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Technical note

Transplantar intramedullary locking nailing in childhood congenital pseudarthrosis of the tibia: A report of 3 cases



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ABSTRACT

The treatment objectives in congenital pseudarthrosis of the tibia are bone consolidation and a restored lower-limb axis. They are difficult to achieve, and various surgical techniques have been described, with varying results in terms of bone consolidation and complications. The present study reports clinical and radiographic results in 3 patients managed by the same original technique of transplantar intramedullary nailing using a custom-made proximal locking nail, without surgical approach or resection of the pseudarthrosis site. Good assembly stability allowed immediate weight-bearing. The technique is relatively noninvasive, offering a first-line alternative in under-3 year-olds.

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1. Introduction

Management of congenital pseudarthrosis of the tibia is surgical, with the aim of consolidating the pseudarthrosis site and restoring the lower-limb axis. Intramedullary nailing associated to bone graft, vascularized fibula transfer and Ilizarov external fixation are the three techniques reported to provide the best consolidation rates [1].

Vascularized fibula transfer and Ilizarov external fixation entail a risk of repeat fracture or residual angulation requiring revision in half of the cases, while length discrepancy and possible joint stiffness are the drawbacks of intramedullary nailing [2].

The present study reports an original transplantar intramedullary retrograde nailing technique using a custom-made proximal locking nail. The advantage lies in not requiring any surgical approach to the pseudarthrosis site, and in nail migration progressively freeing the subtalar and tibiotalar joints during growth. It is a first-line technique in under-3 year-olds, and is percutaneous and simple, providing good stability; it is relatively noninvasive, and allows immediate weight-bearing.

We report initial clinical and radiographic results in 3 cases.

2. Surgical technique

The patient is positioned prone with a cushion under the buttocks and the contralateral limb hanging, to facilitate

fluoroscopic control. The subcalcaneal entry point is located under AP and lateral fluoroscopy, and a 15-mm intramedullary K-wire is introduced. The tibiotalar joint is fixed in slight 10° equinus, to facilitate subsequent walking. The nail should if possible pass through the growth cartilage in a single movement. Reaming uses the K-wire as guide, at slow speed, up to a diameter 2 mm wider than the nail that is to be used. The nail is custom-made in the light of preoperative planning, with a diameter two-thirds that of the narrowest part of the intramedullary canal of the tibia. The nail is rectilinear, and should not extend beyond the lower edge of the tibial tuberosity. It is important to avoid any plantar protrusion that would cause postoperative discomfort. Proximal locking is performed under fluoroscopic control, using 15 mm K-wires or 3.5 mm screws, depending on the size of the nail. Exclusively proximal locking allows the nail to migrate during growth, progressively freeing the subtalar and tibiotalar joints.

3. Case reports 1 and 2

The first patient was 18 months old at diagnosis of right tibial congenital pseudarthrosis, without fibular involvement (Fig. 1). She sustained a fracture at the age of 19 months, causing 10° varus deformity and 15° flexion contracture, managed by a thermoformed splint. She was operated on at the age of 30 months. Postoperative course was simple, allowing immediate weight-bearing. Consolidation was achieved by the age of 46 months, and the subtalar joint was free 19 months postoperatively. At 4 years' follow-up, she could walk painlessly and subtalar ranges of motion were satisfactory (Fig. 2) (Table 1).

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Fig. 1. Case 1: radiographs of congenital pseudarthrosis of the lower third of the right tibia at 18 months.

Table 1
Clinical data for the 3 patients.

	Case 1	Case 2	Case 3
Age at diagnosis (months)	18	18	6
Type (following Crawford)	III	III	IV
Fibular lesion	No	Yes	Yes
Age at surgery (months)	30	20	48
Nail diameter (mm)	6	6	6
Consolidation time (months)	12	16	24
Follow-up (years)	5	12	3
Length discrepancy at last FU	No	No	No
Subtalar range of motion (°) (at last FU)			
Pronation	10	10	5
Supination	20	30	15
Tibiotalar range of motion (°) (at last FU)			
Dorsiflexion	Not free	20	10
Plantar flexion	Not free	50	40

The second patient was 18 months old at diagnosis of tight, enlarged pseudarthrosis, with an identical fibular lesion, causing 15° varus and 20° flexion contracture. He was operated on at the age of 20 months, and was able to resume weight-bearing immediately. The subtalar and tibiotalar joints were free by respectively 20 and 48 months postoperatively (Fig. 3). At 12 years' follow-up, there was no pain or lower-limb length discrepancy (Table 1).



Fig. 2. Case 1: AP and lateral postoperative radiographs. A. Immediate postoperative radiographs. B. At 12 months' follow-up. C. At 24 months' follow-up, showing free subtalar joint. D. At 48 months' follow-up. E. At 60 months' follow-up.

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