THREE CASES OF GUNSHOT WOUNDS OF LARGE ARTERIES, WITH TRAUMATIC ANEURYSM.

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THE chief interest in the first of the cases here reported lies in the fact that it is possible for a perforating wound of the aorta, albeit small, to be inflicted without death resulting. This man, who had his aorta shot through, lived for three weeks after the wound, and died from concurrent injury to the lung.

CASE I.—*Perforation of the Aorta, about an inch above the Aortic Valve, by a Fragment of Shrapnel: Traumatic Aneurysm.*

Sergeant B., aged 33, was wounded on October 27th, 1914, by shrapnel, and was admitted to No. 4 Scottish General Hospital, under my care, on November 4th.

On admission he was pale and anxious-looking, obviously very ill, and rather short of breath. There were several small wounds over the left shoulder and chest, the most conspicuous being situated below the clavicle. The whole left chest was much swollen, the tissues being infiltrated with blood, and the skin discoloured by ecchymosis. Owing to the great infiltration of the chest wall repeated physical examination was entirely negative. Skiagrams revealed no foreign body, but there was always a marked want of definition, involving even the ribs. Captain Riddell, who personally superintended the taking of the plates, suggested pleurisy with effusion as a possible cause of the want of definition.

The external wounds improved rapidly, the effusion of blood in the chest wall slowly diminished, the temperature was generally about 99° F., and the pulse little above normal; the patient took his food fairly well.

On one or two occasions breathlessness became rather pronounced, and slight cyanosis would then develop, but on the whole the patient progressed favourably until November 17th, when, impelled probably by breathlessness, he crawled to the bottom of his bed, was given a dressing-gown by another patient, and tried to walk to a chair close at hand. The nurses' attention was immediately attracted, but the patient collapsed before they could reach him, became deeply cyanosed, and had to be lifted back to his bed. Restoratives were applied, and tracheotomy was considered by the orderly officer, who, finding no evidence of tracheal obstruction, did not perform it. The pulse remained good, but the struggle for breath and cyanosis remained pronounced, and the patient died shortly afterwards.

Necropsy.

On post-mortem examination the left pleural cavity was found filled with blood, much of which was liquid. At the apex there was a small detached portion of lung adherent to the pleura, and at the base a larger detached portion adherent to the pleura and diaphragm, but the rest of the lung was torn away from these portions, much damaged, and compressed by the blood. Death would appear to have been due to a fresh haemorrhage, caused by further tearing of the lung from the portion attached to the base.

Attention was next turned to the heart, which was slightly enlarged and fatty, but otherwise normal, and then to the aorta. Distinct from the mouths of several small vessels which were conspicuous on the inner surface of the aorta when it was opened up for inspection, there was an obvious small perforation of the aorta on either side. On the inner surface of the vessel the little holes were quite distinct, patent, and irregular in outline, while on the outer surface the track of the punctures could not be traced. On the outer surface, however, opposite one of the points of puncture on the inner surface, there was a small aneurysm, about the size of a cherry stone, filled with minute laminated clot. Careful search did not reveal any fragments of shell.

So far as one could see, the man might have lived indefinitely in spite of the aortal wound. The point is one to be noted by the medical jurist, who is prone to assert dogmatically that certain injuries cannot have been inflicted because the victim is still alive. While little or no attempt at healing appeared to have been made by the inner coats, the outer seemed to be quite capable of preventing escape of blood into the surrounding tissues.

The little aneurysm was situated in the coats of the aorta, which formed its walls, and to that extent might be regarded as being of the dissecting type. There was, however, no evidence of lateral extension.

It is not easy to explain the extensive damage to the lung. Had the chest been penetrated by several large pieces of shell the lung would doubtless have been torn by them, but, as a matter of fact, no metal was found, either

in the x-ray photographs or in the subsequent careful post-mortem examination. While small fragments of metal might easily have been overlooked, notwithstanding such examination, large pieces could not be. Probably, therefore, the condition of the lung was one of rupture and consequent haemorrhage and collapse. Such rupture might be caused by the patient receiving a violent blow on the chest from a large piece of shrapnel after the shell had exploded, and this theory would also explain the great bruising and infiltration of the chest wall with blood. Had the lung collapsed entirely at the time of the injury the patient would probably have died immediately, but the presence of clot of varying age and of liquid blood in the pleural cavity make it tolerably certain that there were repeated haemorrhages, accompanied by increasing compression of the lung.

One other point illustrated by this case and the next is the remarkable penetrative power possessed by small fragments of shell. It is difficult to realize that such fragments may possess sufficient momentum to penetrate the chest wall and bury themselves deeply in the tissues.

