



OUTCOME OF INTRAMEDULLARY NAILING OF HUMERAL SHAFT FRACTURES

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ABSTRACT

There are several modalities for the management of diaphyseal humeral fractures, though conservative management remains the gold standard treatment, method of treatment of fractures of shaft humerus surgically is always a dilemma to deal with as they are mostly associated with their own sets of complications. Interlocking intramedullary interlocking nails have gained popularity for stabilization of humeral shaft fractures due to reduced intraoperative time, minimally invasive surgery, load sharing nature of the implant, preservation of fracture haematoma, minimal exposure decreased blood loss and rigid fixation with early mobilization. Intramedullary Interlocking nailing (IMIL) is an accepted technique for the treatment of humeral shaft fractures. Previous studies published concerns over reliability of this technique as to higher complication rates such as nonunion and technical failures compared to plate osteosynthesis. Here we have conducted a study of intramedullary nailing in 73 patients with fracture shaft humerus.

Materials and methods: Between Jan 2014 and Jan 2019, a prospective clinical study on 73 patients of humeral shaft fractures was performed using antegrade locked intramedullary nailing in hospital setting at multiple centres to evaluate the outcome and incidence of complications associated with this method of humeral shaft fracture fixation. The study had follow up period of 6 months. Inclusion criteria were skeletal maturity and humeral shaft fractures treated with IMIL. Exclusion criteria were skeletal immaturity, primary treatment by plate osteosynthesis, presence of metaphyseal fractures and the presence of pathological fractures. Negative outcome measures such as infection, non union and early technical failure were retrospectively assessed.

Results: Intramedullary nailing could treat majority of patients successfully with non-union occurring in total four out of 73 patients (5.4%). Superficial wound infection occurred in two cases (2.7%) with no single case of deep infection. Shortening of 1 cm respectively was observed in single case (1.3%). Mild restriction of shoulder movements remained in two out of 73 patients (2.7%) at 6 months, and single patient (1.3%) developed hypertrophy of scar.

Conclusions: IMIL is a valid therapeutic option for humeral shaft fractures. Good surgical technique and soft tissue handling are important for good outcome. Currently, patient demands are receiving greater consideration. In an era where early full range of motion and rapid return to work with minimal scarring is demanded by most patients, the use of IMN will most likely increase in popularity in the near future.

KEYWORDS : Humeral shaft fracture , Intramedullary Interlocking nailing , Nonunion , Infection, complications.

INTRODUCTION.

Fractures of the humeral shaft are relatively common in musculoskeletal trauma patients. The incidence is approximately 1-3 % of all fractures [1, 2]. Treatment approaches for these injuries continue to evolve as advances are made in both non-operative and operative management. Over the past decades, most musculoskeletal trauma surgeons treated humeral shaft fractures conservatively, using the functional bracing method [3, 4]. Although the majority of patients do well with nonsurgical treatment, some reports suggest that overall functional outcome is lower than that of an uninjured population, and a significant number of patients continue to have functional limitations [1, 3, 5]. Encouraging results, which have been obtained with recent advances in internal fixation techniques and instrumentation, have led to an expansion of surgical indications and new debates regarding the treatment of choice [3, 6].

A prospective clinical study on 73 patients of humeral shaft fractures was performed using antegrade locked intramedullary Interlocking nailing in our hospital setting to evaluate the outcome and incidence of complications associated with this method of humeral shaft fracture fixation. The study had follow up period of 6 months.

Materials and methods

Between January 2015 and January 2019, 73 patients with

humeral fractures were treated with intramedullary nailing in the Gokuldas Tejpal Hospital , Grant Medical College And Sir JJ Group of Hospitals, Saboo Siddique Hospital, Prince Ali Khan Hospital and Habib Hospital Mumbai.

Inclusion criteria included skeletal maturity and humeral shaft fractures treated with IMIL. The definition and classification of shaft fractures was based on the Arbeitsgemeinschaft fur Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) classification [7]. Open fractures were further subdivided by the Gustilo-Anderson classification [8], which was determined at the time of initial debridement in the operating room. Exclusion criteria were skeletal immaturity, primary treatment by plate osteosynthesis, presence of metaphyseal fractures and the presence of pathological fractures. The minimum follow-up period was 6 months, and follow-up was continued until evidence of union.

Treatment protocol

Surgery was undertaken on closed fractures on a semielective basis.

