again in 1853. In his long wrestling with scurvy he spent his resources, apparently out of all proportion to the results, to produce any sort of fermented drink for his men; and his laborious achievement of a sort of beer when there were only three men, himself included, of the ship's company able to move from their bunks, argues a great faith in its value. But there is nothing to show that it justified his faith. All his ingenuity may possibly have delayed the onset and progress of the disease, but his men were in the last stages of scurvy and it was only their occasional supplies of fresh meat that saved them.

At its best, under the most favourable conditions, it has never been claimed that beer is a complete protection from scurvy over any extended period of time; and even in Cook's time his beer and his infusion of malt did not alone confer invulnerability. But (before lemon juice removed the need of it) malt preparations do seem to have given a very considerable measure of protection when methods of malting and brewing were simple. Later, as a nourishing drink, and as a substitute for spirits, beer still had value for the seaman on Arctic service; but with the elaborating and perfecting of malting and brewing processes, the antiscorbutic element seems to have been largely if not completely eliminated. Thus the conclusion drawn by Harden and Zilva¹⁰ from their recent experiments with beer made from kilned malt is confirmed by the history of its failure in Arctic experience. But Captain Dyke's account confirms and justifies the belief in the beer used by earlier generations in the Navy, a hundred and twenty years ago.

Clinical Notes :

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

PRE-OPERATIVE X RAY DEMONSTRATION OF SILENT INTRATHORACIC METASTASES OF MALIGNANT DISEASE.

BY C. HAMILTON WHITEFORD, M.R.C.S., L.R.C.P.

THERE are probably few surgeons who, after having removed a malignant growth with its lymphatic area, have not experienced the disappointment of seeing the patient rapidly die from intrathoracic metastases, while the operation area remained free from recurrence. In not a few of these cases the symptoms of intrathoracic involvement appear so soon that there can be no reasonable doubt that the secondary growths were actually present at the time of the operation. Secondary deposits within the thorax are often "silent"—i.e., may exist for a long time and reach a considerable size before giving a distinctive clinical picture. Radiography is in many cases able to demonstrate the existence of these metastases while still silent. Of this the following case is an example.

A stout multipara, aged 60 years, was seen by the writer last spring. The right breast contained a cancerous mass, the size of a lawn-tennis ball, which had invaded the skin surrounding the nipple, but had not yet ulcerated. The breast was freely movable on the chest wall. No glandular involvement could be felt. Clinically the thoracic contents appeared normal. Except for a somewhat feeble pulse there was no obvious reason why a radical operation should not give a chance of cure, provided that radiography showed no intrathoracic metastasis. The skiagram, however, showed, in both sides of the chest, masses of growth, which appeared as shadows, 5 inches in vertical extent, to the right and left of the sternum and pericardium. The husband was informed of the impossibility of a cure by operation, but was advised to sanction a simple removal of the breast in order to prevent the sepsis which would occur as soon as the involved skin gave way.

The breast was removed, and 14 days later the patient left the nursing home. The pathologist reported that the growth was an alveolar carcinoma with very little connective tissue. Three weeks after operation a slight cough developed, but subsided under treatment. Six weeks after operation dyspnoea commenced and the cough returned, with crepitations in both lungs, death occurring three months after removal of the breast.

In nearly every form of malignant disease the thoracic contents are a possible site of metastases which for a time

may cause no symptoms. The presence or absence of such metastases cannot be decided by a consideration of either the size, duration, or position of the primary growth. Further, the metastases frequently cannot be detected by ordinary clinical methods.

Radiologists are now usually able to demonstrate the presence of secondary malignant deposits within the chest. There is no reason why the radiographic examinations should not include regions other than the thorax in which deep-seated silent metastases are prone to occur.

The principle of employing routine pre-operative radiography in those varieties of malignant disease, both sarcoma and carcinoma, which are liable to cause intrathoracic metastases, is relatively new, and at present is but little acted upon. Its importance for the prevention of useless operations is obvious. The principle is deserving of wide recognition and application.

The results of its adoption in the surgery of malignant disease may be expected to include: 1. A diminution in the number of radical operations performed on cases in which the disease has, prior to operation, produced inoperable metastases, and this elimination of incurable cases will, as time goes on, result in a higher percentage of cures among the cases on which radical operations are performed. 2. A decrease in the number of palliative operations, because many patients decline any form of operation unless the surgeon is able to hold out a definite possibility that the operation may result in cure.

Plymouth.

TOTAL EXCISION OF THE URINARY BLADDER.

BY JOHN C. JEFFERSON, F.R.C.S. ENG.,
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THE following record gives an account of a case of total excision of the urinary bladder in a woman for advanced epithelioma of the urethra.

