

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

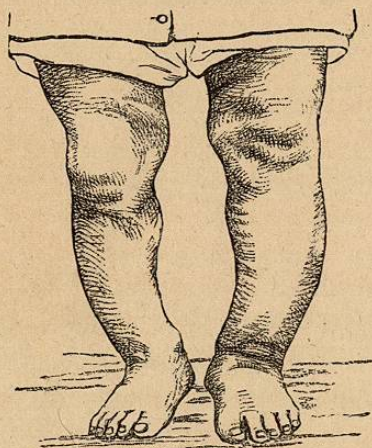


FIG. 41.

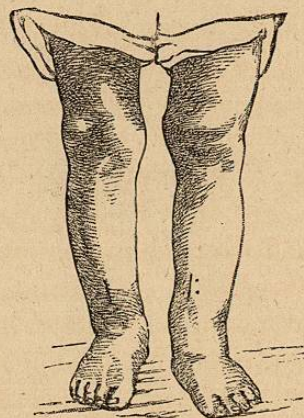


FIG. 42.

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.

To the operation by means of an osteoclast belong the vast majority of cases of deformities. Osteoclasis without an instrument requires but a brief notice. The cases to which it is applicable are so apparent that their recapitulation would be useless except for the correction of certain deformities at the knee joint. I refer to genu valgum and genu varum. Although *redressement brusque* does not belong to the same category as forcible correction of fracture, yet its consideration in connection with osteoclasis seems appropriate. The method was first advocated for rachitic curvature by Guérin¹ in 1848; later, M. Delore, of Lyons, applied this procedure to genu valgum and genu varum. It has been a favorite operation among the surgeons of the French school, while osteotomy has had its chief advocates in England and Germany.

The object of Delore in *redressement brusque* was to cause a partial diastasis between the diaphysis and epiphysis at the lower portion of the femur, and then to slide the epiphysis together with the tibia inward, and thus correct the deformity. Delore's method of operating is as follows: The patient, being fully under the influence of an anæsthetic, is placed on the side on which the limb to be operated upon is situated, with the external malleolus and the upper portion of the thigh resting firmly on the table. Then, by sudden and repeated applications of force by means of the hand placed on the apex formed by the deformity, the knee is forced outward until the leg assumes its normal relation to the thigh. The operation is performed slowly and progressively, the time

¹ "Gaz. Med. de Paris," 1848, p. 743.

required to obtain restitution varying from five minutes to half an hour. In young children only a very moderate pressure is required, while in persons of eighteen or twenty years great force is necessary. M. Taillaux operates by placing the patient upon the opposite side, resting the knee upon a cushion, and, using the leg as a lever, forces the lower limb into the desired position. The deformity gives way with a series of cracks. The lesions produced by this operation differ somewhat in different cases. Yet they are all of a serious nature, and are accompanied at least by effusion into the joint, and often by inflammation. In a patient of Delore's who died of measles twenty days after a *redressement brusque* for genu valgum, it was found that the lower epiphysis of the femur had been partially detached; there was considerable ecchymosis under the periosteum on the anterior aspect of the femur; the external portion of the epiphysis of the tibia had been loosened, and the end of the fibula torn off and dragged upward by the external lateral ligament. Frequently the internal condyle of the femur or inner head of the tibia is flattened or crushed in by the amount of force employed, while the periosteum is torn and detached. In older subjects, fracture of the shaft has been produced, or rupture of the external lateral ligament. Inflammation of the knee, more or less intense, has followed the operation. Notwithstanding the apparently severe nature of the immediate effects of the operation, in two hundred and fifty limbs operated upon by Delore he reports no accident; and states that in about one year all traces of the operation have disappeared. But even then the patient has to

be kept under observation many months, and a return of the deformity is by no means exceptional. Serious inflammation of the joint and suppurative periostitis of the shaft of the femur have been reported. Delore has operated chiefly upon children. It is reported that the injury to the ends of the bones entering into the formation of the knee joint has not been followed by arrest of development in the limb. It would appear that the nearer the patient approached adult life, the more serious and difficult the operation is.

Redressement brusque for genu valgum has had but few, if any, advocates in this country. That it has not been more frequently followed by serious joint disease with disorganization of the articulation is a matter of surprise. Perhaps the explanation is that the operation has only been performed in selected cases, on patients who were in good health and with no predisposition to tubercular affections. The fact that the exact nature of the lesions produced in any single case are so uncertain, and the time necessary to regain use of the joint so long, has deterred most surgeons from adopting this operation; and now that a much better and more precise method of correcting genu valgum and genu varum has been devised in osteotomy, it is probable that *redressement brusque* is an operation of the past.

