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protrusion of both eyeballs

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A CASE OF VASCULAR PROTRUSION OF BOTH EYEBALLS, MOST PROBABLY FROM ARTERIO-VEINOUS COMMUNICATION IN THE CAVERNOUS SINUS—TOTAL BLINDNESS—LIGATION OF THE LEFT COMMON CAROTID—RECOVERY.

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THE cases of vascular protrusion of the eyeball recorded in literature, and the statistics of operations upon the carotid for this disease, have been collected, tabulated, and analyzed by Dr. Th. G. Morton,* of Philadelphia, and Dr. Henry D. Noyes,† of New York. The work accomplished by these gentlemen is thorough, and it seems more appropriate to refer to their papers than to preface my case with a reproduction of their statistics.

I employ here the term "vascular protrusion," substituted by Mr. Nunneley for the less comprehensive and frequently misapplied term, "orbital aneurism." There is satisfactory post-mortem evidence that in cases of supposed orbital aneurism the affection may neither be orbital in site nor aneurismal in character.

Cases of vascular protrusion of the eyeball have been observed and described, in which the symptoms of orbital aneurism depended on an arterio-venous communication in the cavernous sinus. Such a communication I believe to have existed in my case.

In the vast majority of published cases of vascular protrusion from different causes the exophthalmos was limited to one side, in but a few instances both eyeballs were affected, and in some of the latter, *e.g.*, in that of VELPEAU, curious phenomena were noticed. Pressure on the right carotid stopped the pulsations of

* American Journ. of Med. Sciences, April, 1865, and July, 1870.

† New York Med. Journ., March, 1869.

the left eyeball, and pressure on the left carotid those of the right eyeball. Velpeau was very much puzzled by this phenomenon. In another case of double vascular protrusion, described by Dr. HARLAN,* of Philadelphia, only the right eyeball showed marked pulsations, which were controlled by compression of the carotid of the same side, and not at all influenced by pressure upon the left carotid.

My case is one of double protrusion of the eyeballs, and as a particularly interesting feature in connection with it, I may mention the immediate restoration of the totally abolished sight by ligation of the left common carotid artery.

The two cases cited, as well as my case, were of traumatic origin.

Mrs. Susan E. Canterbury, aged 59, a tall, weak, and slender woman, came to the Dispensary of the N. Y. Ophthalmic and Aural Institute, May 10, 1875, and gave the following history. In the evening of February 20, 1875, while descending a flight of stairs of a strange house, in the dark, she slipped and fell down four or five steps, striking her forehead violently against some hard object. The people of the house, roused by the fall, found her lying on the floor in an unconscious condition. They carried her into a room, and applied various restoratives. She recovered her consciousness in about two hours. Her head ached; her forehead, left temple and eye were bruised and sore. She rested but little that night, and early in the morning vomited some black and clotted substance, most probably blood. The headache continued, but she was able to walk to her home, a distance of six blocks. In the course of that day she bled profusely from her nose, the blood streaming from both nostrils. When the bleeding ceased, the headache had entirely subsided, and she felt comfortable for several hours. After that time the headache reappeared, and persisted many days, notwithstanding the repeated application of leeches to the temple, and the extraction of a tooth for the purpose of drawing more blood.

On the fourth or fifth day after the accident the patient noticed a faint noise in the head, which gradually increased in loudness, and could be likened to the working of a steam-engine. The constant noise rendered her very restless and deprived her of sleep. At about the same time she discovered that her left eye squinted towards the nose, moved less freely

* American Journ. of Med. Sciences, July, 1870.

than before, and protruded considerably beyond the other eye. One day later the right eye also began to bulge, and soon protruded as much as the left.

The intense headache, incessant noise, and the bulging of both eyes had lasted several weeks, when she summoned medical aid. Dr. Acheson, of this city, treated her for some time, and succeeded in relieving the pain. Her general condition also improved materially under treatment, and she was soon able to attend to her household duties, though the headache, noise, and protrusion of the eyes persisted, varying in degree at different times.

