

sion, often associated with fear, the fear being probably due to an apprehension of further injury to the pulsating cavity. The patient appears drowsy and lacks initiative. Severe headache is present in all cases. The headache is usually aggravated by movement. The headaches may be intermittent or of a continuous character, but even in the intermittent type the man is never free from pain for more than a few hours. The constant headache is no doubt due to the dura mater (which is almost entirely supplied by the fifth cranial nerve), being firmly adherent to the old scar tissue, and so under constant irritation. Motor aphasia was present in three of the twenty cases, and epileptiform seizures occurred in three cases. Vomiting may occur, especially during exercise, and after vomiting dizziness is marked. In all cases there were very definite and constant eye symptoms. In every case there was an abnormal contracting of the colour fields, sometimes being irregular and interlacing, at other times being entirely absent, resulting in a complete colour blindness. Blurring of vision with a slight choked disc was common. Partial hemiplegia or monoplegia, exaggerated reflexes, areas of anaesthesia, and a marked abhorrence of noise have been found.

Technique of Operation.—Forty-eight hours before operation the head is shaved, great care being taken to avoid nicking the skin, especially in the vicinity of the old scar. The head is well washed with green soap and water, followed by ether and alcohol and a dry sterile dressing and cap applied. Twenty-four hours preceding operation the head, forehead, and ears are freely painted with tr. iodine, allowed to dry, and a dry sterile dressing is again applied.

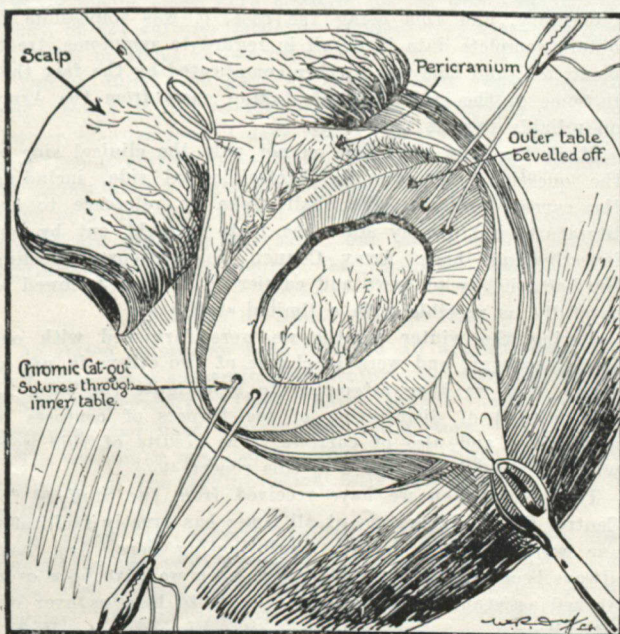
The anaesthetic is of the greatest importance, not only for the safety of the patient, but also that it may be administered in such a way that the anaesthetist will not obstruct the operator. In our first seven cases rectal anaesthesia was used as follows: Two hours before operation the rectum was repeatedly washed until all fluid returned clear. One hour preceding morphine gr. $\frac{1}{4}$ with scopolamine gr. $\frac{1}{100}$ was given hypodermically. To induce anaesthesia 4 oz. of ether was well shaken with 2 oz. of olive oil, and this was slowly introduced into the rectum, at least ten minutes being taken. Surgical anaesthesia was present in thirty to forty minutes. While the anaesthesia produced was all that could be desired, we decided after two unpleasant experiences resulting from shock occurring during the deep anaesthesia that a form of anaesthesia in which the patient could be permitted to "come out" quickly would be safer. Since then we have used an intratracheal method which is most satisfactory in all respects.

