SURGICAL PROCEDURES IN GENERAL PRACTICE

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TREATMENT OF IRRECOVERABLE PARALYSIS AFTER POLIOMYELITIS—II

BY

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Lower Limb

Long experience has led to agreement on certain principles in the construction of appliances for the lower limb, and although there are certain local variations in terminology and construction accurate prescribing is now as possible as it is desirable, for all intelligent appliance-makers are familiar with the terms in current use. Descriptive terms employed below will, I believe, be fairly generally accepted.

Full-length Appliances

The metal bars that protect the lower limb are called "steels," and if full length are invariably double—inside and outside. Unless there is a condition in which the ring would serve some useful purpose—for example, paralytic subluxation of the hip—a calliper splint should never be ordered. Long double steels united by a thigh band

FIG. 7.—Showing use of flexion joint.

superiorly are just as effective and much more comfortable. The need for a pelvic band must always be considered. It is necessary in every case in which muscles moving the hip are so poor that the patient is unable to control rotation; without a pelvic band he never knows which way his foot will point at the next step. The pelvic band is connected to the lateral steel by a bar with a hinge; if there is no hinge the pelvic band will dig into the trunk at every step, and ultimately the connecting bar will break. A joint allowing movement in the sagittal plane (flexion-extension) is often sufficient, but an additional joint permitting not more than 15 degrees of abduction allows of a better gait and is always necessary in heavy patients, who—because of the adduction and abduction that occur at the hip in walking—may snap a connecting bar that hinges only in the sagittal plane (Fig. 7).

This double joint, however, is expensive and should not be supplied except in appliances worn by adolescent and adult patients. In complete paralysis of both lower limbs, in which the patient requires crutches to enable him to get along by means of a tripod gait, joints permitting abduction are dangerous, for if both lower limbs become abducted he has no means of getting them together again.

Next we must consider the need for joints at the knee. In cases of permanent paralysis the value of such joints is that they allow the patient to flex the knee when sitting; when he is walking the joints are locked in extension. Unless parents insist and money is no object such joints should not be fitted to an appliance for a child. They add both to the weight and to the cost of the appliance, which of necessity must be renewed as the child grows. But joints are desirable in every full-length appliance supplied to an adult for permanent use (Fig. 8).

FIG. 8.—Knee-joint, allowing patient to flex the knee when sitting.

Two methods of attaching the steel uprights to the boot are in common use. The simpler and cheaper is the round socket in the heel which permits movement on an axis just below the level of the foot (Fig. 9). More accurate, since it permits movement at the anatomical axis of the ankle (Fig. 10), is the joint at the level of the malleoli, with a flat socket in the heel. The latter is naturally more expensive and should be reserved for permanent appliances for adults.

Short Appliances

These may be single or double according to the needs of the case. T-straps are used to control any tendency to valgus or varus deformity (Fig. 9), and springs to control a drop-foot or paralysis of the calf muscle (Fig. 11). Double T-straps give excellent control of a flail foot. It

should be noted that certain features of appliances need not be specified in a prescription; a good appliance-maker takes them for granted. All transverse bars and straps, and the knee-cap in a full-length appliance, need

FIG. 9.—Short steel with round socket in heel: outside T-strap.

FIG. 10.

FIG. 10.—Flat socket in heel and joint at ankle.

FIG. 11.

FIG. 11.—Toe-raising spring.

FIGS. 12A and 12B.

not be mentioned, unless the surgeon desires a modification of the usual pattern. In appliances for children it is usually assumed that a sliding adjustment to allow for growth will be included (Figs. 9, 10, and 11).

Shortening of more than a slight degree (half an inch in a child, one inch in an adult) calls for a high shoe or

boot. It is rarely necessary to compensate fully for shortening, and the most satisfactory method of determining the lift required is to get the patient to stand with blocks under the short limb and to observe the lowest block that gives him a comfortable stance. A lift of equal thickness at heel and tread is unnecessarily heavy and cumbersome, and a moderate degree of equinus is always permissible. An example of a proper prescription is: "three-quarters of an inch *inside* lift, sloping to a quarter of an inch at tread." Moderate lifts (up to two inches) should be housed inside the upper of the shoe; but anything greater should be part of the sole, so that the upper need not be an enormous leather bag containing a cake of cork or balsa wood of the same superficial dimensions as the sole of the foot (Figs. 12A and 12B).

