fluid. Clinically the results have been the same, whether or not these salts were present in solution. It will be noted that the amount of novocain exceeds 6 grains. I have repeatedly used as much as 15 grains in a local or regional anaesthesia, and have seen 35 grains injected without the slightest evidence of toxicity. Such trouble arises much oftener from old and decomposed adrenalin than from novocain.

There is great individual variation, not only in the capacity of sacral canals, but also in the tightness with which the orifices are plugged by soft parts. Hence the resistance encountered in making the injection is variable. In many cases the solution goes in quite as readily as though the syringe were being emptied into the air. A fair degree of ease is the rule. Not uncommonly, however, considerable force is necessary. When such is the case, one should always suspect that the point of the needle may be engaged under periosteum instead of lying free in the sacral canal. Superficial oedema over the sacrum should be carefully watched for during injection; its appearance is conclusive proof that the needle is not within the canal. When the injection is correctly made, patients often note a transient dull ache down the inside of the thighs and legs—a result of pressure on the first two posterior sacral roots. This symptom is presumptive evidence of success in placing the needle. As soon as the full amount is injected the needle is withdrawn with a quick movement. As a rule, no dressing is necessary over the puncture.

Injections of the sacral canal in the cadaver with methylene blue show that the solution travels up extradurally to a variable extent into the lumbar region. This of course does no harm, except that some fluid is lost from the sacrum. To combat this by the aid of gravity it is advisable to place an extra pillow under the shoulders of the patient as he rolls over on to his back.

It is necessary to wait fifteen minutes for the development of the anaesthesia. This rarely takes longer; often it is complete in ten or twelve minutes. During this interval the patient should lie quietly, and should not be disturbed by talking or the rattling of instruments. His pulse and colour should be watched. If preliminary morphine and scopolamine have been given, he will probably doze. Scopolamine produces a very dry mouth, and water may be given if desired.

Preliminary tests of anaesthesia are likely to be misleading. The pressure sense is often retained where the pain sense is lost, and if the buttock is poked with a needle the patient is sure to state that he feels it. One often hears men inexperienced in local anaesthesia repeatedly asking such questions as "Does it hurt?" or "Do you feel that?" before and during an operation. If it does hurt, the patient will certainly not conceal the fact. Such interrogations are the worst possible psychotherapeutics. A fairly satisfactory test is to pick up the skin near the anus with a sharp-pointed towel-clip, or to put a pair of forceps on a projecting haemorrhoid. But the real test of an anaesthetic method is, after all, in the operation.

All operating under local or conductive anaesthesia requires special gentleness of manipulation. Rough pulling and tearing of tissue are likely to disturb the patient, even though they may not cause pain. Sharp dissection is generally preferable to blunt. Under intrasacral novocain the sphincter is, as a rule, slightly relaxed. Unless it is dilated very slowly and easily, pain referred to the epigastrium may be felt. The ordinary crushing, cutting, or burning of piles can be carried out in the usual way.

No accurate data are at hand as to the duration of the anaesthesia produced by this method. It has always lasted long enough for the operation in hand. In one case, at least, it was still perfectly efficient two hours after injection.

A purely local infiltration anaesthesia may be attended with varying degrees of success. A conductive anaesthesia, on the other hand, is usually either a perfect success, or a flat failure. In a series of more than eighty intrasacral cases the writer has failed six times. Three of these were among the first ten cases, and were undoubtedly due to inexperience and faulty technique in the placing of the needle. In the last three failures it seemed almost certain that the injection had been correctly made; in two no anaesthesia was obtained, in the other a unilateral effect only. It is difficult to explain these cases except on the

ground of an abnormal arrangement of sacral nerves and dural sheath, preventing access of the solution to the nerve trunks. It has been suggested that a factor in the unsuccessful cases might be a low fluid pressure in the sacral canal. This does not seem likely, for perfect anaesthesia is often produced when the solution has gone in with no appreciable resistance. Furthermore, if the volume of the solution is doubled without increasing the amount of novocain, less satisfactory results are obtained.

THE TREATMENT OF GONORRHOEA WITH ACRIFLAVINE.

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THE account given of flavine by Browning and his associates, in the *BRITISH MEDICAL JOURNAL* of January 20th, 1917, showed that flavine possessed in a high degree the properties required of a genito-urinary antiseptic, and it was used as soon as a supply was forthcoming (June, 1917). The results obtained in gonorrhoea cases were very satisfactory, and it now occupies the chief place in the scheme of treatment adopted in the venereal clinics under my control.

The solution recommended for general surgical use (1 in 1,000 in normal saline) was found to be too strong for free application to the urethra. The strength which may be employed for the urethra varies inversely with the quantity of solution used. Thus, when using small quantities by the syringe method of treatment, a concentration of 1 in 1,000 in normal saline may be prescribed, but in lavation ("grand lavage" of Janet) 1 in 4,000 in normal saline was found to be the optimum, one pint being used twice daily.

