A FURTHER CONSIDERATION OF AN OPERATION FOR POTT'S DISEASE OF THE SPINE.

WITH REPORT OF CASES FROM THE SERVICE OF THE NEW YORK ORTHOPÆDIC HOSPITAL.

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ON May 27, 1911, I published[1] a preliminary report of three cases of Pott's disease of the spine, which had been subjected to an operation for the purpose of producing a fusion of the posterior aspects of the vertebræ, to obliterate motion of the vertebral articulations over the diseased area and to relieve pressure on the involved bodies, thereby hastening the cure of the disease and preventing deformity.

In one case only had a sufficient length of time elapsed on the date of the above-quoted publication to make possible the demonstration of a fusion by X-ray picture. At the present writing an equally positive demonstration has been given by the same test in the other two cases previously reported.

Further, in all three instances the strength and functional sufficiency of the new and continuous bone splint covering the affected vertebral area has been abundantly demonstrated by the use to which it has been subjected. The three cases have been without external support long enough to justify the conviction, not only that fusion has taken place but that it has obliterated motion over the operative field, prevented any increase of deformity, and eliminated all symptoms of disease.

The operation was suggested to me by my experience in the use of an operation involving practically the same principles, for stiffening the knee-joint by mortising the patella into the joint after it was denuded of periosteum.[2] The patella periosteum was carefully preserved and sutured to the periosteum of the femur above and to that of the tibia below. In these

cases continuous bone was produced between the femur and the tibia, obliterating the joint.

I thought that in the spine the careful removal of the periosteum of the spinous processes and the laminæ, with the spinous processes transposed to bridge the gap between the vertebræ, would lead to formation of bone, fusing the vertebræ, and eliminating motion between them.

It is important to observe that in the case of the spine, the gap to be bridged between the laminæ and the spinous processes of any two adjacent vertebræ is very narrow. Fig. 1 is a photograph of a dried preparation of the vertebral column and ligaments showing the narrow gaps very plainly.

In performing the operation, a longitudinal incision is made directly over the spinous processes, through skin, supraspinous ligament, and periosteum, to the tips of the spinous processes. The periosteum is split over both the upper and lower borders of the spinous processes and the laminæ, and stripped from them to the base of the transverse processes.

Fig. 2 is a drawing made from a dissection which shows the periosteum retracted and the spinous processes transposed.

Fig. 3 is a lateral view of the transposed spinous processes.

The lateral walls of periosteum and of the split supraspinous ligament are brought together over these processes by interrupted chromic catgut sutures. The skin wound is closed by silk, and a steel brace applied with the space between the uprights increased somewhat at the site of the wound so as not to make pressure upon it.

Rest in bed is absolute for eight weeks. During the next four weeks sitting up is permitted. At the end of the twelfth week walking is allowed.

The brace is continued for another month, when it is removed for a part of each day until gradually left off entirely.

CASE I.—Edward Q., age nine years. Lumbar Pott's disease of three years' duration. Moderate kyphos. Almost complete destruction of bodies of the second and third lumbar vertebræ. Disease active.

Operation (January 9, 1911).—The operation included the last dorsal and three upper lumbar vertebræ, the spinous processes and the periosteum of the laminæ as far as the base of the transverse processes being used in establishing the line of new bone formation.

Fig. 4 is a photograph of the boy before operation. Fig. 5 shows him 15 months after operation, or 12 months after all treatment was discontinued. Fig. 6 is an X-ray of this case taken by Dr. Caldwell of New York, three months after operation, and shows unmistakably the continuous bone formation over the operative field.

This boy has lived a perfectly unrestrained normal life without any form of external support for 12 months, and there has been no symptom indicating activity of the disease and no increase of deformity.

CASE II.—William M., age seven years. Lumbar Pott's disease of two years' duration. Very extensive destruction of the bodies of the three upper lumbar vertebræ. Moderate kyphos. Flexion deformity of both thighs from psoas contraction of 60 degrees. Fluctuating mass in both iliac fossæ.

