CHAPTER VIII.

OSTEOTOMY FOR TIBIAL CURVES.

TIBIAL curves may be studied under three conditions: rachitic, traumatic, and pathological. As in other deformities of the long bones, the vast majority of cases of bending of the bones of the legs are included in the first class. Rachitic curvature of the tibia and fibula belong to the earlier manifestations of this disease, and usually begin before the third year. Their cause is mechanical—standing; sitting with their feet bent under, or cross-legged, a very common position for a child affected with rickets to assume; sometimes the way in which they are carried by their nurse is a factor in the production of these deformities; in fact, almost any position will produce a curvature of these bones in a young child affected with rickets. I have never been able to satisfy myself that the muscles of the limb were an active element in their production.

Curvatures of the tibia may be lateral, anterior, or antero-lateral. The bending may be confined to the lower third of the bone, just above the malleolus, where a sharp, almost angular curve may be found; it may involve the whole bone, from just below the upper epiphysis to the malleoli, or there may be a

sharp, short curvature at its lower third, and then a long one above, or the bone may have only one long anterior curve. In marked cases the tibia is often flattened from before backward, or from side to side. In the latter cases the spine is much sharper and seems more prominent. In anterior curvatures the bone is often elongated on its anterior border, and overhangs the foot (as in Fig. 38). Lateral curva-

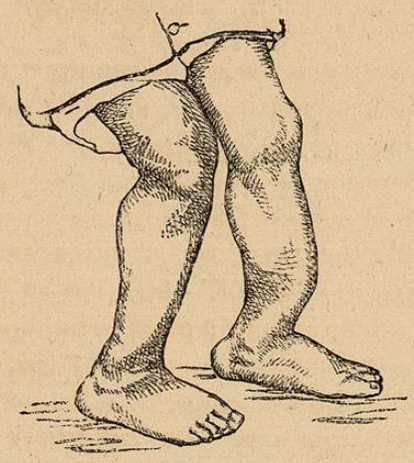

FIG. 38.

ture of the tibia and fibula with that of the femur, form genu varum.

Traumatic deformities of these bones have their origin in fractures, which, for one reason or another, have been allowed to unite at an angle. To this class belong intra-uterine fractures. These are almost always angular; some few cases of simple bending are reported. Deformities from this cause are not as frequently met with as formerly, owing to improved methods of treating these injuries. The greater portion occupy the middle third, and next in frequency

we find malposition of the foot, due to fracture of the lower portion of the fibula and a chipping off of the internal malleolus (Pott's fracture), the foot being turned outward. Thus, in seventy-four cases, fifty-one occurred in the middle third and twenty-three in the lower portion of the limb. Operations for the correction of vicious union of the tibia and fibula above the lower portion may be resolved into three—a simple section, a cuneiform section, and an excision of the ends of the fragments after a simple division. Of simple section nine cases are reported, twenty-six of cuneiform excision, and fifteen of an excision of the ends of the bones after a linear section. Of the first class, suppuration is reported in ten cases; one patient died—no cause assigned; and six were cured—no mention of the formation of pus being made.

Of cuneiform osteotomies, in nine patients suppuration is reported, two died from pyæmia; in two the limb was amputated subsequently; in one the femoral artery was ligated to control hæmorrhage; and thirteen are reported "cured"—no mention being made of suppuration.

Of re-excision of the ends of the bone after a simple division, in six cases suppuration is reported; one patient died from pyæmia; in one the limb was amputated some time after the operation for non-union; and in six no accident is reported.

There have been three operations performed for the correction of the malposition of the foot after a Pott's fracture—namely, an excision of the lower end of the tibia, with a division or osteoclasis of the fibula; an excision of the internal malleolus, with

fracture of the fibula; a cuneiform osteotomy, base inward, on the inner aspect of the tibia, and a linear section, or simple fracture of the fibula. The latter operation has lately been performed by Fenger,[1] of Chicago. The result of these operations has been to bring the foot inward and so to allow its axis to correspond with that of the knee and hip joint. Of twenty-three patients on whom these operations have been performed, in twenty-two recovery took place, with a useful foot, and one died on the tenth day from purulent infection. In five of these suppuration is reported to have occurred; in two, however, it was only slight. In some of the cases the ends of the bones have been wired together, but recovery does not seem to have been any more perfect than in those in which this was not done. It is probable that suppuration occurred in more cases than those given above, as the majority of cases were operated upon before the present methods of operating and management of wounds were adopted.

