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Functional Outcomes of Positive Medial Cortical Support Proximal FemoralNail in Per Trochanteric Fracture

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Abstract
To introduce the concept of fracture reduction with positive medial cortical support proximal femoral nail and its clinical and radiological correlation in intertrochanteric fractures.This study included 90 patients of proximal femur fracture admitted in our institute. The patients were informed about the study in all aspects and informed consent was obtained from each patient. The positive cortex support was defined as the medial cortex of the head-neck fragment displaced and located a little bit superomedially to the medial cortex of the shaft. Results were evaluated using the Harris Hip Score. We had 45(50%) excellent, 31(34.44%) good, 12(17.8%) fair and 2(2.22%) poor results. Fracture reduction with nonanatomic positive medial cortical support allows limited sliding of the head-neck fragment to contact with the femur shaft and achieve secondary stability, providing a good mechanical environment for fracture healing.

INTRODUCTION

Intertrochanteric hip fractures are still a major orthopaedic challenge worldwide [1]. Despite the fact that fracture union rates are high, the functional outcomes tend to be disappointing [2-4]. A combination of factors, such as medical comorbidities, patient compliance, fracture pattern, quality of the bone and environmental factors are thought to be responsible for this poor result [5-9]. Many of these factors cannot be addressed at the time of fracture presentation. As the operative procedure is a major component in the treatment of patients with hip fractures, understanding the causes of failure is integral to any attempt to achieve an improved functional outcome. In 1980, Kaufer [10] described five major factors related to the treatment outcome, i.e. the bone quality, the fragment geometry, the choice of implant, the quality of reduction and the placement of the implant in the femoral head. However, the stability of the fracture after implant fixation is primarily dependent on the quality of fracture reduction. It is well known that slight valgus position to allow impaction means more stable fracture reduction and implies better outcome. Besides the valgus alignment, it is paramount important to achieve an anatomical contact between the anteromedial cortices of the two major fragments, the head-neck and the shaft [11-14].

In this paper, we describe the concept of positive medial cortical support (PMCS) in fracture reduction of intertrochanteric fractures treated with proximal femoral nails. PMCS is defined as the medial cortex of the head-neck fragment is displaced and located a little bit superomedially to the medial cortex of the femur shaft in AP view. PMCS reduction is a key element for stability reconstruction for fractures, as it allows limited sliding of the head-neck fragment after operation (fracture impaction) to contact with the femur shaft and achieve secondary stability, providing a good mechanical environment for fracture healing. PMCS differs from the anatomic reduction of the anteromedial cortex. PMCS is a functional nonanatomic buttress reduction, which is easy to achieve in practice and is used for description of secondary stability after sliding impaction. While exact anatomic reduction is difficult to obtain and is used for primary fracture stability.

MATERIALS AND METHODS

This study included 90 patients of proximal femur fracture admitted in our institute. The patients were informed about the study in all respects and informed consent was obtained from each patient.

Inclusion Criteria

- Patient who has been diagnosed as having intertrochanteric fractures.
- Patients more than 20 years of age.
- Patients who are fit for surgery.

Exclusion criteria

- Skeletally immature individuals.
- Patients unfit for the surgery.
- Patients with pathological fractures.
- Patients admitted for re-operation.
- Patient not giving written consent for surgery.

Patients admitted with Intertrochanteric fracture were examined and investigated with X Ray pelvis with both hips AP and Lateral view (whenever possible). Skin traction was applied to all the patients. All the patients were operated using Proximal Femur Nail.

RESULTS AND DISCUSSION

The study involved 90 confirmed cases of Intertrochanteric fractures of either sex. All the cases were treated with the proximal femoral nail. The study involved patients above 20 years of age. The age distribution was from 22-87 years. The average age was 60-73 years, the largest group of patients being from 61-70 years. There were 33 females and 57 males in the study. Most common cause of injury was fall down followed by road traffic accidents. 90 patients had intertrochanteric fracture.Time between Injuries to operative intervention was within 3 days of injury for 85 patients while 5 patients had an interval of more than 3 days. The average operative time was 60-11 minutes. Positive medial cortical support proximal femoral nail patients get ground-walking (full-weight bearing walking) much earlier, with better functional outcome at 3 months follow-up and less hip-thigh pain presence.

The average radiological union time for Intertrochanteric fracture was 15.8 weeks. The average Partial Weight Bearing walking time was 7.17 weeks ranging from 6 weeks to 10 weeks and the average Full Weight Bearing walking time was 11.17 weeks ranging from 10 weeks to 14 weeks. 1 patient had non-union at the end of follow up. In 6 patients with long spiral fracture, encirclage wiring was done by opening the fracture site to hold fragments. 3 patients had early post-operative infection which was resolved with antibiotics and dressing. 5 patients with screw back-out were treated by inserting a new Screw of smaller size. 1 patient had non-union. 1 patient had the z effect at the end of 9 months, managed by removal of the implant.

