins. For Dr. Œttingen's views see 'St. Petersburger Med. Zeitschrift,' bd. xi, 1866.

forty-five, including cases of cancer, intra-cranial aneurism, and aneurism by anastomosis in the neighbourhood of the orbit.[1] Dr. Harlan treated a traumatic case unsuccessfully by digital compression.

In 1869 M. Wecker met with a traumatic case which was benefited, but not cured, by compression. Mr. George Lawson reported a case which he had not considered it advisable to submit to treatment, and M. Galezowski cured, or nearly cured, a pulsating tumour of the left orbit (developed three years after an injury) by means of intermittent digital compression continued for several months. M. Galezowski's second case of intra-orbital aneurism, met with in 1871, exhibited the affection on both sides. The patient was sixty years of age, and was not submitted to treatment. In 1871, Dr. Schmid, of Odessa, tied the carotid with partial success. In 1873 the first case of ligature of the carotid for intra-orbital aneurism occurred in Germany. The patient was under the care of Dr. Hippel, and the artery was tied on the antiseptic plan by Professor Schönborn with considerable benefit.

M. Julliard, of Geneva, has related a case under the title of a diffuse aneurism of the orbit, due to atheromatous degeneration of the ophthalmic artery, and Dr. Nieden, of Buchom, has recently reported a traumatic case which was much relieved, and, when discharged from hospital, seemed to be on the high road to a perfect cure after ligature of the carotid artery performed according to Lister's method.[2]

[1] 'Klin. Monat.' f. Aug. vi, 1868, p. 114, and 'Noyes' New York Med. Journ.,' 1869. There is an analysis of seventeen cases in Schmidt's 'Jahrbücher,' Nov. 4, 1859. Also in "Die Verletzungen des Auges, von Zander und Geissler, Leipzig and Heidelberg, 1864," thirty-one cases are given. In 1868 M. Léon Lefort wrote on "Ligature of the Carotid for Vascular Tumours of the Orbit," 'Gaz. Hebd.,' 1868, p. 551. He does not give references.

[2] Dr. Nieden states that taking the statistics of Morton, Noyes, and Pilz, he obtains 113 cases of ligature of the carotid for pulsating tumours of the orbit, of which 79 were cured, 14 were not benefited, 7 obtained partial relief, and 13 proved fatal. Now, in 1865 Morton gave 30 cases of ligature, and in 1869 Noyes gave 45, including all Morton's cases and 15 others. In 1868 Pilz gave most of those given by Morton and Noyes, together with some others, such as McGill's, McClellan's,

Mr. Lansdown, of Bristol, has described a traumatic case of pulsating tumour of the orbit as a "varicose aneurism of the nasal artery and vein." It was completely cured by cutting through the tissues of the upper lid, exposing the globular pulsating tumour, and ligaturing the vessels connected with it.

The subject of "orbital aneurism" was discussed at length by Mr. Holmes in his very interesting "Lectures on the Surgical Treatment of Aneurism" delivered at the Royal College of Surgeons in 1873, and I may take this opportunity of expressing my obligation to him for some valuable suggestions and references, when my attention was first drawn to the subject. I am also much indebted to my colleagues, Mr. Waren Tay and Mr. Reeves, and to Dr. Buller and Mr. R. W. Parker, for assistance in collecting the abstracts of foreign cases. It may be as well to add that, from the list of cases enumerated above, I have purposely excluded cases of pulsating cancer of the orbit for which the carotid has been tied, as, for instance, the cases of Lenoir, Hamilton, Woodward, A. B. Mott, Van Buren, and Halstead; the cases of aneurism by anastomosis in the neighbourhood of the orbit treated by ligature by Dr. Wood and Dr. Mott, and Mr. Coe's case of ligature of the carotid for intra-cranial aneurism. The cases of Parrish and Rosas have also been omitted. Some of these will be referred to under the head of diagnosis, nor have I alluded to the case in which Mc Gill successfully tied both carotid arteries within the space of a month for tumours of both eyes, called "vascular tumours" by Pilz and "fungous tumours" by Erichsen, and obtained a subsidence of the swellings, because I have been unable to obtain the number of the 'New York Medical

and Cadwell's cases of "erectile" or "vascular tumours of the orbit." Critchett's case is placed under the head of ligature for hæmorrhage (erroneously, for the bleeding occurred after the operation). At the outside, when all the cases are taken, there would not be a larger number than 50. The statistics obtained from Pilz were communicated to Dr. Nieden in a letter, but it is evident that the total of 113 must have been obtained by adding Morton's 30 cases, Noyes' 45, and 38 from Pilz, together, and thus reckoning the great majority three times over.

and Physical Journal' in which the case is recorded. The exact nature of the case is therefore unknown to me.

In reference to Ullman's case of double ligature it is stated, in Mr. Erichsen's table of ligature of both carotids ('Surgery,' vol. ii, p. 76), that the patient was twenty years of age; the disease, "erectile tumour of the orbit;" that the left carotid was tied in 1823, and the right a year afterwards; and that death took place from hæmorrhage on the third day after the second operation. In Pilz's table ('Langenbeck's Archiv,' vol. ix, 1868, p. 328), however, the disease is described as affecting the "left ear."

I have also omitted Cadwell's successful case of ligature of the carotid for what is described as "erectile tumour of the orbit." The patient was a woman of sixty years of age, the disease had commenced a year previously at the lower border of the right eye, and spread down to the side of the nose. It will be found in Norris and Pilz's tables, and is related by Cadwell in the 'Boston Medical and Surgical Journal' for 1840. To McClellan's case of erectile tumour of the orbit, also mentioned by Norris and Pilz as occurring in 1825, in a girl five years old, as being of four and a half years' duration, and as cured by ligature of the carotid, I have been unable to refer, because it is recorded in vol. v of the 'New York Medical and Physical Journal,' to which I have not had access.

The following is the history of my own case.

On the 8th of July, 1873, Wm. Clark, twenty-four, platelayer, was stooping down on the line, when the iron step of a rapidly moving engine struck the right side of his head and prostrated him. A few minutes afterwards he was taken to the London Hospital; he was quite conscious, and answered questions readily. There were two lacerations of the scalp on the right side of the head above the ear, and between the two a depression of the parietal bone could be felt, but no bare bone could be reached through either wound. At a later period when the swelling had subsided, the depression was found to extend forwards for three inches to the frontal bone. The other symptoms were bleeding from the nose, great swell-

ing of the right eye, and sub-conjunctival effusion on both sides.

On the 17th, ptosis and paralysis of the internal, superior, and inferior recti were observed on the left side, and it was thought that the left eye was rather more prominent than the right; both pupils were dilated, and acted well. On the 24th the left pupil did not act; it remained fixed midway between contraction and dilatation. During the next fortnight the patient improved, and the orbital muscles, with the exception of the levator palpebræ, regained their powers of movement. There was some congestion of the eyeball with a little chemosis. All these symptoms were attributed to effusion of blood near the seat of fracture, occasioning pressure on the nerves and obstruction to the venous circulation. There was no pulsation or tumour. At this time, as usual, I gave up the charge of my patients for a few weeks to my associated colleague, Mr. Reeves. According to the notes furnished to me by my house-surgeon, Mr. Alfred Kebbell, no fresh symptom was noticed for ten or twelve days. On the 23rd of August pulsation of the eyeball was observed, and on stethoscopic examination a bruit was distinctly heard over the temporal fossa. The patient also could hear a noise in the head like wind blowing—he had not heard it previously; it was increased in the recumbent position, and on closure of the ears. Vision with the left eye was impaired. Pressure on the left carotid lessened, but did not stop the bruit and noise in the head.

On September 3rd, Mr. Reeves instituted digital compression of the left common carotid. Six dressers were employed, each compressing with his thumb for ten minutes at a time. As the patient could not bear the pain of compression after the lapse of two hours and a half, ether was given, and its administration was kept up for three hours. At the end of this time it produced so much retching and vomiting, that it was left off, and compression was continued without it for the remaining period. The chief results of the compression were the production of hoarseness, and diminution of the bruit and noise in the head. On the 15th of September

digital compression of both carotids was tried for two hours, but caused too much discomfort to be continued longer. Digital compression of the left carotid artery only for seven hours was maintained without improvement. At the end of the month a consultation was called in reference to ligature of the common carotid, but it was considered inexpedient to perform the operation.

Early in October, when I resumed the charge of my wards, the following was the condition of the patient. There was exophthalmos to the extent of about a quarter of an inch, the eyeball being pressed forwards, downwards, and a little outwards. The conjunctiva presented the ramifications of dilated veins; its lower half formed a thick transverse pad resting on and concealing the everted lower lid. The iris acted less readily than that of the other eye; the cornea was clear; there was ptosis; the eyeball could be moved by the patient in all directions; the hollow beneath the orbital arch was obliterated, but I could not satisfy myself that pulsation could be felt by pressure in this region. There was no pulsation of the eyeball; it had only lasted for a few days. A loud continuous bruit so exaggerated during the arterial pulse as to seem at first intermittent could be heard all over the head; it was much diminished, but not abolished, by pressure on the carotid. The patient remained in the hospital till January, 1874, when he went to the convalescent home at Brighton. Digital compression tried for twelve hours successively in November, and intermittent instrumental compression, had produced no appreciable effect. The patient remained at Brighton for six weeks. On his return the exophthalmos was more marked, and the sight of the left eye so much impaired, that he thought he should lose it altogether. The space between the globe of the eye and the orbital arch was filled on the inner side with a pulsating, soft, compressible and thrilling tumour. Mingled with the bruit which retained its former character of continuity with reinforcements during the arterial pulse, a high plaintive whistling note could be heard at intervals. The sound is called by French authors the *bruit de piaulement* or *miaule-*

ment, from its likeness to the mewing of a cat. It was only audible in front over the eye and the orbital margin. When the pulsating tumour was compressed, the bruit heard over the orbit at once ceased. Ophthalmoscopic examination by Mr. Buller and Mr. Tay showed dilated retinal veins and prominence of the margin of the optic disk. At a later period Mr. Couper observed in addition pulsation of the retinal veins.

The foregoing characters led me to concur in the opinion expressed by Mr. Holmes, who had seen the patient more than once, that the nature of the aneurism was arterio-venous, and that there existed a communication between the carotid artery and the cavernous sinus. A further trial of compression was made in three ways. Direct pressure by means of a pad and bandage was applied to the pulsating swelling, but it increased the congestion of the conjunctiva. Intermittent compression of the left common carotid by means of a collar tourniquet constructed for the purpose was kept up for many weeks without exerting any beneficial influence. At the end of May digital compression was tried once more. The artery was compressed for four hours daily during sixteen days, by Messrs. Fisher, Rees, Heyman, Hughes, Rawes, and Clippingdale, under the constant supervision of Mr. Bowkett, the house-surgeon. At first it arrested the pulsation, but it was observed that pulsation returned in the tumour during the continuance of very firm and effective pressure. The bruit was lessened, but never ceased. Compression of the right carotid did not appear to have any effect. On the cessation of digital compression the patient was still kept at rest in bed, and was ordered tincture of veratrum viride. Beginning with five minims three times a day, the dose was gradually increased to fifteen minims four times a day. Sickness supervened after the increase of the dose, and the pulse fell from 65 to 48. Pulsation and prominence of the pulsating swelling were slightly diminished, but not sufficiently after nearly three weeks' trial to give a prospect of permanent benefit.

The patient was anxious for the cure of an affection which would interfere with his earning his living, partly by

reason of its unsightliness, and partly because it was exacerbated whenever he undertook any exertion. A spontaneous subsidence was improbable. Removal of the eyeball was proposed by the patient, but it was explained to him that the operation would be likely to prove equally embarrassing and useless, and might necessitate ligature of the carotid. Galvano-puncture tried twice unsuccessfully, in other cases did not appear to be a suitable remedy for the form of aneurism. Ligature of the carotid would undoubtedly have been selected as the best method of treatment, but that the effect of digital compression seemed to show that the benefit to be expected from removal of the pressure of the blood in the left internal carotid artery would be but temporary, and that if the exophthalmos, pulsation and swelling were diminished or even removed for the time, they would in all probability return in a few weeks or months. The great desideratum appeared to me to be, to obtain the obliteration of the dilated ophthalmic vein. The agent best adapted for effecting this object seemed to be a solution of perchloride of iron. Injection of the perchloride had been successfully employed by Bourguet and Desormeaux, and strongly recommended by Broca, Demarquay, Delens, and others who had paid attention to the subject. On communicating my views to Mr. Holmes, he expressed the opinion that the information which we at present possessed was in favour of injection in preference to ligature, and in favour of further interference rather than of doing nothing. The comparative risks of the procedure by injection and ligature were explained to the patient, my impression being that injection would involve rather more risk to the eye, and be attended with some pain and discomfort, with sickness for a day or two, whilst ligature would entail more risk to life. The latter risk, however, I estimated at a low rate—the percentage of probable deaths being as I then thought about 15. The patient gave his consent to treatment by injection.

Accordingly on Saturday, July 11th, rather more than a year from the date of the accident which caused the aneu-

rism, I injected into the pulsating swelling below the orbital arch with a Pravaz syringe, five minims of a *neutral* watery solution of the perchloride of iron, of the strength of 28 per cent., in the presence of Mr. Holmes, who kindly assisted me, and my colleagues, Mr. Waren Tay, Mr. McCarthy, and Mr. Reeves. As at one of Mr. Nunneley's operations a violent thunderstorm was raging at the time. The patient was seated in a chair, and was not placed under the influence of an anæsthetic.

The pulsating tumour at the inner third of the orbital margin being very soft and repressible, and the tissues of the upper lid resisting, it was only at the second attempt that I succeeded in introducing into the venous sac the fine trocar and canula employed. This success was demonstrated by the issue of *arterial* blood through the canula on the withdrawal of the trocar. The syringe was then screwed on, and the solution injected. On withdrawing the canula no blood issued. Three or four minutes later it was observed that the upper eyelid was beginning to swell, and it gradually became tense, pressure on the carotid not appearing to exert any influence on it. The conjunctiva round the cornea was raised by clear transparent serum, which afterwards became turbid. Local pressure with a compress and bandage over the upper eyelid relieved the uneasy feelings of the patient.

Locally the effect of the injection was to produce a small coagulum in the ophthalmic vein at its anterior part, and to alter entirely the character of the pulsation and bruit. The pulsation became of a steady heaving character, extending to the outer part of the space between the eye and the margin of the orbit. Here it was much more marked than on the inner side. The thrill was abolished. No bruit could be heard over the upper eyelid or orbital margin. Over the temporal fossæ the bruit maintained its former character. The patient felt at first as if he had a sick headache with considerable local pain and uneasiness. Subsequently he vomited, and the sickness continued throughout the following day.

On Sunday the swelling had increased, and seemed to have reached its culminating point. The conjunctiva round the cornea was infiltrated and raised, so that the cornea was nearly concealed. The upper lid was distended, tense, and œdematous, and had the ecchymosed aspect which was observed in Bourguet's case, but this colour changed to a red inflammatory hue within twenty-four hours. The pulse was 48, the temperature normal. Effervescing ammonia mixture with a little hydrocyanic acid had been given to relieve the sickness, and hypodermics of morphia to relieve the pain. Ice-bags had been applied over the compress, but were too heavy for the patient to bear, the parts being very sensitive. On Tuesday evening, the third day after the injection, the swelling had increased, the cornea was concealed, the pulsation was stronger, the local discomfort was considerable, a slight epistaxis indicated an increase of pressure on the venous circulation. As a second injection would have been attended with difficulty on account of the distension of the upper lid, and could not be expected to lessen the swelling, I came to the conclusion that ligature of the carotid would be advisable, believing that it would relieve all uneasiness, and effect complete coagulation of the blood in the ophthalmic vein, favoured as it would be by the presence of pre-existing clot, that it would cause the subsidence of the infiltration round the eye by removing the vis à tergo, and that as the patient could still recognise objects held in front of the uncovered cornea, the operation would afford him the best prospect of recovering the use of his eye. Under these circumstances I determined to tie the carotid with as little delay as possible, if the measure should be approved at a consultation. Soon after 8 a.m. on the following morning, Wednesday, July 15th, Mr. Hutchinson, Mr. Tay, and Mr. Reeves saw the patient with me, and concurred in the proposal. The patient at first was unwilling to submit to the operation, but ultimately consented. He was placed under the influence of chloroform, as he would not take ether, and a silk ligature was applied to the left common carotid in the usual place above the omohyoid.

Owing to previous compressive treatment the fascia was found condensed and tough, and the tissues were so vascular that one or two superficial vessels had to be secured. The operation, performed as deliberately as possible, was unattended with any further difficulty than that resulting from the shape of the neck, and from the muscular development which was considerable, and rendered the vessel rather less accessible than usual. The jugular vein had a tendency to bulge over the artery inside the sheath, but being repressed with the finger gave no trouble. The sheath, being opened sufficiently to allow the passage of the aneurism needle, was gently separated from the artery on either side with a director, and the needle and ligature were passed.

On tightening the ligature, pulsation at once ceased in the upper eyelid and the tissues became flaccid. The bruit ceased for a minute, but was speedily reproduced, though much less loudly than before. No cerebral disturbance or other ill effects followed the operation. The ligature fell on the 5th of August, exactly three weeks afterwards. The swelling of the ocular tissues at once began to subside, and the arrest of pulsation was so complete that not the slightest beat or thrill could be felt in any part of them, and neither the frontal nor supra-orbital vessels could be detected. In a few days I was greatly disappointed at finding that, notwithstanding the steady removal of infiltration of the ocular tissues, a white spot which had appeared at the lower margin of the cornea had enlarged, and that loss of some portion of it was inevitable. A small ulcer formed, and some sloughing of the superficial layers occurred, whilst the rest of the cornea became hazy. As the upper eyelid was relieved it was ascertained that the ophthalmic vein contained firm clot, a hard rounded body occupying the place of the soft rounded pulsating swelling which had previously existed there. The patient went out in the middle of September. At that time I was away from the hospital, but he came to see me a month later. The eye had quite regained its position in the orbit, and the upper lid had to some extent recovered its power of movement. A narrow fold of

conjunctiva still projected, and the lower lid was everted. The cornea appeared semi-opaque and cicatricial, but the patient stated that he could distinguish light from darkness, and recognise his fingers moving in front of it. The bruit was not so loud as it was when he left the hospital.

On October the 24th I removed the projecting conjunctival fold with a pair of curved scissors, with a view to remedying the eversion of the lower lid. At the end of five or six weeks some eversion of the lower eyelid still remaining, strips of strapping were applied to bring and retain it in position. This treatment was effectual in a few weeks in removing the deformity. At the present time, therefore, the opacity of the cornea is the sole external indication of the original affection. At the latest date he could still distinguish light from darkness.

The main cause of the failure of the treatment by injection must, I think, be attributed to the small quantity of the solution of the perchloride employed. Being anxious to proceed with due caution, and following the recommendations of authors, I injected only five drops; ten or fifteen would probably have effected sufficient coagulation. The subsequent swelling was much greater than I had reason to expect from the records of other cases.

General Remarks.—The cases of intra-orbital aneurism fall naturally into two categories, those arising spontaneously and those following after an injury, or in other words the *idiopathic* and the *traumatic*. Of 73 cases referred to in the present paper, 32 were idiopathic and 41 traumatic. This classification is supported by a comparison of the two series of cases. Thus of 32 idiopathic cases 13 were affected on the left side, 15 on the right side, 2 on both sides, and in 2 the side is not stated. Of the traumatic, 41 in number, 27 were affected on the left side, 10 on the right side, 3 on both sides (in 2 certainly more severely on one side than the other), and in 1 the side is not stated. Hence it will be seen that the preponderance of cases in which the affection has existed on the left side, to which some authors call especial

attention, is entirely maintained by the traumatic cases, and must be regarded, I think, as of a casual character. This is shown also by the nature of the causes of the injuries occasioning the aneurisms. Of 13 cases due to blows of various kinds the disease occurred on the left side in 10. Falls occasioned the disease in 19 cases, 9 being on the right side, 8 on the left side. Punctured wounds in the orbit (2 with the ferrules of umbrellas, 1 with the forked end of the iron rib of a parasol, 1 from a fall on to a stick, and 1 from the entrance of a knitting needle), occasioned 5 cases. All the wounds were inflicted on the left side, but only 4 of the aneurisms occurred on the left side, the other being on the right side or side opposite to the seat of external injury. A discharge of shot received in the left orbit and eye occasioned the disease on the right side in 1 case.[1] One patient was wounded at the inner side of the left upper eyelid by the bursting of a soda-water bottle while he was in the act of stooping and opening a hamper. A pulsating tumour developed at the seat of injury. A blow on the nape caused the disease on both sides, but more severely on the right.

The average *age* of the idiopathic cases is higher than that of the traumatic. In the *idiopathic* cases the age ranged from four months and three weeks, in Mr. Haynes Walton's case (a case clearly of a special character), to 69, the mean age of 27 cases (Mr. Walton's case and one of Dr. Morton's being omitted) being just 43. In the traumatic cases the age ranged from 11 to 72, the mean age of 37 cases being between 30 and 31.

In regard to *sex* there is a further difference between the idiopathic and traumatic cases. Of 30 idiopathic cases, 21 were in females, and 9 in males. Of 41 traumatic cases, 31 were in males, and 10 in females.

[1] The case of Dr. Holmes, of Chicago. It is erroneously stated by Dr. Delens that the aneurismal symptoms occurred on the same side as the entry of the shot. But Dr. Holmes, who had seen Nélaton's first case, conjectured that the shot passed transversely through the tissues of the left orbit behind the upper part of the nose into the right orbit, wounding the ophthalmic artery or some of its branches.

The *mode of accession of the symptoms* deserves attention, and presents different characters in the two sets of cases. In the majority of the *idiopathic* cases the disease commenced suddenly with pain or noise in the head, or some peculiar feeling on the affected side; in other cases these precursory symptoms were absent. Two cases commenced in infancy without pain or constitutional disturbance, but both of these cases were different in kind from the cases occurring in adult life. Four cases occurred in young men and young women, to all appearance perfectly healthy. In two cases, both females, the affection was associated with disease of the heart and great vessels, and commenced suddenly on the left side with violent pains in the head and proptosis. In several there is no satisfactory account of the mode of origin. In a few the disease commenced gradually, with or without attacks of premonitory pain. Five cases occurred during pregnancy in women who had borne several children, four out of the five being six or seven months, and the other two months advanced in pregnancy. In all the attack occurred quite suddenly with violent pain and noise in the head, variously compared to a "sudden snap," the "cracking of a whip," the "report of a pistol overhead," a "blowing noise," and a "steam hammer," whilst in six other females not pregnant (three being over sixty years of age) in whom the attack was equally sudden, the several sensations experienced are described as "something appearing to give way," with or without a crack like that of a gun, "a kind of crowding feeling," a "strong buzzing," a "violent pain in the eye and temple," and "something queer in the head." Two of these patients were aroused from sleep by the pain and noise, in two the affection began as they were getting up as usual in the morning, and the others as they were pursuing some ordinary avocation, one being engaged in washing, another stooping down to take off her shoes, a third rubbing in a liniment ordered by her physician, a fourth returning from a drive, and a fifth sitting down at her work. One woman during an effort of childbirth felt "an unusual rattling in the eye," and perceived that "the eye was driven from the

orbit," whilst another attributed the affection to an effort made during her last confinement, five years previously. There is a strong resemblance between the whole of this group of cases pointing to a like resemblance in pathology. One man felt a deep-seated pain in the eye, and singing in the ear, as he was aroused from sleep. Another perceived one morning, after a fit of coughing, and without any precursory symptoms, that the eye was projecting from the orbit.

The first symptoms to appear after the precursory pains and noises have been generally exophthalmos and swelling of the lids and conjunctiva. Pulsation of the eyeball may be expected to precede the formation of distinct pulsating tumours in those cases in which both are observed. Bruit ought to be heard contemporaneously with the occurrence of the noises in the head, but as it is rarely listened for until pulsation is observed, the point remains to be determined. Exophthalmos has been extreme in a few cases, in two the eye is described as extruded from the orbit and lying on the cheek, in one even below the molar bone.

Of the *traumatic* cases it may be stated that the aneurismal symptoms are often masked by the general symptoms of injury to the head. As a general rule they are fully developed within nine months of the accident preceding the affection. More than half the cases exhibited all the symptoms within two months. Some of the cases were not seen till a much later period, but from the history it is clear that all the symptoms were well established a few weeks after the injury. In two cases only was there an interval of years.

Symptoms of fracture of the base of the skull are noted in 12 of the traumatic cases, in 17 the severity of the injury to the head renders it most probable that it occurred, whilst in 4 more it might not unfairly be presumed. Of the other cases 4 followed thrusts in the orbit, 1 was probably an idiopathic affection, 1 was occasioned by a discharge of shot, 1 by the explosion of a soda-water bottle and resulting wound in the upper eyelid, and 1 had several points of resemblance to a case of cancer, although it succeeded an injury. Setting

aside, therefore, 8 cases, we have 33 cases, of which 12 certainly, 17 almost certainly, and 4 probably had suffered from fracture of the base of the skull, more or less extensive and severe. This circumstance has an important bearing on the probable pathological cause of the affection in such cases.

The *primary symptoms* observed in the traumatic cases present some variations. In fourteen a blowing, roaring, or singing noise or beatings in the head are stated to have been heard either immediately or soon after the injury; in a few congestion of the conjunctiva and chemosis, with or without loss of power in the ocular muscles, and inaction of the pupil preceded exophthalmos, pulsation and bruit, so that in two or three cases the patients seemed to be affected with simple conjunctivitis. Exophthalmos is said to have preceded the pulsation and bruit in more than half the cases. It occurred directly or within a few days in 12, within a month or six weeks in 15, two months or a little longer in 2, five months in 2, and eight or nine months in 1.

The *development of a pulsating swelling beneath the upper eyelid at the inner third of the orbital margin* and *pulsation of the eyeball* are noted in both sets of cases. Of the idiopathic cases, 18 certainly presented a pulsating swelling between the eye and the orbital arch, and in 5 of these 16 cases pulsation of the eyeball was also observed. Of the *traumatic* cases, a pulsating tumour is noted in 24, pulsation of the eyeball also being specified in 8. Pulsation of the eyeball without a pulsating tumour *appears* to have been present in 6 idiopathic and 10 traumatic cases. In 7 cases pulsation is mentioned without distinct specification of the eyeball or of a pulsating tumour. Exophthalmos and bruit without either pulsation of the eyeball or a pulsating tumour appear to have been present in 3 idiopathic and 3 traumatic cases. The existence of bruit is specified in 22 idiopathic and 33 traumatic cases, but it was evidently present in all but two or three of an exceptional character. The exact characters of the bruit are noted only in a small minority. In a few cases the bruit was so loud as to be audible to bystanders.

