physicians at a minimum fee during the year, and a series of free clinical lectures by all the departments of the hospital to the Boston school nurses and the nurses of the Instructive District Nursing Association.

V.

ORTHOPEDIC SURGERY AT THE BOSTON CHILDREN'S HOSPITAL. A REVIEW OF THIRTY YEARS OF CONTINUOUS SERVICE.

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THE progress in the development of the science and art of orthopedic surgery in the past thirty years has been reflected in the work in that department of surgery at the Boston Children's Hospital.

In addition to this, valuable experience has been collected from the work of the many trained observers at the hospital, and as a result deductions have been made and methods of treatment tried, rejected or accepted.

A complete review of the work would be unnecessarily detailed but a condensed statement of conclusions which seem justified may be of service.

TUBERCULOUS AFFECTIONS.

One of the most gratifying changes in the last 35 years in connection with the Hospital is that shown in the great improvement in the results obtained in the treatment of the tuberculous bone and joint affections.

Anyone who can recall the pitiful condition of the cases brought for hospital care in the early days, and their unsatisfactory state when discharged, will view with much satisfaction the results of treatment observed at present. It cannot be claimed that the ultimate goal has been reached, and much greater benefit will undoubtedly be recorded in the next generation, when more thorough measures of combating the invading disease, or strengthening the patient's resistance, have been discovered, but a more surprising improvement is to be recorded now than that formerly possible.

This is due to several factors, viz., greater skill in the early diagnosis of cases; more systematic and thorough treatment carried on continuously for as long a period as is necessary, and greater care in the stage of convalescence.

TUBERCULOSIS OF THE SPINE.

Dr. Sayre's boast, that there will be no more hump-backs, appears to have been justified by the results obtained when careful treatment is

feasible. Certainly the cases brought to the in-service at the Hospital do not now show the distressing deformities which were the rule 30 years ago. There appear also to be fewer resulting abscesses than was the case formerly.

Improved methods of fixation on recumbency frames permitting rest without imprisonment, and locomotion with protection from jar, including head and trunk fixation by plaster and leather jackets, efficient appliances which increase the cures within the control of the surgeon. It may be said now to be a demonstrated fact that no case of caries of the spine where an early diagnosis is made and proper treatment furnished for a sufficient length of time need develop a noticeable deformity; but for such a thorough treatment and such satisfactory results not only a mastery of details is needed, but also a control over the care of patients for a relatively long period. Such a course of treatment does not necessitate hospital detention or even special skill in nursing but the care of a mother or nurse capable of carrying out the required directions. In fact, the care by an intelligent mother may be superior for these cases to that of an overworked nurse whose ward duties may interfere with detailed oversight and attention to important details.

For a choice between ambulatory treatment and recumbency, or locomotion with protection by plaster of Paris jacket fixation, braces with or without head supports, as well as for a selection of the form of brace or the method of application of plaster jackets, the surgeon is guided by the means at his command and the circumstances of the case, as well as by nursing and environment at command. The employment of brace without adequate skill in their design or application does not lead to the best results. Recumbent treatment without fresh air is objectionable. Plaster jackets improperly applied or used without judgment are both untidy and inadequate.

The following suggestions are to be kept in mind. The purpose of all treatment being to keep the diseased bodies from being bruised together by the superimposed weight, recumbent treatment is the best method, unless the disease is situated in such a part of the spine that it is possible to throw the superimposed weight more upon the firm and undiseased portion of the spine, i.e. the articular processes, and to prevent all motion forward at the diseased portion of the spine, or at least to limit it to such a degree that no injurious bruising occurs.

Manifestly, rigid recumbent treatment is more needed in a case when a large region, including many bodies is attacked than where only a small focus or an area surrounded by firm bone is diseased. In recumbency it is necessary to arch the spinal column forward and for this a firm pad (sawdust bags are the most serviceable) on a firm but not too hard surface is needed. This is adjusted to the back at the level of the disease and can be made to serve well if the recumbent

frame holds the patient in place. A plaster of Paris posterior shell, applied when the patient's spine is pressed forward at the diseased point, gives a back support to which the patient can be well secured. In children it is well to place them upon the usual bed frame in addition, to prevent the twisting of the spine by leg kicking.

In cervical caries, head traction, and in psoas contraction, leg traction, is needed, but the amount of pull should not be great when an increasing abscess is to be feared.

Details as to the various methods of applying jackets, or of the braces used must be left to the judgment of the surgeon. Certain common errors are to be avoided, viz., in plaster jackets, the omission of a head or neck support; neglect to carry the jacket down far enough in front; the application of a jacket which holds the patient forward rather than throws him back; or which does not throw the spine back at the point of disease; the application of braces, which do not exert adequate forward pressure at the point of disease, or do not hold the spine firmly enough either because of too light material, or from improperly applied straps.

In the question as to the length of time when recumbency or protective treatment is needed the surgeon has no guide but his own judgment. The presence of muscular spasm, the guarded movements of the patients when free from support are indicative of the instinctive need of support or protection. This differs from the feeble movements of a child just released from recumbency, or from a jacket or brace.

The X-Ray shadow is not an absolutely reliable guide in directing the treatment of spinal caries and the possible release from protection, even where satisfactory pictures can be taken.

New, firm bone may be present although penetrable by the rays, as in the case of the patella, which is often not shown in a front view of the normal knee joint.

That excellent results can be obtained with permanent cures without deformity, with recession of deformity, has been abundantly proved by the Hospital records. The subsequent history of cases severely attacked in childhood have in some instances been known in adult and married life, with the birth and growth of healthy children.

The operative treatment in Pott's Disease consists in opening the abscess and, recently, in the attempt at spinal fixation by bone graft and periosteal flaps.

In regard to the treatment of abscess, it can be said that sound practice seems to consist in abstention from incision as long as the abscess does not increase, or occasions no harm. Complete absorption of some large abscesses has been observed in many instances. But this conservatism is to be supplemented by radical treatment where incision is necessary. This should not only be free, but carried out so as to allow free discharge as near the original source as pos-

sible. To aid in this the surgeon will find a large steel urethral sound of use in finding, and as a guide to the proper points of incision. Multiple incisions in the back, side, and front are often needed to drain a psoas and lumbar region properly. In some instances, costo-transversectomy is needed to drain an abscess in the post mediastinal region, which caused distressing and alarming attacks of dyspnoea. The operation is not difficult, though it is sometimes not easy to palpate and tap the abscess after the opening through the thoracic wall has been made, if the abscess is well forward on the front of the vertebrae.

The injection of germicides into abscesses in Pott's Disease without provision for drainage has not found favor in the Children's Hospital wards. A few unfavorable cases may have prejudiced the observers.

The attempt to ankylose the back of the spinal column by bone transplantation, or by causing ankylosis of the spine, is so recent a procedure that sufficient clinical evidence has not yet been secured to justify a critical estimate of the permanent value of a method. It certainly seems to promise much in shortening the period of treatment.

TUBERCULOUS DISEASE OF THE HIP.

What has been said as to the results now obtained in tuberculous of the spine can be repeated with equal truth in regard to tuberculous of the hip.

There is less deformity, fewer abscesses, and less bone destruction in the cases sent into the in-service of the Hospital for treatment, than was formerly the case. Much better results are obtained now than formerly.

This has been shown in the statistics of the results in cases treated in the Children's Hospital, five or ten years after the end of treatment as compared with the former results, and there is reason to believe that at present even better results can be expected.

