ON
VASCULAR PROTRUSION OF THE
EYEBALL.

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IN the forty-second volume of the 'Medico-Chirurgical Transactions' (for 1859) there is published an account of four cases, in which I tied the common carotid artery for that affection of the eyeball and orbit which, following the opinion of Travers, has since his time been commonly called by the name he gave to it — "Aneurism by Anastomosis of the Orbit."

It may, perhaps, be recollected that attention was first called to this important disease by the publication of a case of it, by Mr. Travers, in the second volume of the Society's 'Transactions;' soon afterwards, Mr. Dalrymple related a case in the sixth volume. By both of these surgeons the disease was considered to be identical in its nature with that condition of the blood-vessels which John Bell had shortly before described, and named "Aneurism by Anastomosis."

For many years no other case, so far as I know, was recorded; and though during the last twenty years several cases have been met with, both in this country and abroad,

the affection must still be regarded as among the rarer forms of disease.

Since the publication of the four cases in the forty-second volume of the 'Transactions,' it has happened to me to have treated three other cases; of these, two were of spontaneous origin, and one the result of injury to the head. I have also had the opportunity of examining the parts immediately implicated in a man and a woman whom I had treated for the affection, and whose deaths occurred long subsequent to deligation of the carotid, from causes entirely unconnected with the operation. I have therefore presumed to hope an account of these cases and post-mortem appearances, may be acceptable to the Society, especially as I believe they not only confirm my former observations, but also conclusively establish the true nature of the affection, which hitherto has been so obscure.

In the twenty-second volume of the 'Transactions' Mr. Busk published an interesting report of a case, exhibiting very similar symptoms to those treated by Travers and Dalrymple, but which was of traumatic origin, supervening upon a violent blow on the head, whilst theirs appeared spontaneously. In this, as in the former cases, the common carotid was tied with success. Mr. Busk considered his case, though arising differently, to be essentially of the same nature as those of Travers and Dalrymple, and remarks—

"I have alluded to these two cases partly with a view of drawing attention to the probability of the supposition I am inclined to adopt, of their being instances of true aneurism in the orbit, and not, as has been considered, of erectile tumours or aneurisms by anastomosis, and in support of this view I would venture to suggest that these cases agree in three essential particulars.

"1st. The sudden accession of the disease, attended with pain.

"2nd. Its rapid increase.

"3rd. The powerful pulsation occurring in the tumours when recent and small—in all of which circumstances do they differ from the erectile tumours described by Mr. John

Bell the presumption of the affection being in all really an aneurism of some vessel in the orbit appears to me materially strengthened."

These observations of Mr. Busk are so weighty as to show that the affection cannot be aneurism by anastomosis, as for a long time was supposed; and, in the absence of any post-mortem examination of the parts concerned, might, not unnaturally, be thought sufficient to justify the conviction of its being, as Mr. Busk supposed, "a true aneurism within the orbit." This opinion, however, I incline to think is not correct, for, though I am by no means prepared to deny that true aneurism may never occur to any of the intra-orbital arteries, or that possibly some of the reported cases may not have been of this nature, I believe that in several of the cases there has not existed any aneurism at all, and, in the great majority, where there has been aneurism it has been within the cranium, and not in the orbit. Further, that the prominent symptoms are not essentially dependent upon an aneurism, either true or false, whether in the orbit or in the cranium, as a primary or necessary cause, but are, so to speak, secondary to it; indeed, that they may arise from other and varied causes which produce post-ocular pressure upon the ophthalmic veins. For this reason I have ventured to suggest the name of "Vascular Protrusion of the Eyeball," as more in accordance with the pathology of the affection than aneurism of the eye or orbit, which may or may not exist, while I believe pressure, direct or indirect, upon the ophthalmic veins will always be found.

I will, however, briefly give a narrative of the three cases, and of the appearances of the parts in the two post-mortem examinations, and then add such observations upon the nature of the affection as it appears to me these seem to justify when taken in conjunction with the four cases previously reported.

CASE 1.—*Traumatic vascular protrusion of the eyeball; deligation of the carotid; cure.*—The first case was of traumatic origin. Mr. J. H—, a publican, æt. 40, when in a state of