The *typical* symptoms of the so-called "intra-orbital aneurism" are exophthalmos, a chemosed pad of conjunctiva concealing the lower lid, pain, paralysis of orbital muscles and iris, with or without anæsthesia, pulsation of the eyeball, a pulsating tumour above the eye beneath the inner part of the orbital arch, distension of conjunctival vessels, obliteration of the hollow beneath the orbital arch, bruit and noises in the head. Pulsation of the eyeball, a pulsating tumour, and paralysis of ocular muscles may be absent without contra-indicating the diagnosis of aneurism; but I do not think that any case should be regarded as aneurismal in which a bruit cannot be heard, or be placed under the head of "Intra-orbital Aneurism," unless, in the absence of pulsation, exophthalmos and congestion of conjunctiva accompany the bruit. In two idiopathic cases pulsation was apparently absent, and a bruit is not mentioned. One of these, a case of Mr. Nunneley's, was probably not an aneurism, for there were not even noises or beatings in the head; in the other, noises in the head were present, auscultation seemingly not having been practised.

The only true basis for the *pathology* of intra-orbital aneurism is the result of post-mortem examinations. Out of the 73 cases adduced in this paper, opportunities for examination of the parts after death have been presented in 12 with the following results:

1. In one case only—the case of Guthrie—has there been found any aneurismal affection within the orbit, and in this case an *ordinary circumscribed aneurism* existed *on each ophthalmic artery*. No account is given of the condition of the blood-vessels behind the orbit.

2. In one case—the case of Dr. Œttingen, of Dorpat—inflammatory mischief within the orbit leading to plugging of the orbital veins was diagnosed. At the post-mortem two years later Dr. Œttingen found no changes in the arteries, but evidences of past inflammation of the orbital tissues and *partial obliteration of the orbital veins*. The condition of the intra-cranial vessels is not described.

3. In the remaining ten cases the affection was caused

by some disease of the blood-vessels immediately behind the orbit.

4. In two of these ten cases *no arterial lesion whatever was discoverable*. One of the cases, Bowman's, was traumatic; and the other, Aubry's, was idiopathic. In both obstruction *to the passage of blood from the orbit through the intra-cranial sinuses* appeared to be the cause of the affection.

5. In one idiopathic case which Mr. Nunneley had cured by ligature, post-mortem examination five years afterwards showed a *circumscribed aneurism of the ophthalmic artery at its origin from the internal carotid.*

6. In three idiopathic cases—those of Baron and Gendrin and a case of Mr. Nunneley's—*rupture of an aneurismal internal carotid in the cavernous sinus* was discovered. In Mr. Nunneley's case the internal carotid artery contained and was surrounded by a clot. The ophthalmic vein and its branches would appear to have been very small, the opposite of the condition in Baron and Gendrin's cases, in which they were dilated. The ophthalmic artery and its branches were enlarged, and the inference from Mr. Nunneley's first description in his paper read at this Society undoubtedly is that these dilated branches of the ophthalmic artery had caused the pulsation observed during life. Further on in the same paper, the carotid artery is incidentally mentioned as "the ruptured and enlarged carotid."[1] From this description we should be quite unable to determine whether the condition causing the symptoms was rupture of an aneurismal carotid, simple dilatation of the carotid in the cavernous sinus, or aneurismal dilatation of the ophthalmic artery, and its two main branches within the orbit. In his subsequent descrip-

[1] 'Med.-Chir. Trans.,' vol. xiii, p. 186, line 19. At. p. 181 he says, "The ophthalmic artery was considerably dilated, its coats thickened with atheromatous patches; two of its branches, particularly the inner or the continuation of the trunk towards the inner angle of the orbit, were distended and filled with coagulum. The outer or lachrymal branch was also large and filled with coagulated blood, but not to the same extent as the inner. (It will be recollected before the operation it was at the inner side that the bruit and pulsation were most decided.) All the other branches, both of arteries and veins, were so small as hardly to be observed."

tion of the specimens, however, before the Pathological Society, he clearly speaks of the symptoms having been caused by a circumscribed aneurism of the internal carotid giving way in the cavernous sinus.[1]

7. In one case—that of MM. Wecker and Richet—the affection appears to have resulted from *simple dilatation and atheromatous degeneration of the internal carotid artery in the cavernous sinus*. It is not quite certain, however, whether the common carotid or the internal carotid in the cavernous sinus is the vessel indicated. No description is given of the state of the cavernous sinus and the sinuses connected with it. Hence it seems not improbable that the great dilatation of the ophthalmic vein and its frontal branch, which had formed the pulsatile thrilling tumours observed during life, may have resulted from the existence of a fissure of the internal carotid in the cavernous sinus which was overlooked at the post-mortem examination.[2]

[1] In the 'Transactions of the Pathological Society,' vol. xi, p. 8, Mr. Nunneley has given a description of the post-mortem appearances, together with a figure showing the left eyeball, the dilated ophthalmic artery, and the carotid surrounded by a clot. He heads the case: "A Circumscribed False Aneurism of the Cerebral Portion of the Left Internal Carotid Artery," and he speaks of the coagulum which surrounds the vessel as having escaped from the vessel. Further, in speaking of the pressure exercised on the ophthalmic vein and its branches, he observes:—"In the majority of cases this pressure is caused either by a small circumscribed aneurism of the internal carotid by the side of the sella turcica or of the ophthalmic artery, just at its origin, which may have given way, as in this instance, and as the history of Travers' and Dalrymple's cases would lead to the supposition had occurred in them (rather than as these two excellent surgeons imagined); or suppose the pressure results from effused blood escaping from a ruptured vessel in consequence of external violence, as in the traumatic cases in which Mr. Busk, Mr. Curling, and others in America and France have tied the carotid artery with success." From this it seems clear that in Mr. Nunneley's case an aneurismal dilatation of the internal carotid gave way in the cavernous sinus where the blood coagulated either before or after ligature, and, this being so, why were the ophthalmic vein and its branches smaller than usual? Could the ophthalmic vein by any possibility have been mistaken for the ophthalmic artery?

[2] After speaking of Bowman's case, Galezowski adds: "Another fact in all respects analogous is that of a patient operated on by Professor Richet by ligature of the carotid, from which the patient succumbed, and in whose body

8. In three traumatic cases a *direct communication between the carotid artery and the cavernous sinus* was found. In one case the carotid artery was nearly torn across, in the two others there was a small hole in the artery.[1]

9. In no single instance has *aneurism by anastomosis* or *cirsoid aneurism within the orbit* been *verified by post-mortem discovery*. In none of the cases referred, to in which the diagnosis of aneurism by anastomosis was made, can an *undoubted* claim be established to that title. This diagnosis was strongly supported in the case of Mr. Haynes Walton, and has recently received the sanction of Mr. Holmes.[2] It seems to rest chiefly on the tender age of the patient and the arterial souffle heard with the stethoscope, and if correct an exception must be granted to the assertion that aneurism by anastomosis in the orbit would not be readily curable by ligature of a distant main artery. One of the two cases reported under the title by Dr. Morton (see Appendix, Case 28 in the 'Idiopathic Series'), presented the typical symptoms of arterio-venous communication, and pressure on the carotid controlled all bruit and thrill with immediate lessening of the orbital tumour; the other, if the tumour was prolonged into the orbit at all, exhibited very different features (Case 29 in the 'Idiopathic Series'). Some have regarded Warren's successful case as a case of aneurism by anastomosis, but I think without sufficient grounds. If it were really of this nature we should be able to adduce it as a fresh instance of the facility with which aneurism by anastomosis of the orbit may be cured by the ligature of a distant arterial trunk.

10. In no single instance has an *arterio-venous aneurism*

at the autopsy no aneurism was found, whilst the ophthalmic vein was greatly dilated" ('Maladies des Yeux,' t. i, p. 826).

[1] Mr. Bryant found the carotid artery divided in its passage through the petrous bone in a case of fracture of the base of the skull ('Practice of Surgery,' p. 49).

[2] "Aneurisms by anastomosis sometimes affect the vessels of the orbit, but the symptoms are quite different from those of the disease now in question." The only reference given is to Mr. Haynes Walton's case ("Lectures," 'Lancet,' Aug. 23rd, 1873).

been *found within the orbit at a post-mortem examination.* Mr. Hart diagnosed his case as arterio-venous aneurism of the frontal artery and vein, but he was not at that time acquainted with the cases of arterio-venous communication behind the orbit; and Mr. Holmes, who saw the case, considers the evidence decidedly in favour of a lesion of the internal carotid. Moreover, the subsidence of the exophthalmos and the removal of all trace of a pulsating tumour of the orbit after ligature, show that so far as the orbit was concerned the affection was cured, whilst the persistence of a loud whizzing bruit audible over the head is sufficient evidence of a morbid condition of a large vessel within the cranial cavity.[1]

11. In no case have the symptoms of intra-orbital aneurism been *proved* to be due to a *tearing across of the ophthalmic artery at or near the optic foramen.* It is clearly established, however, that the ophthalmic artery may be ruptured by violence in connection with fracture of the base of the skull. M. Demarquay adduces the instance of the unfortunate Dr. Bennati, who died in consequence of a fall upon the pavement. The eye was pushed forwards, and a fracture of the base of the skull with effusion of blood into the orbital cavity was diagnosed. At the autopsy it was found that the eye was pushed forwards by an enormous blood-clot, that a fracture of the orbit near the optic foramen existed, and that the ophthalmic artery and vein were torn across.[2] It is not improbable that the symptoms in Mr. Scott's case were due to a rupture of the ophthalmic artery consequent upon a fracture of the base of the skull. The occurrence of proptosis, and irrecoverable loss of vision directly after the accident, point to a tearing across of the ophthalmic artery and

[1] Concerning Mr. Lansdown's recent case I find it difficult to offer any positive opinion. The general distension of the orbital veins and exophthalmos would seem to contra-indicate a varicose aneurism of such small vessels as the nasal artery and vein, and the success of the treatment cannot be used as a conclusive argument in favour of the diagnosis. On the other hand, the absence of noises in the head and the fact that the bruit could not be heard over the head would certainly support Mr. Lansdown's views.

[2] Demarquay ('Traité des Tumeurs de l'Orbite,' 1860, p. 272).

the optic nerve close to the optic foramen. At the same time the symptoms are consistent with injury to the internal carotid, and the occurrence of violent arterial hæmorrhage from the nose decidedly favours this interpretation.

12. *Thrombosis of the cavernous sinus and ophthalmic vein* may be present without occasioning "intra-orbital aneurism." Exophthalmos, œdema of the orbit, hyperæmia, photophobia, dilated immovable pupil, paralysis of the muscles of the eye, and diminution of vision, are the evidences of this condition.[1] Hence I think that it is very probable that Mr. Nunneley's second case, in which the symptoms were œdema of the eyelids and chemosis with slight exophthalmos, little or no pulsation, no bruit or noise in the head, was not an aneurism at all, but a case of thrombosis of the cavernous sinus and ophthalmic vein.

13. *Aneurism of the internal carotid artery in the cavernous sinus* may be present without giving rise to the essential symptoms of intra-orbital aneurism. Mr. Holmes has related a case of a boy of sixteen, who died in St. George's Hospital from heart disease. At the post-mortem examination aneurism of the left internal carotid artery about the size of a small nut, filled with laminated coagulum, was found at the anterior part of the cavernous sinus. The third, fourth, and fifth nerves were stretched by the tumour. During life the orbital symptoms had been ptosis, dilated and fixed pupils, diplopia, impaired vision, and uncertainty in the movements of the eyeball.[2] [Mr. Hutchinson communicated

[1] See Knapp, 'Archiv für Ophthalm.,' 1868, i Ab., p. 207; also 'Annales d'Oculistique,' 1859-60, p. 186; Ogle, 'Brit. and For. Med.-Chir. Rev.,' 1865, "On Morbid Growths of the Brain, Spinal Cord, &c.," Case 281, p. 512; Cassou, 'Thèse de Paris,' 1857, "De la Phlébite de la Veine Ophthalmique;" 'Archiv. Gén. de Méd.,' Sept., 1874, "Ozène et otite purulente, &c., Phlébites des Sinus du Crâne et de la Veine Ophthalmique;" Dr. Œttingen, 'St. Petersburger Med. Zeitschrift,' Bd. xi, 1866.

[2] 'Path. Soc. Trans.,' 1861. M. Giraudet, of Tours, has reported a case of aneurism connected with the right internal carotid and ophthalmic arteries, obliterating the cavernous sinus and stretching the second, third, and fifth nerves, in a woman fifty-two years of age; but the observation throws no light on intra-orbital aneurism, because we are not in full possession of the orbital symptoms observed during life. The orbital symptoms mentioned are

to the Clinical Society, after this paper had been read, a most interesting case of a circumscribed sacculated aneurism

periodical pains in the head with a feeling of being struck by a hammer on the right orbit. This symptom had been present for ten years. There had been progressive loss of sight on the right side (see 'Gazette des Hôpitaux,' 5th March, 1857, p. 105; also Demarquay, op. cit., p. 294). Sir Gilbert Blane's case of aneurism of each internal carotid may also be referred to ('Transactions of a Society for the Improvement of Medical and Surgical Knowledge,' vol. ii, p. 193, 1800). In his 'Thèse des Tumeurs Aneurysmales des Artères du Cerveau,' Paris, 1866, M. Achille Gonguenheim cites the following cases of aneurism of the internal carotid: 1. M. Boudet's case of a dyer, aged fifty-seven, whose death was occasioned by the rupture of an aneurism of the right internal carotid a little before it gave off the anterior and middle cerebral. Previously to the fatal seizure he had been subject for two years and a half, on and off, to heaviness of the head, dimness of sight, and singing in the ear. 2. Dr. Moon's case ('Lond. Med. Gaz.,' 1848) of a woman of fifty-two, who died in consequence of a rupture of aneurism of the left internal carotid near its termination immediately beneath the optic nerve, which it flattened and elongated. The aneurismal sac had burst on the ventricular side, and the blood had penetrated through a fissure into the ventricles. There is no account of the earlier symptoms during life. 3. Holmes's case related by Dr. Ogle ('Brit. and For. Med.-Chir. Rev.,' 1865), with the age stated as 60 instead of 16. 4. A case under M. Bouley of a female, aged forty-three years, whose death was occasioned by the rupture of an aneurism of the left internal carotid and middle cerebral. She had experienced for some years violent pains, and she had been subject for some time to continual headache. 5. A case under M. Bigot of a lady, forty-six years of age, who became subject to violent pains, and one day felt great anguish in the head deeply and behind the left eye. The pain was subdued by treatment, but at the end of a year the left eye seemed to become smaller and retracted into the orbit with increase of pain and ptosis. Nothing could assuage her anguish. Six months later, after some improvement, she was seized with poignant pain in the head, uttered a piercing cry, and expired. The internal carotid artery was ruptured near the anterior clinoid process, the internal and middle coats having been destroyed and the external stretched and extended. My colleague, Mr. James Adams, reported in the 'Lancet,' December 4th, 1869, a case in which he found after death an aneurism of the right internal carotid artery, of the size of a walnut, projecting from the right cavernous sinus. The symptoms during life had been œdema of the lids and conjunctiva, hazy and ulcerated cornea, injected conjunctiva and sclerotic, and paralysis of the 3rd, 4th, 5th, and 6th nerves. For other cases see Breschet, 'Mémoires sur Differentes Espèces d'Anévrysmes;' a memoir, by Albers, of Bonn, 1836, on "Aneurisms of the Arteries of the Brain," Barth, 'Bulletins de Soc. Anat.,' 1849, p. 348; Dr. J. H. Hutchinson's paper, 'Pennsylvania Hospital Reports,' 1869; and Bartholow, in 'Amer. Journ. Med. Sci.,' 1872, vol. lxiv, p. 373, "On Aneurisms of Arteries at the Base of the Brain."

springing from the outer side of the left internal carotid artery in the cavernous sinus, and communicating with the carotid by a small aperture. The patient was a female, forty years of age. The tumour was as large as a pigeon's egg, and occupied the middle fossa of the skull. It appeared to have obliterated the cavernous sinus. There had been no orbital symptoms during life, except those due to pressure on the third, fourth, and fifth nerves ('Lancet,' 17th April, 1875).]

14. It is of the greatest importance to remember that in eight out of the twelve cases examined after death, the *ophthalmic vein and its branches* have been found varicose and enlarged. In four they had formed the pulsating swellings observed during life. This was the condition equally in Aubry's case of obliterated inferior petrosal sinus, in Wecker and Richet's obscure case, and in Nélaton's two cases of communication between the carotid artery and cavernous sinus. In Baron's case the varicose state of the orbital veins was the cause of the exophthalmos. In Bowman's and Gendrin's cases, the distended veins communicated their pulsation to the eyeball. In Guthrie's case the ophthalmic vein was enlarged, but no pulsating tumour could be felt. Pulsation of the eye probably existed, but is not mentioned. In the four remaining cases there is no record of dilatation of the ophthalmic vein. The typical symptoms of intra-orbital aneurism appear to have been absent in Hirschfeld's case, because the hole found in the carotid artery had been blocked up by a decolorised coagulum. In Nunneley's two cases little mention is made of the state of the veins. In Dr. Œttingen's case there are large gaps in the record. Hence there is no ground for inferring that dilatation of the veins did not exist during life in these cases.

15. Dilatation of the ophthalmic vein and its branches requires time for its development. In the early stages of the affection, therefore, a pulsating tumour may not be felt, but in progress of time it will appear, and the distension of the veins may extend to the forehead, the bridge of the nose, and the inner angle of the opposite orbit, and a furrow may be worn in the bone by the pulsating and dilated

ophthalmic vein. Before the dilated ophthalmic vein becomes evident at the margin of the orbit, its pulsations may be communicated to the eyeball, so that pulsation of the eyeball will often precede the development of a pulsating tumour. Ophthalmoscopic examination may be expected to display, in addition to changes in the disk and sometimes hæmorrhagic spots, engorged and perhaps pulsating retinal veins. The dilated and pulsating vessel or vessels observed on the forehead in a few of the cases, and regarded by one or two observers as arteries, must, undoubtedly, be viewed as dilated and pulsating veins.

16. When we endeavour to read the symptoms by the light of the various morbid conditions which have been found after death, the interpretation is easy in some cases and very difficult in others. We understand at once a circumscribed aneurism of the ophthalmic artery in the orbit giving rise to proptosis, pulsation of the eyeball, bruit, paralysis of orbital muscles, and enlargement of the ophthalmic vein. That admission of arterial blood from the carotid artery into the cavernous sinus either from wound or rupture of the carotid should cause dilatation of that sinus, gradual enlargement of the ophthalmic vein and its branches, the formation out of them of pulsating and thrilling tumours, soft, lobulated, and compressible, pulsating retinal veins, exophthalmos, bruit and noise in the head, and that it should be accompanied with various combinations of nerve lesion, we readily comprehend.[1] That in cases of arterio-venous communication, the opposite orbit and eye might become affected in like manner through the passage of arterial blood from the cavernous sinus on one side, through the circular sinus, into the opposite cavernous sinus and ophthalmic vein, is quite intelligible. We can also perceive that any obstruction

[1] According to M. Gendrin, the exophthalmia in his case was due to the dilatation and congestion of the ophthalmic veins and to the infiltrated hæmorrhage, which was produced around the cavernous sinus. The beatings were the result of the pulsation of the carotid, being transmitted by the infiltrated blood and the obliterated orbital arteries; the bruit was the result of lesion of the arterial walls. When the carotid became obstructed altogether the pulsation, &c. ceased ('Leçons sur les Maladies du Cœur,' t. i, p. 240).

to the return of venous blood from the orbit into the cavernous sinus, either from a dilated and atheromatous carotid or an aneurism of the carotid or intracranial portion of the ophthalmic artery, or from obstructed sinuses, might cause enlargement of the ophthalmic vein, congestion of the conjunctiva, chemosis, swelling of the eyelids, proptosis, and even the formation of a soft repressible tumour out of the enlarged ophthalmic vein, which should project between the globe of the eye and the orbital arch. We should expect, in cases of dilated atheromatous carotid, or aneurism of the carotid or ophthalmic artery within the cranial cavity, to find a bruit and to learn that the patient heard noises in the head. But we are at a loss to account for pulsation of the eyeball, or pulsation in the swelling formed by the enlarged ophthalmic vein. According to Mr. Holmes, the explanation offered by Mr. Nunneley of the pulsation observable in his cases of intracranial aneurism, was that the pulsation of the aneurism was communicated to the fluid in the enlarged veins, and so to the eyeball. But in his case of aneurism of the carotid he describes the ophthalmic artery and its inner and outer branches as enlarged, and the branches as filled and distended with coagulum, whilst all the other branches, both of arteries and veins, were so small as hardly to be observed. Moreover, he refers the greater distinctness of the bruit and pulsation at the inner side to the greater enlargement of the inner branch of the ophthalmic artery. This was in his first paper. In his second paper he explains the protrusion of the eyeball by obstruction to the return of venous blood by post-ocular pressure on the ophthalmic vein at its entrance into the cavernous sinus, but I cannot find anything more than an inferential explanation of the pulsation; and as Mr. Holmes has observed, "curiously enough, though Mr. Nunneley lays much stress upon the condition of the veins in explaining the pathology of the disease, he gives no distinct account of the state of the cavernous sinus, or of the venous system in connection with it, in either of his fatal cases."[1]

[1] "Lectures," 'Lancet,' Aug. 2nd, 1873, p. 143.

It is much to be regretted that the state of the internal carotid and of the cavernous sinus is not specified in M. Wecker's case, for as it at present stands we can neither account for the enormous enlargement of the ophthalmic vein, nor for the pulsation in it during life.

It appears to me that we must adopt one of two explanations of the pulsation observable in these obscure cases. Either pulsation is communicated from the carotid artery to the blood in the cavernous sinus, and so to the blood in the ophthalmic vein and its branches, or else it is transmitted from the arteries through the capillaries to the obstructed veins. The latter explanation would accord with the views of those physiologists who hold that pulsation may be transmitted to the blood in any vein in the body when the arterioles are much relaxed.[1]

[1] Dr. Flint says, "The intermittent action of the heart which pervades the whole arterial system is generally absorbed, as it were, in the passage of the blood through the capillaries; but when the arterioles of any part are very much relaxed the impulse of the central organ may extend to the veins. Bernard has shown this in the most striking manner in his well-known experiments on the circulation in the glands. When the glands are in physiological activity the quantity of blood which they receive is very much increased. It is then furnished to supply material for the secretion, and not exclusively for nutrition. If the vein be opened at such a time it is found that the blood has not lost its arterial character; that the quantity which escapes is much increased, and the flow is in an intermittent jet, as from a divided artery. This is due to the relaxed condition of the arterioles of the part, and the phenomenon thus observed is the true *venous* pulse. What thus occurs in a restricted portion of the circulatory system may take place in all the veins, though in a less marked degree. Except in the veins near the heart any pulsation which occurs is to be attributed to the force of the heart transmitted with unusual facility through the capillary system. A nearly uniform current is the rule, and a marked pulsation the rare exception. Mr. T. W. King, in an article on "The Safety-Valve of the Human Heart" ('Guy's Hospital Reports,' 1837), discussing the forces which concur to produce the venous circulation, mentions the fact that in some individuals, after a full meal, pulsation can be observed in the veins of the hand or the median veins of the forehead. This phenomenon is very delicate, and to make it more apparent he employed a thread of black sealing wax about two inches long, which was fixed across the vein of the back of the hand with a little tallow, so as to make a long and excessively light lever capable of indicating a very slight movement in the vessel. In this way he demonstrated

M. Aubry offers two solutions of the pulsation which was observed in his case in the ophthalmic vein. The first theory supported by M. Bérard was, that pulsation was communicated by the carotid to the blood in the dilated cavernous sinus, and thence to the veins in the orbit. The second theory, supported by M. Aubry himself, was that in consequence of the obstruction to the passage of the venous blood out of the cavernous into the inferior petrosal sinus, the capillaries became so much enlarged that they allowed the transmission of the force of the heart's action to the blood in the orbital veins, and this theory was considered by M. Aubry to be borne out by the circumstance that he was able to reproduce pulsation in the tumours by injecting the right carotid.

Concerning Mr. Bowman's case, Mr. Hulke has written forcibly as follows:—"It is difficult to explain the aneurismal symptoms by the pathological appearances, which were those of phlebitis of the cavernous, transverse, circular, and petrosal sinuses. The internal carotid artery may have been partially compressed by the swollen walls of the cavernous sinus against the side of the body of the sphenoid bone, giving rise to the bruit which would have a good conducting medium in the cranial bones. The plugging of the trunk of the ophthalmic vein where it joins the cavernous sinus, by obstructing the return of venous blood from the orbit, accounts for the protrusion of the eyeball, and perhaps also for the pulsation which was felt when the fingers were laid upon it; because each diastole of the ophthalmic artery must have been attended by a general momentary increase of the whole quantity of blood in the orbit, because its exit through the ophthalmic vein was cut off, and the resisting bony walls of the orbit could permit a distension in front only. The healthy state of the internal

pulsation in the veins of the hand, and also in the arm, foot, and leg. These movements are very slight, and are generally only appreciable by some such delicate means of investigation. In certain cases of disease Mr. King has noted very marked pulsation in the veins of the back of the hand and other vessels far removed from the heart" ('Physiology of Man,' vol. i, pp. 312-14).

carotid artery and its branches, and of the internal jugular vein, preclude the idea that the pathological changes in the cranial sinuses commenced subsequently to the deligation of the common carotid."[1]

Adopting these explanations offered by M. Aubry and Mr. Hulke, we may, I think, conclude that pulsation will occur in the orbit whenever the quantity of blood which enters by the arteries is to any considerable extent greater than that which the veins can immediately return. This will happen when the ophthalmic vein and its branches, or the cavernous sinus, is obstructed; the quantity of arterial blood which enters remaining either the same in amount as before, or being from any cause increased, whilst anastomosing venous channels do not suffice for the extra work thrown upon them. The former condition was that which existed in M. Aubry's and Mr. Bowman's cases; the latter would occur if the internal carotid artery in the cavernous sinus, and the ophthalmic arteries should be dilated from atheromatous degeneration, whilst obstructions from clot or other causes impeded or prevented the return current of venous blood. [But if this explanation be accepted, how are we to account for the absence of pulsation of the eyeball or pulsating veins in the orbit in such a case as that related by Mr. Hutchinson? Whilst we cannot agree with some anatomists that the cavernous sinus is not the main channel by which the venous blood passes out of the orbit, we must allow that a certain and even considerable amount of blood might be carried off by collateral channels. The special circumstances attending Mr. Hutchinson's case seem to afford the proper key. The origin of the disease was not, like that of most of the idiopathic cases of intraorbital aneurism, sudden or attended with any loud crack in the head, indicative of something having given way deeply in or behind the orbit. It was gradual, and the progress was slow. Moreover, the aneurism sprang from the outer side of the artery, and was a sacculated diverticulum from the main trunk; it was not an actual enlargement of the carotid

[1] 'Ophthalmic Hospital Reports,' 1859-60, vol. ii, p. 11.

in the cavernous sinus. As it increased the cavernous sinus was compressed, and in the end almost if not quite obliterated, but at the same time, I think, the trunk of the carotid was also compressed, and the ophthalmic artery which mounts up over the aneurism must have been compressed also. In this way, whilst the gradual progress of the disease allowed time for the establishment of collateral venous channels to relieve the ophthalmic vein and the sinus, the pressure on the carotid and ophthalmic arteries diminished the ordinary supply of arterial blood to the orbit. Lastly, there was no obstruction, as in other cases there may be, in the collateral channels themselves.]

