

of the voice sounds by which their quality becomes more amphoric and their duration prolonged into an echo are the striking characters which when accentuated by stethoscopic pressure indicate pathologic changes in the viscera; (5) that the character and distribution of vocal signs over the normal chest are sufficiently constant so that a topographic study of the chest by auscultation may definitely suggest, through recognition of departures from the normal, the intensity and distribution of morbid changes within the lungs, even when these changes are too slight to appeal to the senses through any other method.

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OSTEOMYELITIS WITH BONE TRANS-PLANTATION *

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C. R., a French boy, 12 years old, living in Cambridge, was seen in consultation with Dr. H. C. Hache, Somerville, Mass.



Fig. 1.—Lower part of tibia, 4 inches necrotic with involvement of lower epiphysis. This and the following roentgenograms were taken by Dr. George.

Fig. 2.—Attempt at regeneration of bone, 3 inches having formed at lower end of upper fragment of tibia.

The patient had been sick for eleven days and had been seen by other physicians. Two months before he had received a cut in the right foot while skating, which had healed. Some days previous to our visit he had been skating and came

home with wet feet; then was suddenly seized with intense pain about the right ankle. Swelling rapidly followed and extended to the knee. Pain was excessive, requiring morphin. Vomiting with repeated chills followed.

Examination.—Patient showed signs of septic absorption on Feb. 1, 1911, and appeared listless until leg was handled, then would cry out with pain. Right leg, which was swollen from ankle to knee, was held in a semiflexed position; was edematous and painful. Skin was red and had glazed appearance, especially over the greatest swelling, which was about the ankle. There was marked fluctuation in the vicinity of internal malleolus. A few lymph-nodes in right groin were swollen. Slight tapping on heel caused great pain. Diagnosis of acute osteomyelitis was made. Advised ether operation but it was not permitted until the next day, February 2.

First Operation.—An incision 4 inches long was made over the lower fourth of the tibia down to the bone. About a cupful of green pus was immediately set free. Another incision was made internal to the external malleolus two inches long just through the skin. Multiple small incisions were made through the skin for free drainage. The first incision revealed an area of tibia not covered with periosteum just above the epiphyseal line. In the center of this space was a minute opening in the cortex of the bone the size of a pin-head, through which pus was exuding. Periosteum was peeled back and the cortex chiseled for an area 2 inches long and $\frac{1}{2}$ inch in width. Cortex was thickened, dense and very hard. Pus seemed to well up into wound from ankle-joint. Immediate improvement in general condition followed operation, and all pain, which before operation was described by patient as agonizing, had vanished. Bone-marrow was not disturbed. Wounds were packed with iodoform gauze, dressed every day and drained freely for eight weeks.

Six weeks after operation, March 14, 1911, the first roentgenogram (Fig. 1) showed fully 4 inches of lower part of tibia necrotic with slight involvement of lower epiphysis. Periosteum was shown separated from surface of shaft. Proliferation of periosteum was very nicely shown to the extent of $\frac{1}{4}$ inch in thickness.

Second Operation.—The second operation was performed in the Fenway Hospital, March 30, 1911, eight weeks after the primary operation. Linear incision 5 to 6 inches long was made from the middle down to the lower end of the tibia. Tibia was exposed and periosteum carefully stripped from cortex of the bone from the lower epiphyseal line to 4 inches above it. At this point the tibia was sawed across with chain

saw and removed down to, but not including, the lower epiphysis. As the Roentgen ray showed some involvement of the epiphysis, the latter was curetted very lightly. The periosteum was preserved and sutured with catgut. Plain gut was used for the skin, a drain at the lower end being left. Plaster bandage was applied with a window for drain-

