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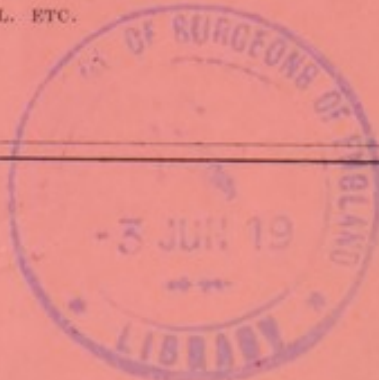
SURGICAL TREATMENT

OF

INFANTS.

BY
DEFOREST WILLARD, M. D.,

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SURGICAL TREATMENT OF INFANTS.

Your committee having invited me to speak to you to-night upon the Surgical Treatment of Infants, I purpose to confine my remarks chiefly to personal experiences in the means of relieving the principal surgical difficulties which are met with during the first two years of life. If the subject shall occasionally lead me to mention older children, it will be because the line between infancy and childhood is not a marked and well defined one.

As you are all active practitioners also, it will be unnecessary for me to dwell on detail, and I shall only touch upon practical points in treatment.

The surgery of childhood as compared with that of adult life, is, aside even from congenital defects, sufficiently marked and distinctive to entitle it to separate consideration. First of all, must the children's surgeon acquaint himself with the anatomy of the child. This is rarely done, as the ordinary adult dissections during a college course give little idea of the size and position of the individual elements as seen in the infant. In consequence of ignorance upon this practical point, many grievous failures have occurred. After unusually large opportunities for the study of both normal and abnormal tissues in the diminutive frame, I am still frequently surprised to note the exceeding smallness of different organs and canals.

Another essential element in the surgeon is tact in the management of the little ones, especially when dealing with those between the ages of two and ten. In hospital cases, but little history is attainable, and much depends upon quick perception. Naturally fearful of pain, the pa-

tient's mind must be diverted and engaged, or great difficulties in diagnosis will often occur from the fright and struggling. The operator not in sympathy with children, can never secure their confidence. Much will often be gained by quiet observation. It is not a month since my opinion, which in the first few moments of the consultation had been favorable to tracheotomy, was changed by five minutes' close watching, and the result proved the correctness of the procedure. To the person, however, who will carefully study individuality as well as disease, no department of surgery offers so pleasant a return for his labors. My personal experience with children has perhaps made me more hopeful in regard to the power of such individuals to endure pain, shock and disease, than would be indicated by the expressions of other authors; but to me there is no domain of surgery so attractive and gratifying as the treatment of children below the age of puberty. Their natural condition is that of hopefulness, and as soon as the depressing influence of shock, pain or fear is removed, the normal resiliency of mind and body asserts itself with such rapidity that the results are often surprising.

Again, a child has only inherited taints of constitution to contend against; his viscera are ordinarily in a healthy condition: an adult has not only hereditary, but all the acquired vices occasioned by misuse or abuse of any organ or sets of organs, a circumstance which often turns the scale in the struggle between life and death. Take, for example, the single instance of the outraging of tissues by either the moderate or the excessive use of alcohol, and every surgeon will testify that

even slight wounds may, in such an individual, quickly develop a fatal attack of mania-a-potu.

Tetanus is not more frequent in infants than in adults, notwithstanding the tendency of the former to nerve excitability.

In regard to anæsthetics, my experience is that great benefit is obtained by the use of ether when pain can thereby be prevented. In the first weeks of existence, I admit that a feeble vitality would contra-indicate its use, although I have successfully administered it to a three-days' old infant. After the first or second month, I see no reason why we should needlessly inflict pain upon an infant simply because we can control it by brute force. In the examination of fractures great suffering is often inflicted by careless and frequent manipulation, and unless the diagnosis is easy and positive, unconsciousness should be produced. No case of bone injury should ever be passed by undiagnosed, when ether will solve the question.

In the opening of abscesses, the "primary influence" of ether is so readily obtained that it should be brought into use whenever practicable, as keenness of pain can thereby be avoided.

Fear plays an important part, and may depress the child's system even more than pain, hence great caution should be observed that all knowledge of any operative procedure should be guarded against. When the day for action arrives, let the surgeon quietly and gently state to the little one, if it has arrived at years of reason, just what it is proposed to do, at the same time assuring him that no pain will be experienced; and if such words be followed by firm, speedy, and judicious management, much agitation and fear will be avoided.

All preparations should be made out of sight and hearing of the patient, and instruments need never be seen by him, except when a strong impression is intended to be made upon the mind of a masturbating boy, requiring circumcision, in which case ether may also be omitted.

One word in regard to the method of anæsthetization. It is but natural that a child should be distrustful of any attempt to deprive him of consciousness, a fear which is greatly increased by the injudicious and greatly to be condemned habit of many parents who systematically threaten their offspring with the expression, "the doctor will come and cut your head off." A few kind words will often quiet the agitation, and simple directions as to the method of breathing will save many minutes of struggling resistance. With very young children, the first smell of ether may be masked by permitting them to see cologne

poured upon the towel, after which ether may be quietly added, and they will feel that it is a perfume that they are breathing. This device has frequently served me a good purpose. I always allow a good admixture of fresh air for the first moment, but when the child actually begins to cry, then quick action answers best. The towel should now be well saturated and held firmly over nose and mouth until two or three strong screams and inhalations will yield a full primary impression, which can be gradually followed up to complete anæsthesia with safety.

