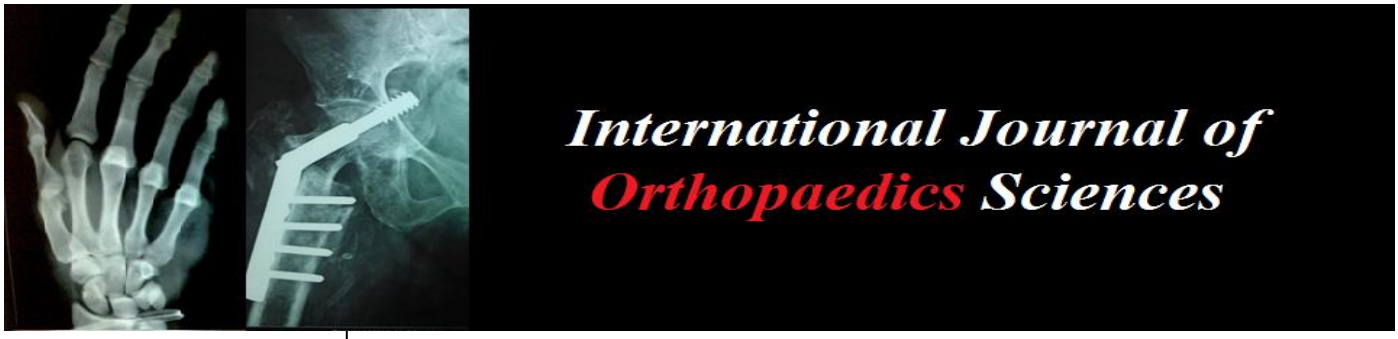

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Evaluation of diaphyseal femoral fractures in children treated with tens nailing: A clinical study

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Abstract
Femur fracture is very common fracture in children. Femur shaft fracture around 2% pediatrics age group fracture. Various methods are used to treatment in femur fracture. Like hip Spica, plating, nailing with tens or Enders nailing. Enders and tens are commonly used methods.
Purpose of study: The know of outcome of elastic tens nailing in pediatrics shaft fracture.
Material and Method: We study's 24 children's of fracture shaft of femur between age group 5 to 14.
Result: The minimum fellow up to 8 month. The average time taken to full weight bearing and clinical union is 6 week to 8 week. In 3 cases there is superficial infection present in 2nd week of post-surgery. Which is cure by antibiotics and wound washing. No case of nonunion, out of 24 cases 12 cases have limb length discrepancy. 6 cases had lighting 6 cases had shorting. On the Flynn criteria 22 cases have excellent result 2 have satisfactory result. No cases show any unsatisfactory results.
Conclusion: Cases which treated by tens elastic nailing achieved primary healing. The advantage of treating patient with enders nail had early weight bearing, reduced hospital stay, less bedridden and early to start to study. Overall tens elastic nailing is have many benefits either then conservation treatment.

Keywords: Nailing, femur, flynn

Introduction
Femoral shaft fracture is the one of most common fracture in pediatric age group. Old method of femoral shaft fracture included hip spica is very common. Which cause angular deformities, due to faster healing children younger than 4 year of age treated can be treated conservatively. The best treatment 4 year to 15 year is still a debate. The operative method like tens, Enders, is a growing tendency Enders have poor rotational stability. Elastic titanium is better than stainless nailing. In the past seven years fixation with flexible intramedullary nails have become popular technique, for stabilizing femoral fracture in school aged children. ESIN fixation system is a simple, effective and minimally invasive technique. It gives stable fixation with rapid healing and prompt return of child to normal activity. This study was intended to assess the results following treatment of fracture shaft of femur by flexible intra medullary nail or elastic stable intramedullary technique. The use of tens nailing technique include early union, early mobilization, and no long term plaster related complications.
In this study we reported tens nailing is a better method of treated femoral shaft fracture.

Matrial and Method
In this study 24 pediatrics age group patients. With fracture shaft of femur treated with elastic nail at Rajshree medical college and research intuition from Jan 2019 to Dec 2019. 15 are male child and 9 are female. Inclusion Criteria are Children and adolescent patients from 5 to 14 year with diaphyseal femur fracture Exclusion Criteria are Patients less than 5 years of age and more than 14 years of age, Patients unfit for surgery, Comminuted and segmental fractures. Fracture involving the distal 1/3rd of femoral shaft. Titanium elastic nails are available in five diameters 2, 2.5, 3, 3.5 and 4 mm and are 440mm in length. The nails are colour code so identification is easy. Nail diameter is equal to. 4 x internal minimum diameter of bone. The following sizes are typically used for children of average stature. The patient may be placed supine on table. Fracture reduction can be accomplished with manual reduction we can use a standard radiolucent table.

