GUNSHOT WOUND OF PERICARDIUM AND HEART; PNEUMO-HÆMOPERICARDITIS; OPERATION; RECOVERY.

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PRIVATE MAJOR T., K.O.S.B., aged 38, was wounded on October 1, 1915, by high explosive shell, and admitted to our hospital on the 3rd, with two shell wounds of the chest-wall and one of the left forearm. His pulse-rate was 77, respiration-rate 32.

Of the two wounds of the left chest wall one was in the fourth intercostal space three inches internal to the nipple line, the other in the seventh space two inches outside the nipple line. The wounds were—as usual—infected. The fragments of shell had penetrated the chest wall. The wound in the arm was explored and a fragment of shell removed.

The patient was expectorating blood. The breath sounds were faint and impaired over the left base. The heart sounds were very faint. There were dyspnoea, and great complaint of inability to sleep. Dullness extended across the chest from one base to the other, and both pleural cavities were suspected of harbouring fluid.

Four days later the patient had not slept, or, if at all, only for the briefest intervals; the cardiac sounds had entirely disappeared, so much so that another stethoscope was asked for on the supposition that the one in use was blocked. The pulse-rate and volume were much the same, but the patient was dusky, much distressed at the inability to sleep, and he complained of a stretching pain at the back of the left chest. He was too ill for an examination of his back. A stimulating expectorant was administered, and the blood-stained expectoration had ceased by the sixth day.

On the eighth day he was more exhausted by loss of sleep. His sclerotics were icteric. His pulse-rate averaged 70 and his temperature was normal. There was no oedema of the chest wall such as I have twice since seen in hæmopericarditis. Although the man was very ill, on Captain Hayward’s suggestion he was taken on his bed to the X-ray room and screened in the “sitting up” position, which he favoured, to confirm the diagnosis of pericarditis and to ascertain the condition of the pleural cavities. It was at once apparent that the extensive dullness was sharply localized and due to an extensive pericardial effusion. Also it was apparent that there was little—if any—hæmothorax. An X-ray plate was taken in this difficult position, and the drawing taken from it illustrates the condition.
Clinical and other Notes

The patient being in great distress, it was obvious that either fresh haemorrhage had taken place or that infection had occurred. An operation to expose the pericardium and heart was decided upon. Ether anaesthesia was induced. The incision made was that following the border of the seventh costal cartilage and the mid-line of the sternum; portions of the seventh, sixth, and fifth costal cartilages were removed and half the width of the sternum, thus giving one sufficient room to introduce at least two fingers and a thumb to grasp the heart if the necessity arose if it were still bleeding, or recommenced to bleed, and steady the organ for suture.

The pericardium, being well exposed, was incised vertically for two inches, and the heart at once plugged the wound.

On pushing that organ backwards a large quantity of foul-smelling gas escaped, followed by froth, and, later, stinking fluid, which was blood-stained. We estimated the amount of gas that escaped as being as much as would displace six ounces of water. The fluid, which had a most foul smell, measured twenty-two ounces. The pathological report on it was that *Bacillus perfringens* and enterococci were grown, also a few staphylococci.

The fingers were at once introduced into the sac and adhesions separated between the heart and the floor and wall of the pericardium. The foreign body was not in the pericardium, but had guttered the anterior and upper border of the heart, and penetrated the sac wall and pleura and entered the left lung. There was no recent haemorrhage.
Clinical and other Notes

Only the most careful examination of the injured area of the sac wall was made, so as to avoid infecting the pleura if it were fortunately sealed off, as we had reason to believe was the case from the X-ray screening.

The patient's colour, which had—up to the moment of opening the pericardium—been dusky and dull, at once assumed a healthy aspect and his pulse became stronger.

The fluid and blood from the breaking down of adhesions were mopped out, and a flanged rubber drain introduced through eusol dressings into the pericardial sac. The heart itself was tolerant of manipulations, and remained so during the subsequent dressings. Part of the wound in the chest wall was sutured together. The patient, much relieved by the operation, was put back to bed.