The problem, however, of the treatment of hip disease is not a simple one, but requires more thought than the treatment of caries of the spine with modifications to fit the varying conditions. Operative interference, attacking the bone in caries of the spine is admittedly impracticable, but in the hip, the natural inclination of the surgeon is to shorten the difficulty by radically eliminating the disease by excision, erosion, removing tubercular foci. The experience of the Children's Hospital in the past 30 years, after a careful trial of both operative and conservative methods, coincides with the experience in many other clinics, in the opinion that where conservative methods can be systematically carried out, which, with proper organization of Hospital, out-patient department, out-door relief, convalescent country homes, are entirely possible—much better results follow than if the eradica-

tion of diseased foci is attempted by operative measures. Surgical Tuberculosis of bone is a constitutional disease with local manifestation. Surgical intervention should be directed to meet the local indications, preventing bone bruising, pain, deformity,—promoting drainage of detritus, and the reparative bony healing, almost sure to occur if fresh air and as much activity as the lesions permit. To cage children in beds, in hospital wards, in heavy plaster bandages preventing locomotion, are measures which may be necessary for a time, but the time should be as brief as possible and, fortunately, in a large majority of cases in children, unless the disease has reached an advanced stage, the time of imprisonment need be short. The surgical indications for prevention of deformity, bone trauma can be met while the patient enjoys comparative freedom in locomotion.

The tuberculous bone process as has been abundantly shown in pathological specimens, not being rapid in its progress, permits and stimulates a conservative bone reaction in the adjacent tissue which if conditions are given, eventually heals. This healing is delayed by injury to bone tissue, as is inevitable in operative surgical interference involving bone destruction. Such interference may be at times necessary when the carious detritus can not escape and acting as an irritant, promotes progress of the disease, where the amount of detritus is too great for absorption, and where no escape is possible. The true *vis medicatrix* in hip disease, as in tuberculosis elsewhere, is the antidote which Nature furnishes in an improved environment. Naturally more can be expected in the way of recovery in children than in adults, both because the reparative power is greater in the former, and a longer period is needed for repairs, and because it is more easy to control favorable conditions of environment for children than for adults.

Early excision; excision of the acetabulum; partial excisions; channeling for foci; are not procedures which are to be recommended for tubercular disease of the hip in children, according to the experience of the Children's Hospital.

As a life saving measure in neglected cases amputation at the hip, in extensive pelvic disease, has been done 4 times in the early period of the Hospital, when more neglected cases were brought for treatment. In one, the patient was known to live to manhood, enjoying excellent health. In two others, death from amyloid disease followed several months after recovery from the operation. In a fourth, the ultimate result was not known.

Operative dislocation of the hip, to relieve interarticular pressure in advanced acetabular disease, was performed three times with benefit and in one instance, the case was followed to adult life, a complete cure resulting with deformity not yet corrected, but perfectly correctable by osteotomy.

The present routine treatment at the Children's Hospital consists of a bed frame, and

traction during the acutest stage, the early application of the abduction traction splint which furnishes better fixation, allows more locomotion, and less bone atrophy than a plaster spica bandage; the use of this with crutches during the florid stage of hip disease followed by a perineal crutch, and weight bearing gradually permitted, according to the progress of the disease toward recovery.

Increasing abscesses are incised, existing deformity corrected either under an anaesthetic or by pull; osteotomy being reserved for healed cases with deformity.

Under such treatment subluxation should be prevented, abduction and flexion also, though in rapidly growing children the prevention of these, especially a flexion deformity, demands protection and limitation of weight bearing for a long period until the epiphyseal bone has regained the required firmness.

TUBERCULOSIS OF KNEE, ANKLE, SHOULDER AND ELBOW.

The conservative treatment of these cases in children seems justified in preference to the operative removal of bone, other than sequestra or detritus. Plaster and leather fixation, with a Thomas knee splint for the knee and ankle, with fixation for the elbow, eventually give as satisfactory results as can be obtained. The course of treatment is, however, regrettably slow, and the use of some methods of early constitutional cure, besides that which comes from protection from trauma and the natural power of repair of the individual, is much to be desired.

These affections are treated successfully on the same principles mentioned in regard to treatment of caries of the spine and hip disease, but the treatment is modified by the varying anatomical and physiological conditions. In the upper extremity the problem of weight bearing being removed, the treatment is simplified, in the shoulder, the drag of the weight of the arm prevents bone crowding, but the spasm of the strong pectoral muscles draws the arm to the side, and furnishes the indication in fixation for an angular axilla pad.

KNEE—ANKLE.

In the lower extremity Thomas' well-known splint, with its modifications is of recognized service, but it should, in the acuter stage, be supplemented by plaster of Paris or leather fixation.

Radical operative excision should never be resorted to in tuberculous disease of the knee in growing children.

In disease of the ankle, subperiosteal removal of an extensively diseased astragalus sometimes shortens the course of the affection but statistics have appeared to show the best results following

FIG. A.—Abduction traction splint padded. (Bradford.)

FIG. B.—Abduction traction splint without padding or straps. (Bradford.)

FIG. C.—Child wearing the abduction traction hip splint. (Bradford.)

FIG. D.—Rear view of the abduction traction splint applied. (Bradford.)

FIG. E.—Model showing trunk fixation by traction applied.

FIG. F.—Model showing lack of fixation when traction is not applied.

FIG. G.—Model showing lack of fixation of hip-joint by plaster spica from the necessary looseness at the pelvis and trunk.

conservative protective treatment, *i. e.*, plaster bandage fixation and a Thomas splint to prevent the injury from weight bearing, in locomotion.

FRESH AIR TREATMENT.

In all tuberculous affections of the joints the chief reliance for cure must, at present, be placed on the tonic of absolutely fresh air whatever may in the future come from vaccine or serum therapy.

The statistics of the Convalescent Home of the Children's Hospital have demonstrated clearly not only that fresh air is beneficial in tuberculous bone cases as in tuberculous affections of the lungs, but that it has a tonic value. Hospital cases removed to fresh air shacks increase in weight, appetite and color; while the physiology of this is not clear, the fact can be regarded as demonstrated.

It would appear that sea air is not superior to that of the fields. It is important that the air should be fresh during the night as well as the day.

OSTEOMYELITIS FROM PUS-MAKING GERMS.

Thirty years ago the distinction between the different forms of caries of the bone were not known and as the relation between osteomyelitis and certain germs had not been studied, the fact that the pathological history of the affection caused by the invasion of the tubercle bacillus differed from that caused by the irritation of the several forms of cocci, or that the latter differed was not understood. While the matter is as yet one which demands much more investigation, enough is known as to the two groups of bone infection to base different policies in treatment.

The fact that as a rule osteomyelitis from the pus causing cocci attacks the diaphysis, and that from the tubercle bacillus involves the region of more rapidly growing bones; the epiphysis or juxta epiphysis, *i. e.*, the diaphysis at its junction with the epiphysis is sufficiently established to be accepted as a rule, with exceptions, and indicates that in the slower developing tuberculous more attention needs to be paid to the prevention of deformity than where the marrow of the shaft is attacked, with its stronger and less rapidly growing and less rapidly cicatrizing bone. In the cocci group of osteomyelitis the indication for drainage is the chief one, whereas, in the tuberculous osteomyelitis the chief purpose of the surgeon is to put the tissues into such a condition that the reparative process may obliterate the destructive otitis.

In fulminating cases of osteomyelitis the indications are clear, *viz.* the region of invaded bone should be found, incised, and the bone drilled. High temperature and blood count are to be observed with marked constitutional symp-

toms and usual local oedema, or swelling at the point attacked.

In the arthritis of infancy, so called, an acute affection, the pathology is not well understood, except that joint destruction, especially of the hip occurs rapidly and suppuration takes place and the invading germ is not the tubercle bacillus, but of the pus-causing group of cocci.

Speedy operative interference is demanded in these cases with the early use of a traction appliance to prevent deformity where the hip is involved.