Examples of Orders for Appliances

Below are given examples of the more important types of paralysis, together with the prescriptions for appliances appropriate to each.

Flail Lower Limbs: No Shortening: Adult.—Long double uprights R. and L.; pelvic band with joints to allow flexion; joints with ring locks at knees; ankle-joints, flat socket in heels, double T-straps; boots.*

Right Hip Controlled (that is, flexors and extensors working): Flail below Hip: Two Inches Shortening: Child.—Long double uprights R.; no joints at knee; surgical boots, R. with one and a half inches inside lift† sloping to three-quarters of an inch at tread; round sockets in heel, double T-straps.

Quadriceps, Dorsiflexors of Foot, and Peronei Paralysed: Three and a Half Inches Shortening: Adult (Left Lower Limb).—Long double uprights L.; joints with ring locks at knee; surgical boots, L. with two and three-quarter inches outside lift sloping to two inches at tread; ankle-joints with toe-raising spring, flat sockets in heel.

Paralysis of Dorsiflexors, Peronei Active, Right Foot Equino-valgus: No Shortening: Young Adult prepared to have the Foot Stabilized Six Months Hence.—Short outside steel R.; round socket in heel (for cheapness, as it is only temporary), toe-raising spring, inside T-strap (to prevent eversion); shoes (because appearances matter).

Flail Right Foot: Half an Inch Shortening: Child.—Short double steels R.; round sockets in heel, double T-straps; boots (no lift necessary because half an inch of shortening may be ignored).

These examples should suffice to indicate the lines on which the surgeon proceeds when ordering appliances.

OPERATIVE TREATMENT

An appliance, however well made, is always a burden to the patient, and to everyone is the hall-mark of the cripple. It is the duty of the orthopaedic surgeon to advise operation whenever the need for an appliance can be abolished by reconstructive surgery.

As in the upper limb, the operations at our disposal are arthrodesis and tendon transplantation, with emphasis on the first, since in the lower limb stability is the chief consideration. There are six general observations worth bearing in mind:

1. Involvement of one lower limb, however extensive, can generally be benefited by operation, but the other limb must be normal or approaching it.
2. The possibility of abolishing appliances by operation in a case of widespread unilateral paralysis is diminished if there is ligamentous laxity of the knee.

* This means that as there is no shortening ready-made boots are to be supplied if possible.

† This should be sufficient for two inches of shortening.

3. Another unfavourable factor is excessive weight.

4. Extensive abdominal or spinal paralysis also adds to the difficulties.

5. Every case of paralysis below the knee, however severe, can be dealt with effectively by operation, so making an appliance unnecessary; therefore the indication for operation on a paralysed foot often depends on whether paralysis *above* the knee is such as to make an appliance indispensable. It is futile to advise stabilization of a paralysed foot if after the operation the patient will still have to wear an appliance to control a more proximal paralysis.

6. In general, tendon transplantations may be performed at any age, but arthrodesis is best deferred until the child is at least 11 years old, so that there may not be too much retardation of growth of the foot as a result of resecting surfaces at which growth occurs.

The Foot

Here we may safely say that any paralysis requiring a short appliance—that is, there is nothing seriously wrong above the knee—can be benefited by operation. So far as the type of operation is concerned surgeons may be divided into two classes: those who are looking for or think they have found a method that is applicable to almost every type of paralysis of the foot, and those who have a number of methods at their disposal, the operation selected in any particular case being determined by the exact distribution of the paralysis. The most famous “universal” operation was the type of astraglectomy devised by Whitman; but it has gradually lost its popularity, as most orthopaedic surgeons have wisely given up their search for a panacea in favour of developing different methods to suit different requirements.

It is tempting at this point to enter upon a discussion of the various operations in current practice; but this would be outside the scope of a general article, and it is still to some extent a controversial subject (Fig. 13).