17. In the traumatic cases there has generally been an interval of at least some days or weeks before the typical symptoms have been manifested. Assuming that the majority of the traumatic cases have been cases of arterio-venous communication in the cavernous sinus, I believe that the interval has been due to the blocking-up of the aperture in the artery by coagulum, this coagulum subsequently undergoing absorption or disintegration. In the early stage, therefore, the only symptoms have been some swelling and redness of the conjunctiva with slight proptosis due to obstruction of the venous current, but as soon as the aperture of communication has become clear, noises in the head, bruit, and pulsation of the eyeball have declared themselves. In my own case the patient named very precisely the date at which he first heard noises in the head, viz. about six weeks after his admission, and this date corresponded with the time at which pulsation of the eyeball and a bruit were detected. In some cases a partial rupture may occur and become complete after a variable interval, or weakening of the coats by injury may lay the foundation for an ordinary aneurism.

We pass now to the consideration of the *differential diagnosis* of the various morbid conditions of blood-vessels within and behind the orbit. Within the orbit we might meet with erectile tumours, venous or varicose tumours, pulsating encephaloid cancer, arterio-venous aneurism, ordi-

nary aneurism either circumscribed or diffused, and aneurism by anastomosis. Meningocele and derangement of the sympathetic system will also require a few words of comment.

1. *Erectile tumours,* which are of two kinds, *arterial* and *venous,* are not likely to be confounded with aneurisms, for they exhibit neither pulsation nor bruit.[1]

2. *Venous* or *varicose tumours* are formed by dilatations of the ophthalmic vein or its branches, owing to some obstruction to the return of venous blood. If formed by the ophthalmic vein they will be prominent at the upper and inner part of the orbit, and yield similar sensations to those afforded by the pulsating tumours found in cases of intra-orbital aneurism, in so far as this, that they will be peculiarly compressible and repressible, but will have

[1] It is to be understood that I use the term erectile tumour in a much more narrow sense than that adopted by Sir James Paget in his 'Lectures on Surgical Pathology,' and in an entirely different sense from Gosselin, Robin, Galezowski, and others. I do not either include or mean the cirsoid aneurisms or the aneurism by anastomosis, but simply tumours consisting either of capillary vessels or of a cellular, reticulated, and spongy tissue containing either arterial or venous blood, and often surrounded by a capsule of condensed connective tissue. Of such a character are the cases of cavernous tumour, four instances of which are referred to in works on ophthalmic diseases, namely, one recorded by Lebert, 'Abhandlungen aus dem Gebiete der praktischen Chirurgie,' Berlin, 1848, p. 88; one by De Ricci, 'Dublin Quarterly Journal,' 1865, Nov., p. 338; one by Von Graefe, 'A. f. O.,' vii, p. 12; and one by Wecker, 'Maladies des Yeux,' t. i, p. 798. In M. Lebert's case the tumour was congenital, and was removed by Dieffenbach. In De Ricci's case, a young woman of twenty-two, the tumour was removed, but a recurrence took place, and then Bowman removed it with the eye. In Von Graefe's case the eye and tumour were removed together. Wecker dissected out the tumour, preserving the eye. Cases of erectile tumours occurring to Abernethy, John Bell, Allan Burns, and Wardrop, will be found in Mackenzie 'On Diseases of the Eye,' 4th edition, 1854, p. 161, &c., or in the French translation, vol. i, pp. 227, 237—239.

Compare also Schmidt's case (vol. i, 'Ammon's Ophthalmological Journal,' 1831) referred to by Busk ('Med.-Chir. Trans.,' vol. xxii).

Dupuytren removed a tumour from the orbit, together with the eye, which was healthy, and found that it was composed of erectile tissue mixed with a certain small quantity of cancerous material (see 'Journ. Hebd.,' 1830, vol. vi, p. 75). Dr. Jeaffreson, of Newcastle-on-Tyne, has related a case of erectile tumour in

neither bruit, nor pulsation, nor thrill. They will increase in size, in expiration, and stooping, and diminish in inspiration and the erect posture.[1] Pressure on the internal jugular vein should cause them to swell.

the orbit. The patient was a lad of fourteen, pale and delicate. A slight protrusion had existed at birth, and since then had gradually increased. The symptoms were exophthalmos of the left eye to such an extent that the lids, which were rather œdematous, could not be closed over it, congestion of the ocular tunics, sluggish pupil, impairment of vision, absence of paralysis of ocular muscles, pain and tenderness, but occasional slight aching and feeling of tension. The floor of the orbit was occupied with a swelling which was deeply seated and had a hard semielastic feel, yielding on pressure or slipping into the orbit. Puncture did not give exit to fluid. On dividing the conjunctiva below the globe the tumour was found to extend deeply into the orbit and to surround the optic nerve. It was unconnected with the bones, from which it was easily separated, and the whole mass, together with the eyeball, was readily enucleated. There was very free hæmorrhage. The socket was plugged with lint dipped in a solution of perchloride of iron, and a rapid recovery took place. The tumour, which was somewhat lobulated and enclosed in an ill-defined capsule, appeared on section to be reticulated and spongy, and to be composed of a large quantity of blood-vessels connected by condensed cellular tissue (' Oph. Hosp. Rep.,' vol. vii, p. 187, 1873). Similar cases have occurred in the practice of Mr. Critchett and Mr. Hutchinson at the Ophthalmic Hospital. A good deal of bleeding sometimes occurs when the tumour is incised. For vascular tumours treated by injection of tannin by Mr. Haynes Walton and Mr. Taylor, see ' Lancet ' or ' Med. Times and Gazette ' for 1858. For the venous erectile tumours see Velpeau, art. " Orbite," Dict. en 30 vols., t. xxii, p. 310). Demarquay refers to three cases as related in abstract in the ' Annales d'Oculistique,' supplément iii, p. 44 ; one in the practice of M. Viguerie and the two others in the practice of M. Dieulafoy. They occurred in infants and their extirpation was followed by abundant hæmorrhage which was arrested by plugging.

Mr. George Lawson has reported an interesting case of nævus of the left orbit in a child, aged three years and two months. Six months previously the eye began to protrude, and was gradually pushed out of the orbit until the cornea suppurated. No tumour could be felt. The pain was constant and severe. Mr. Lawson excised the globe and removed the greater portion of the growth, which consisted of large veins with a cellular matrix. The child recovered without a bad symptom (' Lancet,' 1871, vol. i, p. 116).

[1] A remarkable case is recorded by M. Foucher in the ' Gazette des Hôpitaux,' 2nd Dec., 1858, and may be found in Dupont's thèse, " Tumeurs de l'orbite formées par du sang en communication avec la circulation veineuse intra-crânienne," p. 15. The patient came under the care of M. Nélaton, who cured the disease by two separate injections of perchloride of iron. M. Dupont relates two other

3. *Encephaloid cancer* when very vascular may be and has been mistaken for an aneurismal tumour, for it may possess both pulsation and bruit. Its onset is often

cases of venous tumour (Obs. 3 and Obs. 4, pp. 10—14). The first case was that of an infant sixteen days old, affected with a tumour between the globe of the left eye and the inferior eyelid, and having the aspect of a varix. During continued inspiration and crying it became distended, and the eye was pushed forwards. When the child remained quiet for seven or eight minutes the varix and exophthalmos both gradually disappeared. The reference given is J. A. Schmidt, cité par Himly, 'Ophthal. Biblioth.,' vol. iii, 1er cahier, p. 174, Jena, 1865. The second case was in a boy of 14, who had received the contents of a puff ball in his right eye at the inferior and external part three years previously. There was only pain at the time. Three months later the lad felt that the inferior eyelid swelled when he stooped. In the upright position there was no abnormal appearance, but when he lowered his head a tumour appeared of the size of an almond, soft, reducible, and without pulsation, and the skin became visibly distended and of a violet colour. The tumour gave the patient some inconvenience because he had frequently to stoop whilst working. He passed under the care of M. Serres, of Alais, who injected perchloride of iron into the tumour without success. (Obs. par Drs. A. Mazel et A. Boniface d'Anduze, 'Gazette des Hôpitaux,' 23 Fevrier, 1861, p. 92. See also Demarquay, op. cit., p. 356.) The case of Dr. Parrish, related in the 'Amer. Jour. of Med. Sci.,' Oct., 1841, vol. i, p. 357, seems to have been of a similar character. A factory lad of 16 had a vascular tumour at the external angle of the right orbit under the upper eyelid with a prolongation under the skin of the lower lid. Enlarged and varicose veins were connected with it, and it seemed to derive its blood from deep-seated orbital vessels When the eye was passive there was little to be seen. On everting the lids and making pressure on the blood-vessels of the neck the tumour became distended. It had originated after an injury six years previously received whilst diving. An attempt was made to remove the tumour by means of ligatures, but without success. In the article "Exophthalmia," in 'Cooper's Surgical Dictionary,' the following remarks are made by the author of the article:—"I remember a young lady who was referred to Mr. Laurence and myself by Mr. Maul, of Southampton, for advice respecting a tumour occupying the inner and upper portion of the orbit and attended with a degree of exophthalmia, constant exacerbation at the period of the menses, and occasionally double vision." The case of Rosas referred to by Gioppi was briefly this:—A scrofulous and dysmenorrhœal child received a violent contusion in the orbital region. Slight exophthalmos resulted. At the time of menstruation the eye became prominent, with thrill and profound pulsation. The affection was cured by bloodletting from the saphenous vein, leeches to the genital organs, and emmenagogues." This last case appears to be *sui generis*. Dr. Gruening's case of exophthalmos on lowering the head in 'Arch. of Ophth. and Otol.,' vol. iii, No. 1, p. 23, was probably a venous tumour.

obscure, and the case will be still more obscure if the orbital tumour exists alone, and if its development has followed an injury. Loss of vision, exophthalmos, pulsation, noise in the head, and bruit ceasing when the carotid of the corresponding side is compressed, are symptoms of cancer and symptoms of aneurism. Moreover the encephaloid tumour projecting outwardly may yield a soft semifluctuating sensation peculiarly liable to deceive even the experienced practitioner. In M. Lenoir's case the carotid artery was tied, under the impression that the affection was aneurismal. The disease had followed a fall on the back of the head, and the only symptoms of differential value were the light whispering character of the bruit, the irreducibility of the tumour, and its extension towards the temporal fossa.[1] Pulsation may be present without bruit, and the diagnosis will then be more obvious.

In Mr. Nunneley's case of cancer of the orbit the carotid artery was tied, and checked the progress of the disease; various opinions having been expressed in regard to the nature of the case. Its exact character was only ascertained at a late period of the disease. Here the diagnosis of cancer was rendered probable by the existence of multiple tumours, and by the continuation of the orbital tumour into the zygomatic fossa. The existence of a tumour in the left temple in Szokalski's case, continuous with the orbital tumour, the peculiar shape of the orbital tumour, and the subsequent appearance of a tumour on the left iliac crest, as well as the slight effects of ligature, are suggestive of cancer.[2]

[1] 'Bull. de la Soc. Chirurg.,' t. ii, pp. 61 and 84. Demarquay, op. cit., p. 473.

[2] Dr. Noyes gives the following cases of cancer as having been treated by ligature by American surgeons:—1854, Dr. A. B. Mott treated a malignant disease in the orbit successfully by removing the tumour and ligaturing the carotid; several previous extirpations had been followed by recurrence. In 1857 Dr. Van Buren tied the carotid for encephaloid cancer of the orbit; death took place on the thirteenth day from pyæmia. Dr. Woodward tied the carotid for a cancerous tumour of the orbit and brain. Death occurred in the eighth week. In 1858 Dr. Halstead tied the left common carotid of a girl of thirteen for a cancerous tumour which had been growing for three, years and a half; protruded from the outer canthus, pushed the eye forwards,

4. The distinctive features of *arterio-venous aneurism* within the orbit remain to be determined. [Mr. Lansdown's reported case is worthy of attentive consideration.]

5. According to Guthrie *ordinary circumscribed aneurism* within the orbit yields the typical symptoms of "intraorbital aneurism;" but his observation is so brief that it remains for subsequent observers to discover points of differential value. It is worth remembering, however, that no tumour could be felt by Guthrie within the orbit, and that in any similar case the bruit would most likely be of a distinctly intermittent character.

6. The special features of *diffused aneurism within the orbit* have still to be settled. Traumatic rupture of the ophthalmic artery would, in all likelihood, be accompanied by injury to the optic nerve and be followed by immediate protrusion of the eyeball, and immediate and irreparable loss of vision. The diagnosis of diffused intraorbital aneurism made in one or two cases does not rest at present on any solid foundation.[1]

and pulsated. The exophthalmos diminished, but soon increased more rapidly than before. The sight became *affected* in a few months. Nine months after ligature both the eye and the tumour were removed, and in two months the child was discharged cured. In 1860 Dr. Frank Hamilton met with a tumour in the right orbit in a child two years of age. It presented itself near the outer angle of the eye, was half the size of a Sicily orange, elastic, pulsating, and to the ear affording a rasping sound at each pulsation. The eye was pushed inward and protruding, and the sight of the eye was totally lost. The carotid was tied and caused cessation of the pulsation and bruit and diminution of the size of the swelling. The progress of the disease, however, was only temporarily delayed, and the child finally died of what proved to be a vascular malignant growth. In 1864 Dr. A. B. Mott successfully extirpated a cancerous tumour and tied the carotid. ('New York Med. Journ.,' 1869.)

[1] The term "aneurism by anastomosis," as Mr. Hulke has observed, has been used to comprise very various conditions. It was so used by John Bell, as may be seen by reference to his work on Surgery. But I think that the term is now and ought to be limited to cases in which there is a dilatation of distinct arteries anastomosing with each other, mixed or not with dilated capillaries, and not to tumours composed merely of a cellular structure or capillary vessels. In this sense I use the term in the text. This is the *arterial erectile tumour* of Paget 'Lectures on Surgical Pathology,' p. 581. It pulsates either "fully and softly" or "strongly," and has a distinct bruit. No doubt all the different forms of

7. If we should find reason to exclude Mr. Haynes Walton's case, neither *aneurism by anastomosis nor cirsoid aneurism* confined entirely to the orbit has been observed. In recorded cases which have been indisputably of this nature, and in which the orbit has been involved, the chief enlargement has been in neighbouring blood-vessels, and exophthalmos, congestion, and chemosis, &c., have been altogether absent, rendering the diagnosis easy. I cannot, however, agree with Nunneley, that "it is difficult to understand why Travers should have arrived at the opinion of his case being aneurism by anastomosis;" for although there may be some good grounds of distinction between cases of intraorbital aneurism and cases of aneurism by anastomosis and cirsoid aneurism, the resemblances between the two classes of cases in the aspect of the pulsating tumours and in the sensation imparted by tactile examination are far more obvious and striking than the points of divergence, and these latter are chiefly derived from the experience gained by the accumulation of observations since Travers wrote. What can be more natural than that a tumour formed by dilated and pulsating veins should be mistaken for one composed of dilated and pulsating arteries?

Compare the descriptions of the tumours in cases of intra-orbital aneurism and the descriptions given by authors of aneurism by anastomosis, and the resemblance will be

vascular tumour run into each other, and it is difficult always to draw an absolute line of distinction, some cases appearing to be of a mixed character and to connect the classes of arterial, venous, capillary, and cavernous tumours together. All that I state in the text is that we have no *proof* of the occurrence of tumours in the orbit composed entirely or chiefly of *dilated arteries*.

On this subject see Robin, 'Gaz. Med.,' 1854; Gosselin's "Mém.," 'Arch. Gén. de Méd.,' 1867; Broca, 'Traité des Anévrysmes;' Laburthe, Thèse, 1867, 'Des Varices Artérielles et des Tumeurs Cirsoides.' Cases are included by these writers which, according to later views, were not cirsoid aneurisms at all, but instances of arterio-venous communications. Thus Laburthe relates the cases of Brainard, Bourguet, and Desormeaux; the first as an erectile tumour and the two latter as cirsoid aneurisms of the ophthalmic artery. Using the term "aneurism by anastomosis" in the widest sense, I quite admit that Mr. Walton's case is entitled to that designation.

at once obvious. The spongy feel, irregular shape, vibratory or purring thrill, compressibility, arrest of pulsation by pressure, either on the tumour or on the arteries leading to it, and the gradual extension of the disease are symptoms observable in both.

Intraorbital Aneurism.

Travers says, "The upper half of the inner canthus was filled by the thrilling tumour, which presented a loose woolly feel, was very compressible, and when firmly compressed offered a slight pulsation. The lower tumour, which projected above the suborbital hole, was of a conical shape and firmly elastic to the touch. It could be emptied or pressed back into the orbit, but the pulsation then became violent, and from the increased pressure of the globe the pain was insupportable. Careful compression of the temporal, angular, and maxillary arteries produced no effect on the aneurism. Upon applying my thumb to the trunk of the common carotid I found the pulsation cease altogether, and the whiz of the little swelling was rendered so exceedingly faint that it was difficult to determine whether it continued or not. The recent increase of puffiness in the skin over the root of the nose and below the inner angle of the opposite eye had given alarm to the patients and friends who feared, not without some appearance of reason, a similar affection of the right orbit."

Dalrymple says, "Deep seated between the integuments of the

Aneurism by Anastomosis.

John Bell says, "The tumour which I call aneurism by anastomosis is a perfect aneurism. It arises from some accidental cause; is marked by a perpetual throbbing; grows slowly but incontrollably, and is rather irritated than checked by compression. The tumour has only a sort of trembling or indistinct throbbing at first, but when it is fully formed it has a continual distinct pulsation; it beats strongly upon every occasional exertion; it swells up in spring and summer with a fuller and more active pulsation; it beats powerful in the time of menstruation; and by the incessant pulsation and occasional turgescence it forms among the cellular substance or among the dilated veins sacs of blood. These little sacs form apices and tender points, which become livid and very thin, and burst from time to time, and then, like other aneurisms, this aneurism pours out its blood so profusely as to reduce the patient to extreme weakness." ('The Principles of Surgery,' 1801, vol. i, p. 456.) Bell states that the disease affects all parts of the body, the eyelids included, and that it often begins in adults increasing from a tri-

eyelid a little towards the canthus of the eye, there was a cluster of small tumours of a firm and dense structure, causing great pain when compressed, and communicating to the finger a pulsatory thrill. Interposed between this cluster and the lower edge of the eyebrow, precisely in the course of the frontal branch of the ophthalmic artery, there was a hard tubercular substance which rose somewhat higher above the general surface of the eyelid, and pulsated still more distinctly than the smaller swellings. The texture of this substance was particularly hard and compact, the slightest pressure upon it occasioned intolerable pain. In addition to these appearances, immediately above the nasal third of the superciliary ridge, the integuments were gently elevated into a soft ill-defined tumour, occupying exactly the situation of certain branches of the frontal artery and pulsating simultaneously with the artery at the wrist. A similar elevation of the skin was perceptible at the root of the nose, giving a faint tremulous motion to a finger placed upon it."

M. Jobert says, "By the touch a tumour could be detected which had destroyed a part of the orbital arch; it increased rapidly and at the end of some months reached the frontal eminence. Pulsations synchronous with the pulse, expansile movements, and a species of susurrus like that no-vial pimple-like speck to a formidable disease. His first case was an aneurismal tumour about the size of a small egg, seated immediately over the eyebrow, and exactly in the course of the frontal artery. The tumour was covered with firm sound skin; its throbbing was exceedingly strong and had become very painful, &c. It is figured by Mr. Bell. The eye is not at all affected, but the question would naturally occur to Mr. Travers, what would be the effect of the disease if it occurred within the orbit?

Dr. Delens says, "Situated in the subcutaneous cellular tissue it is rounded, presents a notable relief, but at the periphery loses itself insensibly in the neighbouring soft parts. Its surface is lobulated and bossed, and yields to the touch the sensation of a bundle of worms. By touch, moreover, pulsations, synchronous with the arterial pulse, can be recognised. The tumour is readily reducible by pressure, but after this the finger often detects a furrow worn in the surface of the bone on which it rests. Auscultation reveals a bellows murmur, the characters of which vary according to the moment at which it is practised. Sometimes it is intermittent, sometimes it is continuous and jerky with redoublement," &c., &c. (Op. cit., p. 44.)

Mr. Erichsen says, "Aneurism by anastomosis forms tumours of varying magnitude and irregular

ticed in varicose aneurisms were perceived."

In Mr. Symes' case "the tumour felt not so much like an aneurismal sac as a bundle of small vessels; it was compressible and could be diminished in size, though not completely emptied. Pulsation was almost synchronous with the radial pulse, and accompanied by a sensible and audible thrill, very distinct at the orbital margin, the anterior edge of the roof of the orbit being in part, at least, absorbed."

The foregoing, to which others might be added, were idiopathic cases. In traumatic cases of long standing, the resemblance of the spreading and pulsating veins to the enlarged arteries of a cirsoid aneurism is very striking. Refer to such cases as those of Brainard, Bourguet, Desormeaux, and others, in which dilated and pulsating vessels could be seen on the forehead. That M. Desormeaux should have diagnosed cirsoid aneurism in his case can scarcely be said to be surprising.

shape; they are usually of a bluish colour, have a spongy feel, are readily compressible, not circumscribed, and have large tortuous vessels running into them on different sides. Their temperature is generally above that of neighbouring parts, and a vibratory or purring thrill, amounting in many cases to distinct pulsation, may be felt in them. This pulsation or thrill is synchronous with the heart's beat, may be arrested by compressing the tumour or the arteries leading to it, and returns with an expansive beat on the removal of the pressure. The bruit is often loud and harsh, but at other times of a soft and blowing character. These growths rarely occur in infancy, but generally make their appearance in young adults, though they may be met with at all periods of life, often as the consequence of injury." ('Science and Art of Surgery,' vol. i, p. 711.)

Some of the arguments which have been advanced by Busk, Nunneley, and others, against the view of aneurism by anastomosis, and the distinctions drawn between it and intraorbital aneurism, would appear to be not altogether valid. As distinguished from true aneurism and intraorbital aneurism, aneurism by anastomosis has been stated to be often of congenital origin, and to arise out of a nævus, to commence gradually and increase gradually, not to be caused by injury or violence, to involve neighbouring blood-vessels

which participate actively in the disease, to be confined to the cutaneous and subcutaneous tissues, to possess a feeble pulsation, especially when recent and small and a less audible bruit, and to be intractable to treatment by ligature of the main artery supplying it. Referring to Mr. Busk's arguments, Mackenzie, in his classical work on 'Diseases of the Eye,' states that the suddenness of the attack is the fact most indicative of true aneurism in the cases in question. Pulsation and distinct arterial susurrus attend aneurism by anastomosis. Rapid increase of the symptoms might attend true and anastomotic aneurism. Aneurism by anastomosis does not appear in every instance to arise from original malformation such as we observe in nævus maternus, but may begin in apparently healthy adults, from sudden and sometimes hidden causes. Neither is it confined to the skin or subcutaneous tissue, but affects indiscriminately all parts of the body, and brings on complicated morbid phenomena even among the viscera." [1] Again, in some cases cirsoid tumours have followed after injury, and the results of ligature—an argument *à posteriori,* and one which Mr. Busk says cannot be adduced to prove the nature of a tumour, are not quite so crucial as have been represented. Several cases of aneurism by anastomosis and nævus have been either cured or greatly relieved by the operation,[2] and in several cases of intraorbital

[1] This is taken from 'Bell's Surgery,' vol. i, p. 456. Bell refers to the cases of pulsating spleen related by old authors, and especially to the case described by Tulpius. "The patient was a poor labouring man, and Tulpius one day going to visit him along with Henricus Salius, a physician, they both heard the pulsation of his spleen at the distance of thirty feet, and that so distinctly that they could count the pulse as fairly by the ear as by the finger," p. 473.

[2] See 'New York Med. Journ.,' 1857, "Early History of Ligature of Carotid," for successful cases of Dr. Wood and Dr. Mott. In 1822 Pattison tied the carotid successfully for an "aneurism by anastomosis." A. Robert, Kuhl, and Warren, obtained cures by double ligature. Other surgeons have been less happy. Wardrop's cases of ligature of the carotid for nævus might also be cited. In Zeis' case of ligature of the carotid for nævus of the face in a child fifteen months old, although the patient died from convulsions on the forty-ninth day, the nævus disappeared. Rogers, Wilbaume, McClellan, and others more or less successful, are mentioned in Pilz's tables.

aneurism either only partial relief or no relief at all has resulted, or the symptoms have returned in a few months.

After all it may greatly be questioned whether argument alone would ever have abolished the doctrine of aneurism by anastomosis as applicable to the explanation of cases at least of idiopathic intraorbital aneurism. In the absence of pathological observations the tendency was to divide observers into two sets—those who adhered to the views of Travers and Dalrymple, and those who were convinced by Mr. Busk's arguments and the arguments of M. Demarquay, and adopted the opinion that the vessel implicated was the ophthalmic artery in the orbit.

It is to the records of post-mortem examinations that the disproof of the doctrine of aneurism by anastomosis [1] or cirsoid aneurism is due, and that we have been taught to look away from the orbit to the blood-vessels lying behind it for the origin of the affection.

8. A *meningocele* of small size may project at the internal angle of the orbit, and be mistaken for a nævus or erectile tumour. This happened in M. Guersant's case, which was seen by many Fellows of the Surgical Society of Paris, who agreed in recommending treatment by thread setons. Cerebral symptoms supervened, and the child soon died. It was found at the post-mortem examination that the tumour was composed of a small portion of brain substance covered by the membranes of the brain, which had passed through the fronto-ethmoidal suture, and appeared at the inner angle of the orbit.[2] *Spheno-orbital meningocele* is a disease of very rare occurrence, and its distinctive characters cannot be stated very positively. Dr. Œttingen, of Dorpat, has recently related an interesting case, in which he suspected that meningocele was associated with some arterial angiomatous tumour.

A lad of 14 had struck his head on a step when a year

[1] Mr. Holmes, in his lectures already quoted, observes, "Travers' original assumption that orbital aneurism is usually anastomotic has been conclusively refuted." ("Lectures," 'Lancet,' 1873, vol. ii, p. 255.)

[2] Guersant, 'Maladies des Enfants,' p. 246.

old. Subsequently during thirteen years his left eye had gradually become prominent. The upper eyelid was greatly swollen; the eyeball projected considerably; a tumour could be felt above and to the outer side of the eyeball. It pulsated, and could be emptied by pressure, but quickly filled again. Compression of the carotid checked the pulsation. There was no bruit to be heard. The left side of the head was curiously misshapen, and there was an occipital meningocele of small size having a very narrow channel of communication with the interior of the skull.

