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A prospective study of surgical management of shaft of humerus fracture in general population by humerus IMIL with compression device

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Abstract
Aim: A fracture of the humeral shaft is a very common event. Humeral shaft fractures are generally simple fractures of the mid-diaphysis. The incidence of primary lesion of the radial nerve in association with humeral shaft fracture is quoted at 11.8% on average. Compression at the fracture site is beneficial for fracture healing; this has been used whenever fractures are fixed internally using compression plates and screws. Similarly the use of this technique i.e Humerus IMIL with Compression Device can be beneficial for achieving compression while nailing for treatment of shaft of humerus fracture.
Materials and Methodology: 20 Adult patients with traumatic humerus shaft fractures in Orthopaedic Department of Bapuji Hospital and Chigateri General Hospital attached to J.J.M. Medical College, Davangere, who were willing for surgery were admitted during the period of study. They were clinically and radiologically evaluated.
Result: The most common age group in our study was 21-40 years with the mean age of 41.13 years. Out of 20 patients 15(75%) patients were male and 5(25%) patients were female. The most common mode of injury is RTA, i.e. 16(80%) patients out of 20. This also shows the nature of involvement of Humerus shaft fractures as a part of a polytrauma patient. Right side is more commonly involved than the left. i.e.11 (55%) out of the 20 cases. In this study, the most common site of injury was Middle/3 a total of 15(75%) patients, next most common being upper/3- middle/3 junction - 5(25%). In this study the most commonly experienced type of fracture was Transverse type 14 (70%) patients, 2nd most common was Oblique fractures in 6 (30%) patients. In our study a total of 15 patients (75%) had no complications relating to surgery or post-surgery. 2(10%) cases were having shoulder stiffness which is most common complication. In our study we found that 16 patients (80%) had full range of shoulder movements. Others 4(20%) had 10^0-30^0 of residual abduction which accordingly hampered the functional outcome. In our study, 19 (95%) patients had solid union in less than 26weeks.
Conclusion: Internal fixation of fractures of the shaft of humerus with interlocked intramedullary nail with compression device gives good results with satisfactory result as it allow early mobilization and early recovery with minimal soft tissue damage.

Keywords: Humerus shaft fracture, intramedullary inter locking nail, compression device

Introduction
A fracture of the humeral shaft is a very common event. As a percentage, humeral shaft fractures account for about 1–3% of all fractures [1] of these, about 10% are open fractures & 20% of those are humeral shaft fractures. Incidence is 11 [5] per 100,000 people annually, or 0.011%. [2] There are 2-3 frequency peaks [1, 3, 4].

- During adolescence
- In the 3rd decade of life in men as a result of moderate to severe trauma
- In the 5th - 7th decades of life, especially in women after a simple fall.

Humeral shaft fractures are generally simple fractures of the mid-diaphysis. The incidence of primary lesion of the radial nerve in association with humeral shaft fracture is quoted at 11.8% on average [5].
Most fractures of the humeral shaft can be managed conservatively [6].

The indications for operative treatment include open fracture, pathological fracture, polytrauma, fracture with radial nerve or vascular injury, and failed non-surgical treatment leading to delayed or nonunion [6-7]. Plate and intramedullary nail (IMN) fixation are two traditional methods of fixation for the management of humeral shaft fractures. Compression at the fracture site is beneficial for fracture healing; this has been used whenever fractures are fixed internally using compression plates and screws. The advantage is that this promotes primary bone healing while increasing fracture stability due to direct bony apposition. One of the common causes of nonunion is fracture gap or distraction. This can be also used with nailing techniques to allow compression of bone ends, either to decrease or eliminate the fracture gap and to allow fracture healing [8, 9]. Similarly, the use of this technique can be beneficial for compression while nailing for treatment of long bone nonunions.

