Original Research Paper

Volume - 13 | Issue - 02 | February - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Orthopaedics

A PROSPECTIVE STUDY ON THE ROLE OF INTRAMEDULLARY NAILING IN ADULT DIAPHYSEAL FOREARM FRACTURES, DURING COVID-19 PANDEMIC, HYDERABAD, INDIA

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ABSTRACT **Background & objectives:** Fractures of forearm bones may result in severe loss of function unless adequately treated. Intramedullary nailing is less traumatic than plate-and-screw fixation along with preservation of fracture hematoma. Idea of primary bone healing was one of the reasons why intramedullary nailing became disregarded in favour of plate and screw fixation. The COVID-19 pandemic caused surgeons, to re-evaluate their approach to surgical procedures given concerns over the risk of aerosolization of viral particles and exposure of operating room staff to infection. This study aims to analyse functional outcome and advantages of intramedullary nailing (Titanium ElasticNails, Square or Rush nails) in treatment of adult diaphyseal forearm fractures during the pandemic. Methods: A prospective study on 16 cases of closed simple diaphyseal forearm fractures in the age group of 20 to 60 years from April 2020 to Jan 2021 managed with intramedullary nailing. Results were evaluated based on mode of anaesthesia, operating time, blood loss, average union time, modified Grace and Eversmann scoring system for functional outcome. Interpretation and **Conclusion:** Most cases received brachial block with mean operating time of 40 minutes. Blood loss was minimal. The average union time (radiologic evidence of callus) was 7 weeks. Functional outcomes were excellent in 12 patients (75%), good in 3 patients (18.75%) and poor in 1 case. Intramedullary nailing is a reliable but less invasive alternative for adult diaphyseal forearm fractures during pandemics with excellent stability and predictable results.

KEYWORDS : Intramedullary nailing, forearm fractures, COVID-19 pandemic, aerosols.

Introduction:
Forearm fractures are common and occur in association with high energy accidents or direct trauma to the forearm bones and result in severe loss of function unless adequately treated. Forearm diaphyseal fractures must be considered as intraarticular fractures, due to their anatomic and functional characteristics. Management of these fractures demand familiarity with character of fracture, technical aspect of fracture fixation and varieties of implants available. The goal is to achieve adequate alignment, union and functional range of motion while minimizing complications.

Open reduction and internal plate fixation techniques, developed by the Arbeitsgemeinschaft für Osteosynthesefragen (AO) group is the standard protocol.[1,2] This maintains axial and rotational alignment and permits immediate mobilization.[3] The downside being, extensile approach with muscle and periosteal elevation that could contribute to delayed union or nonunion.[4] Patients can experience symptoms related to the hardware, and implant removal exposes them to the risks of neurovascular injury and refracture.[5,6,7] Intramedullary nails are potential alternative to plate-and-screw fixation, with proposed advantages of smaller scars, less periosteal stripping, fewer implant-related symptoms, and lower risk of re-fracture after implant removal.[8,9]

Most orthopaedic procedures produce aerosols of blood and tissue debris that may contain infective pathogens such as mycobacterium tuberculosis, legionella, hepatitis B/C, Varicella zoster, smallpox, influenza and S. aureus which may be inhaled.[10,11] There is additional risk of infection for patients operated on in the same room. Conventional surgical masks do not offer protection against high-risk aerosol generating procedures (AGPs). The COVID-19 pandemic caused surgeons to re-evaluate their approach to surgical procedures to reduce aerosolization of viral particles and exposure of operating room staff to infection. Intramedullary devices in forearm fractures are gaining interest with added advantages such as, short operative time, less bleeding, reduced post-operative morbidity, good union and satisfactory functional outcomes.

Materials and methods: This was a prospective study conducted in Osmania General Hospital, Hyderabad from April 2020 to Jan 2021 among 16 patients during the pandemic.

Inclusion criteria:
- Age 20-60 years.
- Closed fractures.
- Simple diaphyseal fractures of radius and/or ulna.

Exclusion criteria:
- Open and/or comminuted fractures.
- Fractures more than 3 weeks old.
- Head, chest, abdomen or pelvis injury and neurovascular compromise.
- Other associated fractures.

