

Efficacy of Innovative Screw Intramedullary Nailing for Segmental Forearm Fractures in Adults

Yogesh S Salphale*, Vikrant Salphale, Sharad Dharampal Badade, Wasudeo Gadegone, Anuradha Salphale

Shushrusha Multispecialty Hospital, Chandrapur, India

ABSTRACT

Open reduction and plate fixation is generally the treatment of choice for the diaphyseal forearm fractures and has been accepted as the best choice in many studies. But the concern of periosteal stripping, haematoma evacuation, nonunion and infection always loom and may result in delayed union and complications related to the surgery.

Though Screw intramedullary nails have been reported in the literature for the fracture of the forearm bones, its utility was overlooked in segmental fractures of the radius and ulna.

We report a case of Screw IM nail in the treatment of segmental diaphyseal fracture of ulna and diaphyseal shaft of radius in adults which provided excellent outcomes in terms of cosmesis and function.

Keywords: Forearm nail; Intramedullary nailing forearm fractures; Screw intramedullary nailing; Segmental forearm fracture

INTRODUCTION

The surgical aim of diaphyseal forearm fracture management is to stabilize the fractures and maintain axial and rotational alignment [1,2,3].

Despite the fact that a variety of plates have been identified in the literature, periosteal stripping and excessive cortical contact have been linked to blood supply disruption [4].

The limited contact dynamic compression plate (LC-DCP) and locking compression plate have evolved to minimize plate interaction with cortical perfusion while also providing stronger biological fixation [5,6].

Regardless of how plate designs and metallurgy evolve, concerns about soft-tissue injury, non-union of the fracture hematoma, and infection may all lead to fracture union complications [7,8]. Symptoms related to the long incisions, hardware irritation, and refracture following implant removal is a cause of concern and have been reported [9,10].

The authors report that performing screw intramedullary nailing in the supine position in adult diaphyseal fractures of the radius and ulna maintains the biology, hastening union and gives a very small, cosmetically acceptable scar.

CASE REPORT

The design of the screw intramedullary nail

The Screw intramedullary nail (made of stainless steel/titanium) by K-AIMS ORTHO Implants, Mumbai, India) is smooth and circular, with a bevelled tip. It comes in diameters of 2 mm, 3 mm, and 4 mm (Figure 1). The end of the nail has a threaded head that blends in with the body of the nail (Figure 1a). The circular running notch on the end of the nail shaft has a slot at the tip of the nail to accommodate the 3.5 mm screw driver (Figure 1b). The bevelled distal end of the nail (Figure 1c) helps in fracture negotiation and reduction by being bent depending on the nail diameter. As it advances steadily, it engages in the subchondral region of the bone, providing stability (Figure 1). Soft tissue discomfort is avoided by properly inserting the nail flush into the metaphyseal area.

The procedure is carried out under a brachial block or a general anaesthesia. The patient with segmental diaphyseal fracture of ulna and diaphyseal shaft of radius is placed supine on a fracture table with shoulder abducted and elbow flexed on a post which obviates the need of an additional assistant. Screw intramedullary nails of all sizes and diameter are kept ready on the operation trolley.

We address the segmental ulnar fracture first due to its subcutaneous position and the ease of passing the nail. With the assistant holding the hand and exerting gentle traction, the incision is made over the

Correspondence to: Yogesh S Salphale, Shushrusha Multispecialty Hospital, Lane Opp. Z.P, Chandrapur, 442401, India; E-mail address: yogeshsalphale1@gmail.com

Received: May 17, 2021; **Accepted:** May 31, 2021; **Published:** June 08, 2021

Citation: Salphale YS, Salphale V, Badade SD, Gadegone W, Salphale A (2021) Efficacy of Innovative Screw Intramedullary Nailing for Segmental Forearm Fractures in Adults Surg: Curr Res 11:116.