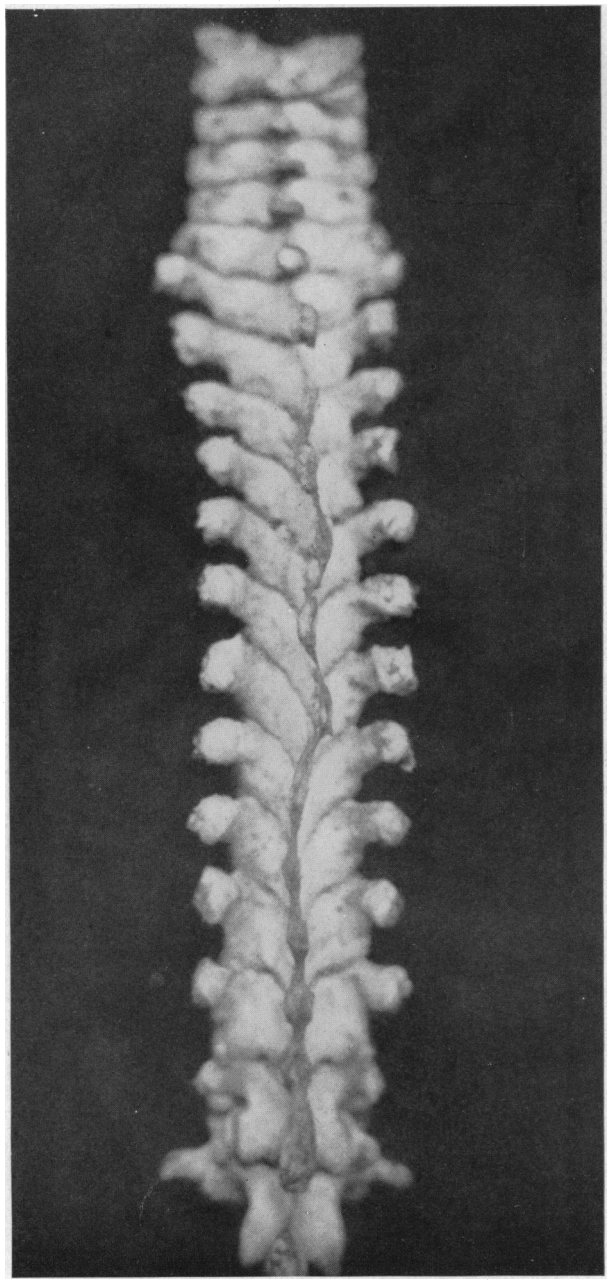
Operation (April 26, 1911).—The operation included the tenth dorsal to the fourth lumbar vertebræ. Fig. 7 is a photograph of the boy before operation, Fig. 8 eleven months after operation, and Fig. 9 is an X-ray which shows the continuous bone formation. He has been without support for eight months and there is no symptom indicating activity of disease, nor has there been any increase of deformity.

There is still, however, some psoas contraction which I believe is due to positive shortening of the muscle, as the flexion of his thighs, which was present at the time of operation, had existed for over a year.

CASE III.—Mrs. B., age twenty-five years. Married, two children. Dorsolumbar disease. Marked kyphos from the ninth dorsal to the second lumbar. Disease very active. A large fluctuating mass, left side, extending from the lower border of the ribs, down under Poupart's ligament for six inches on the anterior aspect of the thigh.

