

RULE II.

The diets of all persons should contain sufficient quantities of all the nutritional elements, including the necessary vitamins.

We cannot conceive that any rational person will take exception to either of these rules, whatever may be his views on the relationship between epidemic dropsy and beriberi, or on the causation of these diseases.

If both of these rules are accepted and acted on, we believe that the beriberi-epidemic dropsy problem will cease to be urgent; it will become an interesting academic study for curious and ingenious investigators.

Incidentally, we believe also that the problem of pellagra ought to be studied on the same lines; vitamin deficiency is now being emphasized to the exclusion of other aspects of the disease; storage of maize may be the clue to pellagra, and even if this is not the case, there should be no hesitation in adopting rational measures for the preservation of maize and maize products at every stage from the harvesting of the grain.

Our attitude towards vitamin B has never been of the nihilistic kind that has been attributed to the senior writer by some authorities. Vitamin B deficiency ought to receive its fair share of attention, but it should not be allowed to obsess our minds to such an extent that we refuse to admit the possible existence of other factors in beriberi-epidemic dropsy, pellagra and other diseases associated with diets.

"EMERGENT SURGERY" IN HEAD INJURIES.

By K. M. NAYAK, L.M. & S.,
Assistant District Medical Officer, Vellore, North Arcot.

"A SCALP wound properly cleansed, antiseptised and drained, represents in a highest degree the possibilities of good surgery," writes Donald J. Armour; "a scalp wound improperly cared for, covered with hair and matted blood, and its extent undetermined, represents one of the worst forms of surgical neglect." This statement is so true that it requires no further elaboration. Although, in my fifteen years of service, I have not seen very numerous cases of head injuries, yet in 1927, a particularly large number of such cases presented themselves at this hospital, and an account of them may raise points of considerable interest.

Lejars, in his "Urgent Surgery," states that the medical practitioner should always be ready for emergency surgery, but how many men keep their equipment for such work in good condition? Only too often are important instruments allowed to get rusty, or jumbled up in a bag with dressings, chloroform, stethoscope, and thermometer. When the emergency arises, the instruments are not fit to use, are rusty and may break. One would state that the following instruments at least

are essential, and that they should be kept separately, and frequently examined to see that they are in good condition.

Cutting Instruments.—Two or three scalpels, two pairs of scissors—straight and curved, and a pair of Liston's bone forceps, angled on the flat. Alcohol, chloroform or petrol may be used to ensure their absolute cleanliness after use; their edges should be perfect, and they should be kept lightly smeared with vaseline. Two grooved directors—one grooved to the tip and the other probe-pointed; one pair of dissecting forceps, another pair with teeth; two double-ended retractors are also essential. An emergent surgeon's safety lies in the number of artery forceps which he possesses, and for work on the head one can hardly have too many; whilst it is as well to complete the series with six pairs of Kocher's artery forceps. Two hand trephines, one of half an inch diameter, and one three-quarters of an inch diameter are also essential.

An aneurysm needle, one or two pairs of volvulum forceps, a curved periosteal elevator, a raspatory, a gouge forceps, a chisel and mallet, are all necessary.

Ligatures and Sutures.—Here it is absolutely essential to use only the very best and most reliable material. It is as well to have catgut, silk, linen thread, and silkworm gut. If catgut properly prepared and sterilised beforehand is not available, it is better to dispense with it.

Needles.—Ordinary straight and curved needles of different sizes are all that are needed. Half curved ones are sometimes useful, but often give more trouble than real help. Fixed needles mounted in handles, such as Doyen's, are extremely useful in suturing the scalp. Michel's clips are even better, and give great precision and exactness in apposing the cut edges.