intoxication, was thrown with considerable violence from his horse. He was taken up quite insensible, and so continued for thirty-six hours. For several days he was partially unconscious. There was a free escape of blood from the left ear. Mr. Hepworth, the surgeon who attended him, thinks that considerably more than half a pint of blood escaped during the three or four days it continued to flow. He believes it to have been all blood, and not serum. The accident happened four miles from the patient's home, to which he could not be removed for several days. There was very little external injury. All the symptoms indicated fracture of the base of the skull. Some few days after the accident the left conjunctiva was observed to be congested, which condition gradually increased, the lids became swollen and red, the conjunctiva chemosed, while the pain became very considerable and the sight materially impaired. It was supposed the case was one of acute conjunctivitis, as appears to have occurred in Mr. Curling's (Vol. XXXVII, 'Med.-Chir. Trans.'). It was for this condition that my opinion was first desired, a month after the accident, when I learned the foregoing particulars. The nature of the affection was at once obvious. The eyelids were swollen and dark; they could not be closed over the globe. The conjunctiva was greatly chemosed and purple, with large congested blood-vessels; the globe protruded considerably, and was much congested. The pupil was dilated and inactive, the lens muddy, and vision materially impaired. He complained of a distressing sensation of distension and aching pain in the globe, and there was a decided pulsatory movement of it perceptible to both sight and touch, as well as a very audible sound. There was confusion in the head, with great noise and pulsation in the left ear, the hearing of which was much impaired. All the symptoms were worse in the horizontal position, than in the erect, so much so that he sat up in bed during the night to avoid the distress in lying down, and all were materially checked by pressure on the left carotid artery. He was still ill, and very weak from the accident, and had not fully recovered his memory, so that it was somewhat difficult to determine pre-

cisely how much of his suffering should be attributed to the primary accident and how much to the condition of the eye.

Though, as the case was so acute, and had so rapidly and steadily increased, I had little expectation of any other treatment than deligation of the carotid being of any use, I thought it proper to try. The upright position was enjoined, ice was directed to be constantly applied to the eye and brow, and digitalis, saline purgatives, with sedatives, to be taken. The depression was so great, and the pulse became so weak and irregular, that in four days the digitalis had to be omitted. As at the end of a week all the local symptoms had increased, and the sight had so far gone that there was only a perception of light, while his strength had still further failed, I tied the left common carotid. The room was a dark one, with a very small window, and a violent thunder-storm came on while the operation was in progress, so as to cause a little difficulty in seeing into the wound. Neither vein nor nerve was exposed. On tightening the ligature the confusion and noise in the head and ear instantly ceased, the hearing improved, and the protrusion, pulsation, bruit, and vascularity in the eye, were greatly lessened. Chloroform was not given in this or either of the other cases where I have tied the carotid artery. He went on as well as possible, the sight improved, and the distress was nearly gone, for the first four days; when, as happened in more than one of the other cases I have treated, the eye became so much more vascular and prominent as to cause the patient and his friends to think the disease was returning as badly as ever. After two or three days, however, in him, as in them, these symptoms again subsided, and he steadily and rapidly improved, so that at the end of three months he was well. The eye had completely retired within the orbit, and had recovered its normal aspect, except that the sclerotic remained somewhat darker and duller in colour, as has always happened. The sight had so far recovered that he could read moderate-sized print with facility. The noise in the head had ceased, the hearing of the left ear was restored,

and the memory was good. It is now more than twelve months since the operation, and he continues perfectly well.¹

CASE 2.—*Case of spontaneous origin, incomplete; treatment refused.*—The second case was of spontaneous origin, but not so acute as most of the others. Mrs. Jane R—, a stout short woman, æt. 47, applied first in May, 1864, at which time the eyeball was decidedly protruded, though it could still be covered with the lids; these, as well as the conjunctiva, were red and tumid; the ball itself was also considerably congested, the iris was dull and sluggish, with the pupil rather dilated, and the sight dim. There was considerable throbbing stretching pain about the orbit, with a pulsating projection of the globe synchronous with the pulse; there was dulness of hearing and noise in the ear of the same side, with confusion and giddiness in the head, all of which symptoms were made worse by stooping or exercise, so that she could only partially attend to her house work. Pressure on the carotid artery lessened all the symptoms, which at once returned on its being removed. She stated that four or five months before, soon after getting out of bed, she was seized with “a giddy fainting fit and something queer in the head,” immediately after which the eye began to be affected, and had gradually got worse. I gave her cold lotion with mercurial purgatives. It was arranged that she should be taken into the hospital for more careful watching, but she did not present herself. In August last I saw her at her own home, when she stated she had experienced so much distress from the shaking in her journey to Leeds, and that for some days afterwards the symptoms were so much aggravated, that she had been afraid of undertaking it again, which, however, was not the whole truth, as the subjoined note will show. There was not any very great alteration in the symptoms, but on the whole they had somewhat increased. She promised to attend, but as she did not I communicated with her medical attendant. The following is the reply:—

¹ June, 1865.—The condition of the eye has now become so far normal that it would not be perceived that any thing had been amiss with it without careful examination.

October 24th, 1864.

"I saw Jane R— yesterday; she promised to come to Leeds on next Tuesday. You will find that she is worse. I have wished her repeatedly to see you, but without effect; she was afraid of some operation or other."

