RECENT TRENDS IN MANAGEMENT OF TROCHANTERIC AND SUBTROCHANTERIC FEMORAL FRACTURES IN THE ELDERLY

ESSAY

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By

Hosny Abdel Fattah Hassan Sarhan

M.B., B.Ch

Under Supervision of

Prof. Dr. Akram Hassan Azzam

Professor of Orthopedic Surgery
Faculty of Medicine
Cairo University

Prof. Dr. Ehab Mohamed Negm

Professor of Orthopedic Surgery
Faculty of Medicine
Cairo University

Faculty of Medicine
Cairo University
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بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم "

صدق الله العظيم

(البقرة ٣٢)

To

My

Mother

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The candidate

Hosny Abdel Fattah Hassan

ABSTRACT

Intertrochanteric and subtrochanteric femoral fractures are one of the most common proximal femoral fractures especially in the elderly with osteoporotic bones, usually due to low energy trauma like simple falls. The incidence of these fractures is rising because of increasing number of senior citizens with osteoporosis. By 2040 the incidence is estimated to be doubled.

A recent surgical procedures as minimally invasive surgery and design of new implants that achieves minimal surgical blood loss, short operative and hospitalization time, low cost, minimal anesthetic risk, the least morbidity and mortality rates, and early weight bearing is favoured to reduce complications.

The most commonly used implants have a plate fixed to the lateral side of the femur. A large screw in the femoral head and a sliding mechanism to allow fracture impaction. An interamedullary nail can be used instead of a plate, offering potential advantages such as a smaller incision, less devascularisation of bone and a shorter operating time. An external fixator can be used in a group of high surgical risk elderly patients for such patients prolonged anesthesia and intraoperative blood loss are not well tolerated.

Recently (the percutaneous compression plate) a minimally invasive sliding screw plate implant used for pertrachanteric femoral fractures with favourable clinical complications rates and biomechanical results. Bone cement and hydroxy apatite-coated screws bone have been advocated in patient with severe osteoporosis and pathological fractures of the proximal femur in elderly.

Key words:
Recent management of trochanteric.
Subtrochanteric femoral fractures in the elderly.

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INTRODUCTION

Fracture of the hip is a leading cause of death and disability in the elderly and the most common injuries necessitating hospital admission and may be classified as pathologic or non-pathologic fracture ***(Panka, 2008).*** Ninety percent of these fractures occur in patients older than 50 years. In younger patients, proximal femoral fractures are usually the result of high-energy physical trauma (e.g., high-speed motor vehicle accidents) and usually occur in the absence of disease. Intertrochanteric and femoral neck fractures account for 90% of the proximal femoral fractures occur in elderly patients. Proximal femoral fractures in elderly patients are often pathologic, usually resulting from minimal-to-moderate physical trauma to areas of bone significantly affected by osteoporosis. However, pathologic fractures can occur at any age; typically, these fractures result from low-energy injuries and may be characterized by unusual fracture patterns ***(Evan, 2005).***

The incidence of proximal femoral fractures among females is 2 to 3 times higher than the incidence of such fractures among males. Also, the risk of sustaining a proximal femoral fracture doubles every 10 years after age 50 years. Other risk factors for proximal femoral fracture include osteoporosis, a maternal history of hip fractures, excessive alcohol consumption, high caffeine intake, physical inactivity, low body weight, previous hip fracture, the use of certain psychotropic medications, visual impairment, dementia, residence in an institution, and smoking ***(McGrory, 2005).***

Intertrochanteric fracture is one of the most common fractures of the hip. Especially in the elderly with osteoporotic bones, usually due to low energy trauma like simple falls. The incidence of intertrochanterric fracture is rising because of increasing number of senior citizens with osteoporosis, by 2040 the incidence is estimated to be doubled ***(Kulkarni, 2006).***

These fractures occur in the transitional bone between the femoral neck and the femoral shaft which composed of cortical and trabecular bone. These types of bone form the calcar femoral posteromedially. The stability of intertrochanteric fractures depends on the preservation of the posteromedial cortical buttress ***(Paul, 2005).***

Subtrochanteric fractures of the proximal femur have been defined as the fractures involving the area between the lesser trochanter and the isthmus of the femur. Although these fractures are the most difficult to manage in the femur, the improved understanding of the complex biology and biomechanics of the trochanteric region as well as the rapid development of orthopedic philosophy and implants has led to consensus on the treatment of trochanteric fractures. However, the appropriate implant for the internal fixation of subtrochanteric fractures remains debatable; and a multitude of different intra-and extramedullary devices for their surgical fixation have been advocated ***(Tornetta, 2002).***