Should any symptoms of ether narcosis occur, it is so easy to depress the head of a child, or to perform artificial respiration by acting upon the ribs, that serious accidents are infrequent. Subsequent vomiting is very common, but is not persistent, and is easily quieted by a small hypodermic of morphia, a procedure which ordinarily brings quiet sleep to the patient. If the child is feeble, I always allow milk up to within two or three hours of the operation, and then administer wine or whisky in water immediately before giving the anæsthetic. Milk with lime water and whisky is usually retained within ten minutes after the first vomiting on rousing. In tedious excisions, not only should preliminary precautions be taken to secure against prostration by shock, but hot water bags should be ready for use, which with hypodermics of brandy, may succeed in tiding over a temporary depression, which would otherwise end in death. When the loss of blood has been great, especially in acute surgery, important assistance may be gained by transfusion, either of blood or of a warm saline solution.

Under the head of arrest of hemorrhage, I would strongly advocate the use of animal ligatures, since the pain often incident upon the removal of threads, greatly disturbs the needed quietude of wound and mind.

Thorough asepsis and antisepsis are especially valuable, since we not only secure the admirable results that are attainable by their use, but are also enabled to disturb the child with far less frequency. I am now treating a girl with a railroad crush of the leg, which would thoroughly have justified amputation, yet which under corrosive sublimate applications has not been dressed but six times in as many weeks, even though extensive sloughing has occurred. Save upon one occasion, at the height of the process of tissue-death, the dressings have been taken away perfectly sweet, and the child has the promise of a reasonably good limb. In my ante-septic days, I cer-

tainly was never able to carry a patient through such a process, and keep the temperature as has been done in this case, below $99\frac{1}{2}^{\circ}$ all the time, and usually but slightly above 98° . With infrequent dressings, the irritation of the child is but slight, and if pain is also absent, contentment is the rule, under proper nursing.

I cannot too strongly emphasize the importance of this latter condition. A kind, quiet, gentle nurse is one of the most valuable assistants in the real progress of the case, especially during the first week following the operation. Such care cannot be delegated to untrained and careless people, hence it is absolutely necessary that children should be in separate hospitals or in separate wards, under the best of care-takers. Even in private practice, the mother is rarely the best nurse for a child past two or three years of age, and a skilled attendant answers best. In hospital practice, I have often been surprised to see how contented and patient the majority of children of even three years of age will become, if the mother maintains a judicious absence and the nurse is efficient and kind.

Another point which I wish emphatically to emphasize to night is the fact that congenital defects are most inexcusably and persistently neglected by even good practitioners, either under the mistaken opinion that nothing can be done, or that a later period will be early enough. The consequence is that many unfortunates become helpless and hopeless cripples by their physician's advice, since, passing out of his sight and mind, the neglect engendered by his direction, "wait," is fostered by parents, ever ready to postpone a dreaded day.

Turning to some of the special surgical diseases of infants, I would say that it is my intention to simply touch upon a few points of treatment without regard to definite arrangement or order, since to consider almost any one of the conditions in full would require an entire evening's discussion.

In a new-born child, the first most probable trouble, requiring surgical relief or treatment will be *imperforate anus* or *rectum*. Such a condition is not improbable when we remember that the intestine is formed as a closed tube. If the malformation be simply one of occlusion of the anus by a membrane, it would seem to be the easiest of procedures for any practitioner to make an opening; yet I have seen children permitted to die with the entire ischio-rectal fossa and perineum bulging with retained feces, when a simple puncture through a membrane closing an otherwise normal

anus would have given immediate relief. This timidity may perhaps be explained by the fact that occluded anus and imperforate anus are confounded with imperforate rectum, and the case is given up as hopeless. In imperforate anus, the operation is still a simple one, since a crucial incision together with stitching of the mucous membrane to the skin, and subsequent dilatation with the finger or probe, is all that is required.

