

Outcome of Locking Compression Plates in Humeral Shaft Non-unions with Augmented Stabilization done in Rural Tertiary Care Centre: A Case Report

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Abstract

Fractures that involve the mid-shaft of the humerus are relatively common. Early surgical correction of such patients helps in early mobilization and improved patient comfort but carries an increased risk of post-operative complications.

Such fractures are usually managed by 4.5 mm limited contact dynamic compression plates (DCP). In recent studies, it has been proposed that narrow, longer implants have better mechanical benefits with improvement in handling of fracture fragments and the surrounding soft tissue support.

TENS provides a three-point bony fixation, hence retaining adequate bony alignment. This prevents micromotion at the fracture site, thereby improving the callus formation and bony union. As TENS is flexible, insertion is easier than rigid intramedullary implants.

Here we present an interesting case of Humerus mid-shaft fracture originally managed with 4.5 mm locking DCP, which later required re-do surgery with Bone grafting and a TENS nail.

Keywords: Dynamic compression plate; TENS (Titanium elastic nail system); Humerus fracture.

INTRODUCTION

Fractures that involve the mid-shaft of the humerus are relatively common. Early surgical correction of such patients helps in early mobilization and improved patient comfort but carries an increased

risk of post-operative complications.¹

Such fractures are usually managed by 4.5 mm limited contact dynamic compression plates (DCP).¹ In recent studies, it has been proposed that narrow, longer implants have better mechanical benefits with improvement in handling of fracture fragments and the surrounding soft tissue support.^{1,2}

TENS provides a three-point bony fixation, hence retaining adequate bony alignment.³ This prevents micromotion at the fracture site, thereby improving the callus formation and bony union. As TENS is flexible, insertion is easier than rigid intramedullary implants.³

Here we present an interesting case of Humerus mid-shaft fracture originally managed with 4.5 mm locking DCP, which later required re-do

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surgery with a Dynamic compression plate and bone grafting and augmentation with a TENS nail following implant failure and Non-Union of the fracture site.

CASE REPORT

Here we present the case of a 25-year-old male who was previously operated 3 years back for a right Humerus mid-shaft fracture. This was corrected by Open Reduction and Internal Fixation (ORIF) using 4.5 mm locking compression plate, which is considered the standard of care in such patients. Patient then developed a fall, following which he experienced pain and swelling over the right arm, with a loss of transmitted movements along with abnormal mobility at the middle of the arm with prominence of the implant on palpation. X-ray Anteroposterior and lateral views of the Right humerus was taken and subsequently, the patient was diagnosed to have Non-union Right Humerus with implant failure.

Patient was planned for implant removal with re-fixation with 4.5 mm Locking compression plate along with Bone grafting.

Incision was taken over the old scar mark, soft tissue dissection was done, and adhesions were cleared. Extensive bone overgrowth was found intra-operatively with the entire plate being covered with bone. Once the broken plate was lifted off the bone, fracture site was examined, and the ends were freshened. Then, the hypertrophic tissue was cleared off the fracture ends and curetted until fresh bleeding was observed.

To prevent rotational malalignment, a single 2mm TENS (Titanium Elastic Nailing System) was passed from the distal to the proximal bone fragments to bring about satisfactory reduction.

Autologous Cancellous bone was harvested from the Right iliac crest and was packed into the defect.

From post-operative day 2, patient was started on progressive in pouch elbow and shoulder mobilization. Wound dressings of both the operative and graft site were done on post-operative day 2, 5 and 10 and the dressings were clean with no signs of post-operative infection.