The form of caries following typhoid fever or pneumonia offers an interesting field for investigation, but at present the clinical course of these cases has not been adequately studied, nor has an allied, distressing ailment where several of the joints become ankylosed and distorted after an attack of acute severity, marked by pain, prolonged fever, but without suppuration. The cases presented at the Children's Hospital have brought records of a prolonged sickness resembling in some of its clinical features typhoid fever, but lacking the distinctive intestinal symptoms.

Cases of multiple bone tuberculosis, cases of mixed infections, *i. e.*, where an original tuberculous bone lesion has been invaded by the pus-forming cocci, and suppurating osteomyelitis has resulted, with such sequelae as to make the original nature of the affection uncertain, have naturally been not infrequent, indicating the need in the future of carefully recorded details of the initial condition of the patient.

It may be said that the prognosis of these cases in children is surprisingly good, when favorable nursing conditions can be furnished.

RACHITIC DEFORMITIES.

As the Children's Hospital has been for many years the chief clinic here for the treatment of rachitic deformities it is to be expected that marked progress has been made in the different methods of treatment in this most common affection.

Formerly, operations upon bone were regarded as a dangerous undertaking, and children were subjected to a tedious treatment with heavy and cumbersome apparatus, with but little prospect of substantial improvement in resistant cases.

The introduction of aseptic measures has made osteotomy safe; osteoclasis is easily performed, and simple appliances adapted to younger and less resistant cases are of service. The X-Ray enables the surgeon to determine the character of the deformed bone, and a more careful and extended knowledge of the clinical history of cases, made possible by large and well organized hospital clinics, have taught that in a large majority of cases the tendency is to a rectification of the deformity in growing children if the conditions favoring help are given. All this com-

bined makes the treatment of these deformities a matter of no great difficulty.

Modifications of the Thomas knee splint can be made for use at night for such young children as require correcting pressure; light walking, correcting appliances can be used where necessary in deformities not suitable for operation and with threatening increase of curves, as a rule cases older than 4, with marked curves should be operated on. Osteoclasts by means of an osteoclast is more precise than manual osteoclasts, and osteoclasts is a simpler operation than osteotomy and therefore preferable in bow-legs. Osteotomy is preferable where correction near the knee or hip is required as in knock-knee and coxa vara. Subcutaneous osteotomy in skilled hands can be made as precise as through a skin incision and is preferable as being simpler. Linear osteotomy, and no further injury of the periosteum makes blood clot healing certain, and if the bone is divided three-fourths through the shaft and the rest broken, the interlacing fibres of the periosteum secure speedy bone healing and allow proper rectification of deformity. Perfect alignment is not necessary, but correction permitting weight bearing in an improved position is followed by further rectification through normal growth.

Anterior tibial curves can be treated without wedge-shaped bone excisions by linear osteotomy of half of the bone and straightening, with blood clot healing of the resulting gap, with or without tenotomy of the tendo Achillis to overcome the bow-string tension on the curve.

Experiments have shown that linear section of a part of the bone is made by osteoclasts. The bone cracks cleanly on the side opposite to the pressure with slight tearing on the proximal side; there is no danger of splintering or shearing in long bone. In osteotomy properly done the clean section is at the point of attack by the osteotome, and any irregularity in the division occurs where the section is completed by manipulative correction. Danger to the arteries and nerves is reduced to a minimum in osteotomy if the osteotome is driven directly through the nearest point to the bone cortex and by manipulating the osteotome the bone undermined from the inside until complete fracture is possible by manual force. A small osteotome will be found preferable over a large one by a surgeon used to the procedure.

In some instances manual correction of rickets curves will be found more easy if the limb has been bandaged by a plaster bandage, worn for a month. Bone atrophy takes place. There is, however, no advantage in this method of procedure over osteotomy.

Of the various forms of osteoclast the well known Rizzoli's appliance has been found reliable and practicable in the clinic. Simple and effective also is a modification of Little's osteoclast.

After correction, the limb, protected by cotton

wadding, or a soft bandage, is held in plaster of Paris fixation for a few weeks, after which as a rule the bone is firm. It is advisable that the plaster bandage be bivalved so that the front of the limb may be inspected at will by the surgeon without disturbing the position. If the plaster bandage is a broken one this can be done without weakening the fixation of the fragments and the surgeon may reassure himself as to the position of the fragments and the proper correction of the deformity.

PARALYTIC DEFORMITIES.

In no branch of orthopedic surgery has there been so surprising an improvement as in the treatment of the deformities of anterior poliomyelitis.

The former treatment consisted simply in the endless and unbeneficial application of Faradic electricity and massage, and awkward and, in the main, useless appliances with the aid of tenotomy of the tendo Achillis in a few instances.

Improvements in appliances have enabled the surgeon, through purely muscular treatment, to secure improvement in the weakened but not paralyzed muscles by the exercise given in locomotion with light appliances permitting, as far as possible, motion in all directions except in the direction of deformity. The essential in paralytic affections of the lower extremity is to place the child on its feet with frame, crutches, or other appliances giving it the sense of locomotion and activity. Deformities are easily corrected by tenotomy, aided by osteotomy in extreme cases, with forcible corrections, and in some cases open incision.

POLIOMYELITIS.

It is an interesting fact in the history of medicine that an interest in the study of poliomyelitis should have been developed acutely and suddenly all over the medical world in the last five years although the ravages of the disease itself have been common always, and there is no reason to think that the affection is more prevalent now than heretofore. It is to be hoped that renewed investigations will bring forth remedial measures which will control our surgery of deformities. It is also singular that this affection was almost ignored in the medical instruction of fifty years ago, except a mention of what was classed as teething palsy, or infantile paralysis.

The treatment of the deformities of poliomyelitis if described in detail would demand a volume in itself for adequate presentation, as the manifestations vary greatly, and much persistency and some ingenuity are needed to furnish the substantial practical relief which may often be given by the surgeon in the correction, the prevention of deformities, and in the utilization of damaged limbs.

A brief statement of the principles involved in the measures to be selected may serve to illustrate the advance made in the last 30 years in combating this affection.

The disease itself displays in most instances at first a marked effort for recovery, for 6 months or a year, and later a tendency to develop deformity from the enforced misuse of the damaged limb. The position in which a dangling limb is held, from constant or gravity position, strains certain weakened muscles and permits contraction of unopposed muscular groups. The superimposed weight falls faultily upon the damaged foot and makes a distortion which becomes permanent with growth. Although at the outset only certain muscular groups are permanently paralysed, many muscles being weakened, and others impaired in their strength by a lack of use, the principles of treatment demand, when it becomes evident that no recovery is to be expected in the muscular groups inevitably damaged, giving such freedom to the limb as may approach the normal and develop strength in supplementary muscles to make up for deficient function.

In the correction of deformity the measures needed are simple: gradual or forced stretching of the contracted muscles, aided or not by tenotomy, myotomy, or even osteotomy, as may be necessary, in order to give the most favorable, useful bearing alignment of the bony structure possible.

Apparatus of the simplest character which is effective is to be furnished to aid proper weight bearing and to check contraction of an unopposed group of muscles.

For the partial restoration of functional activity the employment of muscle transference is of great value and the use of artificial ligaments to check the flail joints has proved of great value.

In cases where no muscles are left unparalyzed and muscle transference is impossible, stiffening the joints by partial excision of the cartilaginous surface, or in paralytic calcaneus, the removal of the os calcis and slipping the foot back, thus checking heel drop are successful procedures.

The details of these measures would form a chapter in themselves. Here can be recorded the fact that few cases of infantile paralysis of a lower extremity need remain unrelieved. Complete restoration of function is not possible, but the children can be freed from imprisonment, to a wheel chair.

SPASTIC PARALYSIS.

