The method I favour most is the extension of the original incision to form a large U or S flap.

FIG. 1.

FIG. 2.

FIGS. 1 AND 2.—To illustrate plastic operation for closure of an elliptical loss of tissue in the scalp. Fig. 1: First stage, showing line of incision for detachment of flap. Fig. 2: Operation concluded.

To close an elliptical loss of tissue in scalp by plastic method, the ends of the wounds may be sutured to reduce the amount of plastic necessary (Fig. 1).

An S incision is made as indicated by the dotted line (Fig. 1). The end A should extend well beyond a line drawn at right angles to the main axis of, and through the end of, the raw area. The scalp is undermined completely to any desired extent, as indicated by the shaded area. This is easily done by thrusting a curved blunt-pointed scissors, concavity towards the skull, between the aponeurosis and pericranium, opening the blades and withdrawing. Here and there it may be necessary to cut away resistant strands of tissue. Suture at *a-a'* to see

FIG. 3.—Diagram of plastic operation for triangular defect in the scalp.

the dura. Thus this method has an advantage over that of turning down a flap, and is no more elaborate. For a triangular defect, proceed as shown in Fig. 3.

After-Treatment.

The semi-recumbent position in bed seems to be that most appreciated by the patient, and at the same time I

think it helps to prevent hernia. Constipation is a feature of these cases. Early action of the bowels is always important. All head cases are given as a routine after operation, calomel gr. vj, followed by salines next morning. Urotropin gr. xx every four hours for thirty-six hours, then intermitted for twenty-four and later repeated, undoubtedly helps to render the cerebro-spinal fluid more capable of dealing with bacteria.

The drain is usually removed in twenty-four to forty-eight hours after operation.

Lumbar puncture ought to be resorted to *before* any marked signs of excessive cerebro-spinal pressure occur—for example, for persistent headache, focal spasms, or a tendency to hernia cerebri. These symptoms are frequently due to local interference with circulation. Removal of cerebro-spinal fluid seems to allow in most cases a rapid readjustment. This may be of importance in preventing "spreading oedema."

The amount removed varies from 10 to 30 c.cm. at a time, according to the amount of pressure. The wound, especially if open hernia cerebri is present, ought always to be observed during removal of fluid, which must be done slowly, in order to prevent breaking down of protective adhesions in the neighbourhood of the lesion.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, February 19th, 1916, p. 261.

EARLY TREATMENT OF GUNSHOT INJURIES OF THE SPINAL CORD.*

BY

TEMPORARY COLONEL H. M. W. GRAY, C.B., A.M.S.

To judge from the greater vulnerability of the spinal cord, its lesser capacity for recovery, and from the anatomical arrangement of the spinal canal, it might have been thought that the general desire to interfere in spinal injuries, and to prevent secondary complications, would have been as great as that shown with regard to cranial injuries, but this has not been the case. The technical difficulties of the classical operation of laminectomy, the loss of blood entailed by it occasionally under general anaesthesia, and the doubtful results of deferred operations, seem to be the chief factors in preventing patients, suitable for early operations, being treated on principles similar to those which govern our treatment of wounds in other parts of the body.

In these late cases the patients are usually in poor condition, suffering from pulmonary or urinary complications, and the parts are obscured by masses of fibrous tissue. But in early cases the presence of fractured laminae usually makes the operation a comparatively simple one; it is easy to perform under local anaesthesia, and the use of good adrenalin makes it practically bloodless. Pulmonary complications are not predisposed to, or influenced by, the anaesthetic. Operation in the early stages can, in fact, be done with extraordinarily little upset to the patient. Out of a large number I have never seen a death which could be said to have been hastened by it.

The fact that so many cases improve without operation, in spite of the abnormal conditions by which the cord is surrounded, would lead one to hope that they would improve more rapidly as well as to a greater extent, and that some cases otherwise permanently paraplegic might experience relief if they were submitted to early operation. The cord, to a greater extent than most parts of the brain, is deleteriously affected and retarded in recovery by pressure of fragments of bone, foreign bodies, and other debris. There seems reason to believe that it responds well to prompt removal of these unnatural conditions.

In a casualty clearing station, however, during an action, a hurried selection of cases for evacuation must be made. Under present conditions only those which are most favourable must be retained. In all cases which are sent off by ambulance train the urine should first be drawn off if retention be present.

Some general considerations in making the decision are here mentioned.

There are three types which arrive at a casualty clearing

* Paper read at a meeting of medical officers of an army in the field.

station showing paraplegia—one in which the symptoms are due to local concussion, another in which the cord is organically severed, and a third in which paraplegia has developed since the injury. The paralyzing effects of local concussion are often very marked. This may be caused even by the flight of a missile close to but outside the spinal canal; for example, temporary paraplegia may follow the passage of a rifle bullet from side to side between the spinous processes. In such cases the paralysis usually begins to clear up within a few days.

If no sign of return of function occurs within nine or ten days, the question of operation for removal of blood clot or possible depressed bone occurs, but must be decided at the base. If, on the other hand, a rifle bullet causing a through and through wound of the trunk traverses the spinal canal, the cord is usually hopelessly pulped. An estimate should therefore be made of the probable track of the bullet, bearing in mind that the position of the patient during examination may not correspond to that in which he was hit.

It is obvious that cases of complete sudden paraplegia should not be kept in the casualty clearing station if they are otherwise fit to travel. If, however, the paralysis has developed since the man was wounded, it is probably due to pressure from blood clot (when it is not likely to be absolute), or to displacement of fragments of bone during movement. In both these cases early operation may be indicated, but in the latter only if *x* rays show a minor degree of displacement. If displacement is great the cord is probably pulped.