In 1861, Berend, of Berlin,[2] reported a case of marked deformity after a fracture, with ankylosis of the ankle joint, in which he performed a cuneiform osteotomy at the lower portion of the tibia with good result. Billroth[3] reports a similar case.

Pathological.—In this class are included those cases of bending of the bone from local diseases—as inflammation of bone. Schede reports the case of a girl with congenital syphilis who had had a chronic periostitis of the tibia for nine years, with

[1] "Med. News," April 15 and 22, 1882.
[2] Campenon, loc. cit., p. 186.
[3] "Wien. med. Wochenschrift," 1881, p. 414.

elongation of the bone, eight to nine centimetres, the fibula not being affected. The tibia was curved, with its convexity inward. Willitts[1] mentions a case in which the tibia was bent at an acute angle outward, following necrosis of the outer portion of the shaft, near the epiphysis. Similar cases may be found scattered through medical literature. These deformities are due to an increased growth of a portion or the whole of the bone, and consequent bending due to the unequal growth of the fibula. It is met only among children and adolescents.

It is rather a common belief among parents, and to some degree among physicians, that children affected with these curves of the bones of the leg will outgrow the deformity, and that all local treatment is uncalled for. It does not seem possible, while a child is running about, that any real obliteration of these curvatures could take place. They may, and certainly do, in some cases, undergo a relative change; the bone increases in length and thickness, while the curve remains the same size as at first, so that it is relatively smaller and less marked in later years. This is especially true of short, sharp curves at the lower end of the tibia. In later years these are apparently smaller and less observable. Long anterior curves do not show the same tendency to become obliterated. They seldom, if ever, diminish, and, when the limbs are uncovered, will always be noticeable.

Treatment.—The same remarks are applicable to curvatures of the bones of the legs due to rickets as to the deformities of other long bones of similar

[1] "Brit. Med. Jour.," February 1, 1879, p. 151.

origin. While the bone is soft, lateral bending of the limb may be straightened by splints; but, after they have become hard, mechanical treatment is useless. Anterior curvatures are not suitable for mechanical treatment, for the reason that pressure can not be applied over the crest of the tibia, the sharp edge of the bone cutting through the skin. It is true that in catalogues of instrument-makers, and in some works on surgery, braces are figured for application over the crest of the tibia to correct anterior curvatures; but they are entirely useless.

When the bones are only moderately sclerosed, time may be gained by putting the patient under ether and forcibly straightening the limb, and then putting it up in plaster of Paris. Mr. Howard Marsh speaks well of this plan. I have adopted it in some cases, and think it an advantage.

After the bones have become hard, osteotomy or osteoclasis must be performed. The latter method will be treated of in another chapter. Osteotomy for bow-legs may be either linear or cuneiform. All lateral and anterior curvatures of slight degree may be corrected by a linear osteotomy; anterior curves of marked degree by a cuneiform section. Osteotomy for these deformities should be made at the point of greatest curvature. In all cases the fibula should be divided *first*, using a small osteotome, because the bone is difficult to steady after the tibia has been fractured, and in cuneiform sections the less the parts about the tibia are disturbed the better. It will be found easier to make the section of the fibula upward and inward. In performing the tibial section, the incision should be made down upon the crest at the

point of greatest curvature parallel to the long axis of the bone, the instrument introduced and rotated so as to be at right angles with its line of entrance. It is best to begin to divide from the crest inward. Care should be taken that the edge of the osteotome does not extend beyond the outer border of the crest, as the anterior tibial artery may be nearer to the bone than normal, and is liable to be divided. I had this accident happen to me in my first case. After the bone has been divided through about two thirds of its thickness, the section can be completed by fracture. The wounds are to be treated in the manner pointed out on page 22. I think it well to make a counter-opening on the inner side of the leg and pass horse-hair through for the purpose of preventing any accumulation of blood separating the edges of the wound. The tibia being superficial, there is not as much room for the effused blood as in bones better covered with muscles, and I have always found that it is liable to force the line of incision open. In simple lateral curves the thinnest osteotome should be used, as the cut in the bone should be as narrow as possible.

