OPERATIVE METHOD FOR CORRECTION OF HEAVY FLEXIONAL ANKYLOSIS OF THE KNEE JOINT WITH NO LOSS OF BONE

By

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In inflammatory destructive processes of the knee joint, when the patient has not been treated adequately, grave flexional ankylosis up to 90° and even more, may result. The flexional deformities are often combined with lateral deviation (genu valgum), external rotation of the crus, and occasionally posterior subluxation of the tibia. When the disease occurs in childhood, the bones of the lower limb are shortened because of the hampering influence of the inflammatory process on the epiphyseal cartilages.

In order that flexional ankylosis of the knee joint may be corrected two main types of operations are practised: 1, Resection of the joint (wedge-shaped, modelling, etc.) with or without tenotomy of the flexor muscles. 2. Para-articular corrective osteotomy of widely different type (Albee, Kocher, Wreden, Lange, Hass, Dega, Thompson, Osgood and others). Resection of the joint is commonly undertaken in continuous joint disease, while in healed joint processes and osseous ankylosis a corrective osteotomy is employed.

Both types of operations have a single common defect: correction is accomplished by means of excision of considerable sections of bone. In severe flexional deformities the loss of bone increases the present shortening to such an extent that the limb becomes difficult to use, or altogether useless for the patient.

We employ a transarticular operative method which allows the correction of the most severe deformities of the knee joint with no loss of bone.

Previously we used to expose the knee joint by a transversally curved incision. Lately the skin incision has been changed, as described below.

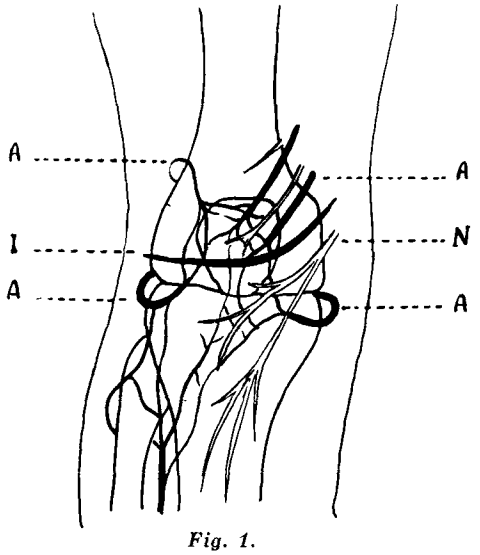

Fig. 1.
Sickle-shaped incision (I) beginning at lateral condyle of femur, passing over lower half of patella and curving upward towards tibial epicondyle of femur. Chief skin arteries (A) and greater branches of n. saphenus (N) are not injured.

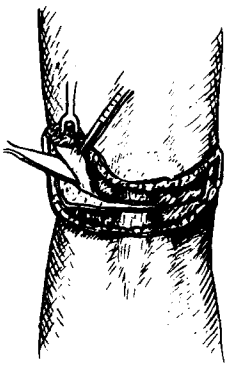

Fig. 2.
Fibrous capsule and patellar ligament incised level with the line of articulation. Incision curves upward before collateral ligaments.

Operative technique:

A sickle-shaped incision, beginning almost horizontally at the external condyle of the femur, passing over the lower half of the knee cap and curving upward towards the internal epicondyle of the femur is performed (Fig. 1). Such an incision does not impair the four chief skin arteries and the bigger branches of n. saphenus. The patellar ligament and the fibrous capsule are incised at the line of articulation. At both ends the capsular incision curves upward before the collateral ligaments to the vasti muscles (Fig. 2). The flap, formed of skin, fibrous capsule and knee-cap, is seperated from the synovia to the upper end of bursa suprapatellaris. Now the anterior part of the synovial capsule (together with bursa suprapatellaris) is removed. The collateral ligaments are isolated and temporarily cut. As the knee joint is carefully flexed. the fibrous adhesions and the cruciate ligaments are excised. If there is a full osseous ankylosis, the latter is chiselled along the line of articulation. The knee is flexed at maximum degree and the following are removed from behind: the fibrously degenerated posterior joint

capsule, the cicatrized ligaments (lig. popliteum obliquum et arcuatum), as well as the fibrous formations around the joint. This operative procedure is performed without a tourniquet, in order that injury to the popliteal vessels may be avoided.