The pericardial cavity was syringed out with warm eusol, which certainly acts as a great deodorant. Large quantities of lymph (which coagulated) formed, and this had to be picked out at every dressing with forceps. The eusol caused some pain. Hypertonic saline was tried, but caused great pain, the pain being always referred to the middle of the back. Saline solution of normal strength was tried, but was also complained of. Iodine solution, one dram to the pint, however, suited him at once, and this strength—or two drams to the pint—was used until the wound had entirely healed, which occurred in seven weeks.

One piece of tough coagulated lymph resembled a cast of the posterior part of the pericardial sac. Pushing the heart out of the way caused no sensation or distress, and he was unconscious of the movement.

The X-ray plate shows distinctly the much-distended pericardial cavity and its almost circular shape, and the more transparent area towards the centre of the opacity due to the contained gas, which was not suspected before operation. The entire absence of heart sounds before operation was a most conspicuous clinical feature.

The congestion of both bases suggested some fluid—the right base was more suspected than the left. Owing to the large quantity of gas and fluid in the pericardium one had anxiety that when the sac contracted infected material would remain in the posterior part of the right recess of the pericardium, and that the healing and closing of the wound would add still further to one's difficulty. At one time I considered the possibility of draining the pericardium from behind, and if the left lung had been collapsed, would have had, I think, little difficulty. On a few occasions a catheter was introduced behind the heart and the fluid sucked out. I was unable to procure a saliva exhauster at the time. The cavity was always filled with lotion at body heat and the heart churned it up with the fragments of lymph, and cavity was mopped out repeatedly until the lotion remained clear.

There is one point in dealing with costal cartilages that is worth bearing in mind, and that is that they heal slowly and are best sectioned as short as is possible, leaving them undisturbed in their perichondrium.
and concave. If left protruding from their membrane they heal slowly.

Pericardiocentesis, judged by the numerous "best spots" given by different authors, is unreliable apart from the usual danger. In this case there was the added risk of sepsis, and had a trocar or aspirating needle been introduced and the heart not punctured, as it would almost certainly have been, gas or froth would have been withdrawn. Possibly the pleura would have been suspected, as gas in the pericardium is certainly unusual. The pleural cavity never became infected.

During the convalescence of the patient the base of his left lung gave us some anxiety. His urine at one time only measured twelve ounces in the twenty-four hours and oedema of the loins was present, but the albuminuria was slight in amount. At this time his pulse became barely perceptible, but never alarmingly frequent.

There have been many discussions as to the position of the heart in pericardial effusions. In this case the heart was anterior and in close contact with the chest wall, and this in the presence of a large effusion of gas and fluid.

In two other recent cases of hæmopericarditis due to gunshot wounds where expectant treatment proved successful, the heart sounds could only be heard at the base of the heart over the sternum in one, and only very faintly in the other; but I have no evidence to offer as to whether the heart was more anterior than posterior.

The wound has long since firmly healed and Captain MacIlwane has kindly examined the patient by the electrocardiograph.

Examination of Cardiac Condition, January 16, 1916.

"There was no evidence of any hypertrophy or dilatation being present. No murmurs were heard; none of the cardinal signs of adherent pericardium were observed. The systolic blood-pressure was 108 millimetres of mercury, and the diastolic pressure eighty-five millimetres by auscultatory method. The electrocardiogram showed a regular rhythm with no abnormal mechanism of beat except a slight inversion of the T wave in lead II. It was difficult to map out the left margin of the heart at the apex as the cardiac dulness was continuous with the dull area in the axillary region. An X-ray plate taken by Captain Crymble showed that there was no increase in the size of the heart."

The patient has apparently every chance of regaining robust health judging by his progress here in France and a report from home. He enjoys short walks, his urine is normal, he has no oedema of the ankles and, in short, has regained, so far as is possible to say, his former condition.

I would like to thank my colleagues and the nursing staff for their help in this case. The skilful dressing of this patient, which was of frequent occurrence by night as well as day, probably just made the difference.