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ORTHOPAEDICS

TITANIUM ELASTIC NAILING OSTEOSYNTHESIS FOR DIAPHYSEAL TIBIAL FRACTURE IN PEDIATRIC AGE GROUP- OUR EXPERIENCE

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ABSTRACT

Background: To study the outcome of Diaphyseal Tibial Fracture treated with TENS Nail Osteosynthesis.

MATERIAL & METHODS: A prospective study was carried out in the Orthopaedic Department ,Tripura Medical College & Dr.BRAM Teaching hospital ,Agartala Tripura for a period of 2 years from April 2014 to March 2016 with thirty(30) consecutive Diaphyseal fracture either both bone or only Tibia in Peadiatric age group between 5 to 13 years of age, irrespective of sex,based on assessment criteria 30 fracture were included in this study out of which 22 were male(73.3%%) and 8 were female(26.7%). Average age of the patients was 9.3 years and mean follow up was 16.7 month (range 9-24 months) were subjected to TENS NAILING OSTEOSYNTHESIS after obtaining written consent.

RESULT: Road traffic accident accounted for 15 (50%) ,fall from height 9(30%) and sports injury accounted for 6 (20%).Out of 30 patients , 16(53.3%) were diaphyseal fracture in both bone out of which 9 were type1 open fracture and tibial fracture in 14(46.7% . Eighty(80%) patients had consented for nail osteosynthesis for early recovery & early mobility. Average time of sound clinical union is 8.5± 2.5 weeks in all cases,radiological cortical bridging was seen at 4th postoperative week. The mean time of complete cortical bridging or radiological union was 12.5±2.5 (range 12 -16 weeks). According to Flynn criteria, outcome of treatment, excellent in 17(56%), satisfactory in 9(30%) & poor in 4(14%).

CONCLUSION: Closed reduction and cast application is still regarded as gold standard in treatment of diaphyseal fracture in tibia of children which is practising in many places. Over the past many years management of tibial diaphyseal fracture in children has turned more towards operative intervention because of displaced fracture, early mobilisation & recovery. TENS Nail fixation is easy, fast operation and very effective method for paediatric tibial shaft fractures. Based on our study TENS Nailing is an effective surgical technique which allows early mobilisation, rapid healing and with minimum complication which can be avoidable with careful precautions.

KEYWORDS : Diaphyseal Fracture Tibia Osteosynthesis

INTRODUCTION

Tibial fracture is third most common long bone fracture in children.The most of the fractures had been treated nonoperatively [4]. Tibial diaphyseal fracture in paediatric age group comparatively common due to high physical activities. Tibial shaft is partially subcutaneous. A thick and flexible periosteum in younger children gives greater stability to angular impacts. In paediatric tibial fracture Closed reduction and Cast application is still considered as Gold Standard[1,3]. Inspite of cast application there are several surgical indication ,including associated fractures,displaced fracture and soft tissue injuries such as open fractures. Titanium Elastic Nails(TENS) are very frequently used for tibial fractures in peadiactric age groups with preserving injury to Physis. Complication such as delayed union or non-union are not uncommon in older childrens [2]. Ocassionally closed reduction cannot be achieved due to displacement, angulation and rotation at fracture site and invite operative intervention [3]. In some cases surgical treatment is essentially required because of open fracture, polytrauma and compartment syndrome[3]. Elastic intram edullary nailing of long bone fracture in paediatric age group has been accepted world wide due to of its clinical effectiveness and less complication[3]. Physical examination of the patient carefully assess for the presence of open fracture or acute compartment syndrome. Most undisplaced fractured may be managed by immobilisation with cast.

Tibial diaphyseal fractures are responsible for approx. 4 to 5% of all paediatric fractures. The fracture may be without deviation, oblique, spiral, transverse and comminuted. Less than 4% of these fractures need surgical treatment. Tibia has limited remodelling potential5. Issues pertaining to diaphyseal tibial fracture have been more dependent on early mobilisation, quick relieve of pain, avoid stiffness of neighbouring joint, prevention of rotational and angular deformity at fracture site. Current treatment is controversial . To minimise the complication, preffered approach is TENS nailing of tibial fracture which will help early mobilisation, reduced joint stiffnes, prevent rotation and early ambulation of patient.