The compression plating was a great advancement in technology for fixation of long bone fractures in the sixties and was the method of choice for nearly two decades. The interlocking nailing which was first described by Modney [10] in 1953, has undergone many design modifications since then and has almost completely replaced the plating in the present day. It offers a load bearing-device with excellent stability against the axial and rotational deformation of the fracture. It involves much less surgical exposure and therefore the reduced risk of infection. However, it fails to create the contact compression at the fracture surfaces, which is a desirable physiological stimulus to fracture union providing a distinct advantage to the compression plating. The AO nail with an oval proximal hole provides the dynamic locking and is able to overcome the said deficiency [11] to some extent but it relies on muscular forces and the weight bearing for the compression, with no inherent compression of the device itself. The special interest in compression nailing started in the 1970s in an effort to combine the advantage of compression osteosynthesis to the nailing. The telescopic locking nail [12] and the intramedullary compression nail [13-15] described to provide a reliable, innovative intramedullary nailing technique of the third generation, provide active compression of the fracture surfaces. They have proved to have excellent usefulness in not only managing the acute fractures but also in many types of revision surgeries like corrective osteotomy, stabilization after pseudoarthrosis resection and arthrodeses. The dynamic compression nail has been devised to produce axial compression at the fracture site through its self-compression locking screw and the oval configuration of the locking hole. To the best of our knowledge, it represents the first intramedullary compression nail providing axial compression without employing any additional implant or the device.

Similarly the use of this technique i.e Humerus IMIL with Compression Device can be beneficial for achieving compression while nailing for treatment of shaft of humerus fracture.

Material and Method

20 Adult patients with traumatic humerus shaft fractures in Orthopaedic Department of Bapuji Hospital and Chigateri General Hospital attached to J.J.M. Medical College, Davangere, who were willing for surgery were admitted during the period of study. They were clinically and radiologically evaluated. Laboratory investigation was carried out before surgery. Inclusion criteria -patients greater than 18 years, patients confirmed with the shaft of humerus fracture, patients with 'Revised AO/OTA classification(2018)- Oblique shaft fracture12-A2 and Transverse shaft fracture 12-A3,patients who give consent Humerus IMIL with Compression Device, patients who are willing to follow up in our department. Exclusion criteria-Patient age less than 18 years of age, patients having an associated radial nerve palsy, patients who are medically unfit for surgery, patients who refused our protocol.

Surgical technique

A standard operating table was used, patient was taken in supine position. Turn the head to the contralateral side to increase exposure of the shoulder. Obtain rotational alignment by placing the shoulder in an anatomic position and rotating the distal fragment so that the arm and hand are pointing towards the ceiling and the elbow flexed to 90degree. Nail diameter was determined under image intensifier control, or by placing the measuring device on the humerus and position the square marking over the isthmus. If the transition to the cortex was still visible to the left and right of the marking, the corresponding nail diameter was used.

Make a longitudinal skin incision from the lateral point of the acromion process and extend it distally, centred over the tip of the greater tuberosity. Incise the fascia of the deltoid and palpate the greater tuberosity. Awl was inserted through medial to the greater tuberosity to gain access to the medullary canal under C-ARM control to make Advance the curved awl until it is seated within the humeral head, and rotate the humerus internally and externally to confirm containment of the awl by image intensification. The entry portal should be centered on anteroposterior and lateral views to ensure that the nail will be in the midplane of the humerus.

Awl was removed and canal opener was used to open the medullary canal further. Ream the proximal metaphysis of the humerus to a diameter 1mm more than the nail to be inserted. Then a ball tipped guide wire of 1.8 mm is passed and fracture is reduced by gentle manipulation. The position of the guide wire and reduction of the fracture were confirmed by Image intensifier. Proper nail length can be verified radiologically pre-operatively and on the table using the guide rod method. With the distal end of the rod 1-2 cms proximal to the olecranon fossa, overlap the second guide rod of the same length extending proximally from the humeral entry portal.

Subtract the length (in mm) of the overlapped guide rod from 500 mm to determine the correct nail length. The selected nail is attached to the Jig. The nail is passed through the medullary canal. When the nail reaches the fracture, maintain reduction manually and gently advance the nail across the fracture. Advance the nail distally until it is 1 to 2 cm proximal to the olecranon fossa, take care to avoid splitting the distal humerus or creating a supracondylar fracture from wedging the tip of the nail too close to the olecranon fossa. Confirm nail position in the distal fragment by anteroposterior and lateral image intensification views by internally and externally rotating the arm. Seat the nail so that its proximal end is beneath the bone to avoid subacromial impingement.

