Beebe (G. D.)

A NEW METHOD

FOR

TREATING FRACTURES

OF THE

FEMUR IN CHILDREN,

By G. D. BEEBE, M. D.,

Late Surgeon in Chief of the 14th Army Corps, U. S. A.

I desire to present to the profession, what I deem an improvement in the treatment of fracture of the shaft of the femur in children; perhaps no one who has treated this fracture in children, has failed to note the difficulty of maintaining apposition of the fragments, and securing rest to the parts sufficient to insure union. The infant, and the child of two, three, or four years, ever active, will twist itself out of the usual dressings, often within a few hours after their application, or at least so far displace them, as to defeat their object, and that too, after a careful adjustment by experienced hands.

While seeking for some principle which would apply to these cases in common, it occurred to me, that if two lines, A, and B, be drawn as in Fig. 1 and fixed in their relative positions, then the intervening space, C, would also have remained unchanged.

Let then the trunk be represented by the line, A, and the

shaft of the tibio by the line, B, the space, C, must then represent the femur.

FIG. 1.

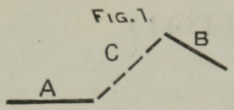
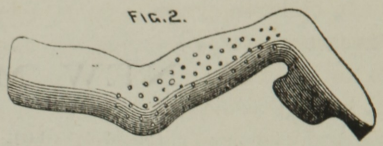


FIG. 2.



When called to a case of fracture at any point in the space, C, the surgeon would proceed to take the measure of the line, A, from near the axilla to the trochanter major, and of the line, B, from the tibio-femoral articulation to the maleolus, the distance from the trochanter major to the tibio-femoral articulation on the sound side would give the space, C. He would then rapidly sketch upon paper a diagram embracing these measurements, with a projecting flap, at D, Fig. 2.

A tinner would, from this pattern, cut a splint from heavy tin which could readily be hollowed to fit the form from the axilla to the ankle, with perforations for the admission of air in the part overlying the femur, the flap, D, being carried underneath and hollowed to receive the calf of the leg, but extending only so far as to cover the posterior surface. This splint being padded, should then be embraced by a roller extending from the toes to the knee. An assistant now makes counter-extension by fixing the pelvis; another makes extension by grasping the knee, the thigh being flexed at the angle indicated by the splint, while the surgeon with his tape measure first ascertains that a sufficient degree of extension is made, and then applies around the body a broad stout band, with a pocket made to receive the axillary portion of the splint, which may be snugly pinned or laced, and if need be, supplied with a few vertical strips of whalebone, after the manner of a corset, to prevent its gathering in folds. It is hardly necessary to say, that this band can be prepared by the childs mother or nurse, while the splint is being made. The axillary portion of the

splint, having thus been secured, the surgeon now continues the roller from the knee upward applying such compresses and latteral supporting splints as the case requires.

In children, fracture of the shaft of the femur is generally transverse, and hence forcible extension and counter-extension is not required to that extent usually necessary in the adult. It may be asked, why the necessity of flexing the thigh? The natural position of the infant is with the thighs flexed, and the restraint imposed in extension on a line with the trunk is a source of great irritation and discomfort and much less likely to secure the desired result.

Since the last Annual Meeting of this Association I have used this splint in the treatment of five cases of fracture of the femur in children, and as the cases of themselves possess some interest I may be allowed to mention some of them.

Case 1st.

Was a female child of J. L., eight weeks old. On the morning of June 30th, 1863, while its mother was giving it the usual morning bath, the child gave a playful spring in the water, the mother heard an audible snap, and the child began to cry vigorously. Dr. W. H. White of this city was called, who diagnosed dislocation of the left hip joint and fracture of the femur at the upper third. I was requested to meet Dr. W., who, before my arrival had reduced the dislocation and then requested me to take charge of the case.

The patient presented every appearance of a healthy, well developed infant, the fontanels closed only to an extent usual in infants of the same age. The femur measured about three and a half inches in length. I made out clearly a transverse fracture three-fourths of an inch below the left trochanter minor.

A splint was constructed similar to the one here presented, (Fig. 2,) which being padded was secured by a roller from the toes to the axilla with a small splint anteriorly, and a compress

in the groin to prevent the upper fragment from tilting forward under the action of the psoas and iliacus muscles. This splint was twice readjusted, and at the end of four weeks it was removed; a firm, provisional callus was apparent; no shortening of the extremity had occurred, and the case was dismissed with a light supporting bandage.

Case 2d.

Oct. 12th I was called to see the same child, now five and a half months old. The mother informed me that it had cried a good deal during the latter part of the night, and in the morning she discovered some distortion of the right thigh. On examination I found a transverse fracture of the right femur at a point corresponding to the seat of the fracture in the left femur which I had treated three months before. The child had grown rapidly during that time and still presented every appearance of vigourous health. The same plan of treatment was pursued as before, and the child was ordered to have one drop, daily, of the tincture of Symphitum off, and this to be continued for two or three months.

Nov. 12th, the case was seen for the final dressing, when a good provisional callus and firm union, with no discernable shortening, indicated a favorable termination. The Symphitum was continued, and up to this date, (Sept., 1864,) no more bones have been broken.

