



COMPARATIVE STUDY OF HUMERUS INTRAMEDULLARY INTERLOCKING NAIL AND DYNAMIC COMPRESSION PLATE FOR THE MANAGEMENT OF HUMERUS DIAPHYSEAL FRACTURES

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ABSTRACT **Background:** Plate and screw fixation has always been the more common surgical treatment of humeral shaft fractures. However, intramedullary nailing (IMN) of the humerus has gained in popularity over the last two decades. So aim of this study was to compare the results of the humerus intramedullary nail and dynamic compression plate for the management of diaphyseal fractures of the humerus.

Material and Methods: The sample is chosen depending on strict inclusion and exclusion criterion. In the available sample size of 60, of which 30 patients (group A) underwent open reduction and internal fixation with dynamic compression plate and remaining 30 patients (group B) underwent closed reduction and internal fixation with interlocking intramedullary nails.

Results: There is no significant difference found in functional outcome between group A (Plating) and group B (nailing). Infection was not encountered in any of the cases due to strict adherence to surgical aseptic precautions and appropriate antibiotic.

Conclusion: In our study there were no significant differences in the functional outcome measures in the two mentioned procedures. Hence both the procedures are safe with reliable results under appropriate surgical expertise. For patients requiring surgical treatment of a humeral shaft fracture, intramedullary nailing and compression plating both provide predictable methods for achieving fracture stabilization and ultimate healing.

KEYWORDS :

Introduction

The humeral shaft is the long middle section of the upper arm bone (humerus). Fractures of the humeral shaft account for just over one per cent of all adult fractures. The annual incidence of these injuries has been reported as 10 and 14.5 per 100,000 people. In the United States, nearly 66,000 fractures of the humeral shaft occur each year. There is a bimodal distribution for these fractures with a peak in young men resulting from high energy trauma and a larger peak in older women due to falls.^{1,2} Plate fixation when combined with open reduction, which provides direct fracture visualization, allows anatomical reduction and rigid fracture fixation (using dynamic compression plates) Intramedullary nails can be either flexible or rigid and locked or not. Flexible nails are not locked but rigid nails are locked at both proximal and distal ends. Nailing is performed by exposing either the upper or lower end of the humerus away from the fracture site and inserting the nail into the medullary canal from the top of the shoulder (ante grade nail) or the bottom (retrograde nail). The nail is then stabilized by interlocking screws in both ends.^{3,4} Astatically locked nail (a nail with interlocking screws at either end for rotational stability) provides good rigidity against tensional forces, maintains length and preserves soft tissues at the fracture site. The aim of all currently used fixation systems is stable fixation, allowing early mobilization and shortened recovery. Both treatment methods have technique-specific complications.⁵

Some conditions, where operative treatment is indicated include failed conservative treatment.⁶ Polytrauma patients with multiple injuries, associated injuries in the same extremity e.g. floating elbow. Segmental fractures, Pathological fracture, Fracture associated with major vascular injury. Holstein Lewis fractures/spiral fractures of lower third humerus shaft, Open fractures. Obesity. Thus aim of this study was to compare the results of the humerus intramedullary nail (IMN) and dynamic compression plate (DCP) for the management of diaphyseal fractures of the humerus.

MATERIALS AND METHODS

The proposed study was undertaken in the Department of Orthopedic. Consecutive patients with fracture of the shaft of the humerus requiring surgical stabilization were randomized using a sealed

envelope to undergo fixation with either DCP or IMN. The operating surgeons were experienced with both procedures. The fractures were located between 2 cm distal to surgical neck or 3 cm proximal to the Olecranon fossa.

INCLUSION CRITERIA includes

Male and female patients aged >18 yrs. Humeral shaft fractures treated within 1 week by nailing and plating, patients with grades 1 and 2 open fractures,

Poly trauma, unstable fractures,

EXCLUSION CRITERIA includes patients who had fractures with epiphyseal plate open, fracture line extending into the metaphysis, patients with grade 3 compound fractures, patients with pathological fractures, patients with neglected fractures of the humerus, those with refractures of the humerus. After being randomized, the patients were treated surgically by DCP or IMN. DCP was implanted through an anterolateral or posterior approach. The plates used were AO 4.5 mm DCP plates, with the length depending upon the type of fracture.

Fixation of eight to ten cortices proximal and distal to the fracture was obtained in every patient. The Russell Taylor IMN was used, and only ante grade nailing was done because of greater familiarity with the method among the surgeons. Proximal and distal locking and reaming was done in all cases. The surgery was carried out under general anaesthesia in all patients.

All patients had a loading dose of antibiotics at induction and of prophylactic antibiotics for 48 hours. All patients were discharged after 48 hours. Stitch removal was done at 12-15 days in all patients. From the first day, isometric exercises of the muscles of the upper and lower arm were carried out. All patients were followed up in outpatient clinics at 6 weeks and at 3, 6 and 12 months. Clinical and radiological assessment was done at each visit. Six months was chosen as a minimum as by that time healing of the fracture would normally have taken place, and functional improvement would be starting to level off. The outcomes were assessed in terms of functional outcome, ability to return to previous jobs after 6 months, union time, union rate and the incidence of complications. Functional outcome was assessed using

the American Shoulder and Elbow Surgeons' Score. Results were analysed using the independent samples t test, chi-square test. A P<0.05 considered as significant.