The subtrochanteric region of the femur is subjected to many stresses resulting from bending movements and compressive forces generated by body weight and the hip muscles, thus leading the malunion and nonunion of the fractures and mechanical failure of the implants ***(Haidukewych, 2004).***

The goal of treatment is fracture reduction so that near anatomic alignment and normal femoral antiversion are obtained. Surgery is the mainstay of treatment for both displaced and non-displaced fractures of trochanteric and subtrochanteric femoral fractures; the primary reason for surgery is to allow the early mobilization of patient, with partial weight bearing restrictions depending on the stability of the reduction ***(Evan, 2005).***

For the elderly patients the treatment of choice for pertrochanteric or basicervical fracture is surgical because non-operative treatment involves high morbidity and mortality compared to surgical treatment ***(Dobbs, 2005).***

Moreover, the general condition of these patients is often poor due to the accompanying cardio-vascular, pulmonary, and liver diseases. In the majority of geriatric patients, walking ability is limited before the fracture, and co-existing anemia and malnutrition make significant intra-operative blood loss intolerable. A surgical procedure that achieves minimal surgical blood loss, short operative and hospitalization time, minimal anesthetic risk, the least morbidity and mortality rates, and early weight bearing is favoured ***(Tomak, 2005).***

The aim was to produce an implant which could be manufactured at low cost, required minimum instrumentation and which could be safely inserted without reaming. This would reduce blood loss and save operating time ***(Hardy, 1998).***

The most commonly used implants have a plate fixed to the lateral side of the femur, a large screw in the femoral head and a sliding mechanism to allow fracture impaction. An intramedullarly nail can be used instead of a plate, offering potential advantages such as a smaller incision, less devascularisation of bone and a shorter operating time. The gamma Nail has been used extensively comparing its use with that of sliding screw plate systems ***(Hoffman, 2000).***

However, a significant number of elderly patients are quite frail and present a high surgical risk. For such patients, prolonged anesthesia and intraoperative blood loss are not well tolerated, posing contraindications for the commonly used surgical procedures. Conservative treatment is an unacceptable alternative, since it has been associated with mortality of up to 60%. An external fixator in a group of high surgical risk elderly patients can be used ***(Karn, 2006).***

APPLIED ANATOMY AND BIOMECHANICS

1) Osseous Anatomy

The neck shaft angle of the adult femur in both sexes averages 130 degrees with a standard deviation of 7 degrees. Average femoral anteversion is 10 degrees with a standard deviation of 7 degrees. There is moderate interracial and intergender variations in these averages ***(Green's, 2006).***

The trochanters project posteriorly to the neck, which originates slightly anteriorly to the midcoronal plane of the shaft. If the lesser trochanter appears in profile on radiographs, the femoral shaft is externally rotated. Understanding these relationships is critical to ensure correct assessment of the reduction and accurate placement of internal fixation. The internal trabecular structure of the proximal femur was first described by Ward in 1838. In accordance with Wolff's law, trabeculations arise along the lines of force to which the bone is exposed. In the femoral neck and intertrochanteric region cancellous trabeculations form from the transition of the shaft cortex into metaphyseal canellous bone. Primary compressive and tensile trabeculations pass through the neck and are separated by an area of sparse cancellous bone labeled Ward's triangle **Fig. (1)**. When mechanically tested in cross section, the cancellous bone of the hip has increased stiffness along these weight-bearing trabeculations and it is significantly reduced in Ward's triangle and in the intertrochanteric region ***(James, 2006).***

