

INTRACRANIAL HÆMORRHAGE IN THE NEW-BORN,

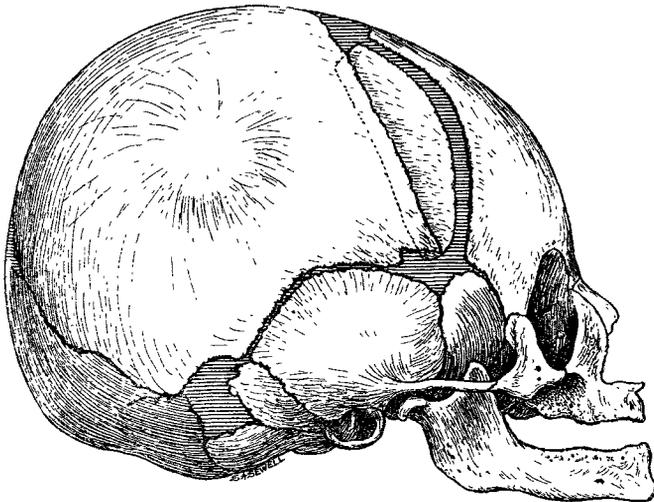
WITH OBSERVATIONS ON FRACTURE OF THE SKULL OF THE INFANT.

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AND
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THE following details of a case of intracranial hæmorrhage in the new-born are given as a preface to some general observations on fracture of the skull of the infant.

The mother was a primipara aged 32. The external measurements of the pelvis were found to be slightly below the normal. Labour was slow and prolonged, delivery was effected by forceps, but with difficulty—indeed, at one time it was doubtful whether with forceps alone delivery could take place. The child, a male, was born in a state of white asphyxia, and artificial respiration was performed for half an hour before he breathed naturally. He weighed 9 lb. 10 oz. There was a large caput succedaneum. During the following two days it was noticed that the child was continually crying, and that the cry was not the normal cry of a healthy baby. On the third day a long screaming fit occurred, and, following this, an elongated soft swelling was observed on the right side of the head extending from the antero-median fontanelle to the antero-lateral fontanelle. The middle of the swelling was three-quarters of an inch in width, and rose three-quarters of an inch above the level of the scalp. On palpation the edges of an opening in the skull could be clearly defined; the posterior border was straight and appeared to be at the fronto-parietal junction. The anterior border was concave, so that the opening was wider in the middle than at the upper and lower limits. There was no subjunctival hæmorrhage, no contralateral paresis, the reflexes were normal, and the taking of nourishment was not interfered with. The head was 14½ in. in circumference; the horizontal distance

FIG. 1.



Diagrammatic representation of skull, showing broken fragment of frontal bone depressed and lying partly under anterior border of parietal bone.

from the glabella to the inion was 5¾ in., and the vertical distance of the scalp on the vault from the level of the auditory meatus was 3¾ in. As the infant was taking food normally, it was decided that if all went well and the swelling did not increase, an operation should not be performed immediately.

Operation on Fourteenth Day.—A vertical incision was made through the scalp, half an inch posterior to the swelling, from the bregma to the region of the anterior inferior angle of the parietal bone. The scalp was then dissected off the swelling in front. This was seen to be pericranium with dark fluid showing through it. On incision of the pericranium about 2 oz. of dark treacly blood escaped, and the broken fragment of the frontal bone became exposed to view. This was depressed about one-third of an inch and it had been shifted a little backwards, so that its posterior border lay under the anterior border of the parietal bone (see Figs. 1 and 2). The dura mater had been separated for about 1 in. in front and for about 1 in. behind the opening, from the frontal and parietal bones. There were several small clots

which required removal from under the edges of the opening. The main mass of the extravasated blood had not clotted, but was in the condition of the blood in the well-known experiment of the "living test tube."

The close attachment of the dura to the bones of the cranial vault in the new-born made it difficult to elevate the depressed fragment of frontal bone. There were signs of further bleeding when an attempt was made to elevate it, and as this could not be controlled while the broken fragment was entire, it was removed in pieces. The bleeding was then found to have come from a branch of the middle meningeal artery which supplies the frontal bone, and which had been injured close to the place where it is given off from the main trunk of the artery. A slight bleeding was still proceeding, but was easily arrested. On removal of the depressed fragment of frontal bone the dura rose to its normal position. The pericranial flaps were laid back in place and the scalp sutured with gossamer silk worm gut. The opening in the skull was 2¾ in. from above downwards and three-quarters of an inch wide.

