Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublisher.com

Orthopedics

A Comparative Study of Plating versus Nailing In the Treatment of Humerus Shaft Fractures

B Mahender Reddy*
Associate Professor, Department of Orthopedics, Apollo Institute of Medical Sciences, Chittoor, Andhra Pradesh, India

Original Research Article

***Corresponding author**
B Mahender Reddy

Article History
Received: 07.04.2018
Accepted: 18.04.2018
Published: 30.04.2018

DOI:
10.21276/sjams.2018.6.4.54

Abstract: Fractures of humerus shaft are very common; it is one of the major causes of morbidity in patients with upper limb injuries. Surgical treatment of such fractures is commonly done in order to obtain better alignment and to prevent complications. The aim of the present study was to compare the results of open reduction and internal fixation with DCP and close interlocking nail, in the treatment of humerus shaft fractures. This study was conducted in Department of Orthopedics, Apollo Institute of Medical Sciences, Chittoor, and Andhra Pradesh. Institutional Ethical committee permission was obtained for the study. The inclusion criteria were patients aged 21 to 70 years of either sex. A total 59 number of patients were included in the study. 30 cases were treated with IL nail and 29 cases treatment was done with plating. Postoperative Results were evaluated according to NEERS classification. Results: The study involved n=59 subjects. The most common age group involved in humeral shaft fractures was 31-40 years accounting for 44.06% of all cases. The male to female ratio was 7.5: 3. The IL nail treated patients saw excellent results in 26.67% and good results were in 43.33% of cases. Fair results were seen in 23.33% cases and poor results were seen in only 6.67% cases. The results of compression plating in 14 cases 48.27% the results were good and in 31.03% cases were having excellent results. Fair results were found in 13.79% of cases and poor was result was seen in 6.9% of cases. Conclusion: It can be concluded that the compression plates had better outcomes and fewer incidences of complications as compared to IL nailing. However, this should not discourage surgeons to use the IL nailing in cases whenever it is indicated. Judicious selection of cases based on the type of fractures for both techniques can provide optimal results for the patients.
Keywords: Fractures, Humerus, Compression plate, Interlocking nail

INTRODUCTION

Fractures of the shaft of the humerus are common and account for 1-3% of all fractures and approximately 20% of all humeral fractures [1]. The incidence of humeral shaft fractures is gradually increasing and reaches high in old ages [2]. Most of the fractures of the humeral shaft are closed fractures especially in elderly patients which results from simple falls. Simple fractures are common and approximately 60% of fractures are through the middle and 40% of fractures are through proximal part of the shaft. Humeral shaft fractures result from direct or indirect trauma. Transverse or comminuted fractures will be caused by direct blows to arm, falls on an elbow with the arm abducted exerts a bending force results in oblique or transverse fractures. Twisting injuries cause oblique and spiral fractures. Humeral fractures also occur in patients with multiple injuries often following RTA or falls from heights [1]. The incidence of radial nerve palsy has been reported in 6-8% of cases and more commonly seen in middle and distal shaft fractures [3, 4]. Most of the humeral shaft fractures can be managed conservatively without operation with good or excellent results [5, 6]. Many devices have been used for the treatment of humeral diaphysis fractures that includes dynamic compression plates [DCP] [7]. It is advocated that compression plating offer the better treatment for humeral shaft fractures that require surgical intervention [8]. However since this is an open procedure there are risks involved in any musculoskeletal procedure that includes radial nerve injury, Infections, and non-union. Therefore intramedullary fixations have become increasingly popular offering load sharing biomechanics especially in osteoporotic bones and also being less invasive [9]. Acceptable alignment of humeral shaft fractures are considered to be 3cm of shortening, 30° of varus/valgus angulation and 20° of anterior/posterior angulations [10, 11] There are no set values for malrotation but compensatory shoulder motion allows for considerable tolerance of rotational deformity [11]. With this background, we in the present study tried to evaluate the results of treatment of fractures of the shaft of the humerus in male and female patients when

they were treated with DCP and IL Nail and tried to evaluate the outcomes of treatment.