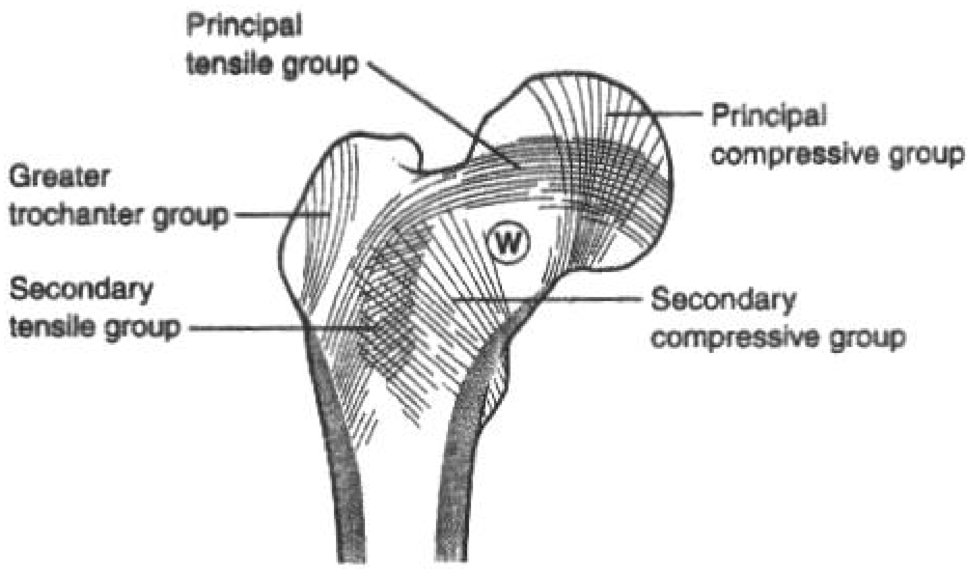

Fig. (1): Diagramatic representation of the major trabecular groups of the proximal femur. The markedly osteopenic area surrounded by the primary and secondary compressive trobeculae and the primary tension group is known as ward's triangle (w) from ***Rockwood (2006)***

This nonhomogenous pattern of bone density and stiffness is particularly apparent in the osteoportotic patient and is important to appreciate when trying to establish fixation.

A dense buttress of bone in the coronal plane, the calcar femorale, extends proximally from the posteromedial portion of the femoral shaft distally and deep to the lesser trochanter **Fig. (2)**.

The calcar is a key support in providing strength to the femoral neck, but does so from this vertical position at the shaft-neck transition. It has been frequently misidentified as the medial cortex at the intersection of the neck and shaft ***(Green's, 2006).***

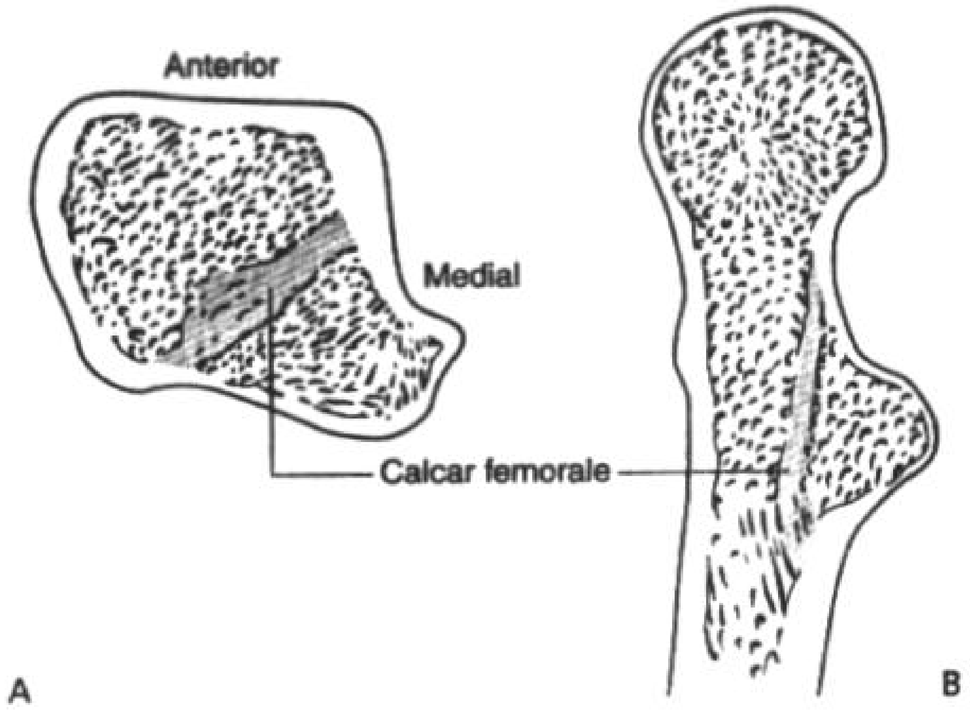

Fig. (2): A dense buttress of bone running in the coronal plane, the clacar femorale is seen in a tronsverse section at the level of the lesser trochanter (A) and in a sagittal section of the proximal femur (B) from ***Rockwood, (2006).***

The intertrochanceric region of the hip, consisting of the area between the greater and lesser trochanters, represents a zone of transition from the femoral neck to the femoral shaft. This area is characterized primarily by dense trabecular bone that serves to transmit and distribute stress, similar to the cancellous bone of the femoral neck. The greater and lesser trochanters are the sites of insertion of the major muscles of the gluteal region: the gluteui medius and minimus, the lliopsoas, and short external rotators. The calcar femorale, a vertical wall of dense bone extending from the posteromedial aspect of the femoral shaft to the posterior portion of the femoral neck, forms an internal trabecular strut within the inferior portion of the femoral neck and intertrochanteric region and acts as a strong conduit for stress transfer ***(Griffin, 1982).***