CASE II.—*Traumatic Arterio-Venous Aneurysm of Common Carotid Artery and Internal Jugular Vein.*

Sergeant R., aged 32, was wounded on May 3rd, 1915, at Ypres, by a small splinter of shrapnel which struck him on the right side of the neck about the level of the cricoid cartilage. Immediately a thin jet of blood spouted out, which drenched his clothes. A comrade at once caught the puncture between his finger and thumb and pinched it, thereby arresting the bleeding, and then applied a field dressing. The neck, however, began to swell, and this swelling increased as the patient was conveyed to a field dressing station, and thence to a field hospital, until finally it had extended up over the right side of the face, the eye becoming closed. The patient was transferred to hospital at Boulogne, and remained there for eleven days. While there skiagraphs were taken of the neck, but no metal was detected. By this time the swelling had begun to decrease; the face and neck were markedly discoloured. As the general swelling subsided, a tumour became apparent in the neck, and pulsation was observed. The patient was transferred to Stobhill on May 15th, when he came under my care. On admission he had a pulsating swelling over the line of the carotid which was most prominent about the level of the cricoid. There was no evident scar, but the skin over the most prominent portion was slightly stretched.

In addition to the marked pulsation a distinct thrill could be detected, particularly to the outer and posterior aspect of the swelling. The patient stated that he had been suffering from headache due to the transmission of the beating to his head, but that this headache was now much less intense, and that he was sure the swelling was steadily decreasing in size. He was therefore kept under observation for three weeks, but, while his general health improved, the swelling not only did not decrease, but became larger and more pointed, the skin over the most prominent portion being now glazed. A diagnosis of rapidly enlarging arterio-venous traumatic aneurysm was made, and operation was decided upon.

Operation.

On June 5th an incision was made below the swelling in the line of the carotid artery, and ligatures were placed on the carotid artery and internal jugular vein. A second, oblique, incision was then made above, just below the tip of the mastoid process, and the origin of the sterno-mastoid muscle cut through. The internal jugular vein was then ligatured close to its point of emergence from the skull, and the branches of the carotid artery were also ligatured. The upper and lower incisions were then united by an elliptical incision surrounding the portion of glazed skin, and the involved area was exposed. The artery and vein were now found to be much damaged, and adherent to one another and communicating, while there was a large aneurysmal sac partly in the substance of the sterno-mastoid muscle. All the structures were much matted together. The sterno-mastoid muscle was next divided for the second time, but low down in the neck, and the separated portion of muscle, containing part of the aneurysm, was removed with the mass. It was hoped that removal would now be easy, as all the main trunks had been ligatured, but such was not the case. The vagus nerve had also been damaged, and was firmly adherent to the mass. While separating it, the sac was opened into, and very free haemorrhage occurred. The opening had therefore to be closed by digital pressure, and the mass separated rapidly from other less close adhesions; the smaller distended branch vessels were caught and divided, and then, finally, all sources of blood having been cut off, the vagus was carefully detached and the mass removed.

After-History.

The patient made a slow but steady recovery; he exhibited no cerebral symptoms, nor did he suffer appreciably from shock. He now (August) feels very well, and is beginning to go about.

(I wish to express my thanks to Major Pringle for his kind advice and assistance in this case.)

Description of Specimen.

The specimen removed shows a large sac—even now, after shrinkage in preservative, fully 1½ in. in diameter—which projects into and distends the sterno-mastoid muscle on the one hand, and on the other comes to within a quarter of an inch from the skin surface. The portion of the aneurysm in the muscle presents a distinct sac wall, composed of the dilated coats of the vessels, while that which projects toward the skin surface has no true wall, and is occupied by a dark red thrombus.

In this case, as in the last, while there is a perfectly distinct history of wounding, no metal was found, either by x-ray examination or at the operation. The presumption is, therefore, that the penetrating fragment was a very small one, and so was overlooked. It is possible, however, that it penetrated quite beyond the area examined. The complex nature of the aneurysm will be noted, that part which projected into the sterno-mastoid muscle having a true sac wall derived from the coats of the damaged and distended vessels, while the portion which projected toward the skin was of the purely traumatic type, there being no true sac wall.

It is remarkable that this man should have suffered such grave injury to his carotid artery, internal jugular vein, and vagus nerve, and yet have complained only of headache due to the throbbing of the aneurysm. So far as he is aware, he never lost consciousness.

It is significant of the changes in methods of warfare that while the two cases reported above were caused by shrapnel, the patient in Case III was wounded by a rifle bullet.

CASE III.—Traumatic Femoral Aneurysm.

T. B., a Boer, was shot on February 8th, 1900, the bullet, presumably a Lee Metford, entering the thigh at the junction of the middle and lower thirds of the femur, in the line of the femoral artery, and coming out about 6 in. higher up, on the outside of the thigh. The wounds of entrance and exit were alike in appearance. The patient was brought to the Military Stationary Hospital, Orange River, where I was stationed as a civil surgeon, on April 8th, 1900, and placed under my care. The history given was that he had been supposed to be suffering from fracture of the femur, with great throwing out of callus, and that he had been treated by massage without effect.