The woman had bronchocele.

CASE 3.—*Cancer in the orbit and cavernous sinus; deligation of carotid artery; cure of protrusion of eyeball; subsequent death; necropsy.*—The third case is curious and interesting, as throwing considerable light on the true nature of the protrusions of the eyeball; I watched it for two and a half years. Were I to relate the details of it, and the different speculations from time to time entertained as to its character, I should occupy unnecessarily the attention of the Society; for though at the time of the operation, and for some months afterwards, none of the medical friends to whom I showed the man, any more than myself, could feel sure as to its true pathology, this in the end, even some time before death, became sufficiently manifest, and therefore a few extracts from my notes as the case proceeded will be sufficient. The cast was taken the day before the carotid was tied.

The patient, Joseph Armitage, æt. 43, a stout, thick, broad-set man, employed as cleaner of woollen rags and also as a musician, playing one of the larger brass instruments—the trombone, I think—first applied to me in February, 1862, on account of considerable protrusion of the right eyeball, which he stated had been coming on for four months. It projected about half out of the orbit, and could with difficulty be covered with the lid. Though there was some vascularity of the conjunctiva and sclerotic, this was not excessive; there was some indistinct pulsation; the sight was dim, but not lost. He complained of giddiness and confusion in the head, particularly on stooping, so that he could not do much work. Suspecting there was pressure on the cervical veins from some cause, I examined the neck and found a considerable bronchocele, nearly joining up to which, but still quite unconnected, was a large tumour on the sternum. Of the en-

larged thyroid he appeared to be hardly conscious, and could give no account whatever, except that he had had it a long time, and thought blowing his instrument had something to do with both swellings. There were also two considerably enlarged glands, one on either side of the neck, unconnected with either the bronchocele or sternal tumour.

The sternal enlargement was first noticed about ten years ago, as a small, fixed, hard lump, which had so gradually increased, without pain or inconvenience, that he had hardly taken any notice of it, and thought so little about it that neither he nor his wife, who accompanied him, would have named it had I not discovered it. Both of them, however, were certain it had not increased during the last twelve months, since he had given up blowing the trombone. The tumour was smooth, hard, inelastic, not sensitive; it was altogether without fluctuation, though it communicated most distinctly the sounds and pulsation of the breast. These sounds were unusually loud and distinct; and all the arteries, particularly the carotids, and more especially the right one, appeared to be much larger than common. The bronchocele was largest on the right side, and from its pressure caused the sterno-cleido muscle to appear broad. There was some roughness in the respiratory sounds from pressure on the trachea. I saw the man frequently during the year up to February, 1863, during which the sternal tumour did not increase; indeed, both he and his wife thought it had decreased. The bronchocele had steadily increased, particularly downwards, so as nearly to reach the sternum. The two cervical glands had varied in size, but on the whole had increased. The eyeball had steadily more and more projected until it protruded altogether beyond the orbit, pushing and stretching the lids, particularly the upper one, before it; not unfrequently this slipped back and left the globe uncovered. The lens was clear, but the pupil was dilated, and vision so far gone that he was doubtful of the position of the window. The ball was more congested than formerly, but still not in an excessive degree. The orbit was filled with a soft pulsating mass, into which the globe could be partially pressed

back. Pressure on the right carotid stopped the pulsation and lessened the protrusion of the ball, both of which returned on the pressure being removed.

During this period two other tumours had appeared. One at the outer side of the orbit, just above the zygoma; it was soft, compressible, and pulsating; by pressure it could be much lessened in size. If pressure were maintained on the carotid the tumour very slowly enlarged, but rapidly if the vessel were free. It apparently communicated with the orbit, as pressure upon the tumour caused the eye to be more prominent and pulsating, while pressure on the ball rendered the tumour fuller and harder. On the right side of the head, near the centre of the parietal bone, a second, soft, elastic, compressible, pulsating tumour, of the size and shape of half a small orange had formed. It could be considerably lessened by pressure, on removal of which it slowly rose again, with a distensible movement. To it, and over it, passed large and freely pulsating arteries from the posterior temporal. Neither of these tumours was tender to the touch, but the general distress was so great, and the pain from the eye so tormenting, that he urgently desired something should be done. Many speculations were started as to the precise nature of the affection, none of which, however, carried conviction. But as it appeared certain that the protrusion of the eyeball was due to some posterior, if not intracranial, pressure, which was distinctly relieved by closure of the carotid artery; as vision was lost, and sloughing of the exposed eyeball impending; as these distressing symptoms had materially increased during the past month, and, still more recently, deafness in the right ear had supervened, with great confusion from the constant noise over the right side of the head, and believing the cause of the protrusion of the eyeball to be essentially of the same character as those where I had successfully tied the carotid artery, I thought the predominant distressing symptoms might be lessened by tying this vessel; while, should the sternal tumour prove to be, as some men of great experience thought it not improbably might be, aneurism of the arch

of the aorta or innominate (a view in which I did not participate), no harm would be done, as it would be only arresting the blood partially on the distal side.