The baby made a good recovery. Six weeks after the operation no opening in the skull could be detected, so rapidly had the pericranium thrown out new bone. It is obvious that the slight symptoms observed (e.g., no contralateral paresis) were due to the depression of the broken fragment of bone which allowed the escape of the effused blood from within the cranial cavity to the subpericranial region beneath the scalp.

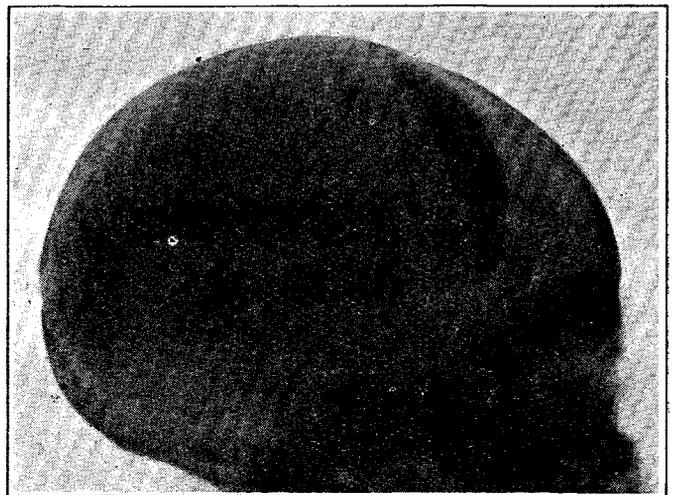
Remarks.

In the Museum of the Royal College of Surgeons of England are two specimens of fracture of the skull at birth, both described in the Jacksonian prize essay of Sir Crisp English, 1902.

No. 877A is the skull of a child at term showing a depressed fracture of the anterior inferior angle of the parietal bone due to the use of forceps in a case of contracted pelvis. The mother, aged 32, had had one miscarriage. Much force was used in the delivery of the child by means of the forceps. In addition to the fracture of the right parietal bone, there is a fissured fracture through the tip of the great wing of the sphenoid on the left side.

No. 877B is the skull of a child at term showing a depressed fracture of the frontal bone due to pressure on the sacral

FIG. 2.



Radiographic appearance of skull, showing fissure and broken fragment of frontal bone.

promontory in a case of contracted pelvis. The mother was a primipara aged 26. As the head did not progress forceps were applied. The child on being extracted stopped breathing after a few gasps, and all efforts to resuscitate it were unavailing. Examination of the mother's pelvis showed diminution in the conjugate diameter, with marked projection of the sacral promontory—a flat rachitic pelvis. The scalp over the left frontal region was extensively bruised, and a very large caput succedaneum had formed over the vertex. There was marked over-riding of the sutures, the right frontal bone overlapping the left. The depression was obviously caused by the projecting sacral promontory, and not by the forceps, which had left no appreciable mark.

Observations of Various Writers.

Harvey Cushing,¹ in 1905, reported four cases in which surgical intervention was employed for the relief of intracranial hæmorrhage in the new-born. Details of these cases are given and two were success-

fully operated on. Each case was an example of difficult forceps delivery.

Cranial palsies, epilepsy, and other nervous disorders which may be a permanent life disablement may ensue from the untreated hæmorrhages arising from trauma during birth. The unsupported venules passing to the longitudinal sinus and pacchionian bodies are easily broken, and thus large extravasations may occur in the subdural space while the giving way of the thin-walled vessels on the outer surface of the dura may occasion extradural hæmorrhage. The extravasations are usually unilateral. Cushing says these hæmorrhages give rise

“to post-natal asphyxiation, a bulging fontanelle without pulsation, convulsions, contralateral palsy, a stabile pupil, ocular proptosis, subconjunctival hæmorrhage and œdema on the side of the hæmorrhage, irregular respiration, slowing of the pulse and a rise of temperature, inability to take nourishment, and death.”

