

FUNCTIONAL OUTCOME OF ANTEGRADE AND RETROGRADE INTRAMEDULLARY INTERLOCKING NAIL FOR THE TREATMENT OF SHAFT OF HUMERUS FRACTURE - A PROSPECTIVE COMPARATIVE STUDY

Orthopaedics

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ABSTRACT

Background: Antegrade or retrograde locked intramedullary nailing are both effective treatments for humeral shaft fractures; however, these two techniques have not been sufficiently compared. In this study, mid humeral shaft fractures treated with these two strategies using the identical locking nails were evaluated for efficacy and potential risks. **Methodology:** 50 fractures in 50 patients with humerus mid-shaft fractures were randomly assigned to get either antegrade or retrograde locked nailing using sealed-envelope method in this prospective comparative research. Clinical outcomes including fracture healing time, complications, functional recovery of the elbow and shoulder, and time for functional recovery were evaluated. **Results:** There was no statistically significant difference in the time of union in this trial, with an average of 13.6 weeks in the Antegrade group and 14 weeks in the Retrograde group. The two treatment groups in the current research were similar in terms of demographics, fracture patterns, surgical indications, and treatment. The antegrade nailing patients regained functional recovery faster while comparing to retrograde nailing patients. **Conclusion:** Antegrade nailing is advised for patients with proximal fractures, young age and patients with tiny medullary canal whereas retrograde nailing is advised for fractures which are distal with broad medullary canal or prior shoulder issues. Due to less complications of elbow stiffness, shortened surgery duration, early functional recovery and since humerus generally tends to have narrow medullary canal we conclude that antegrade nailing is favoured over retrograde nailing for patients with humerus shaft fractures.

KEYWORDS

Prospective comparative study, Antegrade nailing, Retrograde nailing, Humeral shaft fracture

INTRODUCTION

There is debate about the best way to approach humeral shaft fractures. Effective conservative care has been found to produce a high rate of recovery. The literature emphasises the downsides of nonoperative therapy, such as an increased frequency of nonunion, casts not being tolerated well and prolonged immobilisation can cause shoulder stiffness [1..2]. In contrast to the past, when nonoperative treatment was considered the gold standard, there is now a belief that surgical treatment can provide superior advantages in terms of final results and patient management, especially in fractures characterised by an unacceptable reduction, the presence of an exposed or bifocal fracture, the presence of associated radial nerve palsy, or general conditions, such as polytrauma patients, that require operative treatment.

Surgical therapy is characterised by more efficient and accurate reduction, as well as rapid stabilisation, which benefits in pain relief. The goals of surgery are to reduce with length restoration and control rotations (peri-humeral muscular structures can tolerate an anterior angle of 20°, varus of 30°, and a 3 cm shortening without deterioration of functionality and morphology [3], whereas rotational defects, particularly internal rotation, are less acceptable). Other objectives are neighbouring joint stability and early mobilisation.

The literature lists a number of surgical treatment methods, including plates and screws (ORIF), external fixators, and antegrade and retrograde intramedullary nail fixation (CRIF). The use of locked intramedullary nails in conjunction with modern technology has enabled us to achieve better outcomes than in the past, and several studies now highlight the excellent results in the treatment of these fractures with this technique [4-5]. This approach, which requires little surgical access, offers the advantages of conserving the fracture site as well as maintaining vascularity and biologic bone repair while exposing orthopaedic surgeons to a minor radiation load.

The current study evaluated the functional and radiological results of patients who underwent antegrade or retrograde nailing for humerus shaft fractures.

MATERIAL AND METHODS

This is the prospective comparative study to analyse the functional outcome of shaft of humerus fracture treated by antegrade and

retrograde nailing. This study was conducted in Aarupadai Veedu Medical college and Hospital, Pondicherry from June 2019 to October 2022. This study includes 50 patients who sustained shaft of humerus fracture

In this study patient age ranged from 20-70 years where majority of patients were aged between 40 to 60 years (60%) out of 50 patients 39 were affected on right side and 11 were affected on left side. The maximum number of patients were male (76.0%) and 24% of patient were female. The result shows the majority of patient had injury due to accidental fall (54%) whereas 46% of patient had injury due to RTA. In our study most of the patient had spiral fracture (66%) and 22% of people had transverse fracture and 8% of people had oblique fracture and 2% of people had comminuted fracture. System of Postoperative Scoring: Clinical Evaluation: - Maintaining a constant DASH score for the shoulder and elbow

Surgical Technique

Following a pre-operative review, all procedures were performed under regional anaesthesia, which might involve spinal or epidural anaesthesia at the anaesthetist's discretion.