When the anus is normal and patulous, but the rectum is occluded by a membrane, or is actually absent, then a much more serious condition presents itself, the difficulty increasing in proportion to the extent of the deficiency. Should no meconium be passed within the first twenty-four hours, a careful search should be instituted. The little finger or a catheter passed into the anus will detect the obstruction, or if the anus be absent, the vagina, if present, may be explored for the abnormal fistulæ. As soon as the presence of feces can be discovered in the fossa, a careful dissection should be made, keeping well backward, so as to avoid the vagina or the urethra and bladder. A catheter should always mark the position of the urethra. There is but little danger even in deep incisions, if the region of the coccyx and sacrum be followed. The gut found should be drawn down as far as possible, and secured, a channel being maintained through the rectal region, if necessary, by the finger or by bougies, the latter of which should not, however, be retained constantly in position. There is much more danger from subsequent hemorrhage if the external incision be free, and no fear need be entertained about the ultimate retention of the feces; if the child escapes peritonitis and other inflammations, good control of the bowel is always secured, in fact, the chief subsequent danger lies in the formation of stricture. When the length of the bowel will not permit it to reach to the site of the anus, the new opening may be made nearer to the sacrum. Should no trace of the rectum be found within two inches of the anus, it is unsafe to further explore a region where peritoneum would be liable to injury; either left inguinal or left lumbar colotomy should be performed. The right groin is to be selected if there are evidences of absence of sigmoid flexure. The left inguinal position gives a better subsequent opportunity of passing the bougie downward into the rectum, and thus establishing a proper anus. If the colon is full, it will not be difficult to find. In cases of doubt, its distension by air or water through a hypodermic needle

would determine its termination. Abnormal openings into the vagina, bladder, or urethra rarely require early operation, but in non-retention of feces at a later age, Rissoli's plan of procedure is a good one.

Later in childhood, the surgeon is often compelled to treat another condition of the rectum, namely, prolapse. This, if excessive and non-yielding to replacement, astringent applications, hot water bathings and general constitutional measures, must be cured by the production of linear eschars by nitric acid.

The genito-urinary organs may also require attention immediately after birth. A simple occluded urethra is easily relieved by the careful introduction of a sound or catheter. *Epi- and hypo-spadias* and *extrophy* of the bladder should not be allowed to go on to adult life without relief. As soon as the child has passed its dentition period, a plastic operation should be attempted for relief, since the mental and moral effect of such a deformity has often a marked influence upon the lives of the unfortunates. *Adhesion of the vulva*, or *nymphæ*, should not be overlooked, since not only does the nervous system suffer, but the parts may be improperly developed. Separation can almost always be accomplished by the finger or by a probe. An absolutely *imperforate hymen* should never be allowed to exist if discovered, since if permitted to impede the menstrual flow, at a later period, serious and even fatal results may follow its division, if the uterus and fallopian tubes have become dilated by the imprisoned secretion. *Imperforate vagina* should receive at least careful diagnostic attention to detect the presence of a uterus, and if not absent, fuller development will be secured if the passage can be opened during the first few years of life. With a catheter in the urethra and a finger in the rectum, a careful operator can explore safely. I have met with several cases in which the *penis* was preternaturally short and illy-formed, the body of the organ during flaccidity being almost entirely concealed in the fatty tissues of the pubis. In such instances I have removed the prepuce during the first three months of life, and have cut away all restricting bands of skin and connective tissue, sometimes even drawing beneath the penis an extra flap of skin when the corpus spongiosum has been short and dwarfed. By such means the fullest amount of growth is encouraged.

Adherent and contracted prepuce or *phymosis* has been the subject of much discussion, in regard to its causal influence upon certain nervous manifestations. My views upon this subject have been

already published,* and after two years of additional experience, during which time I have been brought daily in contact with this class of cases, I can reiterate what I then stated, namely, that while more or less adhesion is an almost constant and normal condition, yet that when urinary, choreic, parietic, or any other nervous symptoms develop, a careful investigation should never be omitted, since a direct relation will, in a certain number of cases, be clearly evidenced, and removal of the cause will speedily cure the manifestation. The fact that even circumcision does not relieve the symptoms is undoubtedly true in many instances, and I have never claimed that preputial adhesion and narrowing was anything more than one of several factors, which should be carefully scrutinized. I have only urged that its influence should not be overlooked, and when so simple an operation as stripping the prepuce from the glans by the thumbs, or possibly by the use of the probe, is all-sufficient, there can certainly be no argument against removing this one factor. My opinion in regard to the feasibility of drawing back the prepuce in young children, even when the opening seems scarcely pin-hole in diameter, has been greatly strengthened, and circumcision is only necessary when the simpler method described fails to secure a prepuce freely movable over a normal glans. Dilatation even is but rarely required, a few moments of continuous pressure soon revealing the mucous layer, adherent perhaps just above the meatus, which when loosened permits the head to pass through the opening, and the corona is freed with the thumbs. Should temporary para-phymosis occur, two probes or a hair-pin slipped beneath the constriction will easily permit replacement.

Congenital hydrocele rarely requires much surgical interference beyond an evaporating lotion of muriate of ammonia or alcohol, as a few weeks will often close the canal, if hernia does not co-exist, a fact which can be determined by non-translucency and capability of reduction. Should the connection with the peritoneum fail to close, puncture, with the application of a truss will usually complete the cure. A hydrocele with closed canal is better treated by tapping and injection than by seton. The diagnosis between *encysted hydrocele* of the cord, *hernia*, and *undescended testicle*, is sometimes difficult; but if the surgeon remembers that the former is simply a cyst in some unobliterated portion of the peritoneal coat of the cord, that its rounded shape

* Philadelphia Medical Times, June 30, 1883.