On February 17th, 1863, I placed a ligature round the carotid artery.

Owing to the large thyroid gland and the many considerable arteries and veins which I was anxious to avoid, the operation was not an easy one. One large vein passed so directly across the middle of the incision that it could not be avoided; both ends were tied with fine flexible iron wire. I had intended to have tied the ligature below the omohyoideus, but this muscle was spread out to such a breadth by the bronchocele that it had to be placed above, or the muscle must have been divided. Neither vein nor nerve was seen. On tightening the ligature all noise and confusion in the head instantly ceased; the eyeball became less prominent; the two swellings lessened in size, and ceased to pulsate.

For two days the man was as well as possible, when the wound became erysipelatous, with a very severe accession of general febrile symptoms (the day of the operation a man residing at the adjoining house had been seized with violent cellular erysipelas), which for thirty-six hours placed his life in considerable danger; after which the wound freely suppurated, and he greatly improved. On the morning of the 21st (the fifth day), after a very good night's rest, the left side of the body was found to be partially paralysed. This during the day increased to be one of the most complete attacks of hemiplegia I ever saw; as there was not the faintest power of motion or sensation in any part of the side, notwithstanding which both the local and general symptoms improved. On the 25th he became very restless "from pain in the left leg." On the 26th he could just stir the toes. On the 28th (twelfth day) the ligature was lying loose in the wound, which soon after closed, but opened again, and then continued to suppurate, and remained hard for some time. The leg rapidly regained power and sensation. On March 26th he could draw it up, and could just move the fingers a little. Towards the end of May he had recovered sufficient

power on the side to be able to sit up for two hours in the day, and, indeed, the left leg had nearly as much power as the right, but the arm had not recovered in the same ratio. During this period he had been two or three times nearly carried off from diarrhoea, scanty bloody urine, and a distressing cough, with bloody expectoration. Soon after the operation the eyelids had left the ball so completely uncovered that more than once I passed a wire suture through them to retain them over it, but without much success. The cornea became opaque and the ball soft. It gradually atrophied, without suppurating.

The orbital mass had gradually lessened, and there was no pulsation in it or in the cranial tumours. These, which at first were lessened, were now about as large as before the operation.

The sternal tumour continued unaltered; the left carotid artery in its whole course, and the right up to the ligatured spot, pulsated vigorously with enormous volume. The veins of the neck were very large, particularly the right external jugular, in which there was a free pulsatile motion. The voice and respiration were rough, and there was a troublesome irritable cough, with a free expectoration of bloody mucus.

In the middle of June he had sufficiently recovered to return home, ten miles from Leeds.

In the middle of August he came over to see me. My notes are—"He has been in tolerable health, except having had two or three attacks of diarrhoea, which for the time reduced him. He has lost flesh, but is considerably stronger, and can walk up a stiff hill a mile long—fully equal to two miles on level ground. The left arm has not recovered so much power as the leg, though he can use it for most purposes. The bronchocele and sternal tumours are unaltered. The action of the heart is less tumultuous, and the arterial volume diminished. The wound in the neck is perfectly sound, and there is less distension and pulsation in the carotid below where it was tied. The eyeball is reduced to a mere speck, level with the cheek. The lids are natural; the orbit is filled with solid matter, but which is influenced by

pressure on the zygomatic tumour, as the latter is by pressure on the orbital mass. This side tumour is, I think, somewhat larger than it was two months ago; it is soft, compressible, and communicates with the orbit, as a finger placed upon each shows. There is not the least pulsation in it, or in that on the head. This latter has not much altered; perhaps it is more solid. There is neither noise nor confusion in the head. The kidneys now secrete well."

He went on with little alteration until the middle of December, 1863, when his wife called to say that he had suddenly lost the use of the right arm. That a few days before, while making a sudden snatch at one of his children, who had offended him (but who escaped the clutch) the arm fell useless. Suspecting fracture, I sent my son, Mr. J. A. Nunneley, to see him. He found the humerus broken in the middle of its shaft, and put it up with splints. He reported that the man was not much altered, except that he found a considerable tumour over and involving the left scapula, which had been growing rapidly since he had been seen.

The patient was visited occasionally by my son, and I heard of him from his wife every week. The humerus united well. He lingered on, getting weaker, with the sternal and scapular tumours growing larger, until the middle of August, 1864, when he sunk exhausted by diarrhœa.

Necropsy.—I made a post-mortem examination two days after his death.

