

Functional Outcome of Paediatric Subtrochanteric Femur Fracture Treated with Titanium Elastic Nails

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Abstract

Introduction: Subtrochanteric femur fractures are the commonest paediatric fractures. These fractures are quite challenging injuries to treat. Intramedullary nails though have been used to treat paediatric femur shaft fractures, their effectiveness for managing the subtrochanteric fractures are of doubt. *Aim:* The union rates and fracture alignment after elastic nailing of paediatric subtrochanteric femur fractures. *Materials and methods:* The study was conducted between June 2016 and Dec 2017, in which 22 subtrochanteric fractures were treated with elastic stable intramedullary nails and were followed up for clinical and radiographic union. For subtrochanteric fractures especially after failed spica cast treatment in children of 5 to 15 years age group, elastic nailing was used. Fracture union and alignment were measured clinically and radiographically. *Results:* Among the 22 cases, 09 were female cases and 13 were male cases. Out of this, 20 fractures were healed with acceptable complications which included malunion (n = 4), loosening of nails (n = 2), re-fracture (n = 1), wound dehiscence at the nail insertion site (n = 1) and limb length discrepancy (n = 1) and only 2 (6%) had poor outcomes. Hence on overall, there were 13 (61%) excellent, 7 (33%) satisfactory and 2 (6%) poor outcomes. *Conclusion:* Although complication rates were variable (40 %) with elastic nailing for paediatric subtrochanteric femur fractures, it represents an important option for complex subtrochanteric femur fractures.

Keywords: Functional Outcome of Paediatric Subtrochanteric Femur Fracture Treated With Titanium Elastic Nails.

Introduction

Femoral subtrochanteric fractures represent approximately 1% of all fractures and 4% to 10% of femur fractures [1,2] in paediatric age group [3]. The literature shows very few studies regarding the management of paediatric subtrochanteric fractures [2,4]. Few of these studies support open reduction, whereas others support conservative methods [1,5,6].

Subtrochanteric femur fractures are difficult to treat due to inherent fracture instability, a short metaphyseal fragment, and close proximity of the

fracture to the growth plate [7,8] and also difficult to maintain reduction conservatively because of the flexion, abduction, and external rotation produced by the proximal fragment [9,10].

The treatment of subtrochanteric femoral fractures in children is quite variable, ranging from traction, spica casting, intramedullary nailing and plating. The treatment choices depend on the age and fracture pattern. In children below 5 years of age the fractures are generally well treated with a hip spica cast. The choice of treatment becomes dilemmatic in children more than 5 years. The various options in this group being intramedullary

nailing, compression plating and external fixation. Coming to the fracture pattern, different pattern of fractures like transverse, short oblique, long oblique, spiral and comminuted fractures gives different outcomes.

The oblique or spiral fracture patterns make the fracture unstable, affecting the outcome of the limb length. This is because the growth from the proximal femur is lesser than the growth from the distal femur. Elastic intramedullary nailing has been widely used in the western countries for the past few decades in the management of paediatric femur shaft fractures and has now been studied for use in the treatment of subtrochanteric fractures of femur [11,12,13,14].

We have therefore studied the outcomes after elastic nailing of paediatric subtrochanteric femur fractures. The elastic intramedullary nailing has become the choice of internal fixation in paediatric femoral shaft fractures [15,16]. The various advantages of this technique being early union, early mobilization and weight bearing and easy implant removal.

Aim

The union rates and fracture alignment after elastic nailing of paediatric subtrochanteric femur fractures.

Material and methods

This is a prospective study conducted at Department of orthopaedics, Acharya Vinoba Bhave Rural Hospital, Sawangi, Wardha between June 2016 to December 2017. There were 22 cases included in this study. Cases with age group in between five to 15 with closed displaced subtrochanteric fractures were included. Cases with open fracture, pathological fracture and children medically unfit for anaesthesia were excluded.

Procedure

The total femur length was measured on preoperative or postoperative femur radiographs

Surgical Description

Two elastic intramedullary nails were inserted, medially and laterally in a retrograde fashion into the distal femur. The medial nail was advanced into the femoral neck, just short of the proximal femoral physis and the lateral nail up to the trochanteric apophysis, under fluoroscopic guidance. Postoperative immobilization was given, with non-weight bearing until clinical and radiographic union.

The follow up was with sequential radiographs at 1, 3 and 6 months, for assessment of radiographic union. Return to full activity was mostly after six months of surgery.

Institutional ethical committee approval was obtained.

Results

There were 22 cases including 09 female and 13 were male cases. Out of the 22 cases of subtrochanteric femur fractures, 20 of them united completely while 2 of them had non union.

The 20 fractures healed with acceptable complications. These included malunion noted in 4 cases, loosening of nails in 2 cases, re-fracture in 1 case, wound dehiscence at the nail insertion site in 1 case and limb length discrepancy 1 case (Table 1).