Langenbeck's plan of injection of ergotine and compression of the carotid were tried without avail. The left common carotid was ligatured. The tumour diminished in size and ceased to pulsate. Pulsation returned in four hours, but not so evidently. In a few days an attack of pneumonia supervened. The ligature fell in a fortnight, and the wound healed in a month. The tumour did not become more solid. Pressure on it made the occipital tumour swell out, and tapping the former with the finger produced a corresponding impulse in the latter; compression of both jugular veins made both tumours very tense. Compression of the right carotid checked pulsation, but when continued for a time had no curative effect. The ligature of the carotid was followed by considerable benefit.[1]

9. M. Collard supposed that in his case of intraorbital aneurism the accident occasioning it had given rise to a morbid state of the lenticular ganglion, perverting the action of the vaso-motor nerves and thus causing dilatation of the ophthalmic artery and its branches, and he is half supported by Mr. Erichsen, who asks, is it possible that some derangement of the vaso-motric influence of the sympathetic may really occasion the symptoms of increased vascular activity that are so characteristic of this singular disease? Having regard to the phenomena exhibited in Graves' disease, it would be extremely rash to say that the symptoms of intraorbital aneurism might not possibly be simulated in the

1 'Klin. Monat.,' Feb., May, 1874. Abstracted for 'Oph. Hosp. Reports, 1874.

same way as aneurism in the neck is simulated by the pulsating and thrilling thyroid gland. But it may be safely asserted that in none of the cases which have been referred to in this paper is any such explanation either demanded or permissible, whilst the fact that pulsation of the eyeball is never seen in Graves' disease seems to indicate that derangement of the sympathetic system is insufficient to occasion the symptoms of intraorbital aneurism. The case which forms the basis of Mr. Erichsen's query is that of Mr. Bowman, in reference to which Mr. Erichsen states that "no trace of aneurism or other *vascular* disease could be found on dissection." The words should have been "no trace of aneurism or other *arterial* disease could be found on dissection," for there was abundant derangement of the venous system, and the whole point of the case is that the symptoms of intraorbital aneurism may be occasioned by morbid states of the veins and sinuses—a conclusion which has no relation to the idea of a functional derangement of the orbital arteries.

The *differential diagnosis of the various conditions of the blood-vessels behind the orbit* which have been met with in cases of intraorbital aneurism still requires elucidation. So far as our information at present extends it would appear that—

10. The distinctive signs of *arterio-venous communication in the cavernous sinus* are a *bruit which is continuous with reinforcements during the arterial pulse,* and the *bruit de piaulement.* A vibratory *thrill* in the pulsating vein is regarded by surgical writers as characteristic of arterio-venous aneurism. It must be borne in mind, however, that thrill was absent in both of M. Nélaton's cases of perforated internal carotid, and that it was present in M. Aubry's case of obliterated petrosal sinus. Thrill was noticed in several traumatic cases which resembled M. Nélaton's in other respects, and in some of the idiopathic cases which were probably of a different nature. Moreover, in M. Aubry's case there was a bruit which was continued with reinforcements during the arterial pulse. On the

other hand, the *bruit de piaulement* was present in both M. Nélaton's cases, and may prove to be pathognomonic of communication between the carotid artery and cavernous sinus.[1]

11. In *traumatic* cases the previous occurrence of symptoms of fracture of the base of the skull, or the infliction of an injury to the orbit by a thrust from a pointed instrument, would afford strong presumptive evidence of arterio-venous communication. A careful consideration of the mode of occurrence of the injury may yield important information, as it did in M. Nélaton's first case.

12. In *idiopathic* cases advanced age and associated disease of the heart and great vessels would be strongly indicative of atheromatous degeneration and enlargement of the internal carotid in the cavernous sinus or of the ophthalmic artery.

13. In cases in which a pulsating tumour can be felt between the eye and orbital margin, the feel of the tumour would assist the diagnosis. An enlarged ophthalmic vein is at once revealed by its peculiar softness and compressibility as well as by its position near the inner angle of the orbit.

14. A differential diagnosis would certainly be much aided by puncturing the pulsating tumour above the eye with a small trocar and canula. If the blood which issued proved to be *arterial*, the existence of an arterio-venous communication might safely be predicted, provided that the other characteristic symptoms of that condition were present. If these symptoms were absent, and if the bruit were intermittent, the affection would probably be a circumscribed aneurism within the orbit.

If the blood issuing from the canula proved to be *venous*, the diagnosis would rest between obstructed sinuses

[1] The *bruit de piaulement* was present also in the case of Dr. Holmes, of Chicago, who observed it during the administration of veratrum and ergot, in the cases of Desormeaux, in Galezowski's unilateral case, in Dr. Nieden's case, and in my own case. Still, in Bowman's case of obstructed sinuses the bruit was loud and *sibilant*, and therefore much stress cannot be laid upon this peculiarity.

and an aneurismal affection of the carotid or ophthalmic artery causing obstruction to the return of venous blood.

It must, however, be recollected that puncture of the tumour may be attended with ill effects, and cannot be recommended for general adoption.[1] There would not be the same objection to puncture of a pulsating vein beyond the margin of the orbit.

15. Observations have been neither sufficiently numerous nor precise to determine beyond question the distinctions between *aneurisms of the carotid*, *aneurisms of the intra-cranial portion of the ophthalmic artery*, and *obstructed sinuses*. Still I think we might arrive at a correct conclusion by attention to the following particulars:

(*a*) *The sudden onset of the disease* with pain, and noise like the cracking of a whip or report of a pistol, and feeling of something having given way in the orbit, is indicative of the formation of an aneurism or of its rupture.

(*b*) The *presence of paralysis of the orbital nerves* is indicative of an aneurism, or of a ruptured aneurismal carotid surrounded by blood clot in the cavernous sinus pressing upon the nerves. The third nerve was implicated in Gendrin's case, in both Mr. Nunneley's cases, and in Wecker's fatal case. On the other hand, there was no nerve lesion in M. Aubry's case, and in Mr. Bowman's case the pupil was dilated but active, and neither ptosis nor loss of power in the other branches of the third nerve occurred till thirteen days after ligature, when probably the clots in the cavernous sinus or effusion into its walls increased and compressed the nerve.

(*c*) *Complete loss of vision at the outset and failure to recover it after ligature or digital compression* would favour

[1] In Brainard's case, Nunneley's first case, Bourguet's case, and my own (all traumatic), and in Jobert's idiopathic case, puncture of the pulsating tumour gave exit to *arterial* blood. Puncture exercised an injurious effect in three cases—that of Roux, in which venous blood issued, that of Nunneley, and that of Jobert. See Appendix. In M. Jobert's case acupuncture appears to have been injurious to vision.

the supposition of an aneurism of the ophthalmic artery rather than of the carotid.

(*d*) A distinctly *intermittent bruit* would point to true aneurism.

(*e*) A very *soft bruit continuous with reinforcements* and accompanied by thrill in the pulsating tumour, but unaccompanied by nerve lesions of any kind, would indicate a condition similar to that found in M. Aubry's case, and would contra-indicate a coagulated condition of the blood in the cavernous sinus.

16. *With reference to the nature of the recorded cases* I believe that nearly all the traumatic cases were examples of arterio-venous communication more or less free in the cavernous sinus. The evidence for this conclusion is strong. Three out of four fatal traumatic cases in which a post-mortem was obtained exhibited a wound of the carotid artery within the sinus. The pre-existence of severe injury to the head and in a large number incontestably of a fracture of the base of the skull, the similarity in the mode of origin, development, and nature of the symptoms, the pulsating swelling becoming evident at one spot beneath the upper eyelid in the situation of the ophthalmic vein, the peculiar feel of the tumours, the frequent extension of the pulsation to neighbouring vessels which without reasonable doubt have been veins, and the resemblances in the characters of the bruit all point in one direction. The occurrence of the symptoms on both sides in three cases is readily explained by the supposition of a free arterio-venous communication. I was very much struck with the strong resemblance between my own case and M. Nélaton's second case. In the idiopathic cases I am inclined to think that the most frequent condition has been the sudden formation or rupture of an aneurism of the internal carotid artery in the cavernous sinus. The intense pain at the back of the orbit and headache, the sudden snap or crack heard by the patient in a moment and sometimes without any precursory symptoms, the records of the post-mortem examination in the cases of Baron, Gendrin, and Nunneley, the analogy afforded by the symptoms and

necroscopic appearances in cases of ruptured aneurism of the internal carotid after it has left the sinus, the absence of the symptoms of "intra-orbital aneurism"—pulsation, exophthalmos, chemosis, &c., considered to be characteristic of obstruction to the return of venous blood from the orbit in the cases recorded by Holmes and Hutchinson, and in cases of obstructed sinuses related by Knapp and Ogle, seem to me to be strongly in favour of rupture. Aneurisms of the intra-cranial portion of the ophthalmic artery are of very infrequent occurrence. Aneurisms of the ophthalmic artery in the orbit have been found but once or twice, and we have no proof whatever of their rupture during life. Morbid conditions of the orbital veins and intra-cranial sinuses will probably prove to be exceptional causes of the group of symptoms which is covered by the term intra-orbital aneurism. In the present state of our knowledge it is impossible to dogmatise, and it remains for future observers to throw full light upon the pathology of the affection as well as to test the value of the suggestions which I have ventured to make in reference to diagnosis. Post-mortem examinations should be conducted with very great care, and where practicable, as suggested by Dr. Delens, it would be well to remove about the anterior half of the skull for deliberate dissection.

In regard to *treatment* the first question which arises is, what would be the probable course of the affection if left either quite alone or with only medical treatment? We have some data which may assist us in affording a reply. We have four traumatic cases cured by simple means—that of Mr. France in eight months; that of Mr. Erichsen in fourteen months by attention to habits of life and abstinence from stimulants; that of M. Collard in two years and a half by means of leeches, cold lotions, calomel, and belladonna, and light work; and that of Dr. Holmes, of Chicago after the exhibition of tincture of veratrum viride and Tilden's fluid extract of ergot for about six weeks. Then we have the idiopathic case of Dr. Clarkson Freeman cured by the application of cold, the exhibition of digitalis in small doses,

and mechanical compression of the pulsating tumour; the return of the symptoms on the opposite side in M. Herpin's case after ligature removed by the constant application of ice for three months, and the case of M. Julliard, of Geneva, subsiding, it may be, spontaneously, but in all probability assisted materially by the digitalis taken, and the ice applied for about a fortnight to the eye. The cases of Guthrie, Baron, Aubry, Hussey, Hirschfeld, and Carron du Villards, died without surgical interference; but we cannot say that the result was in any way influenced by the absence of surgical assistance. In M. Gendrin's case the eye retired into the orbit, and bruit and pulsation ceased whilst the patient was taking digitalis, but the cornea ulcerated and the anterior chamber became filled with pus, and in fourteen days the patient died. These cases stand on neutral ground. To oppose the expectant treatment, however, we have M. Nélaton's traumatic case dying from hæmorrhage from the nose, only mechanical compression of the carotid having been employed. We have Scott's case probably saved from a similar fate by prompt ligation of the carotid, and we must add those cases which had not improved or had actually deteriorated after a considerable interval of time. There was Travers' patient in whom the affection had existed for three years and five months without improvement; there was M. Jobert's patient who had been under a variety of practitioners for three years; there was Bourguet's traumatic case, which had been gradually getting worse for two years and six months; and there was Mr. Hart's traumatic case in which the symptoms had commenced three years previously to the time at which the patient first came under observation. Besides these cases there were the cases of Nunneley, Bell, Desormeaux, &c., in which at the end of a year the symptoms were aggravated.

The surgical means of treatment at our disposal are local compression of the tumour, digital and instrumental compression of the common carotid, galvano-puncture, subcutaneous injection of ergotine, injection of coagulating fluids, and ligature of the carotid artery or arteries.[1]

[1] To these methods ought to be added ligature of vessels within the orbit.

Local compression has been tried in 10 cases, 5 idiopathic, and 5 traumatic. It aided if it did not effect the cure in 1 idiopathic case (Clarkson Freeman's), produced some benefit in 2 traumatic cases, and was either useless, too painful, or injurious by increasing the chemosis and congestion in the remaining 7 cases.

Instrumental compression of the common carotid has been tried in 4 cases, all traumatic. One case died of hæmorrhage from the nose, and in the other 3 no benefit resulted.

Digital compression of the common carotid first practised by Gioppi has now been frequently employed. Of 16 cases in which it has been applied, 5 were idiopathic, and 11 traumatic. Of the 5 idiopathic cases 2 were cured, the bruit and noise in the head persisting in 1, and vision, nearly abolished at the onset, not being regained in the other. In 3 no benefit resulted; in 1 the treatment was discontinued on account of pain, and in another on account of difficulty of application from the stoutness of the patient.[1]

See the accounts of M. Passavant's and Mr. Lansdown's cases given in the Appendix. The success of Mr. Lansdown's case raises the question whether ligature of the dilated ophthalmic vein might not be of service even in cases of undoubted arterio-venous aneurism behind the orbit.

[1] In Gioppi's case, digital compression was employed on the left side in four ways. 1. Strong pressure between the heads of the sterno-mastoid in a direct line from before backwards diminished the pulsation of the carotid, but prevented the return of blood by the anterior jugular vein, and occasioned some cyanosis. 2. By pushing the index, the middle, and the ring finger along the external and the thumb along the internal border of the sterno-mastoid, immediately below the crossing of the omohyoid, and squeezing it, after having pushed it posteriorly against the above-mentioned muscles, whilst the other hand placed upon the sinciput turned the head downwards and to the left to relax the tissues, the sheath common to the jugular, carotid, and vagus was encountered. The jugular vein and nerve could be made to glide posteriorly between the fingers, whilst the carotid artery was kept between them, and almost perfectly compressed. This method was very efficient. 3. By placing the index finger of one hand along the internal border of the sterno-mastoid in the superior cervical triangle, and pushing it backwards, the carotid was found, so that it was possible to compress it posteriorly upon the vertebral column. When the compression succeeded completely it was only momentarily, because the artery glided easily to the internal or external side, and then—

Of the 11 traumatic cases only 1 was cured, in 1 the pain and giddiness produced rendered it intolerable. In 1 the treatment was discontinued because it caused discomfort, in the remaining 8 no benefit resulted. Perhaps the case which was cured, M. Galezowski's, should be reckoned as idiopathic, as the injury had been sustained three years previously and had not been followed by any symptom, such as noise in the head, indicative of the commencement of the affection. If this be a correct view we should have 3 out of 6 idiopathic cases cured by digital compression and 7 traumatic cases deriving no benefit, a significant indication of a difference of pathological condition.

Digital compression may be either continuous or intermittent, and it is a circumstance specially worthy of attention that in the three successful cases it was only practised for a short period in the twenty-four hours, and not for many minutes at a time. Thus, in Gioppi's case as compression caused faintness it was only employed for a minute or two at a time by the convalescent patients in the ward, the patient herself and the pupils. Pulsation and noises ceased at the end of the fourth day.

In Scaramuzza's case digital compression employed very cautiously on account of aortic disease was practised for not more than five minutes at a time. It was maintained for eighteen days twenty or thirty minutes every day in five or six turns, the total period of compression being only seven hours twenty minutes. The eye had then entirely re-entered the orbit, and pulsation had ceased. In M. Galezowski's case compression was practised every two or three days for fifteen or twenty minutes, afterwards increased to forty-five or sixty minutes daily. Marked relief followed each sitting, and at the end of a month the movements of the globe had returned, the eyelid was raised, and the chemosis was gone. An interruption to the treatment for about a fortnight then took place. Then it was recommenced, and continued for more

4. A slight compression towards the larynx or first rings of the trachea could be tried. The patient practised both the third and fourth manœuvres. 'Ann. d'Oculistique,' 1858, t. xi, p. 731.

than two months every two or three days. A month later the protrusion had almost entirely disappeared, the patient heard no bruit, and none could be heard on auscultation over the cranium. At the time of the report the treatment was being continued, but there was every prospect of a complete cure.

Galvano-puncture has been tried twice each time unsuccessfully, and each time in a traumatic case. M. Petrequin's patient died, but whether in consequence of ligature of the carotid or subsequent galvano-puncture is not clear. Mr. Holmes attributes the fatal result to galvano-puncture ('Lancet,' 1873, vol. ii, p. 257).

Injection of ergotine subcutaneously was practised in the case of Schiess-Gemuseus, and Socin, and produced nausea, vomiting, œdema, and increase of the tumour.

Injection of a coagulating liquid into the pulsating tumour has been practised four times. In two traumatic cases (Bourguet's and Desormeaux's) a solution of the perchloride of iron was used and effected a cure, vision being restored. In my own case, as previously stated, the quantity injected proved to be insufficient to effect complete coagulation, and therefore no positive conclusion can be drawn. In Brainard's case the lactate of iron effected a cure after the failure of ligature, but the eye was lost. Brainard had previously tried the effects of the lactate of iron in solution on a dog without ill effect, and he had also used it on the human subject injecting it into the veins at the bend of the elbow. Each of the veins into which it was thrown was obliterated after a time, and converted into a fibrous cord. He considers that while the perchloride of iron is a foreign substance causing coagulation of the blood, and is apt to be followed by gangrene and suppuration, lactate of iron is composed of elements which are natural elements of the blood, and acts by gradually causing thickening of the coats of the veins, converting them into fibrous cords, and thus obstructing the circulation.[1]

[1] Brainard, in the 'Lancet,' 1853, vol. ii, p. 162. He refers to experiments by M. Pravaz, M. Giraldés, and M. Debout in 'Revue Med.-Chir. de

Ligature of the common carotid has been practised 46 times, the right carotid having been tied 20 times, and the left 26 times. Of the 44 cases, 18 were idiopathic and 26 traumatic. Of the 18 idiopathic cases in which ligature was practised, 12 were affected on the right side, and 6 on the left; 3 died, and 15 recovered. Two of the patients who died were females advanced in years, and both had atheromatous arteries. One aged 65 died on the 16th day from secondary hæmorrhage and cerebral disturbance; the other aged 63 died in 52 hours from cerebral causes only. The third patient (Mr. Critchett's) succumbed some months after the operation from repeated hæmorrhages from the orbit, the disease being, in all probability, malignant. Of the 15 patients who recovered, 12 were cured of the aneurismal affection, vision being restored in 8, lost or not regained in 3, and not mentioned in the others. In 3 partial benefit resulted, vision being lost in 1, impaired in 1, and not mentioned in the other. Of the 26 traumatic cases, 3 died and 23 recovered. The ages of the patients who died were respectively 17, 22, and 40. One of the three was subjected to galvano-puncture, subsequently to ligature, and the cause of death is not stated; in the two other cases the cause of death appears to have been pyæmia. Of the 23 patients who recovered after ligature of one carotid only, 14 were cured of the aneurismal affection in the orbit, 1 subsequently to injection, vision being lost or not regained in 4, and the bruit being noted as persisting in 3. In 8 of the 14 the cure was in all respects complete. In 1 both the common and external carotid artery were tied. In 5 the operation was unsuccessful; 2 were subsequently cured by ligature of the opposite carotid, and 1 by injection of lactate of iron. In 4 partial benefit resulted, the symptoms being diminished but not removed in 3, and being removed for a time only in the other. In Velpeau's case the symptoms were removed altogether on the left side, but returned on the right.

Paris,' May, 1853. On this subject see a Thèse by Pravaz, 1857, 'Traitement des Anevrysmes par le Perchlorure de Fer.'

Taking the two sets of cases together, we have a total of 44 cases. Out of this number there were 6 deaths (1 death having no connection with the operation in my judgment), 5 failures to cure the disease, 7 partial successes, and 26 cures. Of the 5 cases in which the operation failed, 2 were cured by ligature of the opposite carotid, and 1 by injection. Of the 26 cases cured, vision was restored in 17, lost or not regained in 7, whilst the bruit persisted certainly in 3, and probably in several other cases not examined with the stethoscope.

The 2 cases in which both carotids were tied occurred in America. In 1 case the interval between the operations on the two arteries was thirty days, in the other fourteen months. Vision appears to have improved in the former case, but it had been lost and was not regained in the latter.

One or two points of interest deserve a few words of comment.

1. In reference to the *return of the symptoms after ligature.* It is worth while to remark that it may take place in three different ways. In cases of arterio-venous communication the symptoms may return on the same side from want or deficiency of coagulation of the blood in the ophthalmic vein, carotid artery, and cavernous sinus. Possibly in some cases the aperture of communication becomes temporarily obstructed by clot which is afterwards re-absorbed; or, secondly, the symptoms may return on the opposite side. Obliteration of the enlarged ophthalmic vein may have taken place on the side originally affected, but the arterio-venous opening still remains patent, and the arterial blood is pumped through the circular sinus into the cavernous sinus and ophthalmic vein on the opposite side. Thirdly, in cases of true aneurism, the affection which seems to have returned on the opposite side may in reality be the formation of an aneurism of the same kind *de novo*, and not a real return of the disease. It is not quite clear whether the return of the symptoms on the opposite side in M. Herpin's case was due to the second or third condition just mentioned.

2. *The causes of loss of vision* in cases of intra-orbital aneurism, both before and after treatment, are worthy of attention. In some traumatic cases vision might be lost at once, and not regained on account of injury to the optic nerve, as probably happened in Scott's case. In some idiopathic cases it might be lost in consequence of the pressure of a circumscribed aneurism inflicting damage to its structure from which it could not recover, whilst in others dependent on ruptured aneurism in the cavernous sinus, the circulation may be so obstructed that ulceration and even sloughing may occur. Pressure on the ophthalmic nerve may cause ulceration of the cornea, either directly or indirectly. Vision has been lost in cases treated simply, treated by digital compression, treated by injection, and treated by ligature. Thus vision was lost in Mr. France's case about eight weeks after the commencement of the affection and was not regained when a spontaneous cure resulted. In M. Gendrin's case, although the disease spontaneously subsided, aided perhaps by the exhibition of digitalis, the eye suppurated and the cornea softened and ulcerated. In Scaramuzza's case cured by digital compression, sight was lost. In Dalrymple's case cured by ligature within a few months of the origin of the disease, vision which had been abolished at an early stage was not regained. In Jobert's case the cornea ulcerated after ligature, and when Velpeau saw the eye some time afterwards the globe was in a state of advanced atrophy. In one of Mr. Nunneley's idiopathic cases, sight, little impaired at first, was lost before ligature and not regained afterwards. In one of Mr. Nunneley's traumatic cases which was ultimately cured after ligature, sight was lost. In Mr. Laurence's case, in which the carotid was tied within a month of the accident, vision was abolished. In Mr. Bowman's second case sight was not much impaired before the operation, but it was lost afterwards. The cornea ulcerated in Brainard's case after injection, and in my own case after injection and ligature. On the other hand, healing of an ulcerated cornea took place before ligature in Busk's, and after ligature in Hippel's case, and vision, nearly abolished in several cases before treatment,

was restored afterwards. The contradictory results obtained may, I think, be explained in great measure by the varying amount of coagulation which takes place in the carotid and ophthalmic arteries, and in the cavernous sinus and ophthalmic vein. In arterio-venous communication between the carotid artery and the cavernous sinus, it is not improbable that the eye may in some cases be dependent for its nutrition, either entirely or partly on the blood brought by the ophthalmic vein, the current through the ophthalmic artery being diminished, and perhaps now and then altogether abolished. In such a case, when coagulation occurs in the carotid and the cavernous sinus, the blood supply may be so much and so suddenly curtailed as to be insufficient for the preservation of the transparant media, and before the anastomosing channels can become available, irreparable damage to these delicate structures may be wrought. In my own case I believe that the ulceration of the cornea was due to the closure both of the ophthalmic vein and ophthalmic artery, so completely was all trace of pulsation abolished in and around the eye and its appendages. In Mr. Curling's case the cornea grew hazy after ligature only, and sight might have been lost, but fortunately the collateral circulation was re-established in time for its preservation. These considerations lead me to think that sight rests in all cases of intra-orbital aneurism on a precarious foundation, and that it is impossible to predicate positively whether the treatment recommended will succeed in preserving or restoring it in any particular case.

3. Lastly it is desirable to endeavour to form an estimate of the comparative value of the different methods of treatment. My own conclusions may be briefly stated as follows:

(*a.*) The *exhibition of such remedies as belladonna, digitalis, and veratrum,* are worthy of trial before a recourse is had to the more active of the surgical means at our disposal, and may be used as adjuncts to digital compression, rest and regulation of diet, and the local application of ice.

(*b.*) *Digital compression* is most likely to succeed in idio-

pathic cases dependent on true aneurism of the carotid or ophthalmic artery, and very unlikely to succeed in cases of free arterio-venous communication. Experience has shown that the carotid artery is not an artery very readily compressed with effect, especially by medical students.[1] Nevertheless it is worth while to give it a fair trial for several reasons. It appears to be free from danger when applied with due precautions: it may be applied by an intelligent patient by himself, aided by nurses and students; it may effect a cure when only employed for a brief period at a time, and for a few hours spread over several days; even if it does not effect improvement, it is considered by observers (*e. g.*, Mr. Hart, M. Legouest, Mr. Z. Laurence, &c.) to be a most valuable preparation for ligature by establishing anastomosing channels and preventing any disturbance to the cerebral functions subsequently to ligature, and it affords useful information as to the probable results which would follow ligature.

(*c.*) *Instrumental compression* is more difficult to apply

[1] M. Legouest gives a graphic account of digital compression by medical students, to whom, however, the difficulties experienced in applying the method are by no means confined. He says, "After forty hours' duration had had no other results than to diminish during the period of its application alone the uncomfortable feelings which the patient experienced in the orbit, the tension and vascularity of the intra-orbital parts, and to determine sharp pains at the point compressed, and at the same time stiffness in the shoulder, the symptoms of aneurism remained the same. It is true that it was far from having been made with precision. I assured myself several times that the bruit de souffle continued during its application, and that blood passed sometimes abundantly into the carotid unskilfully seized, and escaping the fingers of my assistants. These assistants, being only relieved every half hour, became fatigued. Their fingers were benumbed, and became displaced by the movements of deglutition executed by the patient. He elevated his shoulder, inclined his head, contracted his sterno-mastoid and trapezius to escape the pain of compression which the assistants increased, but in vain, with the view of rendering it more efficacious. In fine, among the great number of assistants employed, several had more zeal and good-will than dexterity." Half an hour is much too long a time for any one to keep up digital compression. Ten minutes or, at most, a quarter of an hour without relief is the longest time which ought to be allotted.

than digital compression, and more likely to do harm to the important nerves in relation with the carotid.

(*d.*) *Galvano-puncture* does not appear to be well suited for application to a sac formed by a thin-walled vein, and would be worse than useless in cases caused by the presence of a circumscribed aneurism behind the orbit.

(*e.*) *Injection of coagulating fluids* is adapted only for cases of arterio-venous communication, and can be used most conveniently when the pulsating veins are prominent at and beyond the orbital margin. It is more painful than ligature, and probably involves more risk to vision, partly because it may cause inflammatory mischief, and partly because the coagulation effected by it may be so abundant as to interfere with the requisite supply of blood for the maintenance of the ocular tissues. The risk to life has not been determined.[1]

(*f.*) *Ligature of the common carotid* is, beyond question, the means most generally applicable to cases of intraorbital aneurism dependent on morbid states of the arteries. Judging from past experience, the risk to life in healthy subjects does not appear to be great. Ligature should not, I think, be practised in cases where there is heart-disease or evident atheromatous degeneration, or in old people. The two cases operated on over sixty years of age succumbed; and if we deduct these as well as Petrequin's case, in which galvano-puncture may have been the real cause of death, and Critchett's case, in which death had no relation to the operation as far as I can judge, only two deaths have taken place in forty cases, or forty-two instances of ligature of the carotid, just 5 per cent. At the same time it must be remembered that there is a considerable per-centage of cases in which the operation has been either partially successful or altogether unsuccessful in curing the disease, or in which an apparent cure has been succeeded by a return of the symptoms.

