

A Outcome Study Of Intramedullary Nailing For Isolated Fracture Ulna Shaft In Adults

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Abstract:

In the modern and industrialization era, increasing incidence of road traffic accidents, natural disasters and industrial accidents, assault leads to varying degree of multiple fractures and higher incidence of morbidity. Of these, the fractures involving ulna form an important part. Even though these fractures can be treated successfully by various surgical methods, the anatomical reduction maintaining the alignment of fracture fragments becomes absolutely essential for effective postoperative function. Delayed medical attention, use of indigenous bandages, native bone centres and associated vascular and nerve injuries contribute to increased incidence of morbidity.

Better understanding of the pattern of injury, availability of better quality implants, the concept of biological flexible fixation and defined post-operative protocols have significantly improved the functional outcomes in patients undergoing surgical procedure. The successful management of these fractures warrants better understanding the character of fracture, technical aspects of fracture fixation, the array of implants available and the art of postoperative management and rehabilitations

Materials & method: *Stainless steel alloy (316L) has been used as a metal of choice for implants since from early 1900s. Compared to stainless steel, titanium or its alloys are new to its application as a implant materials. Owing to its superior biocompatibility and its biophysical properties, its gaining its importance in recent decades Various titanium alloys are used in the manufacturing of orthopaedic implants. Titanium 64 or Ti6Al4V (titanium, 6%aluminium,4%vanadium) is the widely used one.*

Results : *According to GRACE AND EVERSMANN criteria the results achieved is EXCELLENT in 73.33% patients, GOOD in 23.33% patients, FAIR in 3.33% patients.*

Conclusion: *We conclude that intramedullary nailing is a better modality of treatment for ulna shaft fractures. It is more biological way of fixation and is done without disturbing the fracture hematoma, associated with minimal complications compared to plate osteosynthesis. Intramedullary nailing involves minimal surgical trauma and negligible blood loss. It provides negligible rates of infection, delayed union, non-union and malunion. There is less preoperative waiting and shortens the length of patient stay in the hospital. Closed intra-medullary nailing is a potentially cost-effective alternative to plate osteosynthesis for the treatment of ulna shaft fractures.*

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I. Introduction:

In the modern and industrialization era, increasing incidence of road traffic accidents, natural disasters and industrial accidents, assault leads to varying degree of multiple fractures and higher incidence of morbidity. Of these, the fractures involving ulna form an important part. Even though these fractures can be treated successfully by various surgical methods, the anatomical reduction maintaining the alignment of fracture fragments becomes absolutely essential for effective postoperative function. Delayed medical attention, use of indigenous bandages, native bone centres and associated vascular and nerve injuries contribute to increased incidence of morbidity. Due to poor awareness about surgical treatment, majority of adult forearm fractures are treated by traditional bone setters leading to various complications affecting the day to day activity of patient's .

Awareness about the role of various types of surgical fixation, their advantages and their role in successful management of these fractures is absolutely essential for preventing this practice. For good functional range of movements to occur, the maintenance of interosseous space is mandatory while fixing these fractures. Increasing trends in the incidence of these fractures, accompanied with complicating factors like high degree of comminution, neurovascular injuries, antibiotic resistance of infective pathogens warrants new improvement of the fracture management too.

Aims : The ulna shaft fractures are one among the most common fractures encountered in assaults, even today most of these fractures are managed by native bone centres leading to varying degree of complications and poor outcome. So any measures to restore the alignment of fractures and to maintain it will a good option rather than

conventional plating which exposes the patient to various complication. With the advent of intraoperative fluoroscopy and increasing awareness of biological mode of fixation, advances in metallurgy, intramedullary titanium elastic nails can be a better option in treating ulna shaft fractures. Our aim is to study the outcome of intramedullary nailing for isolated fracture ULNA shaft in adults

II. OBJECTIVES :

- 1) To evaluate anatomical and functional outcome and impact of fixation related complications after fixation of ulna shaft fractures.
- 2) To prove the superiority of biological fixation
- 3) In how much cases non-union, malunion or infection done in ulna shaft fracture.
- 4) To achieve stable fixation and early mobilization

III. MATERIALS AND METHODS

All the patients were received in the trauma zero delay ward and are Resuscitated initially. If there are any other major associated injuries or comorbid conditions, they are treated accordingly first. once the general condition of the patient stabilizes, radiographs (AP View and lateral view) of forearm are taken. The fractures were reduced in closed manner under adequate analgesia and above elbow slab was applied and post reduction radiographs are taken. Most of the closed cases are taken for elective fixation after obtaining necessary consent. In patient associated with other long bones fractures preferences are given for intra articular fractures and treated accordingly

Preoperative planning:

Informed consent after explaining about the procedure and the possible complications is obtained.

