

## FRACTURE SHAFT HUMERUS: INTERLOCKING

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### HOW TO CITE THIS ARTICLE:

Deepak P. Kaladagi, Kaladagi P. S, K. Ramachandra, Shiv Sandeep S.V, Gurneet Singh Bakshi. "Fracture Shaft Humerus: Interlocking". Journal of Evidence based Medicine and Healthcare; Volume 1, Issue 17, December 29, 2014; Page: 2173-2178.

**ABSTRACT: BACKGROUND:** The incidence of humeral fracture has significantly increased during the present years due to the population growth and road traffic, domestic, industrial, automobile accidents & disasters like tsunami, earthquakes, head-on collisions, polytrauma etc. In order to achieve a stable fixation followed by early mobilization, numerous surgical implants have been devised. **PURPOSE:** The purpose of this study is to analyze the results of intramedullary fixation of proximal 2/3rd humeral shaft fractures using an unreamed interlocking intramedullary nail. **INTRODUCTION:** In 40 skeletally matured patients with fracture shaft of humerus admitted in our hospital, we used unreamed antegrade interlocking nails. **MATERIAL:** We carried out a prospective analysis of 40 patients randomly selected between 2001 to 2014 who were operated at JNMC Belgaum, MMC Mysore & Navodaya Medical College, Raichur. All cases were either RTAs, Domestic, Industrial, automobile accidents & also other modes of injury. **METHOD:** Routine investigations with pre-anaesthetic check-up & good quality X-rays of both sides of humerus was taken. Time of surgery ranged from 5-10 days from the time of admission. Only upper 1/3rd & middle 1/3rd humeral shaft fractures were included in the study. In all the cases antegrade locked unreamed humeral nails were inserted under C-arm. Patient was placed in supine position & the shoulder was kept elevated by placing a sandbag under the scapula. In all patients incision taken from tip of acromion to 3cm over deltoid longitudinally. Postoperatively sling applied with wrist & shoulder movements started after 24 hours. All the patients ranged between the age of 21-50 years. **RESULTS:** Total 40 patients were operated. Maximum fracture site were in the middle third- 76%, 14% upper 1/3rd. All 40 patients achieved union. The average time of union was 8-10 weeks. All patients regained full range of movements except in few cases, where there was shoulder impingement at the site of insertion of nail, superficial infections, delayed union, neuropraxia. **DISCUSSION:** Bell et al (1985) reported RTA as cause in 73 % and Balfour et al (1982) reported 21-30 years as the age group of patients having the maximum number of humeral shaft fractures.<sup>1</sup> Naimen et al (1987) reported average time of union to be 11 weeks.<sup>2</sup> So we feel fracture union is quick in interlocking nail. We have got union rate of 100 % whereas Bell reported union rate of 94 % with DCP.<sup>3</sup> We conclude that unreamed intramedullary interlocking nail is one of the best methods of treatment of humeral shaft # & can be used in the upper 1/3rd & middle 1/3rd pathological # of shaft of humerus. The procedure avoids osteonecrosis due to reaming. Unreamed humeral nailing of the pathological humeral shaft fractures provides immediate stability and pain relief, minimum morbidity and early return of function to the extremity.

**KEYWORDS:** Fracture, humerus, interlocking.

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**INTRODUCTION:** The humeral fractures account for 3%-5% of the skeletal injuries. The treatment modalities are varied. There have been proponents of closed reduction and casting claiming equally good functional results over the operative means.<sup>1</sup> However with the advent tools and techniques the armamentarium of a trauma surgeon is enriched with a wide array of implants such as nails and plates.<sup>4</sup> Open reduction and internal fixation with plate gives good radiological reduction but are fraught with complications like infection and radial nerve palsy.<sup>5</sup> In today's era of closed technique of fracture fixation various nails are described with very promising results and early recovery.<sup>4</sup> Interlocking nailing has revolutionized the surgical management of fractures of the shaft of humerus. The indication of locked nailing of humerus are fractures in polytrauma, open fractures, pathological fractures, segmental fractures, nonunions and fractures with neurovascular compromise. Locked nailing has several advantages over internal fixation by plating. They are load sharing devices, require less exposure, less blood loss, less operative time, do not jeopardize the vascularity and allow early mobilization. Antegrade locked nailing had the disadvantage of restriction of shoulder functions.