[1] Injection of coagulating fluids in these cases stands, at present at least, on a very different footing from injection of a nævus, and the fatal results of the procedure applied to nævi cannot be fairly used in condemnation of it in the treatment of aneurismal varix.

Nor is it altogether unlikely that in some of the cases reported as cured, and seen for the last time a few weeks after the operation, the affection may have returned when the patient was out of sight. Taking these points into consideration, and remembering such cases as those of Erichsen, Collard, Holmes, Freeman, and others, a hurried resort to ligature cannot be advised, whilst it should be borne in mind that the Hunterian method is not regarded as the best method for treating aneurismal varix in other situations. On the whole, however, I am strongly disposed to agree with Mr. Curling and Dr. Morton, that in traumatic cases and in suitable subjects ligature should be practised early when vision is threatened.[1] It is true that if the arterio-venous communication be free ligature may fail, but the balance of results is very much in favour of ligature; and should the operation fail to cure the disease, ligature of the opposite carotid, and injection of a coagulating liquid, are still in reserve. The mere persistence of a bruit during digital compression need not in any way affect the decision. Experience has now shown that the patient may be to all intents and purposes cured by ligature, and yet, owing to some changed condition of the blood-vessels, a bruit generally of an altered character and of diminished strength will remain for a variable time. If exophthalmos congestion, paralysis, and pulsation can be removed, the bruit is of no account. Lastly, in regard to ligature of the opposite carotid after ligature of one carotid has failed, we must be guided by the special cir-

[1] "When there is danger of the eye being compromised, or even without this, when the disease is increasing and compression has failed, ligation should be resorted to."—Morton, 'Amer. Journ. Med. Sci.,' July, 1860, p. 41. Mr. Curling would not wait for digital compression, and his opinion is confirmed by the negative results of digital compression in the *traumatic* cases. Compression, however, seems valuable as a preparation for ligature. Mr. Curling's case and Mr. Joseph Bell's case illustrate the opinions quoted. In both these cases the patient had lost the sight of one eye, and the affection threatened the other. Ligature was successful in preserving useful vision in both instances, the dilatation of the pupil in Mr. Curling's case being counteracted by the use of a card perforated with a small opening. In the idiopathic cases digital compression should be applied perseveringly.

cumstances of the case ; but if we find the symptoms relieved by compressing the unoperated carotid, the favorable experience of our enterprising American brethren would afford us encouragement to expect success from the procedure. In conclusion let me say that I have offered the narration of my case to the Society, because I believe that the record of cases of intraorbital aneurism, whatever may be the issue of treatment, will materially advance the knowledge of a class of affections which has not yet been thoroughly elucidated, and I have accompanied the narration with as much information as I have been able to collect, in the hope that the labours of future observers and investigators may be lightened.

The subject has been further treated by the author in Heath's Surgical Dictionary.

CHRONOLOGICAL RÉSUMÉ OF CASES OF INTRA-ORBITAL ANEURISM.

I. IDIOPATHIC CASES.

1. *Date, Surgeon, and References.*

1809. Travers, Benjamin. 'Med. Chir. Trans.,' 1809, vol. ii, p. 1. "A Case of Aneurism by Anastomosis in the Orbit, cured by the ligature of the Common Carotid Artery." Two portraits, one before and the other after cure, at the end of the volume.

Sex, Age, Side affected, Origin.

F. 34. Left orbit. A healthy woman, mother of five children, some months advanced in pregnancy, after suffering pain for some days felt a sudden snap on the left side of the head, attended with pain and followed by copious effusion of serum into eyelids.

Symptoms and Progress.

Increase of pain; inability to raise head from pillow; gradual protrusion of globe; appearance of two pulsating tumours on inner side; upper had vibrating thrill, lower pulsated with arteries; constant noise in head in recumbent posture; motions of eyeball impeded; sight impaired. More than four years later when seen by Mr. Travers, hollow of orbit lost. For description of tumours, see ante, p. 51.

Treatment and Result.

Œdematous swelling round orbit reduced by puncture. Issue in temples; leeches; cold washes; no improvement. Moderate compression borne only for a short time, owing to pain. Ligature of carotid in two places. Noise in head at once ceased, and pain was numbed. On twenty-ninth day patient went home and attended to her duties, the tumour being less, pulsation feebler, and pain removed. Five months after ligature a miscarriage with copious hæmorrhage. Next day pulsation in upper tumour ceased. Two months later hæmorrhage from bowels. A few months later cured. Years afterwards Mr. Hodgson saw the patient, and no one could have told she had had anything the matter with her eye.

2. *Date, Surgeon, and References.*

1812. Dalrymple, William. 'Med. Chir. Trans.,' vol. vi, p. 3. "A Case of Aneurism by Anastomosis in the Left Orbit, cured by tying the Common Trunk of the left Carotid Artery."

Sex, Age, Side affected, Origin.

F. 44. Left orbit. "Of a delicate and sickly habit of body," pregnant with her sixth child, seized in the middle of the night with intense pain in

her left eyeball. Attack sudden, instantaneous. Hearing a noise as of the cracking of a whip, and feeling at the same time an extraordinary pain in the globe, she woke in great alarm and leapt out of bed.

Symptoms and Progress.

Ten or twelve hours afterwards eye became inflamed and eyelids swelled; acute pain over whole of left side of head; anguish at bottom of orbit scarcely to be borne. Next night abatement of extreme pain, increase of swelling, feeling as if the eye were forcibly driven upwards. During labour, seven weeks afterwards, a bright red tumour projected between the eyelids. Ptosis came on early, and she became totally blind on the left side. Nine months after the origin of disease symptoms worse, pain constant, acute, chiefly referred to bottom of orbit; noise in head unceasing, like the rippling of water, absolutely insupportable with head lowered. Proptosis, ptosis. Paralysis of muscles of globe; red chemosed pad of conjunctiva lying over everted lower lid; cornea transparent; pupil dilated and fixed. For description of tumours, see ante, p. 51. Strong pressure on carotid lessened, but did not stop, pulsation in upper tumours.

Treatment and Result.

Ligature of left common carotid in two places, artery being divided between the ligatures. Pulsation ceased in tumours. Eight days after ligature no pulsation; eye in the orbit. Patient cured, but sight not regained.

3. *Date, Surgeon, and References.*

1823. Guthrie. 'Operative Surgery of the Eye,' 1823, p. 158.

Sex, Age, Side affected, Origin.

"I have seen one case of true aneurism of the orbit which terminated fatally. The symptoms were similar to those above mentioned (cases of Travers and Dalrymple), but no tumour could be perceived; the hissing noise in the head could be distinctly heard. On the death of the patient an aneurism of the ophthalmic artery was discovered on each side, about the size of a large nut. The vena ophthalmica cerebralis was greatly enlarged, and obstructed where it passes through the foramen lacerum in consequence of a great increase in size which the four recti muscles had attained, accompanied by an almost cartilaginous hardness, which had been as much concerned in the protrusion of the eye as the enlargement of the vessels."

Treatment and Result.

"The disease existing on both sides prevented an operation on the carotid being attempted, to which, indeed, the patient would not have submitted."

4. *Date, Surgeon, and References.*

1829. Roux. 'Journ. Hebdom.,' t. ii, 1831, p. 119. Demarquay. 'Traité des Tumeurs de l'Orbite,' 1830, p. 306. 'Gaz. Hebdom.,' 1856, p. 631.

Sex, Age, Side affected, Origin.

M. 26. Right orbit.

Symptoms and Progress.

A pulsatile tumour gradually developed itself at the angle of the right eyebrow. An oculist to whom he applied made with a trocar a puncture in the centre of the tumour. Very black blood escaped from the wound, and the ocular globe, which was only prominent, began to be deformed.

Treatment and Result.

Roux was obliged to ligature the carotid. The operation was followed by violent pains in the wound and in the tumour. During many days the patient was in a state of agitation bordering on delirium. In the end there still existed exorbitism and pain in the tumour.

5. *Date, Surgeon, and References.*

1829-30. Warren, Dr. J. C. 'Surg. Obs. on Tumours,' Boston, 1837, p. 400. "Aneurism by Anastomosis."

Sex, Age, Side affected, Origin.

F. 18. Right orbit. Experienced a sort of crowding feeling at the anastomosis of the angular ophthalmic and frontal arteries accompanied by a pain so severe as to make her give up her work as a servant.

Symptoms and Progress.

Having remained idle for some months she entered the hospital about a year after the origin of the disease. She was a fat comely girl. At the inner angle of eye, just above lachrymal sac, was a small tumour as large as a hazel-nut; it had an active pulsation extending to the "surrounding arteries." The pulsations of the facial artery were very strong, and by compressing it the vibrations of the tumonr were much lessened; skin over tumour slightly reddened, with increase of heat. Pressure on carotid, which had an increased pulsation, arrested pulse of tumour. Over carotid and facial arteries the saw-mill sound was heard with the stethoscope. Pressure on temporal artery produced no change.

Treatment and Result.

A branch of ophthalmic was tied, the facial divided below, the tumour allowed to bleed to 18 oz. and then compressed; on division of facial pulsation ceased, and the patient was relieved from her bad feelings. On removing compression a slight pulsation was perceived. Pulsation did not wholly cease. She went out and returned in four months, the pulsations of the arteries going to the tumour and of the carotid being very strong. She felt sometimes as if her head was flying off. Face and forehead red and swollen. Patient kept low, bled and took digitalis without benefit. Temporal artery divided. Right carotid tied, and pulsations ceased at once; those on left side slowly subsided. At the end of two months discharged cured.

6. *Date, Surgeon, and References.*

1835. Baron. 'Bull. de la Soc. Anat.,' 1835, p. 178. "Delens," op. cit.

Symptoms and Progress.

Another specimen of aneurism has been presented by M. Baron. The

tumour was situated on the carotid as it passed through the cavernous sinus. It appears to have been ruptured at that part, and a decolorised coagulum the size of an almond occupied the cavernous sinus. Is it not to this cause we must ascribe the varicose condition of the orbital veins which had produced considerable exophthalmos? A further support to the opinion is found in the very intense bellows murmur which the stethoscope detected when applied over the projecting eyeball.

7. *Date, Surgeon, and Reference.*

1825. Gendrin. 'Leçons sur les Maladies du Cœur,' t. i, p. 240. Abridged in Demarquay, op. cit.

Sex, Age, Side affected, Origin.

F. 32. Left eye. Remarkably lean, with disease of heart and great vessels, was seized one evening with violent pains in the left eye. The day afterwards she had the eye pushed forwards as out of the orbit, and sight on that side was lost.

Symptoms and Progress.

A fortnight afterwards symptoms were:—Eyelids swollen, red, and raised as if by a foreign body; eyeballs pushed forward and immovable; cornea transparent; pupil immovable and largely dilated; conjunctiva feebly injected; sight lost; finger laid on eyeball with lids closed detected an elevation synchronous with the arterial diastole; continual groanings; rotatory movement of head; hand carried constantly to left parietal and temporal regions. Very pronounced friction-bruit over orbit and right eye not in temporal or malar regions. Case complicated with heart disease, aortic disease, and paralysis.

Treatment and Result.

Digitalis (5 centigrammes for a dose). For effect, see p. 62. *Post-mortem.*—Ophthalmic vein varicose and distended with coagulated blood. A second external orbit vein also gorged. Internal carotid and ophthalmic arteries surrounded by adherent clot continuous with clot infiltrated into arterial tunics. See p. 32 and note to p. 39.

8. *Date, Surgeon, and References.*

1839. Jobert (de Lamballe). 'Mémoires de l'Academie de Médecine,' t. ix, p. 57. "Observation de Ligature de l'Artère Carotide primitive pour obtenir la Guérison d'une Tumeur erectile de l'Orbite," &c. "Carron du Villards sur l'Exophthalmie," 'Annales d'Oculistique,' 1858, p. 122; and Demarquay, op. cit.

Sex, Age, Side affected, Origin.

M. 50. Right eye. One morning after a fit of coughing perceived that the right eye was injected and projecting from the orbit. No precursory symptom.

Symptoms and Progress.

When seen by M. Jobert, eye driven from orbit; movements nearly abolished; eye red, injected, too sensitive to bear light; chemosis; constant lachrymation; ocular globe could not be covered by the lids. For

description of tumour, see p. 52. A very fine trocar plunged into it gave exit to *arterial* blood. M. Carron du Villards saw the patient before M. Jobert, told him the nature of the disease, and advised ligature. He was prevented by illness from operating.

Treatment and Result.

Bleedings, mercurial frictions, refrigerants, and astringents of no effect; acupuncture caused increase of swellings and violent inflammatory action. Vision was lost. Ligature of right common carotid; pulsation and pains ceased at once and movements returned. Sight not regained. Eye ulcerated and atrophied.

9. *Date, Surgeon, and References.*

1841. Dudley, Dr., of Lexington, 'Amer. Journ. of Med. Sci.,' Jan. 7th, 1843, p. 173, "Aneurism within the Cranium." Mackenzie, "Diseases of the Eye," and Demarquay, op. cit.

Sex, Age, Side affected, Origin.

M. Right eye. Experienced at irregular intervals attacks of pain above the right eye, augmenting in force and frequency.

Symptoms and Progress.

Before the end of the second year the eye protruded considerably from the orbit. In another year the right temple, as well as the right eye, was the seat of a morbid prominence, and the pain was so violent that it occasioned delirium, one attack lasting fifteen days. Sufferings of the patient were intense and incessant until an abundant spontaneous flow of a yellow fluid from the nose brought marked relief. Pains afterwards increased whenever the nasal flux ceased. Objects at a distance not distinguishable with right eye. Deafness in right ear. The eye was half an inch more prominent than the other. The inferior and external part of the frontal bone, including the orbital portion and the outer half of the orbital arch, were deeply involved in the malady, the corresponding portions of the parietal, temporal, and sphenoid separated from the body of the bones were comprised in an enlargement occupying the temple and the side of the head. The bones of the head and face were separated at the external angle of the eye sufficiently to admit the end of the little finger into the site of the transverse suture. The whole mass gave to the touch the characteristic thrill of aneurisms, whilst the eye seen from the side was agitated with an alternate movement of advance and recoil corresponding to the pulsation of the heart.

Treatment and Result.

Ligature of right common carotid. Pulsation at once stopped, tension and swelling diminished. Three weeks after ligature, eye almost restored to the orbit; patient could see distant objects. Quite well at the end of a month. Six months after operation the noise and movements felt by the patient in the head ceased, and the patient was following his occupation as a smith.

10. *Date, Surgeon, and References.*

1844. Herpin, M., of Tours. 'Gazette des Hôpitaux,' 1852, p. 550,

"Tumeur erectile de l'Orbite gauche. Ligature de la Carotide primitive gauche. Guérison. Menace de récidive du coté droit. Réfrigérants. Guérison definitive." Reported by Dr. G. Triquet.

Sex, Age, Side affected, Origin.

F. 59. Left eye. The affection began with pain in the left temple and left eye, at first intermittent and slight, but gradually becoming more and more severe with decreasing intervals between the attacks. Sight impaired, and tumultuous pulsations.

Symptoms and Progress.

Movements of eyeball impeded; lachrymation; chemosis; pains became exacerbated; sight lost after manifesiations of diplopia; proptosis; pulsations continuous and insupportable; vertigo. On admission patient seemed rather reduced by suffering. Exophthalmos about half of globe; sclerotic and cornea normal; œdematous chemosis; vision nearly abolished on left side; lids raised, distended, folds completely effaced, and lids only covering half of the ocular globe. Marked bruit de souffle over temporal region, synchronous with the arterial pulse, disappearing in great part on compression of carotid. "The case," says M. Triquet, "was evidently either simple or malignant tumour, or aneurism of the internal carotid, or perhaps of the ophthalmic artery."

Treatment and Result.

Ligature of left common carotid. Bruit almost ceased. In a week the eye had almost returned into the orbit and recovered its functions. Nine months afterwards commencing exophthalmos and bruit on right side, and compression on the right carotid did not stop the bruit and pulsation; ice was applied constantly for three months, with complete success. Seven years later the patient continued well.

1. *Date, Surgeon, and References.*

1851. Haynes Walton. 'A Treatise on Ophthalmic Surgery,' p. 258, *et seq.*, Lond., 1853, described as "Aneurism by Anastomosis," plate given at p. 259. 'Med. Times and Gazette,' 1854, vol. viii, p. 185.

Sex, Age, Side affected, Origin.

F. 4 months. Right eye. Slight prominence of eye one month after birth. Sister of patient had had a nævus of scalp.

Symptoms and Progress.

At four months eye prominent; lids swollen; cheeks puffy; conjunctiva thickly set with bright red vessels. Pressure on eyeball lessened the protrusion for a few seconds, whilst crying rendered the eye more vascular and caused great temporary protrusion. In a fortnight increase of all the symptoms; pulsation not distinctly felt, at least Mr. Walton could not satisfy himself of it; however, several persons declared that they felt it. Arterial souffle heard with stethoscope over the eye, not heard in the other orbit.

Treatment and Result.

Cold lotion applied for three weeks without result. Ligature of right common carotid when the patient was four months and three weeks old.

In a few days protrusion began to diminish. Pressure was then applied by means of an elastic bandage round the head; a year after operation the eye was nearly in its natural position, and all the movements were perfect.

12. *Date, Surgeon, and References.*

1851. Gervasi. 'Intorno alla Legat. della Carotide Primativa Ecc. Spezia,' 1851, p. 132. See 'Della Chirurgia in Italia, &c.,' di Alfonso Corradi, Bologna, 1871, p. 131. Described as "Aneurism by Anastomosis."

Sex, Age, Side affected, Origin.

M. 34. Right eye.

Treatment and Result.

Right common carotid tied. Cure.

13. *Date, Surgeon, and Reference.*

1853. Aubry, M., of Rennes. 'Gazette des Hôpitaux,' 1864, "Tumeur erectile de l'Orbite; pulsations; bruit de souffle; erreur de diagnostic; dilatation de la veine ophthalmique," by M. G. Triquet.

Sex, Age, Side affected, Origin.

F. 31. Right eye. Had had typhoid fever four years previously. The affection began subsequently. She was of limited intelligence, and was unable to give any clear account of her case, but she had no recollection of any injury to her head.

Symptoms and Progress.

On admission face congested; exophthalmos, but functions of eye preserved. Tumour the size of a nut on inner side of upper lid, subcutaneous and of the colour of the skin. Another tumour divided into two parts by the tendo-oculi existed below it. These tumours were soft, fluctuating, disappeared under pressure, and returned again. With tips of fingers pulsation readily detected. Over palpebral region the ear perceived a bruit de souffle very distinct, intermittent, and synchronous, with the arterial pulse and ventricular systole. It was soft, prolonged, and might be more correctly designated as continued with reinforcements at the moment of contraction of the heart. An aneurismal tumour of the ophthalmic artery was diagnosed. The patient suffered from attacks of vertigo. She died rather suddenly a week after admission.

Treatment and Result.

Post-mortem.—All organs healthy, but the brain under surface of middle lobe softened; walls of cranium very thick and vascular. For appearance of vessels, see ante, p. 6.

14. *Date, Surgeon, and Reference.*

1855. Hussey, E. L., Oxford. 'Oph. Hosp. Rep.,' 1859-60, vol. ii, p. 127, "Protrusion of the Globe, with some Symptoms of Aneurism."

Sex, Age, Side affected, Origin.

M. 42. Left eye. Disease commenced quite suddenly. Being very tired with driving a waggon for four days and nights, and being half asleep, he was roused by something amiss with his team; jumping up, he felt deep-seated pain in his left eye and singing in his ear. From that time the

pain and noise continued. He passed some bloody urine and spat some blood for three or four days.

Symptoms and Progress.

When seen two years after the commencement of the disease he had dimness of sight in left eye; throbbing and pain deeply seated at the back of the eye, much increased on stooping. Exophthalmos forwards and outwards; conjunctiva very vascular; no tumour appreciable by finger. Appearance of eyelids natural. On compressing carotid eye could be returned to its proper position. The man smiled and said that his sight was clear, and that all pain and throbbing had ceased. On relaxing pressure the protrusion and other symptoms returned. Six weeks after being seen by Mr. Hussey he lost all power over upper lid; pupil moderately dilated and motionless; sight gone; globe no longer returned to its place on pressure on carotid, either on right or left side. Subject to epileptic fits, and subsequently had frequent fits and became paralysed. Some months later he lost the sight of the eye, which became enlarged and hard, and emitted a serous discharge.

Treatment and Result.

He died fourteen months after coming under observation, or three years and two months after the commencement of the disease. Some time before his death the globe lost all its natural appearance, and protruded from between the lids a large, hard, raw substance. Skin of upper lid ulcerated superficially. A stream of blood flowed almost without intermission over the cheek from a depression in the middle of the globe. Free epistaxis. Post mortem forbidden.

15. *Date, Surgeon, and References.*

1856. Gioppi, Prof. (Padua). "Anévrysme de l'Artère Ophthalmique guéri par la Compression Digitale," 'Annales d'Oculistique,' 1858, t. xl, p. 215, taken from "Giornale d'Oftalmologia Italiano," short notice in 'Archives Générales de Médecine,' 1858, t. xi, p. 731. Abstract in Mr. Hart's paper, 'Lancet,' 15th March, 1862, with a woodcut of the patient.

Sex, Age, Side affected, Origin.

F. 42. Left eye. During an effort of childbirth she felt an unusual rattling in the left eye. She perceived that the eye was driven from the orbit and pushed the eyelids forwards. In childhood the patient had suffered from rachitis, and was the subject of rachitic curvatures of the spine and pelvis.

Symptoms and Progress.

Rapid formation of serous chemosis, deep pulsation and buzzing perceived by patient in the cranial cavity. After the labour proptosis increased, sight diminished, and was soon lost. On entering hospital twelve days later left eye was immovable and so prominent that the superior eyelid distended upon the tumour was rendered entirely immovable, and hardly covered the superior segment of the cornea. So tense was the eyelid that it could be raised only by the finger; it was swollen and of a livid red

colour, the tarsal cartilage more pronounced and the veins dilated; the volume formed in the eyelid projected in front of the orbital arch. Beneath the arch in the cavity of the orbit a softer tumour, tortuous, cylindrical, easily compressible, and when compressed offering a slight pulsation. It was towards the inner wall of the cavity, had a calibre of four or five millimetres, and did not pass the orbital border; on raising the eyelid the structure of the eye would have been scarcely recognisable but for the cornea and iris; cornea rather hazy; ocular conjunctiva strongly infected; pupil much dilated and fixed; no pain; sensibility impaired. Pulsation and thrill perceptible on any point of conjunctiva together with the souffle characteristic of aneurisms; constant buzzing and roaring in the left ear, depriving the patient of sleep. Compression of carotid instantly stopped pulsations, souffle, and buzzings, and permitted the globe of the eye to re-enter the orbit on pressure. By the ophthalmoscope, pulsation of the retinal veins was discovered; at the same time two arteries recognisable by their clearer colour could be seen to give pulsations synchronous with the arterial pulse; yellow spot undiscoverable.

Treatment and Result.

Some punctures of conjunctiva relieved the tension and swelling. As pressure on the carotid for more than a minute or two occasioned profound syncope, ligature was contra-indicated. Treatment of Valsalva and Albertini with digitaline and ergotine, &c., had no effect. The symptoms increased. Digital compression was undertaken preparatory to ligature (see p. 63). At the end of four days pulsation, bruit, and noises ceased. In three months the eye was in the orbit with perfect movements and nearly perfect vision, objects appeared diminished. Noise in the head had returned and a true aneurismal souffle could be heard over the left eye and over the head.

16. *Date, Surgeon, and Reference.*

1856. Nunneley. 'Med.-Chir. Trans.,' vol. xlii, p. 173. Case 2.

Sex, Age, Side affected, Origin.

M. 38 Left eye. A pale and feeble woolcomber noticed a small swollen spot in the lower lid of left eye, with difficulty of opening lids.

Symptoms and Progress.

The swelling increased steadily for thirty-four weeks, at the end of which he consulted Mr. Nunneley. Lids so much swollen that he could not open them; conjunctiva greatly congested; sight very dim; little or no pulsation; confusion and bewilderment in head; no noise; auscultation apparently not practised; some proptosis. By pressure it could be made to recede. Pressure on carotid diminished congestion of eyelids.

Treatment and Result.

Left common carotid tied. Swelling of lids and congestion at once lessened. In rather more than a month eye had receded; congestion and chemosis gone; lids less swollen. Patient resumed work; shortly afterwards, as he was wheeling a barrow up the hill, he felt his eye suddenly become worse, the lids more swollen, and sight impaired. By rest these

symptoms subsided. Twelve months after operation quite well with good vision.

17. *Date, Surgeon, and References.*

1858. Scaramuzza, Dr., of Verona. 'Thèse d'Henry,' Paris, 1856. "Considérations sur l'Anévrisme Artério-Veineux," applied for, but said to be out of print. 'Annali Universali,' 1856. Mr. Hart's paper, 'Lancet,' 15th March, 1862. 'Arch. Gén. de Méd.,' 1858, t. xii, p. 731.

Sex, Age, Side affected, Origin.

F. Left eye. In weak health, and subject to palpitation. A few days previously, after violent access of fever, she felt an acute pain in the left orbit—something seemed to give way in the orbit. The eye enlarged, and the patient could only distinguish light from darkness.

Symptoms and Progress.

On admission into the hospital the left eye projected entirely beyond the orbit; the lids did not cover the ball; the eye was injected and red; the cornea dull; light hardly discernible; pulsation and thrill over orbit and left temple; dilatation of the heart and of the arch of the aorta.

Treatment and Result.

Digital compression (see p. 64). Cure complete; vision lost.

18. *Date, Surgeon, and References.*

1858. Nunneley. 'Med.-Chir. Trans.,' vol. xlii, p. 175. Case 3.

Sex, Age, Side affected, Origin.

F. 65. Left eye. Mother of fifteen children. After returning from a walk was stooping down to take off her shoes when suddenly, as the crack of a gun, she felt something give way in the left eye. Instantly great pain and buzzing noise in the head; confusion and deafness on the left side. Eyeball protruded, was red and swollen, and felt as if it would burst. The lids became swollen and nearly closed.

Symptoms and Progress.

Six weeks later left eyelids quite closed, much distended, and greatly congested, with superficial veins. Eyeball considerably protruded; iris motionless; lens muddy; conjunctiva greatly chemosed and scarlet, with large convoluted veins; sight gone; decided pulsation synchronous with the pulse; distinct bruit; both bruit and pulsation most marked at the inner side of the orbit; a perpetual beating and buzzing noise in the head, causing confusion and bewilderment, much increased on lying dowu, when she felt as if the eyeball would burst; insomnia.

Treatment and Result.

Left common carotid tied. Pulsation, bruit, noise, distress, ceased at once. Death on sixteenth day. For post mortem see p. 32.

19. *Date, Surgeon, and References.*

1858. Carron du Villards. Annales d'Oculistique, 1858. Demarquay, op. cit., p. 293.

Sex, Age, Side affected, Origin.