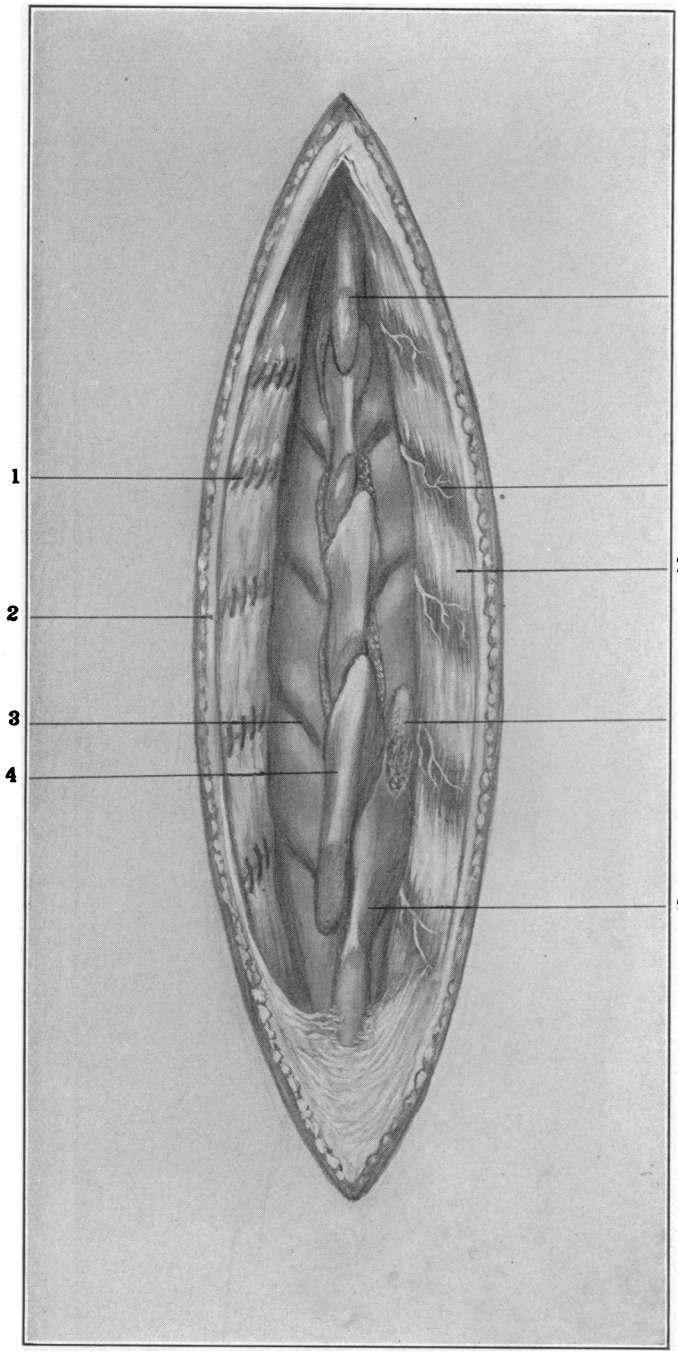
Operation (April 27, 1911).—The operation included the last four dorsal and three upper lumbar vertebræ. A few weeks after operation the abscess was aspirated and has never returned.

FIG. 1.



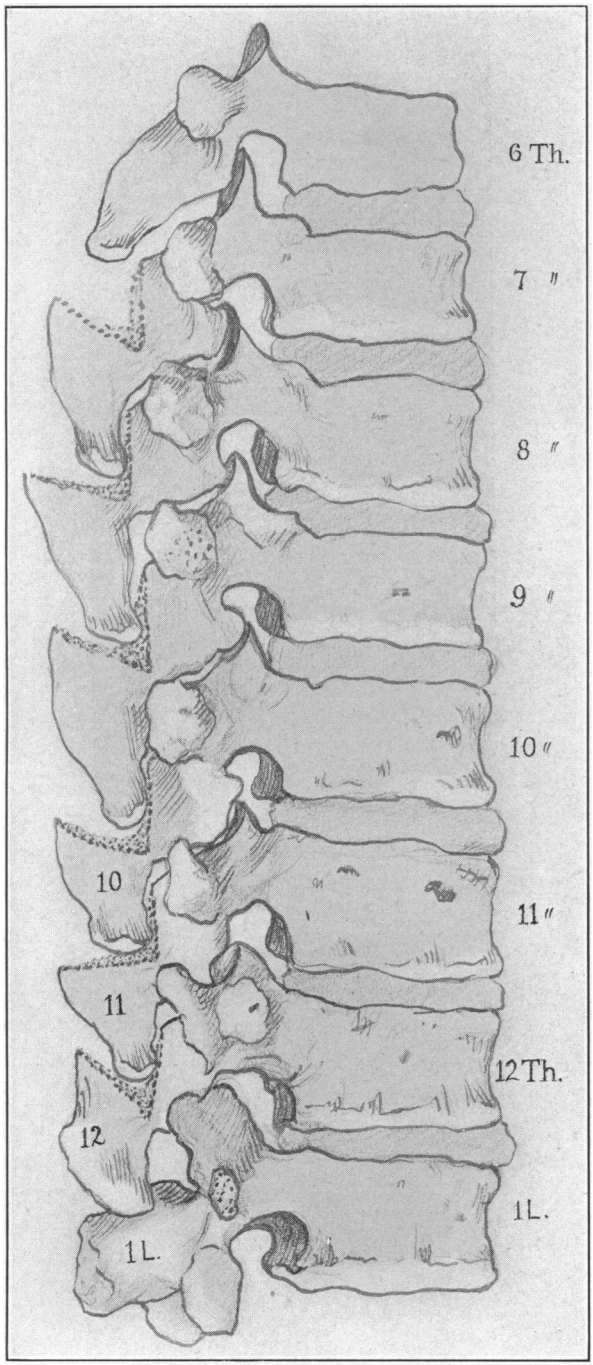
Photograph of a dried preparation of the vertebral column and ligaments.

