She produced photographs of several other sons, taken in khaki and broad smiles, which certainly bore out her statement in so far as they all had a very peculiar one-sided smile. This feature was apparently inherited from their father and grandfather. The boy himself stated that he was always laughed at by his mates for having a lopsided face. The mother, therefore, would not recognize the paralysis as such, or consent to operation on that account.

A week later there was a recurrence of the pain and temperature, and the facial paralysis became more complete. Operation was then agreed to, and a radical mastoid operation performed. The maxillary antrum being explored as a routine with Watson-Williams sinus exploring syringe, thick pus was found in the left antrum. This condition had no doubt been instrumental in keeping up the otitis media.

The temperature returned to normal next day, and the patient appeared to be progressing favourably for the next fortnight, except for attacks of headache, chiefly referred to the frontal region, coming on every two or three days but only lasting an hour or so, and a general mental depression. "No, I haven't any pain but I feel so downhearted," being the usual information vouchsafed. The boy took his food well, and there was never any vomiting.

On the sixteenth day after the mastoid operation, when the patient was up and about the ward, he was given by a friend visiting him some jam tarts and a cigarette. He contrived to smoke the cigarette unobserved in the bathroom, after which he became collapsed, and had to be carried to bed. He then lost consciousness, and developed paralysis of the left arm and leg, with conjugate deviation of eyes to the right, the right pupil being widely dilated and inactive to light; the left pupil remaining of normal size and active to light. The right fundus showed arteries very contracted and veins full, but no swelling of disc. The knee-jerk was lost on the left side. Extensor plantar reflexes on both sides.

Right temporo-sphenoidal abscess was diagnosed, and preparations made for operation.

Two hours later the paralysis had completely passed off, the eyes were normal, and the patient quite conscious, and able to relate his smoking exploit and declare himself all right again.

The operation was proceeded with, the dura being exposed in the tegmen tympani, and further uncovered by the removal of bone upwards. Pus was sought for with a slender-bladed knife, and a small collection found at a depth of rather over an inch, about an inch and a half above and a little anterior to the auditory meatus. A culture of the pus from the abscess gave a feeble growth of *Staphylococcus albus* and a few streptococci. The abscess was drained with gauze, and for some days the patient appeared to be doing well, and was particularly ravenous for food, but died on the tenth day after the abscess was opened.

On post-mortem examination it was found that the abscess cavity was well drained, but the infection had spread up the meninges, there being a thick layer of pus under the dura in the right parietal region.

I think the temporo-sphenoidal abscess must have been present when he was first admitted, but had given insufficient sign of its existence for diagnosis till the accident of the cigarette smoking in a young boy in an enfeebled condition of health led to sudden cerebral congestion which brought out pressure signs, these signs passing off again as quickly as the effects of the tobacco. Previously there was only the very transient headaches and the more marked mental depression to suggest the presence of an abscess. I have noticed before in chronic cerebral abscess a mental depression or melancholy, much greater than would be expected from any complaint of pain or other symptoms, and on meeting this again shall be inclined to try the effect of tobacco or some similar drug for its diagnostic value as shown accidentally in this case.

I am indebted to Dr. Watson-Williams for permission to record this case.

TREATMENT OF TRENCH FEET BY THE SUBCUTANEOUS INJECTION OF OXYGEN.

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THERE are several stages of trench feet:

1. *Neuritic*, producing acute pain, and preventing the patient walking or sleeping. There is no swelling or discoloration of the foot.
2. *Oedematous* without discoloration, but acute pain is present, produced by the pressure of nerve endings.
3. *Oedematous* with blisters, and varying discoloration of the skin short of gangrene.
4. *Gangrenous*, partial or circumscribed, with oedema and blisters, and reddening of the skin involving the lower leg.

I have employed subcutaneous injections of oxygen in Classes 2, 3, and 4.

Technique of Treatment.

It is essential that in all cases of trench feet, whether the skin is broken or not, antitetanic serum should be given under the skin in the arm or pectoral region; the dose should be 500 U.S.A. units.

The operator requires a Woulfe bottle, with two glass tubes bent at an angle and inserted into a tightly fitting cork. To the end of one glass tube is fitted three yards of red rubber tubing connected with the usual oxygen cylinder; to the end of the other glass tube is fitted two yards of a finer rubber tube, and the distal end of the tube has a salvarsan needle fitted on. The bottle contains a saturated solution of sodium carbonate.

