DOI: https://doi.org/10.53350/pjmhs22169189

ORIGINAL ARTICLE

Derotational Plate Augmentation with Retention of Intramedullary Interlocking Nail in Resistant Nonunion at Distal Femur Shaft

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ABSTRACT

Background: Non-union in femur shaft after satisfactory treatment with closed intramedullary interlocking nail is not very common. This nonunion is always a challenging condition for surgeon. These nonunion are usually treated by dynamization, close exchange nail with larger diameter, retention of nail and onlay bone graft, removal of nail and fixed with plates and bone graft, removal of nail and application of cast brace and sometimes removal of nail and applications of external fixators. But no treatment is' gold standard' the rotational instability is blamed to be one of the most common reason of nonunion.
Aim: To control rotational instability, we did plate augmentation with or without bone grafts without removing the nail to treat this nonunion.
Methods: Total patients were 16. Proximal and distal interlocking screws were removed, nonunion site was opened, compression at nonunion site was done, and broad DCP was applied as de rotation plate with or without bone grating. We excluded fracture less than one-year duration and fracture with infective nonunion.
Results: In 12 patients bone grafting was done where there was less callus or there was suspicion of atrophic non-union. We got union in all patients. 6.25 months were average time of union. 13 months was average time between the primary and secondary surgery. 71 minutes was means surgical time. Complications or implant failure were not noted. 0.9 cm was average residual limb shortening and 115 degrees was average range of motion at knee joint.
Conclusion: Nonunion in distal femur shaft fracture with interlocking nail in situ is reliable and effective procedure
Keywords: Distal femur, plate, External fixator. Bone grafting

INTRODUCTION

The most common fracture in orthopedic practice is considered to be the fracture of femoral. Trauma in considered to be main reason of these fractures, although high energy trauma is mainly responsible but low energy trauma in also culprit in osteoporotic bone. The fracture may be associated with neck fractures or patella fractures[1].

Closed intramedullary interlocking nailing is still considered to be 'gold standard' in femoral shaft fractures and excellent results are usually achieved[2]. The non-union in femur after treatment with interlocking nail is not common but if present it is a very challenging for surgeons[3]. The plating after removal of nail, exchange nail, and Illizarov fixation are communally used methods for the treatment on nonunion in femur shaft fractures after treatment with interlocking nail[4].

Exchange nailing is also recommended method for nonunion[5] but results are inconsistent.[6] the treatment of nonunion of femur shaft after interlocking nail is removal of nail and fixation of nonunion with the plate and bone graft is also well-known method. But extensive soft tissue damage occurs and also sometimes and vascular compromise has to face[7]. Most of the surgeons are not in favor of the use of Illizarov fixation especially in the thigh.

Rotational instability is considered to be a main reason of nonunion. So platting in the presence of nail provided rotational stability, and nail also protects the plate from bending forces.

MATERIALS AND METHODS

We operated 16 patients who were admitted in Mayo Hospital Lahore from 1-1-2019 to 31-10-2019.Out of 16 patients 14 patients operated in our hospital and 2 patients were referred from other hospitals. A prior dynamization was done in 12 patients, and in 4 patients' only primary surgery was done. In patients with dynamization, the procedure was between 10 to 24 weeks post operatively. 12 patients had hypertrophic non-union and 4 were with atrophic non-union.

Surgical technique: Lateral position was used in all operations. Lateral approach was used in all cases. The non-union site was observed after cutting the fascia and elevation lateralis muscle[8]. The rotational instability at nonunion site was confirmed the fracture site. In case of severe callus formation and less rotationally instability, the nonunion site was fixed with 8 holes broad DCP and no bone grafting was done. But in case of atrophic nonunion and nonunion in which there was excessive rotationally instability we removed both proximal and distal interlocking screws. The nail was pushed back and nonunion site was fully debrided from non-vitalized tissues, marrow cavity was opened and bone ends also refashioned. The nail is pushed forward again with compression at nonunion site. 8 holes broad DCP plate fixed with cortical screws around the nail. Cancellous bone grafts was taken from ipsilateral iliac crest and put around the nonunion site. Muscle was closed over the bone graft. We did not used suction drain in patients with bone grafting due to the reason the drain will suck the bone marrow contents. We placed non suction drain away from bone graft area and wound closed. Antiseptic dressing was done. The knee was mobilized in first post-operative day. Stitches were removed after 14th post-operative day. Physiotherapy started after 2nd post-operative day. All patients were examined after ever month for 6 months. Partial weight bearing started after 6 weeks and full weigh bearing afar union.

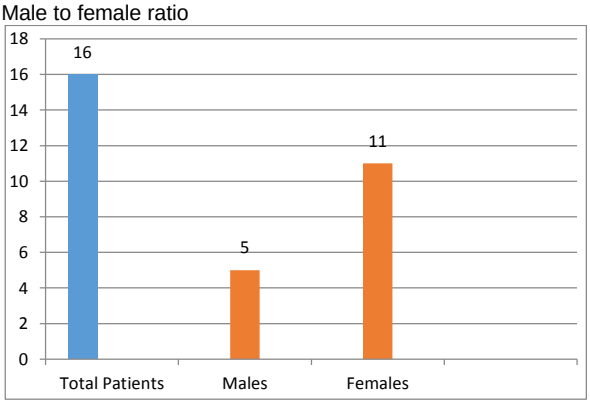
RESULTS

Eleven females and 5 males were operated. The age range was from 26 years to 55 years and 36 years was average age. The time taken from first surgery to second surgery was from 12 months to 15 months and average time was 13 months. Surgical time was range from 55 minutes to 95 minutes and the means surgical time was 71 min. From 120ml to 300ml range of blood loss is expected in each operation and average blood loss was around 180 ml. No complications were found.

Received on 11-04-2022
Accepted on 19-08-2022

Infection was noted in 2 patients who recovered with antibiotics. The follow-up was up to 8 months. The union was achieved in all cases and union time ranged from 4 months to 9 months and with an average time of union of 6.25 months. A shortening of the limb was from .6cm to 3cm and average shorting was about 0.9 cm and The range of knee movement was from 100 degrees to 135 degrees and 115° was average range of motion at knee.

Male to female ratio



DISCUSSION

The results of femur fracture and fixation with inter locking nail are always excellent but nonunions were also reported. The comminuted fracture and fragments displacement are considered to be the main reason of nonunion. Nail of small diameter, improper locking of the screws and mal-alignment of fractures are considered to be other reasons of nonunion[9].

Although various methods to treat these nonunion are available with various advantages and disadvantages but Exchange nailing is considered to be a reliable method[10].

The nail with larger diameters provided rotational and bending forces and also osteogenesis is generated with reamings[11]. Although exchange nailing is considered to be a reliable method to treat nonunion many surgeons reported high failure rate[12]. Due to the wider marrow diameter at distal fragment, the proper stability was not provided and due to this reason exchange nail is not recommended[13].

Good results were also reported with Illizarov external fixators after nail removal to treat femur nonunion .[14] Due to its many complications Illizarov is only used in infected nonunion and more commonly used procedure is dynamization but results are not satisfactor[15].

Removal of nail and plating has much chance of implant failure. Plate augmentation is best treatment. Choi and Kim [16] reported that nail and plate provide rotational stability with macro motion at nonunion site. There are few studies are reported on plate on nail and results comparable to the present study[17,18,19,20,21].

CONCLUSION

DE rotation plate on the nail with or with bone grafting is a useful and easy procedure with good results.

Conflict of interest: Nil

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