No wound of the scalp should be regarded as unimportant, and it is essential thoroughly to clean, disinfect and explore the wound. "Excluding some cases where there has been considerable loss of tissue, hernia cerebri is almost invariably due to inflammatory causes, and asepsis is the best means of preventing it," writes Lejars. Anaesthesia should be resorted to freely, and especially in the case of children, in whom it is frequently impossible to explore a scalp wound properly without a general anaesthetic. Continuous irrigation of the wound with normal saline at a temperature of 110° to 115°F. is often very helpful. The use of a tourniquet, fixed tightly round the head across the forehead, just above the ears, and beneath the occiput, is useful in controlling haemorrhage, and is too often neglected. The importance of shaving and disinfecting a wide area of the scalp surrounding the wound, lies in the fact that it facilitates the thorough and satisfactory examination of the wound in all its depth. Provision should always be made for drainage. In cases of general oozing from the scalp edges and from the pericranium at the bottom of the wound I have always found hydrogen peroxide very useful, for it is a haemostatic

as well as an antiseptic. The supposed danger of air embolism from the use of this drug is a myth, and I have often used it freely.

Every attempt should be made to save as much of the scalp tissue as possible, for the great vitality of the scalp tissues is a powerful factor in repair. In one of my cases almost two-thirds of the skull was completely denuded of scalp tissue, but luckily for the patient the scalp was hanging by a pedicle half an inch wide. I simply cleaned the whole flap and skull with nothing but warm sterile water, and then carefully sutured the whole flap back into position, with four gutter drains at the corners. On the sixth day, when the stitches were removed, the union between the edges was perfect. Cases are even recorded where the completely torn-off scalp has been thoroughly cleansed and replaced in position with a few sutures, leaving very free drainage, and where the implantation has succeeded.

Compound Fractures of the Skull.—In this connection, certain points are important. A linear fracture should be thoroughly opened up. Sometimes a sharp, clean cut edge of the epicranial aponeurosis, or even the cut edge of the pericranium itself, may give the impression that the bone underneath it is fissured, but careful examination will show that it is not. I have myself been misled in this way on two or three occasions. Acute infective osteomyelitis is a rare, but dangerous complication of such cases, leading to the appearance of "Pott's puffy tumour," with high fever and rigors. The bacterial infection in these cases is not always necessarily from the external wound, but may occur by auto-infection, just as a haematoma may sometimes suppurate in a much-debilitated patient. In some rare cases, infection may occur from the middle ear.

Where there is a fissured fracture of the outer table, always suspect the presence of more extensive damage to the inner table. To examine the fracture with a probe is a dangerous and ineffectual proceeding; it gives one but very little information, and may spread infection. It is usually necessary to open up with the chisel and mallet and lay bare the diplöe. If a gaping fissure is present, with the margins at different levels and blood continuously flowing from it, or if a star-shaped depression or a localised crushing of the vault is present, then the best line of treatment is by means of an osteoplastic flap, or, failing this, a trephine hole should be made and the extent of damage to the inner table explored. All irregular fragments must be carefully removed. Do not simply raise them and leave them in place. Never try to tear them out or lever them out from one edge; the dura may be torn or the brain compressed or lacerated by such manœuvres. Seize the fragment transversely about the middle, and raising it gently, separate the underlying dura with a curved elevator or dissector.

If the dura is torn, the cavity should be very gently cleansed with small gauze or wool swabs

on the end of a pair of forceps. Bleeding cortical vessels should be ligatured by passing a ligature on a fine curved needle underneath them. The dura should not be completely closed, and drainage should be provided for. In cases of compound fracture of the skull with depressed bone, operation should be undertaken at once, whether focal cerebral symptoms are present or not. In cases of comminuted fracture, or where a large segment of the skull has been driven in, when the fragments—usually triangular or star-shaped—remain locked together, the attempt should be made to raise by one of its edges that fragment which appears to be the most detached and most moveable. After the first fragment is removed, the others can usually be dealt with easily. Below the layer of superficial splinters will be found the layer of deeper fragments. These should be raised gently, separating the underlying dura mater with a curved elevator or a director; they should never be torn out. Wherever necessary, make more room by the gouge forceps, as the extraction of endocranial scales is of the utmost importance for future recovery.