A married woman, aged 60, admitted to Rochdale Infirmary, stated that three months before she had noticed pain on micturition and difficulty in emptying the bladder, these symptoms gradually becoming worse. About two weeks before admission incontinence took the place of retention. An advanced epithelioma of the urethra was found. I am of the opinion that it originated within the urethra, as the greater part was inside the urethral orifice and not actually about it. Further, though the growth had invaded the sphincter vesicæ, causing incontinence, it had not become attached to the pubic rami. The inguinal glands on the left side were enlarged, but freely movable. The patient was in good condition. Some urine obtained by taking catheter specimens was not foul, though it contained pus, and it improved considerably under treatment. As the patient was in a very miserable condition owing to the constant dribbling away of the urine, I decided to transplant the ureters with their vesical orifices into the colon, to remove the bladder and urethra completely, and at a subsequent operation to remove the inguinal glands.

On March 4th, 1918, with patient in high Trendelenburg position, I opened the abdomen in the middle line, the incision extending from pubis to umbilicus. The intestines were thoroughly packed off with gauze and the wound edges protected with tetras. A transverse incision was made through the vesico-uterine fold of peritoneum and the bladder separated from the cervix uteri and vagina. The ureters were readily distinguished and isolated for not more than $\frac{1}{4}$ inch from their entry into the bladder, a stout loop of silk passed beneath each facilitating handling. The peritoneum on the superior aspect of the bladder was peeled off and the viscus freed on all sides until the pelvic floor was reached. The bladder was opened and the ureteric orifices, with a small circle of mucous membrane around each, excised.

The pelvic colon, which, fortunately, had a long mesentery, was next brought down and each ureter transplanted into it separately, as follows. A linen thread stay suture was passed through the mucous membrane around the ureteric orifice. A small incision was next made into the lumen of the colon through the anterior muscular band. Both free ends of the thread were now passed through the eye of a long curved intestinal needle, the needle passed into the lumen of the bowel through the incision and out again through its walls about 1 inch from the point of entry. By drawing on the thread the ureter was then pulled well inside the bowel and retained there while the aperture was closed around it and the terminal free part of the ureter enfolded in the bowel wall with Lembert sutures. The stay suture was then cut and removed. By this means the

¹⁰ Harden and Zilva, 1918. Journal of the Institute of Brewing.

ureter was drawn through a considerably smaller aperture in the bowel than otherwise would have been possible, and one was enabled to work with a shorter length of isolated ureter.

The transverse incision through the peritoneum of the utero-vesical fold was now sutured around the portion of pelvic colon which had been brought down and the abdomen closed without drainage. The patient was placed in the lithotomy position and the removal of the bladder, together with the urethra and the lower part of the anterior wall of the vagina, rapidly completed. A large drainage-tube was inserted into the space left.

The patient bore the operation remarkably well and, with the exception of a little bronchitis, made an uninterrupted recovery. Thirty days after the first operation I wished to remove the inguinal glands on the left side, now considerably enlarged but still freely movable. The patient, however, insisted on returning home for ten days. I reluctantly agreed to this, but owing to an attack of pleurisy she did not return to hospital until August 5th. By this time the glands were so extensively invaded that it was impossible to remove them completely.

The patient has fair control over her rectum, though the bowels are moved on an average five times during the day and twice during the night. There have been no symptoms of ascending infection of the ureters and kidneys. This I consider due to the fact that the whole orifices of the ureters into the bladder, and not the ureters only, were transplanted. There has been no recurrence of growth in the vagina.

I cannot help thinking that had the patient consented to earlier removal of the glands the result would have been much more fortunate. The operation itself was tedious but not difficult. The transplantation of the ureters in the depths of the pelvis was a delicate procedure, requiring care and patience, though it was much facilitated by the stay suture.

Rochdale.

Medical Societies.

ROYAL SOCIETY OF MEDICINE.

SECTION OF PATHOLOGY.

Discussion on the Pathology of Gas Gangrene.

A MEETING of this section was held on Dec. 3rd, Professor W. BULLOCH, the President, being in the chair, when a discussion took place on the Pathology of Gas Gangrene.

Incidence and Bacteriology.

Dr. JAMES MCINTOSH, speaking on researches on the bacteriology of the condition, said that gas gangrene appeared to have been almost unrecognised previous to the Crimean campaign, when it was described under the name of "gangrène foudroyante." Later it seemed to have been confused with various inflammatory conditions, such as hospital gangrene and erysipelas.

On the Western front during the present war its incidence had varied from time to time according to the battle area and the efficiency with which the wounded were dealt, so that reliable statistics were difficult to compile. The incidence among British troops, declining since the early months of the war, has lately only been about 1 per cent. during the most active operations. But even this meant a good deal when many thousands of wounded were being dealt with.