Little's Disease was formerly treated by massage and appliances as it was regarded as a central nervous affection, cerebral paralysis with a lesion in the cortex. The neurologists considered surgical treatment irrational and absurd, but empirically orthopedic surgeons proved the contrary, Dr. Gibney of New York and the

surgeons at the Boston Children's Hospital being among the first.

It is now known that tenotomy and myotomy, or muscle paralysis surgically induced, followed by muscle training, presents a feasible method of treatment followed by benefit.

The affection being one of disturbed muscular balance the temporary paralysis of the muscles with exaggerated muscular spasm and the development of the overpowered muscles, accompanied by appliances making locomotion possible and correcting a tendency to a relapse of the deformity, is always followed by improvement, in cases that are not mentally defective. Experience has shown that there is a tendency to a gain of muscular control in all these cases if a stimulus to muscular effort is furnished. The removal of deformity removes an impediment to muscular exertion.

Correcting appliances without tenotomy are of little use in these cases. A long after-treatment, muscle training, is to be expected.

Alcohol injections paralyzing the nerve, bringing an exaggerated impulse in addition to the measures correcting the deformity, has appeared to be of advantage, but the exact value of the procedure is still *sub judice*.

Cutting the posterior roots in children who can be helped by milder measures is with our present experience not justified. The mortality of the procedure in children, cannot be disregarded except in the severest cases

ANKYLOSING ARTHRITIS. ARTHRITIS NODOSA.

While degenerative arthritis, the degenerative changes of middle life or old age, the spavin of animals is not seen in children, an affection often confounded with it though pathologically different is occasionally seen in a distressing form in children. It is polyarticular and in this differs from joint tuberculosis. There is usually a painful stage, there is disability and distortion.

While a scientific method of treatment of ankylosing arthritis has not yet been developed many cases at this hospital has shown improvement and in some of the milder cases recovery after a system of treatment directed to the correction of the deformity, steadying the limbs if in the painful stage by plaster of Paris bandages, using apparatus, there is recurring deformity and apparatus, with treatment stimulating the circulation locally; greater improvement in methods of treatment may be hoped for if advances in bio-chemistry succeed in throwing more light upon the nature.

Although this affection has been much studied under different names and has been supposed to be of a tonic nature, the exact nature of the toxin has not yet been established, nor in fact that it was not due to some defect in mentabolism, *i. e.*, an anti-intoxication.

While it is more frequently seen in adults

(in the writer's experience in women) some of the most pitiable cases occur among children, even in infancy.

In other instances the affection appears in children in a much milder form and is followed by gradual recovery, apparently aided by the treatment.

After it became established that certain joint tissue change affections and disabilities result from a degenerative process in contrast to the destructive inflammatory carious processes caused by the entrance of definite germs, it appeared that the treatment needed was to stimulate the tissues rather than to promote tissue atrophy from rest and fixation.

Where active inflammation is not present, the amount of use should be all that is practicable within the limits of discomfort and violence or the trauma of strain. Gradual use under proper proportions is beneficial, aided by such measures as stimulate the circulation, *i. e.*, massage, especially vibratory massage, dry heat, electricity, static, the intermittent current, hydrotherapy, passive exercises, but especially active exercises, weight bearing, carefully directed.

An unexpected amount of improvement will often follow these methods of treatment persistently carried out, accompanied by proper attention to metabolism.

This combined with corrective or prevention of deformities and the protected use of the limbs guided from strain if necessary by crutches or light apparatus, form a practicable system of treatment which must serve until increasing knowledge may furnish a most positive method of cure.

CLUB FOOT.

The treatment of congenital talipes equinovarus 40 years ago was successful in many instances, but the methods were clumsy and the need of thorough after-treatment was not recognized. Relapse and incomplete correction was too commonly the result.

The morbid anatomy was not well understood. The Scarpa shoe formerly much used may be taken as an appliance imperfect for correction and impossible as a walking shoe in after-treatment. Removal of the cuboid, astragalus, and wedge-shaped excision of the tarsus, all mutilating procedures, had been occasionally employed and even amputation performed in resistant cases.

At present all cases of club foot from infancy to adult age are to be regarded as curable without mutilation and with the restoration of normal function. It is, however, necessary to meet certain definite indications fully and thoroughly.

The affection is a congenital displacement of the bones of the foot chiefly at the mid-tarsal articulation, with adapted alteration in the soft tissues, ligaments, tendons, and in the shape of the cartilage and bone in the joint surfaces of the astragalus and os calcis. Roughly, the

deformity may be regarded as a congenital inward subluxation at the mid-tarsal articulation.

Treatment in brief consists in the gradual or forcible correction of the misplaced bones with retention in an overcorrected position for a sufficient length of time for the cartilage, ligaments and muscles to adapt themselves to the normal positions so that the correction becomes permanent.

In infancy under three months, repeated plaster of Paris correction without tenotomy, and in children in arms with tenotomy of the tendo Achillis, and in older children with tenotomy of the tendinous insertion of the tibials, plantar fascia as well, enables over-correction of the deformity. This over-correction should be maintained for several months, and should be followed by some apparatus to ensure normal walking, for in young children a turn in gait leads necessarily to relapse.

Proper walking braces worn inside the shoe, holding the foot in an exaggerated valgus position are often needed. On the sole of the boot a high wedge pressing up the cuboid will correct intoeing in walking if the varus has been fully corrected.

In resistant cases it is sometimes necessary to remove a wedge-shaped piece of bone from the neck of the os calcis and of the astragalus, sparing the articulation to secure proper overcorrection. It is especially important that the cuboid be placed in a normal position, otherwise relapse is sure to follow even if apparent correction has taken place. A club-foot wrench will be found of great assistance in the more resistant cases.

TORTICOLLIS.

The improvement in the treatment of wry neck, *i. e.*, the deformity due to contraction of the sternomastoid, is the result of the aseptic method in surgery. In the preaseptic days the surgeons dreaded the danger of pus in the deeper fascia and subcutaneous tenotomy was the operative procedure employed to divide the contracted muscle. This division was not easily performed thoroughly on account of the neighboring large vessels. Contracted muscles partially divided do not permit satisfactory results; much was left by the surgeon to after-treatment and heavy appliances were used in these half cured cases. When open incisions became safe cures of torticollis were more readily accomplished. The contracted muscle is to be thoroughly divided, the distortion, forcibly over corrected, the head held in an overcorrected position for three months by a plaster of Paris bandage, or by this followed by a light but efficient correcting appliance. There are several methods for the division of the contracted muscle. The one preferred by the writer is an incision carefully made parallel to the clavicle, a few lines above it, with complete division of the sternal and clavi-

cular insertions, a director having been inserted under the tendon to protect the vessels which lie deeper. It is rarely necessary to divide the scaleni for even when contracted they may be forcibly stretched sufficiently.

A complete permanent cure should result.

CONGENITAL DISLOCATION OF THE HIP.

IN the investigation of methods of care of an affection hitherto regarded as incurable, the Children's Hospital has been active for thirty years, from the time of the premature announcement of a cure, afterwards followed by a relapse, by Buckminster Brown by the means of traction applied continuously for a long period, and the first attempt, apparently but not actually successful, by Post of Boston at manipulative reduction. Subsequently the reduction by open incision was performed with a fair percentage of success in a number of cases. Hoffa, of Berlin, operating upon one, and later the method of manual forcible reduction, the Paci Lorenz method, was employed, (several operations being performed here by Lorenz.) The first thoroughly efficient mechanical appliance for reduction introduced by Mr. Bartlett, was employed in a large number of difficult cases with success and finally a careful study of the pathological anatomy of two children dying of contagious disease, before and after operation, made the pathology of the affection clear and the methods of treatment and their indications precise and definite.

At present it may be said that the deformity is an eminently curable one.