Trephining should not be regarded as a highly specialised operation and dangerous proceeding, which only specialists should carry out; for it is often called for in emergent surgery. The specialist may make use of the electric burr, or the brace and burr, either Hudson's or Doyen's, or even Albee's saw method, but the ordinary practitioner must be able to deal with the ordinary case. The trephine which I have always successfully used is the ordinary hand—or so-called "crown" or "circular"—one. It is inexpensive, slow in operation—perhaps—but always obtainable, steady, and sure. In trephining, safety perhaps counts for more than any other factor, and the hand trephine is safer in the hands of the novice than the more complicated instruments. The instrument, however, should be of the best possible description and of small diameter, half or three-quarters of an inch, sharp edged, and fitted with a heavy handle. On striking the inner table of the skull special care is required, as rough or unequal trephining may lead to injury to the dura mater, meningeal arteries, etc. It is very debatable whether the brace and burr pattern presents any real advantage over the ordinary hand trephine, with the possible exception that it may afford some additional safeguard against damage to the dura mater. Experience alone will decide which method appeals best to the operator.

Cranectomy.—Before applying the craniectomy or enlarging forceps, the dura mater must be separated from the bone. The action of the forceps should be a nibbling one, and no attempt should be made forcibly to avulse fragments. The fragments removed by the trephine and the enlarging forceps are useless for purposes of bone regeneration, and are actually dangerous in the event of sepsis. Where a fragment of bone is completely detached all round, simple elevation of it is unsatisfactory, as it may subsequently

cause either sepsis or compression symptoms, and it should be removed. On the other hand, it is necessary to guard against any greater denudation over the surface of the brain than is absolutely essential.

Hæmorrhage is a constant source of trouble in these operations. In hæmorrhage from the diplœ, the use of Horsley's "bone wax" may be useful. Its composition is as follows:—

Vaseline	..	50 parts.
Paraffin	..	50 parts.
Acid carbolici	..	50 parts.

A meningeal artery is best dealt with by passing beneath it a ligature on a fine curved needle, and the same procedure may be applied to a cortical vessel. For general oozing, hydrogen peroxide is very valuable. Every endeavour must be made to ascertain the source of the hæmorrhage; for bleeding from a sinus immediate occlusion with a finger is indicated, then a prompt attempt should be made to underpin it with a ligature in a curved needle, though the pressure in tightening the ligature must be very gradually applied; or, finally, plugging may have to be resorted to. On two or three occasions, I have had to resort to plugging; once, when operating for mastoid abscess, I opened the sigmoid sinus, on which occasion I removed the plug on the third day, found the wound quite dry, and the patient made an uneventful recovery. Where the source of the bleeding cannot be ascertained, irrigation with hot saline at 115°F. is often a useful measure, followed by plugging.

No operation for compound depressed fracture of the skull should be considered complete until the depressed fragments have been elevated or removed, the hæmorrhage checked, and the entire exposed area cleansed and disinfected.

The respiratory centre is very nicely balanced, and it may fail in the early stages of administration of the anæsthetic. If so, trephining must be carried out rapidly, and artificial respiration commenced. The use of *x*-rays is often helpful in estimating the thickness of the skull; in the temporal and cerebellar regions in adults, and in the skulls of children, the bone may be unusually thin, and in such cases the pin of the trephine should be discarded earlier than usual. In bandaging, even pressure over the whole area should be aimed at, and it is often not necessary to bring the bandage over the chin. On returning the patient to bed, he should be placed in the semi-recumbent position with the head thrown slightly backwards, reclining on pillows. The administration of morphia previous to operation is often helpful in preventing restlessness, pain, and excitement after operation. It is often helpful to keep the patient under the influence of morphia for 24 to 48 hours after the operation, or bromides or chloral may be given. Stitches should be removed on the sixth or eighth day (since wounds of the scalp heal very rapidly, and more so than wounds elsewhere in the body), but

the patient should ordinarily be confined to bed for three weeks, and special care should be paid to the avoidance of post-operative constipation.