can be detected if it is pulled well down into the scrotum, that it is usually translucent, that the impulse is not as decided as in the case of hernia, that it returns to the abdomen only by being pressed upward, and not with a slip and gurgle, he will rarely be lead astray. A hernia may co-exist with either of the above-mentioned conditions, but if non-adherent careful isolation will settle the diagnosis. Should the hernia become strangulated, or the non-descended testicle become inflamed and infiltrated, the most careful examination will be necessary. In retained testicle, its absence from the scrotum will be the first point in arriving at a decision, but even in such a condition, the organ might be within the abdomen and an encysted hydrocele present, or the testis might, as has recently fallen under my notice, slip into the tissues of the perineum, and be exceedingly difficult to discover. In the case just mentioned, it sometimes required numerous manipulations to cause the missing organ to return to its place in the pouch. Should hernia and retained testicle both exist, a double purpose can be gained by drawing the latter down and pushing the former up, and then applying a truss. The successful retention of the organ within the scrotum is a matter of great difficulty, and removal is scarcely justifiable in young persons unless pain or inflammation ensues. Extirpation, if required in later youth, will probably not interfere with the procreative power of the individual, since one gland will supply all requisite material, and the affected one is practically useless from atrophy, even if it is not devoid of tubular structure. Traction is of little service, as manipulation tends to increase the sensitiveness of the organ. In prognosis it should be remembered that cryptorchism exists in nearly ten per cent. of males at birth, and that descent may occur within the next few weeks.

Simple *umbilical* and *inguinal hernia* should receive early attention, since in cases with a small opening, a cure can often be effected during the first year of life by the persistent use of a truss. In young infants, I prefer the hard rubber variety as more cleanly. The instrument should be applied during the first few weeks of life, and continued for one or more years. The treatment of strangulated hernia does not differ from that of the adult, but in obstruction of the bowels, *intussusception* is so commonly the cause of the blockade, that unless violent peritonitis is present, laparotomy, with careful search for the invagination, offers the best hope of relief, and I am glad to say is rapidly growing in favor.

Meningocele, Encephalocele and *Spina Bifida*, are complaints that will early require the surgeon's attention, or at least his expression of opinion and his prognosis. If attached by means of a narrow pedicle, constriction with an elastic band is feasible, but unfortunately this pedicle is but seldom found. Injection of iodine following tapping is rarely successful, yet is worthy of trial in so hopeless a task. In a large hydro-rachis of the lumbar region, lately under my care, which resisted pressure, tapping, injection and constriction, I was strongly inclined to excise the thin sac, and attempt a plastic operation by drawing in toward the median line two flaps of skin from the lumbar region, leaving the vacancies to granulate. Soon after a consultation, in which I was dissuaded from my attempt, the tumor ruptured spontaneously, and death occurred in two days, although frequent tapplings had never produced any nervous symptoms. I had then never seen a record of such a plan of procedure, but only last week I noticed in the *Journal of the American Medical Association* (vol. iv, No. 17, p. 466) that Mr. Robson had performed this operation with successful results in two out of four cases. Strict antisepsis was enforced.

Cephalhæmatomata are usually easily distinguished from encephalocele or meningocele, and also from the simpler tumor, caput succedaneum, the latter being exterior to the periosteum and more doughy. The blood in a cephalhæmatoma is always confined between the pericranium and the bone substance, and increases until the second or third day. The hardened ridge around the border of the tumor may give the sensation of an opening in the bone, but the orifice in meningocele is rarely as large as the base of the swelling mentioned. The peculiar crackling feeling upon pressure at a later period, is due to the new bone deposits beneath the periosteum. Absorption so generally takes place in three or four weeks, that aspiration or incision is unwise, even though antisepsis be thoroughly practised, unless in exceptional cases when suppuration is certainly present. Lotions have a good influence, at least upon the brain of the mother.

Hare-lip will early require the careful study of the surgeon, situated as it is upon the portion of the body that is most regarded in the *cosmetic* point of view. Its proper relief therefore becomes not only a matter of surgical skill, but of surgico-artistic taste. The time for the performance of the operation is a point upon which there is a wide diversity of opinion. My rule is to relieve the deformity within three or four days if it in-

