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A retrospective analysis of complications following distal femoral fractures treated with retrograde supracondylar nailing and locking compression plate

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Abstract

Introduction: In the literature, the prevalence of distal third femoral fractures was rare among shaft of femur fractures and accounts up to <7%. In the modern era, management of these fractures has been debated with two renowned implants, like Retrograde supracondylar nail (RSN) and Locked compression plate (LCP). Both the implants have its own pros and cons.

Materials and Methods: We have done a retrospective analysis of 46 patients who were operated on for distal third femur fractures with RSN and LCP in the last 4 years in Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram. We have taken case files of these patients and reviewed them in OPD. There were 21 RSN (45.6%) treated patients and 25 LCP (54.4%) treated patients.

Results: About 10 patients (21.7%) in the RSN group and 14 patients in the LCP group (30.4%) had complications. Both RSN & LCP patients had similar complications except the intraarticular nail protrusion (2/46), plate breakage (1/46) and plate offset (3/46).

Conclusion: Thus, our study overviewed the complications and removed the barrier in approaching their management. Both nailing and plating proved to be better implanted with one's own pitfall. We conclude that proper preoperative planning before surgery aid in good results with both radiological and clinical aspects.

Keywords: Distal third fractures of femur, retrograde supracondylar nail, locking compression plate, complications, management

Introduction

In the literature, the prevalence of distal third femoral fractures were rare among shaft of femur fractures^[1] and accounts for upto <7%. In the modern era, management of these fractures have been debated with two renowned implants, like Retrograde supracondylar nail (RSN) and Locked compression plate (LCP). Both the implants has its own pros and cons. With the trending knowledge about biologics of fracture fixation, the distal third fractures of the femur has been treated with nonlocking plates, precontoured locking compression plates and retrograde supracondylar nail. Since distal third femoral fractures were complex fractures and the same needs a technically sound approach to avoid complications. Many literatures had discussed the complications of the individual implant, which could be uncertain. Our study enlightens and emphasis the enigma by bringing together the pitfalls in the management of distal third femoral fractures.

Materials and Methods

We have done a retrospective analysis of 46 patients who were operated on for distal third femur fractures with RSN and LCP within the last 4 years in Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram. We have taken case files of these patients and reviewed them in OPD. There were 21 RSN (45.6%) treated patients and 25 LCP (54.4%) treated patients. These patients were evaluated with X-rays, clinical examination and range of motion. In our study, we have covered the intraoperative and postoperative complications in the view of achieving an excellent functional outcome. The term postoperative included up to and a maximum of 2 years following surgery.

We haven't included the patient with preoperative complications like previously operated ipsilateral tibia fracture, ipsilateral limb shortening and grade 3C open fractures.

Table 1: Demography of our study population

Parameters	RSN	LCP
Mean Age (years)	45.75	44
Gender		
Male	15	17
Female	6	8
Side		
Right	14	15
Left	7	10
Classification (AO/OTA)		
33-A1	6	5
33-A2	9	4
33-A3	3	5
33-C1	2	6
33-C2	1	3
33-C3	0	2

Surgical techniques

In our study, the patients injured were immobilized with POP/skeletal traction. The preop assessment was done and consent for surgery was taken. Open fractures were undergone external fixation and were posted for definitive

surgery in 2-3 weeks. Both nailing and plating were done under strict aseptic precautions. Postoperative protocol of early knee mobilization was considered pertaining to the fixation of the fracture. Both injectable and oral antibiotics were given. Patients were discharged after first look dressing and followed up periodically.

Results

About 10 patients (21.7% in the RSN group and 14 patients in the LCP group (30.4%) had complications. The following table gives a statistics of various complications aroused intraoperatively and postoperatively. Both RSN & LCP patients had similar complications except for intra-articular nail protrusion (2/46), plate breakage (1/46) and plate offset (3/46).

Table 2: Various complications in our study

Complications	RSN	LCP
Plate offset	-	3 6.5%
Nail protrusion	2 4.3%	-
Anterior knee pain	4 8.6%	-
Knee stiffness	6 13.1%	4 8.6%
Non union	3 6.5%	2 4.3%
Shortening	2 4.3%	3 6.5%
Infection	3 6.5%	5 10.9%
Screw pullout	1 2.2%	-
Plate break	-	1 2.2%