Antegrade Nailing

The patient placed in beach chair position head is moved to the contralateral side to increase shoulder exposure, and a sand bag is put beneath the scapula to elevate the shoulder off the table. A distal longitudinal 2 to 3 incision is performed from the most lateral region of the acromion and The deltoid fascia is incised along the skin incision line and deltoid muscle fibres split in line with its fibres, sub acromial bursa cleared then supraspinatus tendon incised. Mark the entry portal with k wire, bone awl introduced under C-arm control just medial to the greater tuberosity. A guide wire is inserted through the entry portal in the proximal fragment and is passed through the fracture site to the distal fragment after achieving closed reduction under fluoroscopy guidance. With the cannulated reamers the shaft is sequentially reamed till cortical chatter is heard. The appropriate sized nail is inserted and an image intensifier is used to assess the alignment and rotation of the fracture site. The proximal interlocking bolt is inserted using a proximal targeting device and distal interlocking bolt is inserted using the free-hand technique with an image intensifier. Thorough wound wash is given and wound closed in layers and sterile dressing is applied.

Retrograde Nailing

The patient is placed in either a lateral or prone position, depending on the surgeon's preference. An overhead traction can be used to suspend the limb. A posterior midline technique is used to access the distal end of the humerus. The distal end of the humerus is accessible by a midline incision that divides the triceps tendon. 2.5 to 3 cms proximal to the olecranon fossa, a 3 cm oval window is produced. The use of a burr aids in the creation of the entrance point. To avoid the creation of sharp edges, care should be made to reduce the stress-inducing impact. The same nail used for antegrade nailing is used for retrograde nailing. The nail must be navigated at the fracture location while being guided by an image intensifier. Under image control, proximal screw of appropriate size is transmitted from lateral to medial. Injury to the joint surface or the axillary nerve must be avoided. distal locking is accomplished with the use of a zig and screw of appropriate size is passed from posterior to anterior. Thorough wound wash is given and wound closed in layers and sterile dressing is applied.

Postoperative Protocol

The patient was given a bulky dressing with arm sling for the first 2 to 3 days. On the second postoperative day, shoulder pendulum exercises was started with all patients. When the pain was relieved, active assisted shoulder and elbow ROM exercises were started. Wound checks on the third, sixth, and ninth PODs were carried out. On the 11th post-operative day, the sutures were removed. Patients were clinically and radiologically monitored at 6-week, 3-month, 6-month, and yearly intervals until the fracture healed completely while assessing them using the DASH score for shoulder and elbow at every visit.

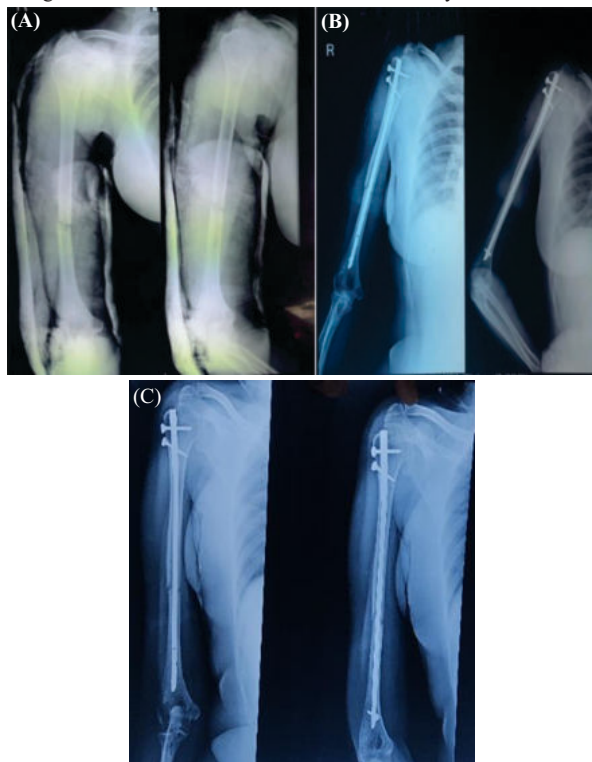


Fig 1: A case of Antegrade Nailing (A) Pre OP X-ray (B) Post Op X-Ray (C) Follow up X-ray