terferes with the proper nursing of the child. Practically I must confess, however, that by the end of the operation the milk has left the mother's breast, unless there is some other baby to maintain the flow. My preference is to wait about three months, until a full, vigorous activity of growth and cell-action is at work, and before the process of dentition has commenced. This period is selected not only for the reasons mentioned, but also because the child cannot use its hands as freely as at a later period of infancy, thus avoiding risk of injury. In one patient, a year old, diphtheria appeared on the day following operation, and in his convulsions all the pins were twice torn entirely from their fastenings and the fresh wound became implicated. In spite of such complication, an excellent result was obtained by holding the parts in position for days with adhesive plaster cut in the form of a triangle, sufficiently large to cover at its base the area from in front of the ear to the corner of the hyoid bone, with its apex prolonged at the width of the upper lip to meet a similarly shaped piece from the opposite side. These sections were united by a small elastic ring, which maintained a constant pull upon the tissues of the cheek, and controlled spasmodic muscular action. In fractious children I have now abolished pins and have substituted catgut sutures for the mucous surfaces, which, if of small size and tied in three knots, will remain in position until union occurs. For the skin edges I use carbolyzed, interrupted silk sutures, my reason for stitching the surfaces separately being that there is less linear depression of the cicatrix, and less constriction of tissues is thereby exercised than by pins and figure-of-eight, while if each set penetrate half-way through the lip antero-posteriorly the sphincter is thoroughly controlled. One of the stitches should pierce the coronary arteries. To prevent any pouching of the flaps or separation of the deeper parts by oozing, horse-hair drainage for a few hours answers the best purpose. Additional control of muscles should be given by adhesive plaster prepared as above indicated, or by strips, which should not only be applied transversely, but, in order to prevent strain, should commence upon the neck on either side, in front of the sterno-mastoid near the cornu of the hyoid, and run thence just above the angle of the mouth across the opposite malar to the front of the ear. If these are all put in position while the surgeon pinches the cheeks well together, he will find upon releasing his grasp that the minimum of tension is exerted upon the stitches. A still better plan is to have the nurse regulate this

muscular action for the first few days by pressure whenever the child cries or eats. Only by securing union by the first intention can we hope to have a narrow cicatrix; hence, I do not allow the child to suck, as is the practice with some surgeons, but prefer spoon-feeding as producing less disturbance. For the same reason, anodynes should be employed to control pain and keep the little one for a few days in a quiescent state. The child should be in the best possible condition physically, as quick union is desirable. To avoid the marginal depression so commonly seen and which is inevitable if the simple inverted-V incision is used, I never sacrifice any portion of the paring; but commencing the incision at the apex of the cleft, it is stopped just before it reaches the border of the lip, thus leaving a base of supply to nourish the flap which remains on either side. These two flaps, when the parts are brought together, project downward and form a fleshy prominence; but, if stitched nicely together, will unite, and from subsequent absorption during the next year will give a slight projection. Even should this be larger than desirable, it is far preferable to the ugly notch which cannot be corrected, since a simple scissor-cut will remove all redundancy and give a nearly normal lip. The same rule in regard to utilization of tissue holds good in complicated cases of hare-lip when it becomes necessary to save as much of the alveolus as possible. Broken or cut, it can often be worked to advantage in bridging the chasm or supporting a fallen nasal septum.

If *cleft palate* co-exists with hare-lip, an additional necessity for early treatment is present, since the closure of the lip will tend greatly to lessen the gap in the hard palate. Dentists realize more fully than surgeons how slight is the pressure required to act upon a tooth or upon the alveolar process; but a moment's reflection will convince any practical man that such narrowing can be accomplished, even if he has never witnessed it. In these instances, as in hare-lip and many other deformities, neglect is often as much the fault of the physician as of the family. An early operation upon the lip, strong pressure upon the maxillary bones, followed by the use of a Hainsby's compressor, will in a few years bring the cleft so closely together that a simple operation will unite the edges.

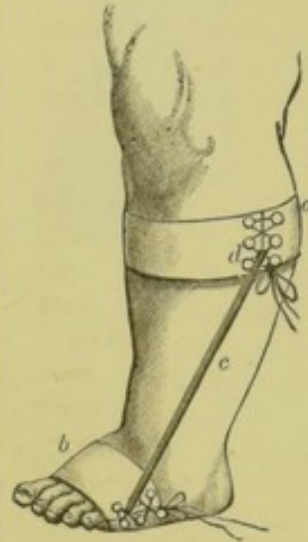
These are the considerations which influence me in advising that, while the lip should be closed early, the cleft-palate operation should be deferred until the plan has been tested. Few children from five to ten are tractable enough to

endure the pain of a staphylorrhaphy without ether, which is desirable, and I see no particular harm in delaying the procedure until the latter period, save that the unused or malused muscles will require a longer period of education after closure. In a recent staphylorrhaphy upon a boy of sixteen, the letters of the alphabet could, however, all be correctly pronounced in three weeks, except the *k* and hard *c* sounds. If a good velum and uvula can be secured by union, the hard palate can be admirably assisted by an obturator. Only last week, by preliminary touching and the use of cocaine I was able, in a child of five years, to make the parings without pain, and thus avoided anæsthesia until hemorrhage had ceased; ether being employed for stitching only.

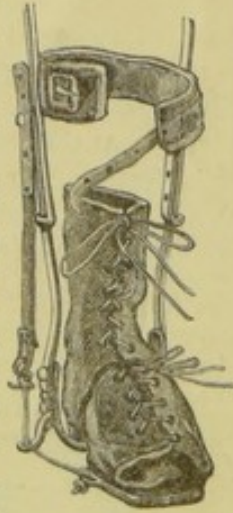
Tongue-tie is a condition that exists more frequently in imagination than in reality, yet the operation for its relief need be no more than the most trifling nick of the frænum, the finger completing the work. If the organ can be protruded to the red border of the lip, no operation is necessary.