With regard to the question of when to operate, it is clear that a patient in a condition of profound shock is not a suitable subject for instant operation. Morphia should be given, and he should be allowed to pass into the stage of reaction before operation is carried out. On the other hand, too much delay is fatal. The period of immediate shock does not usually last more than twelve hours, and the onset of symptoms of compression is marked by a slow pulse, low blood-pressure, Cheyne-Stokes' respiration, and profound unconsciousness. Attention should be directed, not so much to ascertaining the presence or absence of a fracture of the skull and its location, as to the degree and extent of the damage to the brain.

In selected cases, lumbar puncture should always be carried out. It is a most useful aid to diagnosis in doubtful cases, as the presence of blood in the cerebro-spinal fluid may confirm the diagnosis of fracture of the skull. On the other hand, the presence of blood in the cerebro-spinal fluid merely denotes bleeding from an intradural vessel, with or without a fracture of the skull, and the absence of blood does not exclude an intracranial hæmorrhage. Where initial stupor persists and the patient remains unconscious, with laboured respiration and slackening pulse, 15 to 20 c.c. (5 to 6 drachms) of cerebro-spinal fluid should be withdrawn as a therapeutic measure. This may be repeated the next day, whilst daily removal of 15 to 20 c.c. of fluid often gives great relief to cases characterised by headache, nausea, dizziness, stupor, and restlessness. Lumbar puncture, however, can never take the place of a decompression operation.

With regard to the complications arising after operation, but little can be done for cases of meningitis, encephalitis, and ventriculitis. Acute abscess of the brain after operation is usually due to the retention of some foreign body, whether fragments of bone or some piece of stone driven into the wound from a fall. Removal of the foreign body and free drainage are essential. Hernia cerebri is a difficult condition to deal with; often lumbar puncture is useful in such cases, or a fresh decompression operation may have to be undertaken. The formation of scar tissue in the cerebrum may lead to insomnia, fits, paralysis or spasticity. It should always be borne in mind that the surgeon is responsible, not only for the immediate future of the patient, but for his later working capacity, and a depressed fracture which has not been properly treated, or a blood clot which has not been removed, may lead to irreparable injury in future years.

In general, one may say that these cases should be operated on at the earliest possible moment (after shock has been alleviated). Unless the surgeon is fully convinced either that the injury is an undoubtedly fatal one, or so trivial that it

can be ignored, it is his duty to explore the nature of the injury very fully; to administer a general anaesthetic whenever necessary and to remove all sources of irritation. These cases are not—as is so often supposed—minor ones; they may be amongst the most important ones in the general practice of surgery.

APPENDIX: ILLUSTRATIVE CASES.

Case 1.—Male patient, aged 40, a criminal lunatic. He was drying his clothes after washing them when a second criminal lunatic in the same asylum suddenly seized an iron bar from the smithy, and commenced to attack all and sundry whom he met. Three persons escaped with trivial injuries, and two had their heads smashed and converted into a pulp, and died on the spot. The sixth was the patient referred to. He had a compound depressed fracture in the right temporal region, was completely unconscious, and had complete paralysis of the left side of the body. The pulse was full and bounding, and the respiration laboured, deep, stertorous, and of Cheyne-Stokes type. At operation, a piece of the right temporal bone about the size of a quarter-anna piece was found depressed, and jammed down on to the brain beneath. The middle meningeal artery had to be ligatured, the depressed piece of bone removed, and a large extradural clot turned out. The dura mater was fortunately intact. Continuous irrigation with hot saline was applied during the operation, and free drainage provided.

The patient was conscious the day after operation, and the paralysis had disappeared. The wound healed by first intention. I saw the patient six months after operation, when he was perfectly fit and had developed no untoward symptoms and showed no signs of hernia cerebri.

Case 2.—A male coolie, aged 35, was gored by a bull. This injury is a common one in these parts, and is usually to the abdomen, but in this instance it was to the head. On an average we get some six to nine such cases a year,—often with the viscera protruding and wrapped in filthy clothing,—yet such is the resistance of the peritoneum that very few of them die.