Hence on overall, there were 13 (61%) excellent, 7 (33%) satisfactory and 2 (6%) poor outcomes (Table 2).

Complications were more likely after high velocity injuries like motor vehicle accident than from simple injuries like fall.

Table 1: Complications noted in completely fracture union cases

Type of complications	No. of cases (n=20)
Malunion	4 (20%)
Loosening of nails	2 (10%)
Re-fracture	1 (5%)
Wound dehiscence at nail insertion site	1 (5%)
Limb length discrepancy	1 (5%)

Table 2: Outcome of procedure done

Outcomes	No. of cases(n)
Excellent	13(59.09%)
Satisfactory	07(31.81%)
Poor	02(0.09%)

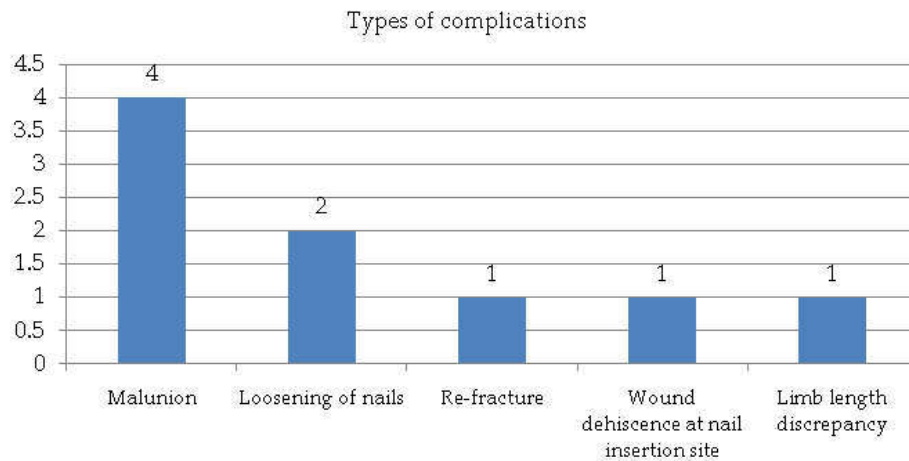


Diagram 1: Showing various types of complications in united cases.

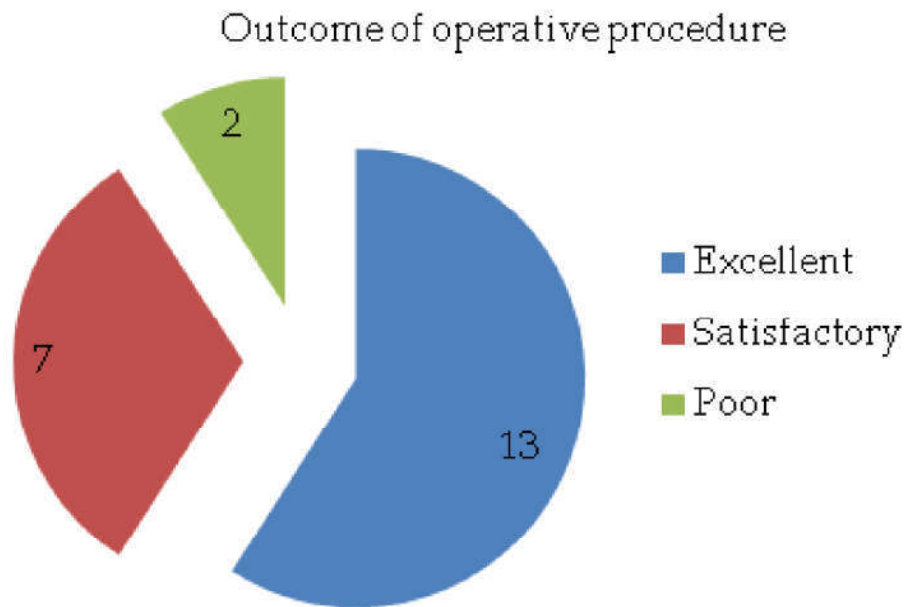


Diagram 2: Showing outcomes of operative procedure.