These cases can be divided into two classes: dislocated hips with an open, and with a narrow capsule. Originally in infantile cases, as is shown by pathological specimens, the capsule is open and loose, the head can be easily placed in or pushed out of the acetabulum. The defect consists in the absence or relaxed condition of the cotyloid ligament and zona orbicularis, which even in a full term foetus is strong enough to hold the femoral head in the socket.

After the child has walked upon the limb, as the body weight falls upon the capsular ligaments and not on the bone structure of the socket, the capsular ligaments become altered in shape and structure, the capsule extending to the upward displaced head is stretched across the acetabulum. In the older cases the capsule tissue becomes firm and resistant and the head can not be replaced in the acetabulum but is pressed against the drum-head-like tissue consisting of the capsule stretched across the acetabulum. The replacement consists in forcible widening of the narrowed capsular opening between the head and the acetabulum and stretching any obstacle which may oppose and pushing the femoral head into the bottom of the socket without folding the capsule in front of the head. To avoid the latter, the lower part of the capsule

should be put under tension when replacement is attempted and to facilitate the reduction the head should be manipulated so as to press in the lowest portion of the acetabular rim (*i. e.*, behind and at the middle.) Shortened muscles can be stretched or relaxed by placing the limb in a flexed and adducted position. Forcibly abducting the flexed limb with pressure on the trochanter presses the femoral head against the tightened capsule and if favorably placed forces it into the socket.

In the cases with an open loose capsule little or no difficulty is encountered in the reduction; in tough, tense, and distorted capsule some force is needed. When the capsule is too firm and narrow to be entered by force, reduction by incision is necessary as the capsular contraction needs to be divided as in the reduction of an incarcerated hernia.

Reduction by incision is rarely needed in young cases, but in the more resistant cases, the procedure has resulted most satisfactorily. Forcible reduction can ordinarily be performed by manual manipulation under an anaesthesia, but in the more resistant cases, when much force is needed to stretch the capsule contraction, mechanical force is an important aid; first, to hold the pelvis firmly, second, to exert traction to stretch the capsule, and third, to apply forcible pressure, driving the head of the femur through the contracted capsule opening.

After the reduction the head should be held in place for a sufficient time for the capsule to form firmly about the femoral neck, that the head may be held in place. Plaster of Paris fixation for several months after a thorough reduction ordinarily ensures a cure which is permanent, as the Hospital statistics at the Children's Hospital have shown.

COSTUME DEFORMITIES.

The fact that growing bone could be altered in shape by pressure constantly applied was not unknown 40 years ago, but that the slight pressure of clothing could alter the shape of growing children was not realized. As is well known now definite faults in shape can be traced as a result of clothing. Round shoulders, weakened neck muscles, prominent clavicles, hollow chest, result from an overgreat drag upon the shoulders caused by the pull of elastic side garters attached to children's waists. Undue abdominal pressure from tight waists, corsets, weakens the abdominal, back and loin muscles. Growing girls should wear loose garments with no shoulder drag or abdominal constraint.

SHOE DEFORMITIES.

The extent of the deformities of the foot from shoe wearing is not generally realized, but a comparison of the baby's foot and that of an adult who has never worn shoes with the foot

of any individual who has worn even ordinary footwear since infancy will demonstrate the fact that the habitual compression of the foot, even only to the extent of the amount of pressure of what are termed comfortable shoes, causes muscular atrophy and the loss of normal muscular foot power. When "stylish" shoes are worn, compressing the front of the foot, or simply checking its proper spread when full weight and the exertion of the back drive of the foot comes upon it, the foot becomes in time distorted.

The foot placed firmly upon the ground, if a heel is worn on the shoe, tends to slide forward and this tendency is increased in the speed of walking. The front of the shoe is always narrower than the spread foot and the toes are necessarily crowded into this narrower space. The stiffness of the sole prevents normal toe flexion, and the fact that the upper is always fitted snugly to the dorsum of the foot to diminish wrinkling of the leather as the shoe is worn, hampers normal play of the foot and checks toe flexion. The stiff shank adds to the crumpling of the foot, and an unstretchable seam across the dorsum of the foot, pressing with a strong pressure on the dorsum of the foot, checking the sliding of the foot forward at each step, exerts a cramping pressure.

The result is that the foot which, as an implement of locomotion admirably adapted by the varying movement at its different articulations to the different conditions and activities of locomotion, is cramped for the greater part of the day in a firm and partially stiffened box.

The part of the foot which is the first to suffer is what may be termed the thumb action of the 1st metatarsal which is lost early. The flexion clutch of the toes, the spread of the front of the foot, muscular strength of the muscles of the sole of the foot and the adductor and flexor muscles of the toes all are impaired, crowding and crumpling of the smaller toes and hallux valgus, a flattening of the transverse arch are frequently developed and by the friction of shoes, bunions, corns, and exostoses. The development of static pes plano valgus usually known as flat foot is the most common result of shoe deformity and it may range from a slight functional weakness to a fixed deformity.

For the full details of treatment for the correction of these deformities and affections more space is required than can be furnished in this publication. That all these ailments, little understood thirty years ago, are entirely curable is well established. The most important element in treatment and in prevention is the removal or avoidance of the cause, viz., faulty foot wear. This indication is clear when it is known that these affections are not known among moccasin-wearing or bare-footed people, while extremely common among urban people with the more snugly fitting shoes. Young children, when it is not possible for them to be barefooted, should wear as much of the time as is possible

moccasins or sandals and at all other times should be furnished with broad toed, loose shoes. Adults, when clumsy shaped, loose shoes are not feasible, should wear as much as possible as a rest to the foot, loose, flexible foot-wear. When walking, or using the feet a great deal, broad toe shoes should be used and conventional shoes only when the feet are not to be used actively.

Measures to strengthen the foot muscles, muscles of the sole and the correction of existing deformity are essential for a cure.

Stiff shoes, flat foot supports are to be regarded as temporary measures to prevent ligament strains. Faulty attitudes in standing and faulty use of the foot in walking are to be avoided by training.

STATIC AND ACQUIRED DEFORMITIES OF THE FEET.

A Children's Hospital does not offer adequate clinical material for a complete study of those acquired deformities of the feet which are more commonly seen in adults than in children. For a thorough understanding of the subject, however, a knowledge of the varieties of human gait and the normal action of the feet is of assistance. This is more readily studied in infants and children than in adults, as continued shoe wearing develops a more or less pathological condition.

An observation of a large number of children's feet shows that in the feet of even comparatively young shoe-wearing children a definite amount of loss of muscular strength is often produced in a majority of cases, together with toe crowding. Toe crumpling may be developed in stocking and shoe wearing children even when not more than three years of age. Investigation has shown that most acquired and static foot deformities (in cases not complicated by trauma, congenital defects or paralysis) are in reality shoe deformities. Investigation has also shown that the normal foot in infancy varies in shape (except as to the length of the second toe) according to race and is true to a type which it would appear has not changed since the prehistoric man.

Although these acquired deformities are much more common in adults than in children, no one can master the subject who has not familiarized himself with the shape and functional activity of the feet, both in shoe-wearing and barefooted children.

TREATMENT OF SCOLIOSIS.

The treatment of scoliosis forty years ago was both unscientific and clumsy to a degree that it could hardly claim a place in the proper domain of rational surgery characterized as it should be by knowledge, judgment, and good sense.

FIG. X.—Resistant lateral curvature in a girl of fourteen before treatment with plaster jackets.

The subject was clouded by ignorance as to the true nature of the affection, lack of thoroughness in the methods employed and a lack of definite purpose as to the result sought.