In this instance nearly two-thirds of the scalp had been removed, and was hanging by a pedicle half an inch wide in the occipital region. The almost torn-off scalp was thoroughly cleansed, replaced in position, a few sutures inserted, and free drainage provided. The wound healed by first intention, and the patient made a sound recovery.

Case 3.—Male coolie, aged 38, was digging at the bottom of a well when a piece of wood from the well-head fell and struck him. On admission there was a lacerated wound some 3 inches long over the vertex, with a gutter-shaped fracture at its bottom. He was fully conscious. On operation, it was found that both parietal bones were involved in the depressed fracture, and the sagittal suture lay in its floor. The inner tables of both bones were found to be intact on trephining, but blood was oozing from the superior longitudinal sinus. This was controlled by pressure, and the patient made an uneventful recovery. He left hospital fifteen days later, but whether he developed a hernia cerebri or not, I do not know. It seems improbable.

Case 4.—A boy of 10 years of age who was stated to have fallen about 10 feet from the plinth of his house. On admission he was unconscious, with a temperature of 102°F., and a lacerated wound in the right temporal region. At operation, a depressed fracture of the right temporal bone was found. The middle meningeal artery had to be ligatured. The dura mater was intact. The patient made an excellent recovery, and five years later was in good health.

Case 5.—This is a case which is of interest from the medico-legal point of view. The patient, a wealthy landlord, aged about 50, was attacked with *lathis* in a riot. He had no less than 32 injuries on admission, most of them on the trunk. There were one or two contusions on the head, however. On admission, he was

suffering from shock, but regained consciousness the next morning and was able to talk. The next day he became very irritable and restless and lapsed into a semi-conscious condition. A lumbar puncture was done and 25 c.c. of cerebro-spinal fluid removed. This was slightly blood-tinged. For the next three days the patient was conscious and appeared to be recovering rapidly. On the fifth day after injury, he complained of very severe headache. Lumbar puncture was again carried out, and 20 c.c. of fluid removed; this immediately cured the headache. Unfortunately, he now developed hypostatic pneumonia, and died on the seventh day after injury.

On the second day in hospital, the deceased had what was rather like an epileptic fit. At post-mortem a small blood clot, about the size of a quarter-anna bit, was found in the region of the right middle meningeal vein. The artery was intact. The skull bones were intact and there was no basal fracture. Being a rather obese subject, he had a certain degree of fatty degeneration of the heart.

The case was tried in the lower court, where 14 persons were put on trial as possibly concerned in the riot and in the death. The defence was that the death was due to hypostatic pneumonia and heart failure. The case was referred to the High Court, which finally ruled that death was due to natural causes and hypostatic pneumonia, and discharged the accused. On the other hand, one is convinced that, had the deceased not sustained the cerebral injury discovered at the post-mortem examination, he would have been alive to-day.

Case 6.—This case again was of medico-legal interest. The patient, a male aged 30, was hit on the head by another man with a stout stick, and received a lacerated wound in the left frontal region. He saw a local doctor the next morning, who gave him a medical certificate, and failed to notice that there was a depressed fracture at the bottom of the wound. The patient was both conscious and rational in his speech.

On the fourth night after the injury he began to develop symptoms of cerebral irritation, and was brought into this hospital on the fifth night after injury, with a temperature of 103.2°F. A diamond-shaped depressed fracture of the frontal bone was discovered at operation, about one inch by three-quarters of an inch, with laceration of the dura and injury to the surface of the left frontal lobe of the brain. The patient's temperature rose to 107°F. after operation and he died two hours later.

At post-mortem, a fracture of the anterior fossa was discovered and a condition of acute spreading oedema of the brain. The immediate cause of death was paralysis of the higher centres of the brain. The cerebro-spinal fluid was under pressure, and compression of the medulla was probably present. The case for the defence was that the deceased, when drunk, had fallen and hit his head on a stone, which was produced and appeared to be blood-stained. A test by the Imperial Serologist, however, failed to recognise any trace of blood on the stone. Five of the six accused were acquitted, but a sixth, who was stated to have thrown the stone, was sentenced to one year's rigorous imprisonment.

