Clinical and other Notes.

REMOVAL OF A BULLET FROM THE RIGHT VENTRICLE OF THE HEART UNDER LOCAL ANÆSTHESIA.

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With Remarks by Colonel H. M. W. Gray, Consulting Surgeon to the British Expeditionary Force, France.

No. 14727 Private N. A., was admitted to a general hospital on July 19, 1915, having been wounded eight days previously. The bullet had passed through and killed a man in front of him. He was knocked down, but did not lose consciousness, and had not had any discomfort other than slight pain from the wound. There was a small dirty wound (half an inch in diameter) just below and to the right of the xiphi-sternal junction, and also a painful swelling of the right parotid gland, which disappeared next day. The patient showed no other symptoms during the first few days. He was kept in bed. The heart appeared to be normal and regular. The pulse varied between 80 to 90. The evening temperature rose to 100° to 101° F.

The following X-ray report was received from Captain S. F. McDonald:

"There was an entry wound in the right epigastrium, but on examination no shadow could be seen in the abdomen.

"Thorax: Lungs and pleural cavities were normal. Diaphragm moved well and evenly on both sides. Heart was normally situated, but there was some slight increase of cardiac shadow on the right side.

"In the lower portion of the heart shadow was a very sharply defined dark shadow moving with the heart and also apparently laterally in relation to the heart.

"This last movement suggested that the object was free in the pericardial cavity, but on turning the patient over it was seen to lie quite definitely in the substance of the heart. It had a distinct rocking movement. No antero-posterior movement was visible in relation to the heart.

"The object seemed to be in or close to the lowest portion of the wall of the right ventricle.

"Its shape and size, so far as could be made out, were those of a rifle bullet. Attempts to take radiograms were unsuccessful."

Colonel Gray, consulting surgeon, saw the patient first on July 25, and again on 26th, on which day a sharp pain developed suddenly in the left leg. As the pulse during the night of the 26th had shown some irregularity (rate 65 to 95), and the heart had occasionally dropped
beats, an operation was decided on and performed on the morning of the 27th. Veronal, 5 grains was given the night before, and three doses of morphia, amounting in all to \( \frac{3}{8} \) grain during the morning before operation. The patient was not unduly under the influence of morphia. He was screened again just before the operation and conversed, sat up and turned himself smartly when asked to do so.

**Operation by Colonel Gray.** — Under local anaesthesia (eucaine 1 per cent, potass sulphate \( \frac{1}{2} \) per cent and adrenalin) a wide horse-shoe-shaped incision was made, convexity upwards, extending along the sixth costal cartilage on each side and across the sternum at the level of the attachment of the fifth cartilage. This incision was used so as to make an exposure of the track of the bullet in the depth. The perichondrium was separated from the left sixth cartilage, which was cut across at the costo-chondral junction and used as a lever to elevate the sternum, while the triangularis sterni, pericardium, etc., were being separated off the posterior aspect of the flap. A small portion of the right sixth rib was removed close to the costo-chondral junction. The sternum, at the lower border of the fifth costal cartilages, was grooved deeply with a gouge and divided with a bone forceps. The soft parts were then separated from the sternum and ribs, so that the flap could be turned downwards and forwards. When the flap was pulled forwards a hole about an inch long appeared in the pleura on the right side, in the track of the bullet. The right lung collapsed. The respirations became laboured and quick, the patient coughed jerkily; he became anxious and complained that he was breathless. The colour remained good, and he settled down in about one minute after being reassured by the surgeon. Except for this disturbance there was apparently no discomfort during the entire operation.

The flap was held forward by hooks, and the pericardium opened obliquely from the base to near the apex of the heart. About a drachm of slightly blood-stained fluid was noticed in the pericardial cavity. The heart looked normal. No wound could be seen. On digital exploration, the bullet was felt to be lying, apparently fixed, at the back of the heart, either in the wall or cavity of the right ventricle. The point of the bullet was near the apex of the ventricle. During the manipulations the heart was noticed to miss a beat occasionally—when touched at the upper and back part of the inter-ventricular septum. The right ventricle was seized with a pair of catch forceps near the apex. When it was seen that this caused no disturbance, a suture was passed through the muscle adjacent, and by these the heart was held forward. This in no way agitated the patient. On further exploration the bullet was definitely located by probing with a needle and found to be fixed in the right ventricle near the posterior coronary vessels. After manipulation, the bullet was felt to change position and to be free inside the ventricle. It was worked away as far as possible from the coronary vessels and
grasped between the thumb and finger. Two stitches were inserted into the muscle wall over the bullet. The wall of the ventricle was incised for half an inch and the bullet removed with forceps. While the wall of the ventricle was still being held firmly between the finger and thumb, the stitches were tied. On removing the catch forceps there was brisk bleeding, which was stopped quickly by an under-running stitch. The pericardial cavity was wiped free of blood-clot and was filled with normal saline to expel the air, and was then sewn up. The right pleural cavity was next filled with saline and the injured pleura sewn up. While the wound was being closed the chest was aspirated to remove the saline. This aspiration was the only part of the operation which seemed to cause the patient any pain.

The patient was wonderfully comfortable on being taken back to bed, but about four hours after the operation the respirations rose suddenly to 48 per minute, and remained at about that level till he died, except for part of the day of 29th and 30th, when, the patient being deeply under the influence of morphia, they dropped to 28 per minute. He was much troubled, after this occurred, by mucus collecting in large quantity in the throat and upper part of the trachea. Various remedies were tried for this with little avail. He took nourishment fairly well. Cardiac stimulants were used after the first two days.

On July 29 his mind began to wander, and he was often delirious till the time of his death on July 31, at 7.30 a.m. He lived nearly four and a half days after the operation.