The researches of Pasteur, Koch, Welch, and others showed that the exciting agents were anaerobic bacteria, which were present in all cultivated soils, and thus contaminated the wounds at the time of their infliction. The injured tissues seemed to provide a suitable nidus for the growth of these bacteria, as within a few hours of the infliction of the wound gas gangrene might have already developed. Previous to the outbreak of hostilities Breiger and Ehrlich had shown that the bacillus of malignant oedema (*Vibrio septique*) was capable of infecting man, whilst Welch and Fraenkel demonstrated that the *Bacillus aerogenes capsulatus* had similar pathogenic properties. There was no doubt as to the cause of gas gangrene, but there was considerable diversity of opinion with regard to the most prevalent type, and to the chief features of the types isolated. This was due to (1) the difficulty of isolating many of these anaerobes and of

obtaining pure cultures; and (2) the methods of isolation employed in many instances being such as would tend to bring out the saprophytic forms in preference to the more delicate pathogenic varieties. As an indication of the relative incidence of the different anaerobic bacteria met with in cases of gas gangrene, Dr. McIntosh gave some results compiled from his own observations made on behalf of the Medical Research Committee. In a series of 41 cases from 1914-17, *B. welchii* occurred in 43.9 per cent., *B. sporogenes* (types 1 and 2) in 29.2 per cent., *Vibrio septique* in 19.5 per cent., terminal oval sporing bacilli in 17 per cent.; and of undifferentiated types, type No. 13 in 7.3 per cent., type No. 18 in 4.8 per cent., and type No. 19 in 4.8 per cent. In a second series of 52 cases during 1918, *B. welchii* occurred in 67.3 per cent., *B. sporogenes* in 38.7 per cent., *Vibrio septique* in 16.3 per cent., *B. oedematiens* in 4 per cent., terminal oval spores in 8.1 per cent., and *B. pseudo-tetanus* in 2 per cent. .

Results of Investigations on Causation and Treatment.

Major J. W. MCNEE laid emphasis on the large number of men who, in the first two years of the war, lost their lives or their limbs from gas gangrene. Owing to the early onset of the complication, which usually developed within the first 48 hours after injury, many cases never reached the base, so that for many workers there could be no clear mental picture of the fulminating cases. The earliest development of gas gangrene which he had seen occurred $3\frac{1}{2}$ hours after receipt of the wound, and it was often well established in 10 hours. The rapidity of spread was far in excess of any microbic infection of which he knew, and half an hour's delay in operation might make all the difference between life and death. Gas gangrene reached its height during 1915, and at this time meant the death of the patient or, at best, his survival after amputation of a limb.

In 1916, in close association with Surgeon-General Outhbert Wallace, deliberate work was begun in the First Army on the pathology of the condition, especially by Captain Shaw Dunn and himself. This work arose out of various clinical observations. It was insisted on by Wallace and Kenneth Taylor that gas gangrene was essentially a disease of muscle, and never arose when muscle injury could be excluded. It was also observed that in early cases of gas gangrene single muscles of a group were often involved whilst neighbouring ones escaped. These observations had special reference to gas gangrene spreading in a limb with an intact blood-supply, and the method of spread in such cases formed their first line of research. It was realised that cases of what came to be known as *group* gangrene were in a different category as regards spread. In them a large blood-vessel was always divided—e.g., the popliteal—and gangrene of gaseous type commenced in all the muscles of the group simultaneously. The onset of gangrene in such devascularised segments of limbs was seen to be analogous to invasion of the warm tissues after death, such as occurs in hot weather. Sections illustrating the spread of gas gangrene in living muscle with an intact blood-supply were shown. In their account of their work, which has already been published in full, great emphasis was laid on the *spreading edge of the gangrene*, a histological study of which gave the clue to the method of spread. The essential factor in the spread was the passing up of a fluid substance in the sheaths of the muscle fibres, causing death and coagulation necrosis of the muscle fibres. In the muscle fibres so killed off an invasion by the anaerobic bacilli at once took place, the muscle sugar being split to give the characteristic evolution of gas. It was not until Bull's work on *B. welchii* toxin was published that the full truth was known. They called the spreading edge where the muscle had just been killed off the "pre-gas" zone of gangrene. Experiments on rabbits showed that if the organisms freshly isolated from a human case were injected intramuscularly no spreading gas gangrene followed unless the muscle was first extensively injured or blood clot was produced.

In wounds of this war, in contrast to those of other wars, all the necessary conditions for the origin of gas gangrene were provided. This war had been fought on a heavily manured soil, saturated with the anaerobic bacilli derived from animal manure. We had had the composite bullet, which breaks up readily, and we had had the short-range warfare of the trenches, so that