ing gain in general strength and digestive power, and in a few weeks the patient was well.

Not to go further into detail, I have seen in consultation during the past eighteen months five cases of scurvy in children aged eighteen, twenty, twenty-two, sixteen, and fourteen months, respectively, which illustrate the etiological point in question. In each of these cases the food was properly proportioned and had for its basis sound cow's milk, but sterilization had been uniformly employed in its preparation. All recovered rapidly upon the same food unsterilized, with the addition of a small quantity of raw beef-juice and orange juice to the diet.

CRANIOTOMY FOR EPILEPSY AND ALLIED CONDITIONS.¹

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THE term used in this paper is craniotomy, and not craniectomy, as usually printed. Craniectomy, which would mean excision of the skull, seems to me ill-chosen.

I have the following six cases of craniotomy to report:

Osteoplastic resection of skull for epilepsy. Daphne S., aged two years and seven months. July 19, 1893. June, 1892, whilst running across room fell, striking right side of head against wooden edge of sofa; was unconscious for some hours, then violent general convulsions all night; after convulsions left hemiplegia, which gradually disappeared.

June 7, 1893. Well-nourished child; speaks only one or two words; paresthesia of left hand and forearm, and weakness of left leg. Mother reports that two to five times daily child, while playing, will stop suddenly, eyes become fixed, head turn to one side (which side not noticed), have spasm of left arm, usually continue playing without paying attention; sometimes fall down. Ordered antipyrine, gr. vi., in two doses, taken in the morning. After two weeks, no improvement occurring, ordered sod. brom., gr. x., in two doses, as before.

July 17th. Mother reports no improvement; spasms more frequent and violent; child more often falls during spasms, and cries after them.

Operation, July 19th. Drs. Otis, Cavel, H. and Ida Stambach assisting. Chloroform; usual aseptic precautions. Fissure of Rolando and motor area of left arm determined by Chiene's method. Tongue-shaped flap over motor area of left arm, with base downward, including scalp and bone turned down; no adhesion of dura mater; no pulsation on exposure of dura mater; incised dura mater, which was much thickened, when organized clot (oedematous) about $\frac{1}{2}$ inch thick found, closely connected with pia mater; bone cut away in direction upward and forward to determine extent of clot for distance of about $\frac{1}{2}$ inch; much serum exuded from oedematous pia mater on scarification; dura mater

¹ Read before the Southern California Medical Association, Los Angeles, June 5, 1895.

sutured loosely with interrupted catgut suture; continuous catgut suture of scalp-bone, which had entirely separated, being replaced; iodoform and aseptic gauze dressing; 6 p.m., temperature, 99°; pulse, 120; general condition good.

December 30th. Dressing removed two weeks after operation no general or local reaction having followed, except slight rise of temperature (patient being up on third day), wound healed *per primam*, and bone solid. Night after operation two slight attacks, but none since, and weakness of left arm almost disappeared, and restlessness and nervousness greatly diminished.

May 27, 1895. Paresis of arm and leg rapidly disappeared, and the child learned to talk. During first year after operation, twice during attacks of acute indigestion, had a single convulsion, but of entirely different character to those formerly seen. Is still abnormally restless, and while running about occasional "jerks" are observed. Otherwise cured.

Osteoplastic resection of skull for epilepsy. P., aged twenty-six years; American; single. December 9, 1893. Family history good. When four years old fell, causing scalp wound in left parietal region. Physician put in one suture. Said to have expressed fear of compression of brain. Continued healthy until age of seventeen. Since that time has been subject to epileptic fits. Patient and (adopted) mother state that fits occur about every eight or nine days, but friends state that attacks are much more frequent, patient often not realizing that he has had one. Before an attack the patient states that he has a sense of "beat" passing upward from abdomen, through the chest to the head. This is followed by general convulsions, with unconsciousness, followed by stupor.

On examination general good health; mind clear, but somewhat childish. In left parietal region is a scar about two and one-half inches in length, commencing about one inch below the vertex, passing obliquely downward and backward. About middle of this cicatrix; scalp firmly adherent to bone, and distinct depression of bone.

