the duodenum, as advocated by Zeller.¹ This gives a better view into the bowel; its wall can be more securely closed, and as an additional protection the peritoneum passing between the walls of the duodenum and the transverse colon, which is often loose and redundant, can be drawn up over the wound.

REFERENCE.

¹ Zeller, *Berl. klin. Woch.*, September, 1902.

ON TWO CASES OF REMOVAL OF PART OF THE PERICARDIUM, AND ITS REPAIR BY MEANS OF THE PECTORAL MUSCLE.

BY

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THE two cases I am about to relate present points of interest both from a surgical and a physiological point of view.

In looking through the most recent textbooks I can find no reference to cases in which a considerable portion of the pericardium has been removed, nor does the question appear even to have arisen as to how repair of the pericardial sac may be effected in case of the gap being so large that the edges of the incision into it cannot be brought together.

In my first case the operation for removal of a tumour of the fifth rib was begun with the knowledge that it might be necessary to open the pericardial sac, but without any intention of having to take away a considerable portion of it.

In the second case the operation was deliberately undertaken with the expectation of having to remove part of the pericardium, which my previous experience had shown might be safely done.

CASE I.—*Columnar-celled Carcinoma Involving the Pericardium.*

Mrs. T., aged 72, was sent to me by her medical adviser on March 21st, 1905, when she gave the history that she had been well up to September of the previous year, at which time she noticed a pain round the left side of the chest and a swelling was then discovered a little below and just external to the nipple. The pain steadily increased, and when she was sent to me her sufferings were severe. In October and November, 1904, she was treated for stomach trouble and also for sciatica, but no definite disease could be found on physical examination of the abdomen or on rectal and vaginal examination. When I saw her the swelling was smooth and firm. It appeared to be fixed to the fifth and sixth ribs and to project between them and was situated a little below the left nipple.

A diagnosis of sarcoma was made, which diagnosis agreed with that of her own medical man and a consultant whom she had previously seen. As the patient was suffering severely, and as no other disease could be found in the abdomen or elsewhere to suggest that this was secondary growth, the question of operation was put to the patient, who, after consulting with her medical adviser and her friends, decided to have it done.

Operation.

On March 22nd, 1905, I freely exposed the tumour by a U-shaped flap extending well over the sternum and with the base external. The tumour appeared to be a large sarcoma, growing from the sixth rib and projecting both externally and internally between that and the fifth rib. I therefore divided the sixth rib an inch external to the tumour, and then carefully separated the pleura from it. On separating the growth towards the sternum the pericardium was found to be adherent, in fact, the growth had already perforated it. The separation of the growth, including the pericardium, was continued onward until the sternum was reached, and the corresponding portion of pericardium was removed, leaving only healthy tissues. On separation of the tumour, by dividing the costal cartilage close to the sternum, a large gap in the front wall of the pericardium was left, fully exposing the heart, which was seen beating, the apex rotating to the right with each beat. From the size of the gap it at once became evident that it would be impossible to close it by bringing together the edges, and the question arose as to how the operation must be completed. I decided to cover in the gap by separating from the chest wall the pectoral muscle and sliding it over, taking care to ligature every bleeding point and to leave the wound perfectly dry. After bringing over the muscle and stitching it in position so as to leave the heart in a closed cavity, the flap of skin with the subcutaneous tissue was brought back into position and fixed there by silk-worm-gut sutures and Michel's clips. The patient gave no anxiety during the whole course of the operation, except at the moment of opening the pericardium, when the anaesthetist, Dr. Maynard Horne, told me that the pulse suddenly flagged for a short time. On putting the patient back to bed the

pillows were raised so as to allow of her being in a semi-recumbent position. Recovery was uninterrupted, and the wound healed by first intention.

The growth removed presented the naked eye appearance of sarcoma, but on microscopic examination it proved to be a columnar-celled carcinoma undergoing colloid degeneration.

A further examination of the abdomen and also a vaginal and rectal examination failed to discover any primary growth, though doubtless there must have been one.

I saw the patient again on May 5th when she returned from the seaside. She was then complaining of pain down the left thigh and of vague spinal pains, but there was still no evidence of local growth to be made out, and there was no recurrence of the chest trouble. She appeared otherwise to be fairly well, and was able to call and see me. Though I did not see her again, I heard that she lived for some months and ultimately died from metastases in the bones. As there was no post-mortem examination it was impossible to state the site of the primary growth.

CASE II.—*Chondro-Sarcoma Involving the Pericardium.*

The second case was that of a lady, aged 33, who was brought to see me by a surgeon who had himself removed, fifteen and again eight months previously, what was supposed at first to be an enchondroma of the sternum and left fifth costal cartilage; the tumour had returned rapidly after each operation. It had been noticed a year before the first removal, or a little over two years before I saw the patient, and the course of the disease throughout had been painless. An examination of the growth removed showed it to be a chondro-sarcoma.