FIG. 13.—Example of an operation for drop-foot (Lambrinudi's operation). A, Tacing from a radiograph taken with the foot in full plantar flexion. The shaded area indicates the amount of bone to be removed in order to obtain satisfactory locking at the ankle when a lift of $1\frac{1}{2}$ in. is required. B, The same foot after operation. C, The same foot made to lock at a few degrees below the right-angle. The only difference in the planes of bone section is in the astragalus, where the bone should be divided at X.

Knee and Quadriceps

At first sight it would appear that paralysis of the quadriceps is a most disabling condition, but this is far from being the case. Provided that the knee is capable of full extension or, better still, slight hyperextension, stability in walking can be ensured by making the foot work in equinus. The happiest cases are those in which the foot is already held in equinus by a slight contracture of the Achilles tendon. When weight is borne on the foot the toe comes into firm contact with the ground, and in trying to get the heel down the patient extends the knee by the weight of his body. Once extended the joint is moderately safe and stable. This action of the foot in equinus is so important that a shortened Achilles tendon should never be lengthened if there is the slightest risk of

interfering with the locking of a knee where the quadriceps is paralysed or weak. So valuable is this mechanism that two operations are employed, either together or singly, to bring it into play. A foot may be deliberately stabilized in equinus in order to give the patient control of a knee that previously was unstable, and a supracondylar osteotomy is sometimes used to produce a slight genu recurvatum at a joint which fails to extend completely and for this reason remains unstable. If a patient with paralysis of the quadriceps has a strong gluteus maximus he may well be considered fortunate; for this most powerful muscle, by pulling the femur into a position of extension at the hip, assists in extending the knee when the foot is firm on the ground.

Very occasionally it is possible to restore active extension at the knee by transplantation of the biceps femoris or tensor fasciae latae.

The Hip

A number of operations have been described to remedy paralysis of the extensors and abductors of the hip, but the opportunities for employing them with a reasonable prospect of success are very infrequent. There is but one reliable operation—arthrodesis—available for the flail or poorly controlled hip-joint, and then only in cases of unilateral paralysis. It is so reliable, however, that, provided the patient is not too heavy or the ligaments of the knee too lax, a completely flail limb may be made reasonably stable and entirely free of an appliance by a combination of arthrodesis of the hip and stabilization of the foot in equinus.

Short Leg

A high boot is only one degree less hateful than a metal appliance, and many patients are glad to submit to an operation that will equalize the length of the lower limbs. Such treatment (bone-shortening and bone-lengthening) has now passed beyond the experimental stage, and excellent results have been shown, particularly in the United States, and, in this country, by Allan of Birmingham.

The Spine

Paralysis of any of the muscles controlling the spine must be taken seriously, as that most fearful of all paralytic deformities, scoliosis, may result from a dis-

FIG. 14.—Full spinal support.

turbance of the balance of the spinal or abdominal muscles. This is the reason for that wise practice of keeping patients with trunk paralysis in bed much longer than is required for paralysis of even the most important

of the muscle groups of the lower limb. Even so, I have seen structural scoliosis appear during the period of recumbency—due to unequal recovery in the abdominal or spinal muscles. For minor degrees of weakness of the belly wall an ordinary abdominal belt is sufficient, but should there be the slightest suggestion of curvature of the spine a full spinal support (Fig. 14) is advisable. Unfortunately paralytic scoliosis is often found in patients who have extensive involvement of the lower limbs and are compelled to wear double full-length appliances. Add to these a spinal support articulated with the appliances, and the unfortunate victim becomes incarcerated in a heavy scaffolding of metal and leather. This has led me to follow a policy that may be bold but is, I think, justified. In a case such as I have described a light belt is fitted. If the scoliosis progresses then the affected part of the spine is stabilized by an extensive (often two-stage) fusion operation. This procedure is exactly comparable with stabilization of a paralysed foot, and, as in the foot, it renders the wearing of an appliance unnecessary. Even in cases in which a strong metal support is supplied the curvature not infrequently continues to increase, and this is an additional inducement to advise fusion of the spine whenever a paralytic scoliosis becomes anything more serious than a slight general curvature.