Rushton Parker¹ has reported some cases of curvature of the femur and genu valgum treated by osteoclasis of that bone. His method is as follows: The knee joint was fixed in an extended position by means of well-padded iron splints, enveloping the

¹ "Med. Times and Gaz.," December 29, 1883.

upper half of the leg and the lower portion of the thigh, so that the part of the limb below the curve or desired point of fracture should be perfectly immovable and serve as a lever. The thigh was then laid on its outer side, the upper part being held firmly down on the table, the point of desired fracture just on the edge, and the rest of the limb projecting beyond. Then, by using the latter portion of the limb as a lever, fracture was readily produced at the desired point. He mentions a troublesome synovitis of the knee joint in one of his cases as a result of the operation.

Rupture of ankylosed joints is a serious operation. Its dangers, however, are different for different articulations, and vary with the nature of the uniting medium. In joints presenting extensive bony surfaces, and in which bony union has taken place, forcible rupture is a grave operation. It is often impossible to cause a separation between the bones, and fracture may take place at a point on either side of the joint and produce a deformity in no way an improvement on the one it was sought to relieve. It is not a safe operation for bony, and is a very questionable one in fibrous, ankylosis of the hip joint. In the former case the enormous power, when the pelvis is fixed, that can be brought to bear upon the upper end of the femur will certainly produce a fracture if the attempt is persisted in, but at what point depends upon where the bone is the weakest. In fibrous ankylosis after suppurative coxalgia, as said before, it is too hazardous an operation. In the knee joint excellent results have followed forcible rupture, and, if the band be fibrous, some useful motion is

often obtained. It is not entirely devoid of danger to the popliteal nerve and vessels behind the joint, injury to which has been recorded. When there is much cicatricial tissue behind the articulation, the danger that the important structures in that situation may be torn is not slight if persistent force is employed. It is questionable whether an osteotomy would not be a better and safer operation in this class of cases, be it linear or cuneiform. In this case, however, a movable joint is not a possibility.

It should be stated, however, that in ankylosis of the hip joint after disease, excellent results from forcible fracture have been recorded by M. Broca,¹ Laborie,² Tillaux,³ and by other surgeons in England and in this country. Yet its dangers, especially after coxalgia, are by no means slight. Disastrous results have been too common, and its results compare very unfavorably with those of osteotomy.

Osteoclasis by means of an apparatus by which considerable power can be applied has been advocated by all writers upon surgery, and many instruments have been devised for this purpose. The earlier operations were restricted to the correction of fractures of the long bone united at an angle, but later surgeons have extended the operation to deformities of the limbs due to other causes. Busch, Louvier, Maisonneuve, and others, have invented instruments for the purpose. In 1846, Rizzoli devised an osteoclast, which, with some modification, is still used. Its introduction into this country is due to

¹ "Bull. de la soc. de chir.," Paris, vol. i, 1860, p. 243.

² *Ibid.*, p. 235.

³ *Ibid.*, 1875, p. 353.

Dr. A. T. Cabot, of Boston.¹ It consists (Fig. 43) of a heavy bar, fifteen inches long, one inch wide, and three eighths of an inch thick, being much thicker in the center, which is pierced for the female portion of a screw. Into this is fitted a round steel bar, one half an inch in diameter, on which is cut a thread corresponding to the nut on the long bar, and furnished at its upper portion with a handle; and at its lower

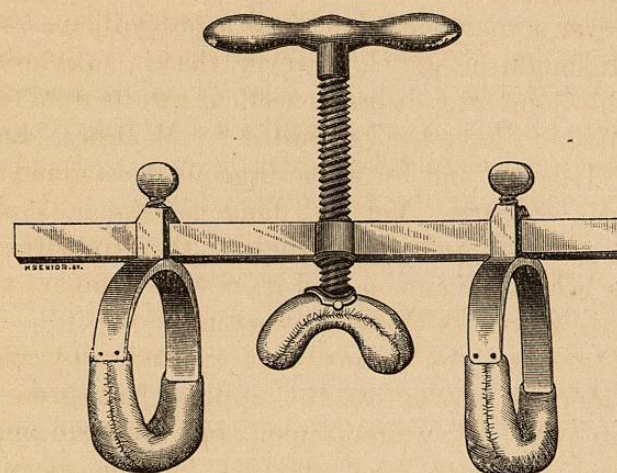


FIG. 43.