Stock solutions of 1 in 500 acriflavine and of 1 in 6 sodium chloride are kept, and 20 oz. of the dilute solution is prepared for each patient by mixing 2½ oz. of the acriflavine solution, 1 oz. sodium chloride solution, and 16½ oz. warm water (106° F.). The stock solutions are filtered if not perfectly clear.

For anterior urethritis, treatment by syringe injections is simple for the patient to carry out in private practice as compared with lavation by means of a douche can, but it cannot be recommended as a routine procedure. The posterior urethra is infected for some time, probably one to three days, before definite symptoms of its involvement are manifest, and it is important that treatment of the posterior urethra should not be withheld during this period.

Brilliant results can be got by 1 in 1,000 acriflavine injections in a proportion of cases, but this method neither prevents the occurrence of posterior urethritis nor aborts it if existing, and is followed by a larger percentage of complications. During a properly conducted treatment by urethro-vesical lavation, posterior urethritis with its risk of complications does not arise; the onset of prostatitis or epididymitis after lavation has been begun means either that gonococci had previously reached the prostatic or seminal ducts, or some failure in the method of lavage.

The following analysis of the cases of gonorrhoea treated in a general hospital during a period when acriflavine was largely employed (January to September, 1918) proves, I think, the value of acriflavine lavation.

A total of 423 cases of gonococcal infections were admitted, and the average detention in hospital was 28.8 days. Of these, 307 were cases of acute gonorrhoea; I have classed 116 provisionally as chronic, the disease having been present for one month or more. The acute cases had an average stay in hospital of 26.8 days; in 222 of them acriflavine was the only antiseptic employed; these cases averaged 21 days in hospital. Of this group of cases, 26 suffered from complications on admission—namely, epididymitis 19, rheumatism 2, cowperitis 2, stricture 2, prostatitis 1. If these are deducted there remains 196 cases of uncomplicated acute gonorrhoea treated by acriflavine lavation. These cases show an average of 19.8 days in hospital, the actual treatment being completed in 15.4 days, and the patients being retained for other 4.4 days for observation before being dismissed as cured. Of the acriflavine treated cases, 6 per cent. relapsed; these cases had been, on an average, only

11 days in hospital, and less than 7 days under treatment we now know to be insufficient.

The complications arising in cases under acriflavine treatment were as follows:

1. *Epididymitis* (2 cases). In both the epididymitis developed while the patients were undergoing dilatation treatment with bougies for glandular involvement, and in both cases the customary insertion of atropine suppositories had been neglected. Infective material expressed from the diseased glands would be carried into the posterior urethra by the bougie, the passage of which would, in the absence of atropinization, excite reversed peristalsis. After the withdrawal of the bougie the patient filled the bladder as usual with acriflavine solution, but gonococci had meantime been carried along the common seminal duct beyond the reach of the antiseptic, and in due course an epididymitis resulted.

2. *Subacute Prostatitis* (2 cases). Both had an acute posterior urethritis and probably some prostatitis when admitted.

3. *Cystic Abscess* (3 cases).

Clinical Course.

When a case of acute gonorrhoea with profuse purulent urethral discharge is put on acriflavine lavation the inflammatory symptoms quickly subside. Within twenty-four hours the discharge has decreased to one-third, and by the third day it has usually disappeared, leaving perhaps a trace of moisture expressible in the morning. After three or four days' treatment gonococci are absent from smears taken from the urethra, nevertheless if the lavage is discontinued at this time discharge and gonococci will return within a few days in many cases. The treatment should therefore be maintained for ten to twelve days, when, with the smear negative, no discharge expressible in the morning, and the morning urine showing neither pus nor filaments, all treatment may be suspended. The patient receives a change of underclothing and remains under observation for four days longer, when he may be discharged to duty should no symptoms of relapse have developed.

Cases which have not cleared up on the tenth day fall into one of the following groups:

I. When the discharge is scanty but diffuse pus is present in both urine glasses, there is probably some degree of cystitis present with a secondary infection by some other organism. In such case a urinary antiseptic—for example, hexamine—is indicated; and, in addition, a small quantity of the acriflavine solution may be left in the bladder overnight. Should these measures not be quickly effective, oxycyanide of mercury solution (1 in 5,000) may be substituted for the acriflavine.

II. In the presence of a continued urethral discharge there is probably a cystic abscess in the anterior urethra or an infected para-urethral passage or other duct where the gonococci are beyond the reach of the acriflavine, and special treatment is therefore required.