Fig. 3.
After total synovectomy and excision of posterior part of capsule, together with fibrous ligaments and cicatricial formations, the flexor muscles are separated from dorsal surface of femur and tibia at length of 10–20 cm.

The femur and tibia are now denuded from the dorsal side to the extent of about 10–20 cm., according to the gravity of the flexional deformity (Fig. 3). Thus, as a total mass, the following muscles are separated supraperiostally from the femur: the origins of the gastrocnemius, m. plantaris, m. popliteus, the muscular bodies of biceps femoris and semimembranosis, as well as the insertions of m. adductor magnus to the medial epicondyle of the femur. The muscular bodies of the gastrocnemius, popliteus and semimembranosis are seperated from the dorsal surface of the tibia. In denuding the bones a sharp raspatorium and a resection knife are used, the operator keeping close to the surface of the bones.

As regards the articular ends, the procedure varies according to the case itself. If the aim is to form ankylosis in a correct position, the articular ends are lightly refreshed. If the further aim of the operation is arthroplasty, only the diseased tissues are removed, without attempting arthrodesis. In such a case we perform "partial arthrectomy"[1] total synovectomy, removal of the cruciate ligaments and meniscuses, excision of the diseased parts of the articular cartilage and curettage of the osseous foci, the healthy cartilaginous areas being carefully preserved. After correction of the flexional position

[1] This operative method is described in "Chirurgia" (bulg.) v. XI, p. 561–563, 1958.

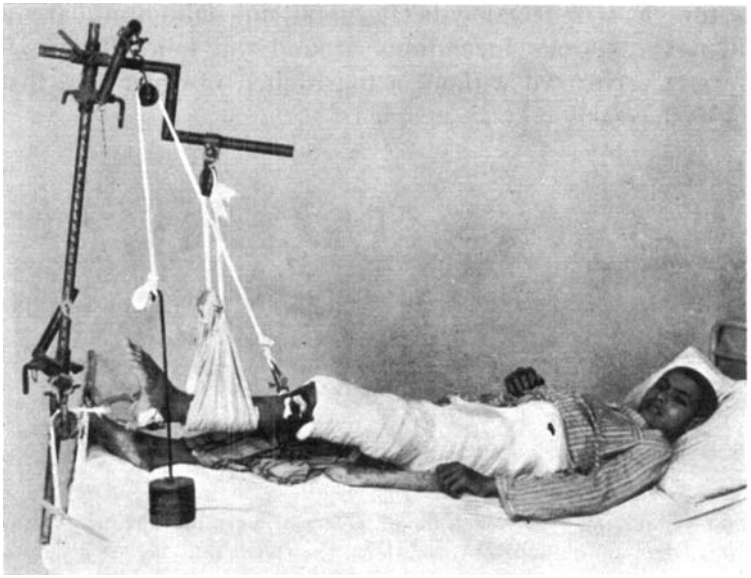

Fig. 4.
Gradually, by means of double skeletal traction through os calcis and tibial tubercle, full correction of deformity is attained. Muscle masses, separated from bones, are streched together with the blood vessels and nerves they contain.

and healing of the joint disease (several years after the first operation), arthroplasty is undertaken.

Finally, the temporarily severed collateral ligaments, the fibrous capsule and the patellar ligament are sutured. The skin incision is closed. A plaster cast, involving the pelvic and thigh, is applied.