Copyright: ©2021 Salphale YS, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use; distribution, and reproduction in any medium; provided the original author and source are credited.

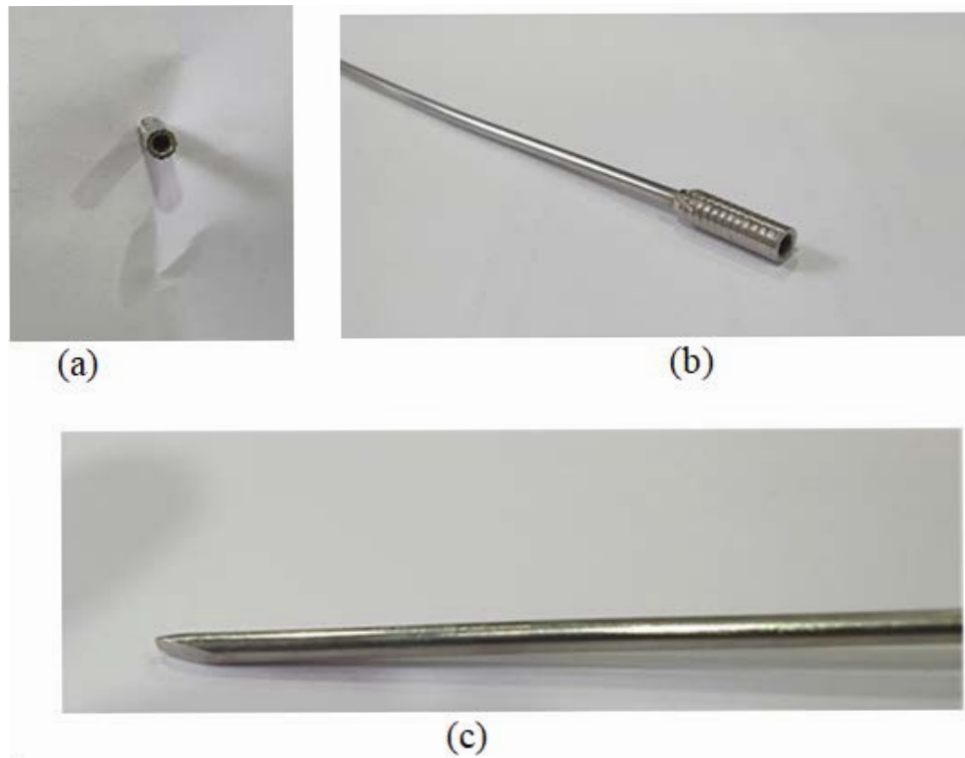


Figure 1: Profile of the Innovative Screw intramedullary nail; (a): Showing the end of the nail which accommodates the 3.5 mm screw driver for nail advancement; (b): Showing the end of the threaded nail which accommodates in the metaphysis; (c): Showing the bevelled end of the nail which rests in the subchondral region.

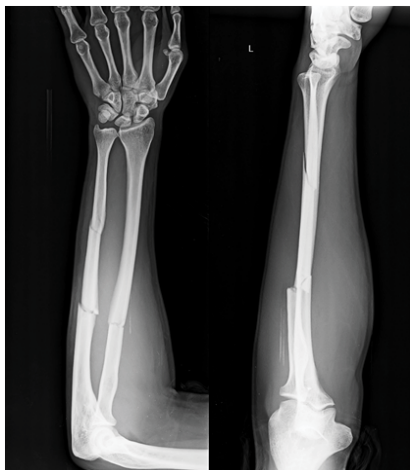


Figure 2: Pre-OP traction x-ray showing segmental fracture ulna with fracture of the shaft of the radius.

tip of the olecranon in line with the shaft of the ulna. With an awl the entry is made which is confirmed by the image intensifier. A 2.5 mm elastic screw nail is introduced through the tip of the olecranon and negotiated across the fracture till it reaches subchondral bone. Approaching the ulna helps in restoring length and alignment of the forearm. The tip of the nail is kept a bit proud should the need arise for any eventual adjustments.