Much satisfactory earnest work has of late been devoted to the subject and it may be added that at present the treatment of scoliosis and spinal curves presents one of the most interesting and satisfactory problems in the field of surgery but one which differs from most surgical questions in that the cure can in no way be hastened by the use of the knife and the course of the affection before a definite cure is established is tediously chronic, involving months and years of observation, beside such time as is necessary for treatment. The affection being a vice in growth, a tendency to relapse exists in many cases during growing years and these years the spine may assume different degrees of variations of distortions according to the amount of resistance of the patient and the varying determining conditions. The resulting spinal curves may be classed as those presented by the weak backs, the curved backs and the twisted backs. The former is characterized by a constant drooping of the spinal column with exaggerated physiological or abnormal curves, which may be voluntarily corrected by the patient, with a tendency to relapse if the patient is tired or remains for any length of time in a sitting or standing position. In the curved backs this condition is complicated by some structural change in the tissue to such a degree that the patient cannot by voluntary effort correct the abnormal curve although in the milder cases these curves can be

FIG. Y.—Case of scoliosis before application of brace.

straightened by pressure of the surgeon's hands.

In the twisted backs the curves are complicated by a twist of the column due partly to the rotation of the individual vertebrae because the superimposed weight forces the vertebrae to twist to the side, as the spine is twisted sideways and partly because the strained ligaments become stretched and offer less resistance to the superimposed weights in one direction than in another, and partly because the muscles pulling on the ribs, the patient being in a curved attitude, twist the column abnormally.

The treatment must necessarily vary according to varying circumstances. Formerly, as it was difficult to control conditions for a sufficient length of time, the satisfactory results were not obtained and many surgeons frankly relegated treatment to gymnastic teachers as the only practical method to be advised.

As the conditions developing these deformities are constantly in the erect position, and as gymnastic exercise could only be practiced for a limited period, the benefit to be derived from gymnastics treatment was limited to the milder cases perhaps capable of improvement under better health conditions or freedom from constricting clothing or faulty school seating.

A step in the study of the disease, was a more rational comprehension of the pathology of the curves and twists. When it became clear that the curves result from changes in a spinal column unable to bear the body weight without yielding with the structural changes resulting

from this inability due to lack of general muscular tone or local weakness and lack of resistance of tissue, a more definite system of treatment became possible. The introduction of plaster jackets did away with the belief that treatment necessarily consisted in general spinal couches and heavy steel corsets, and induced energetic surgeons to turn their attention to the subject of correcting the distorted trunks. But before determining the best method of applying mechanical means to untwist the spine, it was necessary to demonstrate that a pressure upon the projecting ribs acted not simply on the costo-vertebral articulation but the vertebrae itself so that if the pressure were properly applied it could tend to correct an abnormal twist. This has been clearly proved by Dr. Soutter and Dr. Keene.

The effects of abnormal muscle and fascia pull has been carefully studied. Experiments in Germany and here have demonstrated that spinal curves could be developed in growing puppies if fixed for a few months by plaster of Paris bandages in a twisted position. Experiments here also showed the effect of superimposed weight in developing a spinal twist with vertebral rotation and rib prominence. The pathological changes in bones of curved spines has been thoroughly studied. Much study has also been devoted to the normal movement of the spinal column with the result that the informed surgeon is in a position to apply principles deduced from a series of well observed facts to the rational treatment of cases of spinal curve.

Whatever different theories may be presented as to the best methods in treating lateral curvature, all will agree that the whole treatment of structural scoliosis does not consist of or end in the correction of the curve.

Many surgeons have suffered the disappointment of finding a relapsed deformity after a complete correction or over-correction of congenital equinovarus and the probability of recurrence in a corrected curve and twist is even greater in lateral curves than in corrected deformities of the foot, for it is more easy to control the deforming conditions in the latter than in the former class of distortions.

Spinal curves dependent upon vices of growth due to static causes, faulty weight distribution, distorted muscular, or anatomical defect, will tend to recur during the growing years, until the tissues have gained in strength of structure sufficient firmness to prevent yielding to the ever-present force of superimposed weight.

There should therefore not only be vigilance in the inspection of such cases with accurate methods of recording observations at stated times, enabling the surgeon to recognize a threatened relapse, but also measures for the counteraction of such a tendency in an early and more manageable stage.

To apply corrective jackets for a few months or a few years, remove these and leave the patient to take chances of future normal growth,

with only as protection from relapse a reliance upon occasional gymnastics and waist bindings, removable braces or jackets, can not be regarded as thoroughly scientific surgery.

Of the various ways of recording scoliosis, there are advantages in selecting one which can be accurately and quickly made, requiring no more skill than that furnished by an office attendant.

The glass plate tracing method offers the advantages of simplicity and accuracy, and can be obtained if a proper diopter is used, and the patient suitably fixed.

A transparent celluloid sheet set in a frame has the advantage of lightness over the glass plate; an ordinary, four post iron piping frame with side pelvis clamps furnished fixation with an inexpensive apparatus. An inexpensive diopter can be made by using a small wooden block, properly squared and of a size to be held in the hand, with a piece of tubing attached at one end. The surgeon looking through the tube of the diopter placed upon the upright transparent celluloid plate, close to which the patient's bared back rests, can carefully follow lines and contours without the error of change in the position of the eye, from a line vertical to the plane of record. If a pencil which can mark on glass is so placed in the block of the diopter that its marking point would strike the recording plate in the center of the inspection tube, an accurate record can be traced on the celluloid plate, from which it can be traced on tracing paper, and kept as a permanent record of contour lines of shoulder hips, the position of the points of the scapulae, and the line of the marked spines. A record of flexibility can be made if the patient with the shoulders are kept flat to the plate and the body bent sideways to either side, and the line of the marked spines traced.

The value of this flexibility test is greater than might at first be supposed.

An examination of a number of these indicates considerable variations in the flexibility of different parts of the column and enables the surgeon to determine the local increase or diminution of spinal flexibility under exercising treatment and hence beginning relapse, and the urgency of a need for the employment of measures to prevent stiffening at any special part of the spine.

Antero posterior curves need for this record a special means of tracing, for diopter tracing fails on account of the projection of the scapulae. This is obviated by using for the tracing of the back the method recommended by Wollenburg, by which the shape of the trunk as seen from the side can be noted.

The accuracy of these tracings by diopter has been abundantly demonstrated as well as the ease with which they can be taken.

It would appear that this method of testing the lateral flexibility of the spinal column is of use, enabling the surgeon to determine func-

tional defects in the spinal column not recognizable by the unaided eye, by the X-ray, or by photograph. An examination of a number of these records show a marked difference in lateral spinal mobility, which when not due to changes in bone structure, as is probable in many cases, though recognized with difficulty, indicates structural changes in the ligamentous and muscular tissue in different parts of the column, changes which can, in favorable cases, be overcome by treatment.

For recording rotation, various methods are offered for the surgeon's selection. The angle record, indicated in the accompanying illustration, is simple and the angle of rotation more easily noted than in the one more commonly used.

Photographs, pantagraphic records of cross sections of the thorax, are all of assistance, but the method mentioned has been found simpler and of satisfactory accuracy.

A record of the strength can be simply made without the employment of elaborate strength test apparatus. A record is kept of the number of times certain prescribed exercises (using dumb-bells of a certain weight) can be performed. This record can serve as a table and an index of increasing strength; multiplying the weight of the dumb-bell by the number of the exercising movements, a strength index can be noted. The exercises to be noted in such a record will vary with the spinal curve, and its muscular weakness. Recumbent dumb-bell exercises, using the movements frequently prescribed for the correction of scoliosis, will serve as a basis for a strength record as well as for systematic muscular development needed in the after-treatment of lateral curves.

The great difficulty in rational treatment encountered in cases of structural scoliosis,—is in the application of such means, as, after correction of the deformity, will prevent the assumption by the patient of faulty attitudes, without at the same time causing muscular weakness of the trunk muscles, and without being so unsightly or cumbersome as to prevent constant use for the long period needed in growing children. A rigid leather or celluloid jacket, or the ordinary back brace does not meet the complex stature conditions involved in faulty attitudes, where the surgeon with a moderate pressure of his hand can rectify a deformity, and yet hesitates to encase the trunk in a stiff corset binding the waist, necessarily weakening the muscles and inefficient in correcting rotation.