FIG. 2.



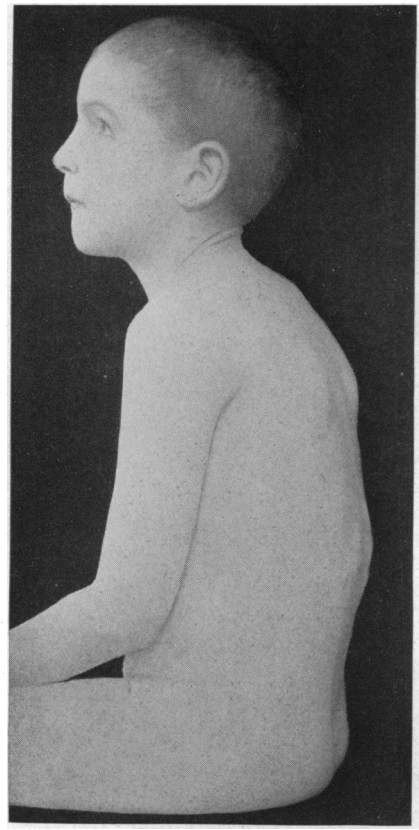
1, shows periosteum sutured; 2, half of supraspinous ligament; 3, space between the adjacent edges of the laminæ; 4, a spinous process transposed by partial fracture, making contact with its own base and the tip with the unbroken spinous process below it; 5, a spinous process marking the upper end of bridge; 4 to 5, transposed spinous processes; 6, space between periosteum when removed from spinous processes and laminæ as it appears before suture; 7, periosteum from spinous processes and laminæ; 8, a small strip of bone elevated from laminæ placed transversely across gap, its free end making contact with the lamina adjacent; 9, spinous process unbroken, marking the lower end of the bridge.

FIG. 3.



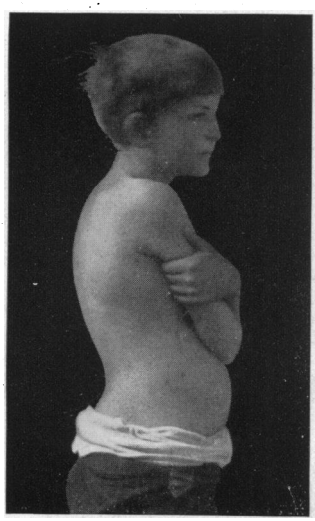
Spinous processes partially fractured and used for bridging the gap between the vertebræ.

FIG. 4.



Photograph of Case I before operation.

FIG. 5.

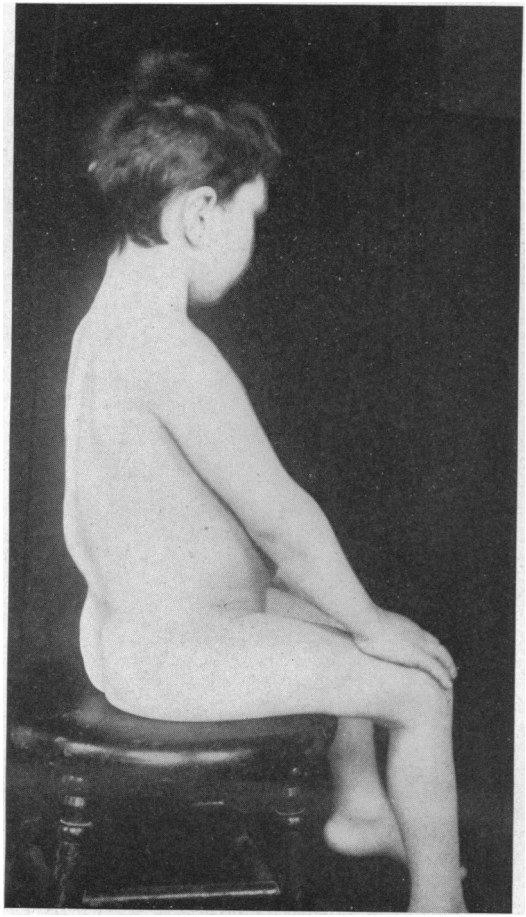


Photograph of Case I fifteen months after operation and twelve months after removal of brace.