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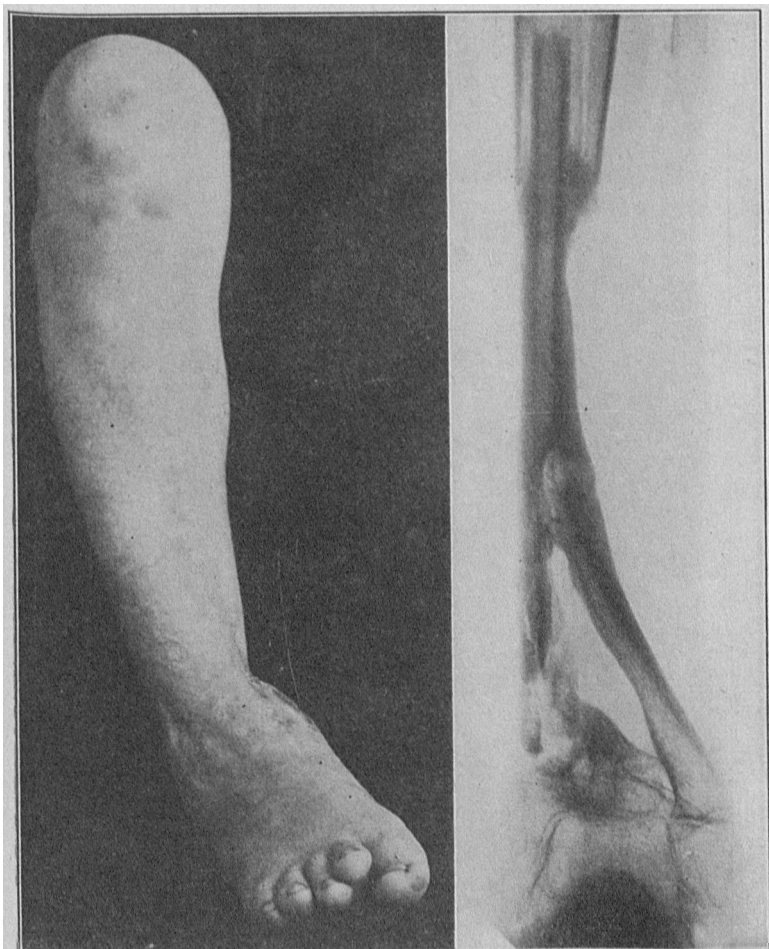


Fig. 3.—Represents foot turned in in talipes-varus position due to lack of support on inner side of leg.

Fig. 4.—Six months after last operation—shows callus formation at junction of tibia and fibula.

age. Patient was allowed to walk with a crutch in three weeks. Wound was drained until June 23, when all sinuses were healed.

July 23, 1911: Roentgenogram (Fig. 2) was taken showing some attempt at regeneration of bone, 3 inches having formed at the lower end of the upper fragment of tibia. There was marked hypertrophy of the fibula. The periosteum of the tibia which had been preserved with the hope that it would regenerate a new tibia was not a complete success, probably because there was considerable sloughing of the periosteum after the removal of the shaft, and also because some necrotic tissue had been left in the lower epiphysis, which it did not seem good judgment during the operation to curet very thoroughly.

September, 1911: A third operation was suggested but was refused by the parents of the boy. Later all casts were removed and the patient was allowed to go without any splints or bandage on leg, although it did not seem wise to allow him to bear any weight on the leg. The only splint was that of the fibula. A photograph (Fig. 3) was taken at this time showing how the foot turned in, assuming a talipes-varus position on account of the lack of support on the inner side of the leg. Transplantation of the fibula seemed to be the only means left and consent was obtained to the operation, which was performed Jan. 3, 1912.

Third Operation.—At Fenway Hospital, Boston, tourniquet was applied and an incision was made in the scar of last operation. Periosteum of tibia was dissected up for an inch or more and a small piece of tibia removed. Fibula was then isolated and cut across fully $1\frac{1}{4}$ inches above the cut in tibia. Fibula upper end was inserted into tibia and the cuff of periosteum of tibia was sewed to periosteum of fibula. With considerable difficulty the lower end of fibula

was next exposed and cut longitudinally for a distance of 3 inches. Great care was necessary to split fibula without fracturing the inner piece. This was accomplished and the inner half was sprung over to the lower epiphysis of tibia, a grooved hole having been cut in the epiphysis to receive it.

Roentgenogram (Fig. 4) taken six months after last operation, shows considerable callus formation at junction of tibia and fibula.