extremity is a strong, well-padded steel plate or crutch, forming a segment of a circle. The portion of steel forming the male part of the screw turns in a socket on the upper side of this crutch. Two steel rings, five inches in diameter, one inch wide, and one fourth of an inch thick, having at their upper portion a slot into which the large bar slides, and to which they are fixed in any desired position by bind-

¹ "Boston Med. and Surg. Jour.," August 14, 1879, p. 217.

ing screws. The lower segment of these rings are well padded with flannel and covered with chamois.

In order to increase the rapidity with which the force can be applied, I have had three threads cut upon the upright bar, which forms the screw.

Dr. C. F. Taylor, of this city, has devised an osteoclast—which is described in the "Medical Record" for April 21, 1877, p. 241—for fracturing the femur in a case of bony ankylosis with marked abduction and flexion of the thigh occurring after hip joint disease. As the instrument is at the present time being remodeled, a description is omitted. The instrument is an excellent one for certain purposes, and should be better known.

Osteoclasis has been employed for—

1. The correction of deformities after fracture.
2. For straightening ankylosed joints.
3. For the correction of rachitic deformities.

Rizzoli produced an oblique fracture of the sound femur in order to compensate for shortening of the other limb. I am not aware that any other surgeons have followed this plan of treatment.

Osteoclasis for deformity of the long bone after fracture has been performed by many surgeons, and instruments of various designs have been devised for this purpose. It is an operation that is attended with but little danger, and has yielded excellent results. Thus, in Gurlt's statistics¹ the femur was fractured fifty-three times, the leg twenty-four, without an accident, and with a good result as to its function and use. The records of hospitals will furnish many examples of this method of correcting

¹"Arch. gén. de méd.," September, 1875, p. 338.

deformities. The results and technique are so well known to practical surgeons that an extended notice is not called for. Osteoclasis for deformity after hip joint disease by means of an instrument has been performed. Most of the apparatuses used for this purpose have been devised for fracture near the joint at an uncertain point. Taylor's osteoclast was devised to produce a fracture at a point entirely under the control of the surgeon. From the anatomical position of this articulation it is impossible to select a point above the junction of the middle with the upper third, and herein is the defect of the osteoclast of Dr. Taylor. The fracture is at a point so far from the joint that the resulting deformity is considerable, and increases the amount of shortening.

Fig. 44 is from a case reported in the "Medical Record," April 21, 1877, p. 242, and shows the amount of deformity after the use of this osteoclast.

Osteoclasis for the Correction of Curvature of the Leg of Rachitic Origin.—For certain curvatures of the bones of the legs osteoclasis is to be preferred to any other operation, in that it does away with all cutting and takes but little time for its performance. For the past three years I have abandoned osteotomy for long lateral and antero-lateral bending of the bones of the leg. I do not think that anterior curvature or acute bends near the epiphysis are well adapted to this means of treatment, for reasons that will be given farther on. I use Rizzoli's osteoclast, as described on page 155.

The method of using it is as follows: The patient being placed under ether and the desired point of

fracture having been determined, the limb is passed through both rings, which are adjusted on the straight bar so that one shall be just above the lower and the other just below the upper epiphysis of the tibia. The semicircular pad should be directly over

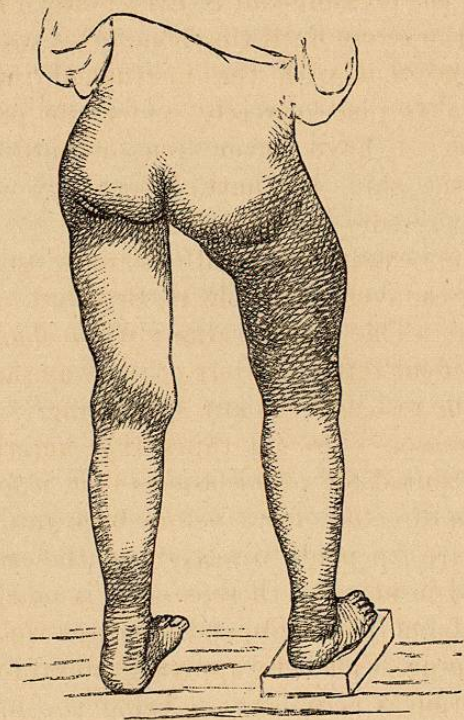


FIG. 44.

