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The study of distal ¼ diaphyseal extra articular fractures of humerus treated with antegrade intramedullary interlocking nailing

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Abstract
Humerus fractures are one of the most commonly encountered Orthopaedic injuries after fall and road traffic accidents. In general, humerus diaphysis fractures accounts for 1 to 2 % of all fractures occurring in the human body and 15% of all the fractures of humerus. In the operative management, there has been a long-term debate between nailing and plating. The purpose of our study is to evaluate the clinical outcome of antegrade intramedullary closed interlocking nailing in distal ¼ humeral diaphyseal fractures. A total of 42 patients with acute distal ¼ humeral diaphyseal fracture were selected on the basis of anatomical location and, managed with closed reduction and antegrade intramedullary interlocking nailing over the period of 13 years (January 2003 - July 2016). They were evaluated using AMERICAN Shoulder and Elbow Surgeons' Score. All 42 patients' fracture got united with primary fracture healing in mean time of clinical union of 13.61 weeks (range 10 to 18 weeks). Amongst all, two patients suffered from shoulder stiffness post operatively. None of the patient suffered from iatrogenic neurovascular injury. For patients having distal ¼ humeral diaphyseal fracture closed antegrade intramedullary nailing is dependable solution for achieving fracture stabilization and ultimate healing with less amount of blood loss, complications and less operating time. It is minimally invasive surgery and has minimum morbidity if performed using basic principles.

Keywords: Humerus diaphyseal fracture, distal ¼, antegrade nailing

Introduction
Humerus diaphysis fractures accounts for 1 to 2 % of all fractures occurring in the human body [1] and Fractures of the distal ¼ humeral shaft account for 15% of humeral fractures [2, 3]. There is bimodal distribution in incidence of these fractures with small peak during adolescence and the other larger peak in 40-60 years of age. Options for the treatment of humeral shaft fractures include functional bracing, intramedullary nailing, internal plate fixation, and external fixation. Distal ¼ humerus shaft fracture is difficult to treat as having short distal fragment and adjacent neurovascular structures. ORIF with plating is an effective approach for treatment. However, it is associated with increased surgical time, iatrogenic radial nerve palsy, infection, disturbance of fracture hematoma & soft tissue covering around fracture site, which leads to delayed union, non-union. Intramedullary nailing by antegrade approach is good option to treat such fracture with good reduction, fixation and minimal complication [4, 5]. In this study we have tried to analyze the outcome in terms of time for consolidation, union rates, functional results and complications of distal ¼ humeral shaft fractures managed with closed antegrade interlocking nailing.

Materials and methods
The study was carried out in Department of Orthopaedics at Ruby Hall Clinic, Pune over a period of 13 years that includes the patients from January 2003 to July 2016. Only acute humeral fractures were included in this study. Many of the patients were poly-trauma cases with one or more associated injuries. The study was designed to assess the result of antegrade intramedullary locking in humerus distal ¼ diaphyseal fractures.

Inclusion criteria

- Fractures of distal diaphysis of humerus (upto 5 cm from Olecranon fossa)
- Fractures in skeletally mature patients.
- Fresh fractures due to trauma.

Exclusion criteria

- Fractures with intra-articular extension
- Fractures in skeletally immature patients.
- Pathological fractures
- Pre-existing shoulder pathology.

Total number of 42 patients were selected for the study and informed consent were taken. The patients were studied prospectively in terms of radiological union time, range of motion at shoulder joint and to study the complications i.e. nonunions, infection, impingement etc. The patients' case records, routine radiographs, age, sex, mode of injury, anatomical level of fracture, associated with radial nerve palsy, delay between injury and operation, and operation time with amount of blood loss were noted. Detailed pre-operative anaesthetic check-up and assessment in the form of nail length, diameter, instrumentation and additional implants if required was done in each case.

Operative Technique

1. **Implants:** AO Type and Indian
   41 nails – AO 6.7 & 7.5mm diameter with 20-30 cm nail length
   1 Indian Custom made 8mm diameter with 32.5 cm nail length
2. **Position:** Antegrade interlocking nailing is done in beach chair position with sand bag under the scapula on the ipsilateral side over the radiolucent table with image intensifier on opposite side of the affected side and perpendicular to the operating table.
3. **Approach**: Using anterolateral approach, oblique incision is taken from lateral border of anterior 1/3 acromion and deltoid muscle is split longitudinally followed by splitting of rotator cuff muscle fibres along its direction. Entry is made with help of awl just medial to greater tuberosity in sulcus between Greater Tuberosity and articular area.

