ORIGINAL ARTICLE

Comparison of titanium elastic nails versus Thomas splint traction for treatment of pediatric femur shaft fracture

Muhammad Naseem,[1] Rahat Zahoor Moton,[2] Muhammad Aslam Siddiqui[3]

Abstract

Objective: To compare titanium elastic nails with Thomas splint traction treatment for femur shaft fracture in children.

Methods: The descriptive randomised study was conducted at Abbasi Shaheed Hospital, Karachi, from January 2013 to December 2014, and comprised children aged 6-12 years with simple femur shaft fractures. The patients were randomised into two equal groups. Group A patients were treated with titanium elastic nail and group B patients with Thomas splint traction. Patients were mobilised without weight-bearing on the 5th to 7th postoperative day. In group B, traction was maintained for about 8 to 10 weeks. After splint removal, patients were referred to physical therapy. Patients were available for one-year follow-up.

Results: There were 30 patients; 15(50%) in each of the two groups. Those group A had full weight-bearing at 4-6 weeks and early return to routine activities compared to group B patients who took 8-12 weeks. The results were Excellent in 12(80%) patients in group A and 6(40%) patients in group B Postoperative superficial infection occurred in 3(10%) patients.

Conclusion: Titanium elastic nailing is an effective treatment of femur shaft fractures in children.

Keywords: Thomas splint, Titanium elastic nailing, Paediatric femur fractures. (JPMA 65: S-160 (Suppl. 3); 2015)

Introduction

Femoral shaft factures are among the most common major paediatric injuries treated by orthopaedic surgeons.[1] Most femoral fractures in children are closed injuries and traditionally have been treated by closed method. For children aged 5-15 years, a wide range of conservative and surgical options are available. It includes spica casting and traction splintage among conservative options. External fixator, plate and screw fixation and intramedullary nails are options of surgical intervention. All procedures have its merits and demerits. Plate and screw fixation is a reliable method, but the requirement of a second operation to remove the plate puts additional burden on the patients.[2] Kunstchner and the interlocking nail that require medullary reaming are not widely used for children because of potential of injury to greater trochanteric growth plate and blood supply to the femoral head leading to avascular necrosis (AVN).[3]

During the last 1- years titanium elastic nails (TEN) has become the most widely used implant for operative treatment of fractures of the shaft of femur(4). These have been specially designed for the treatment of diaphyseal fractures in children.[5]

The current study was planned to compare the outcome of femur shaft fractures in children using Flynn's criteria treated by two methods: retrograde intramedullary TENs; and Thomas splint traction.

Patients and Methods

The descriptive randomised study was conducted at Abbasi Shaheed Hospital, Karachi, from January 2013 to December 2014, and comprised children aged 6-12 years with simple femur shaft fractures.

Closed fractures, Arbeitsgemeinschaft für Osteosynthesefragen (AO) classification 3.2.A (Figure-1) were included. Children with AO 3.2.B and 3.2.C fractures, previously diagnosed neuromuscular disease (e.g., cerebralpalsy), metabolic bone disorders (e.g., osteomalacia), or pathological and open fractures were excluded. Back slab was applied to all patients for controlling pain. For patients in group A, the standard TEN technique was applied according to the method described by Flynn.[6]

Majority of the patients underwent surgery within two days of their injury. Two titanium elastic nails of identical diameter were used (Figure-2). The diameter of the individual nail was selected as per Flynn's formula (diameter of nail = width of the narrowest point of the medullary canal on anteroposterior [AP] and Lateral view $\times$ 0.4mm) and on intraoperative assessment. The diameter of the nail was chosen so that each nail occupied at least 30% to 40% of the medullary cavity. Fractures were reduced using fluoroscopic guidance. Nails were inserted in retrograde fashion. In retrograde elastic nailing medial

[1,2]Abbasi Shaheed Hospital, KMDC, [3]Baqai Medical University, Karachi.

Correspondence: Muhammad Naseem.