Club-foot is a deformity which is frequently neglected, not alone from the apathy of parents, but, as is shown by the cases which come under my notice, far more frequently from the incomprehensible advice of the family physician, who has counselled that "nothing shall be done for the present." Weeks slip away into months, and months into years, during which time one set of muscular fibres and one set of ligaments have become elongated, while the opposite ones are atrophied, condensed, and shortened. Bones, too, have become distorted and wedge-shaped, and the difficulties have of course increased fourfold with each advancing year. I have never been able to comprehend any reason why delay should be countenanced a single day after birth, since manipulation and subsequent fixation can easily be accomplished at the first dressing of the child. I know of no words sufficiently strong to characterize such neglect of duty as is seen in numerous instances. Twice in the last three days have I had this matter brought before me by parents who have come to the office and who have given as the reason of their inaction that the physician had directed them to wait. Even before the age for walking, great condensation of tissue will take place, and increase of deformity will occur from simple pressure of clothing, but as soon as the weight of the body is brought to bear upon these misshapen members the change will be rapid. The secret of cure of club-foot lies not in operation, but in careful attention to all the means of relief.

At the first hour of birth, as I have said, manipulation should be commenced by bringing the foot from the abnormal into a normal position, or as near it as possible, and confining it there by wood, felt, binder's board, or leather splints, rightly adapted. At the next visit, leather, gutta-percha, or preferably, printer's blanket cinctures (*a* and *b*), should be laced upon the foot and leg, and connected by an elastic strap. The two-ply printer's blanket, with its rubber face, does not slip even when applied with only moderate tightness, thus being superior to other materials. Hook-eyelets are easily inserted by any shoemaker, and the lacing need not impede circulation. Manipulation can be practiced twenty times a day without taking off the apparatus, while removal at night gives opportunities for massage, frictions, etc. If co-operation of parents is wanting, plaster-of-Paris can be employed with excellent advantage for fixation, a gain being effected with each month's renewal of the dressing. Leather, felt, sheet-lead, and silicate of soda are of use, but do not permit removal for manipulation, and are, therefore, inferior to the bands already mentioned. Those bands, which permit of constant elastic traction day and night, are very inexpensive, if remnants are bought. Their use puts the successful early treatment of any case of talipes in the hands of the ordinary practitioner for the first few months of life. In cases which are of a severe type a subsequent operation is usually necessary, but the manipulation which has been practiced up to the time for tenotomy stretches condensed tissues and increases nutrition, so that relapse after division of the tendons will not occur if the same measures be continued subsequently. Failure after tenotomy is nearly always due to the neglect of manipulation. The special form of apparatus is far less important than a strict attention to details. The chief advantage of the shoe which I employ lies in the fact that it permits manipulation and stretching without removal, owing to its flexible sole-shank of upper leather, which acts as perfectly as a ball-and-socket joint, the force being exerted by an elastic strap (*b*) operating upon the foot through a cat-gut cord passing through the eye (*a*) at



tached to the upright (c). The eye-bearing arm is ordinarily constructed with too little of an outward bend. If I can control the patient, I rarely operate until the tissues are thoroughly stretched; but if the foot cannot be placed upon its plantar surface at eight or nine months—that is, when the age of walking arrives—tenotomy should be delayed no longer, since each step will increase the deformity. In operating, I divide every tissue that interferes with perfect straightening, whether it be tendinous or fascial. The tendon of the posterior tibial is an exceedingly difficult one to sever in a fat infant with poorly-developed heel. The puncture should be made just below the malleolus, and having placed the back of a tenotome towards the artery, division can be safely made. Tenotomes, as found in the shops, have too long a cutting-surface for infantile work, as the sharp edge will frequently enlarge the external wound unnecessarily. It is my practice to leave the tendo-Achillis until the end of the operation, in order to gain its fixation lower in the leverage required for stretching the parts into position—a procedure which is best accomplished at the time of operation. The amount of power which should be employed in this process is governed by the degree of resistance and the caution of the surgeon, especial care being taken that the force be expended only on the resistant tissues. In the class of cases with which this paper deals—namely, young infants—it is scarcely possible that tarsectomy could be called for, although an English surgeon has thus operated upon a sixteen months' old babe. I now use the gypsum-dressing entirely after tenotomy, since it is not only less expensive, but chiefly because it holds the foot and heel in much better position than is possible by any apparatus, and is less liable to produce sloughing, since the pressure is exerted over the entire surface. The instances where plaster produces a slough are always due to faulty application, mainly caused by some indentation produced during the setting process. If the bandages are smoothly and rapidly applied (salt having been added to the water in which they are immersed), the surgeon can, by grasping the knee, hold it steadily in place, while with the palm of his other hand placed against the plantar surface



of the child's foot, complete rectification can be maintained until the plaster hardens, and without danger of depressing any region of the cast. A dossil of curled hair placed over the ball of the great toe, and over the prominence of the cuboid or astragalus, when confined in position by the flannel bandage enveloping the foot, will also assist in averting any harmful pressure.