Cuneiform Osteotomy.—Anterior curvatures, if marked, are best corrected by the removal of a wedge-shaped piece of bone. The more angular the deformity, the less will linear section correct. A counter-opening should always be made on the inner aspect of the leg, opposite a point corresponding to the apex of the wedge, and carbolized horse-hair be passed through the cut and out of the operation wound. An easy way to accomplish this is to pass a pair of dressing forceps (closed) down, through, and below the

divided bone, and, by a twisting motion, force the end beneath the skin at the point where it is intended to make the counter-opening. The blades are separated and the skin divided between them. The horse-hair is then caught in, and the forceps drawn up through the original incision. The edges of the cut on the anterior aspect of the leg are to be united with antiseptic gut, and over this a small compress, the wound having been first washed out with some antiseptic. I have used iodoform, dusted over the wound, but any similar method of wound-dressing may be adopted. The whole limb and lower portion of the thigh is then incased in a plaster-of-Paris splint. Before this becomes hard the limb is put into the desired position. It is well to over-correct a little, as after a time the plaster splint becomes loose and allows the position of the limb to be altered. In this class of cases a tenotomy of the tendo Achillis is often necessary. The horse-hair should be removed upon the second day through a fenestra cut over the situation of the wound. Its removal causes no pain. The method of performing a cuneiform osteotomy has been given with much detail, because I am satisfied, from personal experience, that its success—that is, primary union of the wound—depends much more upon the manner of dressing than upon the way in which the section of the bone is performed. In the first five cases, eight limbs, in which I removed a wedge-shaped piece for anterior curvature of the tibia, suppuration, more or less extensive, occurred in all the limbs. On examination of the wound on the second day, blood was found to have been effused and to have burrowed up under the skin to a con-

siderable distance. The edges of the wound were separated by the blood, and, notwithstanding the use of strict antiseptic precautions in some cases, suppuration invariably followed, and in one or two cases counter-openings had to be made. Drainage from the wound itself did not seem to obviate the difficulty. Since I have adopted the plan mentioned above the course of the wound has been similar to those after a simple osteotomy. I have never seen a drop of pus. In one case I removed a wedge-shaped piece of bone from the inner side of the tibia just below the epiphysis in order to correct an angular deformity at that point; the wound closed by primary union. The pinching of a piece of muscular and cellular tissue between the fragments may cause suppuration.

The hæmorrhage following a cuneiform osteotomy is much greater than after a simple section of the bone. Other things being equal, I think that suppuration is more liable to follow an osteotomy, be it either linear or cuneiform, of a bone that is subcutaneous, than of one that is well covered with muscles, and I attribute this to the fact that in the former case any great accumulation of blood is sure to cause tension on the wound and prevent primary union. Therefore, the more subcutaneous the bone, the greater is the necessity for a counter-opening and good drainage.

Complications.—There have been two deaths reported after an osteotomy of the tibia and fibula, one by Muralt[1] in a young girl who died, some days after the date of the operation, from diarrhœa The

[1] Bœckel's Tables.

autopsy revealed nothing to account for the fatal result. Gould[1] reports a fatal case in a healthy boy, eight years of age, death being due to carbolic-acid poisoning thirty-six and a half hours after the operation. In neither of these cases can the fatal result be attributed to the operation itself.

In two hundred and fifteen cases of osteotomy tabulated by Bœckel and Campenon, an excessive hæmorrhage occurred in four, in forty-one suppuration took place, and in fifteen a limited necrosis of a portion of the cut surface is reported. Volkmann[2] mentions a case in which he amputated a limb on account of an enchondroma, having its origin at the point of section. I have lost two patients from inter-current disease after firm union had taken place, the fatal issue being in no way connected with the operation: one from diphtheria, and one from meningitis.