Operation. Ether; usual aseptic precautions; trephining over seat of depression; horseshoe incision with base downward. Portion of bone, about two and one-half by two inches, cut out with chisel and mallet; base left adherent to periosteum. Scalp found firmly adherent to bone, and dura mater to inferior surface of bone. Skull thickened on internal surface, corresponding to depression; no other change; dura opened. Brain protrudes rather more than usual; otherwise normal. Dura closed by three catgut sutures. Sheet of gold leaf interposed between dura and bone. Bone replaced. Scalp wound closed by continuous catgut sutures. Aseptic gauze and cotton dressing.

December 14th. Slight rise in temperature every evening since operation (highest 101.4°), but otherwise condition good. Had two convulsions on the night following operation, but none since.

30th. Dressing removed two weeks after operation. Complete *per primam* union, and bone solid. Had slight convulsion twelve and thirteen days after operation during night, and a very mild one on December 28th. After first ordered sod. brom., gr. xc., at night and in three doses.

June 2, 1894. Cultures from scalp showed staphylococcus pyogenes albus.

May 27, 1895. Patient has mild convulsions at intervals of three

weeks to a month. Says they do not last so long, and are not followed by stupor, as before. Mental condition much improved—apparently normal.

Jacksonian epilepsy with mental aura; trephining. Rosa T., aged eight years; American. February 1, 1894. Child has had strabismus since birth. Family history good. When fourteen months old had attack of what was probably cerebro-spinal meningitis, with apparently complete recovery. At age of three years fell backward from balcony, some six to eight feet, striking left side of head on a pile of bricks. Scalp wound of left parietal region, which healed readily. About four months later commenced to have attacks of following character. When seeming perfectly well child would become apparently insane, commence to scream violently, and strike at any one near. Attacks usually accompanied by spasmodic contractions of left, sometimes of both arms; usually ceased when child was held and spoken to severely. Attacks generally followed by unconsciousness or semi-stupor, lasting a few minutes to several hours. Frequently complete aphasia, lasting several hours after attack; if not, always indistinctness of speech ("tongue seemed thick"), and mental confusion or condition of apparent insanity. Attacks occurred both by day and night, during sleep or waking, without apparent exciting cause, sometimes five or six times in twenty-four hours, sometimes only two or three times a week. Medical treatment (by bromides, etc.), had little or no effect. General health and development good, but child, while intelligent and learning rapidly, restless, excitable, and difficult to control. Complaints of constant pain, pointing to frontal, both parietal and occipital regions. Examination shows nothing abnormal, except as above, and a cicatrix of a small scalp wound not adherent to the bone in left parietal region, about half inch below estimated motor area of arm. No evidence of depression of bone. Ether; usual aseptic precautions. Omega-shaped incision of scalp, base downward, over left motor area of arm; fragment of bone one and one half inches vertically by one inch transversely removed entirely with chisel and mallet. Dura non-adherent, normal; opened, and pia found somewhat edematous, vessels engorged, and brain protruding more than normal. Two catgut sutures of dura. Bone not replaced. Scalp wound closed somewhat loosely by continuous catgut sutures. Iodoform crystals. Iodoform and sterilized gauze and cotton dressing.

February 2d. No shock or general reaction following operation. Child had two mild spasmodic attacks of usual character during night. Condition exactly same as before operation, but says pain in the head has disappeared.

6th. Two slight attacks night of February 2d; none since. Mother says child is much quieter and less restless than before.

14th. Dressing removed; complete primary union.

26th. When seen two days ago, mother stated that since operation child had three severe attacks and a number of premonitions not followed by attack; much quieter and less restless.

May 27, 1895. Patient has occasional attacks once in three or four weeks of similar character to those before operation, but much milder and not followed by stupor, aphasia, or insanity. Still very restless and excitable, but much less so than before, and constantly improving.

Trephining for Epilepsy. Katie K., aged twelve years and seven

months; American. August 23, 1894. When about ten months old, patient had attack of left hemiplegia, without known cause; no specific history. Partially recovered from this, but at the age of two years and seven months commenced to have severe general epileptic attacks. Since that time patient has scarcely grown or developed at all. Has never learned to walk, use her hands, or speak; and though there is no apparent paralysis of tongue or muscles of mastication, child has apparently forgotten how to chew, and only swallows soft and liquid food. Passes urine and feces voluntarily, but without knowing enough to call attention beforehand. Intelligence limited to recognizing members of family and indicating hunger and thirst by putting out tongue. Has from five to twenty-five general convulsions every twenty-four hours, and requires constant attention.