I cannot too strongly emphasize my appreciation of plaster-of-Paris in the treatment of fractures in infants, giving, as it does, a perfectly-adaptable material, and yet, when hardened, securing an immobility of the injured part that permits free handling, provided the articulation both above and below the injury is included in the dressing. This is feasible even in fractures near the hip, since the splint can be made to encircle the thorax, and thus prevent the great motion that is always present if only the pelvis is fixed. No risk of injurious swelling need be feared, if a flannel bandage or a thin layer of cotton is first applied to the limb. It is better to saw open a dressing at the end of two weeks, and either tighten it or apply a new one. Silicate and other rigid dressings harden so slowly, the displacement may occur during the process. The fractures occurring during birth are often overlooked for several days, and the fact that the child moves a particular portion of its body freely is not proof that lesion of bone has not occurred. I have seen several instances of fractured clavicle in which the child indulged in most vigorous movements of the arm. These collar-bone breaks are quite common, either from falling out of bed or from careless handling, or from the playful jerking of other children. The under-waist of an older child placed in proper position over the well arm, and pinned tightly around the body so as to include the injured member, often keeps in place better in fat babies than a Velpeau bandage, especially if the hand is secured with a loop. Borated cotton should be placed in the axilla.

Green-stick fractures are best treated by etherizing the child and slowly straightening the bone by hand-pressure. Even should complete solution occur, the result will be good. A slight curve can be reduced by splint and bandage. Separation of epiphyses are practically fractures, and should be treated as such.

Dislocations do not differ from similar injuries in adults, save that they are even more readily replaced by manipulation.

The resultant deformities of *infantile paralysis* are numerous, and are frequently passed over by both physician and parents, under the erroneous

impression that nothing can be done for the relief of these poor weakened members. Recognizing that restoration is best accomplished by massage, electricity, etc., and particularly by action, it is my rule never to assist a muscle if it is capable of permitting locomotion, or unless deformity is being produced by non-support. The following are considerations that determine the necessity for apparatus. If a bone is bending, or an articular surface becoming distorted, or a ligament yielding, or muscles becoming atrophied from excessive stretching, or if by applying a support the child can be made to walk, then I always order an apparatus which shall not take the place of the enfeebled muscles or put them in splints, at rest, but which shall render just enough assistance to enable them by hard contraction to accomplish the desired purpose. If rigid steel is used, they will soon relinquish their attempts at assertion of power and enfeeblement will increase. By a judicious adaptation of mechanical appliances, many who are now condemned to chairs and beds can be placed upon their feet. The advisability of tenotomy will depend upon the benefit to be gained by such a procedure. In many cases it will assist greatly in placing limbs in proper position for locomotion, and for this reason its mechanical effect should be thoroughly studied. My observation leads me to believe that it is employed too seldom. The excision and shortening of tendons by suturing is often of advantage. Any irregularity in the length of limbs should be counteracted, lest lateral curvature result.

Navi, if situated upon exposed portions of the body, must be cured early in life if rapidly increasing in size, and in the majority of cases should be attended to before six months is reached. The question of excision, ligature, subcutaneous ligature, injection, electrolysis, or sun-heat, will depend upon situation, size, etc.

Webbed fingers and supernumerary toes and fingers will yield smaller resultant scars, if operated on during the first half-year of life.

Wry-neck may follow injury to the spinal accessory nerve during labor, or it may be found as a result of some of the exanthemata. If resistant to local and constitutional remedies, myotomy should be performed at the end of a year.

Spinal caries in young children can be retarded by placing the sufferer upon its back between two sand-bags, while passive motion is employed to develop muscular power. A jacket or cuirass may be added if bone-death is rapid, or if difficulty of retention is experienced. Horizontal extension is rarely necessary. I have occasionally seen

lateral curvature in weak infants, caused by the mother's habit of always holding them in one position, the reversal of which custom has, together with constitutional remedies, completed a cure. It may also be the result of a rachitic tendency, which will necessitate the appropriate medicinal and hygienic management. Simple posterior curvature and also lordosis are sometimes found, and should be closely watched, as other symptoms of that disease of malnutrition, rickets, may soon present themselves. Dorsal decubitus should be maintained until the proper treatment has had time to strengthen the child.

Rickets, fortunately, is seen upon this side of the Atlantic far less frequently than on the Eastern shores, and, I am thankful to say, is seldom found in Philadelphia even as compared with New York. In fifty thousand cases in our hospitals, I find that less than fifty are enumerated under rickets and its results, including knock-knee, bow-legs, etc. Its onset is usually within the first six months of life, but unfortunately many cases are not brought to the notice of the surgeon until one or two years have elapsed and great deformity has already resulted. When pronounced, the most rigid care should be taken to prevent the distortions from which no bone in the body seems exempt. The effects upon the female pelvis are most disastrous, as life is thereby endangered. The recumbent position is the only safe one, and must be maintained until the general remedies have time to act, passive motion meanwhile taking the place of active. The *tibial curves* are the most common defects. Very slight bowing is sometimes corrected in the growth of the individual, but we have no more right to expect that such a result will spontaneously occur than that a crooked tree will be blown into the upright position by chance winds. The proper means should always be used to compel rectification. If the bones are springy, then much can be expected from manipulation, pressure, and apparatus properly constructed. During the first two years of life we may confidently hope to accomplish a good result by such means, but in later childhood or adult life, if the deflections are great, the bones rigid, and especially if the curve is anterior, but little can be gained by these means, and osteotomy is the more certain and speedy means of relief. The risks of this operation, if done antiseptically, are but very slight, as the case, if sealed, becomes one of simple fracture. Plaster-of-Paris again gives us the best fixation after operation, and is very comfortable to the patient.