The distal interlocking is done by free hand technique in an anteroposterior direction. Ideally the 3.4 mm locking screw will be used distally for 7mm & 8mm and 2.9mm for 6mm nail. Prior to compression insert a proximal gliding screw, which is applied through the dedicated guide hole in the aiming device. Compression of the fracture site or closure of a gap is applied by inserting a compression screw from the top of the nail. By tightening the screw, the whole nail with the

distal fragment is pulled retrogradely. Confirm the effect under image intensification. After achieving satisfactory reduction remove the compression screw. The proximal interlocking is done with the help of zig lateral to medially. The zig is removed and locking confirmed by the Image intensifier and the wound closed after securing complete hemostasis.

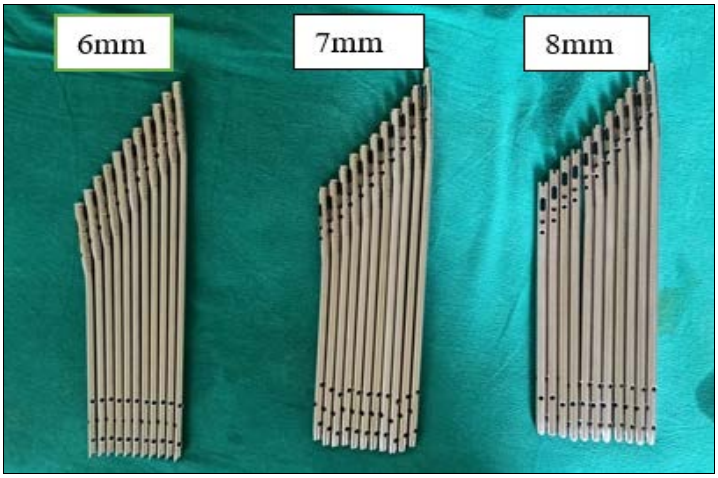

Fig 1: Humerus IMIL

Fig 2: Compression device

Fig 3: General Instruments

Result

This prospective study was conducted at Bapuji and Chigateri General Hospital attached to JJM Medical College, Davangere for a period of two years from July 2018 to July 2020.The most common age group in our study was 21-40 years with the mean age of 41.13 years. Out of 20 patients 15(75%) patients were male and 5(25%) patients were female. This shows Males are more predominantly affected with Humerus fractures as compared to female. It shows a male preponderance with the ratio being M:F 3:1. In our study, the most common mode of injury is RTA. i.e.16 (80%) patients out of 20. This also shows the nature of involvement of Humerus shaft fractures as a part of a polytrauma patient. In our study, Right side is more commonly involved than the left. i.e.11 (55%) out of the 20 cases. In this study, the most common site of injury was Middle1/3 a total of 15(75%) patients, next most common being upper/3- middle/3 junction - 5(25%). In this study the most commonly experienced type of fracture was Transverse type 14(70%) patients. 2nd most common was Short oblique fractures in 6 (30%) patients. In our study a total of 15 patients (75%) had no complications relating to surgery or post-surgery. 2(10%) cases were having shoulder stiffness which is most common complication, 2(10%) cases were having superficial skin infection, 1(5%) case had bent dynamic screw.

In our study we found that 16 patients (80%) had full range of shoulder movements. Others 4 (25%) had 10^0-30^0 of residual abduction which accordingly hampered the functional outcome. 2 patients (10%) had only shoulder Stiffness. In our study, 19 (95%) patients had solid union in less than 26 weeks, 1(5%) cases had delayed union (26-36 week).