In the foetal skull the sutures are absent, the adjacent margins of the bones of the skull are separated by fibrous septa continuous with the dura mater internally and the pericranium externally; hence it is difficult to separate the flat bones of the vault from the underlying dura mater, each bone being lodged as it were in a dense membranous sac. The bones of the vault consist of a single layer without any diploë. The effect of an injury to the cranial vault of an infant is as a rule limited to one bone, and this is naturally the result of the anatomical conditions of the cranium present at this period of life. Cushing writes in the paper above referred to:—

“The calamities of childbirth are responsible for a large proportion of crippled and spastic children that come under our care. The vessels most likely to rupture are those which ascend over the cortex and enter the longitudinal sinus from the mid-cerebral region. Rupture of vessels may take place on one side only, extravasation is indeed usually limited to one side of the falx, though bilateral lesions are common enough, as the many patients with diplegia would indicate. Birth palsies due to injury are commonly supposed to be bilateral, and many of the writers on the subject regard the spastic diplegias or paraplegias as the typical cases of Little's disease. Some at least, however, of the spastic hemiplegias must also be due to injuries sustained at birth. Epilepsy is a common sequela in recovered cases. In these late stages any form of therapy is hopeless. On the other hand, a new-born child stands operation for the removal of intracranial or subdural hæmorrhage well. It is to be noted that symptoms may not arise till some days after birth. Fever and unilateral convulsions on the fifth or sixth day after birth must not be mistaken for an infective process.”

Cushing's cases in brief are as follows:—

1. Male, seen three days after birth. Mother a primipara, aged 35. Labour prolonged. Child deeply asphyxiated at birth. Can move both arms and legs. General convulsions. Left eye kept closed. Left pupil dilated. Cheyne-Stokes respiration at time of operation. Operation: Osteoplastic flap, left parietal bone. Dura tense, plum-coloured. Much clot removed from subdural space. Death eight hours later.

2. Baby seen one week after birth. Mother primipara. Tedious breech presentation. Pallid asphyxia present at birth. Temperature rose to 101.6° F. on fifth day. Pulse 80. Sixth day convulsions, mostly left-sided and with cyanosis. Fontanelle bulging, tense. Operation: Osteoplastic flap, right parietal region. Dura tense and plum-coloured. On opening it much blood and clot removed. Recovery.

3. Girl seen on eighth day. Difficult forceps labour. At birth child profoundly asphyxiated. On third day protrusion of left eye with subconjunctival hæmorrhage and swelling. Refused to suck. Convulsions and twitching, especially of right hand, noticed. Fontanelle very tense. Operation: Osteoplastic parietal flap on both sides. On opening dura much blood-clot removed, and much cerebro-spinal fluid escaped. Recovery.

4. Second child, precipitous labour, seen on third day. Cephal-hæmatoma left parietal region. Left pupil larger than right. Pulse slow. Failure to take nourishment. Superficial veins of scalp very full and visible. Right limbs more rigid than left. Convulsions. Operation: Left parietal osteoplastic flap, dura plum-coloured. On incision much clot removed. Child suddenly stopped breathing and all efforts to restore spontaneous respiration failed. Autopsy: Hæmorrhage limited to left side of falx. Cortex uninjured. One of the large cortical veins was found torn close to its point of entry into the longitudinal sinus. The cephal-

hæmatoma was not connected in any way with the subdural hæmorrhage.

Von Bergmann² figures a case of Bruns of fracture of the frontal bone extending into the orbit in a new-born infant. He writes: “In rare cases the pressure of the forceps may cause fracture of the skull, particularly of the frontal bones. Generally it is not the closure of the blades that is responsible for the fracture but the violent pressure of the head against the promontory as it is forcibly dragged through the pelvis.”

In E. D. Truesdell's³ volume radiograms are given of birth fractures, as follows: (1) Fracture of occipital bone, breech delivery; (2) transverse fracture, right half of frontal bone, forceps delivery; (3) fissure fracture, right parietal bone; (4) fissure fracture, right parietal bone, face presentation.

Subcranial hæmatoma is said to be characteristic of these fractures. Kosmack* reported four cases, all forceps cases, three frontal fractures and one parietal; operation successful in each case. In the case reported by Dr. A. B. Davis depression of the frontal bone resulted from pressure on the infant's brow by the promontory of the sacrum. The rule, Truesdell says, is to operate on all these fractures, especially if they are depressed.

Ernest Bumm⁴ gives three figures showing deep depression on the infant's skull at birth. In two cases the depression occupied the left parietal region and in one the right parietal region. The latter was thought to be due to pressure on the sacral promontory.

