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Operative management of pediatric humeral shaft fractures

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Abstract
The aim of this study to describe the indications, technic and results of operative of Pediatric Humeral Shaft Fractures operated at Ashwini Hospital between Jun 2013 to May 2015. Twenty Pediatric patients ranging in age from 7-14 years (Mean 10 years) where treated surgically with TENS by lateral dual entry approach and follow up done at 3, 6, 12, 24 & 36 weeks. The patients were followed for 9 months. All fractures healed in good alignment relative surgical indication included compound fractures, lower extremity injuries including fractures and head injuries. Two patients had radial nerve injury at the time of presentation in the casualty. There were no complication line neuro vascular injuries and two patients developed superficial infection post operative. Two patients with preoperative radial nerve injury recovered on conservative treatment by Ten weeks. All the Twenty patients return to their normal activities of daily living with no completions. Therefore, we conclude that TEN fixation is an ideal procedure for treating Humeral Shaft Fractures in which provides stable fixation, with minimal tissue damage at the fracture site. The Lateral dual entry point is better and avoids injury ul nerve.

Keywords: Humerus, diaphyseal fractures, titanium elastic nail (TEN) system, lateral approach, dual entry point

1. Introduction
Pediatric traumatic Humeral Shaft Fractures require surgical treatment only infrequently, usually in cases where surgical stabilization of humeral shaft fractures is required to assist with patient mobilization, wound care and the maintenance of adequate alignment.

2. Metrials and Metals
Twenty Pediatric traumatic Humeral Shaft Fractures treated with TENS between Jun 2013 to May 2015 were reviewed. Antero posterior and lateral views were reviewed to evaluate fracture healing. Healing in these fractures was defined as cortical contiguity in all four cortices seen on standard Ap & lateral radio graphs of the humerus. All patients were follow at 3, 6, 12, 24 & 36 weeks for clinical and radiological assessment.

3. Surgical technique
The surgical technique was followed based on the principles describe by the originations of flexible nail implants in Frans. When retrograde insertion was followed, a longitudinal incision is made laterally at the level of the lateral epicondyle. According to the implant desired, the cortex is opened with a 3.2 or 4.5 mm drill bit. The size of the implant selected is approximately to be 40% of the diameter of the medullary canon and to equally sized implants should be used to prevent asymmetrse force on opposite cortices through the lateral approach. In our study, the implants were in the range of 2.5mm to 3.5 mm. The nail is prebent and driven to the fracture site, followed by obtaining reduction in a closed or open method. The nails are driven proximally to within 1-2 cm of the proximal humeral physis, cut as close possible to the site of insertion.

4. Post op care
Patient were splinted and given a sling for comfort for 10-14 days. Radiographs were obtained at immediate, 2 weeks post operatively to check for loss of reduction. 3, 6, 12, 24 & 36 weeks

post operatively to evaluate healing at the fracture site and fictional status of the limb and also plan for elective removal of the implant after healing at 10 months post surgery.

1: Frequency of side of injury

Side	Frequency	Percentage
Right	15	75
Left	05	25
Total	20	100

2: Sex Distribution

Sex	Frequency	Percentage
Male	15	75
Female	05	25
Total	20	100

3: Mechanism of injury

Mechanism	Frequency	Percentage
h/o fall	08	40
h/o RTA	12	60
Total	20	100

4: Type of fracture

Type	Frequency	Percentage
Open	06	30
Closed	14	70
Total	20	100

5. Results

All patient were operated by duel lateral entry technique. All fractures were reduced with the closed technique under image intensifier guidance. All fractures united without an angular are rotatory deformity of $>10^0$ within 12 weeks. There was clinical evidence of superficial infection in two patients, managed by regular dressing and appropriate antibiotics. All the fractures were united radio graphically.

6. Observations

Twenty Patients (15 Boys: 5 Girls) to had Humaral shaft fractures treated surgically with elastic nails at our hospital between Jun 2013 to May 2015 were identified. The mechanism of injury was RTA in fifteen patients and fall in five patients. Three patients had Gustilo-Anderson type-I injury. Two patients had radial nerve injury of neurapraxia type. Associated injuries included, three had closed head injury and five with lower exhibity injury. The indication for surgery included, twelve patients could not be maintained in acceptable alignment by conservative treatment and were, therefore, treated operatively. The indication for surgery in the remaining eight patients were open fractures in four, closed head injury in two, pelvic fracture and crush injury left two in one each. The average follows us ten months.

7. Discussion

Humeral shaft fractures comprise approximately 2.5% of all traumatic fractures in children. Most of these fractures of humeral can be treated successfully with closed methods. Union rates of more than 92% are often reported. Multiple closed techniques are available like traction, hanging arm cast, velpaeu dressing, functional brace and shoulder spica cast. Acceptable alignment of humeral shaft fractures is considered to be 3cm of shortening, 30^0 of varus/valgus angulations and 20^0 of enterior/posterior angulations. Surgical treatment of fracture should be advised if the number of the fractures are unable to be reduced adequately. In children, TENS are the preferred implant for stabilizing humarel shaft fractions. The surgical technique and performed either by retrograde or antegrade manner. Retrograde entry is our current expected method, but it requires careful dissection so avoide fracture and nerve injury. The lateral dual entry point approach avoids the nerve injury.

The results here show that flexible nails provide the stability required for satisfactory fracture healing in children.

8. Conclusion

The Titanium Elastic Nail (TEN) System of fixation is an ideal procedure for treating humeral shaft fractures in children. This system provides stable fixation, with minimal soft tissue stripping at the fracture site, and allows early mobilization of the extremity.

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