the point of desired fracture on the outer aspect of the limb. It makes no difference whether the steel plate at the end of the screw is equidistant from the two rings, the point of fracture takes place immediately under it, no matter where it is placed, pro-

vided it is far enough from one of the rings to allow sufficient space. I do not think that I have ever had less space than two inches. I think it safe to place several layers of flannel over the points of pressure and counter-pressure. After the instrument is adjusted it is made tight with a few turns of the screw, and then the pressure-pad is driven down rapidly by turning the screw until the bone gives way. It has been found that with the instrument the fracture always takes place directly under the pad, and is transverse. I have never seen or heard of any injury to the skin, nor have I seen any ecchymosis from the pressure of the instrument.

In some experiments with Rizzoli's osteoclast, on the adult cadaver, by Dr. E. H. Bradford, of Boston,¹ he states: "The fracture was always sharply transverse, as if cut three quarters of the way through and waving the rest without any splintering."

The reason I do not think that anterior curvatures are suited for osteoclasia is that, if force is applied in a direction from before backward, pressure will have to be made directly over the crest of the tibia; and in many of these cases it is much sharper than in the normal limb, and is not as well covered. If the fracture is made by applying lateral force, much manipulation is necessary to bring the lower fragment forward. It has never worked satisfactorily in my hands. Angular deformities near the epiphysis I have never tried to correct, as it would be necessary to place one of the rings over the epiphysis, and separation of that portion of the bone might occur. In this class of cases I have always performed a

¹Private note.

linear osteotomy. I have never had an accident of any kind happen after an osteoclasis of the bones of the leg.

I think that, with the above exceptions, all cases of tibial curves should be corrected by osteoclasis.

Accidents.—A case of non-union is reported by Dr. Fifield.¹ It occurred in a girl, five years of age, who presented a congenital distortion of the arms and legs. In August, 1880, osteoclasis was performed on the left tibia and fibula. In October of the same year a similar operation was done on the right leg and fore-arm. The bones of this limb united in a good position in a few weeks, but the left tibia did not unite firmly, and there was considerable projection forward at the seat of fracture. In March, 1881, the bones were again fractured at the point of partial union, and the tendo Achillis divided. The leg was straightened and placed in a plaster-of-Paris splint. In April there was no formation of callus, but by May there was partial union with bowing forward of the tibia. During the next sixteen months she wore a steel brace, but there was no improvement. During the month of June, 1882, it was twice fractured, but with no effect as regards union. In September, 1882, an incision was made down upon the point of fracture; the periosteum was found to be thickened and the ends of the bone sclerosed. A thin, wedge-shaped piece of bone was removed from the extremities of both fragments and the ends of the bones wired together, and in two months firm union was established between the fragments. Porter² re-

¹ "Med. News," April 14, 1883, p. 416.

² "Boston Med. and Surg. Jour.," April 14, 1879, p. 217.

ports a case of anterior curvature of the tibia. On one limb osteotomy was performed, on the other osteoclasis. Five weeks after the latter operation there was found considerable overlapping of the ends of the bones, and a small fragment was found to be movable at the point of fracture, which later became attached and solid, thus proving that there had been comminution.

The object of osteoclasis is to produce a simple fracture and then to keep the limb, in a fixed bandage, in a corrected position until firm union has been established. With the osteoclast of Rizzoli and Taylor the point of fracture is certainly under the control of the operator, and, with the exception of the two cases mentioned in a previous page, I have never heard of any accident or failure to correct in lateral and antero-lateral curvature.

The result on the bone itself has been determined by Dr. A. T. Cabot,¹ who obtained a specimen from a patient who died four months after the operation. On longitudinal section of the bone, an imperfectly marked transverse line indicated the point of fracture. The medullary cavity was somewhat narrowed, though by no means obliterated. There was a thin layer of spongy bone enveloping the tibia and extending for an inch or an inch and a half above and below the point of fracture.

Cases of curvatures of the tibia suitable for osteoclasis are those of long lateral bends in which there is not any marked anterior deformity. Pure anterior curves I do not think as well suited for the operation. The danger of applying any considerable force

¹ "Boston Med. and Surg. Jour.," 1879, vol. ci, p. 217.