MATERIALS AND METHODS

This study was conducted in Department of Orthopedics, Apollo Institute of Medical Sciences, and Chittoor Andhra Pradesh. Institutional Ethical committee permission was obtained for the study. The study was conducted from Jan 2016 to May 2017. The patients involved in the study were informed regarding the procedure in their local language and a written consent was obtained. Only those participants were included those who were willing to voluntarily participate in the study. The inclusion criteria were patients aged 21 to 70 years of either sex. A total 59 number of patients were included in the study. 30 cases were treated with IL nail and 29 cases treatment was done with plating. All cases were evaluated pre-operatively Radiographs Anteroposterior (AP) and lateral views were obtained first. The shoulder and elbow will be included in the radiographs CT and other scans were advised only if indicated but not in all cases. After X-rays, the fractures were classified and managed accordingly with intramedullary nails or DCP all the cases were done under General Anesthesia. For Interlocking nail, a 2-3 cm incision was given an anterolateral aspect of acromion in the direction of deltoid fibers split fascia and then rotator cuff interval. The start point is between greater tuberosity and sulcus in the center of the humeral head. The fracture was reduced using traction, varus/vagus and rotational force applied manually. Sequential reaming done over the guide wire, insert the nail over guide wire following lateral bend targeting guide 30° anterior to table mallet in using strike plate, bury nail 7-10mm. screws were inserted with targeting jig. Distal locking is done by free hand technique fracture compression given by back hammering and wound closed A.S.D done crepe and arm sling applied.

For DCP patients was placed in supine position with shoulder fully adducted and forearm lying on the chest. The incision was given proximally and distally to fracture site. Skin and subcutaneous tissues were incised; deep fascia was incised in the line of skin incision. Biceps muscle was identified and retracted exposing brachialis and brachioradialis muscle. Radial nerve was identified and explored if required. Muscles were lifted with periosteal elevator, fracture reduced and a plate of appropriate sized fixed screws. Wound washed with saline and betadine and stitched in layers underdrain, crepe bandage applied arm sling given. Postoperatively limb was elevated over a pillow. Broad-spectrum antibiotics IV were along with analgesic and anti-inflammatory. Physiotherapy was advised after next day in the IL nail patients and after 12 days in DCP patients after the removal of sutures. Physiotherapy included weight-bearing as tolerated, physical therapy, the range of motion exercises to elbow/wrist/hand, pendulums for the shoulder. Postoperative follow-up and radiographs were taken and clinical examinations for tenderness, infections, pain, and movements were recorded. Results were recorded for NEERS Classification [12].

RESULTS

The study involved n=59 subjects of different ages and sex. The most common age group involved in humeral shaft fractures was 31-40 years accounting for 44.06% of all cases. The male to female ratio was 7.5: 3. The second commonly involved age group was 21-30 years and the number of patients involved in humeral shaft fracture was 17 (12 male and 5 female) 28.81%. The 41-50 years contributed 12 patients 20.34% followed by 51-60 and 61-70 years 5.1% and 1.6% respectively given in table 1.

Table-1: showing the age and sex wise distribution of cases involved in the study

Age group	Male	Female	Total	Percentage
21 – 30	12	5	17	28.81
31 – 40	18	8	26	44.06
41 – 50	9	3	12	20.34
51 – 60	2	1	3	5.1
61 - 70	1	-	1	1.6
Total	42	17	59	100

Following the inclusion criteria and based on the X—rays the classification of fractures was done based on the revised AO/OTA classification (2018) [13] and the treatment was decided and 29 patients were treated with Compression plates and 30 patients were treated with Interlocking nail for the fractures of shaft of humerus given in table 2.