Examination: Very anæmic, emaciated child, showing development of a child of four years. Paresis of muscles of both legs and arms, chiefly involving extensors, so that the hands are held in flexed position, knees flexed, and feet extended. Rhachitic deformity of chest and curvature of lower end of left tibia. Had fairly well-developed and fairly formed head, except that parietal eminences are unusually prominent and there is corresponding depression at situation of posterior fontanelle.

Ether. Usual aseptic precautions. Omega-shaped incision with base downward, over upper portion of motor centres on right side; found a thickening of bone, due to a deposit of soft cancellous bone, over a circular area, three-quarters of an inch in diameter at the upper and posterior portion of area of bone exposed. Removed with gouge and chisel an area of bone one and a half inches in diameter. Bone about half as thick again as normal, soft, and very vascular. Dura not specially adherent, but vessels much enlarged, pin adherent to dura, stripping off with it, and vessels much enlarged. Dura closed with one silk suture. Bone not replaced. Scalp wound closed with continuous silk suture, iod. crystals, iodoform gauze, and cotton dressing.

August 24th. Little evidence of shock during or after operation. While coming out of ether had three slight convulsions; none since, and condition good. Much discharge of cerebro-spinal fluid through dressing, which, however, is dry and not changed.

September 6th. Dressing removed. Complete primary union.

For about three months after operation no convulsions. Then began to have occasional attacks, but single, and not more than once in two or three weeks. Parents thought intelligence improved, but probably not. Died of unknown intercurrent disease after about seven months.

Epilepsy. Trephining. S., American, single, aged twenty-one years. April 29, 1894. Family history good. Was well developed and healthy, except for one or two convulsions as baby, until three years of age. At that time had mild attack of diphtheria. From that time on commenced to have epileptic convulsions; mental development almost ceased and growth was greatly retarded. Has never learned to speak more than a few words, is entirely childish, and takes little notice of surroundings. Recognizes a few persons, but slowly, and with difficulty. Has to be fed, and can only take soft food, having apparently not learned to chew; walks feebly, and generally with support, but no paralysis. If watched carefully, will indicate when she desires to pass water or have movement of bowels.

Menstruation began about the age of fifteen, and normal since. Ap-

petite good, sleeps well, and howels regular. Had general epileptic convulsions after diphtheria; nt first, as many as sixty a day; has taken almost constantly large doses of hrmmides, and convulsions have diminished to about five or six in twenty-four hours, occurring day and night.

Examination: Feeble, excessively anæmic and rather emaciated, having the appearance and development of a girl of fourteen. Mental condition as above. Used as a child to complain of unpleasant feeling in the stomach before an attack.

Operation. Right side of head shaved and whole head close clipped. Usual aseptic precautions. Ether. Trephined on right side, in upper portion of motor area directly nver fissure of Rolando, using mallet, gouge, and chisel. Removed an oval piece of bone about two and a half inches vertically and one and a half inches transversely. Found skull very much thickened, about twice normal extent. Dura normal, not adherent. Dura opened, marked congestion of pia mater. Dura replaced with catgut suture. Bone not replaced; scalp loosely sutured with continuous catgut suture to allow drainage, iodoform crystals, iodoform gauze, sterilized gauze, and cotton dressing.

April 30th. No shock; three slight convulsions during night and forenoon. Free escape of stained cerebro-spinal fluid, wetting dressings. Covered with iodoform gauze and bandage.

May 15th. Dressings removed. Complete primary union. During stay in hospital patient has been very well and has gained flesh and become less anæmic. Has had a very few slight convulsions, but without losing consciousness.

28th. Patient was removed to her home May 16th. Parents state that she was much brighter, recognizing people more readily, and connecting words in sentences, which she had never done before, and having only one or two very slight convulsions. Am informed that yesterday, without known cause, patient commenced to have violent convulsions, recurring every ten minutes, and died that evening. No autopsy.