Fig 1: Approach

4. **Technique**: Standard antegrade nail entry is made with awl, then guide wire over T-handle is inserted and passed over the fracture-site after the fracture is reduced. Fracture is held in reduced position and serial reaming is done upto 5 mm proximal to olecranon fossa. Usually medullary cavity of humerus ends 1.5-2 cm proximal to olecranon fossa, so cancellous bone above the olecranon fossa is reamed to lengthen the medullary cavity upto 1-1.5 cm. Reaming is avoided at entry site to prevent injury to rotator cuff. Appropriate nail length and size measured and inserted while holding the fracture in reduced position. Two proximal bolts inserted from lateral to medial and one most distal anteroposterior locking bolt inserted. Rotator cuff closed precisely.

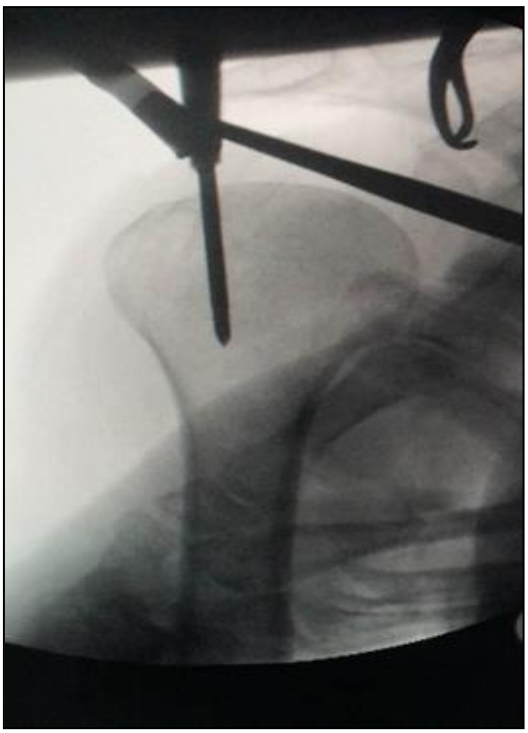

Fig 2: Entry with awl

Fig 3: Serial reaming

Fig 4: Entry of nail

Fig 5: Nail passed through reduced fracture

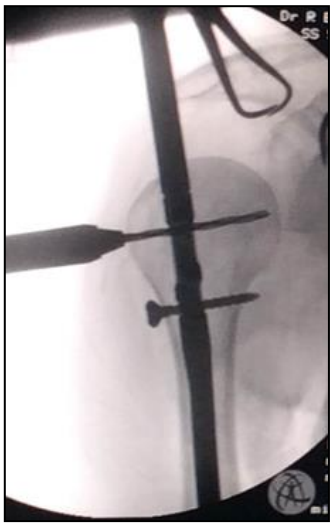

Fig 6: Proximal locking

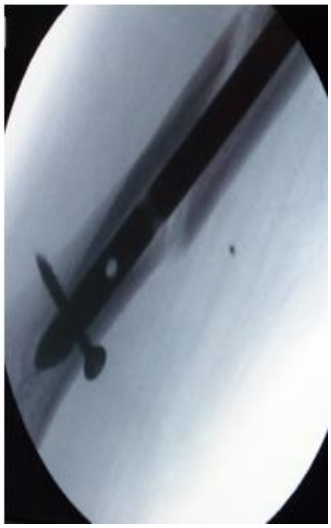

Fig 7: Distal locking

Results

Fig 8: Pre-op radiographs

Fig 9: Immediate Post op Radiographs

Fig 10: 3 months Post op Radiographs

Table 1: Mode of Injury

Mode of injury		
	Frequency	**Percent**
Assault	2	4.76
Sports injury	4	9.52
Fall	10	23.80
Road traffic accidents	26	61.90
Total	42	100.0

Table 2: Sex Distribution

Sex		
	Frequency	**Percent**
Male	28	66.67
Female	14	33.33
Total	42	100.0

Table 3: Age Distribution

Age group	Frequency	Percent
≤ 30	16	38.09
31 – 40	6	14.28
41 – 50	2	4.76
51 – 60	4	9.52
> 60	14	33.33
TOTAL	42	100.0

Table 4: Side Distribution

Right/left		
	Frequency	**Percent**
Left	17	40.47
Right	25	59.50
Total	42	100.0

Table 5: Type of Fracture

Close/open		
	Frequency	**Percent**
Closed	40	95.23
Open	2	4.76
Total	256	100.0

Table 6: Pattern of Fracture

Pattern Of Fracture		
	Frequency	**Percent**
Transverse	0	0.0
Oblique	0	0.0
Spiral	15	35.71
Comminuted	27	64.28
Total	42	100.0

Discussion

The present study consists of 42 patients with humerus distal ¼ diaphyseal fractures, which are treated with antegrade intramedullary nailing. Data of these cases (42 patients) using various parameters like age, sex, mechanism of injury, type of fracture, associated radial nerve palsy, trauma-surgery interval, duration of surgery, radiological union time, range of motion at shoulder joint, ASES shoulder score had been compiled and condensed as master chart. Care of associated injuries were taken with equal enthusiasm. Patients were followed up at 6 weeks, 3 months and 6 months post operation.

