

KNEE FUSION – A NEW TECHNIQUE USING AN OLD BELGIAN SURGICAL APPROACH AND A NEW INTRAMEDULLARY NAIL

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Knee arthrodesis is a useful procedure in difficult cases such as failed total knee arthroplasty, severe articular trauma, bone tumors, and infected knee joints.

The most common techniques for knee fusion include external fixation and intramedullary nailing. Küntscher's nail is driven antegrade from the intertrochanteric region into the knee.

We describe a new technique for knee arthrodesis using a new intramedullary nail and an old Belgian surgical approach to the knee joint published by Lambotte in 1913. This approach provides excellent exposure for the implantation of the nail by osteotomizing the patella vertically. The nail is implanted using HeyGroves method, whereby the nail is inserted retrograde into the femur and pulled distally antegrade into the tibia. We now use this technique as our standard procedure for knee fusion.

Keywords : knee fusion ; knee arthrodesis ; intramedullary nailing.

Mots-clés : arthrodèse du genou ; enclouage centro-médullaire.

INTRODUCTION

Knee arthrodesis is an important procedure in difficult cases. Indications for knee fusions are failed total knee arthroplasty (3, 9, 12, 13, 14, 25, 26, 27), severe trauma such as complex fractures with major skin and soft tissue loss (2, 4, 17) or open dislocation of the knee (28). Massive bone loss secondary to bone tumors requires arthrodesis (1, 6, 7). Infected knee joints such as peripheral

joint tuberculosis (11, 15) are also treated by this procedure.

There are different techniques for knee arthrodesis. In the literature, plate arthrodesis is described by Broderson *et al.* (5) and Lucas *et al.* (21). However the most common technique for knee arthrodesis is external fixation, as described by Key in 1932 and modified by Charnley in 1948 (8). An alternative is Küntscher's technique of intramedullary nailing (18). Disadvantages of intramedullary nailing are the opening of the intramedullary canal of the femur and, with a closed method, lack of débridement of the knee joint.

The purpose of this technical note is to describe a new nail which is inserted retrograde from the knee into the femur. The insertion procedure requires an adequate exposure of the knee which can be achieved by Lambotte's approach. At the same time débridement of infected tissue can be performed.

SURGICAL TECHNIQUE

This new technique combines the surgical approach to the knee joint from Lambotte and a

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new short intramedullary nail for knee fusion. The 4 principles of this technique are : 1. straight incision, 2. split patella, 3. knee guides and 4. interlocking nail.

The key to Lambotte's approach to the knee is the longitudinal osteotomy of the patella ("arthrotomie verticale trans-rotulienne") (19). This approach was republished by Lecène in his book "Chirurgie des os et des articulations des membres" in 1927 (20). Both authors recommend a straight longitudinal midline incision from approximately 10 cm above the patella to the tibial tuberosity. After the incision is made to the subcutaneous tissue, the underlying patella, the patellar tendon and the quadriceps mechanism are identified. The next step is to dissect longitudinally the fibers of the quadriceps muscle, the periosteum of the patella and the patellar tendon to the tibial tuberosity. The crucial part for this approach is the longitudinal splitting of the patella with a saw to open the articulation. The resulting medial and lateral fragments of the patella should be of the same size to facilitate their reapproximation. When the knee is bent, the lateral fragment of the patella moves laterally, and the medial fragment moves medially. This motion delivers the trochlea of the femur into the operative field. With two retractors the incision can be held open giving an excellent exposure of the intercondylar region of the femur and of the tibial plateau (fig. 1). Reaming procedures using flexible reamers are then performed for the femur as well as for the tibia.



Fig. 1. — Surgical approach to the knee joint by osteotomizing the patella. After : Lecène P. ; Masson, Paris, 1929.

The nail has a length of 31 cm and a diameter of 12 or 13 mm with 5° of flexion in its central portion (fig. 2). Four holes each measuring 5mm are located at the proximal as well as the distal part of the nail. In the midsection the nail has 9 more holes each measuring 2.5 mm to facilitate sliding of the nail. The nail is manipulated either by passing a wire through a small hole and tethering it or inserting a Steinmann pin into one of the small holes.

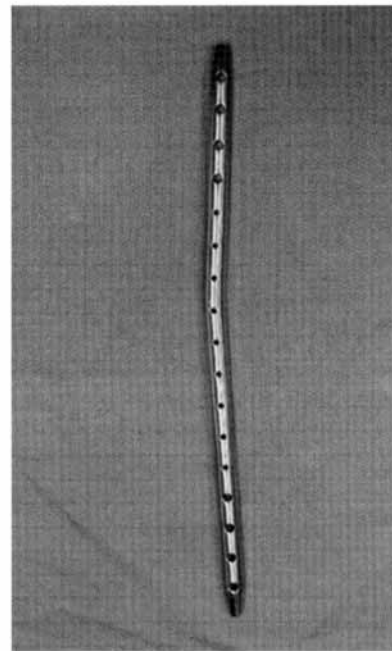


Fig. 2. — New solid nail for knee arthrodesis

The nail is then introduced in the bent knee by passing it retrograde up the femur (fig. 3a). The knee is reduced and brought in position for arthrodesis with approximately 5° of valgus and 5° of flexion. The rod is passed antegrade into the proximal tibia (fig. 3b) until the bend of the nail is located between the distal femur and the proximal tibia (fig. 3c). The position of the nail is confirmed by fluoroscopy before securing it in position with proximal and distal interlocking screws (Xrays : fig. 4a, 4b). The ends of the femur and the tibia are debrided and a cancellous bone graft is placed if necessary. While refixation of the patella is not