In this case, lumbar puncture at the moment when pressure symptoms were first recognised, might have saved life. The giving of the first certificate by the local doctor on the day after injury, and the fact that he clearly failed to recognise the severity of the injury, are special features of the case.

Case 7.—This was a female child, aged 7. Whilst her father was lopping off the branch of a tree, she was standing below the tree, about 12 feet below, when the axe fell out of his hands and struck her on the vertex. There was a comminuted fracture of the right parietal bone, with a smaller but similar lesion of the left parietal. All comminuted pieces had to be removed, and the superior longitudinal sinus was found to be badly lacerated and bleeding profusely. Firm plugging was applied, and the patient's condition, from shock and haemorrhage, was bad. She made a

splendid recovery, however, and was discharged from hospital a month later in sound health.

Case 8.—This was a male child, aged 6 years, kicked on the right side of the forehead by a cow. The brain substance was protruding from the site of injury. There was no sign of paralysis or of cerebral irritation. At operation a small detached piece of bone was removed, which had become detached and buried in the brain substance. A month after his discharge from hospital, the small patient was brought back to hospital with a visibly pulsating mass in the right temple. This was dressed daily with dressings of a copper sulphate lotion. On the fifth morning it suddenly disappeared, and the patient made a complete recovery. What had happened here is quite uncertain. The patient had no hernia cerebri when discharged from hospital. The tumour, when it appeared, showed undoubted pulsation. The favourable termination of the case was at least fortunate.

Case 9.—Male patient, aged 35, who fell over a stone, and sustained a lacerated wound running from the middle of the left eyebrow to the scalp. There was a gutter-shaped fracture of the left frontal bone, and the left frontal sinus was also involved. At operation trephining had to be resorted to, but the patient made an uneventful recovery, and was discharged cured.

Case 10.—A male patient, aged 14, who had sustained a fall. At operation a depressed fracture of the right parietal bone was found. Trephining had to be resorted to, and a branch of the middle meningeal artery tied. The patient made a sound recovery.

Case 11.—A male patient, aged 37, who had received a blow during a scuffle, the result of a stone which had been thrown at him. There was a lacerated wound at the back of the head, and a compound depressed fracture of the left parietal bone. The outer wound was about an inch in diameter, but the lesion to the inner table only five-eighths of an inch by half an inch. He was discharged in good health a fortnight after admission.

Case 12.—A male patient, aged 18, who was stealing mangoes from a tree, and fell immediately he picked the first mango. He had a lacerated wound on the left side of the forehead, with a compound depressed fracture at the bottom of the wound. The left half of the frontal bone was also fractured and depressed inwards into the brain. The scalp wound was slightly oedematous, owing to injury to the left frontal air sinus. The dura mater was badly torn and the brain very badly lacerated. One fragment of bone was actually deeply buried in the brain. Despite this, he was operated on and left hospital 18 days later in good condition.

Case 13.—Boy, aged 15, who fell from a mango tree, and had a compound depressed fracture of the frontal bones running for nearly 4 inches above the superciliary ridges. The dura mater was badly torn and the brain matter literally flowing from the wound. He was discharged from hospital a month after operation in sound health.

Case 14.—The patient, a male aged 50, fell to the bottom of a well nearly 30 feet deep. On admission, he had a badly lacerated wound on the top of the head, running from behind forwards in the middle line. On exploring the wound, it was found that there was a severe diamond-shaped depressed fracture of both parietal bones, with extensive comminution. There were two perforations of the dura mater, and the brain was injured underneath these. The superior longitudinal sinus fortunately escaped. The area of brain denuded of bone was diamond shaped, and measured 4 inches by 2 inches. Unfortunately, the patient died on the fourth day after operation.