On examining the patient, who otherwise was in perfect health, a hard, somewhat irregular tumour was found involving the fifth rib and costal cartilage closely adjoining the sternum. It was firmly fixed to the deeper parts, but was free from the skin and cicatrices of the old operations. From the description given of the previous operations it was quite clear that no operation for the removal of the growth could be undertaken without the possibility of its involving interference with the pericardial sac. This was explained to the patient, who knew the nature of the disease, and it was quite clear that as the tumour had recurred twice, no partial operation could do any good. After other opinions had been taken, and the husband and other relations had been made aware of the dangers likely to be incurred, the patient decided to submit to operation, which was performed on June 5th, 1907.

First Operation.

A dome-shaped incision was made and a flap reflected from the front of the sternum and left ribs, leaving the tumour projecting in the centre. This was laid bare quite down to the sternum and the ribs. The fifth and sixth ribs were divided by bone forceps, and by means of a Hey's saw the sternum was deeply grooved half an inch from the margin of the tumour. The ribs, with the tumour attached, were then gently raised and the finger and a raspator were passed behind it, separating the pericardium as far as possible. When the tumour was reached the pericardium could no longer be separated from it, as it was firmly fixed to and incorporated with the growth. It could not, therefore, be removed without taking away a portion of the anterior wall of the pericardium, which was deliberately done. Bone forceps were employed to divide the remaining portion of the sternum along the groove originally made by the saw. When the pericardium was opened the pulse failed somewhat and the patient became rather livid, but as soon as the growth had been completely taken away the pulse again became regular, though the heart was fully exposed to view. The torn edges of the pericardium were cut away and the margins approximated as far as possible by iodized catgut, but it was impossible to make the edges meet, the gap being in one place fully an inch across. The pectoral muscle was then freed from the chest wall for some distance and the muscular flap was brought over the gap and fixed there so as to completely shut in the pericardial sac, after which the superficial skin flap was placed in position and fixed by silk-worm-gut sutures and Michel's clips. The patient, on being put back to bed in the semirecumbent position, suffered for the first forty-eight hours from slight dyspnoea, but had very little pain. The pulse remained good and the temperature was normal throughout, the wound healing by first intention. Her general health remained good. An examination of the tumour showed it to be a sarcoma blended with cartilaginous elements, the tumour having a capsule and being apparently of a low form of malignancy.

Second Operation.

I did not see her again until a year later, when I had a note to say that there was a suspicious lump on the costal cartilage below the point of the previous removal. Her general health was still good, and there was no evidence of enlargement of glands.

At first I was disinclined to operate again, knowing the extensive character of the former operation; but her own medical man, supported by a well-known physician, thought that an operation ought to be undertaken, especially as the patient and her friends wished it.

On April 28th, 1908, I again operated, removing a portion of the seventh and eighth costal cartilages, and also the lower end of the body of the sternum, all of which seemed to be involved. On this occasion it was not necessary to open the pericardium, which was, however, fully exposed and appeared to be normal.

The tumour removed on this occasion proved to be composed principally of fibrous tissue without any cellular infiltration or

excessive overgrowth of cartilage. The parts removed extended wide of the growth. The patient made a satisfactory recovery from the operation and was quite well for nearly a year. She wore a metal shield covered with wash leather to protect the cardiac region where the natural bony and cartilaginous covering was missing.

The patient is still living, but is suffering from recurrence of growth in the chest wall too extensive for removal.

These cases serve to show that it is quite safe to remove even a considerable portion of the pericardial walls, and that the gap in the fibro-serous sac can be efficiently covered in by a flap taken from the pectoral muscle.

The apparent limitation of growth in both cases and its seemingly complete removal gave hope at the time that operation might be completely successful.

Had it been possible to know the nature of the growth before removal in the first case it would have been recognized as hopeless, since carcinoma of the ribs is a secondary affection, though curiously the primary disease was never found, either when the patient was under my observation or during the later months of life.

The encapsulated nature of the sarcoma in the second case and its apparently complete removal made the recurrence a year later a matter of great disappointment to every one concerned.

Although the actual operation in these two cases was attended with immediate success, the after-progress of the cases was not such as to make one desirous of repeating what was necessarily a very anxious procedure; both for surgeon, anaesthetist, and patient.

I have related these cases from a sense of duty rather than as an example to be followed, and because I think it is an interesting fact worthy of note that the pectoral muscle seemed to answer perfectly as a substitute for the deficient pericardium.

THE SULPHUR MINERS OF SICILY: THEIR WORK, DISEASES, AND ACCIDENT INSURANCE.