Bone transplantation at present is used not only to fill in defects in bones in the same limb, but also to replace bones in other parts of the body. The various substances used as substitutes for bone are (1) bones from animals; (2) bone chips decalcified (used by Senn); (3) absorbable material, as catgut, and (4) non-absorbable material, such as rubber and Mosetig-Moorhof's mixture of spermaceti. One hundred and twenty cases were reported by the last named method and all successful.

Thomas W. Huntington of San Francisco reported a case in 1905 of a boy who had a defect of several inches in the tibia following partial regeneration of the periosteum. He suggested the use of the fibula to take the place of the tibial defect by transplanting the upper fragment, and six months later the lower end was transplanted to improve the weight-bearing function. The result was good.

The cases of Stone, Codman, MacAusland and Wood, all of Boston, and the one here reported are different from any others on

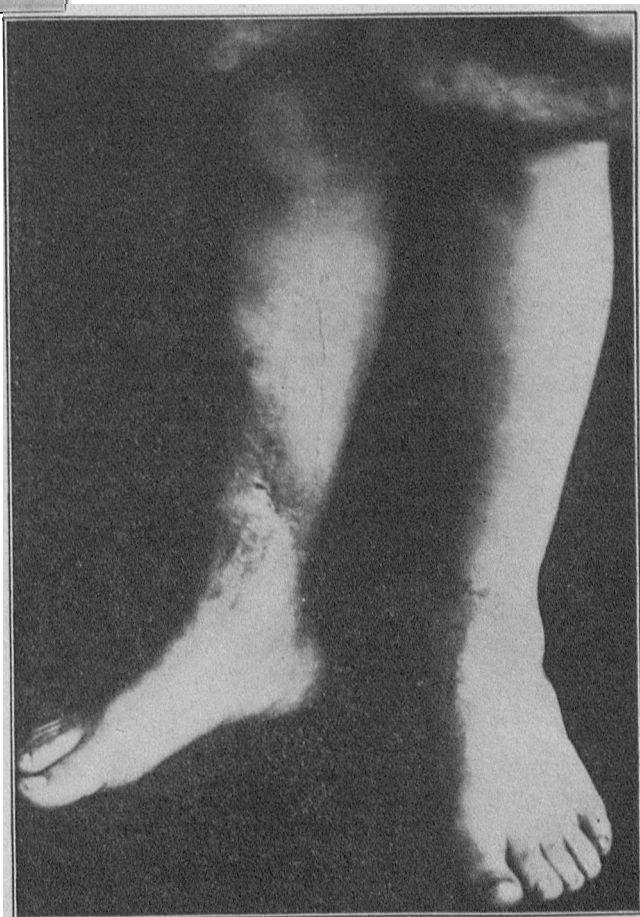


Fig. 5.—Photograph of both legs. Barring limitations of ankle movement, boy's good leg only $\frac{1}{2}$ inch shorter than its fellow.

record in that one end of the fibula is attached to the tibial fragment while the other end is left in its normal attachment. Stone's operation was done in two separate stages, six months apart. His first step consisted in transplanting the upper fragment. The second step or operation consisted in splitting fibula and transplanting the lower fragment.

In the case reported by MacAusland and Wood, the lower fragment of the fibula was transplanted six weeks after transplanting the upper fragment, while in the case here reported both steps were done in one operation. As far as my knowledge goes it is the only case reported in which both upper and lower fragments have been transplanted at one operation.

A photograph of both legs (Fig. 5) was taken, December, 1912, almost a year after this paper was read. Boy is not wearing any support and has about one-half inch shortening. There is a slight limitation of motion at the ankle, but otherwise he has a good leg with good function.

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NEW OPERATION FOR THE CURE OF INDIRECT INGUINAL HERNIA

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This operation consists in making an incision, about 2 inches long, parallel with Poupart's ligament. The end of the incision should be about one inch above the usual location of the internal ring. The fascia of the external oblique muscle is divided in line of its fibers. The arching fibers of the internal oblique are separated and retracted. The fascia of the transversalis, together with the peritoneum, is opened. If adhesions are encountered they can be broken up by traction and blunt dissection with the finger within the sac.