On examination the whole limb was found to be oedematous, while a large swelling existed on the front and inside of the thigh, extending from above the wound of entrance to about the apex of Scarpa's triangle in front, and to 3 in. below the groin on the inside, where the swelling was most prominent. The swelling was very tense and hard in front, but it presented slight fluctuation on the inside. Pulsation of the femoral artery could be faintly but distinctly made out below Poupart's ligament, and a slight thrill was also occasionally detected over the swelling. Pulsation of the popliteal or tibial arteries could not be detected, but the oedema was quite sufficient to account for this, even had pulsation been present. The patient complained of pain and discomfort over the whole limb.

Operation.

The operation was performed on April 12th. An incision, 4 in. long, was made over the most prominent part of the swelling. Immediately the skin had been incised dark blood clot presented, while dark-coloured blood flowed from the upper end of the incision. The clot was removed in large masses, both fresh and old, some portions having become organized. About four pints of clot were removed. As the tourniquet did not entirely control the bleeding and it was impossible to determine the bleeding point within the sac, the superficial femoral was ligatured through a fresh incision, and then the remainder of the clot was turned out and the cavity packed with iodoform gauze.

After-History.

The patient was collapsed after the operation, but quickly responded to restoratives. The oedema had very markedly decreased by next day, and on the day following had almost disappeared. The patient made an uninterrupted recovery, the temperature never rising much above normal.

The aneurysm in this case was of the regular traumatic type, in which, the vessel having been wounded—and extensively wounded—the blood is poured into the surrounding tissues, which are stretched and compressed thereby. There was, therefore, no true sac wall, the blood being confined by the compressed surrounding tissues and by blood clot. The diagnosis of fracture, with great effusion of callus, made in another hospital should not be lightly set aside as ridiculous, since the hard nature of the swelling, its slow increase in size, and the entire absence of pulsation might easily mislead.

THE Governor reports that in the two weeks ending September 9th, 7 cases of plague occurred in Mauritius, with 2 deaths.

THE TREATMENT OF WOUNDS IN WAR.

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A YEAR after the beginning of the present European war all surgeons who have had experience of recent military surgery agree that our preconceived notions on the subject require considerable modification. Since the war began I have worked in an Indian General Hospital, seeing and treating every variety of injury produced in modern warfare. The purpose of this paper is to call attention to the importance of certain methods of treatment and to describe some modifications of practice which, in my hands, have given very gratifying results after unusually short convalescence.

With the exception of some perforating wounds of soft parts, practically all wounds met with are septic, the majority suppurating freely. The kind of wound to which I particularly wish to draw attention is the large lacerated wound of soft parts with considerable loss of skin, often accompanied by compound comminuted fracture of the long bones—for example, the so-called explosive exit type. This is the type of injury which causes the most permanent disability, the subsequent usefulness of the limb depending very largely on the nature of the treatment adopted.

All surgeons are agreed on the desirability of procuring free drainage at the earliest possible opportunity. To attain this end the entrance wound is enlarged if necessary, and a rubber drainage tube passed along the track of the wound. Free drainage is then taken for granted, although the object of the tube is only too often defeated by placing a thick pad of dressing, such as gauze or cotton-wool, over the wound. What happens is that at first the discharge flows freely into the dressing, but the discharge is of a viscid character, and capillary attraction soon fails to make the fluid permeate into the dressing as fast as it is exuded from the wound. In a short time, varying according to the amount of the discharge, drainage comes to a standstill. Pus accumulates in the wound behind the tube, dammed back by a sodden, practically impermeable, mass of dressing, and the surgeon, on removing the latter, is greeted with a flood of pus, a most disappointing and disconcerting end to an honest effort to secure free drainage.

If further proof be required, take a dressing partially soaked in pus and run a gentle stream of water over it. It will be seen that where the dressing is covered with pus the water runs over it as over the back of a duck, and with an equal amount of penetration in either case. If water behaves like this, what of viscid pus? Of course, in time a certain amount of pressure will arise behind the pus, but let us hope, for the sake of the patient, that this seldom amounts to anything appreciable. To get over this difficulty, I have for some time treated these cases without anything in the way of dressings in contact with the wound; the method adopted is as follows:

A piece of perforated zinc sheeting is bent, so as to form an arch of suitable size over the wound. Some wool is arranged to absorb any discharge after it has left the wound. The zinc sheeting arch is fixed in position by a bandage at its extremities only, and covered with two thicknesses of gauze. The wound is now inside a little chamber, open freely to the air; there is nothing to hinder the exit of discharge, and it is protected from flies or dust by the gauze, which acts as an efficient filter. The free access of oxygen seems to be of distinct benefit, and of greater value than the occasional application of hydrogen peroxide, though there is no reason why this should not be used as well. In the case of a limb it is at times of great help to sling the limb by flannel strips to a Balkan splint, the discharge dripping into a mass of cotton-wool placed on a mackintosh sheet on the bed beneath.

As to the results obtained, at the end of forty-eight hours the discharge diminishes to an extraordinary extent. At the end of a week or ten days there is only a scanty, thin, sero-purulent discharge, which continues until the wound heals completely. From the commencement the wound should be irrigated from time to time with saline—either normal or hypertonic, or some weak antiseptic lotion. In severe cases continuous irrigation may be called for.