FIG. 6.

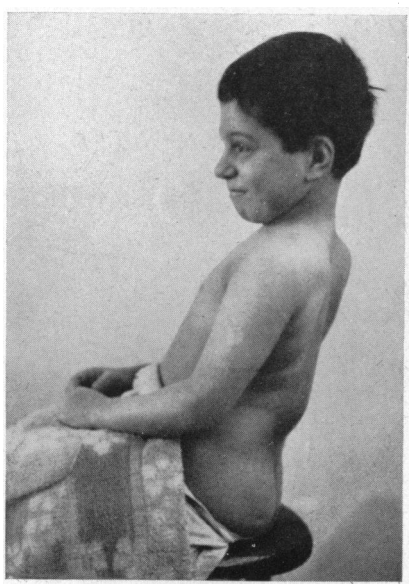
X-ray of Case I three months after operation.

FIG. 7.



Photograph of Case II before operation.

FIG. 8.

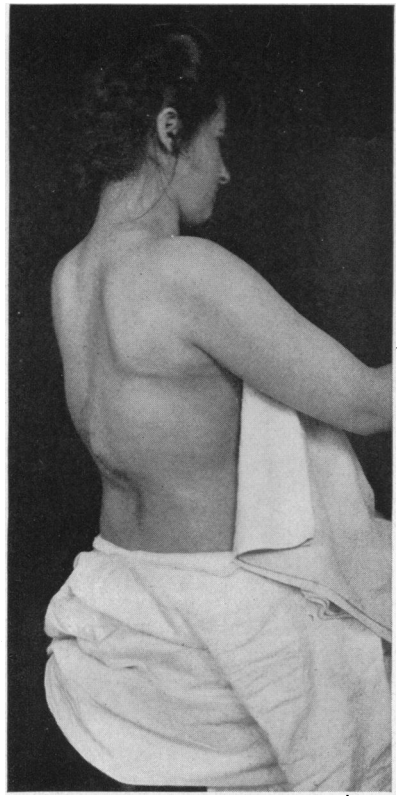


Photograph of Case II eleven months after operation.

FIG. 9.

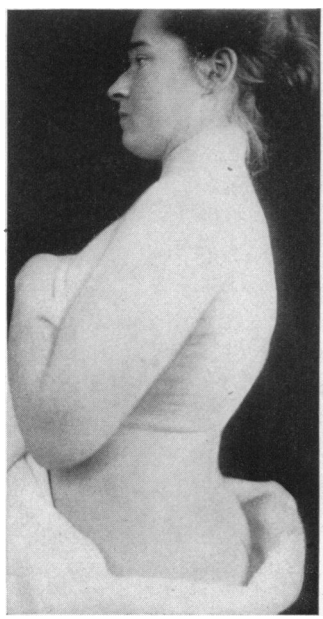
X-ray of Case II showing continuous bone formation.

FIG. 10.



Photograph of Case III before operation.

FIG. 11.



Photograph of Case III eleven months after operation and eight months after removal of brace.

Fig. 10 is a photograph of the patient before operation, and Fig. 11 eleven months after operation.

The very great reduction of her deformity is obvious from these photographs. The X-ray picture taken by Dr. Caldwell, while it shows unmistakably a continuous bone formation, is not sufficiently clear for reproduction on account of the stoutness of the subject. In any case the adequacy of her support is unmistakable, as for eight months she has been without any brace and has lived a perfectly normal life. There has been no symptom indicating activity of her disease and no increase of deformity.

The number of vertebræ in each instance included in the operation is determined by the extent of the disease. It is necessary always to be sure of attaching the diseased vertebræ at either end of the involved area to healthy ones above and below. The extent of the disease may be determined accurately in some cases by X-ray pictures. When this is not possible, the only guide is the kyphos or the region of rigidity.

It is a fact that all the vertebræ involved in the kyphos are not diseased, and that inaccuracy in the number of vertebræ to be operated on is possible. But care should be taken to include a sufficient number, as otherwise the elimination of motion of the diseased joints will not be obtained.