On May 11, ten weeks after the accident, I examined the patient and made the following notes :

The patient is very pale, and has an anxious expression of countenance. Both eyeballs are considerably pushed forward, and almost entirely covered by the distended, swollen, and intensely red upper lids, which can only slightly be raised by the action of the frontal muscles. The tarso-orbital folds are effaced. On lifting the upper lids the somewhat chemotic ocular conjunctivæ are seen traversed by dilated and exceedingly tortuous veins, radiating from the periphery of the cornea towards the transition folds. The left eye presents an exophthalmos of at least 6''', and an inward deviation of 3'''. Its mobility outward is entirely abolished, and the inward, upward, and downward movements are limited, not amounting to more than 1''' in any one of these directions. The cornea is clear. The iris has a greenish hue, and appears swollen. The moderately dilated pupil does not respond to light. The anterior chamber is of normal depth. The lens shows an opaque stripe in the posterior cortical substance. Vitreous clear. The fundus exhibits the typical picture of choked disk. The papilla is swollen ; its outline blurred. The retinal arteries are thin, almost filiform. The retinal veins are large and tortuous, and mark their course by a number of hemorrhagic patches in the adjoining retinal tissue. Tn. F. complete. Perception of colors good. Hm. $\frac{1}{2}$ °. S. $\frac{2}{0}$.

The protrusion of the right eye measures about 6'''. The eye occupies the primary position, from which it moves slightly in every direction, no excursion amounting to more than one line. Its pupil is moderately dilated, and reacts very perceptibly, though somewhat sluggishly, upon the direct admission of light. The media are clear, with the exception of the posterior cortical substance of the lens, which shows a few opaque stripes. There is also choked disk, but without retinal hemorrhages E. S. $\frac{2}{0}$. Tn. F. complete.

On auscultation an intracranial bruit is heard over every part of the

head, most distinctly, however, over the left temple and the corresponding eye. The bruit is transmitted through both common carotids, is heard everywhere on the neck, and loudest over these vessels. It consists of two distinct sounds, the one being continuous and purring, the other interrupted, synchronous with the diastole of the arteries, and puffing, not unlike a distant steam-engine at work. The continuous sound is heard over both eyes and temples, louder on the left than on the right side, but not at all over the other parts of the head or neck. The interrupted puffing sound is heard from every part of the head and neck, but also more distinctly on the left than on the right side.

Compression of the left common carotid stops the noise completely. Compression of the right common carotid reduces it considerably. The patient is pleased with either measure, and expresses her gratification at the instantaneous relief from the incessant noise. Prolonged pressure upon the left carotid causes dizziness, faintness, even complete syncope. Pressure upon the right common carotid produces no such effects. When the hand is placed over either eyeball, and slight pressure exerted, a marked thrill is felt. The left eyeball shows rhythmical pulsations only at times, especially after some bodily exertion, or in moments of mental anxiety. The right eyeball does not pulsate. By palpation no circumscribed tumor can be felt in either orbit. By firm pressure upon the eyes much annoyance and pain is caused, but not the slightest reduction of the exophthalmos effected.

When the patient inclines her head or body forwards, no increase of protrusion ensues. In the recumbent position she is more incommoded by the noise than in the erect. The patient hears badly. The tick of my watch (hearing distance 5') is neither heard by conduction through the air nor through the bones of the head. She understands what is spoken with a loud voice, but says that every sound seems drowned in the noise.

The drum membranes are dull, sunken, and devoid of their light spots, but perfectly movable.

The Eustachian tubes are permeable. She heard well before the fall.

The examination of the chest shows nothing abnormal. The lungs are sound. The area of dulness in the region of the heart is not increased. The heart-beat is felt in the fifth intercostal space a little to the left of the nipple. The first sound appears somewhat veiled.