This difficulty is usually side stepped, the surgeon prescribing daily exercises, relying upon these for preventing relapse.

Exercises, however, can only be rigidly enforced for a comparatively short period each day, while the need of measures to counteract the static influences causing relapse, is in many instances constant when the patient is erect.

Various appliances have been devised, and

FIG. M.—Brace applied.

FIG. N.—Brace applied. Front view.

none are entirely satisfactory,—an indication that the subject needs further investigation.

It is manifest that there is need of pressure and counterpressure in various directions, and that this pressure be as effective as possible it should be applied exactly where the curve extends toward the upper part of the spinal column. It is mechanically absurd to apply

FIG. O.—Diagram illustrating check brace. 1. Showing steel upright side, crutch pelvic, and neck leather. 2. Same with shoulder strap. 3. Same with side correcting bands. 4. Same with rotation pressure pad.

FIG. P.—Diagram of brace as seen in front with out-line showing points for rotation correction.

correcting pressure only or chiefly on the lower part of the trunk and where the column twists and it is desirous to check this. Any corset which twists with or around the trunk is inefficient.

It is better to frankly leave the patient to the correcting forces of nature than to use inefficient measures, which cause discomfort and even injury. But if the surgeon leaves scoliotic curves to chance, he must expect relapses in many cases.

It is of the first importance in a reliable check brace, meaning by this an appliance which will check a slump to faulty attitudes, that it should fit the pelvis at the hips, in order that it should not twist. This can be satisfactorily furnished if a cast is taken, and leather is stretched around such a cast. A base for counter-pressure, both lateral and diagonal, is in this way furnished, and the tendency to slip around the trunk checked.

A leather collar can be moulded at the neck for the upper point of counter-pressure, extending down to the shoulder, but, as this has a tendency to project with the patient's movement, it is better to rely upon a strap for counter-pressure, where it is important to avoid unsightliness or a conspicuous brace. A steel rod connecting the upper and the lower points of counter-pressure serves to furnish a line for lateral pressure. This should be secured to a cross-band attached to the leather around the pelvis, and should be stiff enough not to twist.

A light steel crutch, reaching from the pelvis to the axilla on one side, prevents the riding upward of the brace, and checks the patient's tendency to drop a shoulder.

Points for counter-pressure being furnished at the neck and pelvis, side correcting pressure is needed upon the ribs at the region of greatest

deformity. This can be arranged by a broad strap fastened to the steel upright at a desired point; can if secured by a strap to the pelvis leather be made to exert any desired amount of counter-pressure.

Where one shoulder is held high with projection of the scapulae, this can be checked by means of a shoulder strap, which passing around the back uprights is secured in front, pulling the shoulder back and down.

In front the neck and the pelvis leather should also be connected by a steel upright to give steadiness, and, if furnished with a leather pad, can be made to exert pressure upon the front projecting ribs.

In a majority of such cases, it is also necessary to check rotation of the ribs. This must be done by pressure, exerted in such a way that it will not also compress the flattened parts of the chest.

Cross steel straps attached to the uprights and furnished with pads can be arranged like a clamp to press upon the projecting ribs without crowding the depressed portion of the trunk.

An appliance of this character needs careful adjustment at first, but can be regulated by the patient or nurse, and does not interfere with activity, and is not noticeably disfiguring. It will prevent the patient's tendency to slump into a faulty attitude. As it is removable, it can be worn only for such a portion of the day as is necessary to correct the greatest tendency to slump, or it can be used constantly, removed only during the gymnastic period. It furnished the maximum amount of pressure with the minimum amount of injurious muscular constriction.

As there is comparatively little objection on the part of the patient to a light apparatus of this character, correction can be employed as

long as may be required in the child growing period.

Little need be said here as to special muscular exercises needed in these cases as so much has already been written upon the subject. It is sufficient to say that dumb-bell exercises, if properly directed, can serve excellently for special muscular development by daily home exercises; they can be simple and suited for home direction.

Something more than muscular exercises and check braces are needed in the more obstinate of these cases.

A constant tendency of certain ligaments to lose elasticity exists when faulty attitudes are constantly assumed. This danger of adaptive change in ligament and fascia is to be counteracted by daily correction or over-correction of a faulty curve.

This can only partly be effected, and in some instances not at all, by muscular exercises, and should be made when the muscles are relaxed in order to overcome muscular resistance. Correction of this sort must be accurately applied, and should be of such a character that it may be made a part of the daily home routine.

An arrangement indicated in the accompanying illustration will be found to have certain advantages for home correcting exercises.

It consists of an oblong piping frame with cross cloth straps for head, shoulder and pelvic rests for the patient, who kneels head downward in the frame; side straps with weight pulls to keep pelvis and trunk in a correcting direction, and by means of a lever with pressure attachment the twisted thorax can be over-corrected at any desired section. The amount of correcting pressure can be easily regulated.

This arrangement for daily correction can be used also in the application of corrective plaster jackets, and it will be found of advantage for this purpose in many cases, especially in the higher curves.

The avoidance of conditions favoring faulty attitudes is advisable in the after treatment of spinal curves, corrected, or in the earlier stage of development.

The avoidance of sitting for long periods without the interruption of a period of active play, the enforcement of a period of flat recumbency or the prone position to rest the back muscles, serve as an aid to prevent a habit of faulty attitudes. Lounging in large, or deep, or broad seated chairs, is to be avoided, as it favors a twisted attitude. Expensive, especially made chairs, are not necessary. A narrow seated stool or chair with proper attention to the length of the legs can answer for study or any occupation requiring a seated position for some time.

Night corrective appliances are as a rule not necessary for cases of structural scoliosis after the stage of plaster-of-Paris correction, nor in the slighter flexible cases. If this is not the case, the appliances mentioned can be worn as a night

appliance with but slight alteration and padding to protect the night clothing. It is not more uncomfortable than a plaster jacket.

Certain facts are to be held in mind by those treating cases of fixed spinal curves.

The best method of correction is by properly applied plaster jackets. But correction of the curve is not curing the patient and gymnastics are adjuvants in treatment, but not to be relied upon exclusively when a relapse is threatened.

Check braces are of assistance if they prevent slumping and faulty attitude. Such braces should be efficient and prevent slumping of the spinal column and the assumption of faulty attitude and not be waist or thorax compressing corsets.

As there is a tendency to relapse during growth, inspection and treatment may be needed for a long period. As the patient has rights, ugly, heavy disfiguring appliances should not be applied for an indefinitely long period.

To be honest with himself the surgeon should in watching the most chronic of surgical ailments keep accurate records and measurements of contour, flexibility, curve and rotation to enable him to detect relapse definitely and to note gain positively.

PLASTER OF PARIS JACKET CORRECTION.

Sayre's plaster of Paris jacket proved of unestimable value in the treatment of caries of the spine, but the benefit obtained in scoliosis from head suspension and plaster jackets applied in this position was not so marked; but it has been abundantly demonstrated that a steady pressure correcting and constantly applied will correct curves in scoliosis and that a properly applied plaster jacket furnishes a suitable means for such pressure.

Various methods have been suggested for the suitable application of jackets, and as the curves vary considerably, difficult methods of application will be needed.

Manifestly the maximum of endurable pressure should be exerted upon the convexities in the trunk while no pressure should be placed upon the hollows, which will gradually expand in respiration if freed from pressure while the rest of the chest is compressed.