**MATERIALS AND METHODS:** Prospective analysis of 40 patients randomly selected who presented to our Emergency Department with an acute humeral shaft fracture between the beginning of 2001 and the end of 2014 and who underwent IMN were included in this study. Patient demographics and baseline characteristics were prospectively recorded: Gender, age, accident type, and energy level of trauma, localization of the fracture, fracture classification, concomitant injuries, intra- and postoperative complications including nerve palsies, length of hospital stay, and delayed union and non-union.<sup>6</sup> Delayed union was defined as the failure of healing after 14 weeks and non-union as failure of healing after 24 weeks.<sup>7</sup> Patients were interviewed concerning pain and shoulder mobility. Shoulder movements were assessed in accordance with the American Shoulder and Elbow Surgeons scores (ASES Score). 4=Normal, 3=mild compromise, 2=difficulty, 1=with aid, 0=unable. A whole range of functions are assessed whether patient is able to do.<sup>8</sup>

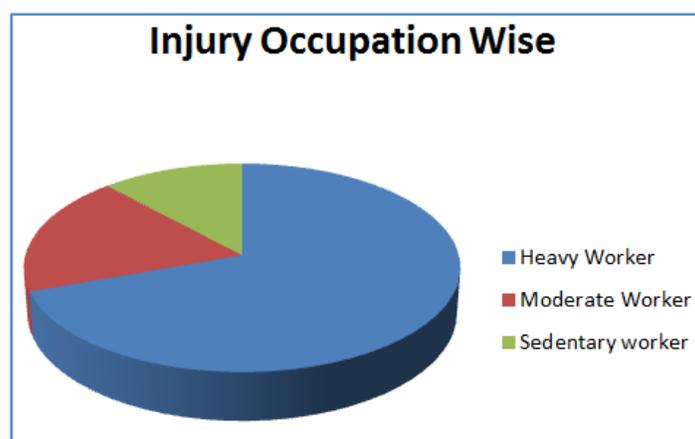
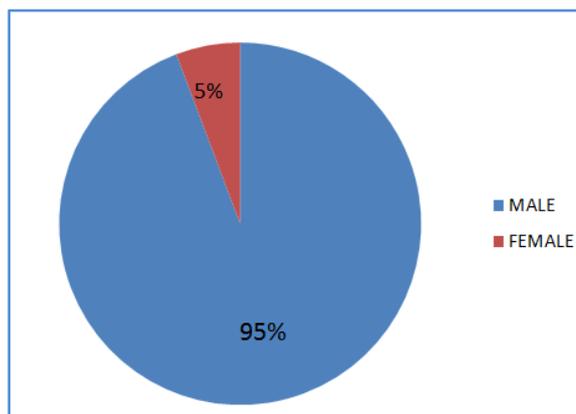
- Reaching Back Pocket - Perineal care
- Wash opposite axila - Eat with utensil
- Comb hair - Use arm at shoulder level
- Carry 10 lb at side - Dress
- Sleep on affected side - Pull
- Use hand overhead - Throw
- Lift

AGE	DISTRIBUTION	PERCENTAGE
21-30	14	35%
31-40	16	40%
41-50	10	25%
	40	100%

Age Distribution

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## SEX WISE DISTRIBUTION:



85% fractures were due to RTA, 10% due to fall, 5% pathological fracture. All fractures were simple in nature.

The upper arm was X-rayed in two planes to confirm fracture healing and integrity of implants. Traffic accident was the mechanism of injury in 24 cases and a history of fall in the rest. Eight patients (10%) had associated injuries like # clavicle, supracondylar # humerus, Colle's #, Pelvic # which were treated accordingly. There were 14 left-sided humeral fractures and 26 right-sided ones. Thirty fractures (75%) were localized in the middle third, 6 (15%) in the upper 1/3rd, and 4 (10%) in the distal third. A minimum length of 3-4 cm of the distal fragment was considered necessary for stable fixation.