Taking into account the symptoms occurring in this case from prolonged compression of the left common carotid, I could at that time neither resort to continued digital pressure nor to ligation. As a preliminary step it seemed to me necessary to establish a sufficient collateral circula-

tion in the left side of the head. This I hoped to accomplish by brief and frequently repeated compression of the left common carotid. Accordingly I taught the patient to compress this artery, and directed her to release the pressure as soon as dizziness or faintness appeared.

During the first few days compression was badly borne, and could only be made in periods of two or three minutes. After five or six days it was possible to continue it for hours without producing the symptoms mentioned above. At this juncture, since neither the exophthalmos nor the bruit had been in the least reduced by the interrupted compression, and sight had even been more impaired, I urged the patient to submit to the operation of ligation of the left common carotid. She wished to consult her family, left my office, and did not return.

Two weeks later, June 6, I was summoned to her house. I found her in bed, utterly prostrated, with all her symptoms aggravated, and entirely blind. The exophthalmos had still increased. The ocular conjunctivæ protruded between the lids, forming thick and fleshy masses overlapping the lower lids. The eyes were perfectly immovable, the pupils moderately dilated and irresponsive to light. No quantitative perception of light. I was informed that the absolute blindness had then existed three days. The ophthalmoscope showed the choked disks as before, but still more pronounced; the retinal arteries were not visible, and in the left eye the venous hemorrhages had increased. The intracranial noise had not changed in character, but gained in volume. Compression of the left common carotid still caused great relief, by entirely stopping the bruit and the violent frontal headache (supraorbital neuralgia). I proposed the immediate ligation of the left common carotid. To this she did not yet accede, but waited two days, and then, June 8, applied for admission as an indoor patient to the Ophthalmic and Aural Institute.

In the afternoon of that day I ligated the left common carotid without anaesthesia, in the presence of the gentlemen connected with the Institute, Drs. Knapp, Pooley, Gebser and Sattler. The operation offered but little difficulty. Above the omo-hyoid the distended and strongly pulsating internal jugular vein covered the artery entirely. For this reason I chose the point of ligation immediately below the omo-hyoid, where the artery was not overlapped by the vein. The form of ligature chosen was Lister's carbolized catgut. When the ligature was tightened the bruit ceased immediately. No unpleasant symptoms became manifest. I had just cut short the ends of the ligature, and began to close the wound, when the woman exclaimed, "Doctor, I can see you!" On examination I found that she could count fingers with either eye at a distance of fifteen feet. Both visual fields were complete. Having closed the

wound by eight interrupted sutures, I noticed that the lids of both eyes had lost their tense and shining appearance, and become soft and wrinkled. The conjunctivæ, though as much swollen as before, looked much paler. There was no change in the appearance of the fundus of either eye. The operation was completed at 4 P.M.

At 10 P.M.—Pulse 90. Tem. $100\frac{1}{2}^{\circ}$. Patient is comfortable; absolutely no bruit; no headache; slight pain in swallowing.

June 9, Morning.—Pulse 108. Tem. 101° . Patient slept but little during the night. No bruit; no headache; no pain in wound; great pain in swallowing. The exophthalmos has diminished considerably, the eyes are only slightly prominent, the lids are relaxed and wrinkled. Less chemosis. Slight reaction of both pupils. Function of ocular muscles restored, with the exception of the left rectus externus. The retinal veins are smaller and less tortuous, the arteries just visible. Papillæ less swollen. Sight and hearing improved.

Evening.—Pulse 108. Tem. $101\frac{1}{4}^{\circ}$. Appearance of wound favorable. Pain in swallowing very slight.

June 10.—Pulse 108. Tem. in axilla $101\frac{1}{4}^{\circ}$; in right external auditory canal $100\frac{1}{2}^{\circ}$; in left $99\frac{1}{4}^{\circ}$. Patient slept well during the night, feels well, and has no pain in swallowing. Wound has healed by first intention. Hemorrhagic patches in left fundus smaller.

June 12.—Pulse 86. Tem. 99° . No bruit. Sutures removed.