The body was greatly emaciated. The nature of the disease was now obvious enough; there was an enormous tumour under and partly involving the left scapula. The sternal tumour was much larger, and in the skin all around it were scores of small tubercles; it reached up to the enlarged thyroid gland, and apparently was confounded with it. The glandular swellings in the neck were much larger; the right orbit was filled with a tuberculous mass, which also projected from it; the zygomatic and parietal tumours were of about the same size as they had been for a long time. No other similar tumour had appeared on the right side of the head.

The skin had not given way in any place. The right humerus was again fractured, and the bone much splintered. It had given way with an audible crack two days before his death, while his son was turning him over in bed.

Before section of the body malignant disease was obvious enough. The sternal tumour had apparently commenced in the bone, the texture of which had nearly disappeared. The mass projected as much into the chest as it did externally, pressing the lungs upwards and the heart downwards to the left side. The lungs were not diseased; the heart was large and soft, but not otherwise abnormal, it was partly filled, particularly the left ventricle, with clear tenacious fibrine; the thyroid gland was one large mass of medullary cancer, which pressed upon the trachea and œsophagus. The zygomatic and orbital tumours were one, communicating through a large opening in the wing of the sphenoid bone. In the orbit the mass was firmer, but at the zygoma it was like thick porridge, thus accounting for the lessening of this tumour and the retiring of the eyeball as either of them was pressed on. The parietal tumour passed through a large opening in the bone into the skull upon the dura mater, to which it was attached. It was very soft, like the other tumour, thus accounting for its being lessened on pressure, and the pulsation. On opening the skull the surface of the brain was found covered with serum; its structure was soft, but otherwise normal. By the side of the sella turcica, passing through an opening into the apex of the right orbit, *was a continuation of the diseased orbital mass which had obliterated the right cavernous sinus. This mass was more solid than those on the head. The ophthalmic vein had been pressed on until it was lost in the mass*, thus, in my judgment, proving that the ocular protrusion was essentially of the same nature in this as in the other cases I have reported, different as the material causing the pressure might be. The vessels constituting the circle of Willis were alike on both sides. The right carotid had been securely tied. Below the ligature and the left carotid in its whole course the vessels were at least double their normal size, and would just admit the tip of the little finger.

The abdominal viscera appeared healthy, except the liver, which was dark and soft, but not affected with malignant disease.

Necropsy of Case 4, related at page 187, Vol. XLII, 'Med.-Chir. Trans.'—The other post-mortem examination which I have had the opportunity of making is the fourth case mentioned in the paper referred to. The disease began instantaneously on the 28th of July, 1859. The carotid was tied on the 21st of August following. The woman perfectly recovered, though some considerable time elapsed before the globe altogether retired into its normal position in the orbit and the swelling and congestion of the lids had entirely passed away. However, in the end they did, and all the parts resumed their natural appearance, except the lens, which remained opaque, and the sclerotic a little dull. I had frequent opportunities of seeing the woman, who always said she was well, except that she had some difficulty of breathing, which I attributed to the large bronchocele. After her recovery from the operation she continued to perform the household work of the family until the end of February, 1864, though latterly she had complained of being weak and lethargic. On the 26th of February she was seen by a medical man, who found her quite sensible, but suffering from what he thought to be a severe attack of bronchitis, which was then very prevalent. In the afternoon of the following day symptoms of serous apoplexy supervened, and she died the same evening.

I examined the head and neck forty hours after death. The veins of the scalp and all the cerebral sinuses were full of black fluid blood. The arachnoid membrane was thicker and more opaque than natural. All the vessels of the pia mater were congested. The brain was small, with some clear serum upon its surface. The upper surface of both cerebral hemispheres was alike; but on cutting through these, on a level with the corpus callosum, the whole of the anterior portion of the right hemisphere, particularly the fibrous part, was found to be considerably less than that of the left side. This was

most marked on the under surface, so that the inferior part of the right anterior lobe was not much more than half the size of the left. There was no other change to be noticed in it; the vascularity, colour, and firmness of the two sides were alike; the blood-vessels of the two sides of the brain were equally patulous, and of like size.

On the right side of the sella turcica was found a circumscribed aneurism of the ophthalmic artery, just at its origin, as large as a hazel-nut, which was filled with a dense, solid, red clot, so loosely attached to the arterial walls that when these were cut into the clot at once fell out. The ophthalmic artery continued forwards into the orbit, but both trunk and branches were of very small size.

The right carotid divided, as usual, into its three branches, which were of equal size with those of the left artery, and the circle of Willis was normal.

