Fixation of subtrochanteric fracture femur by locked proximal femoral plate versus dynamic condylar screw plate

Thesis

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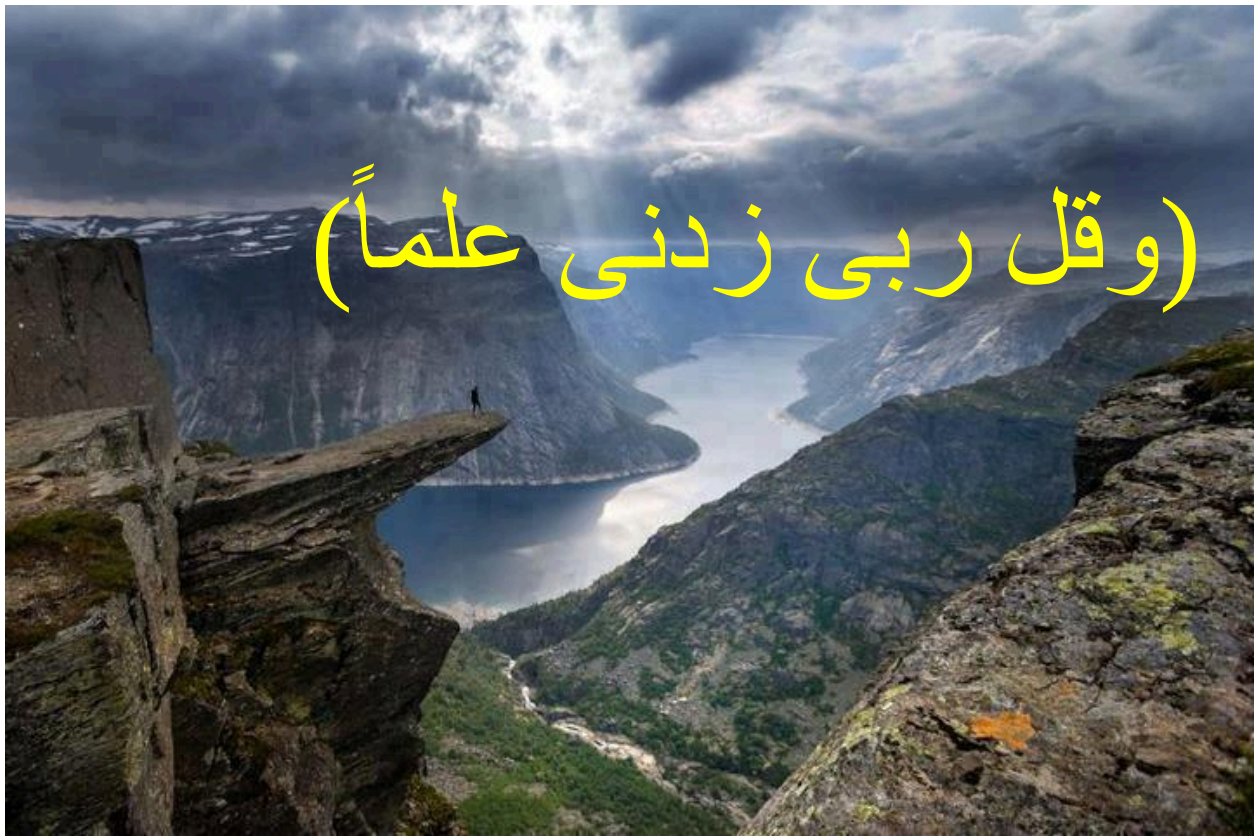
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Table of Contents

List of Tables

List of figures

List of diagrams

Abstract

Background: The universally accepted treatment modality of subtrochanteric fractures is open or closed reduction and internal fixation using Lateral plate-screw system or intramedullary fixation systems as the Gamma-nail.

Objective: the purpose of this study is to compare of treatment of subtrochanteric fracture femur by indirect reduction and internal fixation using DCS plate versus open reduction and internal fixation using proximal femoral locked plate.

Methods: We evaluated two types of plates for fixation in 60 subtrochanteric fractures in a prospective study; the dynamic condylar screw plate and the proximal femoral locked plate. The patient's age ranged from 30 years to 90 years.

Results: The group treated by Proximal femoral locked plate had better Merle score at second and third month follows up than Dynamic condylar screw plate group, among 60 patients treated 5 cases only had complications that need interventions .

Conclusion: Overall the functional outcome varied from good to excellent as assessed by the Merle d'Aubigné Hip Score .

Keywords: Dynamic condylar screw plate fixation, proximal femoral locked plate fixation, subtrochanteric fracture, proximal femur.