Table-2: Showing the methods of treatment done

	Male	Female	Total
DCP	20	9	29
IL Nail	22	8	30
Total	42	17	59

Out of the 30 patients treated with IL nail, there were complications in few cases, there was open of splinter at the fracture site in 1 (3.3%) case. There was an infection in one case of a male it responded well to antibiotics and dressing and later healed well and there was delayed union of fracture in 1 case of male and 1 female. Bending of the nail was in one case and Restriction of shoulder movement in 1 female case. Therefore the total number of complications in IL nail was 20% of cases see table 3.

Table-3: complications of IL Nail

Complications	Male	Female	Total	Percentage
Open of splinter at the fracture site	1	0	1	3.3
Radial Nerve Palsy	0	0	0	0
Infection	1	0	1	3.3
Delayed union [>16 weeks]	1	1	2	6.7
Bending of Nail [Nonunion]	1	0	1	3.3
Restriction of Shoulder [ROM]	0	1	1	3.3
Restriction of Elbow [ROM	0	0	0	0
Total	4	2	6	20

The total number of cases treated by the by compression plates was 29 out of that 13.7% of cases had complications. Radial nerve palsy and non-union was in one case each Delayed union was seen in 2 cases seen in table 4.

Table 4: complications of plating

Complications	Male	Female	Total	Percentage
Radial Nerve Palsy	0	1	1	3.4
Infection	0	0	0	0
Delayed union [>16 weeks]	1	1	2	6.9
Nonunion	1	0	1	3.4
Implant Failure	0	0	0	0
Total	2	2	4	13.7

The Criteria for evaluating functional results Rodríguez– Merchán criteria [14] was used for final results. The IL nail treated patients saw excellent results in 26.67% and good results were in 43.33% of cases. Fair results were seen in 23.33% cases and poor results were seen in only 6.67% cases given in table 5.

Table 5: Results of IL nail [Rodríguez– Merchán criteria] [14]

Result	Male	Female	Total	Percentage
Excellent	6	2	8	26.67
Good	9	4	13	43.33
Fair	5	2	7	23.33
Poor	2	0	2	6.67

The results of compression plating were done was done by Rodríguez– Merchán criteria [14]. In 14 cases 48.27% the results were good and in 31.03% cases were having excellent results. Fair results were found in 13.79% of cases and poor was result was seen in 6.9% of cases given in table 6.

Table-6: Results of Plating [Rodríguez– Merchán criteria] [14]

Result	Male	Female	Total	Percentage
Excellent	6	3	9	31.03
Good	10	4	14	48.27
Fair	3	1	4	13.79
Poor	1	1	2	6.9

DISCUSSION

In the present study, we tried to evaluate the results of treatment of humeral shaft fractures with DCP and IL nail in male and female patients of different age groups. There was over all male preponderance, and male to female ratio was 7.5: 3. In a study by Pratap Singh *et al*. [15] found the male to female ratio of 7:3 and similar results were observed by Reddy *et al*. [16] agreeing with our results. More numbers of the male are usually seen in fractures because of their routine outdoor activities and involvement in RTA. In the present study (35 cases)