June 16.—Pulse 86. Tem. $99\frac{1}{2}^{\circ}$. Exophthalmos and chemosis have entirely disappeared. Left eye more deeply set in orbit than right. Left abducens still paralyzed. R. S. $\frac{2}{0}$, L. $\frac{2}{0}$. Wound firmly closed, free from irritation.

June 19.—Patient has left the bed. No trace of choked disk. Left papilla whiter than normal. Retinal arteries and veins of ordinary size. Hemorrhages, in left eye absorbed; no bruit.

June 27.—Patient discharged. S. R. $\frac{2}{0}$, L. $\frac{2}{0}$. Atrophic discoloration of left papilla; no bruit; no exophthalmos. Mobility of ocular muscles and upper lids normal, with the exception of the left rectus externus which is still paralyzed. Pupils react readily, veins of ocular conjunctivæ still large and tortuous; no chemosis. Hearing, R. ear watch 4". Left ear 3".

After her discharge from the hospital the patient remained under my observation until this day, Nov. 10, 1875. Her general health continued to improve. In October the paralysis of the left abducens disappeared, and both eyes have at present—five months after the operation—a normal range of mobility. During this time the patient never complained of noise in the head, though I occasionally detected a faint intracranial

blowing sound, especially when I auscultated the head after she had walked briskly. The left eye is more deeply set in the orbit than the right, but there is absolutely no exophthalmos. Sight and hearing remain unchanged. R. E. S. $\frac{2}{3}0$, L. Hm. $\frac{1}{2}0$, S. $\frac{2}{10}0$. She hears the watch with either ear at 4''.

The analysis of the symptoms presented in this case, together with the result obtained from the operation, led me to suppose that I had to deal with a direct communication between the left ~~common~~^{internal} carotid and the cavernous sinus. The patient had sustained an injury causing successively unconsciousness, headache, bleeding from both nostrils, paralysis of the left abducens, intracranial bruit, protrusion first of the left and then of the right eyeball, paralysis of all the other motor nerves of both eyes, supra-orbital pain and deafness. With a high degree of probability I may assume that the injury resulted in a fracture at the base of the brain, involving the left ~~common~~^{internal} carotid in the region of the sella Turcica. Here the internal carotid artery lies in close contact with the bone, and traverses the cavernous sinus. Between the outer wall of the artery and the inner wall of the sinus passes the sixth nerve, which, in our case, became paralyzed through the exophthalmos, and the bruit had supervened. This may be explained by the supposition that the weakened parts of the artery yielded under the normal arterial pressure, and by their distention compressed the sixth nerve. When finally the rupture of the artery occurred, and the arterial blood passed freely into the sinus, the resulting enormous pressure within this venous channel was transmitted to the left ophthalmic veins, which becoming distended caused exophthalmos by their increase in calibre and through œdema of their surrounding tissues.

The continued pressure within the left cavernous sinus, causing first collateral congestion in all the venous channels at the base of the brain, must also have been directly transmitted to the circular, transverse, right cavernous, and petrosal sinuses. Thus the occurrence of right exophthalmos may be ascribed to the repletion of the right cavernous sinus, and the symptoms of paralysis of all the motor nerves of both eyes, and of irritation of the first branch of the fifth nerve to the distention of the walls of the cavernous sinuses, and the pressure thereby exerted upon these

nerves. The deafness may be due to the congestion of the petrosal sinuses.

With the symptoms of the case before us, we could certainly not have been tempted to seek the seat of the lesion within the orbit, and assume an improbable symmetrical affection. If, on the other hand, we consider the absence of all cerebral symptoms and the rapid disappearance of the pathological conditions of both eyes, we can neither suppose the existence of true or diffuse aneurism of the left internal carotid, nor of both internal carotids, within the cranium. Thus both by the analysis of the symptoms and the process of exclusion, we are led to the probable diagnosis of intra-cranial arterio-venous communication.