III. If filaments are present in the urine glandular involvement is suggested. The prostate should be examined per rectum, and the urethra should be explored with an acorn-tipped bougie and examined through the urethroscope, and treatment appropriate to the condition found should be instituted.

Before any instrumentation involving the posterior urethra, and also before any thorough rectal examination is attempted, atropine suppositories (1½ grain) should be used to obviate the risk of vesiculitis or epididymitis being excited.

Mode of Action of the Acriflavine.

Acriflavine acts both on the medium and on the invading organism.

1. That the acriflavine penetrates the tissues is indicated by the staining of the mucous membrane which is apparent after its use. The mordant action of sodium chloride may have some effect in delaying the disappearance of the dye. There is evidence in the urine of the presence of acriflavine for several hours after lavation, and the mucosa therefore is kept in a condition which renders it unsuitable as a medium for the growth of gonococci. This effect of the acriflavine can be demonstrated in the laboratory by washing a sloped tube of gonococcus medium with acriflavine solution; gonococci will not grow on medium so treated.

2. Acriflavine is a gonococcicide. Colonies exposed to the action of a 1 in 4,000 solution are killed in two minutes.

There are no contraindications to the use of acriflavine, and the only drawback to its use is the staining by this powerful dye of clothing and hands. This can be

reduced to negligible proportions with sufficient care; a perforated rubber apron and rubber gloves may be used. Stains may be removed from fabric by means of eusol, and from the skin by 1 per cent. hydrochloric acid in methylated spirit.

Acriflavine, in my experience, has proved a distinct advance on any antiseptic previously used for the treatment of gonorrhoea. In attempting to improve on the results achieved by lavation with potassium permanganate I have tried many other antiseptics—for example, brilliant green, auramine and other dyes, eusol, chloramine-T, etc.—and, instead of lavation, I have experimented with instillations and injections of acriflavine, brilliant green, etc., in various oils, but so far I have found nothing to alter the conclusion reached over a year ago, that lavation with 1 in 4,000 acriflavine is the most satisfactory routine treatment for acute gonorrhoea at present available.

THE VALUE OF "BIPP" IN PRIMARY OPERATIONS FOR GUNSHOT WOUNDS OF JOINTS.

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THIS war has been responsible for bringing before the notice of the profession many antiseptics, of which some are new and others have been revived. Bipp (bismuth, iodoform, and paraffin) is one of the latter, but, as with many other things, its results are disappointing unless one carries out to the letter every detail in the preparation of the material and surgical technique as laid down by Rutherford Morrison.¹

If strict attention to detail is observed, it is my opinion that surgeons will find in bipp a valuable asset, particularly so in the case of joint wounds. Its value here is obvious if one can obtain primary union of skin and bone as well as good functional result; for not only has the limb been saved, but the actual time taken in recovery is far less than by any other method of treatment, and I venture to say that the ultimate functional result will be much better.

The two cases I am about to record were each wounded by shell fragments, and naturally the wounds were in a very lacerated and dirty condition, being covered with sand.

CASE I.

Sgt. A. was admitted to the casualty clearing hospital on May 17th, 1918. There was an extensive shell wound of the left elbow, a semilunar flap of skin including the olecranon process of the ulna had been reflected upwards, and there had been free bleeding from the interosseous recurrent artery. The joint was completely exposed from behind and the synovial membrane and skin edges severely bruised.

Operation.

The skin was cleansed with ether, methylated spirits, and carbolic lotion (1 in 20), but the wound itself, including the exposed joint, was cleansed with methylated spirits and flushed with saline. No carbolic solution was used for fear of irritating the joint. Extreme care was taken to get as much sand as possible out of the wound by lightly rubbing with a swab whilst the saline was flowing. When the wound was thoroughly cleansed the skin edges were excised, lacerated muscle and ligamentous tissues removed, and the edges of the lacerated synovial membrane trimmed. All the bleeding points were secured. The wound was again flushed with saline, a swab steeped in methylated spirits was applied, and fresh towels arranged. Bipp was then lightly rubbed into every crevice of the wound and the olecranon was secured in position by passing iodized catgut smeared with bipp through the periosteum of its posterior surface and the periosteum of the shaft of the ulna. The synovial membrane was likewise sutured with fine catgut and the wound closed with a continuous stitch of thread smeared with bipp. A spirit gauze dressing was applied and the limb secured to an anterior straight splint.

I kept the patient under observation for seven days, during which time the temperature twice rose to 100.6°, but the pulse never rose above 80. On the fourth day I had to change the dressings because there had been a copious serous exudation. The wound then had a sodden appearance, but was otherwise healthy. I squeezed out a quantity of serum and reapplied a spirit dressing. On the fifth day the temperature subsided and remained normal until the patient was evacuated on the seventh day. Five weeks later I learnt from the base that there had been primary union of the wound, that the functional result was already very good and would be still better.