A 2 mm pre bent elastic screw nail is then introduced through the styloid process of the radius. Manual traction is exerted lengthwise and the anteroposterior translation is addressed with the thumb pressure. Once the nail is negotiated across the fracture it is advanced gradually by the act of screwing it with the 3.5 mm screw driver till it reaches the subchondral bone of radial head. The stability is assessed while the nail is *in situ* and checked under the C arm.

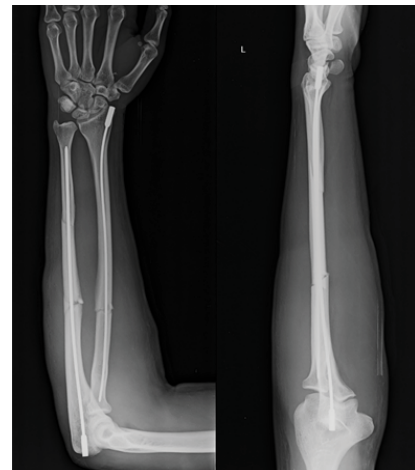


Figure 3: Immediate post-op x-ray with well-maintained DRUJ and the interosseous space.

As the nail is advanced in the metaphyseal region of the bone, it creates its path and the bone is compacted additional compression can be achieved with the screwing of the nail in Ulna and radius. The radial bow and the distal radioulnar joint is assessed and checked under C arm. The incision is closed and an AE slab is applied (Figures 2-4).

DISCUSSION

Since forearm fractures are considered intraarticular, ORIF with plate fixation remains the gold standard of care. [1]. It is sometimes difficult to perform ORIF at certain locations of the forearm, such as the proximal radial shaft, where the pronator teres and supinator are inserted and the posterior inter-osseous nerve crosses making it vulnerable for injury.

Though a variety of nails have been described in the management of the fractures of radius and ulna, from simple rush nails [10] to

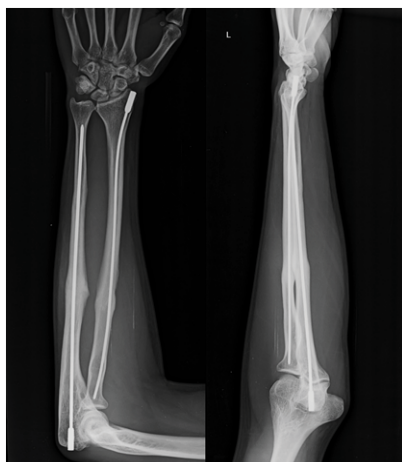


Figure 4: Showing a well healed fracture at 13 months follow up.

interlocking nails [11], the consensus has been equivocal as regards to the management of these fractures.

The newer interlocking nails for the radius and ulna fractures requires screws which lock at both ends, with looming of risk of PIN injury during the proximal locking procedure and the risk of extensor pollicis longus and/or superficial radial nerve injuries while performing distal locking [12-14].

For the segmental fractures of the radius and ulna rigid plate fixation is the gold standard. The use of Screw intramedullary nails provides an alternative means for internal fixation of adult proximal radial and ulnar fractures. The act of gradually tightening with the screw driver and advancing the nail to the subchondral region helps in achieving compression across the fracture. The three point fixation of the nail, the inherent elasticity of the nail restoration of the radial bow and the interosseous space are the advantages. It does impart an environment of relative stability which hastens the union.

Patients with intramedullary diameter less than 3 mm or with radial head and neck fracture or distal ulnar metaphyseal fracture which don't allow proper locking can be managed with this nail.

Internal fixation with an intramedullary nail provides the relative stability necessary to achieve secondary bone union, and callus formation should be discovered at 3 months postoperatively during follow-up.

The nail scores due to minimal soft tissue dissection and insult, negligible possibility of neurovascular injuries, cosmetically acceptable scars, preservation of the fracture hematoma.