If conduction, either motor or sensory, is present in the affected part of the cord when the patient is admitted to the casualty clearing station, it is usually found that fragments of bone are pressing on the cord, or that the missile causing the injury is in close relationship to it, and will probably have carried in sepsis. There may or may not be partial division of the cord. A missile with momentum sufficient to carry it far past the cord usually produces complete early paraplegia, even although it may not cause complete section. If, then, *x* rays reveal fracture or the presence of a foreign body partly or wholly in the spinal canal, operation should be done at once, with the quadruple purpose of relieving pressure, cleansing the wound, restoring normal circulation as soon as possible, and, thus, of combating sepsis.

In some cases pain is so excessive and uncontrollable by other means, that, whatever the amount of paralysis, operation is imperative in order to relieve the pain.

Selection of Cases for Operation.

Roughly speaking, it may be said that operation is indicated or advisable at a casualty clearing station:

- (1) In the presence of incomplete paralysis of motion or sensation below the lesion, especially
- (2) if *x* rays show displaced fragments of bone or the presence of a piece of metal in or near the cord.
- (3) When the symptoms of paralysis have developed after the infliction of the injury, unless due to inflammation in cases which have been "lying out," when operation is practically hopeless.
- (4) When pain, due to pressure on nerve roots, is excessive and uncontrollable.
- (5) In very exceptional cases, when the character of the wound is such that sepsis, although not already evident, is likely to develop and cause rapid death.

In all other cases it is better, when feasible, that the patient should be evacuated without delay.

In cases which are retained for more than a few hours in a casualty clearing station, urotropine should be given as a "routine" in an attempt to prevent cystitis. Too great care cannot be exercised in performing catheterization.

Certain Operative Details.

1. Local anaesthesia, by infiltration down to and including the periosteum of the laminae and articular processes, is as effective as in a trephining operation, and even more easily carried out. The patient should receive such a preparatory dose of morphine or omnopon-scopolamine that he becomes drowsy. It is rarely necessary to use a small amount of chloroform at any stage of the operation, unless the track of the missile is followed into non-anaesthetized tissues. A few whiffs may be given if

the patient complains much of the pain of the injection, but the latter should be gone on with during the administration. Adrenalin renders the field practically bloodless.

2. If the wound is in or near the mid-line it should be carefully excised down to the bone, as in a trephining operation. Suture is usually not advisable. If the wound is well to one side, a fresh, free incision should be made in the mid-line. This is sutured at the end of the operation, while the track of the missile is cleaned up and used for drainage purposes. Carrel's method should be applied.

3. Set operations should be avoided. A typical laminectomy is rarely indicated. The laminae can usually be nibbled away, as is done in most cases of trephining for depressed gunshot fracture, until healthy dura is exposed all round the injured area. All obstruction to the easy removal of fragments should be removed before any attempt is made to lift them out. The greatest delicacy should be exercised, especially if movement of these fragments causes pain or twitching. One of the great advantages of local anaesthesia is that the patient is capable of feeling such pain. This fact may prevent further gross injury to the cord.

4. If the wound is not sutured, if the dura has been opened, Carrel's method of after-treatment, with the patient lying on one or other side, should be carried out. If the dura is unopened a gauze pack may be used.

It will be seen that the operation, in cases suitable for it, is on all fours with trephining the skull in gunshot injuries, both as regards technique and indications for dealing with dura, etc., except that in the one case we are in contact with inert and in the other with vital portions of the nervous mechanism.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

DERMATITIS FROM EXPLOSIVES USED IN AIR RAIDS.

DR. SEQUEIRA'S record of cases in the JOURNAL of June 30th, p. 894, induces me to supplement his notes from similar cases that have passed through my hands during a recent air raid.

The men, all soldiers, were engaged in digging out bombs, and when so doing did not wear any protective coverings. The orange staining of the skin, of hands, feet, and face, came on the next day; the hands were principally affected, and these were very deeply stained; the vesicles appeared five or six days later.

The main symptom complained of was the intense itching and irritation; the hands, as in the case of the staining, were most affected in this way. In one case the man suffered considerable irritation of the testicles. The staining on the feet and face has now, five weeks after its first appearance, disappeared, but the hands, which were so deeply coloured, are now peeling; the flakes that are coming off are stained and thickened; the new skin underneath the flakes is tender and red. There have been no outstanding constitutional symptoms. All the men complained of nausea for a few days, and were until now unable to enjoy their food. The taste was altered; they compared this to the sensation which is noticed when chewing tobacco.

No local treatment has been of any avail.

Folkestone.

W. J. TYSON, M.D., F.R.C.P.

In the BRITISH MEDICAL JOURNAL of June 30th Dr. J. H. Sequeira refers to some cases of severe dermatitis due to contact with powder from bombs dropped in the air raid on London on Wednesday, June 13th. On the day on which these cases first appeared at the London Hospital—namely, on Tuesday, June 26th—there came also to the skin department at St. Bartholomew's Hospital twelve persons suffering from this complaint. All these patients had what might be described as severe pompholyx, and the only difference from the more ordinary cases of pompholyx was in the deep yellow staining of the skin of the palms and fingers and soles and toes. As in Dr. Sequeira's cases, the eruption first appeared on Friday evening or early on Saturday morning, nine days after the air raid. Among the patients were the mother and four