How far the diminution in size of the right hemisphere was dependent upon the closure of the carotid of the same side it is difficult to determine. At first sight, it appears reasonable to suppose that they might stand in the relation of cause and effect, but this, I would observe, appears to me to be, to say the least, doubtful, as the two sides of the brain appeared to be equally full of blood, and all the arteries were equally patulous; besides, if the cutting off of the supply of blood was the cause, we should have expected the effect to have been produced immediately, or shortly after the ligature had been applied, as happened in the man whose case is above related; in the woman who died after the operation, referred to in Vol. XLII; and in cases reported by other surgeons, after ligature of the carotid for various affections.

Mr. Busk, as we have seen, had called his "A Case of Aneurismal Tumour in the Orbit,"¹ and Mr. Curling his "A Case of Traumatic Aneurism of the Ophthalmic Artery,"² and thus showed their conviction of the nature of the affection as seen by them supervening upon injury to the

¹ 'Med.-Chir. Trans.,' Vol. XXII.

² Vol. XXXVII, id.

head. Yet, as no post-mortem examination of the parts had been made, the proof was still wanting to overturn the idea of aneurism by anastomosis originated by Travers, and so long entertained by the profession. In the paper referred to I gave several reasons, as well as the result of the examination of the parts in the one case which had died after the application of the ligature, which I thought to be conclusive against the long-received opinion of the nature of the affection; but the history of the case of Armitage, now given, the condition of the parts concerned found on death, taking place eighteen months after the carotid had been tied, and the post-mortem examination of the head of Mrs. Jackson, nearly five years after the operation and cure of the protrusion, so decisively show that the idea of such protrusion of the eyeball being aneurism by anastomosis in the orbit is altogether erroneous, that there cannot now be any hesitation in abandoning it. *In fact, in the great majority of such cases of protrusion of the eyeball there is no disease whatever in the orbit; the seat of it is most commonly intra-cranial. The protrusion of the eyeball is passive, and the other distressing symptoms are secondary, depending upon obstruction to the return of the blood through the ophthalmic vein, just as happens in those cases of popliteal and axillary aneurisms where the limb swells below the tumour, because this presses upon the accompanying 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 to its origin, is, I think, now certainly proved. In cases of traumatic origin, supervening soon after severe injury to the head, the cause is most probably effused blood near to or within the cavernous sinus, while in those cases where the protrusion does not come on until some time after the receipt of the injury, or where the violence has not been so considerable, it may be serum or fibrine, or even pus, the result of suppuration in the sinus. This latter was most probably the true cause of the protrusion of the orbital contents in the woman who died after the diligation of the carotid in Moorfields Ophthalmic Hospital, where the protrusion

had not supervened until some time after the receipt of a violent blow with the fist upon the temple, and where, as only pus was found after death in the cavernous sinus, some doubt appears to have been entertained as to the correctness of the diagnosis and the propriety of the operation.

That the aneurism of the ophthalmic artery, or effused fluid, whatever its character, or even a tumour, may be seated within the orbit rather than in the cranium, is quite possible ; but inasmuch as those conditions which would make a small amount of pressure felt considerably do not exist in the orbit, but do exist to a very considerable degree immediately behind its apex in the cavernous sinus, it will, I apprehend, be in reality found that in this situation the actual cause does exist in the great majority of cases. In the orbit there is a large quantity of soft, yielding material, which would require a body of considerable size to cause sufficient pressure to produce the urgent symptoms witnessed in a sudden and acute case of protruded eyeball, whether of spontaneous or traumatic origin ; whereas, bound closely together as the artery, veins, nerves and absorbents, are in the dense, unyielding fibres forming the walls of the cavernous sinus, a very small cause will necessarily produce a very great effect. Further, it must not be forgotten, that it is very rare to meet with aneurism in any of the arteries of a size such as are found in the orbit. When an aneurism does spontaneously form, it is almost invariably found in connection with a vessel of some considerable size, the coats of which are far more obnoxious to that loss of elasticity which predisposes the inner one to give way than are those of the size of the orbital branches. The ophthalmic artery is much larger at its origin and in the cavernous sinus than it is soon after entering the orbit.

When the protrusion takes place more slowly, and is unaccompanied by the acute symptoms usually resulting from aneurismal pressure, we may, not unreasonably, especially if there be any corroborating indications, as in the case of Armitage, suspect the cause to be some growth in or near the cavernous sinus, or some tumour or effusion within the

orbit, and near its apex, rather than aneurism, whether true or false.