After pre-anaesthetic check-up and valid written informed consent, patients included were managed at the earliest with closed reduction and internal fixation (CRIF) with intramedullary nailing devices (Titanium ElasticNails, Square Nail, and Rush nails). Ulnar entry was taken on radial aspect of olecranon tip, 5mm from lateral cortex, in line with the longitudinal axis of the ulnar shaft. Radial entry was made on radial aspect of Lister's tubercle, 5 mm to 1 cm proximal to articular surface. The nails were passed, under C-arm guidance. Post-operative immobilization with long arm slab was given. Elbow and finger mobilization was done early. Suture removal was done at post-operative day 10. Patients were followed-up at regular intervals of 3 weeks, 6weeks, 12 weeks and 6 months. Cases were analysed for type of anaesthesia, duration of surgery, blood loss, radiologic union time, functional outcome using modified Grace and Eversmann scoring[12] [Table-1].

Results: Of the 16 cases, 10 were males (62.5%) and majority cases sustained right-sided injury (68.7%, n=11). Mean age was 32.1 years ranging from 21 to 57 years. 10 patients sustained direct blow to forearm, 4 fell on out-stretched hand and 2 were involved in RTA. All patients were operated within 2 days of presentation. Brachial plexus block was used for 14 cases and general anaesthesia for 2 cases. Operating time varied from 30 to 75 minutes, with a mean of 40 minutes. The mean post-operative follow-up time was 16 weeks. The average union time (radiologic evidence of callus) was 7 weeks. Presence of bridging callus across three or more cortices was reported in 12 patients (75%) by 12weeks. We had excellent functional results in 12 patients (75%) [Figure-1], good in 3 patients (18.75%) [Figure-2] and one had poor result [Table-2]. Blood loss was minimal. 1 case of superficial infection and 1 case of delayed union were encountered.

Figure-1: Functional outcome in 21 year old female

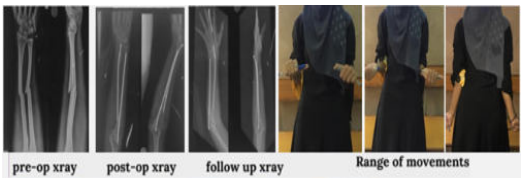

Figure-2: Functional outcome in 25 year old male

Table-1:

Modified Grace & Eversmann Scoring system

PRONATION AND SUPINATION		
RATING	R.O.M.	SCORE
EXCELLENT	>80	4
GOOD	60-80	3
FAIR	40-60	2
POOR	>40	1

RADIOLOGICAL UNION AFTER 6 WEEKS	
UNION PRESENT	2
UNION ABSENT	1

RANGE OF ELBOW MOVEMENT		
RANGE	RESULT	SCORE
FLEX >120	EXCELLENT	4
FLEX 100-120	GOOD	3
FLEX 80-100	FAIR	2
FLEX <80	POOR	1

RESULT	SCORE
EXCELLENT	10 AND ABOVE
GOOD	8-9
FAIR	6-7
POOR	<5

FLEX- Flexion; R.O.M. - Range of movement

Table-2: Our analysis of functional outcome assessed using modified Grace and Eversman scoring.

RESULT	NO. OF CASES	PERCENTAGE
EXCELLENT	12	75%
GOOD	3	18.75%
FAIR	-	-
POOR	1	6.25%

Discussions:

In this study, 62.5% participants were males, 68.7% sustained injury to the right forearm with direct blow to the forearm being the most common mode of injury. The operating time was calculated from start of surgical incision to wound closure. It gradually improved with our experience. It varied from 30 to 75 minutes, with an average of 40 minutes which was comparable to Harish et al-2014[13] and Reinhardt et al-2008[14] in which the mean duration of surgery and tourniquet time were significantly shorter for the intramedullary nailing group than plating group[15]. This reduction in operative time helped to reduce the exposure of health care workers. In 14 out of 16 patients we used brachial block and general anaesthesia in 2 patients, additionally; open bone drilling was not done in intramedullary nailing which helped to reduce aerosolization of potentially infective material into operating room. The disadvantages of open fixation such as, increase in chance of infection, disturbance of the soft tissues, periosteal stripping, and evacuation of fracture hematoma were avoided. Blood loss was minimal with better cosmetic results as compared to the plate-and-screw fixation. The mean follow up time was 16 weeks. The average union time was 7 weeks. Evidence of bridging callus across three or more cortices noticed in 12 patients (75%) at 12 weeks which was comparable to other studies.[13] 1 case of superficial infection and 1 case of delayed union were encountered. We had excellent results in 12 patients (75%), good in 3 patients (18.75%) and one had poor result. This was comparable with open reduction internal fixation (ORIF) with plating [16,17] and other similar studies[18].