NAIL SIZE: 1). Plain radiograph anteroposterior and lateral view of the opposite normal limb is taken for measuring the isthmus which determines the size of the nail propably will be used. Radiographically the isthmus is measured in millimetres and nail size corresponds to two third of the measured isthmus.

Nail size = $0.6 \times$ isthmus diameter

Surgical Approach:

CLOSED REDUCTION INTRAMEDULLARY NAIL FIXATION:

While selecting an intramedullary device, it is mandatory to select a nail of appropriate diameter for fixation. If the size of the nail is small, there is side to side and rotatory movement leading to instability. If the size of the nail is large, further communication or additional fracture may occur. The nail diameter should be selected to be between 30% & 40% of the narrowest medullary space diameter. Ulna is considered as a unit & nails should occupy 60% of the bony canal. The nails must be of same thickness & similarly present(17) Principle : -Since the fractures of ulna are fixed in closed manner, fracture hematoma is preserved leading to early union and consolidation. Moreover, the chance of infection is minimized. -The ulna is fixed. -An appropriate sized nail is selected, so that the nail fits snugly inside the medullary canal. Titanium elastic nail offers three point fixation thereby stabilizing the fracture fragments.

Duration of hospitalization: The average duration of hospital stay following surgery was 3 days ranging from 2-4 days

Follow up: The maximum follow up was two years and minimum follow up was six months and the average being 13 months. Patients were called for review at 3 weeks, 6th week, 3rd month, 6th month. If there is substantial evidence of union both clinically as well as radiologically

Condition at discharge: All patients were advised non weight lifting and finger mobilization exercise

IV. OBSERVATION / RESULTS:

This Prospective study includes 30 patients of Ulna shaft fractures treated with intramedullary nailing from August 2020 to January 2022. These included closed as well as open injuries and polytrauma patients. This chapter takes into account observations of the study and effect of various factors on the results. The study includes patients operated at Department Of Orthopaedics, at Guru Gobind singh Government Hospital, Shri M P Shah Medical College, Jamnagar

MODE OF INJURY	NUMBER OF CASES	PERCENTAGE (%)
ROAD TRAFFIC ACCIDENT	8	26.67%
ASSAULT	8	26.67%
FALL FROM HEIGHT	3	10.00%
DOMESTIC FALL	11	36.66%
TOTAL	30	100%

MODE OF INJURY:

FRACTURE PATTERN

LOCATION	PART	NUMBER OF CASES	PERCENTAGE %
PROXIMAL (2U1)	EXTRA ARTICULAR (2U1A)	0	0%
	ARTICULAR (2U1B)	0	0%
	PARTIAL COMPLETE ARTICULAR(2U1C)	0	0%
DIAPHYSEAL (2U2)	SIMPLE (2U2A)	26	86.66%
	WEDGE (2U2B)	3	10%
	MULTIFRAGMENTARY (2U2C)	0	0%
DISTAL (2U3)	EXTRA ARTICULAR (2U3A)	1	3.34%
	ARTICULAR (2U3B)	0	0%
	PARTIAL COMPLETE ARTICULAR(2U3C)	0	0%

OBSERVATIONS AND RESULTS AT FINAL FOLLOW UP

DURATION IN NUMBER OF MONTHS	NUMBER OF CASES	PERCENTAGE (%)
6-11	10	33.33%
12-17	5	16.67%
18-24	15	50%
TOTAL	30	100%

V. DISCUSSION

Ulna fracture is one among the most common fractures. Due to the prevailing concept of perfect anatomical reduction, providing absolute stability open reduction and plate osteosynthesis is considered as a widely acceptable treatment modality for treating Ulna fracture. Positive results have been reported in various literatures. Compression plate osteosynthesis for Ulna fracture done with large skin incision, periosteal stripping, evacuation of fracture hematoma, neurovascular complications, postoperative infection and scar, stress shielding effect leading to refracture once the plate is removed. The advent of newer techniques of flexible biological fixation, various advances in implant designs and materials questions the superiority of plate osteosynthesis to intramedullary fixation of ulna fractures. Initial reports of intramedullary nailing with K-wires, Steinmann pins, or rush pins resulted in poor union rates due to lack of rotational stability. Foresight nail was introduced by Cranes hew, that can be bended intra operatively according to the geometry of the ulna. Titanium with Young modulus of elasticity nearly one half of the 316L stainless steel alloy makes the fixation flexible enough for adequate bone healing. Titanium being less rigid, it provides favourable biomechanical environment for fracture healing.

In our study the minor complication seen in about 20 % of the patients is the skin irritation caused by the nail tip. This may be attributed to the bare nail cut ends being exposed.