There was never any indication that the operation on the heart had interfered with its action, which though quick (average 120 to 130) was wonderfully strong up to within a few hours of his death. No dropping of beats was noticed after the operation.

At the post-mortem examination it was found that the external wound had healed well. No sign of any inflammation. There was no exudation of either blood or pus into the pericardial cavity, but the heart was covered by a shaggy layer of lymph, about one-sixth inch thick. The wounds in the heart had healed perfectly. There were several shreddy, ante-mortem clots entangled in the chordae tendineae of the right ventricle and a long narrow clot in the pulmonary artery, extending into its right branch, besides the usual post-mortem clotting. There was an abrasion of the endocardium of the posterior wall of the right ventricle where the bullet had been lying, but the cavity looked normal otherwise. No wound of entrance was discovered. The heart was sent to the Royal College of Surgeons of England for further investigation.

There were several small clots in the branches of the pulmonary arteries with corresponding infarct areas in the lungs. The right lung had expanded to about two-thirds the size of the left. There were about two pints of blood-stained serous fluid in the right pleural cavity. The cause of death was judged to be multiple pulmonary infarction from clots derived from the right ventricle.
Remarks by Colonel H. M. W. Gray.

I should like to add to the notes of Lieutenant Birkeck and Lieutenant Lorimer that the irregularity of the pulse-rate (65 to 95) without extraneous cause, the occasional dropping of a beat, and the sudden pain and swelling in the right parotid and left leg (due possibly to small emboli), made me decide to operate. The patient was otherwise extraordinarily well, and showed no distress whatever. One did not care to risk postponing operation till the patient could be transferred to England.

The method of using the local anaesthetic was by infiltration of the line of incision and blocking of the intercostal nerves on each side from the fourth to the seventh. There was no anaesthetic injected into or around the pericardium or pleura.

Interesting points about the operation are:

1. The complete success of the local anaesthetic. So far as I can gather, this is the first occasion on which any operation on the exposed heart has been done with local anaesthesia alone. The patient was not deeply under the influence of morphia. He responded to questions, requests or suggestion at once.

2. The evanescent nature of the distress when the right lung collapsed.

3. The absolute absence of sensation of the pericardium, both parietal and visceral, and of the heart itself, to squeezing, pulling, pricking, cutting, or suturing. These manipulations caused apparently no interference with the cardiac action. During the extraction of the bullet, at least one half of the right ventricle was firmly grasped between the fingers and thumb. The heart missed a beat repeatedly whenever the upper and back part of the interventricular septum was pressed, but began to beat again at once when this pressure was removed. I could not assure myself that the ventricles alone were implicated. The patient denied having any discomfort during these times, or indeed at any time during the operation, except when the right lung collapsed and when the aspirating needle was being introduced into his chest, when he complained loudly of pain. Even swabbing out the pericardial cavity caused no pain. All these observations are very interesting when one thinks of the effect of similar manipulations of either bowel or parietal peritoneum.

4. There was a little difficulty in being certain of the position of the bullet, owing to its proximity to the interventricular septum, which, when contracted, gave a similar sensation on palpation. Therefore, a straight needle was used to locate the bullet definitely.

5. The method used to obtain rapid distension of the lung at the end of the operation, in the absence of a positive pressure apparatus. On account of commencing respiratory distress, aspiration was stopped after about twenty-five ounces of the saline solution were removed. It was thought that the remainder would be rapidly absorbed.
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(6) The possibilities of future successful operations for intracardiac conditions, which are conjured up by the virtual success of this one. I understand that a French surgeon recently removed, with permanent success, a rifle bullet which had lain in the right ventricle for five months. Unfortunately, I cannot meantime give a reference to the account of his operation.

BRAIN ABSCESS IN A CASE OF PARATYPHOID B.

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The importance of a more accurate clinical and bacteriological differentiation between diseases of the coli group appears to be amply justified by the findings of the present campaign. Statistics are as yet incomplete, but those we have since the outbreak of hostilities demand a closer investigation of the interesting paratyphoid group. The following case of paratyphoid B which recently occurred at No. 1 General Hospital presents a particularly interesting complication.

The patient, aged 21, a private, was admitted into No. 1 General Hospital on February 3, 1915. He gave a history of feeling ill, with pains in the abdomen, diarrhoea and headache commencing on January 26. In addition, he now complained of pains in the back and legs. There were sordes, furred tongue, and characteristic spots on abdomen, which was tympanitic and tender on palpation; spleen enlarged. No abnormal signs in lungs and heart. Urine normal. Nothing characteristic in the feces. Pulse 110; temperature 103°F.

On February 4 a provisional diagnosis of enteric fever was made, and the patient was removed to the isolation division of the hospital. He complained of severe pain in the right side of the head and seemed very ill and drowsy. The pulse became dicrotic. Cultures were made from the blood, but proved to be sterile. No organism of the typhoid group could be isolated from the urine or feces.

On February 8 the patient developed a hemiplegia of the left arm and leg; his left facial and left hypoglossal nerves were also paralysed. He had incontinence of urine and feces, but no vomiting. No abdominal or cremasteric reflexes could be elicited. His expression was clouded and he became more drowsy, dull and apathetic. He replied to questions very slowly, thickly and not immediately, and yawned occasionally. He complained of pain in the right temporal region and the back of the right ear. Percussion over these areas made him wince. There was no oedema over either mastoid, but tenderness was present over the right mastoid area, especially over the tip. Tenderness was also elicited over and down the right side of the neck in line with the internal jugular. On examination of the ears, beyond a slightly injected Shrapnell's membrane and a little injection around the handle of the malleus on the