In the operation of per trochanteric fractures, anatomic reduction is always prior to the recommended positions of variety implants. Although the posteromedial cortex alignment is the key for successful reduction, most implants used today do not have the ability to purchase the less trochanteric fragment. According to the reduction criteria modified by Baumgaetner, most fractures could only achieve an acceptable reduction grade, i.e. good alignment. For these fractures, the Garden alignments and anteromedial contact between the femoral head-neck and shaft fragments are extremely important [1]. However, valgus position in fracture alignment is not synonymous to positive medial cortical support in fragment displacement. Compression of the bone fragments is beneficial to bone healing. For unstable per trochanteric fractures, it can be achieved through two approaches intraoperative fracture compression and postoperative impaction via controlled sliding along the axis of the instrument device (helical blade or lag screw). The former is the manoeuvre done by the surgeon during surgery to compress the fracture site through which to obtain primary fracture stability, while the latter is the postsurgical compression provided by a fixation device with a sliding capability, in association with muscle contraction and patient weight bearing, attained secondary fracture stability.

Harris hip Score:

Results were evaluated using the Harris Hip Score. We had 45(50%) excellent, 31(34.44%) good, 12(17.8%) fair and 2(2.22%) poor results.

Fig. 1: Pre Op x-ray post op x-ray 1 year follow up

Fig. 2: 1 Year follow up

Fig. 3: Pre Op x ray Post op x ray 1 year follow up

Fig. 4: 1 year follow up

Fig. 5: Pre Op x ray Post op x ray 1 year follow up

Fig. 6: 1 year follow up

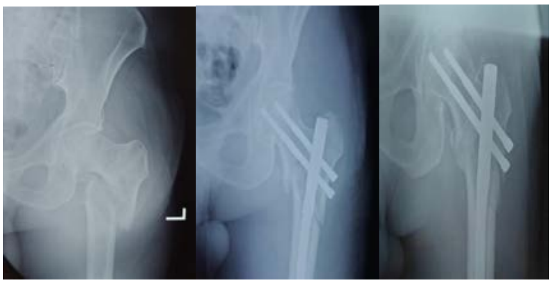

Fig. 7: Pre-Op x ray post op x ray 1 year follow up

Fig. 8: 1 year follow up

Table 1: Functional results based on Harris hip score

Harris hip score		Number of patients
<70	Poor	2
71-79	Fair	12
80-89	Good	31
90-100	Excellent	45

Table 2: Study.

Study	Excellent (90-100)	Good (81-89)	Fair (70-79)	Poor (<79)
Timothy *et al.*[29]	24.2%	51.5%	15.2%	9.1%
Jose A *et al.*[30]	58.8%	29.4%	8.8%	2.9%
Rajesh kapila *et al.*[31]	24%	56%	12%	8%
In Our Study	50%	34.44%	17.8%	2.22%

Controlled fracture impaction by limited sliding, provides secondary axial and torsional stability between the head-neck fragment and the femur shaft. Controlled fracture impaction is particularly important for the maintenance of stable reduction during fracture healing and is compatible with the subsequent dynamic events of cyclic loading and remodelling across the fracture line. In contrast, fracture collapse, also termed uncontrolled fracture impaction, or excessive sliding, is fracture impaction-displacement, with loss of reduction. Fracture collapse is one of the major reasons for failure of fixation of these fractures. The concept of nonanatomic positive cortex buttress reduction was firstly introduced by Gotfried [20-21] for displaced sub capital femoral neck fracture. On the premise of 180° fracture alignment in lateral view, it was defined a displaced sub capital femoral position, AP view, in which the distal femoral neck fragment is positioned medially to the lower-medial edge of the proximal fracture fragment. In this state, the distal fragment can limit the femoral head excessive sliding through cortex-to-cortex buttress [22].

We present a counterpart concept of positive medial cortical support in unstable per trochanteric fractures. It also demands a 180° fracture alignment in lateral view, while in AP view, contrary to the Gotfried’s standard, the distal femoral shaft fragment is intentionally positioned a little bit laterally to the lower-medial edge of the proximal fracture fragment. Unlike the usual displaced route of the proximal fragment in unstable femoral neck fractures, for per trochanteric fractures, when sliding begins after surgery, the head-neck fragment is tended to displace laterally, impacted into the comminuted and low-intensity trochanteric region, which finally led to collapse. As in the positive medial cortical support position, the cortex contact between the two main fragments is achieved, meanwhile, the medial cortex of the femoral shaft can resist the femoral head-neck fragment from further sliding laterally. The anterior cortical contact after head-neck sliding can also provide rigid buttress for secondary stability [23-24]. However, considering the essence of lateral sliding direction, we think positive medial cortical support may be more effective than anterior cortical contact [14]. In addition, obtaining both medial and anterior cortical buttress (anteromedial reduction) is the best option for per trochanteric fragment reduction.

Conclusion:

Fracture reduction with positive medial cortical support and valgus alignment, allows limited sliding of the head-neck fragment to contact with the femur shaft and achieve secondary stability, providing a good mechanical environment for fracture healing.

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