Craniotomy for Idiocy. Dorn P., aged twenty-five months; California. Birth normal, no instruments being used. Was fed on mother's milk until three months old, then cow's milk. She was bright and well until she was ten month's old, when she had a severe illness, lasting one week. Fever, vomiting, and purging were marked, and a diagnosis of cholera infantum was made by the attending physician. After this illness the fontanelles, which had previously been open, closed rapidly, and the child has never shown the slightest intelligence since, does not recognize any of the family, or take any notice of anything. She has never tried to crawl or speak, and her only voluntary action is sucking. Ever since the illness mentioned she has had nocturnal epilepsy, sometimes three fits in one night, and nearly always one. During the day she has attacks of "jerking" all over every few minutes; does not lose consciousness, but sometimes cries. She has inco-ordination, but no paralysis; knee and ankle reflexes normal. The head is large, the back being well developed, but in the frontal and parietal regions it is greatly contracted.

Operation, March 16th. Usual preparations and aseptic precautions. Ether. Left side of head operated upon. Pressure was made by an assistant over the temporal artery, thus controlling the bleeding. A large horseshoe-shaped incision was made, beginning one inch from the outer angle of the eye, embracing the posterior one-third of frontal and anterior two-thirds of parietal regions, and being carried around to a

point one-half inch anterior to and on a level with the top of the ear, thus leaving a pedicle one inch wide, containing the temporal artery. The highest part of the incision was within three fourths of an inch of the sagittal suture. The periosteum was removed from the bone in the line of the incision for a space one-third of an inch wide, and the bone was then removed to the same extent. In removing the bone a mallet and chisel were used to make the first opening down to the dura, and the bone was then rapidly cut away with the rongeur forceps. The piece of bone left under the skin-flap was fractured under the pedicle, causing it to stand out, and leaving more room for expansion of the brain. The patient being in good condition, a linear craniotomy was then done, extending from the posterior superior part of the former one to within one-fourth of an inch of the occipital protuberance. The entire wound was then closed with a continuous suture of fine black silk, the stitches not being drawn tight. A dressing of iodoform gauze, gauze roller, and cotton, and a starch bandage were applied. The whole operation was completed in forty minutes.

April 2d. The night of the operation the patient's temperature rose to 105°, but subsided the next day, and has been normal ever since. There was complete primary union in the wound. There have been no convulsions or jerking spells since. The mother and nurses think the child shows increased intelligence. Right side of head operated on in precisely the same manner to-day. Operation completed in twenty minutes.

3d. No local or general reaction.

13th. Stitches removed from wound on right side of head to-day, complete primary union. No attack since first operation.

15th. Discharged.

Of these, the first five belong to the class of simple trephining for epilepsy, an operation long known and practised, but with very indefinite indications. Of these, one, the first, in which the epilepsy was complicated by aphasia and paresis of one arm and leg, may be considered, I think, as cured. The second, third, and fourth, as greatly improved. While the fifth died several weeks after operation, probably from exhaustion due to convulsions following each other almost without intermission during several hours. As she had frequently had as many as sixty convulsions in one day before this, it is hard to say how much the operation had to do with the fatal result.

In all, an omega-shaped flap was formed with the base downward, about two and a half by two inches in diameter, and the bone rapidly cut out with gouge, chisel, and mallet. In only two cases was the bone replaced, after having become completely separated from the flap during the operation. In all the dura mater was opened to observe the condition of the brain, and then replaced; the wound was closed without drainage, and healed *per primam* under one dressing. No shock or other unpleasant symptoms followed in any case. I would urge that the operation may be done purely empirically, in all cases where the epileptic seizures are so frequent and violent as to make them a constant source of danger, anxiety, and care to the family of the patient, and where