Results :

Table 1:

Parameters		Group A (n=30)	Group B (n=30)	P Value
Age		31.78 ± 9.51	49.27±11.25	<0.0001
Sex	Male	15 (50%)	16 (53.33%)	>0.05
	Female	15 (50%)	14 (46.67%)	
Mode of injury	RTA	17 (56.67%)	16 (53.33%)	>0.05
	Fall	13 (43.33%)	14 (46.67%)	
Habits	Smoking	2 (6.67%)	0	-
	Tobacco	2 (6.66%)	0	
	No	26 (86.67%)	30 (100%)	
Side	Right	18 (60%)	16 (53.33%)	>0.05
	Left	12 (40%)	14 (46.67%)	
Radial Nerve injury	Yes	5 (16.67%)	2 (6.67%)	>0.05
	No	25 (83.33%)	28 (93.33%)	
Approach	Antegrade	0	30 (100%)	-
	Anterolateral	11 (36.67%)	0	
	Posterior	19 (63.33%)	0	
Outcome	Poor (Grade IV)	1 (3.57%)	0	>0.05
	Fair (Grade III)	0	2 (6.90%)	
	Good (Grade II)	7 (25%)	3 (10.34%)	
	Excellent (Grade I)	20 (71.43%)	24 (86.21%)	

Table 1 showed that there is no significant difference found in functional outcome between group A (Plating) and group B (nailing).

Discussion:

Sixty (60) patients with diaphyseal fracture of the shaft of the humerus were randomized prospectively retrospectively and treated by open reduction and internal fixation with IMN or DCP. The criteria for inclusion were grade 1 or 2 compound fractures, Poly trauma, early failure of conservative treatment and unstable fractures.^{6,7,8} The patients with pathological fractures, grade 3 open fractures, refractures and old neglected fractures of the humerus were excluded from the study. In our study we herewith segment the patients who underwent ORIF with DCP as Group A and Patients who underwent CRIF with Interlocking nail as group B. Mode of injuries due to road traffic accidents was more in group A than group B. 70% of patients were free of any co morbid in both group A and group B. There was preponderance to right side compared to left in the ratio in group A. There was no significantly sided preponderance in group B. In group maximum of patients were non smokers compared to who consumed tobacco either in terms of smoking or chewing. In group B all patients were non smokers. In group A less patients did not had any associated injuries compared to group B. With respect to type of fractures involved oblique fracture pattern constituted common pattern of fractures in both the Groups. There a relative more communited fracture pattern in group B compared to group A. This was followed by Oblique fractures in both groups. There was less cases of radial nerve injuries in group B compared to group A.

The indications for operative treatment are open fractures, segmental fractures,

humerus fractures in Poly trauma patients, radial nerve palsy after fracture manipulation, fractures with unacceptable alignment^{9,10} The usual operative modalities used are the dynamic compression plate (DCP) and intramedullary nail (IMN). The use of the dynamic compression plate requires an extensive operation with stripping of soft tissues from the bone, complications due to the proximity of the radial nerve in the usual field of dissection and less secure fixation especially in osteoporotic bones.^{11,12}

The recent technical advances and aggressive marketing have popularized the use of the IM nail. Rockwood and Green recommend fixation of diaphyseal fractures of the humerus by the IMN, which can be inserted ante grade from the shoulder or retro grade from the elbow.^{13,14} Theoretically speaking, fixation with the IMN requires less invasive surgery, has a biomechanical advantage, acts as a load-sharing device, has less stress shielding, has less chance of refractures after implant removal and reaming can yield auto graft.

References:

- Chapman. Jens r.et al: randomized prospective study of humeral shaft fracture fixation nails versus plates journal of orthopaedic trauma march 2000 volume 14(3):162-166.
- Farragos. Anthony. fschemitsch emilth.et.al: Complications of intra medullarynailing for fractures of the humeral shaft a review jbjbs may 1999, volume 13(4):258-267.
- Chlodwiskirchoff Volker braunstein.et al:Outcome analysis following removalof locking plate fixation of the proximal Humerus.bmc musculoskeletal disorders . 2008: 9-138 doi 10.1186
- Lin.jinn md et al:Treatment of humeral shaft fractures with humeral locked nailand comparison with plate fixation trauma MAY 1998, volume 44 (5): 859-864.
- Standard.jp. Harris hwmcgwingir et al :Intra medullary nailing of humeral shaftfractures with a locking flexible nail jbjbs am 2003, 85:2103-2110.
- Bone l fractures of the shaft of the Humerus in chapman mw. ed. operativeorthopaedics volume 1philadelphia jblipincott(1988) ,221-234.
- Lin J, Hou SM, Hang YS, et al. Treatment of humeral shaft fractures by retrograde locked nailing. ClinOrthopRelat Res. Sep 1997;(342):147-55.
- Persad JJ, Kommu S, U cast or functional bracing following fractures of the shaft of humerus. Emerg Med J. May 2007;24(5):361.
- O'Donnell TM, McKenna JV, Kenny P, et al. Concomitant injuries to the ipsilateral shoulder in patients with a fracture of the diaphysis of the humerus. J Bone Joint Surg Br. Jan 2008;90(1):61-5. .
- Stern PJ, Mattingly DA, Pomeroy DL, et al. Intramedullary fixation of humeral shaft fractures. J Bone Joint Surg Am. Jun 1984;66(5):639-46.
- Lin J, Inoue N, Valdevit A, et al. Biomechanical comparison of antegrade and retrograde nailing of humeral shaft fracture. ClinOrthopRelat Res. Jun 1998;(351):203-13.
- McKee MD, Miranda MA, Riemer BL, et al. Management of humeral nonunion after the failure of locking intramedullary nails. J Orthop Trauma. 1996;10(7):492-9. .
- Mostafavi HR, Tornetta P 3rd. Open fractures of the humerus treated with external fixation. ClinOrthopRelat Res. Apr 1997;(337):187-97. .
- Pollock FH, Drake D, Bovill EG, et al. Treatment of radial neuropathy associated with fractures of the humerus. J Bone Joint Surg Am. Feb 1981;63(2):239-43.