Case 15.—The patient, a male aged 35, was working at the bottom of a well when the wooden beam at the top of the well fell a distance of some 20 to 25 feet and hit him directly on the vertex. There was a longitudinal wound about 2 inches long, with a depressed fracture of the right parietal bone. At operation the whole of the right parietal bone was exposed, and a lozenge-shaped piece was found to have been detached and buried in the brain matter underneath. The fracture

fortunately stopped half an inch short of the middle line and the superior longitudinal sinus. No trephining was necessary. On admission he had slight paresis of the left arm, but this was gradually recovered from. He left hospital cured a month after admission.

Case 16.—This patient, a male aged 30, was also injured whilst working at the bottom of a well, a large stone having fallen on to him from above. On admission, there was complete hemiplegia of the left side of the body. There was an irregular depressed pond-like fracture to the right of the middle line. The right parietal bone had to be trephined, and a branch of the middle meningeal artery tied. One fragment which was very loose was removed, but a second was elevated and left in position. The hemiplegia cleared up immediately after operation, and the patient left hospital cured on the 22nd day.

Case 17.—This was a case of medico-legal importance. The patient, a male aged 45, was injured on the right side of the forehead during a riot. He came to hospital at 11 o'clock on the night of the injury, walking, and fully conscious. There was an irregular wound about one inch by half an inch above the outer half of the right eyebrow; also minor injuries to other parts of the body. He refused to stay in hospital and went to his home for the night, but returned to hospital the next morning. For the first six days he appeared to be doing well, but suddenly dropped down dead about 11.30 p.m. on the night of the seventh day after injury.

At post-mortem, a crescentic fracture of the frontal bone was discovered. Starting from the zygomatic process, it passed backwards along the roof of the orbit. During life, there had been no signs or symptoms indicating trephining or the necessity for elevating the bone; it appeared to be a simple fissured fracture. But at post-mortem examination, a condition of acute spreading oedema of the meninges at the base of the brain was discovered, and the immediate cause of death was apparently paralysis of the higher centres of the brain. The cerebro-spinal fluid was under pressure, and there was probably medullary compression as well. A timely lumbar puncture might have saved life in this instance, but the symptoms were not such as to call attention to the necessity for it.

The medical officer who was called into court gave it as his opinion that the injury might have been caused by a stick. The defence said that it was caused by a stone; they said that the deceased was drunk at the time of the occurrence, and that he fell and hit his head on a stone, and proceeded to produce the alleged blood-stained stone. The Imperial Serologist, however, failed to find any trace of blood on the stone. The judge acquitted five of the six accused, and sentenced the other to one year's rigorous imprisonment only.

I have perhaps said sufficient to show the importance in general medical practice of head injuries, and the necessity for the general practitioner to be constantly prepared to deal with them at any hour of the day or night. He requires an armamentarium carefully selected beforehand, and kept in the very finest of working order. Further, he must remember that he may at any time be called in to give medico-legal evidence in connection with such cases. The questions that he may be asked in court, indeed, are sometimes ludicrous. Lately I was asked in court whether an infant four months of age could have committed suicide by leaping down a well. When the facts of the case came to light, it was discovered that the child had been thrown down the well by his mother, since it was a male child and illegitimate, and she did not wish it to grow up and interfere with her clandestine trade. In another case, it was suggested to me that a newly-born baby had committed suicide by swallowing

a handful of ashes. Is the answer to be that death was due to "heart failure," or to "carelessness," or "to an eclipse of the moon"?

~~TRACHEOTOMY FOR DIPHTHERIA IN CHILDREN.~~

By P. BANERJEE, F.R.C.P.S.,
MAJOR, I.M.S.,

Resident Surgeon, Medical College Hospital, Calcutta.

THERE is considerable difference of opinion as to whether a low or high tracheotomy should be performed for the relief of urgent dyspnoea in children suffering from diphtheria. There are objections against either form. But so far as I am aware, there appear to be more objections against the performance of a low tracheotomy than against that of a high one.