medicinal agents fail to relieve. Further, in cases of traumatic origin, where there are indications of injury to some portion of the skull or brain; and, lastly the best recognized indication of all, in Jacksonian epilepsy, where symptoms, motor, sensory, or psychical, indicate that a definite portion of the cortex is diseased. In traumatic cases it is probably best to follow the suggestion of Starr (*Brain Surgery*, p. 26), that "when the injury and the localizing symptoms do not coincide, it is better to follow the localizing symptoms rather than the surgical injury." In localizable epilepsy, Horsley's method may be followed of excising any portion of the cortex which can macroscopically be seen to be diseased, or excising the cortical centre, which, on the application of a weak faradic current, is found to be the starting point of a convulsion. The resulting paralysis may be permanent or temporary. Objection has been made to this that the resulting brain cicatrix will probably form the starting point for new attacks. It seems, however, hardly probable that a healthy cicatrix should be as serious a cause of irritation as softened and diseased tissue, when, however, no macroscopic evidence of disease is found, Starr advises not to excise. The statistics of the results of trephining for epilepsy are given so fully by Starr in his admirable monograph on brain surgery, already referred to, that I will not detain you with them now.

My sixth, and in some respects most interesting case, is the only one strictly belonging to the class for which the operation of craniectomy or craniotomy was suggested by Fuller (1878), Lane (1888), and Gueniot (1889), but first performed by Lannelongue, and described by him in 1890, an operation "intended to facilitate the expansion of the brain, and, in consequence, the development of the intellectual faculties in microcephalics whose skulls are prematurely ossified, and in the most diverse intra-cranial lesions, hæmatemata, serous cyst, pachymeningitis externa, cerebral sclerosis, limited or diffused." It is true that two of the preceding five operations were performed on idiots, but only with the hope of diminishing the frequency and severity of their epileptic attacks, as their ages (twelve and twenty-one, respectively) made any intellectual improvement hopeless. Lannelongue's operation was received at first with much enthusiasm, but, as is usual, a reaction occurred. A number of deaths were reported, directly due to the operation, and numerous other cases in which the patient survived the operation, but no improvement followed. Perhaps the hardest blow of all was struck by Abraham Jacobi, at the International Congress in Rome, 1894, when he stated that he had collected thirty-three cases of craniotomy for idiocy and microcephalus, and found that the results were always negative, and that a skull in Sach's possession proved the existence of a contraction rather than enlargement of the cranium, as the result of operation. As a result of these causes, the operation has been almost abandoned in France and England, is strongly condemned in Germany, while Ameri-

can surgeons are, I think, inclined to regard it as dangerous, unscientific, and useless.

To meet these objections and to show that the operation is in certain cases both reasonably safe and justifiable is the chief object of this paper.

The first and most serious objection urged is that the imbecility, epilepsy, and the abnormal conditions observed in microcephalics are due to organic disease of the brain, the cranial synostosis being merely secondary, and that these conditions cannot be benefited by operation. This question has been very thoroughly studied by Starr, to whose monograph I must again refer. He divides the cases of imbecility, in which the question of trephining arises, into three clinical groups; the description of which would occupy too much time. In regard to the pathological conditions present in these three groups, he states that "the lesions found are various in type, in origin, and in situation, but . . . first, that the difference in the clinical types is due to the varying situation of the lesion, rather than to its varying nature. Secondly, that the various processes of disease have, as a fairly uniform result, a condition of atrophy with sclerosis of the brain, which we may term sclerotic atrophy." Finally, he concludes that many of the conditions described are clearly such as to be unaffected by operation, but that, "on the other hand, there are conditions, such as mal-development of the cortex without gross lesion, in which it is possible that anything which may stimulate latent powers of growth or may remove those influences which interfere with development might result in improvement," especially as "the brain is capable of growth and development until the age of twenty, if not longer." As it is impossible to determine the actual pathological condition before operation, we must fall back on clinical experience as a guide. Let us see then what clinical experience teaches. We have already learned that Jacobi collected 33 cases in which no benefit resulted. Lannelongue stated at the French Congress of Surgery, 1891, that he had operated 25 times, with but one fatal result, and that the patients improved after the operation. His statement is too indefinite to allow of any conclusion. Starr gives in detail 34 cases, with 14 deaths and 13 improved, or greatly improved. C. Beck, "Craniectomie (Lannelongue's operation) für Microcephalie und Idiotie" (*Prager med. Wochenschrift*, 1894, No. 39-45. Ref. *Centralblatt für Chirurgie*, No. 10, 1895), has collected 72 cases, with a mortality of 17 per cent. In the remaining cases the results were as follows:

	Cases.
I. Complete, permanent improvement	16
II. Complete, improvement, with slight progress later	4
III. Slight improvement, which slowly progresses	1
IV. No improvement	1
V. Worse	11
VI. No improvement, or reported too soon	27

While these results are not brilliant, we must remember that the conditions for which the operation is performed are otherwise entirely hopeless—the patients being a burden to themselves and to the community, and that even one success among a great many failures would justify the operation.