Effect of compression device

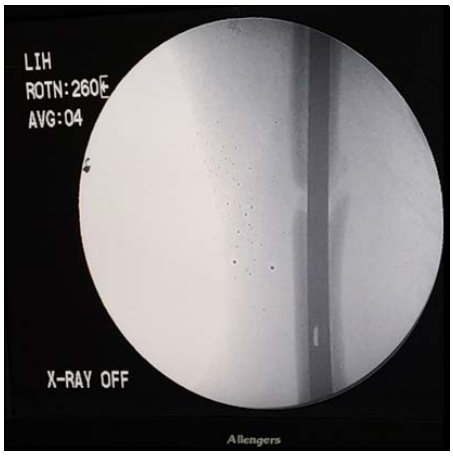

Fig 4: Before compression device

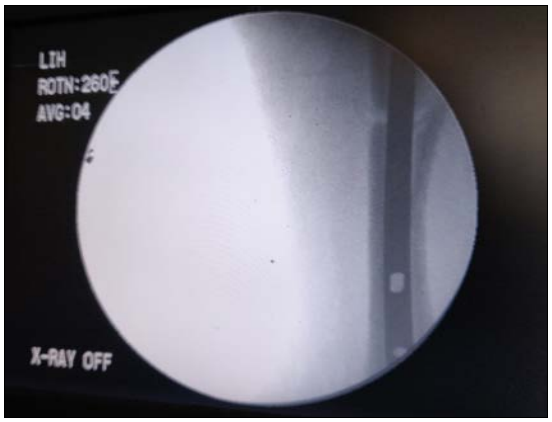

Fig 5: After compression device

Case

Fig 6: Pre op x-ray

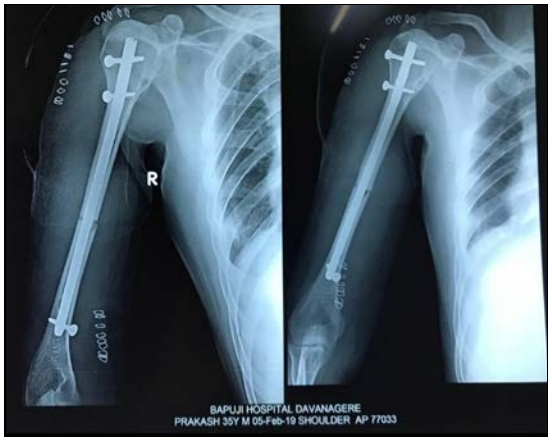

Fig 7: Immediate post-OP

Fig 8: 6th month follow UP

Fig 8: 1 YR follow UP

Discussion

The management of fracture shaft of humerus has always been a challenging problem to the orthopaedic surgeon, also as they are very frequently associated with multiple injuries, leading to complications of rotation, infection, delayed union, non- union & radial nerve injury (neuropraxia).

The main aim of treatment is to achieve proper length and alignment and give finally good union. In several reported series, the presence of associated multiple injures was the most frequent indication for internal fixation of humeral shaft.

In this study, fractures of shaft of humerus are seen commonly in middle aged adults ranging from 20-30 years group, with the mean age being 41.13yrs.The mean age in other study reported by Loya Lava Kumar S [16] is 41.4 +/- 8.2 years, Ashwin Kasturi *et al*. [17] is 43.5years.Out of 20 patients 15(75%) patients were male and 5(25%) patients were female. This shows Males are more predominantly affected with Humerus fractures as compared to female. It shows a male preponderance with the ratio being M:F 7:3.

In our study, the most common mode of injury is RTA. i.e.16 (80%) patients out of 20 similar to Loya Lava Kumar[16] study. Right side is more commonly involved than the left,i.e.11 (55%) out of the 20 cases. Among them most common site of injury was Middle1/3 a total of 15(75%) patients, next most common being upper/3- middle/3 junction - 5(25%), similar to study conducted by Mir G. R. Wali *et al*. [18] i.e 62% of middle 1/3 humerus fracture. The most commonly experienced type of fracture was Transverse type 14 (70%) patients. 2nd most common was short oblique fractures in 6 (30%) patients similar to study conducted by Mir G. R. Wali *et al*. [18].

In our study a total of 15 patients (75%) had no complications relating to surgery or post-surgery.2 (10%) cases were having shoulder stiffness which is most common complication. In our study we found that 16 patients (80%) had full range of shoulder movements. Others 4(20%) had 10^0-30^0 of residual abduction which accordingly hampered the functional outcome.2 patients (5%) had only shoulder Stiffness. In our study, 19 (95%) patients had solid union in less than 26 weeks, 1 (5%) cases had delayed union (26-36 week).

