Triple Arthrodesis and Lambrinudi Arthrodesis

Literature Review and Follow-up Study

L. Dekelver, G. Fabry, and J. C. Mulier
University Hospital, Department of Orthopaedic Surgery, B-3041 Pellenberg, Belgium

Summary. A literature review is presented about triple arthrodesis and Lambrinudi arthrodesis including indications, techniques, complications, and a more extensive review of some specific indications.

Forty-eight patients were operated on between 1961 and 1977, 25 of whom were reviewed at follow-up.

Our follow-up study shows a rather high rate of pseudarthrosis, with however a normal failure rate.

According to these findings transfixation of the bones with K-wires is to be considered.


Dieser Erfahrungen zufolge soll eine Durchbohrung der verschiedenen Knochen mit K-Drähten berücksichtigt werden.

Definition

1. Triple arthrodesis: arthrodesis of talus, calcaneum, navicular and cuboid.
2. Lambrinudi arthrodesis: arthrodesis of the same bones, with a wedge resection of the talus in order to correct an equinus deformity.

History [14, 28]
Albert, 1882: Talofibular arthrodesis
Davis, 1921: Talonavicular osteotomy
Hoke, 1921: Talocalcaneal and calcaneo-navicular arthrodesis with excision of the head of the talus
Dunn, 1921: Triple arthrodesis with excision of the navicular bone, and fusion of the talus to the cuneiform bone
Ryerson, 1923: Classic triple arthrodesis with two skin incisions
Lambrinudi, 1927: Triple arthrodesis with wedge resection of the talus.

Important Follow-up Studies [14, 28]
Conn, 1925: 19 triple arthrodeses
Miller, 1928: Results of Hoke arthrodesis in 200 feet
Cole, 1930: Results of 110 cases of triple arthrodesis
Miller, 1931: Results of 185 tarsal stabilising operations
Fitzgerald and Seddon, 1937: 24 Lambrinudis with four failures
Crego and McCarroll, 1938: 1,100 stabilizing operations on poliomyelitis feet
Gallie, 1943: 45 calcaneal fractures treated with talocalcaneal fusion
Thompson and Friedse, 1954: 25 calcaneal fractures treated with early triple arthrodesis
Wilson, 1965: 31 failures in 301 triple arthrodeses. Mostly due to talonavicular pseudarthrosis (due to insufficient bone contact or premature weight bearing in a cast).

Indications [7, 13, 14, 22, 23, 26, 28]
The indications for a triple arthrodesis or a Lambrinudi arthrodesis are as follows:
— Correction of a deformity
— Stabilisation
— Relief of pain
— Improvement of function.
Therefore one can conclude that most of the instability and deformity should be situated in the subtalar and midtarsal region.

A. Specific Indications

1. Neurological Deficit (gives the best results)
   — Poliomyelitis
   — Friedreich’s ataxia
   — Charcot-Marie-Tooth
   — Cerebral palsy
   — Meningomyelocele
   — Spina bifida
   — Syringomyelia
   — Hemiplegia.

2. Congenital Disorders
   — Talipes equinovarus
   — Arthrogryposis
   — Congenital vertical talus
   — Painful spastic flatfoot
   — Congenital rigid flatfoot.

3. Calcaneal Fractures

4. Pain due to
   — Arthritis
   — Rheumatoid arthritis
   — TBC
   — Traumatic arthritis.

B. Specific Indications for Lambrinudi Arthrodesis

— Dropfoot
— Equinovarus
— Equinovalgus
— Cavus
— Fixed equinus (the best indication).

Stabilizing the foot, however, cannot correct a dropfoot on its own. The chances of a patient to get enough muscle control postoperatively are small, unless a tendon transfer is carried out.

With a Lambrinudi arthrodesis there is a significant risk of talonavicular pseudarthrosis. Therefore, very good bone contact is needed, as well as a good radiological evaluation. Long immobilization is required postoperatively.

Contraindications for Lambrinudi Arthrodesis

Ankle instability: because the smaller posterior part of the talus will fit more loosely between the malleoli than the larger anterior segment, the ankle instability will increase.

— Pronounced knee instability which makes a brace necessary.
— Painful preoperative ankle arthritis.
— Patient of less than 11 years of age.

Thereby there is a greater risk of avascular necrosis of the talus, which will cause pseudarthrosis and painful arthritis.

Age at Operation [12, 20, 23, 26, 27, 28]

The intervention must not be carried out in children less than 6–7 years old, since the cartilage of the talus head is too thick, and one cannot obtain a good contact between talus and navicular bone on reaching bleeding subchondral bone.

The thickness of the cartilage decreases after 10 years of age, and the results improve proportionally from the age of 12 on. (Failure at 9 years of age: 50%; Failure at 9–12 years of age: 10%).

According to Norman and Hill [13] the intervention can be carried out between 5 and 8 years of age if needed. Radiological ossification is needed in the navicular bone, according to these authors. They also state that avascular necrosis is less frequent in young patients.

According to most authors, however, the intervention should be postponed until after the age of twelve because prior to that age:
   — the structures are too small,
   — immobilisation postoperatively is very difficult,
   — muscle strength cannot be evaluated and therefore unpredictable deformities arise postoperatively.
   — muscle imbalance can cause deformities in the non-adult foot,
   — there may be interference with the growth of the foot.

General Principles [15, 26, 28]

Most of the weakness and deformity must be situated in the subtalar and midtarsal region.

The ankle must be stable, and should have dorsal and plantar flexion.

The calcaneum must form a plantigrade foot, together with the talus in good relationship to the weight bearing axis.

The talo-navicular and calcaneocuboid joints must be fixed in order to prevent medial and lateral instability of the forefoot.

The circulation of the talus must be preserved by not sectioning the interosseous ligament underneath it