William Sharpe⁵ points out that in fractures of the infant's skull it is not the fracture that is the important point but the lesion beneath the fracture. In his paper extensive fractures of the parietal and frontal bones of the new-born infant are illustrated. Lumbar puncture is said to be of great use in the diagnosis of subdural bleeding. Increase of intracranial tension is always present; it can be measured with the mercurial manometer during lumbar puncture, and by the use of the ophthalmoscope. It is advised to operate on all depressed fractures; and sub-temporal decompression is recommended.

Dr. Vaglio⁶ quotes the remark that the mortality is higher on the day of birth than on any other day that humanity has to meet. The percentage of this mortality, which is due to obstetric injuries, is variously estimated as 5 and 1. Intracranial hæmorrhage is the chief harm that results. Extravasated blood should always be evacuated, and a few cases in which this has been done are cited. In Vaglio's own case convulsive movements of head, eyes, and limbs occurred on the second day. By lumbar puncture a large quantity of bloody fluid was withdrawn. Great improvement at once took place. Hæmorrhage, it was thought, could not have been large as patient made an excellent recovery. The symptoms were due to high pressure of the cerebro-spinal fluid. At the age of 6 months the child was the picture of health.

Dr. Foote⁷ writes that in the new-born with intracranial hæmorrhage there may be a general tendency to bleeding. Other hæmorrhages (stomach and rectum) have been observed after a cranial operation has been successfully done. In 7 cases in which treatment was by lumbar puncture 1 died. In 36 autopsies on stillborn infants or those dying shortly after birth, 50 per cent. showed hæmorrhage over the brain cortex and 5 of the infants vomited blood before death. In one of these cases 12 hours after birth the face became blue and the respiration laboured. There were no marks of head trauma. The coagulation-time of the blood exceeded nine minutes. Blood came from the stomach, rectum, nose, and ears. In one case recovery is recorded after treatment by thromboplastin and horse serum. Dr. Foote's conclusions are that (1) Intracranial hæmorrhage of the new-born may be a local manifestation of a general condition; (2) early lumbar puncture and the use of substances which increase the coagulability of the blood should be given even prior to operation.

* Bulletin of the Lying-in Hospital, N.Y., vol. ix., No. 1.

Fractures Resulting from Direct Post-Natal Injury.

As the consequence of direct injury, during early infant life, similar fractures occur, as happen sometimes during delivery. Indeed, such fractures, without fissures radiating in many directions, are to be expected till the time comes when the bones of the cranium are united by sutures and not simply joined together by fibrous tissue, and when they are no longer thin lamellæ without diploic tissue separating an inner and outer table.

Frazer⁸ writes: "The diploë appears about the age of 10 years; it becomes most developed in bones that are thick." Sir Arthur Keith⁹ writes: "The membrane-formed bones consist at first of a thin lamella of osseous fibres radiating out from the point at which ossification commenced. The osteoblasts beneath the pericranium on the outer surface of the lamella and the dura mater on the inner surface deposit bone, and by the fifth year an outer and inner table, with diploic tissue between, are developed." In the Museum of the Royal College of Surgeons of England a section of a skull of the age of 3 years shows diploic tissue at the glabella, at the inion, and at the anterior inferior angle of the parietal bone, while the intervening bone shows no diploë and no differentiation into an inner and outer table. A section of another skull of the age of 5 years shows diploic tissue throughout the bones of the cranial vault. In another specimen of a skull at the age of 15 months the sutures separating the cranial bones are beginning to be well seen.

The facts in regard to the infant's skull after birth were pointed out very clearly by Sir Rickman Godlee in a paper read before the Pathological Society in 1885, entitled *On Simple Fracture of the Skull in Infants followed by the Development of Pulsating Subcutaneous Tumours*. The pulsating mass may consist of blood and cerebro-spinal fluid with or without brain matter. Godlee's cases were aged 5 months and 8 months and both suffered parietal fractures. In both cases the injury was caused by a fall out of window in one of 8 and in the other of 14 feet. In one of the cases the brain cortex was ruptured so as to open the ventricles. Godlee writes:—

"When a young child receives a blow on the head the mischief is almost all spent upon the part struck and that lying immediately beneath it. The process extends little if at all beyond a single bone; indeed, no one of the common fractures of the skull as we meet with them in the adult can take place in its typical form in an infant, but, on the other hand, there are forms of fractures special to the young skull. There are fractures of the infant's skull which would have been undetected (the bone after breaking the adjacent dura and severely lacerating the brain having sprung back in place) had not actual brain matter been found in the wound beneath the scalp or in the pus (as I saw in one case) evacuated from the suppurating hæmatoma which formed over it."

