canal was thus obtained, and a small vertical slit in the dura mater showed where the missile had entered. There was a considerable escape of cerebro-spinal fluid. The dura was incised in an upward direction from this slit and the foreign body, a piece of copper driving band, half an inch by a quarter of an inch, was found embedded superficially in the spinal cord, about half an inch above its termination. It was removed, together with some fragments of cloth, the wound in the cord being bipped, and the canal sutured with fine catgut. The rest of the operation area, with the track in the erector spinae, was then bipped and the whole completely sutured, with catgut for the muscles and silkworm gut for the skin.

After-History.

The patient was retained in hospital ten days. The excessive pain and hyperaesthesia were much improved the following day, and disappeared very quickly. By the third day he was able to flex both knees and hips, and the power in his limbs increased up to the time of his evacuation. A catheter was passed night and morning at first, and the bladder washed out with boric lotion. On the fourth day he micturated himself, but for the next two days required a catheter again. From the seventh day he micturated regularly, and completely emptied his bladder. The wound had healed completely before his evacuation to the base, and his general condition was very satisfactory.

CASE II.

Pte. N., stretcher-bearer was admitted (April, 1918) with a wound of the back, about 2 in. to the left of the middle line, and opposite to the fifth lumbar spine. His chief complaint was of pain down the left leg, like sciatica, aggravated by the weight of the clothes. There was loss of power in the leg, though it was not completely paralysed, the movements being limited and weak. The right leg was much less affected. He said he had tried to pass urine and had failed, and there was a feeling of numbness in the penis. X rays were not available. A catheter was passed and normal urine withdrawn.

Operation.

About eighteen hours after being wounded the wound and damaged erector spinae were excised, and the track found to lead into the vertebral canal on the left side between the laminae of the fourth and fifth lumbar vertebrae, with fracture of the fourth. On introducing the beak of an artery clip along the track into the canal, it came into contact with the missile, the characteristic metallic sound being elicited. An attempt to extract the fragment resulted in its being pushed further up the canal, the manipulations being accompanied by contractions of the limb muscles. Laminectomy was proceeded with as in Case I, the skin flap being turned over to the right side, and the third, fourth, and fifth lumbar spines snipped off by nibblers. The foreign body, which was a piece of shell the size of a hazel nut, could not be removed till the laminae of the third as well as those of the fourth lumbar vertebrae were partially nibbled away. The fragment, which had particles of clothing attached to it, appeared to fill the canal, and there was considerable damage to the nerves in the cauda equina. The hole in the dura mater was quite ragged and there was considerable escape of cerebro-spinal fluid. The hole was not sutured. The whole operation area and track were bipped and completely closed, with catgut for the muscles and silkworm gut for the skin.

After-History.

On account of pressure the patient was only retained in hospital for six days. After the operation temperature and pulse were normal, and, apart from what he called a "chronic dyspepsia" his general condition was quite good. A catheter was passed night and morning and the bladder washed out. He complained of numbness in the left leg rather than pain, though he continued to have some of the "sciatic pains," which diminished in severity with time. In addition to the leg, he complained of numbness of the penis. The loss of power and the movements in the legs were about the same as before the operation. At the time of his evacuation to the base the wound looked quite well.

CASE III.

Bombdr. B. was admitted (June, 1918) with multiple wounds. His story was that he lost the power of his legs at the moment of being hit, and at the same time he experienced severe pain shooting down the legs, especially the left. Since being wounded, in addition to the pain, he complained of a feeling of "pins and needles," referred to the left leg particularly, as well as numbness and loss of power. The movements in the left leg were very slight, but quite good in the right. He had experienced no difficulty with his urine. His injuries consisted of:

1. A penetrating wound on the back of the left wrist.
2. Entrance and exit wounds of the left side of the scrotum, with a large haematoma.
3. A large dirty tangential wound on the inner side of the left thigh, close to the fork.
4. Entrance and exit wounds of the left buttock, superficial.
5. A small penetrating wound of the back 1 inch to the right of the middle line, at the level of the fourth lumbar spine, associated with considerable swelling.

Operation.

He was operated on about twelve hours after being wounded.

1. The wound over the back of the left wrist was excised, and a large piece of shell was found embedded in the lower end of

the radius. It was removed, and the hole in the bone scraped and cleaned. The track was then bipped and left open.

2. The entrance and exit wounds of the scrotum were excised, and much blood clot evacuated. The testicle was found to be destroyed; it was removed. The wounds were bipped and sutured up completely.