Email: drmuhammadnaseem@yahoo.com

and lateral incisions were made 2.5-3.5cm proximal to distal physis (Figure-3). The nails were pre-bent sufficiently so that apex of the bowed nails rested at the same level on the fracture site to ensure a good equal recoil force. The nails were driven proximally in divergent manner and the tips got anchored approximately 1cm proximal to the physis. Postoperatively, patients were nursed in supine position with the operated leg elevated on a pillow. Patients were mobilised without weight-bearing on the 5th to 7th day postoperatively. Partial weight-bearing was started at three weeks and full weight-bearing by 6 to 8 weeks.

For Patients in group B, Thomas splint traction was applied within 24 hours of admission (Figure 4). The traction was maintained for about 8-10 weeks depending on the age of the patient. After splint removal, patients were referred for physiotherapy. Follow-up visits were at 2, 4, 12 and 24 weeks after discharge. Patients were available for one year follow-up. Radiological union, limb alignment, limb length discrepancy (LLD) and wound-site infections were assessed at each visit.

Data was analysed using SPSS 17.0.

Results

There were 30 patients; 15(50%) in each of the two groups. Mean age was 8±2.17 (SD) years in group A and 9±2.00 (SD) years in group B. Femur shaft fracture occurred more frequently in male children than in female in both groups (Table-1).

Fracture union time was 4-6 weeks in group A and 9-12 week in group B. Radiological evidence of union was achieved in all cases. Flynn's criteria was used to assess prognosis (Table2).

Figure-1: Procedure Entry ports of titanium elastic nail.

Figure-2: Xray showng Fracture shaft femur.

Figure-3: Xray showing Post-operative titanium elastic nail.

Figure-4: Xray showing Femur shaft fracture with Thomas splint applied.

The results were Excellent in 12(80%) patients in group A and 6(40%) patients in group B (Figure-5).

Entry-site wound infection developed in 3(10%) patients

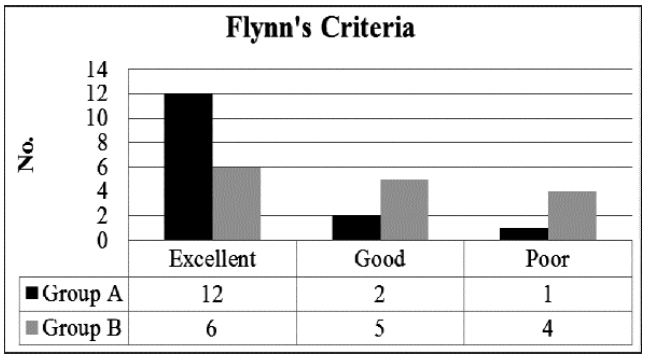

Figure-5: Outcome.

Table-1: Group Demographics.

Group	Sex	No.	%
Group A	Male	10	67%
	Female	5	33%
Group B	Male	11	73%
	Female	4	27%

Table-2: Prognosis Assessment.

	Flynn's Criteria		
	Poor	Good	Excellent
Limb Length Discrepancy	>2.00cm	1.00-2.00cm	<100cm
Angulation	>10	5-10	<5

and was resolved with oral antibiotic course of amoxiclav.

Discussion

Femoral shaft fracture is a major paediatric orthopaedic injury, more common in boys, and occur in an interesting bimodal distribution with a peak during the toddler years and again in early adolescence.[7,8] The ideal device for the treatment of most femoral shaft fractures in children should be a simple, load-sharing internal splint that allows mobilisation and maintenance of alignment and extremity length until the bridging callus forms.[9,10] The titanium flexible nail with its newer design and improved material provide better inherent stiffness resulting in adequate strength and elasticity.[11] Traction used in the treatment of femoral shaft fractures fails to provide adequate stability. Patients in this group tend to have higher degrees of angulation compared to those treated operatively. Moreover, higher rates of LLD in this group show the limited control over riding of the fragments.[12] There is always an impending risk of distal femoral epiphysis separation on application of excessive traction force.[13,14] TEN is currently the most popular method for treating fractures of the shaft of the femur in children of school-going age.[15]

Conclusion

Children had excellent results treated with titanium nail and their return to full activities was earlier than with the conservative traction treatment.

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