Many other surgeons have described such cases. In Warrington Haward's¹⁰ case a child 19 months of age fell 15 feet on to its head, sustaining a fracture of the frontal bone above the right eyebrow. A tense translucent swelling appeared in this region; this was tapped and cerebro-spinal fluid withdrawn. The child died of meningitis two weeks later. Before death left-sided convulsions occurred.

Clement Lucas¹¹ described three cases:—

1. Girl, aged 2 years and 6 months. Three months before admission fell 18 feet from a window. Unconscious for some hours. A fluid, non-pulsating swelling formed on left side of head, occupying the temporal fossa. A fracture could be felt running in an irregular horizontal line beneath the swelling. In two months the swelling disappeared, and the child was discharged from hospital. The patient died in hospital one year and nine months later of meningitis. She was readmitted to the hospital in an emaciated rachitic state due to gross neglect. The post-mortem examination showed that at the time of the accident extensive injury to the brain occurred; and that the contents of the tumour were in communication with the lateral ventricle.

2. Boy, 1 year and 11 months, fell 10 feet from a window. Unconscious and convulsed for some time. Pulsating fluid swelling appeared left frontal region. Vertical fracture through left half of frontal bone felt through tumour. Two

months later the child left hospital well; the pulsating fluid swelling had disappeared.

3. A child, 1 year old, fell 12 feet down a staircase. Convulsions followed. Left side paralysed. Swelling left parietal region. Trephining; paralysis passed away. Escape of cerebro-spinal fluid from wound on fourteenth day. Death on twentieth day from meningitis. Post-mortem: The injury to the brain had extended to the ventricle.

Clement Lucas, from the study of these and other cases, drew two conclusions: (1) That cases of simple fracture of the skull followed by collections of cerebro-spinal fluid beneath the scalp are peculiar to young children, and (2) that when cerebro-spinal fluid escapes through the vault (whether the fracture be simple or compound) the injury has extended to the ventricular cavity.

Sir Thomas Smith¹² described two cases:—

1. A boy of 8 months with a right parietal swelling containing cerebro-spinal fluid. Two months before admission to St. Bartholomew's Hospital he fell 8 feet out of a window, the injury being followed by collapse, irregular breathing, convulsions, most marked on the left side, and inability to swallow. Death took place a week after admission and post mortem a long wide horizontal gap was found in the right parietal bone.

2. A girl, aged 3 years; when 4 months old she fell on her head and was unconscious for one week. On examination she was found to have a soft fluid pulsating swelling corresponding to the right occipital region. On firm pressure no sense of resistance was met with. There seemed to be a complete absence of bone at the site of fracture. The child was admitted to St. Bartholomew's Hospital for synovitis of the left knee and strumous disease of a phalanx. The occipital swelling was not the cause of any symptoms. "Of these two cases it is to be remarked that the size of the gap in the skull is too considerable to be accounted for by fracture alone. Nor can the opening in the cranium represent a piece of detached bone. There must have been some considerable removal of bone by *absorption* subsequent to the fracture. The absorption may be due in these two cases to injury to the growing centre of the affected cranial bones."

Sir Thomas Smith refers to the cases of Clement Lucas and Warrington Haward and to one mentioned by Sir John Erichsen.† Also to two cases described by Dr. Corner,‡ and concludes with the statement—

"That though so far 22 cases have been described, it may well be doubted if the number of recorded cases adequately represents the frequency of the lesion. Aspiration is a help to diagnosis but cannot be regarded as a curative measure."

Golding Bird¹³ reported the case of a girl of 7 months who fell to the floor from the lap of a woman who was nursing her. A large pulsating fluid tumour developed in the right parietal region and disappeared in about three and a half weeks.

In Sawicki's¹⁴ essay some interesting cases are cited:—

(1) Dembowski's case, a boy, 1 year and 4 months old, who fell on his head one month before being seen, and showed fracture of right parietal and frontal bone. A swelling appeared and grew rapidly so as to occupy the right half of the skull. Illustrations are given showing the child's head before and after operation. At the operation part of frontal and most of parietal bone depressed and almost detached. Displaced bone replaced and the gap which still remained was closed by pericranial flap. Complete recovery. (2) Schramm's case, a girl, 5 months old, seen two months after a fall from a height; right parietal meningocele resulted. (3) Koajewski's case, a boy, 4 years old, who at age of 16 months fell on head. Right parietal traumatic meningocele formed. (4) Bossowski's case, a boy, 4 years old, who fell on his head some time before being seen. Left fronto-parietal traumatic meningocele followed. (5) Bossowski's second case, an infant, 17 months old, who fell on head. Right parietal swelling following. A fissure fracture of the os parietale could be palpated.