**PROCEDURE:** It was performed under general anaesthesia. Patient was placed in supine position with sandbag under the scapula. Lateral incision about 3-4 cms is taken from the angle of acromion downwards over the deltoid, 0.5 cm posterior to bicipital groove. Advance the curved awl medially, inferiorly and posteriorly. Confirm the placement in image intensifier. Drill the point of entry 2-3cms long, 1 mm > selected nail. Nail is aligned to jig. With the help of guide wire length of the nail measured intra-operatively. Aligned nail is inserted into the point of entry till it

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reaches the fracture site, confirmed with C- arm. Fracture reduction is done. Nail passed gently through the fracture site till it reaches 2-3 cms form the tip of olecranon fossa. Through the proximal drill guide the proximal hole of the nail is confirmed. With the help of 2.7mm trocar to T handle Jacob check, make a nick in the cortex and drilled with 2.7mm drill bit till it pierces both the cortices. Insert 4mm proximal screw through the sleeve into the proximal locking hole, entry and position is confirmed with C- arm.

**DISTAL LOCKING:** 1 cm transverse incision centered over the slot in the nail with 2.7mm trocar to T handle jacob check, drill parallel to the distal slot of the nail with help of C-arm. Insert 4mm screw in the slot of the nail. Confirm with C-arm.

Postoperatively, the arm was suspended in an envelope sling and the patient was advised to flex the ipsilateral elbow from the first postoperative day as many times a day as possible. Strict advice was given against any attempt at external rotation of the arm for the first 4 weeks. Sling was disregarded after a month, and the patient started active external rotation along with muscle strengthening exercises. At 6 weeks, exercises to improve external rotation were initiated that usually lasted for 2-3 weeks. Assisted forward flexion of the shoulder was encouraged from day 1 with care not to perform simultaneous external rotation of the affected arm. Further mobilization of the shoulder was done according to a protocol for cuff tear repair. The assessments of function were made at the latest postoperative visit & followed up to 2 years.

**RESULTS:** Postoperative radiographs showed a near anatomical fracture reduction in 40 patients. The patients were followed up at three, six and twelve months. The fracture consolidated in 4 months. No perceptible shortening was noted. Two cases had shoulder impingement at the site of insertion which was relieved by removal of the nail after fracture union in 1 case & by enhancement of the nail that has been pushed downwards in the other case. Two cases had superficial infection which was treated by appropriate antibiotics. One case had delayed union which was managed by bone marrow infusion locally at the delayed union site. We had non-union in two cases which was due to the primary distraction and implant breakage. Two patients had radial nerve neuropraxia which recovered eventually without any complications. Two patients lost follow up after 8 months. The average elbow flexion movement was between 4 degrees short of full extension to an average flexion of 130 degree. Shoulder abduction averaged 88 degrees, external rotation of 54 degrees and internal rotation of 68 degrees was noted.

TIME OF RADIOLOGICAL UNION		
NO. OF PATIENTS	TIME-WKS	%
16	6	40%
20	8	50%
2	10	5%
2	14	5%

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**DISCUSSION:** The patients mean age is 35.5 years (range being 21-50 yrs.) and maximum number of patient being 40% between 21-30 yrs and is the age of maximum activities. Bell et al(1985) reported RTA as cause in 73%<sup>2</sup> and Balfour et al(1982) reported as 21-30yrs being the maximum number of patients.<sup>1</sup>