supply to the pericranium, which will form the covering and part of the blood supply to the graft. After reflecting the skin flap a longitudinal incision is made through the occipitofrontalis aponeurosis and pericranium over the skull opening, extending to at least $1\frac{1}{2}$ in. to either side of the opening. At the site of the old scar it will be found that the aponeurosis, pericranium, and dura mater are all matted together in a dense mass of cicatricial tissue. With care this scar tissue can be stripped from the dura mater, provided that this membrane has not been opened at the time of injury or first operation. The dura mater, which is found firmly adherent to the edges of the opening in the bone, is then freed, and a periosteal elevator passed under the bony margin to see there are no adhesions here. If the dura mater has been opened at the time of injury or at the previous operation, it will be found to be so densely involved in the scar as to make it impossible to separate without opening. If it is found necessary to open the dura mater it is done by making a cross incision, freeing the adhesions to the cortex and turning back the corners. This opening in the dura mater is closed by grafting a small piece of fascia lata with some fat adherent to its surface. The surface containing the fat is placed against the cortex, and the fascia lata tacked to the dura mater at the corners by four fine catgut sutures.

The bed for the graft is now made by bevelling off the outer table for a distance of $\frac{1}{2}$ in. from the bony opening. To do this a Martel burr is attached to an Albee motor, and the outer table is carefully removed, in such a way that the cancellous and vascular diploë, from which the skull receives its main blood supply, is left to act as a fertile bed to receive the graft. Two or three holes are now drilled through the inner table with Albee's electric drill, a metal guard being placed between the inner table and dura mater to prevent injury to the brain. Twenty-day chromic catgut is threaded through these holes to be used in immobilizing the graft. The head is now covered with warm sterile towels and left, while the graft from the tibia is removed.

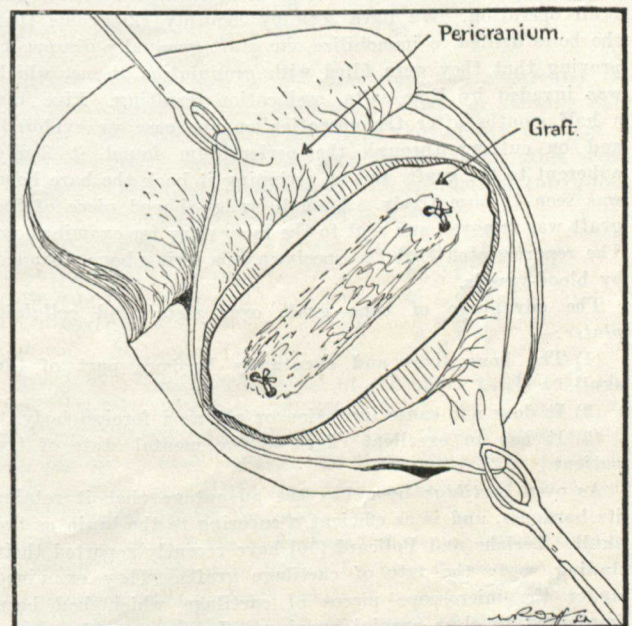
To remove the tibial graft the bone is exposed for at least 8 in., a flap being preferable. The inner surface of the tibia gives the best area. A graft, the entire width of this surface and $\frac{1}{8}$ in. in thickness and retaining its periosteum, is removed by using a saw, the blade of which is narrow and can be turned to any angle.

On removal the graft is immediately transferred to its bed in the skull. The graft is never placed in saline or other media, as any foreign substance tends to devitalize the graft. The periosteal surface of the graft is turned towards the



Outer table bevelled off, diploë and inner table showing.

To expose our cranial opening the horseshoe flap is used, making the incision at least $1\frac{1}{2}$ in. from the edge of the bony opening. In bringing down this flap one of the most important points in the whole operation occurs. The primary incision must be made only through the skin and subcutaneous layer and the flap thrown back, leaving the occipitofrontalis aponeurosis (galea aponeurotica) attached to the pericranium. This gives strength and an increase of blood



Bone graft immobilized.

dura mater, only the area which will lie on the diploë being bared of periosteum. The periosteum is turned towards the dura mater for three reasons:—

- (1) To provide a smooth surface with which the dura mater shall be in contact.
- (2) To guard against growth of bone inwards. The periosteum being a limiting membrane prevents any chance of an exostosis growing from the under surface of the graft and eventually causing pressure.