MATERIALS AND METHODS: A prospective study was carried out in the Department of Orthopaedics, Tripura Medical College, Hapania, Agartala ,Tripura for a period of two years from April 2014 to March 2016. Thirty(30) consecutive cases of tibial diaphyseal or both bone fracture in paediatric age group between 5 to 13 years irrespective of age & sex were subjected to TENS Nailing osteosynthesis of tibia after obtaining written & informed consent . In this study 22 were male(73.3%%), 8were female(26.7%).

Inclusion criteria: Diaphyseal fracture of leg, age between 5 to 13years , Type1 open fracture, fracture with soft tissue superficial & deep injury, displaced & unstable fracture and polytrauma.

Exclusion criteria:Pathological fracture, open fracture type2& type3, fracture with Head injury, mental and physical inability to cooperate, presence of medical complication like Heart Disease and undisplaced fracture.

Patient were initially examined and assessed in emergency and out patient departments of the hospital. X-RAYS of the leg was taken followed by first aid in the form of analgesia, sterile wound dressing, immobilisation with posterior POP slab and other resuscitation methods. Patient was admitted in orthopaedics ward and all routine investigation like Complete blood count and Biochemistry and X-RAY chest was done. Patient and patient party was informed and written consent was taken for operation.

SURGICAL TECHNIQUE: Patient was placed supine on radiolucent operative table, general anaesthesia was administered, antiseptic dressing & drapping of affected limb was done. The Titanium Elastic Nails(TENS) System was used in all patients. Under C-ARM ,the fracture site and proximal tibial physis was marked,point of nail insertion was 1.5 to 2 cm distal to the Physis and sufficiently posterior to the saggital plane. About 2cm longitudinal incision was made on both the lateral and medial side of the proximal tibial metaphysis just proximal to the bony entry point. The soft tissue were bluntly dissected down to bone and appropiate diameter of implant is selected so that the nail diameter is 40% of diameter of narrowest part of the medullary canal,a bone awl roughly larger than the diameter of the selected nail was used to make holes at the cortex to open the medullary cavity. Prior to insertion, the nails were prebent by hand into a gentle C “shape . Both the nails were inserted one by one through the entry holes and advanced to the level of the fracture site. Under C-

ARM guidance the fracture is reduced in both the planes ,then the first nail is advanced past the fracture site. Intramedullary position of the nail distal to the fracture site is confirmed on AP and Lateral view and if found satisfactory second nail is past advanced the fracture site .Both the nails are advanced and tips lie just proximal to the distal tibial physis confirmed by C-ARM. The nails are backed out a few centimetres and cut along proximal tibial metaphysis.Then readvanced the implant until 1.5 cm of nail lies outside the bone ,the skin incision was closed in layers and wounds were well padded with gauze. To protect nail fixation and to minimise irritation at the nail entry site from knee motion ,16 patients were immobilised postoperatively by posterior long leg slab and 14 patients were given posterior BK slab .On second postoperative day check X-RAY of the leg full length AP & Lateral view was done,splint was removed and dressing was changed and application of the cast done .All the children were initially non weight bearing and mobilised with physical therapy on 2nd postoperative day. Most of the patients were discharged from hospital 5th to 9th postoperative day, antibiotic was continued for 14 days in type 1 open fractures(9no cases). Skin stiches was removed on 14 th postoperative day, patient was followed at 3 weeks, 6weeks ,3 months and finally at 12 completed months .At each visit patient was assessed clinically and radiologically for the outcome of result. Cast was removed in all cases in 6 weeks after operation(6) .Assessment included standardised clinical evaluation and Flynn`s scoring criteria.