I approve of instruments in lateral bow-legs,

but when they fail to secure straight limbs in the class of cases above mentioned, I firmly advocate operation. To permit the deformity to continue is not only unsightly, but also interferes greatly with the locomotive powers. It is not true that a bow-legged man is strong. He has, on the contrary, to use his limbs at a disadvantage, and if he is vigorous it is in spite of his complaint.

The question of *tracheotomy* in young infants, with whom our present discussion chiefly deals, is one demanding the gravest consideration, whether the dyspnoea originates from diphtheria or from true croup. So fatal are the results, that the mortality in babes below the age of six months is placed by some writers as high as ninety-five per cent.; and even taking all cases under two years, we cannot expect to save more than from ten to fifteen per cent. When we consider, however, that some English writers place the mortality of croup without operation at ninety per cent., we cannot believe that the operation has at least increased the number of deaths. Moreover, when cases are taken at the most favorable age and the most favorable conditions, we can scarcely hope to save more than twenty-five per cent. of all cases operated on. I have spoken thus in regard to prognosis, since some surgeons absolutely condemn the employment of tracheotomy for these young cases. I cannot feel, however, that they are absolutely hopeless, and if surgery can relieve them from the horrid death by suffocation we should not hesitate to give them the aid of science, although a true tracheotomy is well-nigh impossible in a young, fat infant, owing to the exceeding shortness of the trachea and the great size of the thyroid body. It is usually best to do an inferior laryngotomy (or crico-thyro-laryngotomy), making the opening through the crico-thyroid membrane, and also through the cricoid if necessary. The risk of hemorrhage is thereby greatly diminished, since while the crico-thyroid arteries may be cut, they will be far less troublesome to secure than will the vessels about the thyroid body or the middle thyroid artery, which often lies in front of the trachea. Again, the innominate artery may rise high in the neck, or a wound of a vein near the innominate may speedily kill the little one, as has happened in a number of instances even when the operator has been experienced. The fact that surgeons who have opened the wind-pipe several hundred times look upon this operation as an exceedingly difficult one, is proof that the utmost care is necessary. The danger of wandering from the median line may be partially obviated by having the child's head kept perfectly straight and

by placing the body in an exact line with the table. The trachea is sometimes missed because it has not been thoroughly cleared of everything before attempting to open it. The puncture should be made firmly but guardedly. The size of an infant's trachea will surprise one who has never studied it. Although I had given large and special study to the anatomy of childhood, both from the cadaver and clinically, my first tracheotomy case died on the table before I could insert the tube, my error being in trying to push the canula too far back. Unless the urgency is great, ether should be given in moderate amount and the operation carefully performed. A plunge into the trachea is never good surgery; in infants it would be worse than folly. If a circular piece is taken from the crico-thyroid membrane and cricoid, and a pilot used, introduction will be rendered more easy. In fat necks, the windpipe may be brought nearer the surface by extending the head far backward and by grasping the tube on either side and dragging it forward. If fixed thus in the median line, and retained continuously by an assistant, much time will be gained. In a recent case I found it wiser to go above a large thyroid body, even in a five years' old child, and insert the canula in the crico-thyroid space. There was afterwards a slight burying of the upper edge of the plate, owing to its high position, but a strip of sheet-lead obviated this difficulty. To arrest the venous hemorrhage, just before puncture, hot-water sponges answer admirably. After operation the temperature of the room should be kept above 80°. I have never opened the larynx to remove a foreign body in a very young child, but the universal habit of making the mouth the general receptacle of everything makes the introduction of such substances exceedingly probable at from one to two years.

Foreign bodies in the nose which cannot be seized, if not removed by sternutatories, should be always sought for with the aid of anæsthetics.

In the ear the opposite rule holds good, since consciousness of pain will often prevent an unskilled practitioner from doing great injury to the *membrana tympani*.

Joint-diseases are best treated by recumbency, with fixation or extension.

Excisions are rarely performed at this early age, and need not, therefore, be discussed.

I omit strumous and syphilitic diseases, and a score of other conditions which might well detain us for hours, since time forbids.

I have thus, gentlemen, hastily touched upon only the more frequent of the surgical maladies met with in daily practice among infants. Many of the suggestions may be already familiar to you, but even the brief mention which I have been allowed to bestow upon each subject may possibly have served to revive in your minds old and forgotten experiences, and thus be helpful. You will at least see that the field is a wide one, and that results are most encouraging.

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