59.32% of cases were due to RTA. The management of diaphyseal fractures has remained controversial [17]. Conservative treatments have been advocated especially in cases of simple fractures of the shaft of the humerus and the outcomes have been good as the shaft will unite irrespective of the type of fracture and non-union is not an issue as the blood supply is abundant [18]. There is an increasing demand today from the patients for early mobilization and this is one of the reasons why surgical approaches have been utilized in many cases. In the present study, we evaluated the outcomes of the treatment of fractures of the humeral shaft by compression plates and IL nail. In the study, we found that the patients treated with compression plates had Excellent and good results in 79.3% of cases and complications were noted in 13.7% of cases. Studies have shown that the dynamic compression plates have stood the test of time as an excellent method of stabilizing of transverse diaphyseal fractures of the humerus [19, 20]. The plate produces compression at the site of fractures and produces osteosynthesis [21]. The main advantage of plate osteosynthesis is that allows anatomical reduction of fractures direct viewing and inter-fragment compression of the fracture and the chance to explore and isolate radial nerve [22]. Some studies have considered the outcomes to be superior to intramedullary nailing and they have preferred this technique for the treatment of humeral shaft [23-25]. Although it appears from the present study and other studies that the compression plates have better outcomes yet this technique is not suitable for segmental fractures, pathological fractures, comminuted fractures, gross osteoporosis, non-union and fractures of the proximal or distal shaft of the humerus. The presence of surgical scars and the potential of the opening of the central point of fractures with loss of hematoma at fracture site are the other disadvantages of this technique [26]. Therefore in several cases we have to use an interlocking nail for the treatment, in the study we found that that the patients treated with IL nail had excellent and good results in 70% of cases and complications were seen in 20% of cases. IL nails have become popular due to their load-sharing properties and better aesthetic results due to smaller incisions. The load sharing properties are very useful, especially in osteoporotic patients [27]. The preservation of fracture hematoma, soft tissue and periosteum around the fracture that occurs with close nailing has been causes of high rates of good results with no risk of radial nerve palsy. They are also associated with low rates of infections and good pain relief in pathological fractures. It is considered as an acceptable alternative for the treatment of acute humeral shaft fractures in multi-trauma patients [9]. Several studies also demonstrated that the newer implants and improved techniques and locked IM nailing have high success rates comparable to other methods [14, 28, 29]. In these studies the incidence of non-union was approximately 6%, the rate of infection was 2%, and incidence of radial nerve palsies in 3% cases [29-33]. Agreeing with our results here we found the incidence of non-union in 6.7% of cases incidence of infection was 3.3% and incidence of radial nerve palsy was nil.

CONCLUSION

Within the limitations of the present study, it can be concluded that the compression plates had better outcomes and fewer incidences of complications as compared to IL nailing. However, this should not discourage surgeons to use the IL nailing in cases whenever it is indicated. Judicious selection of cases based on the type of fractures for both techniques can provide optimal results for the patients.

REFERENCES

1. Mohammed Saqib Zafar, Keith Porter. Humeral shaft fractures: a review of literature.Trauma 2007; 9: 273–82.
2. Ekholm R, Adami J, Tidermark J, Hansson K, Tornkvist H, Ponzer S. Fractures of the shaft of the humerus. An epidemiological study of 401 fractures. J Bone Joint Surg Br 2006;88: 1469–73.
3. Garcia A, Maeck BH. Radial nerve injuries in fractures of the shaft of the humerus. Am J Surg 1960; 99:625–27.
4. Williams PL, Warwick R, Dyson M, Bannister LH, eds. 1989. Gray's anatomy, 37th ed. New York, NY: Churchill Livingstone, 406–10.
5. Mast JW, Spiegel PG, Harvey JP, Harrison C. Fractures of the humeral shaft. Clin Orthop. 1975;12:254-62.
6. Sarmiento A, Kinman P, Galvin E. Functional bracing of fractures of the shaft of the humerus. J Bone Joint Surg. 1977; 59:596-601.
7. Jupiter JB, Wyss H. Stable fixation of osteoporotic fractures and nonunions in the upper limb‐life before the "locking plate". Acta Chir Orthop Traumatol Cech 2010;77:361‐64.
8. Niall DM, O'Mahony J, McElwain JP. Plating of humeral shaft fractures – has the pendulum swung back? Injury 2004;35:580‐86.
9. Ramji Lal Sahu, Rajni Ranjan, Ajay Lal. Fracture Union in Closed Interlocking Nail in Humeral Shaft Fractures Chinese Medical Journal June 5, 2015;128 (11):1428-32.
10. Klenerman L. Fractures of the shaft of the humerus. J Bone Joint Surg 1966; Br 48: 105–11.
11. Beaty JH. Humeral shaft fractures. In: Tornetto, Saumgaertnes, ed. Orthopedic knowledge update American Academy of Orthopaedic Surgeons:Rosemont 1999, Ill, 278–86.
12. Neer CS, 2nd Displaced proximal humeral fractures: I. Classification and evaluation. J Bone Joint Surg Am. 1970;52:1077–89.
13. Kellam, James F, Meinberg, Eric G, Agel, Julie More. Journal of Orthopedic trauma 2018;32: S1-S10.