Certain drawings (Figs. 3, 4, 5, 7, 8, 9, 10, 11, 12, and 14), without which much of this article would have been unintelligible, were made under the direction of Mr. Geoffrey Ernst, to whom I am greatly indebted for many helpful suggestions. Fig. 13 is reproduced from the *British Journal of Surgery*, 1937, 25, 284, by kind permission of the publishers, Messrs. John Wright and Sons, Ltd., Bristol.

Nova et Vetera

ACADÉMIE DE MÉDECINE 1820-1939

The list of members, associates, and correspondents of the great Académie de Médecine of Paris¹ provides the dates of birth, death, election, and the places concerned with these events of about 2,250 men of distinction. It is introduced by a historical preface which mentions that the Academy was created by Royal Command on December 20, 1820, to supply the Government needs as regards public health, epidemics and other forms of disease, the promotion of vaccination, new and secret remedies, mineral waters both natural and artificial. It took the place of the Royal Society of Medicine and the Surgical Academy of France, which had both been suppressed by the Convention in 1793, and thus brought together the physicians and surgeons, who in the eighteenth century were on hostile terms. Originally the new Academy had three sections—of medicine, surgery, and pharmacy—each of which met fortnightly; but this was not a success, and in 1829 the number of sections was expanded to eleven, and many changes in the organization have been made since. There are now a number of grades: members in six sections; associates—national (twenty), not resident in Paris, and foreign (twenty); national correspondents divided into six sections, and foreign also in six sections. This historical note is modestly signed by the initials C. A., which may safely be assumed to be those of the secretary-general, Professor Charles Achard, who became junior secretary in 1919 and since 1921 has held the senior post. Originally the presidency and the secretaryship were perpetual, and Portal was president until his death. The perpetual secretariat was abolished in 1920, and in its place a general secretaryship was created tenable for five years, the holder being eligible for re-election for one further term of five years; but in 1925 these restrictions were removed, and this would appear to be a high tribute to the present secretary-general. The biographical index should obviously be in every medical library.

¹ *Index Biographique des Membres, des Associés, et des Correspondants de l'Académie de Médecine de Décembre 1820 à Juillet 1939.* Paris: Masson et Cie. 1939.

BUST OF LORD MOYNIHAN AT LEEDS GENERAL INFIRMARY

A bust of the late Lord Moynihan, the work of Sir William Reid Dick, R.A., has been presented to the Leeds General Infirmary and placed at one end of the main hall in such a position that it can be seen from the front entrance. In recognition of Lord Moynihan's outstanding services to that institution a ward (No. 4) had already been named after him. He entered the Leeds Medical School as a student over half a century ago, and his first appointment was as house-surgeon at the infirmary. For many years he was surgeon and in later life honorary consulting surgeon on the infirmary staff and professor (afterwards emeritus) of clinical surgery in the university. The bust has been subscribed for by more than 300 persons, including former patients and friends of Lord Moynihan.

colleagues on the board of management of the infirmary, members of the honorary medical and surgical staff, and past and present students of the medical school. Some of the subscriptions have come from as far away as China, India, and Brazil.

This striking piece of sculpture, which was exhibited at the Royal Academy last year, is finished in dull white marble and shows Lord Moynihan in his robes as President of the Royal College of Surgeons, which office he held from 1926 until 1932. Sir Edwin Lutyens, president of the Royal Academy, has collaborated with the sculptor in designing the pedestal and niche. The inscription bears the word "Moynihan" and the years in Roman numerals, 1865 and 1936, which were those of Lord Moynihan's birth and death. In his carving of the features the sculptor has seized the characteristics familiar to those who knew him. It had been intended that the presentation of the bust should be the occasion of a formal unveiling ceremony by Mr. Hugh Lett, the present President of the Royal College of Surgeons, but the circumstances of the war caused the ceremony to be postponed indefinitely.

[The photograph reproduced is by the *Yorkshire Post*.]