Position the image intensifier on the lateral side of the affected femur for AP and lateral view of the thigh from hip to knee. Reduce the fracture and confirm alignment with 'c' arm both AP and lateral views. Prepare and drape the leg from hip to knee. Contour both nails into a bow shape with nail tip pointing towards the concave side of the bowed nail. The apex of the bend should be at fracture site and at a distance, 3 times the diameter of bone, usually. The selection of entry point for the nails in medial and lateral at the top of the flare of the femoral condyles, so that after insertion, they will tend to bind against the flare of the condoyle. If the nail insertion is too low it will tend to back out. An incision in made on the lateral side of leg 2.5 cm above the physis and extending distally for 2.5cm. The fascia lata is incised and vastus lateralis is retracted. Select the next largest drill bit relative to diameter of nail. Use drill sleeves to protect the soft tissues. Start the drill bit perpendicular to the bone surface, penetrate the cortex. Use a curved bone awl, enlarge the hole in 45° angulations. Similarly make a medial entry point in same manner. Both the nails are inserted through entry points one after the other and are driven upto the fracture site. Using 'C' arm align the nail tip so the convex side will glance off from far cortex. It is very important that sufficient reduction of the fragment in achieved so that about half of medullary canal overlap. Use 'F' tool for reduction which is a radiolucent device. Viewing with image intensifier note which nail will be the easiest to drive across the fracture site. This nail is advanced 2cm into proximal fragment and then rotated. Motion of the proximal fragment demonstrates that the nail is in the proximal fragment. At this point it is advanced further. By rotating this nail further reduction of fracture can be accomplished, and then second nail in inserted. Don't advance the first rod so far until the second rod crossed the fracture site. If the first rod in advanced too far, it will shift the fragments and make passing of the second rod difficult. The traction in released and both the nails are advanced to their full length. Any deformity can be corrected by altering the position of nail. Varus or valgus angulation can be corrected by rotation of the nail whose concavity faces same direction of deformation through 180°. The two curves which were originally diametrically opposite are now facing the same direction. Opposing the deforming force and correcting axial deformation with sagittal angulations, the two nails are directed so that their convexity opposes deformation. If there is any significant mal rotation, the child must be repositioned and nailing redone. The cut off point for the nail should be 1 to 2 cm outside the cortex: bending the nail tip sometimes irritates the soft tissues. The wound in closed in layer and a water proof dressing applied. Before waking up the patient bend the knee to 900 to avoid stiffness of knee. With usual transverse fracture, no external immobilization is necessary. The patient is started on range of motion of knee and hip. Weight bearing will depend on the fracture pattern and stability. Progression of weight bearing should be at the discretion of surgeon. When early callus formation is observed weight bearing can be increased, external support can be discontinued when radiographic healing in complete. Usually nails for fracture shaft of femur are removed from 6 to 9 months. Each child was followed up to 1 year to 1 year 6 months after the surgery. Postoperatively the patient was immobilized in a resting Thomas splint. Patients were started on quadriceps exercise as soon as the pain subsides. After 3 weeks, the ranges of motion exercise were started, partial weight bearing after visible callus seen. With radiological evidence of union, full weight bearing was started after 6-8 wks. Follow up were carried out 12 weeks, 24 weeks and 1 year. Follow up anteroposterior and lateral radiographs were reviewed for each postoperative visit. These radiography were analysed for coronal and sagittal plane misalignment and shortening across fracture site. Patient's range of motion of knee, hip and limb length discrepancy, degree of pain or swelling documented. Rotational deformity of femur was measured using foot progression angle. All operative and post-operative complications were noted.

Results

24 cases were operated. The minimum fellow up to 8 months. Radiological union take place in all patients. Full weight bearing after 9 weeks (7-8weeks) postoperative period. 22 patients have excellent results. 2 patients have satisfactory results. In 3 cases there is superficial infection present in 2nd week of post-surgery. Which is cure by antibiotics and wound washing. No case of nonunion, out of 24 cases 12 cases has limb length discrepancy. 6 cases had lighting 6 cases had shorting. Physiotherapy of knee joint start after suture removal at day 11. The functional range of movement achived at 9 week.

Discussion

The treatment of femoral shaft fractures in children age is still debated. Conservative treatments remain the primary approach in most children of six years of age and younger considering the high healing power, the high remodeling power and the wide range of acceptance in this type of patients [1-10]. According to research conservative method was used in past but the trend towards surgical treatment [28]. Most common surgical option adopted in diaphyseal femoral fracture in children is the tens nailing.

Different studies compared clinical and radiographic results obtained with conservative and surgical treatment after femoral fracture in adolescence. A recent systematic literature review of 531 femoral fractures confirmed comparable clinical results, with a slightly higher risk of malunion between conservative and surgical treatment (11.5% *vs* 8.1%), but a lower risk of complications (1% *vs* 4%) [5]. The authors concluded that there was insufficient evidence to determine if long-term function differed between surgical and conservative treatment.

Ligier *et al*. [14] and Flynn *et al*. in their studies have reported that tens can give rotational stability if good care is taken intra-operative during nail insertion and postoperative, especially for comminuted, spiral and long oblique fracture.

Tens nailing to be safe and useful method in the management of the conditions allowing for easier nursing and avoiding pressure ulcer. Analyzing the good results obtained. Tens has become the first choice treatment given in isolated femoral fracture in children older than six year of age and under 45 kg weight.