Fig. 1: Pre Op Xray



Fig. 2: Broken Plate



Fig. 3: Tens Nail Augmentation



Fig. 4: Stable Fracture Fixation

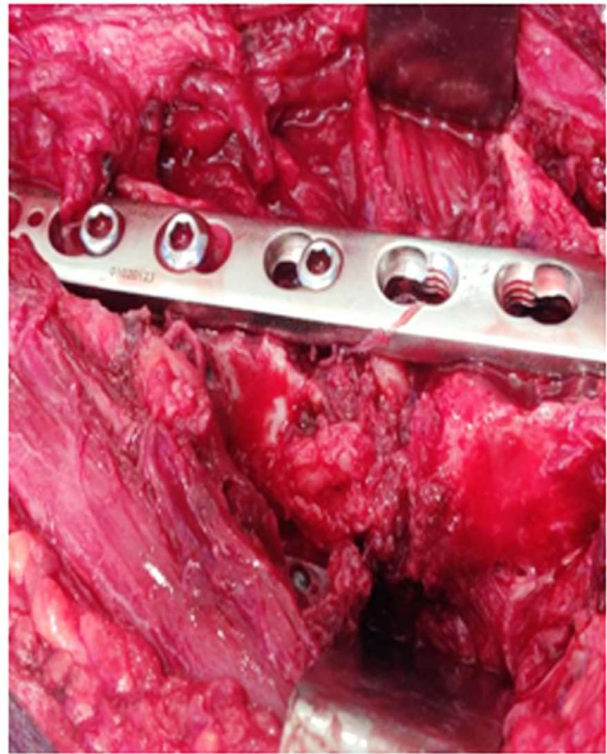


Fig. 5: Impacted Bone Graft



Fig. 6: Post Op X-ray

DISCUSSION

Osteoporotic humeral non-unions are notoriously challenging to treat. Such conditions get complicated further by previous surgical attempts and comorbidities such as obesity and osteopenia.¹ The incidence of non-union ranges from 0 to 8% with non-operative treatment and 0-13% with operative treatment.¹ The goal of correcting any non-union is the restoration of function, achieving stable fixation, acceptable alignment, and a functional range of motion. The treatment of Non-union is by various operative procedures, including plating, intramedullary nailing, external fixation with Ilizarov device.^{2,3} Extensive fibrosis, enlarged screw

holes and sclerotic avascular bone ends are some of the reasons for non-union.^{1,2} In plate osteosynthesis of long bones, the stability of the fracture depends on the friction between the cortical bone surface and the plate generated by the hold of the screws.³ The stress in the implant bone construct in fragile bones is high, and the holding power of the screws is low, and cut out with subsequent implant loosening is likely. ORIF may have a high failure rate of about 10-25%, with the decreased holding power of plate and screw fixation in osteoporotic bone fractures.^{4,5}

Similarly, nerve injury is seen in 0-5.6% cases and carries a high risk of re-fracture.³ Another disadvantage is that it requires exposure, which is associated with increased rates of infection and non-union. Circular external fixators have advantages, such as not requiring postoperative plaster cast immobilization.⁴ Still, they have disadvantages, such as the difficulty of application, technical problem, the possibility of injury to blood vessels and nerves, restricted movement, pin tract infections, and septic arthritis.⁴ Treatment with intramedullary nailing has advantages such as requiring less soft tissue dissection, a small area of exposure, a low infection rate, relative ease of use, and a low rate of radial nerve paralysis.³

Intramedullary fixation offers an advantage compared with plate fixation in that the implant is load sharing rather than load bearing. However,

it also has disadvantages, such as inapplicability in cases where the distal fragment is short or rotational instability or lack of compression 3 lack of a locking mechanism. Traditional non reamed nails, such as Ender and Rush nails and reamed Kuntscher nails, do not achieve sufficient stability, particularly in rotation. Gupta et al. obtained good rotational stability with intramedullary nails, with a functional improvement rate of 89%.⁶ Successful outcome rates in non-unions treated with intramedullary nails are 87.5–100%.⁶ In our patient, we identified the right nail based on the width of the medulla. The TENS nail was used to provide additional stability across the fracture site as well as the proximal and distal fragments. It helped to achieve both adequate rotational stability as well as complete consolidation in 96%^{5,6} of the patients. For successful treatment of non-union, one must achieve adequate compression across the fracture site while using an IM nail. Nonetheless, 100% successful results have been reported with the achievement of stability. Sufficient contact between fracture fragments intra-operatively can reduce the rate of non-union.

CONCLUSION

In conclusion, for surgical re-fixation of the Non union fractures with Compression plate, the above-mentioned technique of bone grafting of the non-union with TENS nail augmentation can be used along with the compression plate to accentuate the treatment of Non-Union.

Conflicts of interest

The author has none to declare.

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