F. 50. Right eye. Affection attributed to efforts made during her last confinement at the age of forty-five.

Symptoms and Progress.

Auscultation detected an intra-orbital pulsation synchronous with the movements of the heart. Compression of the carotid arrested all pulsation in the tumour, and lessened it. The pulse intermitted at every fourth beat. The patient had also aneurism of the right femoral artery.

Treatment and Result.

M. Carron du Villards abstained from expressing a decided opinion as to treatment. He lost sight of the patient, and heard some time afterwards that she had died suddenly.

20. *Date, Surgeon, and References.*

1859. Nunneley. 'Med.-Chir. Trans.,' vol. xlii, p. 187. Case 4. Also vol. xlviii, p. 28.

Sex, Age, Side affected, Origin.

F. 42. Right eye. Mother of six children. A week before confinement with seventh child got up as usual early in the morning, but owing to great and peculiar pain in the right side of the head was obliged to go to bed again. While lying there she suddenly—"sudden as a flash of light"—called out to her mother, who was standing by her bed, "The pain has gone into my right eye, it feels all on fire." The eyelids closed. Sight was not affected. Immediate sickness and faintness from pain, and confusion in the right side of the head and ear.

Symptoms and Progress.

A fortnight afterwards she was delivered of a healthy male child at full term. Increase of symptoms. About a fortnight later, when seen by Mr. Nunneley, the symptoms were almost complete proptosis of the right eye; sight quite lost; cornea hazy; iris immovable and moderately dilated; lids rather livid, and so greatly distended as to be unable to meet, the intervening space being filled with a thick, protruding, transverse fold of conjunctiva intensely congested and chemosed; great heat of the part, and a feeling as though the eyeball would burst;" over the right side of the head, and a constant noise in the ear just like, and as loud as, the steam hammer of a foundry." Bewilderment increased by exertion. Bruit heard, and pulsation felt, over the eye and also over the left temple, neither being so marked as in other cases. No fluctuation; tumour too solid either for fluctuation or fluid.

Treatment and Result.

Ligature of right common carotid. Instant cessation of noise in head and bruit; proptosis and congestion diminished. At the end of seven weeks could just discern light from darkness. Paralysis of muscles of orbit and iris continued, but eyeball receded and cornea became clear. Death about five years afterwards. For post-mortem appearances see p. 32.

21. *Date, Surgeon, and References.*

1860. Syme, James. 'Observations in Clinical Surgery,' p. 161. Reported also, with remarks, by Dr. Joseph Bell in 'Edin. Med. Journ.,' 1861, p. 1064. "Case of Pulsating Tumour in the Orbit cured by the Ligature of the Common Carotid Artery."

Sex, Age, Side affected, Origin.

F. 22. Right eye. Always enjoyed excellent health. In October, 1859, she noticed a slight tendency to protrusion of the eye. She married in December. Four or five weeks afterwards she suffered from urinary irritation, pain after and during micturition, and obstinate constipation and derangement of digestive system. She then suddenly felt a smart pain in her right temple, which lasted a couple of hours. She was ordered by her physician to rub the temple with a mixture of chloroform and laudanum, and during the rubbing felt a crack as if something had given way inside.

Symptoms and Progress.

A week after the first occurrence of morning pain double vision and proptosis. Poultice ordered under supposition of abscess. Two days later pain recurred with great intensity, followed by pain in the head, which continued throughout. Some weeks later conjunctiva of lower lid became everted and protruded, forming a prominent red mass below the eyeball. Several months afterwards when admitted into the Edinburgh Infirmary patient had an anxious, care-worn look; right eyeball was excessively prominent, as if it would burst from the confinement of the swollen lids; conjunctiva injected, tense, and œdematous; lids could hardly meet over eyeball; lower lid everted, with great vascular swelling of the conjunctiva. Between eyeball and margin of the orbit a soft pulsating tumour could be felt through the lid, and seemed to contain fluid. It was less like an aneurismal sac than a bundle of small vessels; it was compressible, and could be diminished in size, but not completely emptied. Pulsation accompanied by a sensible and audible thrill, very distinct at the margin of the orbit. On auscultating the head a most remarkable whizzing noise, audible and very annoying to the patient, audible to the bystanders at the distance of a yard. Restless night, the pulsation and whiz constantly waking her with a start. Pressure on carotid stopped pulsation, bruit, and noise, and the orbital tumour almost subsided.

Treatment and Result.

Scarification of conjunctiva and two salivations of no effect. Right common carotid tied with instant relief, diminution of tumour, and cessation of pulsation. A strip of conjunctiva removed with scissors at the operation, and the rest a few days afterwards. Eye in orbit in a week. Within a month patient discharged cured.

22. *Date, Surgeon, and References.*

1861. Bowman, Wm. 'Med. Times and Gazette,' August 4th, 1860, and July 27th, 1861. "Pulsating Tumour of the Orbit; Ligature of Common Carotid; Recovery." 'Royal Lond. Oph. Hosp. Rep.,' vol. iii, No. 2, New Series, p. 235. Reported by Mr. Francis Mason.

Sex, Age, Side affected, Origin.

F. 41. Right eye. Mother of six children. When six months pregnant was engaged in washing. Suddenly a pain came on with a blowing noise on the right side of the head, followed in a few hours by proptosis. She was confined three months afterwards.

Symptoms and Progress.

When seen a month later the symptoms were—proptosis about a quarter of an inch; hollow under orbital arch filled; pulsation easily felt with fingers; a decided sharp blowing bruit audible over whole of right side of head and face, and also on left side above the globe, loudest over left eye, fainter over the cheeks, and least of all over the forehead and temples, the sound being propagated most readily along the soft parts in the course of the vessels. Paralysis of external rectus only; convergent squint; diplopia; sight unimpaired; conjunctiva very vascular; fulness and engorgement of the upper lid; arrest of symptoms on compressing carotid. With ophthalmoscope choroid and retina were seen much congested. No headache or cerebral symptoms; no pain on applying pressure over the eyeball.

Treatment and Result.

Digital compression of carotid ordered by Mr. Hulke, ten to twenty minutes, three or four times a day for a fortnight. Symptoms increased. Ligature of carotid with relief to the symptoms. Paralysis of sixth nerve permanent. Eye still prominent. Forty-five days after operation hæmorrhage and collapse. Eye more prominent, and eyelids, &c., œdematous; appearance of pulsating swelling. Eyeball hard and prominent; much pain. Pulsation ceased on compressing left carotid; soft bruit heard over orbit. Ultimately able to follow her occupation, swelling subsiding, but vision lost.

23. *Date, Surgeon, and References.*

1861. Clarkson, Freeman, M.D., President of the Halton Medical Association, Milton, Canada, West. 'Amer. Journ. of Med. Sci.,' July, 1866, p. 277. "Intra-orbital Aneurism treated by Compression."

Sex, Age, Side affected, Origin.

M. 61. Left orbit. Pain in the eyeball. It subsided, and returned in a few months. Then both eyes became swollen, and the left projected. Double vision.

Symptoms and Progress.

Aneurismal tumour within and on nasal side of orbit, strongly pulsating, and with distinct whizzing bruit; tumour felt elastic and cyst like. He could see better without his glasses with his left eye than with them with his right. Slight stiffness and numbness of the left cheek; unable to breathe freely through his left nostril, and when lying on his right side both nostrils were closed. No pain, but stuffing, as if from cold; slept well.

Treatment and Result.

Application of cold and direct pressure against the swelling by a curved spring attached to an india-rubber band around the head. Digitalis in small doses. After a few weeks tumour became hard and dense, and ceased to pulsate; eye retired and vision improved. Five years later no reappearance of disease.

24. *Date, Surgeon, and Reference.*

1864. Nunneley. 'Med.-Chir. Trans.,' vol. xlviii, pp. 20 and 37. Case 2. "On Vascular Protrusion of the Eyeball."

Sex, Age, Side affected, Origin.

F. 47. A short stout woman, soon after getting out of bed one morning, was seized with a giddy fainting fit and something queer in the head. Immediately afterwards eye began to be affected, and gradually got worse.

Symptoms and Progress.

Three months later proptosis; lids red and tumid; congestion and chemosis of conjunctiva; sight dim; pupil dilated and sluggish; pulsating eyeball; noise in ear and giddiness in the head; throbbing; stretching pain in orbit. Symptoms relieved by pressure on carotid.

Treatment and Result.

Declined operation. A year afterwards unfit for work. Suffered much pain; frequently in bed. Less prominence and chemosis; pupil inactive; ptosis; useful vision lost; light painful. Eye kept constantly covered with a wet cloth.

25. *Date, Surgeon, and References.*

1865. Morton, Dr. T. G., Surgeon to the Pennsylvania Hospital. 'Amer. Journ. of Med. Sci.,' vol. xlix, April, 1865. "Aneurisms, with the History of a Case of Aneurism of the Ophthalmic Artery successfully treated by Ligation of the Common Carotid."

Sex, Age, Side affected, Origin.

F. 36. Right eye. Mother of four children. Two months pregnant. Was awakened from sleep by the report of a pistol overhead, but was persuaded that it was only a dream. A peculiar sensation in the head with a slight purring noise prevented her from sleeping.

Symptoms and Progress.

Dull headache and defective vision followed. Vision failed; eye became prominent; noise distressing; convergent strabismus. Seven weeks after confinement proptosis; congestion; vessels over side of nose tortuous and pulsating. Pulsation of eyeball seen and felt; aneurismal thrill; condition unendurable.

Treatment and Result.

Digital compression too painful. Ligature of right common carotid with immediate relief. In less than a month went home perfectly well. Vision excellent. Several years later continued well; no impairment of vision; had been confined without difficulty.

26. *Date, Surgeon, and Reference.*

1866. Œttingen, Dr., of Dorpat. "Zur Casuistik und Diagnostik der Orbitaltumoren." 'St. Petersburger Med. Zeitschrift,' Bd. xi, 1860. 'Klin. Monat. f. Augenheilkunde,' 1874.

Sex, Age, Side affected, Origin.

F. 64. Right orbit. Mother of five children. Three weeks previously

lesion excited by cold. Pains and prickings on right side of head. Proptosis and loss of sight. Thoracic and abdominal organs sound. No marked degeneration of arteries.

Symptoms and Progress.

Singing noises in head had disappeared; eyelids infiltrated; orbital hollow obliterated; lower lid everted; veins of eyelids not particularly distended; chemosis; anæsthesia of conjunctiva; pupil dilated and fixed; total loss of vision; exophthalmos; pulsation of eyeball; diastolic bruit; pulsation specially marked between globe and outer part of orbital floor, but felt all round the eyeball; bruit only audible over the eye. Pressure on right carotid stopped pulsation and bruit, but scarcely affected tension of parts. Ophthalmoscopic examination prevented by opacity of vitreous.

Treatment and Result.

Leeches, scarifications, compressions, with little effect. Pus in eyelids evacuated. Death two years afterwards; no arterial change. Partial obliteration of the orbital veins.

27. *Date, Surgeon, and References.*

1868. Wecker and Richet. 'Annales d'Oculistique,' 1869, t. 61, p. 186. "Sur les Tumeurs pulsatiles de l'Orbite." 'Heidelberg. Oph. Gesels.' 1868.

Sex, Age, Side affected, Origin.

F. 63. Left eye. On returning from a drive experienced a strong buzzing in the left ear. Was seized with shivering and violent headache, and was forced to lie down. The day after ptosis and absolute paralysis of motor oculi.

Symptoms and Progress.

A month later paralytic symptoms had diminished. One of the vessels of the orbit running along the forehead gave a perceptible thrill to the finger; exophthalmos; intense hissing bruit synchronous with pulse; noise in the head. During next two months proptosis and paralysis, and size of distended frontal vessel increased; slight pulsations were observed in the eye; retinal veins distended, and outlines of papilla effaced; a little later cerebral symptoms; sensation lost in right side of body; buzzing in the ear continual, depriving patient of sleep. She could only sleep in a voiture when the noise in the streets was stronger than that in her head. Dilated left ventricle.

Treatment and Result.

Digital compression arrested the pulsations, bruit, and buzzing for a time, but the excessive stoutness of the patient did not permit the constant application of Luer's compress. Ligature of left common carotid by Professor Richet. Noise in head ceased immediately, but a slight souffle could be heard on auscultation. Three hours after operation patient was struck with paralysis of right side, and fell into a state of stupor. Death in fifty-two hours. For result of post mortem see pp. 15, 33, and 41.

28. *Date, Surgeon, and Reference.*

1869. Morton, Dr. T. G. 'Amer. Journ. Med. Sci.,' July, 1870, p. 44.

"Aneurism by Anastomosis with Orbital Tumour. Involvement of the entire Side of the Head and Face by the Extension of the Disease."

Sex, Age, Side affected, Origin.

M. 25. Left eye. Soon after birth the left side of the head and face was observed to be rather more fully developed than the right. As far back as he could remember the left eye had been prominent. Many years ago he noticed a rushing sound in his head and eye, more intense at times, the protrusion and noise being increased by heavy work or the stooping posture.

Symptoms and Progress.

Excessive exophthalmos; vascular and chemosed conjunctiva; intense pulsation and marked thrill perceptible to the touch on the temple and eyeball; the noise could be heard at some distance from the head; a considerable tumour, irregular, flattened above, to be felt deeply in orbit and at the inner angle of the eye, the thrill being very marked and intense in the tumour itself; orbital portion of tumour globular and readily compressible, but with removal of pressure it filled instantly; movements of eyeball lost; fingers could be counted with great difficulty at one foot; marked continuous bruit in vessels of face; left side of tongue enormously hypertrophied; this varicose aneurismal condition invaded the entire side of the head.

Treatment and Result.

As pressure on the left carotid controlled all bruit and thrill, with immediate lessening of the orbital tumour and exophthalmos, ligation of the vessel was advised as the affection was increasing, and the risks of hæmorrhage were thought to be considerable.

29. *Date, Surgeon, and Reference.*

1869. Morton, Dr. T. G. Op. cit. "Aneurism by Anastomosis involving the Orbit at the Inner Angle."

Sex, Age, Side affected, Origin.

F. 12. Right orbit. Tumour growing gradually since infancy at the angle of the right orbit.

Symptoms and Progress.

Growth rather more than an inch in diameter; larger at times and more prominent under excitement; pulsation slight, and sometimes scarcely to be felt. The child said she felt or heard a sound in her head all the time. Tumour could be forced by pressure almost away, after which it gradually refilled; the exertion of going upstairs producing great prominence. The eye was not displaced, nor vision interfered with.

30. *Date, Surgeon, and Reference.*

1869. Galezowski. 'Traité des Maladies des Yeux,' 1872, p. 829.

Sex, Age, Side affected, Origin.

F. 60. Both eyes. Had existed five weeks in right eye, and three in left. No account of mode of origin.

Symptoms and Progress.

Eyes very prominent; eyelids fallen; serous chemosis. In right eye

pulsation of central artery of retina. On applying the ear to the two eyes a *bruit de souffle et de sifflement*. The patient herself heard the noise constantly in the ears, and compared it to that of a railway. There was probably a spontaneous fissure of one or both carotids.

31. *Date, Surgeon, and References.*

1871. Schmid, Dr., of Odessa. 'Klin. Monat.,' ix, 219, 1871. 'Annales d'Oculistique,' 1872, vol. lxviii, p. 245.

Sex, Age, Side affected, Origin.

M. 25. Right eye. Bleeding from the mouth one evening so abundantly that he lost consciousness.

Symptoms and Progress.

Six months later very pronounced exophthalmos; ptosis; pad of conjunctiva concealing lower lid; bulb injected; cornea a little troubled; iris hyperæmic; retinal vessel dilated and sinuous; visual field free; fingers could be counted at a distance. Pulsation and thrill to be felt in upper eyelid, weakened but not ceasing entirely on compressing the right carotid or even both carotids. Bruit de souffle at the superior border of the orbit, and over half the head. *Diagnosis.*—Aneurism of the ophthalmic artery at its origin from the internal carotid.

Treatment and Result.

Ligature of right common carotid. Pulsation and thrill ceased; bruit altered, but not abolished. Patient left hospital about five weeks after operation. He could count fingers at twelve feet; still slight exophthalmos and congestion; neither pulsation nor thrill, but the whistling or piping bruit could be heard occasionally.

32. *Date, Surgeon, and Reference.*

1872. Julliard, of Geneva. 'Note sur un Anevrisme Intra-orbitaire, &c.," Paris, 1873.

Sex, Age, Side affected, Origin.

F. 69. Left eye. Always had good health. Was sitting at work when she suddenly felt a violent pain in the left eye and temple, and lost consciousness for some moments. In the night the pains persisted, and the patient perceived that her eye enlarged rapidly, and that the sight was gone.

Symptoms and Progress.

The next day, 26th April, when seen at the hospital, symptoms were—exophthalmos, the eye forming a large tumour half the size of the first; superior eyelid deep red, strongly stretched, and œdematous; conjunctiva red, swollen, gorged with blood; cornea transparent; pupil easily distinguished, immovable, and dilated; the eye pushed outside the orbital cavity; passed by a centimetre at the least the superior eyelid; the cornea reposed upon the cheek a little below the cheek-bone. The tumour presented pulsations synchronous with those of the heart, easily perceived when the hand was applied upon it, and augmented when the head was lowered; no thrill and no bruit to he heard over the tumour with the stethoscope; much pain and very distinct beatings felt by the patient, as well as a constant buzzing in the ear. Atheromatous arteries and heart

disease; marked whispering bruit continuous with redoublements heard next day. Compression of carotid stopped the pulsations. High fever. Tumour formed by proptosed eye and swelling round it compared to the tumour in Freer's case.

Treatment and Result.

Ice and digitalis. Next day cornea tarnished, conjunctiva mortifying. April 28th.—The entire eye sphacelated; intense headache. May 3rd.—Eschar becoming detached; pulsations and bruit as before. 8th.—Pulsation and pain less; bruit not heard. 20th.—Tumour less; eye partly eliminated, now the size of a hen's egg, hard, and not painful; pulsations gone. June 2nd.—Pains and beatings in the right eye; left eye eliminated. 6th.—Ptosis on right side. 24th.—Patient left hospital quite well. Orbital tumour still the size of a hen's egg; eyelids œdematous. February 20th, 1873.—Exophthalmos gone; left eye not sunken; no pulsation in orbit, kern to conjunctivitis.

33. *Date, Surgeon, and Reference.*

1807. George Freer, Birmingham. 'Observations on Aneurism and some Diseases of the Arterial System,' p. 32. "Fungus Hæmatoides."

Sex, Age, Side affected, Origin.

M. 30. Left. Attacked immediately after an inflammatory fever with stiffness and throbbing in the orbit of the eye.

Symptoms and Progress.

Pain rapidly increased, and in a few days the eye was protruded and suppurated. Tumour daily increased, very minute vessels ramifying on its surface, and in two months was nine inches in circumference. Repeated hæmorrhages very profuse and restrained, with difficulty. Health gave way; dropsical symptoms and death.

Treatment and Result.

Large doses of opium alone gave relief. Astringents and escharotics applied, but too painful.

34. *Date, Surgeon, and Reference.*

1854. Critchett, George, Assistant Surgeon to the London Hospital. 'Med. Times and Gazette,' Dec. 23, 1854, and May 5th, 1855, "Aneurism by Anastomosis."

Sex, Age, Side affected, Cause.

M. 35. Right.

Symptoms and Progress.

Exophthalmos. Pulsation.

Treatment and Result.

In November, 1854, ligature of right common carotid. Patient went on quite well for several weeks; eye sloughed. Hæmorrhage from the orbit occurred at the end of a month; recurred several times, and the patient died in March; no cerebral symptoms; no examination of the body.

II. TRAUMATIC CASES.

1. *Date, Surgeon, and Reference.*

1830. Warren. 'Surgical Operations on Tumours,' Boston, 1837.

Sex, Age, Side affected, Cause.

F. Age not stated. Right eye. Fell down stairs and struck inner angle of right eye.

Symptoms and Progress.

Pulsating tumour at inner angle of right eye, extending into orbit and affecting the vision of the eye.

Treatment and Result.

Right common carotid artery tied. No effect on disease.

2. *Date, Surgeon, and Reference.*

1834. Scott, Surgeon to London Hospital. Case related by Busk, 'Med. Chir. Trans.,' vol. xxii, and Curling, op. cit., vol. xxxviii.

Sex, Age, Side affected, Cause.

M. Boy. Right eye. Fell into a ship's hold.

Symptoms and Progress.

Concussion; proptosis; fixed globe and pupil. Vision lost at the end of a month; pulsation of the globe, which could be both seen and felt. A week later profuse arterial hæmorrhage from the nose during a fit of coughing.

Treatment and Result.

Pressure made on the globe for two days; was too painful to be borne longer; ligature of the right common carotid. Cure; vision lost.

3. *Date, Surgeon, and Reference.*

1835. Busk. 'Med. Chir. Trans.,' vol. xxii, p. 124. "A Case of Aneurismal Tumour of the Orbit, cured by tying the Common Carotid Artery."

Sex, Age, Side affected, Cause.

M. 20. Left eye. Severe blow on the right side of the head from the gaff of a vessel.

Symptoms and Progress.

Concussion; hæmorrhage from the right ear and unmistakable symptoms of fractured base of skull. Early symptoms were—swelling of left eyelids from serous effusion; immovable globe; fixed and dilated pupil; impaired vision; "inflamed" conjunctiva; onyx and ulceration of cornea, which subsequently healed. Six months and a half after accident, when on the point of being discharged, pulsation of the globe and a pulsating tumour detected; the latter was at the upper and inner corner of the orbit, immediately within the supra-ciliary ridge. Distinct thrill; loud, whizzing bruit; loud noises in head, on right side like church-bells, on left like breaking of waves on sea-shore. Pressure on carotid stopped bruit and pulsation.

Treatment and Result.

Having bled the patient the day before to 20 oz., Mr. Busk tied the left

common carotid; pulsation, bruit, and noise in head ceased. Four hours later feeble pulsation and whiz as loud as ever. Next day bled to 16 oz. with benefit, and the following day tumour, pulsation, and bruit all gone, and eyeball receding. Discharged in seven weeks and five days after operation. Cure; good vision with upper half of cornea.

4. *Date, Surgeon, and References.*

1839. Velpeau. 'Bulletin de Thérapeutique,' t. xvii, p. 128, 1839; 'Leçons Orales,' t. iii, p. 437; Art. "Orbite," Dict. en 30 vols., t. xxii, p. 323. Reported by Velpeau as "Erectile Tumour of the Orbit," the lesion being seated on the branches of the ophthalmic artery.

Sex, Age, Side affected, Cause.

M. 30. Both eyes, right more severely. Blow on nape from fist of a very muscular man.

Symptoms and Progress.

The day after accident right eye more prominent, and strong beatings in the head. Left eye became prominent after a time. Two months later dilatation of veins of eyelids, some of which became prominent and resembled cysts. Four months and a half after the accident there were pulsatile tumours and bruit on both sides; the tumours were situated beneath the orbital arch under the skin of the upper eyelid, and the pulsations were evident to sight and touch; bruit over orbits rasping, and louder on right side. See ante, page 4.

Treatment and Result.

Ligature of right common carotid; noise in head, pulsations, and bruit stopped at once and continued absent for some time, but at the end of three months they had all returned on the right side, and the tumour was reproduced. The patient declined further operation. Partial success.

5. *Date, Surgeon, and Reference.*

1845. Petréquin, Chirurgien-en-Chef de l'Hôtel-Dieu de Lyons. 'Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,' 1845, t. xxi, p. 994; 'Gazette Médicale,' 1846. Described as "Aneurism of the Ophthalmic Artery and of the Origin of its Branches, with Exophthalmia."

Sex, Age, Side affected, Cause.

M. 22. Left orbit. In October, 1844, fell upon his forehead; headaches were the only primary symptom.

Symptoms and Progress.

Three months after the injury the patient perceived a tumour in the orbit, which presented the characters of an aneurism; pulsations synchronous with the arterial pulse; bruit de souffle; chemosis; exophthalmos very marked; sight weakened, but preserved. When seen by M. Petréquin tumour was small, transverse, and elongated. Pressure on carotid stopped pulsation and diminished the tumour.

Treatment and Result.

On the 5th of June, 1845, the left common carotid was tied, with relief to

the symptoms. At the end of the second week bruit and pulsation returned. About a month later galvano-puncture was applied, in the hope, M. Petréquin observes, of saving the life of the patient. It was the first of M. Petréquin's cases treated in this way, and the mode of application left, he says, much to desire. The patient died in about a fortnight; a post-mortem was not obtained.

6. *Date, Surgeon, and References.*

1851. Brainard, Dr. Daniel, Professor of Surgery, Rush Medical College, Chicago. "Case of Erectile Tumour of the Orbit, cured by Infiltration with the Lactate of Iron after the Ligature of the Carotid Artery had failed, with Observations on the Effect of that Solution in operating on the Blood-vessels." 'Lancet,' 1853, vol. ii, p. 162.

Sex, Age, Side affected, Cause.

M. 34. Left orbit. Severe kick from a horse on the left side of the lower jaw, fracturing it on the right side and severely injuring him.

Symptoms and Progress.

On recovering from the shock he heard a blowing sound in his head; the eye became prominent, and pulsated with a thrill when touched; a loud blowing sound audible over the orbit and more or less over the head; arteries of head and neck pulsated with unnatural force; veins of face prominent; head hot; severe pain in head, with nausea and vomiting; pressure on left carotid instantly stopped pulsation and sound. At the end of four months much worse; more protrusion; conjunctiva ulcerated; lids incapable of closure; thrill heard over whole head; bilious attacks and vomitings had increased the size of the tumour; great heat of head and insomnia; only able to sleep by keeping cloths dipped in cold water applied constantly to it; anxious for operation.

Treatment and Result.

On account of great tenderness compression could not be borne. Ligature of carotid four months after accident; pulsation and bruit ceased; bags of pounded ice and evaporating lotions applied. On third day a slight pulsation and sound were detected; symptoms returned. A year after operation exophthalmos; eversion of lower lid, which was covered with a fungous projection; elastic and pulsating swelling at upper and inner part of orbit, near root of nose; small vessels of forehead and side of nose dilated and pulsated strongly with peculiar thrill. Puncture with hot knitting needles on three occasions. A drachm of solution of lactate of iron (8 grs. to ℥j of distilled water) injected into the tumour; intense pain in left temple, nausea, and vomiting resulted. For twenty-four hours all liquids were rejected, and the vomiting lasted six days; bladders filled with ice and salt gave relief to pain; neither thrill nor sound could be perceived after the injection; veins were much diminished and arteries reduced to normal state; ulceration of cornea, severe inflammation of the eye, and loss of the humours succeeded, and the eye collapsed. The patient resumed his ordinary occupation three months after the injection. Cure, with loss of eye.

7. *Date, Surgeon, and Reference.*

1852. Nunneley. 'Med. Chir. Trans.,' vol. xlii, p. 168, Case 1.

Sex, Age, Side affected, Cause.

M. Left eye. Blow on left eye whilst fighting.

Symptoms and Progress.