In a physio-pathological point of view this recurrence of spontaneous fracture presents some questions of interest. So far as I have been able to examine no entirely similar case is upon record. The nearest approach to similarity is a case of fracture from muscular action during convulsions in an epileptic patient, 12 years of age, recorded by Lente, of Cold Spring, N. Y. In that case, however, the subject was epileptic from early infancy, and died soon after the occurrence of fracture, indicating an unhealthy constitution.

In the case before us, the child was of healthy parents, and posessed of a vigorous healthy constitution. There has never been any indications of convulsions. A playful spring in the bath, was certainly the occasion of the first fracture, and notwithstanding the keen watchfulness of the mother, no exciting cause could be discovered for the second. What was the predisposing cause of these fractures? Shall we say *fragilitas ossium*? In each of these cases there was a rapid development of provisional callus, and in ample quantity; is this consistent with the theory of fragilitas?

Having thus stated the question, I will so far as I am able, proceed to answer it. Osteo-genesis in the infant, takes place through the medium of true cartilage, or we may prefer the term bone cartilage, which first developing gives the outline or frame-work of the future bone.

Within this the bone cells develop and assume position gradually pushing themselves out from centres of ossification until the whole reticular structure of the cartilage is occupied and the bone is said to be fully ossified. This bone cartilage represents the organic portions of the bone, while the bone cells represent the earthy portions. These earthy and organic elements are not chemically united, but simply brought closely in contact and intimately blended, and hence there is no fixed percentage of either in fully developed bone. In the child they are in about equal proportions, in the adult the earthy matter is equal to 74 per cent. of the whole, while in old age the earthy matter still farther preponderates, and the animal matter is reduced to 12 per cent. of the entire bone.

It will be observed too, that this constant change in the relative amount of animal and earthy matter is entirely consistent with perfect health, and hence, it cannot be denied that a decided preponderance of earthy matter might be present in a vigorous, healthy infant.

To account for the rapid repair of these successive fractures by means of provisonal callus it must be borne in mind that several methods of repair of broken bones are found to exist.

A fracture may unite by the interposition of true bone cartilage, and ossification go on in this as in the original development of the bone. Or there may be developed at the seat of fracture a provisional callus made up of effused fibine, and presenting when organized, all the characteristics of connective tissue, and within this the process of ossification may go on as rapidly as within the meshes of true bone cartilage. Admitting then, the presence of fragilitas and the deficiency of bone cartilage, it does not follow that the blood is not rich in fibrin, and hence, rapid union of bone with abundant provisional callus may, as it doubtless does, take place in marked cases of fragilitas ossium.

Another question presents itself in this connection. What is the range of the action of Symphitum? Though still engaged in careful investigation upon this subject, I think I may venture the assertion that it will be found to promote cartilaginous development where that tissue is deficient, and to favor bony union by means of cartilage when fractured in such localities as to preclude the formation of callus.

In a comminuted fracture of the patella occurring in May, 1863, I distinguished six fragments giving mobility and crepitus. Perfect apposition of the fragments was secured by a dressing constructed for the occasion, and Symphitum employed locally aud internally. In two weeks the patient,—a man aged 45 years,—walked about within doors still wearing the dressing. In four weeks the dressings were removed, and a perfect use of the knee was recovered, the patella being one-third larger in circumference than the one upon the sound side, and giving upon its anterior surface slight ridges of callus to correspond to the linef of fracture. To say that union took place in this case in a marvelously short space of time is saying but little, as all experienced surgeons will agree, and no rational explanation can be found other than that union took place by primary intention in this bone in a manner analagous to union by first intention in the soft tissues, and I am persuaded that this result was hastened by the action of the Symphitum.

The third case of fractured femur, treated with the angular splint, was a son of Mrs. C, aged three years, a transverse fracture of the left femur at the junction of the middle and upper thirds. A surgeon of some pretensions was called to the case, who applied the usual dressings, but the child being a very active one, managed to twist himself out of the apparatus as often as it could be readjusted. Other surgical help was called and from day to day, various expedients were employed, until at the expiration of ten days, the case was abandoned. On visiting the little patient, I found considerable distortion at the point of fracture, with free mobility of the fragments and crepatus.

The splint already described, was applied and readjusted from time to time, and at the end of four weeks, on visiting the house I found the little fellow running about the floor, the bone firmly united and without distortion or shortening.

Case 4th.

Was a transverse fracture of the left femur at the middle, in a boy of 5 years, taking place July 1st, 1864. July 25th the patient was sent hence to St. Joseph, Mo., still wearing the splint. The recovery was apparrently not retarded by the journey.

Case 5th.

Boy aged 3 years, an oblique fracture of the right femur, at the upper third, recovered without distortion or shortening, and was dismissed without dressings, four weeks after the injury, the boy walking upon that foot.

Doubtless improvments may yet be made in this simple appliance, and with sliding plates moved by a screw in the part overlying the femur, it might readily be applied to fractures in the adult, but it does not commend itself as being in such cases, superior to the ordinary dressing.