It is best to sterilize the needle in boiling oil, and this should be done for each individual case. The operator having sterilized his hands uses a little iodine on the proposed sites of puncture. The needle is inserted into the subcutaneous tissue at a point midway between the heel and external malleolus. The oxygen is allowed to enter slowly until the foot is filled up. The needle is then withdrawn, and inserted midway between the internal malleolus and the heel. If the toes are black and cold the needle is inserted in the mid-line at the base of the toes. It is important that the oxygen should be injected slowly. So far the process is simple, but one learns with experience that if the part is almost gangrenous injection into the deeper tissues is of advantage.

The treatment is based on the conclusion that trench foot is akin to Raynaud's disease. The oedema produces stasis in the veins of the foot, impeding or stopping circulation. The venous blood, if oxygenated, will help to keep the tissues alive until the serum can be drained away. The oxygen helps to drive out the serum slowly but steadily through the puncture holes. Mere puncturing has been found useless in relieving the oedema. Furthermore, the oxygen balloons up the subcutaneous tissue, and relieves thereby pressure on the blood vessels and lymphatics. When the oxygen is absorbed and the serum drained away circulation is quickly restored to the limb.

There is marked relief to pain at once, and under the eye of the observer certain changes can be seen taking place. The reddish-blue appearance changes to pink; the redness which often extends up the leg disappears, and where blackened areas exist a white line makes its appearance, and any living tissue is picked out in pink. The white line indicates what would ultimately be the line of demarcation of gangrene, and it is noted that healthy granulations start from this white line after injections of oxygen. The destruction of parts is greatly lessened, and is often confined to the tips of the toes. Areas of black blood on the dorsum of the foot rapidly undergo change, becoming greyish-white and pink, more resembling healthy tissue. In many of the severe cases recovery of the whole foot has taken place, and in some the loss of a single digit has been recorded. I have amputated in two only out of a large number of cases; both were suffering from severe toxæmia and dangerously ill. In each the other foot made splendid recovery, but amputation of the relapsing foot had to be undertaken to save life. These patients have been evacuated to England in a good state of health.

A minor but important point is the treatment of all blisters. They should be drained by sterilized thread

passed through by means of a straight surgical needle and the ends cut short. The dead skin should be left *in situ* as a protective unless pus is present.

The oxygen causes an increase in the pulse of the posterior tibial artery. There is no rise in temperature, pain is relieved, and sleep promoted. Lint wrung out in 1 per cent. solution of picric acid is applied to the part and renewed every day. No cotton-wool should be employed or disastrous results will ensue. The lint and bedclothes next day will be found saturated with serum, sometimes clear, and sometimes blood-stained. The skin will have a peculiar wrinkled appearance, pointing to the previous state of oedema. The foot is warm even at the toes, and movement will have returned. At the end of the second day tingling sensations are complained of. A second injection may be given in the severe cases which are semi-gangrenous and where the oedema still persists. One injection is usually found to be sufficient, but picric acid should be used once or twice a day to keep the part dry and sweet. The effect of the oxygen on the deeper layers of the true skin is notable; a rich red velvet colour persists for several days.

I would advocate conservative treatment in all cases of trench feet unless gas gangrene should be present or grave toxæmia. Repair is slow but sure, and many hopeless-looking cases have recovered with useful limbs and small loss of structure.

I have to record one case of gas gangrene in a lance-corporal who was admitted with trench feet of the severest type. The left foot responded to the oxygen treatment, and the threatened gangrene in both feet disappeared, but the right foot never cleared up. The patient was too ill on admission to be operated on, and he died two days later. *Post-mortem* examination revealed extensive gas gangrene of liver and spleen. The gas gangrene organism was grown from the right foot, spleen, and liver. The blood from the liver was injected into a guinea-pig, which died fifteen hours after injection, and the same organism was demonstrated from its blood as was present in the organs of the man. Captain A. A. W. Petrie, R.A.M.C., kindly carried out these experiments, which were conclusive, microscopically and experimentally.