In high tracheotomy, especially in children, laryngeal stenosis sometimes occurs, due to oedematous granulations at the seat of operation, which is very close to the larynx. Thus, in a series of 53 cases where high tracheotomy had been performed, in 5 laryngeal stenosis was observed with the result that the little patients could not do without their tracheotomy tubes. On removal of the tube, urgent dyspnoea with cyanosis supervened. In one case for the relief of this symptom the tracheotomy tube was taken out and intubation was attempted without success, owing undoubtedly to the stenosis that had taken place. In every one of these cases low tracheotomy had again to be performed, which made the healing of the high tracheotomy wound possible and led to the disappearance of the oedematous granulations. After 4 or 5 days, the low tracheotomy tube was removed without any trouble. In the 77 cases of low tracheotomy performed by me, there was not a single instance where dyspnoea persisted after removal of the tracheotomy tube in the usual course in 2 to 3 days.

The objections against a low tracheotomy are, (1) that the trachea in the lower part of the neck lies deeply, (2) that there is a danger of injuring the large vessels, which pass into the neck from the thorax, (3) that owing to the depth, which separates the trachea from the skin wound, a large tracheotomy tube is required as otherwise it is coughed up, (4) that there is a danger of producing mediastinal cellulitis, and (5) that there is a likelihood of driving the diphtheria infection into the trachea. Thus, the arguments against a low tracheotomy appear to be quite formidable, but fortunately do not stand examination. When a low tracheotomy is performed in what I consider the proper way, there is no danger of wounding any large vessel, such an accident never having occurred in any of my cases. As for the other objections they appear to me to be purely theoretical, as I have never seen mediastinal cellulitis or extension of the diphtheritic membrane into the trachea when it had not already been there. In children, the depth at which the trachea lies is not great, and does not make the

operation in any way difficult. It is also quite easy to fit a proper sized tracheotomy tube into the trachea.

It will thus be seen that when correctly performed a low tracheotomy, as it does not produce laryngeal stenosis and is also definitely indicated in those cases where the diphtheritic membrane has extended from the larynx to the upper part of the trachea, is the operation of choice.

In all these cases apart from septic bronchopneumonia, which is almost always present, the heart is enfeebled, as is well-known, by the diphtheritic toxin. It is therefore not advisable to use either ether or chloroform as a general anaesthesia in these cases, nor is such anaesthesia necessary, the only pain in the operation being a momentary one caused by the skin incision.

Descriptions of tracheotomy operations in textbooks are frightening, as is the situation where the operation is performed. Thus, a simple operation, which may be performed in 2 or 3 minutes, is regarded with fear by the general practitioner in this country and is not attempted, this resulting in death to many little children.

I will now take the liberty of describing the operation as I perform it. To me it seems that it would be better for beginners to forget the existence of all the vital structures which lie in the neck round about the trachea, because they are far away from the field of operation. The only caution necessary is that one should stick strictly to the middle line. In performing the operation, the structures that will come in the surgeon's way are the two anterior jugular veins, Burns' space, the thymus, the trachea, the inner edge of the sterno-thyroid muscles, and the thin line of deep fascia between them.

After having cleaned and sterilized the neck in the usual way, extend the neck by raising the shoulders on a sand bag and holding down the head at a lower plane. The little patient is rolled up in a sheet to make movement of the limbs impossible. One assistant holds the patient down by the lower limbs and another holds the head with great care, keeping it in the middle line. The surgeon stands to the right side of the patient.

Putting the tip of the index finger of the left hand at the sternal notch, a longitudinal incision about 2 inches long should be made exactly in the middle line down to the investing layer of the deep cervical fascia. This brings into view the thin line of deep cervical fascia between the sterno-thyroids in the middle line, and also resting on the muscles on either side the two anterior jugular veins. There is little or no haemorrhage at this stage of the operation, and there is no pain felt subsequent to this. With the sharp edge of a small scalpel directed towards the chin pierce the deep cervical fascia at the level of the lowest points reached by the anterior jugular veins before they disappear into Burns' space to communicate with each other, and continue dividing the two layers of the deep cervical fascia which