In regard to the liability of the deformity to return after an osteotomy, in one case only have I seen it, and that was in a boy five years of age, on whom a linear osteotomy was performed on both limbs for lateral curvature of the tibia. He was an inmate of an asylum. The bones were quite hard. He was discharged with limb straight and union firm. Five months later he was returned to the hospital with an angular anterior deformity at point of section, with the statement that it had only recently appeared. The boy at the time of re-admission was in poor condition. It would seem probable that the angular deformity was due to softening of the callus, owing to improper food, and not to bend-

[1] "Brit. Med. Jour.," May 28, 1881, p. 850.
[2] "Berl. klin. Wochen.," 1877, No. 40, p. 591.

ing from a soft condition of the bones. Billroth reports one case, of a child four years of age, in whom the deformity (lateral curvature of the tibia) returned after some months.

ILLUSTRATIVE CASES.

Case I.—M. P., four years of age, was admitted into St. Mary's Hospital, January, 1879, with a marked antero-lateral curvature of both limbs, of rachitic origin, most marked at their lower third.

In February a linear osteotomy was performed upon both tibiæ, a section of the fibulæ having been first done. A counter-opening was made on the inner aspect of the limb, and carbolized horse-hair passed through. The limbs were put upon a temporary splint, and, after the wound had closed, a plaster-of-Paris dressing was applied. This was kept on until consolidation had taken place, when she was allowed to get up and use her limb.

Figs. 39 and 40 are from photographs taken before and after section.

Case II.—G. H., four years of age, was admitted into St. Mary's Hospital, in 1882, with a marked curvature of the bones of both legs at their lower third. The bones have a lateral, with a marked anterior bend, so that the crest of the tibia overhangs the ankle joint. In February osteoclasis was performed upon both limbs, but only the lateral curve could be corrected. The limbs were immediately put up in plaster of Paris in a straight position as regards the lateral bend. In May a cuneiform osteotomy was performed upon both tibiæ, and a linear on the fibulæ, counter-openings were made,

carbolized horse-hair passed, and the lips of the tibial wounds were united with carbolized catgut. On the following day the horse-hairs were removed. The

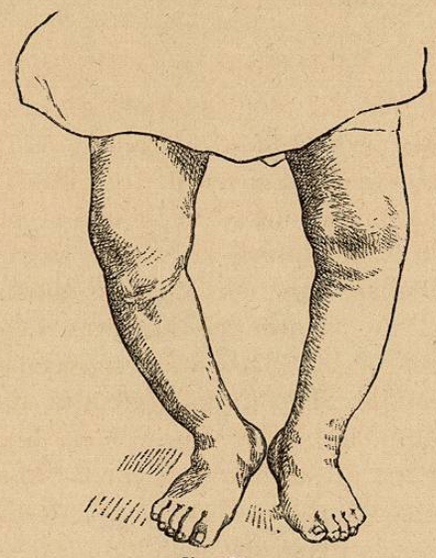

Fig. 39.

Fig. 40.

wounds healed by primary union. The temperature was never above 99°. In four weeks the splints

FIG. 41.

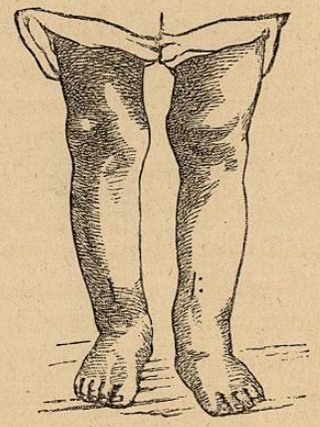

FIG. 42.

were removed, and the union was found to be firm. Figs. 41 and 42 show the deformity, and correction obtained.

CHAPTER IX.

OSTEOCLASIS.

THE correction of deformities of the long bone by fracture is an old operation, and its history dates back to the time of Hippocrates.

Osteoclasis may be either manual or instrumental. Cases appropriate to the former procedure are deformities after fracture and bending of the long bone, in the one before union is firmly established, and in the other while the bones are in a pliable condition. In this class should be included cases of fibrous, and some of bony ankylosis of joints—and "*redressement brusque*." To instrumental osteoclasis is applicable all cases of deformity after fracture and curvature of the long bones, where perfect consolidation in the one and sclerosis in the other has taken place.

The cases that can be corrected by manual osteoclasis are comparatively few, and even in those in which it is possible to correct without the use of an apparatus for the application of power, the latter is better, on account of the precision with which the point of rupture can be determined. Fracture, or bending of the bones of the legs, even in quite young children, is more difficult than is supposed.