3. The thigh wound was excised and sutured completely.

4. The entrance and exit wounds of the buttock were excised, and the track cleaned and bipped. It was left open.

5. The small entrance wound of the back was excised. The track extended inwards, fracturing the spine of the fourth lumbar vertebra and passing across the middle line. It continued between the laminae of the third and fourth lumbar vertebrae into the vertebral canal, chipping the lamina of the third *en route*. On passing the beak of an artery clip into the canal the metal foreign body was struck, but it could not be gripped. Laminectomy was proceeded with as in the other cases, the skin flap being turned over to the left side. The spines of the second, third, and fourth lumbar vertebrae were removed, and the laminae of the third only. The missile had passed through the left side of the canal, and at the time of operating was half in the spinal canal and half impacted in the back of the body of the third lumbar vertebra. It was removed, together with some shreds of cloth, and turned out to be a shell fragment $\frac{1}{2}$ in. by $\frac{1}{4}$ in. There was the usual escape of cerebro-spinal fluid. The hole in the vertebral body was scraped with a spoon and cleaned. No serious damage to the cauda equina was noted. The whole area was bipped and completely sutured, with catgut for the muscles and silkworm gut for the skin.

After-History.

The patient was retained at the casualty clearing station for twelve days.

1. The wrist did quite well, and, as there was no inflammation, it was sutured up on the ninth day.

2. The scrotal wounds healed by first intention.

3. The thigh wound was slightly moist from repeated fouling, but no stitches had to be removed and it did very well.

4. The entrance and exit wounds of the buttock remained quite clean, and both apertures were sutured on the ninth day.

5. The spine incision healed completely by first intention.

The patient had no trouble with micturition from the beginning. Pain gradually diminished in the limbs, and sensation and power improved. He described himself as being "ready for anything" when he was evacuated.

Apart from the complications arising from the nervous injury, those that may be expected in cases of this nature are the same as in other injuries. Haemorrhage, which may be considerable both from the muscle detachment and the bone removal, is controlled, as has been mentioned, by hot packs and pressure, and, as in head cases, the application of bipp to the cut bone surface has been found to be of assistance.

Sepsis may lead to a spinal meningitis, but, in addition, prolonged catheterization is very liable to end in infection of the urinary passages, with serious results. At the same time, in cases like those here recorded, where probably it is a question of a few days only before micturition is re-established, one is loath to do suprapubic cystostomy. (The risk of this infection ceases with the re-establishment of micturition.) Unfortunately no report of Case II after his evacuation is to hand from the casualty clearing station, though one was asked for.

No shock was observed in any of the cases, and they were well from the first.

These are essentially the class of case in which x rays are of the greatest assistance, but they were only available in the first. Fortunately in the other two the missile could be actually felt in the canal on passing the beak of an artery clip along the track.

NOTE.—In a letter from England from Bombdr. B. (Case III) dated August 6th he says he is "out of bed for the first time." From it I judge his recovery was uninterrupted.

THE VALUE OF FLAVINE.

A CLINICAL APPRECIATION.

BY

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CASUALTY surgical practice always affords a large proportion of septic injuries which, although "minor" from the point of view of the operating surgeon, nevertheless are extremely disabling to the patient for the time being, and, as in the case of finger lesions, may result in permanent impairment in the earning capacity of an artisan. Therefore I have devoted much attention to the treatment of these cases with flavine. The observations were almost

entirely clinical, but in a few cases I was able to compare the numbers of organisms before and after the application of flavine by taking frequent cultures, as well as by microscopic examination. The results obtained in these seemed disappointing at first, because I often found very little difference in the rapidity of growth or number of colonies before and after treatment and in cases treated otherwise, but I almost invariably found that, whereas in those cases not treated with flavine there was usually a considerable amount of local inflammation, lymphangitis, enlarged glands, and high temperature, and that repeated incisions and removal of tissue (all most vexatious to the patient) were required before a cure was obtained, on the other hand, in cases treated with flavine I have come to regard the absence or marked decrease of constitutional symptoms as the rule. Further, if these local or general symptoms pointing to active infection are present, flavine properly applied has actually worked wonders in bringing about rapid improvement.

The application of flavine should be very carefully attended to. I have known several workers who condemned it, but upon inquiring into their methods it was clear that their results were undoubtedly due to improper use of the antiseptic. For instance, it is not uncommon to hear that cases have been treated for days or weeks with flavine and, except for an initial good effect, the condition has not improved at all. This is very true, but it is due to failure to make use of the valuable properties of flavine. In my experience, which entirely corroborates that of Drummond and McNee¹ and Carslaw and Templeton,² it is the early effect of flavine, which follows within several days after its application, that is the most important feature; the great advantage to be gained from its use at this stage does not seem to be sufficiently recognized.