Nevertheless, it is still unclear what the first-option treatment should be in pre-school children with diaphyseal femoral fracture. Indeed, these patients have a great potential of growth and bone remodeling after fracture. For many types of fractures, both nonsurgical and surgical methods have yielded good results, but conservative treatment has traditionally been the first choice [1, 4].

Considering the experience reported in older children undergone intramedullary nailing with TEN, it is evident that, besides clinical and radiographic outcomes, other parameters need to be taken into account for treatment choice [16].

Long hospitalization with long time in traction or

uncomfortable immobilization is no longer acceptable in many situations. A faster recovery with early motion and weight-bearing should therefore be prioritized also in very young patients. In addition, surgical treatment allows for reducing the care costs relative to conservative options [15].

Abhijit *et al*. in their study showed that tens nailing had definite advantage over the other techniques that have been used in the management of pediatric femoral shaft fracture [11].

Long time hospitalization in traction or other immobilization method is no longer acceptable in many situations. A faster recovery with early motion and weight bearing should thereafter be prioritized also in teen age group. In addition, surgical treatment allow for reducing the core costs relative to conservative options [16].

The most common complication of tens nailing is entry site irritation and pain. Other complications, fracture angulation, refracture and infection. The good and radiographic results at follow-up, tens showed to be a safe, less scar mark and minimum time with surgeon friendly technique.

Table 1: Flynn criteria

	Excellent result	Satisfactory result	Poor result
Leg length discrepancy	< 1 cm	< 2 cm	> 2 cm
Malalignment	< 5 degrees	< 10 degrees	> 10 degree
Pain	None	None	Present
Complication	None	Minor and resolved complication	Major complication or lasting morbidity

Table 2: Patient profile and results

Sr. No.	Age	Sex	Side	Type of fracture	Type of fracture	Mode of trauma	Hospital stay	LLD	Time of radiological union	Flynn's criteria results
1.	8	Male	Right	Closed	Transverse	Fall from height	5 days	0.5cm	10 weeks	Excellent
2.	9	Male	Right	Closed	Transverse	RTA	5 days	0.5 cm	8 weeks	Excellent
3.	8	Male	Left	Closed	Oblique	Fall at home	9 days	1 cm	12 weeks	Satisfactory
4.	7	Female	Left	Grade I open	spiral	Fall at home	9 days	1 cm	10 weeks	Excellent
5.	11	Female	Left	Grade II open	Spiral	RTA	5 days	None	12 weeks	Excellent
6.	6	Male	Left	Closed	Transverse	RTA	6 days	None	10 weeks	Excellent
7.	14	Male	Right	Closed	oblique	Fall from height	5 days	0.5 cm	12 weeks	Excellent
8.	7	Female	Right	Closed	Transverse	RTA	6 days	None	12 weeks	Excellent
9.	15	Male	Right	Grade II open	Oblique	RTA	7 days	1 cm	12 weeks	Satisfactory
10.	7	male	Left	Closed	Transverse	RTA	4 days	None	8 weeks	Excellent

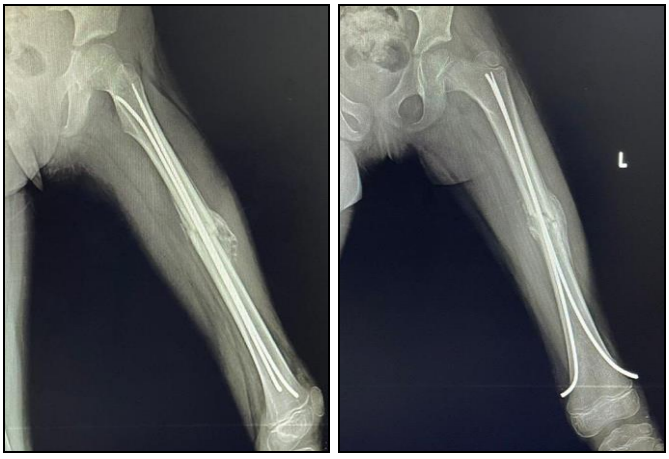

Fig 1: (1 month post opertive)

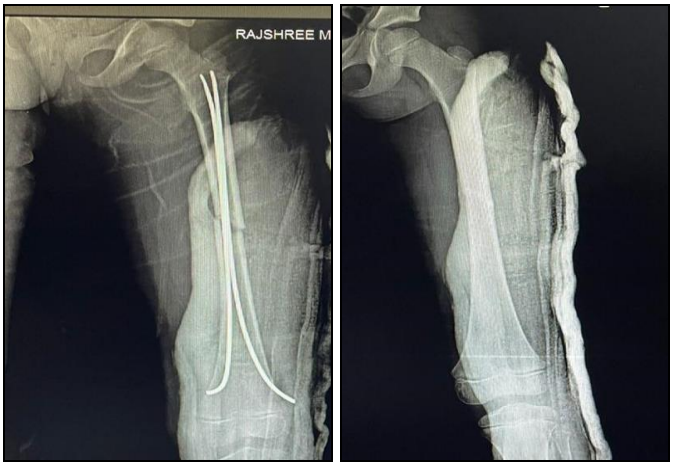

Fig 2: (preop and postopertive)

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