Dr. Bastian's¹⁵ case is as follows:—

A boy, aged 4 years, fell 22 feet out of a window. In falling he struck the left side of his head against a projecting window-ledge, and was unconscious for four days. A large non-pulsating tumour formed over the left parietal bone; he was seen three and a half weeks later, when right hemiplegia, aphasia, and paralysis of left third nerve were noted. The swelling was slowly increasing in size. Operation: Much brain substance under scalp. Oblique fracture of parietal bone. The edges were so clean that they might have been cut with a knife, and were separated about one-third of an inch. The edges of the fracture had evidently sprung back

† Science and Art of Surgery, vol. i., p. 423, sixth edition.

‡ American Journal of the Medical Sciences, 1884.

in place, bringing brain substance with them, after the fracture and bone depression had taken place. The dura mater was cut through in position and extent corresponding to the fracture in the bone. The operation was soon followed by disappearance of the encephalocele and all swelling. Two years later speech had returned; power over the right leg was restored, but the right hand was useless.

Remarks.

It will be seen from the cases narrated that the pioneer papers illuminating fractures of the infant's skull after birth were contributed by Clement Lucas, Thomas Smith, and Godlee, while the same is true of Harvey Cushing concerning the fractures of the skull in the new-born. At both periods of life the fractures tend to be of the same type, and so the surgical treatment suitable for the one is also proper for the other.

Clement Lucas was especially interested in the escape of cerebro-spinal fluid in the fractures of the vault, and came to the conclusion that when cerebro-spinal fluid escapes through the vault the injury has extended to the ventricular cavity. It may well be that in any severe injury to an infant's skull the delicate tissue (the fluid texture) of the infant's brain may suffer a rent which reaches the ventricle at the same time that the bone fracture occurs; but we now know that cerebro-spinal fluid may escape from the subarachnoid spaces of the cortical meninges of the cerebrum and cerebellum in considerable quantity without there being any direct communication with the ventricles. In cases of brain tumour when a decompression is carried out by the removal of a portion of the cranial vault and incision of the dura mater, the absence of a flow of cerebro-spinal fluid may be accounted for by the brain rising into the craniectomy opening and acting as a cork. Harvey Cushing urges justly that operation should be undertaken promptly, not only to obviate impending death but also in case of the recovery of the infant to anticipate and prevent the common sequelæ of such injuries—paralyses, amentia, epilepsy, &c.—which cause the child to become a burden to its parents and a useless member of the community. Though the surgeon is apt to pride himself on some successful operations for the cure of traumatic epilepsy, it surely ought to be his object to avoid such operations. This can only be accomplished by operating shortly after the occurrence of the injury to the infant's skull. The elevation of depressed bone, and the removal of subcranial or subdural clots may well obviate the necessity for operation later on in life, the success of which is by no means assured.

Dr. Benjamin Winslow Dudley,§ professor of anatomy and surgery in Transylvania University, in 1828 contributed to the literature of the subject a remarkable paper, in which were described, among others, the following two cases:—

1. A man, aged 21, who when 5 years old received an accidental blow on the left parietal region. Paralysis of the opposite side ensued and slowly disappeared. Pain in the head and attacks of faintness occurred till the fourteenth year, when severe epileptic convulsions supervened every two or three weeks. These were soon followed by loss of memory and stammering speech. There was a cicatrix over the original site of injury. At operation, May 10th, 1825, a portion of depressed bone was removed. A spicule of the inner table was fixed in and perforated the dura. Twelve hours after operation cerebro-spinal fluid began to escape and continued in large quantity for three days and three nights. The quantity of fluid that escaped was estimated at two gallons. Patient made a complete and perfect recovery.