Conclusion

Compression can minimize residual fracture gaps in the

clinical setting. This may increase stability and potentially improve union rates of acute fractures. Additionally, the compression achievable may improve the historical results of non-unions treated with intramedullary nailing.

Further studies are needed to address the clinical application of the humerus IMIL with compressive device.

Reference

1. Stuby FM, Honntzsch D. Humerus shaft Fractures. Z. Orthop. Unfall 2009;147(3):375-86.
2. Court-Brown CM, Rimmer S, Prakash U, Mcqueen MM. The Epidemiology of long bone fracture. Injury, 1998;29(7):529-34.
3. Cole PA, Wijdick CA. The Operative treatment of diaphyseal humeral shaft fractures. Hand Clin. 2007;23(4):437-48.
4. Schittko A. Humerus Shaft Fractures. Unfallchirurg, 2003;106(2),145-58.
5. Shao YC, Harwood P, Grotz MR, Limb D, Giannoudis PV: Radial nerve palsy associated with fractures of the shaft of the Humerus; a systematic review. Journal Bone Jt Surg. 2005;87-B:1647-52.
6. Walker M, Palumbo B, Badman B, Brooks J, Van Gelderen J, Mighell M. Humeral shaft fractures: A review. Journal of shoulder and elbow surgery / American Shoulder and Elbow Surgeons 2011;20(5):833-44.
7. Clement ND. Management of Humeral Shaft Fractures; Non-Operative Versus Operative. Archives of trauma research. 2015;4(2):28013.
8. Augat P, Penzkofer R, Nolte A *et al*. Inter fragmentary movement in diaphyseal tibia fractures fixed with locked intramedullary nails. J Orthop Trauma 2008;22:30-6.
9. Penzkofer R, Maier M, Nolte A *et al*. Influence of intramedullary nail diameter and locking mode on the stability of tibial shaft fracture fixation. Arch Orthop Trauma Surg 2008.
10. Modny MT. The perforated cruciate intramedullary nail: a preliminary report of its use in geriatric patients. J Am Geriatric Sc 1953;1:579.
11. Muller ME, Algower M, Schneider R, Willenegger H: Manual of internal fixation: techniques recomonded by the AO-ASIF group. Edition 3, Berlin Springer-verlag 1990.
12. Goessens ML, Van De Wildenverg FJ, Eggink GJ, Stapert JW. Treatment of fractures of femur and tibia with the telescopic locking nail : Design of a new implant and the first clinical results. J Trauma 1999;46(5):853-62.
13. Hutter CG, Oden R, Kirk R: The intra medullary compression rod. Clin Orthop 1977;122:165-73.
14. Ritter G. Kompresssions osteosynthesen mit dem neun AO Universalnagel. Funktionsprinzip und biomechanische Voraussetzungel. Unfallchirug 1991;94:9-12.
15. Gonschorek O, Hofmann GO, Buhren V: Interlocking compression nailing. A report on 402 applications. Arch Ortho Trauma Surg 1998;117:430-7.
16. Loya Lava Kumar S. "Dynamic compression plating versus intramedullary interlocking nail technique: a prospective study in a tertiary care centre": International Surgery Journal Kumar LLS. Int Surg J. 2016;3(2):653-657. http://www.ijsurgery.com, 2016.
17. Ashwin Kasturi, Ramu Chokkarapu, Srinivasan Nadadur, Natesh Kolusu. "Comparison Of Outcomes Of Dynamic Compression Plate And Interlocking Intramedullary Nail For Fracture Shaft Of Humerus: A Prospective Study": Journal of Research in Orthopedics and Sports Medicine 2015;1(1):34-37.
18. Mir Wali GR, Asif Baba N, Irfan Latoo A, Nawaz Bhat A, Omar Khurshid Baba, Sudesh Sharm. "Internal fixation of shaft humerus fractures by dynamic compression plate or interlocking intramedullary nail: a prospective Randomised study", Strat Traum Limb Recon 2014;9:133-140.