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In the spring of 1910 I visited Sicily, with the object of studying upon the spot the conditions under which sulphur mining is carried on, and its effects upon the men and boys employed. I was the guest of Dr. Alphonso Giordano of Lercara, a gentleman whose professional life has been spent amongst the sulphur miners, and who is regarded as the greatest authority on the diseases of the mining classes. Unusual opportunities were thus afforded me, not only of descending into the mines and of seeing the men and boys at work, but of discussing with Dr. Giordano and mine managers what steps should be taken to improve the conditions under which the work is carried on. On my way to Sicily, in passing through Rome, I had an audience of the Prince de Scalia, Under Secretary of State, who was kind enough to ask me to favour him with a report upon the sulphur miners and their work, accompanied by such recommendations as I thought fit to make. This request was subsequently complied with.

Lercara is situated in one of the sulphur-bearing areas near the centre of Sicily. On our way from the station we passed carts laden with large blocks of sulphur, mules carrying similar loads, and near Lercara a few worked-out mines. In consequence of several of the mines having become exhausted, and partly, too, in consequence of American competition, sulphur mining in Sicily has not been prosperous during recent years. There are therefore fewer mines working in Lercara than formerly.

Many of the mines are in the hands of small proprietors, and in them the conditions under which the work is carried on are bad. They are not ventilated. The descent into these, as well as into even most of the large and partly ventilated mines, is by steps cut out of the rock. At one large mine there are 1,000 such steps. Immediately on entering the cave-like opening which leads into a mine the descent at once begins, and as many of the steps have become worn away, are irregular and broken, and have become greasy as the

result of the myriads of bare feet which have travelled down and up the steps, ingress and egress in the feeble light with which the mine is supplied are difficult and not free from danger.

In sulphur mines the men who bring down the ore, mostly by means of a pick, are known as *piconniers*; their work is carried on in a stifling atmosphere and in a high temperature. The exertion required is so great and the attendant circumstances are so trying—although the men work without any clothing—that they are obliged to rest after every fifteen to twenty minutes. I took the body temperature of the men, and found it slightly elevated—37.2° C. (99° F.), pulse rate 91, and respirations 28 to 34. The *piconniers* perspire freely, and drink from eight to ten pints of water daily.

The ore got by the men is carried on the shoulders of barefooted, scantily-clad boys up the steep and worn steps to the surface. As these *carussi* are not always given lights, the journeys up and down are made in the dark. Many are the sad accidents which have taken place owing to the *carussi* slipping. The boys and their burden roll down the steps, entangling in their descent other *carussi* who may be ascending. On coming out of the mine to deposit their burden of ore, these boys are seen to be panting for air, their breathing is quickened, and for the moment they are somewhat distressed. I found the respiratory rate of the *carussi* almost doubled—30 instead of 16—their heart beating at the rate of 128, and their temperature 38.1° C. (100.5° F.). The effect upon the boys of having to carry upon their shoulders such heavy loads of ore as 50 kilos, or a little over 110 lb., and frequently more, is seen in the undersize of the lads and the peculiar distortion of their spine. Formerly boys entered the mines at 7 years of age; now the age required is 12, but the law is not rigidly enforced. The *carussi* not only become hunchbacked and deformed in their legs, but worse; owing to the hard nature of their work, the inhuman treatment by the men, the long hours and monotony of their employment, mental development and physical growth do not keep pace with age, and as a consequence their manhood is arrested. In addition to the boys transporting the ore, the work is also done by men who commenced life in the mines as *carussi*, and who, as the result of having for years carried ore upon their shoulders, present a large hump on their back upon which the ore rests, a deflected spine, deformed lower extremities, and a distorted chest. So diminutive in stature are these men, and so deformed physically, that the Government can hardly obtain in a sulphur-mining district conscripts for the army. In going through the streets of a sulphur-mining town on a summer evening, or better on a Sunday when the men are all standing about, one is struck by the short stature and defective development of the men who transport the ore on their shoulders. Some of the men whom I measured, although 30 years of age and upwards, were only 4 ft. high, and in mental development were but as children. Partial or complete loss of vision is not uncommon among the miners as the result of injuries to the eyes.

The *carussi* are often harshly treated by the *piconniers* and by the men generally. Those who work in the small mines live at home or in lodgings, but at the large mines further away in the country the boys are housed with the men in barracks, the windows of which are barricaded during the day, so that sunlight never enters, and ventilation of the rooms hardly ever takes place. No females are employed to look after the rooms or bedding; men and boys feed together in a canteen, their food being bread, oil, and macaroni, with vegetables, dried beans, and lentils. The men have meat on Sundays, and they drink wine freely that day. So tired are the *carussi* and the *piconniers* after their ordinary day's work in the mines in the country away from the ordinary attractions of the towns, that they retire early to rest. A *carusso* pays 6d. a day for his food.

Sulphur miners work nine hours a day. The boys can make 1 franc a day, or a little more, according to age and physical fitness; the men carriers 1.80 francs, and the miners 3 francs. House rents are cheap in Lercara. One transporter whom I visited in his home paid 2 francs a month for his house; his wife had had eight children, four of whom were alive. The muscles of this man's back were enormously overgrown and the skin of the left