The best method of application of plaster jackets are those giving the patient the least discomfort, the surgeon the greatest convenience, while placing the patient in such a position that correction will not present unnecessary obstacles, *i. e.*, the patient should be recumbent rather than standing, that the superimposed body weight should be eliminated as a factor. Whether the best position is with the patient upon the back, face or side, depends largely upon the seat of the curve, high dorsal, low dorsal; lumbar; in the higher curves a position upon the face seems preferable and in the lower upon the back, in the higher curves the jacket

should reach above the shoulder on the side of the dropping shoulder.

The writer has found the kneeling position of service, the shoulders and pelvis being fixed with side pressure correcting curves and strong pressure upon the most prominent part of the deformity with counter-pressure arranged as needed.

No difficulty is met with in providing any amount of correcting pressure; the patient's endurance is the limit of feasible application.

Removal jackets are much less effective than permanent ones as means of correction, but they become necessary where the maximum amount of correction has been reached to prevent muscle weakening by daily exercise.

Removable leather jackets exerting constant correcting pressure, and light supporting braces are effective but not disfiguring, and worn for a long time make with proper gymnastics a systematic treatment possible, continued through the growing years if necessary. The nature of the treatment will depend upon the progress of the case which can be determined by careful records. It is to be remembered that while the bones of the spinal column are lacking in resisting structure and bear the superimposed weight of the body and while faulty attitude persists either from an anatomical defect or from habit or muscle weakness, after correction of curves, recurrence must be guarded against.

A KNOWLEDGE OF THE USE OF APPARATUS.

An obstacle to the more general study of the special branch known as orthopedic surgery has been the need of readiness and skill in the prescribing and applying suitable apparatus. This is not absolutely necessary in practice.

The surgeon can correct deformities by operative measures or by the use of plaster of Paris bandages, and be entirely independent of the instrument maker. At the same time in a large number of cases better results can be obtained as in other branches of surgery if the orthopedic surgeon is thoroughly familiar with the best implements for the readiest accomplishment of certain desired results.

The first essential in an apparatus is that it should be efficient, *i. e.*, that it should meet the mechanical indications in the most direct and thorough way.

The second requirement is that it should be as comfortable to the patient as possible.

A third, that it should be simple and readily applied by the attendant, nurse, or mother.

Great improvement has in the last 30 years been wrought in the simplification of appliances and at present the experience in our hospital clinic, where the orthopedic appliances used are made under the surgeon's direction, will give the necessary knowledge.

A surgeon, however, who has not mastered the details is as poorly equipped in his art as an artist who has not mastered his palette. The

surgeon needs to be able to adapt apparatus to the need of the individual case.

In practice there is a natural tendency at a large clinic to neglect the careful use of appliances, which require some experience and skill, and to rely on the use of plaster of Paris bandages, the application of which are often relegated to a subordinate, or are more easily applied than is the case with apparatus. There is to the mind of the surgeon, as ordinarily trained, a prejudice against the use of apparatus with joints, straps, and buckles. This prejudice is not only unfounded but based largely on the supposition that a knowledge of the use of appliances is something which is with difficulty acquired. Although plaster of Paris bandages have many advantages they are not without marked disadvantages, and no one undertaking the practice of orthopedic surgery should fail to familiarize himself with the careful use of appliances.

The early establishment of a shop in direct connection with the Hospital with workmen under the control of the surgeon proved of great advantage in the treatment of deformed children at the Children's Hospital.

No. 44.—Torticollis, right.

Driscoll, age 5. Date of admission, Aug. 28, 1896. Date of discharge, Sept. 3, 1896. Duration, 3 years. Since birth. Operation, Aug. 28, 1896. Incision, myotomy, plaster. Result 10 years later.

A retrospect like this would be incomplete without a few words as to the probable future of orthopedic surgery as a specialty. It was certainly justified itself in the past by its record of advance in the care and better treatment of a considerable number of affections previously regarded as practically incurable or treated with great difficulty. But the question is pertinent whether in the future the prevention and

cure of deformities will not form a part of the work of the general surgeon. Specialization is to be condemned unless justified by definite reasons; surgery is surgery-healing by means of the skilled hand. But there is a great difference in the skill needed by the operator who attempts to overcome a disease by a surgical feat and that required in the management of cases where special treatment is needed, for months or even years, before, after or in place of an operation. It is doubtful if any surgeon can become a leader in both fields at once. Orthopedic surgery will, it would seem, retain its place as the surgery of chronic cases.

Ambroise Paré is right in his famous saying,—that the surgeon was but a dresser, as healing was in the hand of the Deity; but in correcting deformity, the surgeon must often match his skill against an errant nature, using the laws of growth against the faults of growth.

VI.

INFANTILE SCORBUTUS.

By JOHN LOVETT MORSE, A.M., M.D.

THERE has been a rapid and progressive increase in the number of cases of scurvy coming to the Medical Out-Patient Department of the Children's Hospital during the last four years. This increase has been not only absolute but also relative to the total number of cases, as is shown by the following table:—

TABLE I.

Year.	Number of New Cases.	Number of Cases of Scurvy.	Percent.
1904	2,579	3	0.11%
1905	2,533	11	0.43%
1906	2,288	4	0.17%
1907	2,075	7	0.33%
1908	2,407	6	0.24%
1909	2,062	5	0.24%
1910	2,311	11	0.47%
1911	1,967	12	0.61%
1912	1,932	13	0.67%
1913	2,416	21	0.87%

An analysis of the foods taken by the babies suffering from scurvy during the last ten years was then undertaken to determine, if possible, the cause of this increase. The data in the records were, unfortunately, in many instances, incomplete. The food taken by these babies at the time of the appearance of the first symptoms of scurvy is shown in the following table. No data as to the food was given in the others.

TABLE II.

Condensed milk mixed with water or gruel	4
Proprietary foods mixed with water	14
Proprietary foods mixed with milk—raw	1
pasteurized	1
boiled	7
no data as to heating	7
Proprietary foods, no data as to milk or heating	10
Milk, plain, diluted with water or cereal diluents, or modified—pasteurized	5
boiled or scalded	23
no data as to heating	14
Breast-fed	3
Total	89

A summary of the above figures shows that 18, or 20%, were fed on "stale" foods, that is, condensed milk or proprietary foods mixed with water. 44, or 50%, were fed on either proprietary foods or condensed milk. In the 37 cases in which milk was used either with or without proprietary foods and data given as to whether it was heated or not, the mixture was given raw in one, or 3%; pasteurized in six, or 16%; boiled, scalded or sterilized in 30, or 81%. It is probable that the milk was boiled in at least one-half of the other cases in which milk was used with proprietary foods, because the directions on the can containing the food used in these cases call for boiling. It is also probable that in a considerable proportion of the cases on modified milk prepared at milk laboratories the mixture was pasteurized.

It would appear from these figures that proprietary foods, "stale" foods and the heating of milk to the temperature of pasteurization or higher, may all play a part in the etiology of scurvy. The fact that three cases developed in babies taking only breast-milk shows, however, not only that no one of these can be the exclusive cause, but also that there must be some other cause. The most striking fact in these figures is, however, that 54 of the 58 cases, or 93%, in which there are data as to the "freshness" of the food, were fed on foods which were not fresh, that is, containing either no milk or cooked milk.

It was thought that a comparison of the feeding of the individual infants in a year at the beginning of the investigation and in the last year might show something as to the cause of the increase in the frequency of the disease. The following table shows the foods taken by these babies in 1905 and 1913.

TABLE III.

1905.

1. Mellin's Food. No data as to milk or heat.
2. Modified milk. No data as to heat.
3. Modified milk. No data as to heat.
4. Malted milk. No data as to milk or heat.
5. Mellin's Food mixed with condensed milk and water.
6. Sterilized milk, shredded wheat, oatmeal, barley.
7. Condensed milk and oatmeal gruel.