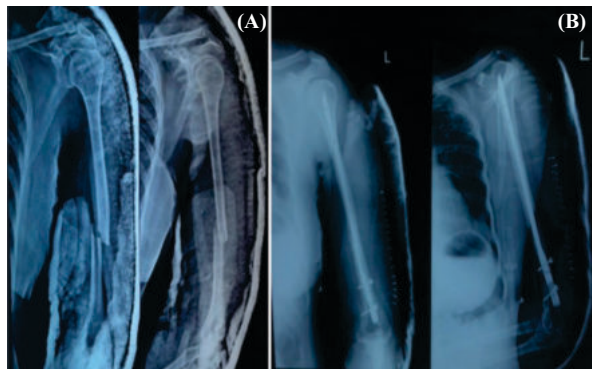


Fig 2: A case of Retrograde Nailing (A) Pre op X-ray (B) Post op X-ray (C) Follow up X-ray

RESULT

In this study 50 Patients was treated (25) antegrade and (25) retrograde nailing for shaft of humerus fracture. 76% of the total patients were males and 24% of them were females in both Antegrade and Retrograde. Average age of Antegrade patients was 47.6 and Retrograde patients was 50. Most of the cases affected on right side fracture than the left side fracture in both Antegrade and Retrograde. Major cause of injury was accident fall and Road traffic accident. There was no statistically significant difference in the time of union in this trial, with an average of 13.6 weeks in the Antegrade group and 14 weeks in the Retrograde group. The maximum operating time falls between 61-75 min for Antegrade and 75-80 min for Retrograde cases. The average blood loss was 174.9 ml in antegrade and 183.2 ml in retrograde nailing. Shoulder function was excellent in 4 cases of antegrade and 18 retrograde patients, good in 17 for antegrade and 6 retrograde patients, both have one in fair grade, no one in poor grade. Elbow function was excellent in 17 antegrade and 5 retrograde patients, good in 7 antegrade and 16 retrograde patients, fair in 1 antegrade and 3 retrograde patients and no poor function in antegrade but 1 in retrograde.

Out of 25 cases in antegrade nailing, 1 case had axillary nerve injury and in retrograde nailing 1 case had radial nerve injury. No other complications were seen.

DISCUSSION

Intramedullary nailing has been the preferred technique of therapy for lower limb bones such as the femur and tibia due to its load-sharing philosophy. However, the consequences of the same have just lately been famous for humerus[3]. The first-generation nails, such as the Kuntscher nail, Rush nail, Enders nail, and J nail, offered three-point attachment but lacked rotational stability, which was the root reason of their failure. With the development of interlocking nailing technology^[6,7], these challenges were considerably minimised.

The diameter of our nail is 6 to 8 mm. Although 6 mm nails are normally solid, 7 and 8 mm nails feature a cannulated bend and are somewhat curved both proximally and distally, with two locking screws giving rotational stability. It may be implanted either anterogradely or retrogradely, and both methods are totally extra-articular. Because the nail is so large, it must be inserted with additional care. To minimise mechanical blockage at the elbow^[8], it is crucial that the aperture in the medullary canal be exactly situated in the centre of the triangle of the dorsal surface of the distal metaphysis, and that it be somewhat higher than the level proposed by INGMAN and WATERS (1994). More communiton, supracondylar fracture, or anterior cortical penetration may occur if the hole is not highly oblique and almost parallel to the medullary canal. The nail tip should not be closer to the surgical neck in order for the locking screw to insertion without injuring the axillary nerve or the articular cartilage. The distal wound must be carefully cleaned following nail implantation to reduce the formation of periarticular callus.

The age range of the patients in this research extends from 20 to 70 years, with a mean age of 48.8 years. The majority of patients with this fracture are men, and the most prevalent mode of injury (about 75 percent) in both categories is a road traffic accident. Our series of 50 thoroughly investigated individuals yielded a very favourable result. The average period in our series was 13.8 weeks. There was no statistically significant difference in the time of union in this trial, with an average of 13.6 weeks in the Antegrade group and 14 weeks in the Retrograde group. The incidence of axillary and radial nerve injury in

humeral shaft fractures was found to be 6 to 15%. The incidence was determined to be 4% in our study

In retrograde nailing the olecranon fossa technique was expected to cause joint damage, which might explain why the antegrade procedure recovered elbow joint function faster. Because the articular cartilage was not injured, the antegrade approach group healed faster than the retrograde approach group.

CONCLUSION

Antegrade nailing is advised for patients with proximal humerus shaft fractures, young age and patients with tiny medullary canal whereas retrograde nailing is advised for fractures which are distal with broad medullary canal or prior shoulder issues. Due to less complications of elbow stiffness, shortened surgery duration, early functional recovery and since humerus generally tends to have narrow medullary canal we conclude that antegrade nailing is favoured over retrograde nailing for patients with humerus shaft fractures.

Author Contributions

The authors contributed equally for its content, writing, and reviewing and/or editing of the manuscript before submission.

Conflicts Of Interest

The authors declare no conflict of interest.

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