Beating noise in head and ear came on immediately and continued throughout. A few weeks after blow eyes bloodshot, sight dim, and aching pain; globe prominent; conjunctiva congested; iris sluggish; movements of globe slightly impeded; sight not materially affected. Two months later symptoms aggravated, and pulsation became perceptible, with a decided thrill. Pressure on carotid arrested it, and relieved the other symptoms.

Treatment and Result.

Puncture of tumour beneath upper lid caused increased swelling. Ligature of left carotid about four months after accident; pulsation and noise ceased and proptosis diminished. In three weeks the eye was nearly natural. The symptoms returned, then abated, and then returned again. Ligature of the right carotid was thought of, but after two or three venesections the patient improved. Ultimately he was cured, with loss of sight from a cataractous condition of the eye. In 1859 he remained well. Cure; vision lost.

8. *Date, Surgeon, and Reference.*

1853. France, Ophthalmic Surgeon to Guy's Hospital. 'Guy's Hospital Reports,' ser. iii, vol. i, 1853, p. 58. "Case of Pulsating Swelling in the Orbit."

Sex, Age, Side affected, Cause.

F. 38. Left orbit. Thrust in the left orbit with an umbrella from a drunken soldier.

Symptoms and Progress.

Ecchymosis. Eyeball protruded in a fortnight. Symptoms subsided, but a month later recurred. Inflammatory œdema of upper lid; lower lid everted and covered with projecting conjunctiva; injection of conjunctival vessels; veins of orbit distended; face swollen; vision lost entirely in eight weeks; pain so great as to preclude sleep. Pulsation on nasal and temporal sides of the eye, and as protrusion diminished a definite rounded tumour with pulsation appeared at the inner canthus.

Treatment and Result.

Mixture of acetate of ammonia, antimonial wine, and sulphate of magnesia; scarification of conjunctiva; chemosed pad incised; symptoms abated. As the swelling subsided the lower lid was brought into position with plaster. At the end of eight months the tumour and pulsation had disappeared, and the movements of the eyeball were regained, but vision was lost. Eighteen months later she continued well.

9. *Date, Surgeon, and Reference.*

1854. Curling, T. B., Surgeon to the London Hospital. 'Med.-Chir. Trans.,' vol. xxxvii, p. 226. "Case of Traumatic Aneurism of the Ophthalmic Artery consequent on injury to the head, cured by Ligature of the Common Carotid Artery."

Sex, Age, Side affected, Cause.

M. 49. Right orbit. Fell from the top of a stack of wood seven feet high on to his right shoulder and right side of his head.

Symptoms and Progress.

Evident symptoms of fractured base of skull. In five or six weeks congestion and chemosis of conjunctiva; eyeball became prominent; great pain on right side of head; pulsation detected on placing the finger on the upper lid and pressing gently on the globe; proptosis increased, and a very distinct bruit was heard over the right temple. Vision not impaired, but in a few days it began to become so, and other symptoms were aggravated; motions impaired.

Treatment and Result.

Having lost the other eye from cataract, it was of great consequence to the patient to preserve the right eye, so that the right common carotid was tied ten weeks after the accident; the pulsation and beating in the head was at once arrested. Next day vision was lost, and pupil dilated and fixed: chemosis. Congestion and protrusion subsided, but cornea became dull and hazy. It cleared, however, in a few days, and patient regained useful vision, and with the aid of a card perforated with a small hole was able to read with a little difficulty; power of moving eye was recovered.

10. *Date, Surgeon, and Reference.*

1854. Van Buren, Dr. W. H., Professor of Anatomy in Univ. Med. Coll., and Surgeon to the New York Hospital. 'New York Journal of Medicine,' July, 1857. In Dr. Wood's article on "The Early History of Ligature of the Common Carotid."

Sex, Age, Side affected, Cause.

M. 21. Left orbit. Fall of the walls of the house on which he was labouring.

Symptoms and Progress.

No external injury, but profuse bleeding from left ear, paralysis of left facial nerve, and concussion. Four weeks later protrusion of eyeball, tensive pain, and injection of conjunctival vessels; feeling of throbbing; aneurismal thrill discovered with stethoscope; pulsation and thrill arrested by pressure on left carotid.

Treatment and Result.

Ligature of left common carotid; pulsation, throbbing, and tensive pain arrested; exophthalmos subsided, but never entirely disappeared. Slight aneurismal thrill returned three weeks later, but it subsided. Patient was well when seen a year and a half afterwards. Cure; good vision.

11. *Date, Surgeon, and References.*

1855. Nélaton. Thèse d'Henry, 1856. 'Considérations sur l'Anévrysme Artério-Veineux' (out of print). Dr. Delens, op. cit. Holmes, "Lectures on the Surgical Treatment of Aneurism," 'Lancet,' 1873. Originally related, but briefly and with inaccuracies, in 'Bulletins de la Société Anatomique,' t. xxx, 1855. Short account by Dr. E. L. Holmes, of Chicago,

who witnessed it, in 'Amer. Jour. Med. Sci.,' July, 1864, new series, vol. xlviii. Gougenheim 'Thèse.'

Sex, Age, Side affected, Cause.

M. 21. Right eye. Thrust with the ferrule of an umbrella in the left lower eyelid.

Symptoms and Progress.

Abundant bleeding from nose and ptosis of right upper eyelid. Wound of left eyelid healed rapidly, but at the end of some days the right eye became more prominent, with diplopia and mydriasis. Two months later left eye healthy; right eye prominent; ptosis; dilated veins on surface of upper lid; pupil largely dilated; external strabismus; absence of movement of the eyeball; diplopia and presbyopia of right eye, which had been myopic before; patient blew blood habitually from the right nostril; paralysis of right third pair; pulsation of eyeball; bruit de souffle continuous, with reinforcements during arterial pulse; absence of thrill. A little later "bruit de piaulement" audible also to the patient. The patient continued to blow blood from the right nostril, and at times had epistaxis. See anté, page 7, for M. Nélaton's diagnosis.

Treatment and Result.

Compression of the right common carotid was adopted as the method of treatment, at first with M. Charrière's apparatus, which did not fulfil all the necessary conditions, and then with one devised by M. Henry. Compression did not occasion discomfort, but was ineffectual. The patient had already had rather abundant epistaxis on several occasions, and though he entered the hospital in order that the apparatus might be applied with greater accuracy, he had two returns of abundant epistaxis followed by syncope, and he died suddenly the day after admission. See ante, page 7, for result of post-mortem.

2. *Date, Surgeon, and Reference.*

1854. Bourguet, Chirurgien-en-Chef de l'Hôpital d'Aix. "Note sur un Cas d'Anévrisme d'Artère Ophthalmique et de ses principales branches gueri au moyen des Injections de Perchlorure de Fer" (lue à l'Académie des Sciences dans la Séance du 19 Novembre, 1855). 'Gazette Médicale de Paris,' 1855, p. 772.

Sex, Age, Side affected, Cause.

F. 12½. Right eye. Fell, three years previously to coming under treatment, from the second story of a house, and sustained two contused wound on the right side of the forehead, which suppurated for a month and a half or two months.

Symptoms and Progress.

Six months after the fall the parents noticed that the right eye became more prominent than the opposite eye, and that there existed a small pulsatile tumour at the internal part of the orbit, opposite the lachrymal sac. The tumour by degrees increased, and when M. Bourguet saw the patient there were a series of soft, indolent, elastic, pulsatile tumours at the base of the forehead, the inner part of the orbit, and in the upper lid; the frontal

tumour, as large as a large almond, reached to the middle of the forehead; the internal tumour was the size of a pigeon's egg, and the tumour of the eyelid was formed of a single trunk, the size of the little finger, and of numerous flexuosities and circumvolutions anastomosing together; all the tumours had a vibratory thrill; bruit de souffle continuous with redoublement, extremely distinct and audible even to the naked ear; skin over tumours thin and bluish; eye in great part driven from orbit, and the seat of pulsations synchronous with pulse; vision almost lost in right eye. Pressure on carotid abolished pulsation of tumours and eyeball and bruit.

Treatment and Result.

Electro-puncture (Bunsen's pile with six cells); four needles successively introduced into various parts of the tumour; great pain, but no clot formed. Three other sittings without effect. Injection of six or seven drops of solution of perchloride of iron to 28° into tumour; pulsations at once ceased in the part. Compression of both carotids maintained before and for twenty to twenty-five minutes after the injection, and cold applications were made to the forehead. The next day a second injection of seventeen to eighteen drops; some nausea and vomiting followed during the rest of the day. Next day tumours on forehead hard; eyeballs more prominent; eyelids infiltrated, the pulsation and bruit persisting in the upper eyelid and bottom of the orbit; then the prominence and pulsations gradually lessened. The patient left the hospital, and ten days later the tumours were all devoid of pulsation, and with a yellow tint like that of ecchymosis. At the end of ten months the eye completely retired into the orbit; the tumours had disappeared, vision was perfect, and the cure left nothing to desire.

13. *Date, Surgeon, and Reference.*

1857 to 1859. Gurdon Buck. Abstract given by Dr. Noyes. 'New York Medical Journal,' 1869, p. 664. Compare Poland, 'Royal Lond. Oph. Hosp. Reports,' 1859-60, vol. ii, p. 219.

Sex, Age, Side affected, Cause.

M. 22. Right eye. Fell from aloft on to the deck, and struck on his feet, ten weeks before admission into hospital in December, 1857.

Symptoms and Progress.

Insensible till following day, then found sight gone. Four weeks after pain commenced at inner angle of right eye, with throbbing and whizzing in the ear. On admission.—Marked exophthalmos, eye being pushed downwards and outwards; veins of upper lid enlarged and tortuous; conjunctival and scleral vessels dilated; pupil widely dilated and immovable; pulsation distinct and arrested by pressure on the carotid.

Treatment and Result.

Right common carotid artery tied shortly after admission; tumour did not subside, but pulsation was less marked; exophthalmos began to decrease, but all the symptoms returned, and on June 11th, 1858, the patient was discharged. He went to sea, and made a visit to London, returning in February, 1859; exophthalmos greater; eye scarcely any perception of light. Left carotid tied on February 23rd, 1859; a few minutes after

still a thrill in tumour, but less distinct. June 15th, protrusion nearly gone; perception of light only; a bruit audible at times in the tumour. Nov., 1859, bruit and tumour gone; vision nil; pupil enlarged.

4. *Date, Surgeon, and Reference.*

1857 and 1858. Halstead, Dr., New York. Case given by Dr. Noyes. 'New York Medical Journal,' 1869, p. 665.

Sex, Age, Side affected, Cause.

M. 37. Both eyes. Fell through a hatchway, Dec. 10, 1857, and was admitted into New York Hospital.

Symptoms and Progress.

After eight days complained of noise in left ear; left pupil sluggish; more contracted than the right. On 10th day diplopia; injection of both eyeballs. About two months after injury ptosis of right upper lid. A week later left eye began to protrude; chemosis in both eyes; distinct bruit heard on left temple and all over head, most decided over left frontal sinus; pulsation detected by pressure on eyeball.

Treatment and Result.

Feb. 14th, 1858, left carotid tied; immediately pulsation and bruit ceased and tumour diminished. Next day ptosis diminishing, noise in ear gone. On 20th noise in ear and bruit returned. April 3rd, discharged cured; no bruit; sight occasionally dimmed.

5. *Date, Surgeon, and Reference.*

1858. Bowman. 'Oph. Hosp. Rep.,' April, 1859, p. 6. "All the capital signs of orbital aneurism present in a marked degree, but independently of aneurism or any erectile tumour." By Mr. Hulke.

Sex, Age, Side affected, Origin.

F. 40. Left orbit. Blow from a fist on left side of head and temple, which knocked her down.

Symptoms and Progress.

Next day severe pain in left temple, disturbing sleep. At the end of a fortnight it was replaced by a rushing noise like the beating of a steam-engine; noise constant and audible to her husband; sight "bothered." At the end of four months and a half left eye became red and projected. On admission, on February 19th, into King's College Hospital, at the end of five months.—General fulness of orbital region; congestion; proptosis. Pupil dilated, but active; distant objects seen perfectly; inability to read. Loud sibilant bruit audible over left side of head; pulsation of eyeball; no head symptoms; depression at lower border of orbit between malar and upper maxillary bones.

Treatment and Result.

Left common carotid artery tied February 27th; pulsation and bruit at once ceased. Next day eye less prominent; sight better. March 7th.—Bruit heard over eye and a little above ear, a continuous musical note swelling out at each pulsation. 21st.—Ligature came away. Next day secondary hæmorrhage; eyeball again prominent; pupil dilated and fixed;

eye everted; ptosis. 15th.—More bleeding. 17th.—Death. For result of post-mortem see ante, p. 9. The malar was detached from the maxillary bone.

16. *Date, Surgeon, and References.*

1858. Hirschfeld, L. 'Comptes Rendus de la Société de Biologie,' 1858, t. v., 2 série, p. 138. "Épanchement de Sang dans le Sinus Caverneux du Côté Gauche, diagnostiqué pendant la vie." Dr. Delens, op. cit., p. 75. Holmes, "Lectures," 'Lancet,' 1873. 'Gazette des Hôpitaux,' 1859, p. 51.

Sex, Age, Side affected, Origin.

F. 72. Left. Fall from a carriage on to the pavement.

Symptoms and Progress.

A large wound at the root of the nose; very free bleeding. The wound healed a month later without any precursory symptom. She lost the power of raising the left upper eyelid and moving the eyeball. Some exophthalmos; complete anæsthesia of the eyelid, ala of the nose, and forehead; vision normal. Diagnosis on admission in this state into hospital two months after accident.—"Effusion of blood compressing the motor nerves before their entry into the orbit."

Treatment and Result.

9th January (second day after admission).—Small blister to left temple. 10th.—Erysipelas of face followed by intense fever; coma and death on the seventeenth day. *Necropsy.*—A blood-clot enveloping the third and compressing the ophthalmic nerve found in the cavernous sinus, and this clot covered a small circular hole in the carotid, which looked as if it had been punched out and was occupied by a string of decolorised clot about two inches long, passing into the mass of coagulum; bones sound.

17. *Date, Surgeon, and Reference.*

1859. Corner, F. M., Surgeon to the Poplar Hospital. 'Transactions of Hunterian Society,' 1874.

Sex, Age, Side affected, Origin.

M. 33. Right eye. Fall from aloft on to the deck of a ship, striking the left side of the head against the combings of the hatchway, in March, 1859.

Symptoms and Progress.

Insensibility, bleeding from ear, and afterwards deafness of left ear, due, it was thought, to fracture of the base of the skull. In May, when about to discharge him, Mr. Corner noticed a fulness of the right eyeball and pulsation at each beat of the heart; loud whizzing bruit audible over the head; bruit *double* and audible to patient. Pressure on carotid stopped bruit and pulsation.

Treatment and Result.

May 18th.—Ligature of right common carotid; symptoms at once arrested. Before the end of the day the bruit returned, but not the pulsation. Twelve

years afterwards he noticed that the bruit stopped for a minute or two and returned, then stopped for a longer time, and finally ceased entirely. The patient was shown to the members of the Hunterian Society. The cure was complete.

8. *Date, Surgeon, and References.*

1860. Passavant, de Frankfort sur Mein; Wecker, 'Maladies des Yeux,' t. i, pp. 803, 804.

Sex, Age, Side affected, Origin.

F. 9. Side not stated. Some knitting was thrown at her in a rage by her sister; one of the needles penetrated the external side between the eyelids, but was withdrawn.

Symptoms and Progress.

A short time afterwards an exophthalmos supervened with all the symptoms of an aneurismal tumour. As the eye had lost all mobility outwards, and was strongly turned inwards, it was thought that the affection was an aneurism of the lachrymal artery.

Treatment and Result.

Part of external wall of orbit resected, the soft parts having been dissected off the bones sufficiently to permit the finger to penetrate behind the globe. At the apex of the orbit, very deeply, and on the inner side of the optic nerve, the finger encountered the pulsations of an aneurismal pouch, but all attempts to tie it were in vain. Swelling of the lids and cheek supervened, but the wound healed, and the child ultimately remained in the same state as before.

9. *Date, Surgeon, and Reference.*

1861. Ernest Hart, Surgeon to West London Hospital. 'Lancet,' March 15th, 1862. "On a Case of Intra-Orbitar Aneurism cured by Ligature after Failure of Digital Pressure." Plate given.

Sex, Age, Side affected, Origin.

M. 11. Left orbit. Blow from the forked end of an iron rib of a parasol at the inner angle of the left upper eyelid.

Symptoms and Progress.

Free bleeding and rapid swelling of lid; the latter subsided, and eye continued a little bloodshot; headache and singing noises in head. Nearly four years after accident the mother noticed a pulsating tumour at site of wound in lid; this increased; lids became protuberant; conjunctiva congested; eyeball prominent. The tumour had strong pulsation and perceptible thrill; loud whizzing bruit audible all over left side of head and temple, continuous through systole and diastole; whizzing noise in head like a steam-engine. A large tortuous vessel could be felt between the eye and the roof of the orbit; this was thought to be the frontal branch of the ophthalmic artery. Pulsation arrested by pressure on the carotid.

Treatment and Result.

Intermittent compression by a staff of three persons of left carotid for

several hours daily, fifteen minutes at a time, during three weeks; pressure borne well; beneficial, but not curative. March, 1861.—Ligature of left common carotid; immediate cessation of pulsation and flattening of tumour. In 1862 no trace of tumour or pulsation; no noises in head; whizzing bruit still audible over the head. In all other respects quite well.

20. *Date, Surgeon, and Reference.*

1862. Greig, David, M.D., Surgeon to the Royal Infirmary, Dundee. 'Ed. Med. Journal,' Nov., 1862, p. 446. "Case of Intra-Orbital Aneurism cured by Ligature of the Common Carotid Artery."

Sex, Age, Side affected, Origin.

F. 47. Left orbit. Fell down a stair and struck the left side of her head against the framework of a loom.

Symptoms and Progress.

Stunned, confused and sick. The next day at work, but feeling "stounding" pains in her head and singing noise in left ear. Ten days later obliged to go to bed on account of severity of frontal headache, and she began to complain of her eye as well as of the singing noise in her left ear. Fourteen days after the accident, when admitted into the infirmary, she exhibited proptosis of left eyeball, which was nearly covered by the swollen, œdematous, livid, red, and protruded lids, and chemosed conjunctiva overlapping cornea. Vision was reduced to an obscure perception of light over both lids, all round the eyeball, but especially over the inner part of the upper eyelid; there was a strong pulsation synchronous with the cardiac beats and arrested by compression of the left carotid. Two days later eye more prominent; pulsation increased; loss of power to distinguish light from darkness.

Treatment and Result.

Sixteen days after accident ligature of left common carotid; pulsation ceased, swelling subsided, and power of moving eyeball returned; vision gradually improved and became nearly normal. Power over external rectus not regained till after she had left the hospital.

21. *Date, Surgeon, and Reference.*

1863. Holmes, E. L., M.D., Surgeon to the Chicago Charitable Eye and Ear Infirmary. 'Amer. Jour. of Med. Sci.,' July, 1864. "Aneurismal Tumour of the Orbit; Recovery."

Sex, Age, Side affected, Origin.

M. 23. Right eye. "Received on the *left* side a charge of No. 5 shot from an ordinary fowling-piece; some of the shot entered the left lung and the left kidney, several struck the side of the head, and two at least entered the left eye."

Symptoms and Progress.

Vision at once destroyed. Severe renal and pulmonary symptoms followed, but subsided, and the patient resumed his duties. At this time he noticed a slight protrusion of the *right* eye, conjunctival œdema at the lower part, and a peculiar blowing sound in the right side of the head. An attack of bilious fever aggravated the symptoms. Six weeks after the following

were the appearances of the left eye :—Complete ptosis ; congested conjunctiva ; iris discoloured ; pupil contracted, filled with lymph, and drawn upwards to the sclerotic ; globe slightly atrophied, and only painful on pressure ; fistulous opening in sclerotic. *Right* eye so far protruded as to prevent closure of lids ; chemosed conjunctiva ; a fold concealing the lower lid ; upper lid slightly œdematous, and its motions impaired ; iris and pupil normal ; vision perfect ; tendency to photophobia ; pulsation not to be seen on inspection, but revealed by moderate pressure with the fingers on the upper lid, and then it became evident to the sight ; loud souffle over eye and temple, described by patient and physicians as like the puffing of a high-pressure engine heard at a distance ; pressure on carotid rendered pulsation scarcely perceptible ; pulse 116.

Treatment and Result.

Superficial scarification of the conjunctiva of the right eye produced accidental hæmorrhage to the extent of a pint without benefit or injury. Five drops of Veratrum viride every three hours, and Tilden's fluid extract of ergot four times a day. Nausea was controlled by diminishing the dose of Veratrum. Pulse fell to 80, then to 40. No change for a fortnight, except the presence of a second sound like the sharp whistle sometimes heard in the smaller bronchi. At the end of second week exophthalmos and chemosis began to subside, and souffle was subdued. All symptoms gradually improved, and at the end of six weeks patient went home and continued treatment for three weeks. Subsequently the eye became normal.

Date, Surgeon, and Reference.

1863. Legouest. 'Mémoires de l'Académie Impériale de Médecine,' t. xxvii, 1865-66, p. 156. "Aneurysme Traumatique de l'Artère Ophthalmique Gauche ; insuccès de la compression indirecte ; ligature du tronc carotidien et de la carotide externe ; guérison."

Sex, Age, Side affected, Origin.

M. 21. Left orbit. Was carrying a large beam on his shoulders. Some companions threw the beam to the ground, thereby upsetting him, and he fell beneath it, and it struck the left side of his head and neck.

Symptoms and Progress.

Insensible for five hours. After recovery from effects of accident he went to the Hôpital Beaujon. At the end of seven weeks from the injury his condition was as follows :—Considerable exophthalmia ; orbit filled with a tumour without precise limits ; palpebral furrows obliterated ; eyelids swollen, blue, and traversed by varicose veins ; chemosis ; paralysis of sixth nerve ; very marked internal strabismus ; sight of left eye disturbed, but preserved ; diplopia ; movements of upper eyelid sluggish ; pulsation on laying fingers on globe and the tumours outside of it ; over orbit a very strong "bruit de soufflet" like a forge bellows, continuous with reinforcements, synchronous with the pulse ; bruit not heard on forehead, temple, or cheek ; pressure on common carotid suspended bruit and pulsation, and diminished tension and vascularity of the eyelids and of the eye ; pains round the orbit and temples, and in the ear, &c.

Treatment and Result.

Digital compression by medical students on five days for ten hours daily, with interruption of two hours for breakfast, three hours for dinner, and nine hours in the night for sleep. After forty hours' compression no real effect on tumour. Compression tried again with only six students for five days; after it had lasted nineteen hours it was abandoned. The disease increased; a voluminous chemosis covered almost entirely the ocular globe; inferior eyelid everted and covered with ulcers at seat of scarifications. Vision preserved, but troubled; parts menaced with inflammation; severe pain. Left common carotid tied; a slight bruit remained. External carotid tied; bruit ceased; all symptoms steadily disappeared. Five months later good but impaired vision; only internal strabismus left.

23. *Date, Surgeon, and Reference.*

1863. Nunneley. 'Med.-Chir. Trans.,' vol. xlviii, p. 17.

Sex, Age, Side affected, Origin.

M. 40. Left eye. Thrown from his horse while intoxicated.

Symptoms and Progress.

Insensible thirty-six hours. Free bleeding (more than Oss) in three or four days from left ear. Probable fracture of the base. In a few days lids swollen and red; chemosis; much pain; sight impaired; thought to be a case of conjunctivitis. In a month eyelids swollen, dark, incapable of closure; much chemosis of a purple colour; considerable proptosis and dilatation of superficial vessels; pupil dilated, inactive; lens muddy; vision materially impaired; distension and aching in globe; pulsation of globe perceptible to sight and touch; bruit and confusion in the head; great noise and pulsation in left ear. All symptoms increased on lying down, and relieved by pressure on the carotid; symptoms became aggravated and perception of light only remained.

Treatment and Result.

Ice, digitalis, rest, ineffectual. Five weeks after injury left common carotid ligatured; confusion; noise in head and ear instantly ceased, and hearing improved; protrusion and bruit lessened. Improvement, followed by relapse, and then a second subsidence. At the end of three months quite well; vision good. Quite well a year afterwards.

24. *Date, Surgeon, and Reference.*

1865. Nélaton. Published for the first time in Dr. Delens, op. cit. Abridged in Holmes' "Lectures," 'Lancet,' 1873.

Sex, Age, Side affected, Origin.

F. 17. Left eye. Fell from a voiture in July, 1864. Entered hospital February 25th, 1865.

Symptoms and Progress.

Did not lose consciousness. Blood flowed from the mouth, the nose, and both ears. Violent pains in head on left side; delirium for eight days; abscess in ear and left facial paralysis. Strabismus of left eye; swelling of

the conjunctiva; exophthalmia; aneurismal pulsations of the upper lid, and bellows murmur. Chemosis covering everted lower lid; bruit continuous with intermittent reinforcements; eye moveable; vision perfect; a small, rounded, moveable tumour, pulsating synchronously with the arterial beat without thrill, yielding to the pressure of the finger, about the size of a nut, and readily reducible, was felt at the upper and inner part of the left orbit. Besides continuous murmur and intermittent whiz, there was heard at irregular intervals a piping, whining sound ("bruit de piaulement"). Noise and pulsation perceptible, but not very inconvenient to patient. Compression of carotid stopped both and lessened tumour, but not exophthalmos. According to the patient exophthalmos immediately succeeded the accident. The chemosed conjunctival pad was not developed for five months. M. Nélaton diagnosed an arterio-venous communication in the cavernous sinus.

Treatment and Result.

Digital compression too irksome to patient; direct compression on globe; increased chemosis and congestion. Ligature of left common carotid about eight months after accident. March 6th, 1865.—Pulsations almost completely abolished; bruit remained; chemosis suppurated and diminished; exophthalmos lessened. Rigors, vomiting, on 11th and 13th. 17th.—Death. Post-mortem.—Fracture traversing body of sphenoid and petrous portion of temporal on each side. On left side a sharp point of temporal bone detached, and had probably penetrated the carotid and the wall of the sinus. Cavernous sinus and ophthalmic vein dilated and tortuous. Small hole in carotid below and externally communicating with the sinus.

5. *Date, Surgeon, and Reference.*

1865. Szokalski and Vrosinski. 'Annales d'Oculistique,' 1865, vol. i, p. 116. "Anévrysme Traumatique Diffus de l'Orbite."

Sex, Age, Side affected, Origin.

M. 50. Left orbit. Struck his left temple on two occasions whilst cutting wood.

Symptoms and Progress.

Some days after the left eye became a little more prominent, and then patient remarked there a flattened spot and fluctuating tumour, which a country barber wished to open. The patient consulted M. Szokalski. He had proptosis (one third of an inch); movements of globe upwards and outwards limited; sight preserved; fatiguing diplopia; a flattened tumour, extending deeply into the orbit, projecting in front, could be felt between the globe of the eye and the orbital arch; it presented a marked expansive pulsation. The left temple, strongly prominent, presented another tumour separated from the former by the external and superior border of the orbit; it had the extent of a five-franc piece, raised the temporal muscle, and extended in front as far as the circular temporo-frontal line. Pulsation in both tumours synchronous with the pulse, and pressure on the temporal tumour increased the tension of the tumour in the orbit. It was clear that

there were two communicating cavities filled with fluid. There was a bruit, and pressure on the carotid arrested both it and the pulsation in both tumours. M. Szokalski considered that the anastomoses between the lachrymal and temporal arteries had been torn by the injury.