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

The next most important objection is that the operation does not actually increase the capacity of the skull, or even, as Jacobi tries to show, that it actually diminishes it. I think that this objection is justi-

fied by the character of the operations which have usually been performed. By linear craniotomy most surgeons understand an operation consisting in the excision of a strip of bone, a quarter to a third of an

FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

FIGS. 1-10. Operative procedures of Lannelongue.

FIG. 11.

Operation of Wyeth

FIG. 12.

Operation of Postempski.

inch in width, extending from before backward, on one or both sides of the median line. But a glance at the architecture of the skull will convince anyone that such an operation is little calculated to increase

the capacity of the skull. As may be seen from the accompanying diagrams, taken from Dr. A. Chipault's encyclopedic work, *Chirurgie Opératoire du Système Nerveux*, vol. i., most of Lannelongue's opera-

FIG. 13.

Operation of Dumont. (From CHIPAULT.)

FIG. 14.

Operation of Jabouloy.

FIG. 15.

Operation of the Author.

tions, "à lambeaux," as he calls them, accomplish even less than this. The only two operative procedures hitherto practised which seem to me in any way to meet the indications are those of Wyeth (*Medical Record*, February 21, 1891, p. 232), (Diagram No. 12); and Dumont (*Correspondenzblatt für Schweizer Aerzte*, 1893, No. 23, p. 778. Rev. in *The Medical News*, January 13, 1894, p. 48), (Diagram No. 14), and in the first of these cases practically a complete cure resulted, while in the second the improvement was very great. Both operations, however, have been very generally condemned on account of the severity of the operative procedures, to which most patients would probably succumb. It was to obviate these difficulties that I devised the operation already described. The formation of the two anterior skin- and bone-flaps rendered the operation by compression of the temporal arteries, until clamps had been applied, almost bloodless. By operating on one side

first and on the second after an interval of two weeks, the danger of shock was greatly diminished. In my case, as only the anterior portion of the head was microcephalic, it seemed sufficient to cut out flaps in this region, but otherwise I should not hesitate to extend the operation to the posterior half instead of a simple linear craniotomy. I may mention that the mode of operation which I employed (making a small opening with gauge, chisel, and mallet), and cutting out the strip of bone with "rongeur" forceps, proved entirely satisfactory—the first operation occupying forty minutes and the second only twenty. With regard to the final result of the operation it is, of course, too early to make any statement, but a report just received (June 26, 1895) from the mother states that the child has learned to say mamma and papa, is learning to walk, though slowly, plays with toys, and shows in other ways steady improvement. There have been no convulsions.

It would be easy for me to give an extensive bibliography of the authors consulted in preparing this paper, but the work has been so thoroughly done by Starr (*Brain Surgery*), Dr. A. Chipault (*Chirurgie Opératoire Système Nerveux*), and C. Beck, already mentioned, that I shall content myself by referring those interested to these authors.

October 9, 1895. In regard to Case VI., Dora P., I have just learned from the mother that the child has learned to walk and talk and shows constantly increasing intelligence. Dr. Comstock, the attending physician, reports that the result has surpassed his most sanguine hopes. I have, since then, performed a similar but much more extensive operation in a case of microcephalus, with complete idiocy, aged eight years. There has been little if any improvement in the mental condition, but the entire absence of any local or general results indicates that the operation is almost free from danger.

CHRONIC DYSPEPSIA IN CHILDREN.

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EVERYONE recognizes dyspepsia in adults in its protean and omnipresent forms, every medical man knows its importance in infancy in association with errors of diet, not between these two periods of life is one in which its frequency and the varied symptoms it produces are perhaps less commonly realized, although possibly it is hardly less prevalent than in adult life, and scarcely less important than in infancy. Childhood—especially boyhood—is a period when the digestive and assimilative powers are supposed to be at their maximum, when the