2. A man, aged 24, who, when 5 years old, was kicked by a horse. The parietal bone was fractured and depressed. From the fifteenth year epileptic convulsions occurred every two or three weeks, and mental enfeeblement was marked. At operation, February, 1826, most of the depressed bone was removed by the trephine. A spinous process projected from the inner table about half an inch long. The dura beneath the depressed bone was in part defective. Between the dura and the brain was a sinus (arachnoid cyst), the size of a hen's egg, containing colourless fluid. The patient made a complete recovery, regaining perfect health.

§ American Journal of Medical Sciences, vol. ii., 1828, contains an abstract of a paper on injuries of the head and the cure of traumatic epilepsy from the first number of the Transylvania Journal of Medicine.

Dudley remarks that—

"In skilful hands the operation of trephining beyond the atmosphere of large cities is neither dangerous in its consequences nor difficult in execution."

These two cases serve to remind us that successful operations for traumatic epilepsy were not first performed by the present generation of surgeons or even by its immediate predecessor. They also emphasise the importance, well recognised at the present time, of operation on all depressed fractures, including those of infants. The first case quoted is an illustration of profuse escape of cerebro-spinal fluid from an injury of the vault. The injury in this case did not at first appear very severe; the boy was not unconscious, he was able to walk home from school, and it does not seem likely that the injury to the brain extended as far as the ventricles.

Lastly, it may be affirmed from our experience that infants bear well operations on the skull, carried out with the greatest gentleness, and with every effort to prevent loss of blood. This is a confirmation of the views of Harvey Cushing. Since the dawn of the Listerian era of scientific surgery, we, unlike the older surgeons, can operate on the skull of the infant without fear of sepsis and with every confidence of success.

Bibliography.

1. Cushing, H: American Journal of the Medical Sciences, October, 1905.
2. Bergmann, v.: System of Practical Surgery, by Profs. Bergmann, Bruns, and Mickulicz, vol. i., p. 24, 1904.
3. Truesdell, E. D.: Birth Fractures, New York, 1917.
4. Bumm, E.: Grundriss zum Studium der Geburtshilfe, 1913, pp. 578 and 579.
5. Sharpe, W.: International Clinics, vol. iv., 29th series, p. 249, 1919.
6. Vaglio: *Pediatria*, Naples, 1921, p. 12. Treatment of Intracranial Hæmorrhage in the New-born.
7. Foote, J. A.: American Journal of Diseases of Children, 1920, vol. xx., p. 18.
8. Frazer: The Anatomy of the Human Skeleton, 1920, p. 196.
9. Keith, A.: Human Embryology and Morphology (4th edit.), 1921, p. 144.
10. Haward, J. W.: THE LANCET, 1869, ii., 79.
11. Lucas, C.: Guy's Hosp. Reports, 1876, 1878, 1881, and 1884.
12. Smith, T.: Traumatic Cephalhydrocele, St. Bartholomew's Hospital Reports, 1884.
13. Bird, G.: Guy's Hospital Reports, 1889.
14. Chipault: L'état actuel de la chirurgie nerveuse, Sawicki, vol. ii., p. 166, 1903.
15. Ballance, C. A.: Some Points in the Surgery of the Brain, 2nd edit., 1908, p. 38.

A NOTE ON THE USE OF DIMOL IN THE TREATMENT OF SUMMER DIARRHŒA IN INFANTS.

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IN a disease so fatal to the infant life of the country as so-called summer diarrhœa, any new method of treatment must be considered which appears to hold out more hope of success than those at present in vogue. I therefore communicate the results obtained last summer (1921) in the treatment of a small number of cases of acute and subacute diarrhœa with dimol syrup, in the hope that others may give the treatment a trial. Dimol is in constitution dimethylmonomethoxyphenol and resembles creosote in taste and odour. It is said to be 35.5 times more potent than phenol and to be entirely non-irritant, non-toxic, and non-absorbed. At present it is sold in the form of a syrup and in two kinds of pulverette. I used the syrup in doses of approximately one drachm for babies 9–15 months old, and half a drachm for babies 3–9 months old, every four hours.

Unfortunately only a small series of cases, 23 in all, was obtained, as the use of the drug was not commenced till the second week in September. In order to put it to as severe a test as possible, in the first series of 16

|| Erichsen: Science and Art of Surgery, tenth edition, vol. i., p. 736, 1895: "Non-interference is the proper course to pursue in some cases (simple depressed fracture without symptoms), more particularly in children, there can be no doubt." The view long held that a boat-shaped depression on an infant's skull need not be elevated is not now tenable.