The internal ring, including the neck of the sac, is caught up with an Allison tissue forceps or a hemostat and pulled up to the incision, where a purse-string suture of No. 3 plain catgut, on a needle, is passed around the circumference of the ring, engaging the fascia of the transversalis except at the junction of the inner and lower quadrant, where the vas deferens or round ligament is encountered; this is excluded externally from the ligature. Pulling up the internal ring and transversalis fascia restores them to the original position held before a hernia was produced (Fig. 1).

The purse-string is drawn taut, tied and the same suture is passed from within outward through the parietal peritoneum and through some of the fibers of the internal oblique muscle. It is then passed from without inward through the muscle and peritoneum of the opposite side of the incision, where it is tied to the free end of the purse-string. The next stitch is

then passed through the peritoneum, then through what is now the superior portion of the ring. When this is drawn tight it faces and holds the ring firmly against the parietal peritoneum (Fig. 2). The remainder of the peritoneal incision

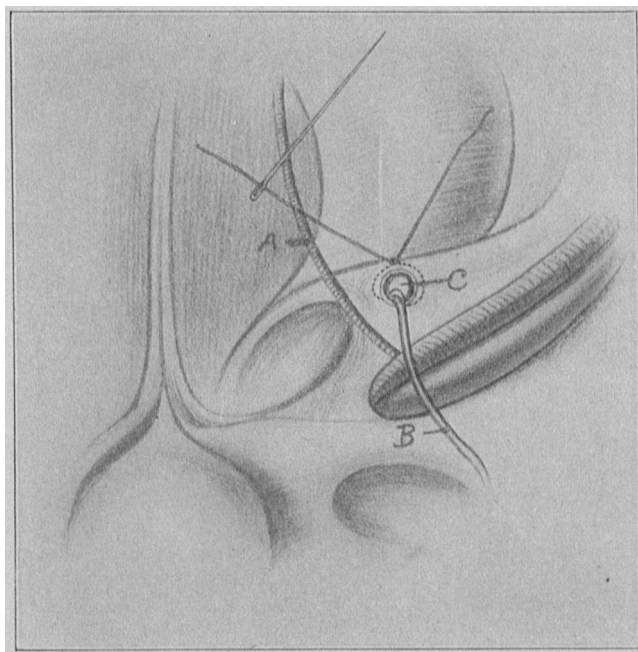


Fig. 1.—Operation for the cure of indirect inguinal hernia. A, deep epigastric artery; B, vas deferens; C, internal ring surrounded by purse-string suture, ready to be tied.

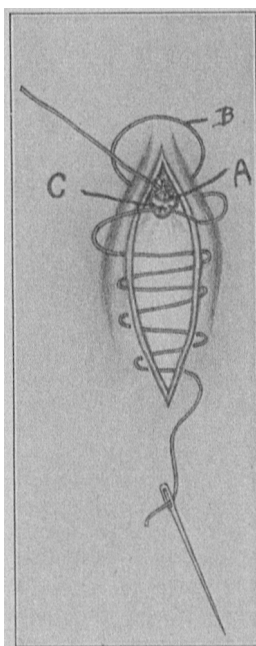


Fig. 2.—Further stage in hernia operation. A, internal ring, with purse-string suture tied, brought up to the lower end of peritoneal incision; B, this loop drawn tight before being tied to free end of suture; C, continuous suture passing through peritoneum from within outward; on return it catches up edge of ring at C, and on being drawn tight faces it against peritoneum.

is closed by a continuous stitch with the same suture. The remainder of the wound is then closed in the usual manner.

This operation has been performed in six cases of oblique inguinal hernia since October, 1912. Thus far there has not been a single recurrence of the hernia.

SUMMARY

1. This operation is more easily performed and requires far less time to complete than the older operations.

2. It requires a smaller incision, without the usual traumatism and strangulation of tissue, and with a small amount of catgut there is less chance of suppuration.

3. Restoring the inguinal canal to an oblique direction by drawing the internal ring to its normal position, causing the intra-abdominal pressure to be directed at right angles to the canal (thus preventing a shuttle-valve action) and closing and suturing the ring, renders a recurrence of the rupture practically impossible.

4. In a strangulated hernia if a resection is necessary, it is more easily and safely accomplished.