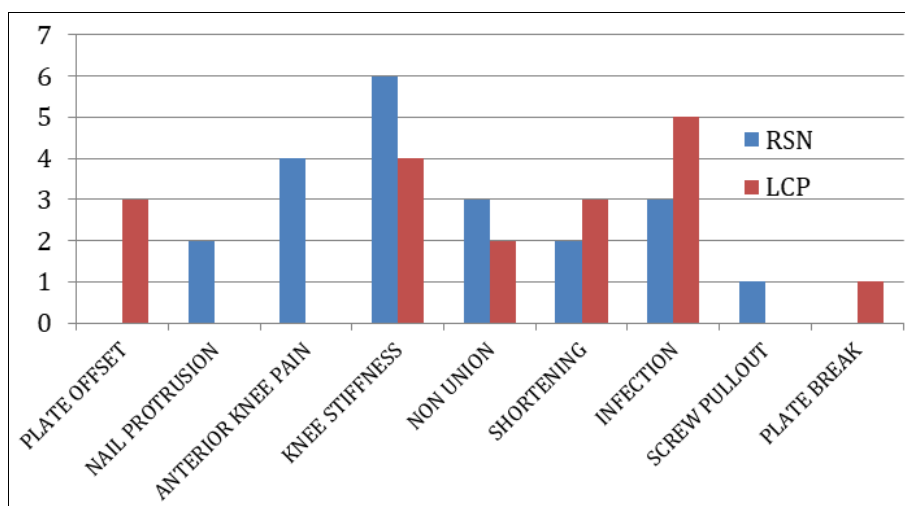


Chart 1: Bar chart showing the rate of complications in RSN & LCP



Fig 1.1: Plate break with varus collapse



Fig 1.2: Distal screw pullout



Fig 1.3: Plate offset



Fig 1.4 Nail protrusion



Fig 2.1: Nonunion after nailing



Fig 2.2: Infected nonunion after plate removal



Fig 2.3: Shortening of left lower limb



Fig 2.4: Knee stiffness

Discussion

Management of distal third fractures of femur were complex and needed a meticulous preoperative workup. In the timeline, failure rates with the management of distal third fractures of the femur were more common. In the past, they were treated by open anatomical reduction and rigid fixation with traditional plates, which lead to delayed or nonunion rates of 29%-38% and infection in 7% -20% of cases [2-5]. Nowadays, most systems were designed with options to apply the implants in a minimally invasive fashion to preserve the local biology and avoid problems with fracture healing and infection [6, 7].

The advent of modern implants like LISS [8] and intramedullary retrograde nailing has brought an increase in union rate and reduced the time of surgery. In spite of using minimally invasive approaches with these implants, there were complications arising like malunion, loss of fixation, and other implant-related shortcomings [9, 10, 11].

In the view of the application of nailing, the complications arised were lack of alignment, screw pullout, intrarticular nail protrusion, retrocurvation, non-union and perforation of joint cartilage [12]. While the plating had encountered complications due to improper alignment of the plate, varus malalignment, rotation of distal fragments, infections and plate breakage.

The major complication associated with our study was knee stiffness (fig-2.4) which was present in overall 10/46 patients (RSN>LCP) [21.7%]. At 1 year follow-up, the patients with ROM $\leq 90^{\circ}$ were considered to have severe knee stiffness. This can be prevented by arthrofibrosis after implant fixation and early quadriceps exercise. Dong-Wook son *et al.* [13] has reported the importance of the extensor mechanism in the prevention of knee stiffness. At 3 months, patients with knee stiffness were given physiotherapy with a continuous passive motion (CPM) machine. Ehlinger *et al.* [14] has reported a loss of knee flexion upto 30° - 40° compared to normal knee was common after surgery.

Other common complication presented was infections (17.4%) in overall 8/46 patients, mostly settled with culture sensitivity based antibiotics and 2 patients needed secondary

wound wash and debridement. William M¹⁵. In his cohort study of 335 cases, he stated that infections alter the surgical outcome in both closed and open fractures. He also identified risk factors for healing and implant failure: diabetes, open fracture, younger age, smoking, and higher BMI. These risk factors can alter the prognosis, which were out of the surgeon's control.

Anterior knee pain was present in 4 patients (8.6%) with nailing and had no significant changes in functional outcome. They were treated with analgesics for a longer period (2-3 weeks) compared to other patients. Many studies have proved the higher incidence of knee pain in patients with nailing and this was in agreement with our study. Many theories postulated that pain produced was due to the unwashed debris stayed within joint cavity during reaming which in turn irritates the synovium. This complication can be prevented by using protection sleeve till serial reaming ends.

Few other complications overlapping in both groups were nonunion (10.8%) and shortening of 2 cm (10.8%) [Fig 2.1-2.3]. Implant failure [Fig 1.1-1.4] was present in 5 patients which didn't hinder the union. Among the implant failure plate offset (6.5%) and intrarticular protrusion (4.3%) of nail were more common. Plate break (2.2%) with varus collapse and distal screw pullout were also present.

Number of intra-operative complications can be minimized by right alignment of fracture fragments, diligent selection of correct entry point under adequate fluoroscopic guidance and proper selection of nail diameter and length. In contrast, plate length was a risk factor for implant failure that can be controlled by relatively minor technical modifications. We recommend the use of relatively long constructs for the treatment of distal third fractures of femur with locked plates.

Conclusion

Thus our study overviewed the complications and removed the hindrance in approaching their management. Both nailing and plating proved to be better implants with one's own pitfall. Choice of implant has to be decided by the surgeon based on fracture pattern, physical condition, time duration of surgery and expected intraop difficulties. Main idea behind this study was to enumerate the lacunae in treatment of distal third fractures of femur and preventing the errors. Since the sample size was small and followup was difficult, the morbidity couldn't be assessed. We conclude that proper preoperative planning before surgery aid in good results with both radiological and clinical aspects.

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