- Among 42 patients who were studied, most included RTA (61.9%) cases followed by assault cases and elder cases with history of fall. Most of the patients were adults less than 30 years of age (38.9%).
- The antegrade approach was used in all cases. 2 cases had open grade 1 injury for which debridement and antegrade IM nailing was done. There was minimal blood loss during operative procedure. 4.7% patients had a significant restriction of shoulder movements. The final functional outcome is good to excellent. The nails are subjected to lower bending forces, making failure by fatigue less likely to occur [6].
- All 42 patients fracture got united, as compared to 97% union rate in study done by Crates *et al.* [6] and 95.6 % union reported by Demirel *et al.* [7].
- The mean time for radiological fracture union was 13.60 weeks with range from 10-18 weeks. Similarly Demirel *et al.* [7] reported 13 weeks of average union time with range from 10-36 weeks.
- There was no case of iatrogenic radial nerve palsy. Ingman *et al.* [5] also reported no iatrogenic radial nerve injury with modified Grosse-kempf nail.
- The functional outcome of patients with humeral shaft fracture is probably the most important consideration when deciding on the best mode of treatment for a particular fracture pattern. 4.7% of our patients had mild shoulder stiffness at final follow-up and that even in whom associated injuries were there and were non-compliant with follow-up. Shoulder stiffness is a significant problem in antegrade nailing, which can be minimized if care is taken to prevent the proximal protrusion of the nail and repair the rotator cuff properly.

Crates *et al* [6] reported fair to poor shoulder functional outcome in 10% patients who had severe concomitant injuries also.

- However, Moran [23] recommend open technique while passing distal interlocking screw from the lateral aspect of the humerus to avoid injury to the radial nerve and posterior cutaneous nerve of forearm. We encountered no such problem as we locked the nail with distal interlocking screw from anterior to posterior direction.
- The results of the present study indicate that in the presence of proper indications, reamed antegrade intramedullary interlocked nailing appears to be a method of choice for internal fixation of humerus distal ¼ diaphyseal fracture, particular in old osteoporotic bone.

Conclusion

- IM fixation is a simple technique with minimal exposure and shorter operative time with less blood loss.
- The preservation of fracture hematoma, soft tissue and periosteum around the fracture that occurs with close nailing has been proposed for high rates of union and good results, with no risk of iatrogenic radial nerve palsy.
- Humeral nailing is associated with early return to function of the extremity, low infection rates and also very good pain relief in pathological fractures.
- An acceptable alternative for the treatment of acute humeral shaft fractures in multiple injured patients.
- In an era where early full range of motion and rapid return to work with minimal scaring is mandatory for most patients, the use of IMN will most likely increase in popularity in the future.

References

1. Court-Brown CM, Caesar B. Epidemiology of adult fractures: A review. Injury. 2006; 37(8):691-697.
2. Tytherleigh-Strong G, Walls N, McQueen MM. The epidemiology of humerus shaft fracture, 1998.
3. Chun-Hao Tsai, Yi-Chin Fong, Ying-Hao Chen, *et al*. The epidemiology of traumatic humeral shaft fractures in Taiwan, 2009.
4. Rommens PM, Verbruggen J, Broos PL. Retrograde locked nailing of humeral shaft fractures. A review of 39 patients. J Bone Joint Surg Br. 1995; 77:84-9.
5. Ingman AM, Waters DA. Locked IMN of humerus shaft fractures.J Bone Joint Surg. 1994; 76:23-29.
6. Crates J, John MD, Whittle AP. Antegrade interlocking nailing of acute humeral shaft fractures. Clin Orthop. 1998; 350:40-50.
7. Demirel M, Turhan E, *et al*. Interlocking nailing of humeral shaft fractures. A retrospective study of 114 patients. Indian J Medi sci. 2005: 59(10):436-432.
8. Moran MC. Distal interlocking during intramedullary nailing of the humerus. Clin Orthop Relat Res. 1995; (317):215-8