In our series in all 40 patients we used antegrade nailing as a method of choice with unreamed interlocking humeral nails. The average time taken for fracture healing was 8.6weeks. Robinson (1992) reported average time of union 8-10 weeks<sup>9</sup> with seidal nailing.<sup>10,11</sup> Naimen et al (1987) reported average time of union to be 11 weeks.<sup>2</sup> So we feel fracture union is faster in interlocking method. We have got union rate of 95% whereas Bell reported union rate of 94% with DCP.<sup>2</sup> Seidal reported 100% union in 4 series of 80 fractures treated by interlocking nails<sup>12</sup> Stern (1984) reported 1 case of radial nerve palsy in a series of 70 # treated by interlocking which is 1.4%. Shoulder stiffness is seen in 2 patients i.e., 10% and regained abduction 100\* by 10th week and later on full movements regained. Some authors recommend open technique while passing distal interlocking screw from lateral aspect of humerus to avoid injury to the radial nerve and posterior coetaneous nerve of forearm.<sup>13</sup> We encountered no such problem as we locked the nail with distal interlocking screw from anterior to posterior direction. Mc-Carmack et. al. Reported 14.2% of his patients developing radial nerve palsy, mostly neuropraxia, with full recovery in post-operative period. Hems et.al reported 9.5% radial nerve palsy during manipulative reduction of distal third fractures and claimed full recovery in his patients.

**CONCLUSION:** Unreamed humeral interlocking is one of the best methods of proximal 1/3<sup>rd</sup> & middle 1/3<sup>rd</sup> humeral diaphyseal #s with good results.

## BIBLIOGRAPHY:

1. Balfour, G.W., Mooney, Vert and Ashby, M.E. (1982): Diaphyseal Fractures of the Humerous Treated with a Ready-made Fractures Brace, *J. Bone and Joint Surg.* 64-A: 11-13, Jan.
2. Naiman P.T., Schein A.J., Siffert R.S. (1987): Use of ASIF compression plates in selected shaft fractures of the upper extremity. *Clin Orthop.* 71: 208-16.
3. Bell M.J., Beachamp C.G., Kellam J.K. and McMurty R.V. (1985): The results of plating humeral shaft fractures in patiets with multiple injuries. *J. Bone joint Surg.*67: 293-296.
4. Ingman AM, Waters DA: Locked Intramedullary nailing of humeral shaft fractures. Implant design, surgical technique, and clinical results. *J. Bone Joint Surg Br.:* 1994, 76 (1); 23-9.
5. Gregory PR, Sanders RW: Compression plating versus intramedullary fixation of Humeral shaft fractures. *J Am Acad Orthop. Surg,* Jul1997; 5 (4): 215-223.
6. Zuckerman JD, Koval KJ: Fractures of the Shaft of the humerus. In: Rockwood CA, Green DP, Bucholz RW, Heckman JD, eds. *Rockwood and Greens. Fractures in adults 4th edition Philadelphia, Pa: Lippincott-Raven;*, 1996, 1025-1053.
7. Foster RJ, Dixon GL Jr, Bach AW, et al: Internal fixation of fractures and non-unions of the humeral shaft. Indications and results in a multi-center study. *J Bone Joint Surg Am Jul;* 1985, 67 (6): 857-64.
8. Beaty JH: Humeral shaft fractures. In: *Orthopaedic knowledge update: Rosemont, III: American Academy of Orthopaedic surgeons: 1999, 278-286.*

# ORIGINAL ARTICLE

9. Robinson C.M. et al 1992: Locked nailing of humeral shaft fractures. J.B.J.S. 66A. 552-556;
10. Riemeer B.L., Butterfield. S.L., D' Ambrosia. R. and Kellam. J. (1991): Seidel intermedullary nailing of humeral diaphyseal fractures – A preliminary Report., Orthopaedics. 14: 239-46;
11. Seidel H (1989): Humeral locking nail – A preliminary Report. Orthopaedics.12: 219-26.
12. Crenshaw AH: Shaft of humerus. In: Canale ST, ed Campbell's operative Orthopaedics 9th ed. St Louis, Mo: Mosby: 1998, 2296-2309.
13. 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 (1): 84-9.

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Date of Submission: 12/11/2014.  
Date of Peer Review: 13/11/2014.  
Date of Acceptance: 26/11/2014.  
Date of Publishing: 29/12/2014.