For antegrade nailing [6], the patient was placed in the beach chair position. A 2 cm incision on the anterior border of the lateral edge of the acromion was made in an anterior direction. The supraspinatus tendon was split in line with its

fibres (anterior tendon splitting technique). Under image intensification, the entry portal for nail insertion was determined. For straight nails (MHN) this was the dome of the humeral head, for bend nails (UHN and EHN) this was at the transition of the head to the greater tuberosities footprint. The entry portal was created with a cannulated awl or a hollow drill bit. A Guide wire was inserted and passed through the fracture site and the position was confirmed in true AP, lateral and axial directions by the image intensifier. The nail length was determined with a ruler. While considering the anterior bent of the humeral diaphyseal canal, the longest and thickest nail possible was chosen. The nail was inserted with hand force and careful rotational movements. No reaming was done. Optimal care was taken to insert the nail base below the level of the humeral head cartilage to avoid iatrogenic damage to the rotator cuff. In the case of straight nails, the proximal end of the nail was placed 2 mm below the humeral head cartilage to have optimal proximal anchorage. The supraspinatus tendon was closed meticulously with non-resorbable sutures at the end of the procedure.

Outcome measures

Negative outcome measures such as infection, nonunion and early technical failures were retrospectively assessed. Infection was classified into two groups, namely, superficial or deep infections, which were defined according to Dellinger et al. and CDC guidelines [9, 10]. A superficial wound infection was one located entirely above the fascia, with erythema and tenderness that required antibiotic therapy. A deep infection involving bone was defined as an infection involving tissue below the muscular fascia, requiring surgical debridement and/or removal of the osteosynthesis material. Fracture healing was defined as: clinically, no pain or tenderness over the fracture zone and radiographically, solid bridging callus ridges connecting the fracture fragment on both the anteroposterior (AP) and the lateral views. We followed the US Food and Drugs Administration (FDA) guidelines, defining nonunion as a fractured bone that had not completely healed within 9 months of injury and that had not shown progression towards healing over the past three consecutive months on serial radiographs [11].

Results:

During four year study period, with 6 month follow up we could treat 73 patient with above mentioned inclusion and exclusion criteria. We found that Intramedullary nailing could treat majority of patients successfully with non-union occurring in total four out of 73 patients (5.4%). Superficial wound infection occurred in two cases (2.7%) with no single case of deep infection. Shortening of 1 cm respectively was observed in single case (1.3%). Mild restriction of shoulder movements remained in two out of 73 patients (2.7%) at 6 months, and single patient (1.3%) developed hypertrophy of scar.

Observations:

The mean age was 42.5 years (range 20–74 years).We identified 41(56.2%) male patients and 32(43.8 %) female patients. Mechanisms of injury are summarised in Table 1. Falls from height dominated, involving 77 (61.6 %) patients.

Table 1: Mechanism of injury for humeral shaft fractures Mechanism of injury (n = 73) No (%)

Mechanism	Number	Percentage
Fall from height	46	63.01
Traffic accident	12	16.4
Trip and fall (low energy)	09	12.32
Sport trauma	05	6.84
Crush trauma	01	1.3

Table 2 : Age group of patients

Age Group	Number	Percentage
20-35	19	26.02

35-50	33	45.20
55-70	18	24.65
Above 70	03	04.1

Table 3: Sex of the Patient

Sex	Number	Percentage
Male	41	56.1
Female	32	43.8

Table 4: Complications Of IMN

Complication	Number	Percentage
Superficial wound infection	2	2.7%
Deep wound infection	0	0.0%
Shortening of arm	1	1.3%
Mild restriction of shoulder movements	2	2.7%
Hypertrophy of scar	1	1.3%

The mean age was 42.5years (range 20–90 years).

The mean hospitalisation period for all patients was 8.7 days (range 2–62 days). In polytrauma patients (ISS>16), the mean hospitalisation period was 22.4 days (range 5–62 days). Primary healing was seen in 69 patient (94.6 %) fractures after a mean time of 18 weeks (7–18 weeks). Nonunion was diagnosed in four (5.4 %) patients. Patients who developed a nonunion, were treated by exchange nailing. Further evolution of these patients was uneventful and union occurred. Minor complications occurred in 6 patients these include, superficial wound infection which occurred in two cases (2.7%) with no single case of deep infection. Shortening of 1 cm respectively was observed in single case (1.3%). Mild restriction of shoulder movements remained in two out of 73 patients (2.7%) at 6 months, and single patient (1.3%) developed hypertrophy of scar.

CONCLUSIONS

IMIL is a valid therapeutic option for humeral shaft fractures. Good surgical technique and soft tissue handling and retaining the fracture haematoma and minimal blood loss are important for good outcome. Currently, patient demands are receiving greater consideration. In an era where early full range of motion and rapid return to work with minimal scarring is mandatory for most patients, the use of IMN will most likely increase in popularity in the future.

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