In non locking intramedullary nailing, small skin incision which has almost uncomplicated location and very small scar away from visible exposed part of forearm along with equal results makes it a treatment of choice for isolated shaft fracture ulna. So even though it has made way to more complex and costlier procedures still a simple ulna nail or Titanium Elastic nail is an art not worth forgetting

Limitations of the study: The results of this study may be limited by measurement error. The physical measurements may be subject to both, observer's errors and patient variability. The study is also limited to patients having surgical fixation for their fracture. These results therefore, cannot necessarily be compared to the outcome achieved with non-operative management or other modalities of treatment.

Conflict of interest: NIL

References:

- [1]. P Hernigou, J Pariat – History of internal fixation (part - 1):development with wire and plates -International Journal Orthopaedics springer ,2017
- [2]. D Prabhu Basavanagouda,AS Shetty -surgical management of diaphyseal shaft fractures of forearm in adults using DCP – International journal of orthopaedics 2021
- [3]. U Knothe, ML Knothe-Tate, SM Perren- 300 yrs of intramedullary fixation -European journal of Trauma ,2000
- [4]. A Grosse, H Haarman, H Seidel, G Taglang-practise of intramedullary locked nail ,Scientific basis Internationale pour l'Osteosynthese,2002
- [5]. Flexible intramedullary nailing of forearm fractures at the distal metadiaphyseal junction in adolescents clinics in orthopedic surgery 2017;9:101-108
- [6]. Talwalkar ak., Internal fixation of fractures of radius and ulna in adults with talwalkar intramedullary nails. Indian j orthop. 1967;1(1):26– 30.
- [7]. Crenshaw AH, Zinar DM, Pickering RM. Intramedullary nailing of forearm fractures. Instr Course Lect. 2002;51:279–89
- [8]. Street DM. Intramedullary forearm nailing. Clin OrthopRelat Res. 1986; 212:219–30.
- [9]. Street, Dana M. clinical orthopaedics, Intramedullary forearm nailing, 219-230, 1986.
- [10]. Elastic intramedullary nailing : an alternative in elderly osteoporotic forearm fractures international journal of orthopaedics traumatology & surgical sciences, volume-3, special issue 1, february 2017, page 441-446
- [11]. Use of intramedullary implants in adult diaphyseal fracture ulna bone international journal of research in orthopaedics orthop. 2018 mar;4(2):243-248
- [12]. A newly designed intramedullary nail for the treatment of diaphyseal forearm fractures in adults Indian j Roth p. 2017 nova - dec; 51(6): 697–703.
- [13]. Gray.Henry: osteology, forearm muscles in grays anatomy ed. Williams , peter L et al , Norwich , churchwill living stone , 1989, 410-415pp.(p6,9,11,13,14,17,20,21)
- [14]. Rockwood And Green's Fractures In Adults, 7th Edition, Bucholz, Robert W.; Heckman, James D.; Court-Brown, Charles M.; Tornetta, Paul
- [15]. Hoppenfeld: The forearm. Chapter -4 surgical exposures in orthopaedics, 2nd edn, Philadelphia: Lippincott raven publishers, Bibliography..... 103 1999: 117-133(p36, 37) 11. Jones DB, Kakar S. Adult diaphyseal forearm fractures: intramedullary nail versus plate fixation. J Hand Surg. 2011; 36(7):1216–1219. doi: 10.1016/j.jhssa.2011.03.020.
- [16]. Grace TG, Eversmann WW Jr .forearm fractures: treatment by rigid fixation with early motion. J Bone joint surg Am. 1980; 62:433-8(p53, 54) 7. Gadegone W, Lokhande V, Salphale Y. Elastic intramedullary nail for the management of adult forearm fractures. Indian J Orthop. 2012; 46 (1):65–70. doi: 10.4103/0019- 5413.91637.
- [17]. Moerman j, leneart a, deconinck d, haeck l, verbeke s, uytendaele d. intramedullary fixation of forearm fractures in adults. Acta orthopbelg. 1996;62(1):34
- [18]. Eijer H, Hauke C, Arens S, et al. PC-Fix and local infection resistance— influence of implant design on postoperative infection development, clinical, and experimental results. Injury 2001; 32(Suppl 2):B38-B43.
- [19]. Nadeem A Lil, Damandeep S Makkar , Aleem A Adatia- closed intramedullary nailing using talwalkar square nail in adult forearm fractures-Malaysian orthopaedic journal 2012 Vol 6 No 3.
- [20]. UfukOzkaya ,AyhanKilik, UmitOzdogan, KubilayBeng, Yavuz Kabukcuoglu -comparison between locked intramedullary nailing and plate osteosynthesis in adult forearm fractures-Acta OrthopTraumatolTurc 2009;43 (1):14-20