Introduction

During the last 50 years, the treatment of subtrochanteric femur fractures has evolved with improved understanding of both fracture biology and biomechanics. Previously, nonsurgical treatment of these fractures was associated not only with significant shortening and malrotation but also with the morbidity and mortality of prolonged immobilization. Early techniques of surgical repair demonstrated unacceptably high rates of complications; however, the benefits of restoring the anatomy and encouraging early mobilization are recognized and have led to significant research and improvement in implants. The subtrochanteric fracture remains technically challenging, even to experienced fracture surgeons. (Chapman, 2001)

Subtrochanteric fractures account for approximately 10-30% of all hip fractures, and they affect persons of all ages. Most frequently, these fractures are seen in 2 patient populations, namely older osteopenic patients after a low-energy fall and younger patients involved in high-energy trauma, (Nieves JW,et al.,2007). A newer population of patients experience subtrochanteric fractures after bisphosphonate use. These so-called atypical fractures have a transverse or short oblique pattern with cortical thickening and medial cortical "beak." (Ekström W, Németh G,et al. ,2007).

Subtrochanteric femoral fractures are fractures of the proximal femur that may extend proximally into the piriformis fossa or distally into the isthmus of the femur. The proximal extension of the fracture varies and may include fracture patterns combined with intertrochanteric and femoral neck fractures. The common element of subtrochanteric femoral fractures is that the fracture extends to the level of the lesser trochanter, leaving a short proximal fragment.

Wiss and Brien, 1992 described these fractures as involving the zone between the lesser trochanter and the junction of the proximal and middle thirds of the femur. The surgeon should recognize that a subtrochanteric fracture may mas querade as an intertrochanteric fracture.

Failure to fully appreciate the true nature of the fracture may lead to unplanned difficulties with reduction and improper selection of fixation devices. Fracture reduction may be challenging because of comminution and deforming muscle forces. (Douglas W., 2007).

The difficult nature of treating this fracture stems in part from the fact that this injury pattern is anatomically distinct from other proximal femoral peritrochanteric fractures and also from the difficult features of femoral shaft fractures. As a result, it must be treated with specially designed implants that can withstand significant muscular forces for prolonged periods of

healing. These strong muscle forces deform the fracture fragments and make reduction difficult. In addition, comminution is common in this region and implants must withstand significant early loading. Not surprisingly, this fracture has significantly higher rates of malunion and nonunion than other femoral fractures. Still, with an improved understanding of this fracture and the specific treatment options, successful results can be attained. (Rockwood CA, Green DP,2001).

In elderly patients, minor slips or falls that lead to direct lateral hip trauma are the most frequent mechanism of injury. This age group is also susceptible to metastatic disease that can lead to pathologic fractures. In younger patients, the mechanism of injury is almost always high-energy trauma, either from direct lateral trauma (eg, motor vehicle accident [MVA]) or from axial loading (eg, a fall from height). Gunshot wounds cause approximately 10% of high-energy subtrochanteric femur fractures. Iatrogenic fractures may also occur secondary to stress risers following previous surgery on the proximal femur. (Kloen P, Rubel IF, 2003).

The subtrochanteric region of the femur, arbitrarily designated as the region between the lesser trochanter and a point 5 cm distal, consists predominantly of cortical bone. Healing in this region is predominantly through a primary cortical healing. Thus, the fracture is quite slow to consolidate.

In addition, this region is exposed to high stresses during activities of daily living. Axial loading forces through the hip joint create a large moment arm, with significant lateral tensile stresses and medial compressive loads, (Perren SM., 2002).

Significant compressive forces have been described in the calcar region which contributes to the dense cortical bone of the subtrochanteric femur. A man who weighs 200 pounds can generate forces in excess of 1200 lb/in^2, (Craig NJ, Maffulli N, 2005).

In addition to the bending forces, muscle forces at the hip also create torsional effects that lead to significant rotational shear forces. During normal activities of daily living, up to 6 times the body weight is transmitted across the subtrochanteric region of the femur.(Saarenpää I, Heikkinen T, 2007).

Intramedullary devices require less surgical exposure, enable early weight bearing, achieve better proximal fixation, and exert less biomechanical stresses (as the lever arm is moved medially). (Ramakrishnan M, Prasad SS, 1994) . however, they are not suitable for subtrochanteric fractures with intertrochanteric extension and are associated with technical difficulties in up to 63% of cases.(Rec Charnley GJ, Ward AJ,1996) construction nailing is technically demanding; plate and screw fixation is probably the best option.(Boldin C, Seibert FJ,2003) Indirect reduction and condylar blade plate

(CBP) fixation achieved excellent results in comminuted subtrochanteric fractures, despite being technically demanding.(Garnavos C, Peterman A,1998) Sliding hip screws are technically straight forward, but anchoring the proximal fragment cannot be supplemented with screws. Dynamic condylar screws (DCS) simplify fixation and require less-exacting technique than CBPs.(Lavelle DG.,2006).