Kirschner wires are passed through the heel and through the tibial tubercle and a double skeletal traction is used (Fig. 4)—one along the length of the limb, in order that the mass of muscles seperated from the femur and tibia may be streched, and another upward, so as to prevent the displacement of the tibia backward, or to eliminate any existing position of subluxation.

At the very end of the operation, without any exertion and, therefore, with no danger of overstretching the popliteal vessels and fibular nerve, it is possible to attain certain correction of the flexion to the extent of about 20–30°. This initial result is due to the removal of the fibrously degenerated capsule and cicatricial formations. In the following weeks, under the influence of the skeletal traction, the separated from the bone flexor muscles, together with their blood vessels

Fig. 5.

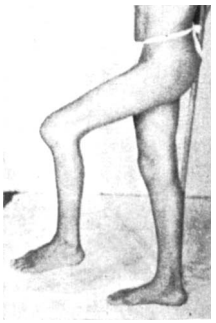

Fig. 6.

Figs. 5 and 6.
Flexional ankylosis following tuberculous osteoarthritis of 7 years before. Absolute shortening of limb 4 cm.

and nerves, yield to such an extent, that full correction of the flexion and valgus position is achieved. If desired, considerable diastasis of the articular ends may be produced. Such a condition is advisable when future arthroplasty is anticipated and the surgeon wishes to avoid osseous fusion of the joint. In that case the patient wears a leather brace, so as to prevent flexional contracture, and carries out light, active exercises with the knee in order that muscular tone may be preserved.

We have operated in this manner on 29 patients up to the present, many of whom had flexional ankylosis of about and over 90°. In each case full correction of the flexional and valgus deformity of the knee joint was reached. We have observed in any of these patients incidents in regard to the fibular nerve or the popliteal artery. In order to avoid possible complications, the joint should not be forced at once, but gradual correction by means of double skeletal traction should be aimed at.

The following is one of our personal observations:

Case 29. Student, 16 years old. Tuberculous inflammation of left knee had appeared 7 years before. The knee was gradually flexed to a right angle. Unsuccessful attempts had been made at correction of the deformity.

Local status: Fibrous ankylosis of the left knee joint in flexion 85° and in valgus position. There was a posterior subluxation of the crus

Fig. 7.
Roentgen photograph of same patient. Unsuccessful attempts for correction have caused posterior subluxation of crus.

(Figs. 5 and 6). The musculature was atrophic. The skin was hot. The joint capsule was thickened. The patient felt pain at palpation. Active movements were impossible. Passively the knee could be moved at about 2°, the patient feeling severe pain. Absolute shortening of the limb 4 cm. Roentgen photographs (Fig. 7): Irregularly narrowed articulation margin. Rough articular surfaces. Linzenmeier 140 sec.

Feb. 15, 1957. Operation. The joint capsule was thickened, rough and covered here and there with tuberculous granulations. The articular surfaces were eroded. The semilunar cartilages and the cruciate ligaments were involved in the tuberculous process. No active caseous suppurative foci were discovered.

In this case total synovectomy was performed and the posterior part of the capsule removed, together with the fibrous popliteal ligaments and the cicatricial formations. The intra-articular adhesions, the cruciate ligaments and the meniscuses were excised. The erosions over the articular surfaces were curetted out. The patella was refreshed and covered with free fascial-fatty tissue.

By means of double skeletal traction, in the course of 23 days, correction of the flexional position and elimination of the posterior subluxation were accomplished. At that time diastasis of the articular ends, about 3 cm., was etablished (Fig. 8). In the course of treatment streptomycin 1 gr. daily was given for 28 days. On the 24th day after operation the traction was removed and the leg was immobilized in a large plaster spica for a month. Afterwards the straight position of the knee was preserved by means of a leather lacer brace from groin to ankle.