The unique nature of the threads of this nail is that it plays a significant role in its locking as well as the integration with in the metaphyseal region.

CONCLUSION

The Screw intramedullary nailing has an edge over the other invasive methods. It does necessitate 3-4 weeks of long-arm cast immobilization. But the potential advantage of minimal learning curve, low cost of implant and cosmesis at the surgical site adds it to the armamentarium of the surgeons.

REFERENCES

1. Gadegone W, Salphale YS, Lokhande V. Screw elastic intramedullary nail for the management of adult forearm fractures. *Ind J Orthopaed*. 2012;46: 65-70.
2. Anderson LD, Sisk D, Tooms RE, Park 3rd WI. Compression-plate fixation in acute diaphyseal fractures of the radius and ulna. *J Bone Joint Surg*. 1975;57:287-297.
3. Chapman MW, Gordon JE, Zissimos AG. Compression-plate fixation of acute fractures of the diaphyses of the radius and ulna. *J Bone Joint Surg*. 1989;71:159-169.
4. Perren SM, Cordey JA, Rahn BA, Gautier EM, Schneider ER. Early temporary porosis of bone induced by internal fixation implants. A reaction to necrosis, not to stress protection. *Clin Orthopaed Related Res*. 1988;1:139-151.
5. Perren SM, Mane K, Pohler O, Predieri M, Steinemann S, Gautier E. The limited contact dynamic compression plate (LC-DCP). *Arch Orthopaed Trauma Surg*. 1990;109:304-310.
6. Frigg R. Locking Compression Plate (LCP): An osteosynthesis plate based on the dynamic compression plate and the point contact fixator (PC-Fix). *Injury*. 2001;32:63-66.
7. Saikia K, Bhuyan S, Bhattacharya T, Borgohain M, Jitesh P, Ahmed F. Internal fixation of fractures of both bones forearm: Comparison of locked compression and limited contact dynamic compression plate. *Ind J Orthop*. 2011;45:417-421.
8. Azboy I, Demirtas A, Uçar BY, Bulut M, Alemdar C, Özkul E. Effectiveness of locking versus dynamic compression plates for diaphyseal forearm fractures. *Orthoped*. 2013;36:e917-e922.
9. Leung F, Chow SP. Locking compression plate in the treatment of forearm fractures: a prospective study. *J Orthopaed Surg*. 2006;14:291-294.
10. Henle P, Ortlieb K, Kuminack K, Mueller CA, Suedkamp NP. Problems of bridging plate fixation for the treatment of forearm shaft fractures with the locking compression plate. *Arch Orthopaed Trauma Surg*. 2011;131:85-91.
11. Sah RK, Akhtar M, Din IM, Nadeem RD, Muhibi AS. Comparative study of effectiveness of rush pin with long arm cast and dynamic compression plate in management of closed diaphyseal fracture of radius and ulna in adults. *JPMA. J Pak Med Associat*. 2019;69:1431-1436.
12. Hopf JC, Mehler D, Nowak TE, Gruszka D, Wagner D, Rommens PM. Nailing of diaphyseal ulna fractures in adults-biomechanical evaluation of a novel implant in comparison with locked plating. *J Orthopaed Surg Res*. 2020;15:1-7.
13. Saka G, Saglam N, Kurtulmus T, Avci CC, Akpınar F, Kovaci H, et al. New interlocking intramedullary radius and ulna nails for treating forearm diaphyseal fractures in adults: a retrospective study. *Injury*. 2014;45:S16-S23.
14. Hong G, Cong-Feng L, Chang-Qing Z, Hui-Peng S, Cun-Yi F, Bing-Fang Z. Internal fixation of diaphyseal fractures of the forearm by interlocking intramedullary nail: short-term results in eighteen patients. *J Orthopaed Trauma*. 2005;19:384-391.