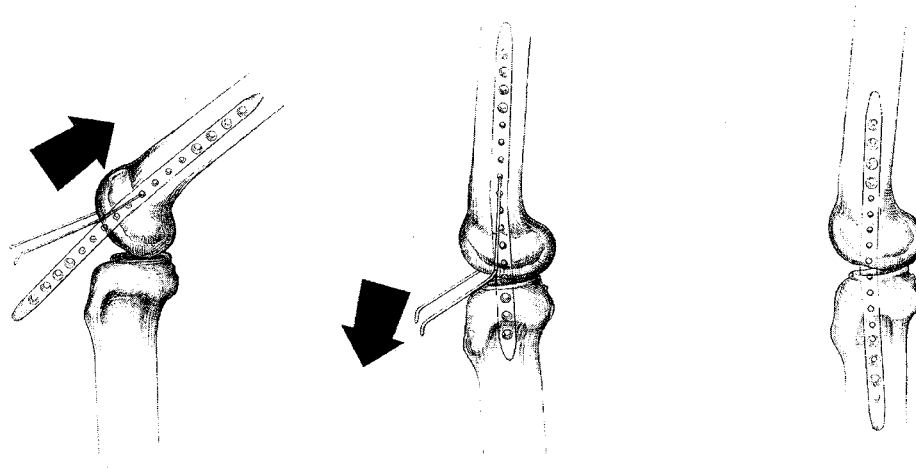


Fig. 3. — *a.* Retrograde introduction of the nail into the femur. *b.* Antegrade insertion of the nail into the tibia. *c.* Lateral view of the arthrodesis.

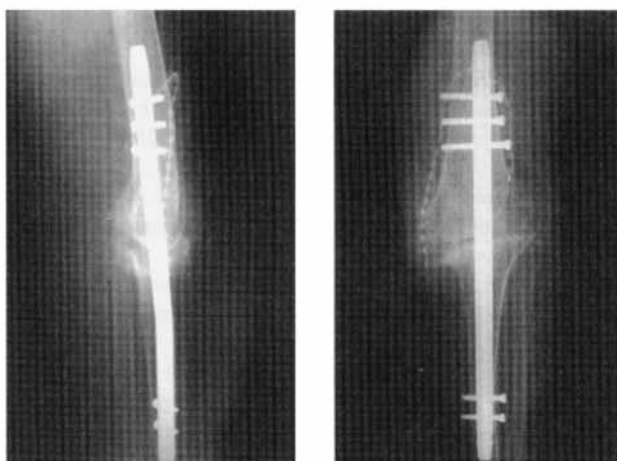


Fig. 4. — *a.* Postoperative lateral xray. *b.* Postoperative AP xray.

necessary, we advise that the periosteum of the patella is closed with nonabsorbable sutures.

DISCUSSION

Although there are no good comparative trials evaluating techniques for knee fusion available, Damron and Mc Beath reported in 1995 in a review of the literature (9) that success rates in arthrodesis following intramedullary nailing (10, 13, 16, 22, 27), ranging from 67% (27) to 100% (16), had been consistently higher than those of external fixator

methods (5, 12, 16, 23), ranging from 38% (16) to 81% (5) in series of adequate size. Vlasak *et al.* (25) concluded in their retrospective study of 32 arthrodeses that intramedullary arthrodesis was a more reliable treatment of failed total knee replacement than arthrodesis using an external fixator.

Intramedullary nailing with a curved Küntscher nail requires a surgical approach to the intertrochanteric region of the femur and driving the nail antegrade into the femur all the way down to the knee joint (18). This procedure opens up the whole intramedullary canal of the femur risking a recurrence of infection by contaminating the canal. When done closed this procedure does not include débridement of the knee joint (26).

With an approach to the knee joint, as described by Lambotte (19), adequate débridement and retrograde insertion of the nail into the femur, opening up just the distal part of the medullary canal, can be performed at the same time.

The retrograde implantation of the nail into the femur requires a smaller nail than the common curved Küntscher nail. Waldman *et al.* (26) as well as Arroyo *et al.* (1) used a modular nail for knee arthrodesis whose femoral part is inserted retrograde into the femur. After insertion of the tibial part the two segments of the nail are joined using a conical couple and secured with interlocking screws. They report excellent results with a fusion

rate of 90% in Arroyo's study and 95% in Waldman's study.

We describe a technique using a solid nail with a central bend of 5°, that allows adequate fusion of the knee joint. Nail removal is necessary only for failure or irritation caused by the proximal end of the nail. In some cases screw loosening in the tibia has been documented.

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RÉSUMÉ

V. ALT, D. SELIGSON. Arthrodèse du genou – une nouvelle technique utilisant une ancienne voie d'abord belge et un nouveau clou centro-médullaire.

L'arthrodèse du genou est intervention de sauvetage fréquemment utilisée dans certains cas d'échecs d'arthroplastie du genou ou de destruction articulaire

traumatique sévère mais également en pathologie articulaire tumorale ou infectieuse. Les techniques les plus utilisées pour l'arthrodèse du genou sont la fixation externe ou l'enclouage centro-médullaire par un clou de Küntscher introduit dans le genou à partir de la région intertrochantérienne.

Nous décrivons une nouvelle technique d'arthrodèse du genou utilisant un nouveau clou centro-médullaire et une ancienne voie d'abord chirurgicale publiée par

Lambotte en 1913. Cette méthode offre une excellente voie d'abord pour l'implantation du clou, après ostéotomie verticale de la rotule. Le clou est implanté en utilisant la méthode de Hey Groves : il est inséré par voie rétrograde dans le fémur puis retiré vers le bas afin de pénétrer dans le tibia.

Nous utilisons cette technique comme technique standard dans l'arthrodèse du genou.