Conclusion:

Intramedullary nailing is less traumatic, to bone and soft tissues, than plate-and-screw fixation. It reduces risk of aerosolization, blood spill and exposure to infective viral particles. It limits exposure of operating room staff and patients to infection. CRIF with intramedullary nailing was a reliable alternative for diaphyseal forearm fractures during the pandemic and future outbreaks, to avoid extensive exposure, have short operative time, achieve excellent stability and predictable results.

REFERENCES:

1. Anderson LD, Sisk D, Tooms RE, Park WI 3rd. Compression-plate fixation in acute diaphyseal fractures of the radius and ulna. JBJS 1975.
2. Burwell HN, Charnley AD. Treatment of forearm fractures in adults with particular reference to plate fixation. JBJS 1964.
3. Dodge HS, Cady GW. Treatment of fractures of the radius and ulna with compression plates. JBJS 1972.
4. Rand JA, An KN, Chao EY, Kelly PJ. A comparison of the effect of open intramedullary nailing and compression-plate fixation on fracture-site blood flow and fracture union. JBJS 1981.
5. Hidaka S, Gustilo RB. Refracture of bones of the forearm after plate removal. JBJS 1984.
6. Labosky DA, Cermak MB, Waggy CA. Forearm fracture plates: to remove or not to remove. JBJS 1990.
7. Rosson JW, Shearer JR. Refracture after the removal of plates from the forearm. An avoidable complication. JBJS 1991.
8. Visna P, Beitl E, Pilny J, Cizmar I, Vlcek M, Kalvach J, et al. Interlocking nailing of forearm fractures. ACB 2008.
9. Weckbach A, Blattert TR, Weisser C. Interlocking nailing of forearm fractures. AOTS 2006.
10. Harpaz R, Seidlein VonL, Averhoff FM, Tormey MP, Sinha SD, Kotsopoulou K, et al. Transmission of hepatitis-B virus to multiple patients from a surgeon without evidence of inadequate infection control 1996.
11. Nogler M, Wimmer C, Lass-Florl C, Mayr E, Trobos S, Gegenhuber C. Contamination risk of the surgical team through ROBODOC's high-speed cutter 2001.
12. Grace TG, Eversmann WW Jr. Forearm fractures: treatment by rigid fixation with early motion. JBJS. 1980.
13. Harish G, Amit Chaudhary. "Management of Fractures of both Bones Forearm using Intramedullary 'L'RODS: A Clinical Study" JEMDS-2014.
14. Reinhardt KR, Feldman DS, Green DW, Sala DA, Widmann RF, Scher DM. Comparison of intramedullary nailing to plating for both-bone forearm fractures in older children JPO-2008.
15. Zhao L, Wang B, Bai X, Liu Z, Gao H, Li Y. Plate Fixation Versus Intramedullary Nailing for Both-Bone Forearm Fractures: A Meta-analysis of Randomized Controlled Trials and Cohort Studies. WJS.-2017.
16. Ufuk Ozkaya, Ayhan Kilic, Umit Ozdogan, Kubilay Beng. Comparison between locked intramedullary nailing and plate osteosynthesis in the management of adult forearm fractures. AOTT-2009.
17. Visna P, Vicek M, Valcha M, Beitl E, Jaganjac E, Smidl Z. Management of diaphyseal forearm fractures using LCP angle stable fixation devices and intramedullary nailing. Rozhl Chir-2009.
18. Goldfarb CA, Ricci WM, Tull F, Ray D, Borrelli J Jr. Functional outcome after fracture of both bones of the forearm. JBJS-2005.