A few essential facts must be borne in mind for the use of flavine: (1) In the first place it is imperative that all affected parts should be reached as far as possible, and in order to carry this out thoroughly I always endeavour to introduce flavine solution by means of a hypodermic or dental syringe. (2) The flavine-soaked gauze should always be applied as wet as possible and any cavities filled up with the solution immediately before, and the part covered with a piece of mackintosh and wool. (3) A third important feature is the duration of the use of flavine; if applied continuously, a yellowish "pellicle" will appear on the surface of the wound in the course of a few days. This pellicle appears to be composed of leucocytes and fibrin. It is noteworthy that in several cases I have observed that the pellicle failed to appear when using flavine in double saline solution (that is, 1.7 per cent. NaCl) instead of the usual normal saline. It is not well to use this solution over prolonged periods, however, because it seems to predispose to irritation of the skin and the appearance of a rash.

I have been led to conclude that the best results from flavine have been obtained from its early application and that the appearance of the pellicle is an indication that a change should be made—for example, to eusol, brilliant green, or magnesium sulphate—on the fourth day or thereabouts and then to revert to flavine once in every three days. This method has given me great satisfaction. It is clear that an enormous amount of sepsis would be prevented by the primary use of flavine, and therefore its use is to be advocated in every case septic or likely to become septic.

The use of the hypodermic syringe has been mentioned above. One of the best conditions to demonstrate the procedure is the common whitlow; after incision, the needle is inserted well down into the tissues a short distance proximal to the lesion and inclined towards it; it will then be found that on emptying the syringe the fluid exudes from the incision and thoroughly irrigates the infected base. It may be necessary to inject in two or more places in order to get a satisfactory irrigation of all parts, and it has been found advantageous that some of the fluid should infiltrate the tissues. By this method it has been possible almost entirely to do away with the practice of fomentations and baths. Admittedly the initial treatment is somewhat more painful than putting on a fomentation, and so it is advisable to use a dental syringe with its fine needle. In spite of the initial discomfort many of my patients have remarked on the rapidity of healing. In this connexion the use of flavine which I have practised in the

treatment of lymphangitis and enlarged and painful glands is worthy of note. Although in most cases efficient treatment of the primary lesion speedily causes relief of this condition, in severe cases, seen for the first time after lymphangitis and lymphadenitis have developed, 10 to 20 minims of flavine (1 in 1,000) have usually been injected into two or three places along the tract of lymphangitis after treating the primary lesion; the results have been excellent. I have also found that 1 in 1,000 flavine solution may be safely introduced into the abdominal cavity in cases of appendix abscess, gastric perforation, etc., a quantity being left in the peritoneum after the completion of the operation. I should like to emphasize the value of this procedure, as I am convinced of its advantages. For general use the most efficient preparation has been found to be acriflavine 1 in 1,000 in normal saline.

REFERENCES.

¹ *Lancet*, October 27th, 1917. ² *Ibid.*, May 4th, 1918.

EXTENSION APPARATUS FOR FRACTURE OF THE FEMUR.

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MANY cases of fracture of the femur arrive at base hospitals without extension which extends. The surgeon at the casualty clearing station may have applied a good extension and seen to it that sufficient pull was applied. When the case left his hands the extension strips were exerting traction, but there are several reasons why the case may arrive at the base without extension—the extension strips stretch, the ring of a Thomas splint settles into the buttock, and no provision has been made for these factors.

The trouble lies in the footpiece. There are many—far too many—in use, and each has some single virtue. None perform all the functions required, so that a surgeon must choose which function is most important and use that footpiece.

The footpiece I have devised combines the important features of practically each of the old models and has the additional advantage of allowing the leg to be slung below the level of the bars of the splint. The extension strips

can be tied to the bars of the footpiece which render a spreader unnecessary, since these are just wide enough apart to clear the malleoli and not so wide as to produce anterior-posterior cutting about the ankle.

To compensate for the loosening of the extension, a spiral spring may be hooked to the cross-bar of the foot-piece provided for the purpose. By tying the distal end of the spring to the end of the splint, extension is produced which acts through the spring. The spring is such that 20 lb. pull will stretch it $1\frac{1}{2}$ in., that is, 7 lb. per $\frac{1}{2}$ in. Then the extension may loosen $1\frac{1}{2}$ in. before it becomes loose. This obviates the necessity for watching the tension of extension strips. An advantage of the spring is that as the fracture stretches out the pull automatically