The cost of the oxygen treatment is small, and oxygen is usually available to most units. There is no risk to the patient if intelligently used. More punctures than three can be used, but healthy tissue as far as possible should be utilized. The length of time for repair and recovery of the part is long in the semi-gangrenous or gangrenous cases. The granulation tissue is often indolent with the epithelial margin heaped up, and here, again, oxygen has been found to stimulate epithelial growth, a hypodermic needle being utilized in place of the salvarsan needle.

The conclusion drawn is, that if the oedema can be relieved by withdrawing the serum, the circulation can be re-established, and during this withdrawal the tissues are given oxygen to keep them nourished.

These notes are offered as an additional line of treatment for combating a condition which is the despair of the military commander and medical officer. My thanks are due to Lieutenant-Colonel A. Hull, of — Base Hospital, for his helpful encouragement and permission to publish these notes, and to Captain A. A. W. Petrie for his experiments in the case of gas gangrene recorded above.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

CARTILAGE GRAFTS FOR CLOSING CRANIAL DEFECTS.

In the *British Journal of Surgery*, January, 1917, p. 454, a method of closing cranial defects by portions of bone taken from the tibia is described by Mr. Albert Morrison, and in the *BRITISH MEDICAL JOURNAL*, March 3rd, 1917, p. 307, is an abstract account of a similar method advocated by Dr. R. Pfugradt, the bone in the latter instance being taken from the external table of the skull. The method I am about to describe I have found simple and efficient.

A flap of scalp slightly larger than the cranial defect it is proposed to remedy is turned down and separated from the dura mater. The edge of the internal table is separated also from the dura mater for about one-eighth of an inch all round. A flap of skin is now turned down over the false rib near the sternum, and with a scalpel a piece of

cartilage is removed slightly larger but corresponding in shape to the bony defect. If the opening is a large one several pieces of cartilage may be used. The piece or pieces of cartilage should be bevelled at the edges to allow them to fit under the bone. Should there be any difficulty in retaining the cartilaginous grafts in position, cross sutures of catgut can be inserted over the gap, from one side to the other, so as to form a cage under which the cartilage lies; this, however, is seldom necessary. The scalp flap should be replaced and sutured, and a few strands of silkworm-gut placed beneath the angle of the wound to prevent a hæmatoma forming.

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A SIMPLE METHOD OF BLOOD TRANSFUSION.

SINCE blood transfusion is often necessary where there has been either primary or secondary hæmorrhage, it may be useful to describe a simple apparatus which I have on several occasions employed in direct transfusion.

The transfusion is from the radial artery of the donor to the median basilic vein of the recipient, the corresponding limb of each being used; and the connexion is made by means of a glass cannula, as illustrated. Each limb of the

cannula, and also its transverse portion, measures three and a half inches. The ends of the cannula are tapered, and have a flange near their termination.

The donor and recipient are placed in the dorsal decubitus and their abducted limbs are placed in the supine attitude on a small table between the patients. The surgeon and his assistant are then able to stand between the patients and have easy access to the field of operation. Before beginning the operation, however, the cannula must be in sterile liquid paraffin at the body temperature, ready for use. The radial artery of the donor and the median basilic vein of the recipient are simultaneously exposed under local anaesthesia by the surgeon and his assistant. A small slit is then made in the radial artery and one end of the cannula inserted to a little beyond its flange. A ligature is now tied round the artery and cannula, thus fixing the cannula in the lumen of the artery. With each pulse blood is pumped through the cannula, and, while this is so, its other end is inserted in a similar fashion into the lumen of the median basilic vein of the recipient. To keep the stream of blood, whilst flowing through the cannula, at its normal temperature warm sterile lotion should be continuously dropped on the cannula.

During the transfusion the condition of the donor must be carefully observed, and the transfusion stopped when symptoms of depletion are fairly evident. Most donors can stand it for about fifteen minutes without any untoward effects.

The one drawback to direct transfusion is, of course, that we cannot estimate the quantity of blood transfused. On the other hand, it is difficult to say how much blood any individual can give without suffering after-effects, so that in any case the donor's condition is the only safe gauge to go by. This method of transfusion may recommend itself to some on account of the simplicity of its technique, the cheapness of the apparatus, and the security which it affords against either blood clot or air entering the circulation of the recipient.

This transfusion cannula can now be obtained from Messrs. Down Bros., Ltd., London. I am indebted to Corporal H. J. Lowe, of the 11th Royal Warwick, for the illustrations.

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