Treatment and Result.

Digital compression for fifty-six hours at a time failed. Ligature being refused, the patient went out. Three months later he returned. Proptosis increased, and orbital tumour had passed the osseous border. Compression again failed. Left common carotid tied by M. Vrosinski; pulsation at once ceased; no cerebral disturbance; pains in orbit and forehead persisted for some time. After two months tumours softer and not pulsating. Some time later the tumours had shrunk considerably, and eye had partly returned into orbit. A small tumour about the size of a pigeon's egg over the left iliac crest had appeared, and was regarded as an aneurism of the circumflex iliac artery.

26. *Date, Surgeon, and Reference.*

1865. Erichsen. 'Science and Art of Surgery,' vol. ii, p. 88.

Sex, Age, Side affected, Origin.

M. 44. Left orbit. Fell on his head.

Symptoms and Progress.

Some months later eyeball greatly protruded; conjunctiva and eyelids congested and swollen. Bruit and pulsation very loud and distinct.

Treatment and Result.

Ligature advised by Mr. Erichsen and Mr. Greaves, of Boston, but declined. By attention to habits of life, abstinence from stimulants, &c., the tumour subsided and eye retreated. At the end of fourteen months the symptoms had, to a great extent, disappeared.

27. *Date, Surgeon, and Reference.*

1866. Desormeaux. Thèse de Laburthe, 1867. 'Des Varices Artérielles et des Tumeurs Cirsoides; de leur traitement specialement par les injections de perchlorure de fer." Delens. Op. cit.

Sex, Age, Side affected, Origin.

M. 33. Left eye. Had his head jambed between a heavily-laden chest and a crane, February 2nd, 1866.

Symptoms and Progress.

Blood flowed from mouth, right nostril, and right ear. Sight at once lost in both eyes, and he even stated that both eyes were driven from orbits and hung over the cheeks. Right eye was soon completely lost; right upper jaw was broken and consolidated; hearing lost in right ear; right facial paralysis and anæsthesia. Patient heard a *bruit*, and believed there was a steam-engine at work under the ward, and only recognised his error when he found the noise follow him as a convalescent to Vincennes. About three months after accident the left eye was already prominent, but vision remained, and the patient could read nearly at normal distance; a tumour,

of the size of a small pea situated at the inner angle of the left orbit, appeared, a large vein proceeding from it and mounting up to the top of the forehead. The symptoms increased, and a year after the injury the left eye was markedly prominent; conjunctiva injected; cornea sound; pupil moderately dilated. Abduction only incomplete; partial ptosis; chemosed pad of conjunctiva overlapping lower lid; patient could read. Tumour of size of small nut, round, depressible, and not affecting the colour of the skin, yielding pulsations synchronous with pulse and evident both to the eye and finger. Two smaller pulsating tumours near it; veins in neighbourhood and on forehead enlarged. A large vessel ran vertically along the forehead from the eyebrow to the root of the hair, continuous with the larger tumour, nearly as large as the little finger, and slightly flexuous, and having the aspect of a varicose dilatation; its walls seemed thickened and pulsated vigorously; near the eyebrow it was constricted. M. Desormeaux thought it was the trunk of the ophthalmic artery, and diagnosed a cirsoid aneurism of that vessel. Others thought it to be the dilated vein. Strong pulsation of globe, raising finger laid on it; very intense *bruit de souffle* continuous with redoublements during arterial pulse, and at variable intervals the *bruit de piaulement*, which was very intense on the forehead. Pressure on carotid arrested bruit and pulsations, &c., but was not well borne by patient. Noise in head only heard at intervals by patient, and louder in recumbent posture.

Treatment and Result.

Rather more than a year after accident an injection of eight drops of perchloride of iron was made into the dilated vessel in the frontal region, and caused cessation of the pulsations in it. During the injection local pressure was kept up on the surrounding vessels. Three weeks later a second injection of twelve drops. Two months afterwards (13th May, 1867) the patient left the hospital; the tumour had much diminished, and there was neither pulsation nor bruit. Sight nearly normal; a little induration at the level of the tumour. M. Wecker found with ophthalmoscope a pale papilla, indications of hypertrophy of cellular tissue, very dilated veins, and some little hæmorrhagic spots.

28. *Date, Surgeon, and Reference.*

1866. Collard (de Berne). 'Gazette Médicale,' 1866, p. 631. "Anévrysme Traumatique de l'Orbite Gauche."

Sex, Age, Side affected, Origin.

M. 41. Left eye. Fell on to the back of his head.

Symptoms and Progress.

Insensible; small wound on left side of occiput; no signs of fracture. Eight or nine months afterwards a tumour had developed at inner angle of left eye, of thickness of a haricot, pulsating with vibration; hissing noise in ear; eyes engorged with blood and very prominent, left more than right; very marked congestion of lids; diplopia. *Diagnosis.*—Dilatation of ophthalmic artery and branches arising from and maintained by a morbid

state of the ophthalmic ganglion which furnishes vaso-motor filaments to the arteries of the eye.

Treatment and Result.

After some time a course of purgatives, with calomel and belladonna pill daily, and cold lotions to the forehead. Then tonic treatment was pursued. Exerting himself unduly when he was improving, he suffered a relapse. The symptoms were again subdued by leeches, calomel, belladonna, and cold lotions. Two years and ten months after accident he got some light work, and at the end of two months there was sensible improvement. In two or three months more the eye had re-entered the orbit, the tumour and dyplopia had gone, and he was cured.

29. *Date, Surgeon, and Reference.*

1867. Laurence, Zachariah, Surgeon to the Southwark Ophthalmic Hospital. 'Brit. Med. Journ.,' October 5th, 1867, vol. ii, p. 289. "A Case of Traumatic Aneurism of the Orbit in which the Common Carotid Artery was successfully tied."

Sex, Age, Side affected, Origin.

M. 41. Left orbit. He was an habitual drunkard, and on Monday January 14th, 1867, after a drinking bout, was taken home intoxicated at 3 a.m. During his staggering journey he fell down several times on to the kerbstone on to the back of his head, where there was a small wound. On reaching home he fell down in the passage, and there his wife let him lie.

Symptoms and Progress.

At this time he vomited considerably, and his wife noticed something amiss with his left eye. On recovering from his stupor three hours afterwards he complained of an aching pain on the left side of his forehead; slight proptosis of left eye. Then he had a fit with convulsions and stertorous breathing. Vomiting continued on and off for a week. Eight days after accident great proptosis; complete ptosis; immobility of globe; pupil fixed; perception of light; great chemosis of conjunctiva. Four days later Mr. Laurence observed pulsation of the eyeball, ceasing on pressure on the carotid; a distinct bellows murmur audible over the left side of the head. Patient heard a blowing bellows sound in left temple; upper lid livid and œdematous; details of fundus showed no special features; violent pulsation of carotid without bruit; slight epistaxis nearly every day.

Diagnosis.—"Rupture of ophthalmic artery near its origin from carotid consequent on fracture of the base of the skull."

Treatment and Result.

Compression with Skey's tourniquet applied for twelve days almost constantly. The effects were cessation of pulsation and bruit. The eyelids became more flaccid, paler, and cooler. The action of compression was aided by the local application of ice and ten-drop doses of tincture of digitalis and tincture of opium; no permanent benefit resulted. On February 19th, less than four weeks after the accident, the left common carotid was tied; pulsation ceased, and proptosis was lessened. April 23rd.

—Extreme ptosis; no congestion of eyeball, which was recovering its movements; cornea misty; still a line of chemosis. June 26th.—Eyeball in orbit; ptosis nearly gone; movements nearly perfect; vision lost.

30. *Date, Surgeon, and Reference.*

1867. Bell, Joseph, Lecturer on Surgery, Edinburgh. 'Ed. Med. Journ.,' July, 1867, p. 36. "Case of Pulsating Tumour of the Orbit cured by Ligature of the Common Carotid Artery."

Sex, Age, Side affected, Origin.

M. 42. Left orbit. Knocked down by an omnibus thirteen months before being seen by Mr. Bell. Lower jaw fractured, and head cut.

Symptoms and Progress.

Deep scar on left eyebrow. Since accident occasional paroxysms of intense headache; confusion and noise in head. A month after accident protrusion of left eyeball began, and steadily increased. Six months afterwards his sight began to fail rapidly. When seen by Mr. Bell he had extreme proptosis; both eyelids stretched and everted, especially the lower one; chemosed pad of conjunctiva; exposed cornea dim and lustreless. A tumour existed in the orbit, pulsating, compressible, and very soft. One specially rounded tumour just above the ball projected in the shape and size of a filbert, and was very soft. The supra-orbital artery and vein were both much enlarged and tortuous; the artery nearly as large as the radial, pulsated feebly. Well-marked bruit distressingly audible to the patient was heard over the head and neck. Pulsation and bruit ceased on compressing the carotid.

Treatment and Result.

Being almost blind with the right eye owing to a corneal nebula he was exceedingly anxious for operation. April 15th.—Left carotid tied; three hours after operation pulsation almost gone. In three days pulsation gone entirely. Cured with fair vision.

31. *Date, Surgeon, and References.*

1867. Foote, Dr. Case reported by Dr. Williams, of Cincinnati. 'New York Medical Record,' April 15th, 1868, vol. iii, No. 52, p. 75. Abstract (here given), by Dr. Noyes, 'New York Med. Jour.,' 1869, 665.

Sex, Age, Side affected, Origin.

M. 20. Left eye. Had a blow and depression of skull two and a half inches long, from vertex to left frontal boss, seven months before entering the hospital, June 15th, 1867.

Symptoms and Progress.

Immediately afterwards the eyeball protruded. When examined the external vessels of the left eye were very much increased in number and size; pulsation and thrill very strong. By ophthalmoscope the retinal vessels seemed much enlarged and tortuous, the optic nerve swollen, the borders ill-defined, grey in colour, and speckled by minute ecchymoses; along the veins some extravasations were seen, and the whole appearance was that of neuro-retinitis.

Treatment and Result.

June 22nd.—Carotid tied. Thrill and murmurs ceased, but returned in two hours; vision, which consisted in ability to count fingers at two feet, unaffected. After thirty days, the symptoms not being relieved, the other carotid was tied. Bruit and thrill silenced, but returned in five minutes; retina clearing. Three weeks after second operation vision improved; bruit very faint. August 21st.—Discharged cured.

32. *Date, Surgeon, and References.*

1869. Schiess Gemuseus and Socin. 'Klin. Monat. für Augenhlk., viii, p. 57, 1870. Shortly noticed in 'Ann. d'Oculistique,' 1871, vol. lxvi, p. 253. "Aneurism of the Orbit and Exophthalmos." Abstract, 'Oph. Hosp. Rep.,' vol. viii.

Sex, Age, Side affected, Origin.

F. 40. Left eye. In December, 1867, she received a blow from a horse's foot on the left side of the face while intoxicated. She was found insensible on the ground the next morning, her face greatly swollen, and she was bleeding from a wound under the eye.

Symptoms and Progress.

Unable to open eye for three months, and then she kept it closed because she saw double. From a very early period she heard a rushing or sawing sound in the left temple. Protrusion did not increase much after the first few months. In April, 1869, the symptoms were—exophthalmos; profuse lachrymation; congested conjunctiva; neighbouring veins congested; upper lid swollen and projecting; tumour above the eye compressible, fluctuating, very elastic, spread outwards under the orbital wall as far as the lachrymal region, inwards to the frontal vein, and upwards over the orbital margin, as a spindle-shaped swelling. Eyeball movable by patient. No ptosis. Pulsation and thrill in every part of tumour visible in profile. Pulsation of eyeball. Loud systolic bellows murmur, and shorter diastolic bruit. Compression of carotid stopped bruit and pulsation, and made tumour flaccid. Eyeball could then be pressed further back into orbit. Diplopia, the left image being the lower of the two. Vision with left eye $= \frac{1}{2}$. Congestion, prominence, and want of definition, of the optic disc. *Diagnosis.*—Aneurism of the orbit, probably of the frontal artery. Thrill and bellows murmur on carotid. In three weeks tumour larger.

Treatment and Result.

Three injections of ergotine subcutaneously caused vomiting, œdema, and increase of tumour. Digital compression for eight days, for from one to five hours daily, and then at the end of another week renewed for a week. No improvement. Prof. Socin tied the carotid, June 15th, 1869. All symptoms at once subsided, but half an hour later there was slight pulsation in sac. At the end of five weeks pulsation, bruit, and thrill had returned. At the end of five months the state of matters was much the same as before the operation. An attempt was made to ligature the frontal artery, but a network of vessels was encountered. Several were tied. June 29th, 1870.—The

tumour pulsated feebly, and was very compressible. Compression of right carotid stopped bruit and pulsation.

33. *Date, Surgeon, and References.*

1869. Harlan, George C., M.D. "Case of Traumatic Aneurism of the Orbit treated by Compression." 'Amer. Jour. Med. Sci.,' July, 1870. Also abstract and engraving in Dr. Morton's paper in the same number of journal.

Sex, Age, Side affected, Origin.

M. 25. Both eyes. While standing on the platform of a car in motion received a severe blow on the head from a car moving in the opposite direction. Lower jaw fractured on both sides and severe scalp wounds were inflicted. This was on 20th June, 1868.

Symptoms and Progress.

Partially insensible for three weeks. On recovering consciousness right eye very prominent and swollen, and he heard a roaring sound like water in his eye with every stroke of the pulse. A "red tumour" appeared on right eye and interfered with vision; it was cut off by medical attendant. A scar was left on conjunctiva, showing that the tumour was a chemosis. In two months the left eye began to protrude. During most of this time he had been at work, suffering inconvenience only from the deformity and noise which he referred positively to the right eye. August 14th, 1869.—Great exophthalmos of both eyes, greater of left, which was almost dislocated. Left ball could be pressed back, but not the right. Pupils freely movable; vision good. A loud aneurismal murmur audible over any part of the head and face. Pulsation of right eyeball. Bruit and noise stopped by pressure on right carotid; no effect on either eye by compressing the left carotid; no effect on left eye by compressing either artery. The right globe could be pressed back during compression of right carotid.

Treatment and Result.

Tinct. Veratri Viridis given as an adjunct to digital compression. Pulse reduced from nearly 100 to 44 and 56 beats a minute. Digital compression for eight hours first day, and then chiefly by patient for from four to six hours daily for five weeks. Sometimes a tourniquet, sometimes a stick with a pad, was substituted for patient's thumb. Subsequently relays of students kept up pressure uninterruptedly for twenty-four hours. Effects alteration of tone in bruit and noise in head, and decided diminution of exophthalmos of left eye. He returned to his occupation in a few weeks as bad as ever.

34. *Date, Surgeon, and Reference.*

1869. Wecker. 'Annales d'Oculistique,' 1869, t. i, p. 189. "Sur les Tumeurs Pulsatiles de l'Orbite."

Sex, Age, Side affected, Origin.

M. 31. Right eye. Fall from a ladder and wound over superior orbital border.

Symptoms and Progress.

Insensible for a quarter of an hour; wound healed, and he returned to work at the end of three months; considerable proptosis; chemosed pad of

conjunctiva. Movements of globe impeded; adduction abolished; distension of vessels at level of internal palpebral ligament, and there only a strong thrill synchronous with cardiac systole; intermittent bruit. Pressure on carotid stopped pulsation and bruit. Full account of ophthalmoscopic examination.

Treatment and Result.

Compression, application of ice, and mild purgatives. Some diminution of swelling, and slight improvement in vision. The patient left Paris.

35. *Date, Surgeon, and Reference.*

1869. Morton, Dr. T. G. 'Amer. Journ. Med. Sci.,' July, 1870, p. 43. Case 2, with engraving.

Sex, Age, Side affected, Cause.

M. 25. Left eye. Blow with the end of a loaded whip directly over the left eye; considerable swelling and ecchymosis.

Symptoms and Progress.

Twelve months later a slight swelling or lump appeared which he could grasp with his finger, soft and compressible; gradual slow growth, displacing eye downwards and outwards. At the end of two years it advanced more rapidly. For a long time he experienced a hissing or purring noise, more at night and in stooping posture. Vision gradually diminished after development of tumours. At the end of four years symptoms were—strongly marked exophthalmos; tumour above the eye extending backwards, soft, compressible; with some effort globe could be forced partly within the orbit, the tumour diminishing, and with the removal of the pressure the growth slowly regained its size; slight pulsation with feeble bruit; pressure on carotid did not entirely control the whir; pupil active; retinal veins full and dilated; disk atrophied; irregular fundus.

Treatment and Result.

The diagnosis being rupture of orbital vessels, followed by absorption of effused blood, and subsequent dilatation of the vessels arterial and venous, which were ruptured so as to produce an aneurism by anastomosis, Dr. Morton was of opinion that a partial removal of the tumour with the knife and ligation of the deeper portion would probably be sufficient.

36. *Date, Surgeon, and Reference.*

1869. Lawson, George. 'Brit. Med. Journal,' Dec. 11, 1869, p. 631, "Diffuse Orbital Aneurism in a Boy."

Sex, Age, Side affected, Cause.

M. 15. Left orbit. Five years before entering Middlesex Hospital he was jumping off a wall four or five feet high, when he fell on the end of a stick, which struck the inner side of the left orbit and pushed the eye outwards.

Symptoms and Progress.

Considerable bleeding, he thought "about a pint," a week after the accident; the eye was as prominent as on admission. Symptoms.—Exophthalmos to about half an inch; movements of eye in different directions in no

wise impeded; tortuosity and dilatation of conjunctival vessels; lids easily closed over globe; no tumour perceptible either to sight or touch; no visible pulsation of the eye; no pulsation when fingers were placed firmly against the globe; a distinct bruit audible over the left temple and forehead, and even slightly on the opposite side of the head, increased after exertion. Pressure on the carotid at once arrested the "slurring sound," which he compared to the blowing off of steam from an engine in motion, and controlled the bruit so completely that he frequentiy pressed the vessel with his finger to stop the noise in his head.

Treatment and Result.

Digital compression could not be maintained by the lad for more than two minutes at a time on account of the giddiness and faintness which it produced, whilst the pain rendered it intolerable. The effect of compression led Mr. Lawson to consider it inexpedient to ligature the carotid.

37. *Date, Surgeon, and References.*

1871. Galezowski. 'Gazette des Hôpitaux,' 1871, pp. 237, 241, 245, "Sur l'Exophthalmie consécutive à une Tumeur Vasculaire de l'Orbite." "Maladies des Yeux," 'Annales d'Oculistique,' 1871, t. lxvi, p. 104.

Sex, Age, Side affected, Cause.

F. 42. Left eye. Three years and a half previously she fell in the street and was wounded in the border of the orbit of the left eye. The eyelids continued red for fifteen days; since that time she had suffered nothing.

Symptoms and Progress.

Six weeks before seeing M. Galezowski, on rising in the morning, she had a headache, with pain and nausea, lasting the whole day. The headache resembled that to which she had been subject since seventeen, at the period of the courses. Whilst lying down she vomited bile, and afterwards heard a noise like that produced in sawing wood. In two days the eye was closed. When seen the eye was greatly projected and immovable; ptosis; pupil a little irregular; sight good; chemosed pad of conjunctiva covering lower lid; pains at root of nose and hemicrania; no engorgement of vessels of eyelids; retinal vessels engorged; double bruit de souffle and bruit de piaulement; feeling as if the eye was being pushed out of the orbit; no mention of pulsation or pulsatile tumour. Case seen also by MM. Gosselin, Richet, Labbe, Delens, and Gueneau de Mussy, and considered to be arterio-venous aneurism and exactly like M. Nélaton's case.

Treatment and Result.

Compression of the eye by bandage, iodide of potassium, and digitaline for nightly pains; pains ceased; compression continued for a month. Digital compression of carotid for fifteen or twenty minutes every two or three days, then increased to forty-five or sixty minutes daily; marked relief after each sitting. In a month movements of eye and eyelid had returned; chemosis gone. In the month of April the treatment was interrupted for a fortnight, and then continued every two or three days till July. In August the protrusion had almost entirely disappeared; no bruit audible either to patient

or surgeon. Treatment was being continued with every prospect of cure at time of publication of the account.

38. *Date, Surgeon, and References.*

1873. Hippel, Dr. A. V., and Schonborn. Prof. Graefe's 'Archiv f. Ophth.,' Bd. xx, Abth. 1, 1874, "A Case of Retro-ocular Aneurism, with Extreme Prominence of the Right Eye, after Injury to the Head." Abstract in 'Ophth. Hosp. Rep.,' vol. viii.

Sex, Age, Side affected, Cause.

M. 21. Right eye. Six weeks before coming under Dr. Hippel he had fallen from a horse, and, his foot catching in the stirrup, he was dragged along for some distance; he struck the left side of his head.

Symptoms and Progress.

Picked up insensible and bleeding from the nose, mouth, and left ear; both eyes bloodshot, and left pupil very small compared with right. In a few hours prominence of left eye; this disappeared; the right became congested and in a few days projected. For three weeks patient was insensible; on recovering he could scarcely open right eye or move eyeball; repeated attacks of epistaxis. Exophthalmos increased without pain; loud humming noise in left ear, the hearing in which had been defective since the age of four. When seen, left eye normal; commencing ulceration of right cornea, with extreme congestion and great chemosis; very small pupil, sensible to light; retinal vessels dilated and tortuous; no pulsation or tumour; loud bruit, hard-blowing and systolic, audible all over the head; bruit and noise ceased at once on compression of carotid. Diagnosis.—Diffused aneurism, either of internal carotid in cavernous sinus or of ophthalmic artery. The absence of pulsation and tumour of orbit contra-indicated an aneurism of that cavity. On review subsequently to ligature Dr. Hippel considered it a case of arterio-venous communication between the right internal carotid and cavernous sinus.

Treatment and Result.

Compression by bandage; diminished prominence of eye. Digital compression for five days, during several hours daily diminished bruit for a short time. Right common carotid tied by Prof. Schonborn rather more than three weeks after admission, on antiseptic plan; the bruit stopped at once, but returned feebly in three quarters of an hour. Compression of left carotid, tried several times, had no permanent effect upon the bruit; exophthalmos and congestion diminished; sight improved so that patient could read the smallest print, and cornea healed. In two months there was still the bruit, with some projection of globe and congestion. Compression of left carotid was tried for two or three hours daily for several days, but without benefit.

39. *Date, Surgeon, and Reference.*

1874. Rivington, W., Surgeon to the London Hospital. 'Med.-Chir. Trans.,' 1875.

Sex, Age, Side affected, Cause.

M. 24. Left eye. Blow on right side of head from iron step of an engine.

Symptoms and Progress.

Fracture of base of skull. Symptoms developed at the end of seven weeks.

Treatment and Result.

Digital compression on several occasions; mechanical and direct compression; Tinct. Ver. Vir.; injection of perchloride. Ligature four days after injection; cure with some opacity of cornea and persistence of slight bruit.

40. *Date, Surgeon, and Reference.*

1874. Nieden, Dr., of Buchom. 'Klin. Monatsbl. f. Augenheilkunde,' Januar Heft, 1875.

Sex, Age, Side affected, Cause.

M. 19. Left eye. Nearly six months previously to being seen by Dr. Nieden a large mass of coal had fallen on his head, causing slight abrasion of the scalp.

Symptoms and Progress.

Insensible till the next day; violent pain in the head, giddiness and nausea, and some bleeding from the nose. Twenty-four hours after the accident loud buzzing in left side of head with palpitation of the heart; prominence and redness of left eyeball. Next day proptosis as marked as at any subsequent time. Soon able to get about, the proptosis and noise in head remaining. After five months several attacks of giddiness and temporary loss of consciousness. Other appearances noticed by Dr. Nieden.—Upper lid much bulged forwards and dark red; movements limited; slight conjunctival chemosis; conjunctiva injected; the subconjunctival veins full, the injection disappearing on pressure; media clear; veins of retina turgid and tortuous; vision normal; diplopia; hearing on left side diminished; about half of eyeball may be replaced by light pressure, but there is then pulsation, which communicates a visible heaving movement to the hand, and the noise in the head becomes deeper and more intense; distinct thrill with each pulsation, and a prolonged blowing murmur synchronous with the ventricular contractions. All these phenomena disappear when the carotid is compressed. Diagnosis.—Diffuse retro-bulbar aneurism.

Treatment and Result.

Digital compression at first for half an hour twice daily, then by patient and nurses for eight or ten hours daily; patient's pressure effective. Elastic ring compressor used for four weeks. At the end of ten weeks, compression having been in vain, ligature of left common carotid on Lister's plan. Thrill, murmur, and pulsation ceased; noise in head greatly lessened; a distant blowing murmur could still be heard. Wound healed without complication six weeks after operation. Discharged with slight prominence of eyeball; very little injection of conjunctiva; about one fifth as much noise in head.

41. *Date, Surgeon, and Reference.*

1874. Lansdown, F. P., Senior Surgeon to the Bristol General Hospital.

"A Case of Varicose Aneurism of the Left Orbit cured by Ligature of the Diseased Vessels," 'Brit. Med. Journ.,' June 5th, 1875, p. 736, June 12th, p. 771, and June 26th, p. 846.

Sex, Age, Side affected, Cause.

M. Age not stated. Left. Wound on inner side of left upper lid, caused by the bursting of a soda-water bottle. The wound penetrated the upper lid and was about half an inch in length. The eyelids became distended to their utmost by effusion of blood, and an artery was jetting blood from the wound. The edges of the wound were brought together by suture, and in a few days the patient was apparently well.

Symptoms and Progress.

In about six weeks the eye gradually became prominent, the eyelids swollen, and the veins of the conjunctiva tortuous and distended. In a few weeks a small pulsating tumour was discerned at the inner angle of the orbit, beneath the cicatrix of the old wound; there was a distinct murmur over this as well as over the eye. The sight was perfect. The exophthalmos was about half an inch in extent. The bruit was continuous, and heard only over the inner angle of the orbit. Engorgement of retinal veins. Bruit arrested by pressure on carotid.

Treatment and Result.

Rest and remedies to restrain the circulation. Pressure on aneurismal swelling applied by means of a truss gave much pain, and pressed the swelling into the orbit. Ligature of carotid advised by Mr. Bader and Mr. Higgins, of Guy's Hospital. On February 18th, 1874, Mr. Lansdown cut down and opened the old wound, exposing a small, white, glistening, globular, pulsating tumour, about as large as a good-sized pea, with a large tortuous vein coming off from the front of the sac and passing to the back of the orbit. Between the eye and the aneurism there were several smaller vessels going to and surrounding the sac, which made the operation tedious. Having found the feeding vessel Mr. Lansdown placed a carbolised ligature on the cardiac and distal sides of the aneurism and closed the wound. On the fourth day the sac was discharged from the wound. In a week the eye had returned nearly to its natural level, and the patient made a complete recovery. A year after the operation no one could notice any difference in his eyes.