I would further remark that, though this vascular protrusion of the eyeball in its most acute form is evidently one of the rarer diseases, or more frequent instances of it would have been recorded (for I cannot suppose that the fact of so many as seven cases having been treated by myself within the space of twelve years is more than one of those curious fortuitous circumstances for which it is impossible on any rational ground to account), *I believe in a less intense degree, and more chronic condition, protrusion of the eyeball resulting from posterior venous congestion is by no means uncommon. Whatever obstructs the return of blood may indirectly, if not directly, induce fulness of the eyeball. Tumours of every kind, in the orbit, cranium, or neck, may be all causes.*

Enlarged thyroid gland is certainly a very frequent cause. In at least five of the cases of spontaneous origin which I have seen the thyroid gland was of large size; and, although in two of these the cause was the sudden formation of aneurism in the cavernous sinus, and in another the deposit of cancerous matter, as proved by the post-mortem examinations, we cannot trace any connection between the enlarged gland and the weakened arterial coats, yet the coincidence is worth notice.¹

Anæmic young women with bronchocele very frequently have marked fulness of the eyes, the protrusion of which occasionally goes on to such an extent as to cause serious anxiety and inconvenience. This is a state which has long been known, and the obscurity of its origin and the difficulty of its removal commented upon. Lately, some most excellent observers, in this country as well as on the Conti-

¹ It may also be mentioned that the sister of Mrs. Jackson has a large bronchocele, and that I have the mother under care for one of the largest bronchoceles I ever saw, which will probably, ere long, kill her, as the skin has ulcerated, and a large fungoid mass of granulations (non-malignant) bleed, slough, and form again, without there being the least disposition to cicatrization; also that Mrs. R— states her mother had an enormous bronchocele.

ment, have written upon it, and noted the coincidence of ocular protrusion and bronchocele. In goitre it is often most marked.

The glazed and prominent eye is known to everybody as a very usual occurrence when there is a feeble, flabby, dilated heart; particularly when the valves of the right side act imperfectly. In emphysema and chronic bronchitis, and confirmed asthma, nothing is more frequently seen than protrusion of the eyeballs. In fact, whatever obstructs the return of blood to the right side of the heart, or its escape from the cavities of it, is in the end almost always accompanied by, if it does not directly cause, protrusion of the eyeballs. In many of these cases it may not improbably happen that the impediment to the return of the blood is accompanied, and the protrusion made worse, by some effusion into the loose post globular tissues of the orbit; for nothing more surely tends to cause such exudation from the weakened vessels than impediment to the return flow of the venous blood. Thus this effect becomes in its turn an aggravating cause. In the weak anæmic young female, where the blood is wanting in its due proportion of fibrin and globules, a very slight impediment may be sufficient to cause exosmosis of the thin serum. A slight pressure on the venous stream, possibly only a functional disturbance, or a cause so slight as to be overlooked may be all, and thus the well-marked prominent symptom of protrusion of the eyeballs be regarded as the disease itself; whereas it is only the effect of a more obscure but more important abnormal condition. It is, I think, certain that such a state never supervenes in the robust and strong unless there is evident pressure in the course of the veins.

At the present time I am attending two ladies, both above the middle age, in each of whom, I have little doubt, considerable prominence of one eyeball results from some vascular fulness or effusion in or behind the orbit.

In one, a pale, weak, and very nervous lady, who, since girlhood has had enlarged thyroid gland, both eyes are prominent; but the right one has, since a severe attack of bron-

chitis with persistent cough, become so decidedly more so, with pain and congestion, as to excite alarm, and to be mistaken for conjunctivitis and treated accordingly. In the other lady the attack is more acute, and was very sudden. I suspect here there is a small clot of blood pressing upon the ophthalmic vein. She was for two years in declining health; and had numbness of the arm and bleeding of the nose. The attack came on instantaneously whilst sitting out of doors on a cool evening, after travelling in an open carriage exposed to the sun on a very hot day on the continent. The pain was so great and the protrusion of the eyeball so considerable, that it was mistaken for general ophthalmia, and treated with leeches, mercury, and atropine. I doubt not many members of the Society can recall similar instances which have fallen under their notice.¹

Appendix.—Since the reading of this paper Dr. T. G. Morton, of the Pennsylvania Hospital, has related a case of spontaneous origin, in which he has recently tied the carotid artery with success.² In the comments appended to this case, Dr. Morton has alluded to the abstract of this communication as published in the Journals, and has adduced two statements which he thinks conclusive against the opinions I have advanced as to the seat of the disease being rather post- than intra-orbital—viz. “in many cases distinct and readily defined aneurismal tumours could be felt in the orbit,” and that in “severe cases cures have been effected by injecting coagulating fluids into the aneurismal sac.” These circumstances, Dr. Morton considers, could not happen were there not a true aneurism within the orbit itself. I must confess these two arguments do not appear to me to possess much value, for who does not know that an aneu-

¹ July, 1865.—Under the influence of iron, iodine, and strychnia, gentle irritants behind the ear, good diet, and change of air, both of these cases are so much improved that they may be said to be cured, though, on careful observation, a slight prominence in each eye may still be perceived.