14. Rodríguez-Merchán EC. Compression plating versus Hackethal nailing in closed humeral shaft fractures failing nonoperative reduction. J Orthop Trauma. 1995;9(3):194–197.
15. Partap Singh, Vikas Gandhi, Deepak Bansal. Comparative Study of Compression Plating vs Interlocking Nail in Fracture Shaft of Humerus. Journal of Contemporary Medical research 2016; 3(11):3385-88. International
16. Reddy BJ, Athmaram M, Swaroop VS. A clinical study of fixation of fracture of shaft of humerus with interlocking nail. JEMDS 2015;4:2172-79.
17. Koch PP, Gross DF, Gerber C. The results of functional (Sarmiento) bracing of humeral shaft fractures, J Shoulder Elbow Surg 2002; 11(2): 143-50.
18. Sarmiento A, Zagorski JB, Zych GA, Latta LL, Capps CA. Functional bracing for the treatment of fractures of the humeral diaphysis. J Bone Joint Surg Am 2000;82:478‑86.
19. McCormack RG, Brien D, Buckley RE, McKee MD. Fixation of fracture of the shaft of humerus by dynamic compression plate or intramedullary nail. J Bone Joint Surg 2000;82:336-9.
20. Gupta R, Raheja A, Sharma V. Limited contact dynamic compression in diaphyseal fractures of the humerus. Acta Orthop Scand 2000; 71:471-74.
21. Sarmiento A, Jagorski JB, Zych GA. Functional bracing for the treatment of the fractures of humeral diaphysis. J Bone Joint Surg. 2000; 82:478-86.
22. Ali E, Griffiths D, Obi N, Tytherleigh-Strong G, Van Rensburg L. Nonoperative treatment of humeral shaft fractures revisited, J Shoulder Elbow Surg. 2015; 24(2): 210-14.
23. Ma J, Xing D, Ma X, Gao F, Wei Q, Jia H, Feng R, Yu J, Wang J. Intramedullary nail versus dynamic compression plate fixation in treating humeral shaft fractures: grading the evidence through a meta-analysis, PLoS One. 2013; 8(12): e82075.
24. Dai J, Chai Y, Wang C, Wen G. Dynamic compression plating versus locked intramedullary nailing for humeral shaft fractures: a meta-analysis of RCTs and nonrandomized studies, J Orthop Sci. 20014; 19(2): 282-91.
25. Kurup H, Hossain M, Andrew JG. Dynamic compression plating versus locked intramedullary nailing for humeral shaft fractures in adults, Cochrane Database Syst Rev. 2011; (6): CD005959.
26. Okcu G, Aktuglu K. Management of shotgun-induced fractures of the humerus with Ilizarov external fixator, J OrthopTraumatol 2004; 2: 92-7.
27. Robinson CM, Bell KM, Court-Brown CM, McQueen MM. Locked nailing of humeral shaft fractures. Experience in Edinburgh over a two-year period. J Bone Joint Surg Br 1992; 74(4): 558-62.
28. Ingman AM, Waters DA. 1994. Locked intramedullary nailing of humeral shaft fractures. Implant design, surgical technique, and clinical results. J Bone Joint Surg Br 76: 23–29.
29. 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.
30. Sims SH, Smith SE. Intramedullary nailing of humeral shaft fractures. J South Orthop Assoc 1995; 4: 24–31.
31. Brumback RJ. The rationales of interlocking nailing of the femur, tibia, and humerus. Clin Orthop 1996; 324: 292–320.
32. Crates J, Whittle AP. Antegrade interlocking nailing of acute humeral shaft fractures. Clin Orthop 1998; 350: 40–50.
33. Tomé J, Carsi B, García-Fernández C, Marco F, López-Durán LS. Treatment of pathologic fractures of the humerus with Seidel nailing. Clinical orthopaedics and related research. 1998 May(350):51-5.