FLYNN`S SCORING CRITERIA			
Variable	**Excellent**	**SATISFACTORY**	**POOR**
Limb length inequal	< 1.0 cm	<2.0 cm	>2.0 cm
Malalignment	5DEGREE	10 DEGREE	>10 degree
Unresolved pain	ABSENT	ABSENT	PRESENT
Other complains	None	Minor & resolved	Major, lasting morbidity

RESULT

Results on the basis of the Flynn scoring criteria on 22(73.3%)male and 8(26.7%) female patients whose ratio 2.75:1 had undergone TENS nailing osteosynthesis for the diaphyseal fracture tibia.Road traffic accident (RTA) accounted for 50% (15 fractures) ,fall is 30%(9) and sports injury is 20%(6). Sixteen (53.3%) were both bone diaphyseal fracture out of which 9 were type 1 open fracture and alone tibial fracture in 14(46.7%). 80% had consented for TENS Osteosynthesis for early recovery,mobility and prevent deformity, 20% percent for early relief of pain and deformity.

The mean time of sound clinical union is 8.5±2.5 weeks in all cases .Radiological cortical bridging was seen at 6th postoperative week .Mean time of complete cortical bridging or radiological union was 12.5± 2.5 (12 to 16 weeks). According to Assessment criteria outcome of treatment excellent in 17(56%), satisfactory in 9(30%) and poor in 4(14%). There was no limb length inequality ,minor complication like entry point irritation.

Fig.1 Instruments & Implant

Fig.2(a)Preoperative X-Ray

Fig.2(b) Preoperative X-Ray

Fig.3 Postoperative X-Ray

Table 1: MODE OF INJURY

Mode of Injury	No. Of Patients	Percentage
RTA	15	50%
Fall from Height	9	30%
Sports injury	6	20%
Total	30	100%

Table 2: OPERATIVE INDICATION

Indication	No. Of patients	Percentage
Fracture with displacement	21	70%
Early mobility and relief of pain	8	26.6%
Open fracture type1	1	3.4%
Total	30	100%

Table 3: TIME TO UNION

Type of union	Duration to union(weeks)	Mean duration to union(weeks)
Clinical	8.5 to 10	8.5 ± 2.5
Radiological	12 to 16	12.5 ± 2.5

Table 4:Final Outcome[Flynn`s Scoring Criteria]

Outcome	Number Of patients	Percentage(n=30)
Excellent	17	56 %
Satisfactory	9	30%
Poor	4	14%
Total	30	100%

Similar study was reported by Wudbhav N.Sankar[6,8]. Road traffic accidents (RTA) were accounted for majority of fractures 50%, fall accounted for 30 % and remaining 20% in sports injury. Clinical union was seen at mean time of 8.5 ±2.5 weeks in all our cases. All the fractures achieved union in mean time of 12.5± 2.5 weeks (range 12 - 16 weeks). Jeong Heo et al[12] found union achieved in mean of 16.1 weeks after surgery; V.R.P. Vallamshetla et all[11] reported the mean time of clinical & radiological union was 10 weeks . In this current study there is no angular deformity . Bjørn Asser Hansen et al[19] found 25 patient had angular deformity out of 102 children. In the present study 4 children had malunion, 1 child had superficial infection and there is no limb length inequality with no neurovascular damage. Srivastava et all[10] in his study reported 2 patients had neurovascular injury, 2 had superficial infection, 2 had malunion and 1 had limb length discrepancy out of 24 tibial shaft fractures operated. Goodwin, Ryan C et al [12] reported 2 patients had angular deformities out of [19] tibial fracture operated .In the present study out of 30 fractures none has developed non-union, similar data also reported by V.R.P Vallamshetla et all [11].

CONCLUSION

Historically, the preferred method of treatment of diaphyseal fracture of tibia in children has been conservative. Recent studies have concentrated on displaced tibial or both bone fracture leg. Flexible intramedullay nail provides excellent fixation in children with unstable tibial shaft fracture . Flexible IM nailing is a straight forward technique that provides good results[12]. In this study excellent result was found in 17 (56%) cases , satisfactory in 9 (30%) and poor in 4(14%) cases. The study donot have instances of growth arrest . Observation of our study suggest flexible Titanium nails are an effective treatment to achieve and maintain alignment and stability.

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