² “On Orbital Aneurisms,” ‘American Journal of the Medical Sciences,’ April, 1865, page 318.

rismal anastomosis, even of large size, may not unfrequently be cured by the injection of a coagulating fluid into it? and in precisely the same way would such fluid act upon the congested and distended blood-vessels in the orbit, if this condition be caused in the way I have supposed it to be in these cases. By the coagulation of the blood in them, their occlusion and the subsequent absorption of the coagulum, the distending force would be removed. But I apprehend Dr. Morton would not, as a rule, expect such treatment to be successful in either one form of the disease or the other. As to the existence of an aneurismal sac being felt in the orbit, I think he must be a very bold man, having far more or much less experience than most surgeons, and possess far more than the average amount of the "*tactus eruditus*," who would unhesitatingly declare the existence of an aneurismal sac from tactile sensation alone, in such a situation, with such symptoms as actually exist in these cases. When he recollects how difficult the wisest and best men find it, in many cases, to diagnose by touch between many deep-seated swellings, and particularly when he is informed that it has actually been proved, in the only four cases where post-mortem examinations have been made, *no tumour, aneurismal or otherwise, has existed within the orbit*, I do not see how the assertion can be clung to. We cannot rely too much upon Mr. Guthrie's case, where the symptoms during life are not very distinctly set forth. In the case of traumatic origin operated upon in the Moorfields Ophthalmic Hospital, which Dr. Morton has himself referred to as so evident as not "allowing the slightest doubt as to the nature of the affection," all "the arteries were found quite healthy," and the only disease was in the post-ocular veins; and in the two cases of spontaneous origin, of which I have related the post-mortem appearances, during life the pulsating protrusion of the orbital contents was so decided that they might have been taken as illustrative cases for the existence of aneurismal sacs, yet after death no disease whatever was found in the orbit, whereas in the cavernous sinus it was evident enough.

Of the treatment to be adopted I would only venture to say that in the most acute attack, whether spontaneous or traumatic, I believe tying the common carotid of the same side will be found the best. Indeed the symptoms are so urgent as to necessitate the promptest measures, or the eyeball and lids will slough. Of the six cases in which I have adopted the plan, five were cured, and in the one which died the affection of the eye was arrested, death resulting from exceptional causes; while in the one case which is still under observation, although by no means so acute as most of the others, where only an expectant plan has been hitherto adopted, the disease appears to be steadily advancing, and in one of those where ligature of the carotid speedily cured the patient, rest and other means had previously been perseveringly but unsuccessfully tried for upwards of seven months. No one would think of placing a ligature round the carotid in the less severe forms, as probably the cause might be removed by treatment, for the pressure may be caused by tumour or effusion, which may be taken away; and in those more frequent and subdued forms, resulting from bronchocele, anæmia, or obstruction in the heart or lungs, alone or combined, treatment must rather be directed to relieving these conditions than to that of the eye, which will be restored to its normal state when the causes of protrusion are removed.

I am aware that two cases of cure by compression of the carotid artery have been reported, one in Padua and one in Verona, and the plan has found some supporters in this country who have tried it more than once; but though pressure appears to have been effectually and vigorously kept up, it has, so far as I am aware, failed to effect a cure; nor should I expect it in the majority of cases to be successful. The common carotid, I apprehend, is one of the least promising of the large arteries of the body to subject to compression; should a clot form in the vessel and become detached it would readily be conveyed to the brain, and there producing embolism, cause considerable danger to life. No pressure can be effectually made upon the artery without

pressing unduly upon the jugular vein, pneumogastric and sympathetic nerves, which, for many reasons, it is desirable to avoid. That a cure may possibly be effected by pressure the two cases prove, and therefore it may be tried. Nevertheless, knowing how almost universally successful deligation of the common carotid artery has been, and that compression has frequently failed, so far as at present adopted, the former plan is the one which I should be prepared to adopt in any other case.

The propriety of active interference is also confirmed by the present condition of Mrs. Jane R— (Case 2, page 20), whom I have lately seen, August, 1865. Though in her the affection has been from the first the least active of any of the cases I have described, the distress the woman suffers is, and has been, very considerable. She is altogether unfit for any work. She has been confined to her bed for upwards of four out of the last twelve months. Even now she can only move slowly about, as all exercise, particularly stooping, occasions giddiness and acute pain in the head. She sleeps badly from pain and noise in the head. All useful vision is lost, yet light is very painful, and induces a sensation of nausea. She keeps the eye constantly covered with a wet cloth, which, she says, lessens the distress. The globe has somewhat receded into the orbit since last August, and there is now less chemosis of the conjunctiva than then existed; but there are several largely congested vessels in it as well as in the sclerotic. The iris is dull, the pupil inactive, the lens is muddy, and there is ptosis of the upper lid. This is a state which contrasts unfavorably with the more acute cases in which the carotid artery was tied.