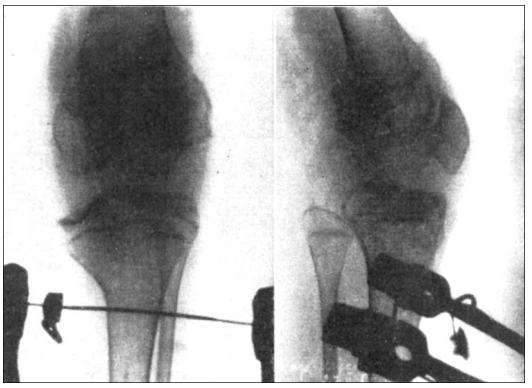

Fig. 8.
After the operation, in the course of 23 days, double skeletal traction has achieved straightening of flexion, correction of subluxation, and diastasis of articular ends.

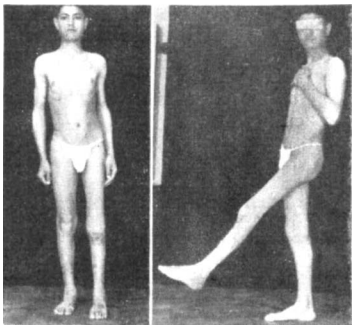

Fig. 9.
Final resul shows fully corrected deformity.

Control examination 4 and 17 months later: the leg is straight (Fig. 9). Active mobility of the joint reached a few degrees. The patella was adequately movable on contraction of the quadriceps muscle. Roentgen photograph (Fig. 10): the two articular surfaces were correctly placed. The subluxation was eliminated. No signs of inflammation of the knee joint. No swelling. No skin temperature. Westergreen 4:8 mm. The leg was still in a leather brace. In walking pain was not felt. Possibilities for future arthroplasty after a few years are present.

SUMMARY

The author describes an operative method which makes possible the correction of very grave ankylosis of the knee without loss of bone.

Fig. 10.
Posterior subluxation of crus is eliminated.

Access to the joint is obtained through a sickle-shaped skin incision. Total synovectomy is performed and the intra-articular adhesions, the cruciate ligaments, the semi-lunar cartilages, the posterior part of the capsule, together with the fibrous popliteal ligaments and cicatricial formations, are excised. The flexor muscles are seperated from the dorsal surface of the femur and the tibia at a length of 10–20 cm. The deformity is gradually corrected in the course of 2–3 weeks by means of double skeletal traction through the tibial tubercle and os calcis.

RESUME

L'auteur décrit une méthode opératoire qui rend possible la correction de très graves ankyloses du genou sans la perte de l'os.

L'accès à l'articulation est obtenu par incision épidermique en *sickle-shaped*. La synovectomie totale est pratiquée et les adhésions intraarticulaires, les ligaments croisés, les cartilages semi-lunaires, la partie postérieure de la capsule, ainsi que les ligaments fibreux poplités et les formations cicatricielle sont excisées. Les muscles fléchisseurs sont séparés de la surface dorsale du fémur et du tibia sur une longueur de 10 à 20 cm. La déformité est graduellement corrigée en l'espace de 2 à 3 semaines, au moyen d'une double traction squelettique à travers le tubercule tibial et l'os calcanéum.

ZUSAMMENFASSUNG

Der Verfasser beschreibt eine operative Methode, die die Korrektur schwerer Knieankylosen ohne Knochenverlust möglich macht.

Der Zugang zum Knie wird mittels eines sichelförmigen Hautschnittes erzielt. Totale Synovektomie wird ausgeführt und die intraartikulären Adhäsionen, die Kreuzbänder, die Menisken, der rückwärtige Teil der Kapsel zusammen mit den fibrösen Bändern der Poplitealregion und Narbenbildungen werden excidiert. Die Beugemuskeln werden von der dorsalen Oberfläche des Femurs und der Tibia in einer Länge von 10–20 cm separiert. Die Deformitet wird im Laufe von 2–3 Wochen mit Hilfe einer doppelten Skelettextension an der Tuberositas tibiæ und am Calcaneus korrigiert.

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