The stiffening of a small segment of the spine in a given case is not a serious matter, in view of the fact that the remaining healthy joints compensate for the loss of function of the few. Indeed is it not a fact that comparatively few cases of Pott's disease recover, with movable joints?

A striking illustration of this is Case III, a woman of twenty-five. While six vertebræ were included in the operation, thus stiffening a long segment of her spine, the spine above and below the field of operation allows such freedom of motion that she shows almost no awkwardness.

In these three patients no attempt was made to close the narrow gaps in the periosteum laterally, as is shown in Fig. 2. In many cases since I have closed these gaps, thus establishing at once continuous periosteum on either side which is sutured together in the middle.

The small space between the laminæ with the gap between the spinous processes filled by their transposition makes me doubt the necessity of thus suturing the periosteum, as I think it becomes continuous and that a fusion of the laminæ and spinous processes of the vertebræ operated on takes place. Certainly the result in these three cases was satisfactory. However the practice of this part of the technic is not difficult.

There are two other features of the technic that have been practised in a number of the cases which seem worthy of emphasis. One is pushing back the periosteum from the adjacent edges of the laminæ to their ventral side, after its removal from their posterior surfaces. This can be done easily with a thin blunt periosteal elevator, without injury to the membrane of the cord. The other is the elevation of a small piece of bone from the laminæ, placing it transversely across the space between them, its free end in contact with the lamina next below, which establishes a bone bridge (Fig. 2).

It has long been the accepted theory that the osteoblast was generated from the periosteum, and for that reason great care has been exercised to remove it without injury.

However, Macewen's[3] experimental studies of bone growth seem to prove that the osteoblast emanates from the bone. Whether it is generated from periosteum or from the bone, or from both, is a question which need not be determined in estimating the value of the surgical procedure under discussion. We have both structures here in abundance, the operation stimulates the generation of the osteoblast, provides a place for its deposit and nutrition between the periosteum and bone, establishes ideal conditions for bone development, insures its continuous formation along the posterior aspect of the vertebræ operated, and produces a fusion of laminæ and spinous processes from the transverse processes of one to those of the other side, thus giving a perfectly symmetrical, extensive, and adequate support.

My experience of the beneficial effects of immobilization,

even when imperfectly obtained by braces and casts, on tubercular disease of vertebral and other articulations, justifies me in believing that a more perfect degree of such immobilization, produced by bony anchorage of the diseased structures in the desired position, will unquestionably be of the greatest help in arresting and controlling the morbid processes, and will rapidly lead to a radical cure of the disease.

From the results in these three patients, I have felt justified in continuing this work and have operated on 33 other patients, making a total of 36—21 in the dorsal, 4 in the lumbar, and 11 in the dorsolumbar region.

Twenty-one were from 3 to 10, 13 from 10 to 15, one 18, and one 25 years of age. The duration of the disease has varied from three months to ten years, in the large percentage under five.

In all, the wounds have healed without complication, pain has been slight, and there has been no reaction from the operation. Eighteen of the cases have been without support from three to seven months, and have shown no symptoms of disease or any increase of deformity.

While it is too early to make a final report on these cases, one other observation has been made in connection with this operative experience, which is of very significant importance. The fact that in six cases, or nearly 17 per cent., a fusion of the laminæ and the spinous processes of two or more vertebræ involved in the kyphos was found.

Five of these cases were under ten years of age, one was sixteen, at the time of operation. The duration of the disease in one was only two years, in four under four years, and in one ten years.

In all six cases the fusion was of vertebræ in the lower segment of the kyphos, in two of three vertebræ, and in four of two vertebræ, but in none was the fusion complete in producing anchorage of the diseased vertebræ to healthy ones both below and above.

The attempt on the part of nature to eliminate motion of these diseased joints by extraordinary bone growth, though

it was incomplete, is very important, as it indicates the principles which should guide the surgeon in attempting to produce this result by operation, and suggests that the procedure herein described, which preserves all the structures essential to the development of bone and stimulates their activity, is consistent with those principles.

REFERENCES.

[1] New York Medical Journal, May 27, 1911.

[2] Hibbs: Operation for Stiffening the Knee-joint, ANNALS OF SURGERY, March, 1911.

[3] Macewen: The Growth of Bone; Observations on Osteogenesis. An experimental inquiry into the development and reproduction of diaphyseal bone, 1912.