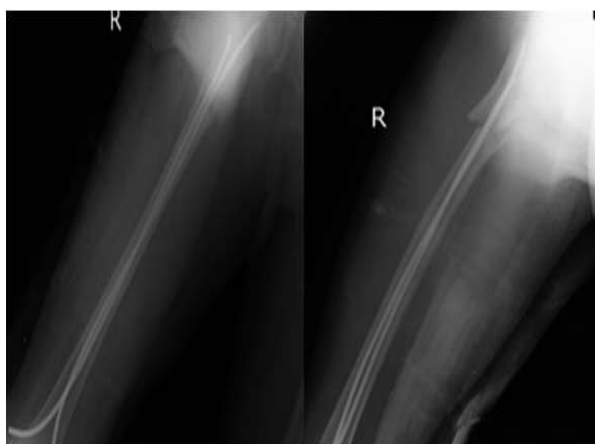


Image 1: X-Ray of subtrochanteric femur fracture post of day 1 (AP and lateral view)



Image 2: X-Ray of subtrochanteric femur fracture post of sixth month showing complete union (AP and lateral view)

Discussion

Paediatric subtrochanteric femoral fractures has not been extensively studied as compared to the mid shaft femur fractures in the literature. Very few published studies directly address the management of paediatric subtrochanteric fractures [2].

Subtrochanteric femur fracture fixation has widely evolved over the past few decades, from traction, hip spica casting, plate fixation and external fixation to methods such as elastic intramedullary nailing.

The earlier methods like traction and hip spica methods though provided high levels of union; they were largely associated with family psychosocial impacts. The external fixation method was associated with more complications like refractures, pin tract complications and arthrofibrosis.

However, the intramedullary nails allows early union, rapid mobilization with fewer complications and hence is becoming the treatment of choice amongst most of the surgeons [17,18,19,20].

Paediatric subtrochanteric femur fractures can be challenging to treat because of displacement of the short metaphyseal fragments and limited remodelling potential of the proximal femur. Elastic intramedullary nailing is advantageous as it decreases morbidity, decreases length of the hospital stay, and early functional recovery.

The treatment for subtrochanteric femur fracture in children aged 5 to 15 years is most dilemmatic. The various treatment options offered being traction, hip spica cast, elastic intramedullary nailing, plating and external fixation.

Tolo et al., in his study described that many surgeons preferred traction followed by hip spica cast as a method of treatment of subtrochanteric femur fracture in children aged 5 to 15 years. However, that method required a relatively long hospitalization and frequent follow up to assess accuracy of the fracture with radiographs [21].

Reeves et al. concluded in his study that, children weighing more than 45 kgs or in children older than 10 years of age, the 90/90 skeletal traction with post traction spica was not suitable, due to high incidence of femoral shortening and malrotation [22].

However, Staheli & Sheridan, in their study showed that immediate spica casting was suitable for isolated femoral shaft fractures in children below 6 years of age [23].

Gregory et al. has found satisfactory results with external fixators, but the complication rates were

high in the form of pin tract infection, refractures and loss of reduction [24].

Ziv & Rang, had shown that though plate fixation worked well in the paediatric age group, they also posed lots of disadvantages like poor cosmetic appearance of the scar, blood loss associated with exposure and reduction of the fracture and higher degree of overgrowth induced by the plates compared with intramedullary fixation [25].

Humberger et al., had shown that internal fixation showed better results than conservative methods [26].

Theologis and Cole, described the management of subtrochanteric fractures with various surgical methods and concluded that, traction and casting was useful in children younger than 10 years of age and for surgical intervention a careful selection of patients was required [10].

Schwarz in his study recommended that in cases where conservative treatment failed, dynamic compression plate could be considered as a treatment of choice [27].

Daum et al. in his study concluded that operative treatment was a preferred modality over conservative method to obtain anatomical reduction and to prevent later complications [1].

Ireland and Fisher preferred treating children younger than 10 years with conservative methods and those above 10 years with internal fixation, especially when conservative methods which failed to achieve acceptable alignment [4].

Barfod et al. suggested that the limb length discrepancies was due to normal overgrowth of the femur and not likely a complication of intramedullary elastic nailing [28].

Patients in prior studies had an average of 22 days of hospitalization and had 8% to 23% unsatisfactory early results and 4% to 10% unsatisfactory late results with traction and spica casting [10].

The results of our study are superior, compared to those of prior study results, with minimal hospital stays and better satisfactory results (Table 1 and 2).

However, a future larger prospective study is needed to enhance these results.

Nevertheless elastic intramedullary nailing should be considered as a safe and sound option in treating paediatric subtrochanteric femur fractures. This technique provides several advantages like short periods of immobilization, minimally invasive techniques, and fewer complications, to name a few.

Limitations

Since at our institution elastic nailing was the main modality of treatment used for treating these subtrochanteric fractures, comparison with other treatment options as a control group could not be done.

Conflict of interest

No conflicts of interest

Conclusion

This retrospective study on functional outcome of subtrochanteric femur fractures in paediatric age group treated with elastic stable intramedullary nails shows satisfactory to excellent results in 91% of the cases. This suggests that elastic intramedullary nailing is a good and effective option for the management of these paediatric femur fractures.

Although the complication rates are variable, up to 40% with elastic nailing for paediatric subtrochanteric fractures, this method represents a better option for difficult-to-manage paediatric fractures.

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