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Review

Unstable trochanteric fractures: Issues and avoiding pitfalls

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ABSTRACT

The incidence of trochanteric fractures is rising because of increasing number of senior citizens with osteoporosis. There are various modalities for reduction and internal fixation. However, the incidence of complications remains high. In the herein article we discuss issues that influence the fixation and outcomes of unstable trochanteric fractures. Moreover, the results of a prospective, randomised, cohort, time bound, hospital based, comparative study is presented.

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Introduction

It is universally accepted that the treatment of trochanteric fractures necessitates stable internal fixation allowing early mobilisation as soon as possible. Stable fixation till fracture union is the keystone to a successful outcome.

Several factors have been reported to be essential for the pre-operative planning prior to reconstruction of these fractures including: i)Fracture geometry ii) Bone quality, iii) Amount of comminution and iv) Fracture extensions in nearby areas like neck femur or subtrochanteric extension [1]. The surgeon should also be familiar with parameters which may contribute to inherent instability and failure of fixation such as i) Loss of posteromedial support, ii) Severe comminution at the Greater Trochanter leading to difficulty in passing an intramedullary nail, iii) Subtrochanteric extension of fracture, iv) Reverse oblique fracture pattern, v) Burst lateral wall, vi) Posterior wall Fracture/Coronal Split, vii) Extension into femoral neck area/piriformis fossa, and viii) Poor bone quality [1].

Appropriate selection of implant, good reduction intraoperatively and proper surgical technique from the surgeon's point of view can minimise the risk of failure and necessity for re-intervention.

In the herein study, we endeavour to review the literature and to evaluate the treatment of unstable trochanteric fractures in our institution. This study also introduces a modification of the well accepted AO/OTA classification with addition of CT based analysis of comminuted fractures in unstable patterns.

Review of literature

Evans in 1948 observed that the key to a stable fracture reduction is rest7oration of the posteromedial cortical continuity. He further observed that the reverse obliquity pattern is inherently unstable because of the tendency for medial displacement of the

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femoral shaft [2]. He also stressed the importance of the cortical buttress of bone on the inner side of the femoral neck and shaft.

Dimon and hughston in 1967 developed a technique whereby the spike of the proximal head neck fragment is impacted within the medullary canal of the femoral shaft, which previously was displaced medially beneath that spike. This however, leaves a posteromedial defect and thereby stability is not achieved. If stability by primary medial displacement fixation is achieved initially, then it seems reasonable to expect the complication rate to decrease as fracture no longer needs to settle and migrate into a position of stability [3].

Bannister GC et al. using the Evans classification reported the outcome on two or three part (62%) and four part (38%) fractures respectively. Open reduction proved necessary in four cases. They found that neutral rotation gives the best reduction most often. Internal rotation was almost equally valuable in two and three part fractures. External rotation was significantly more useful in four part fractures yet was the position of choice to only 25% [4].

Baumgaertner et al. in 1997 compared the results of the surgical treatment of trochanteric hip fractures before and after surgeons had been introduced to the tip-apex distance (TAD) as a method of evaluating screw position. There were 198 fractures evaluated retrospectively (control group) and 118 after introduction to the TAP concept (study group). The TAD is the sum of the distance from the tip of the screw to the apex of the femoral head on anteroposterior and lateral views. This decreased from mean of 25 mm in the control group to 20 mm in the study group. The number of mechanical failures by cut-out of the screw from the head decreased from 16 (8%) in the control group at a mean of 13 months to none in the study group at a mean of 8 months. There were significantly fewer poor reductions in the study group. Their study confirms the importance of awareness of TAD and good surgical technique in the treatment of trochanteric fractures and supports the concept of TAD as a clinically useful way of describing the position of the screw (Fig. 1) [5].

Madsen et al. conducted a prospective study to compare the results after operative treatment of unstable per- and subtrochanteric fractures with the Gamma nail, compression hip screw (CHS), or dynamic hip screw with a laterally mounted trochanteric stabilising plate (DHS/TSP) [6]. They analysed 170 patients with unstable trochanteric fractures surviving 6 months after operation. 85 patients were randomised to treat with either gamma nail or the compression hip screw and compared with a consecutive series of 85 patients operated with the dynamic hip screw with a laterally mounted trochanteric stabilising plate (DHS/TSP group). They concluded that the trochanteric stabilising plate (TSP) may be an aid in the treatment of these difficult fractures because the problem with the femoral shaft fractures using the Gamma nail is avoided and the medialisation of the distal fracture fragment frequently associated with the CHS is prevented [6].

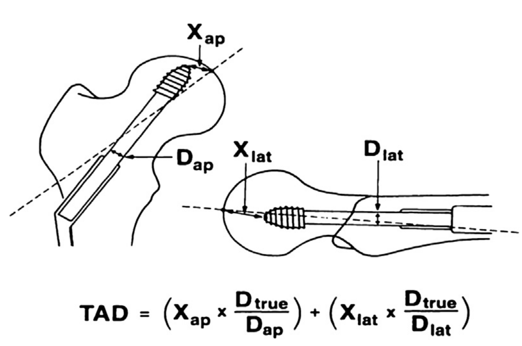

Fig. 1. Technique for calculating the tip-to-apex distance (TAD). For clarity, a peripherally placed screw is depicted in the anteroposterior (ap) view and a shallowly placed screw is depicted in the lateral (lat) view. D true = known diameter of the lag screw.

Haidukewych et al. in 2001 in their retrospective study reported that the reverse oblique fractures of the intertrochanteric region is a distinct pattern, when treated with cephalomedullary implant. It has advantage of shorter lever arm for the fixation device, and it has less potential for the fracture collapse and limb shortening when used for unstable intertrochanteric fracture [7].

Kim et al. in 2001 studied the failure of intertrochanteric fracture fixation with a DHS in relation to preoperative fracture stability and osteoporosis. They concluded that unstable fractures with osteoporosis had a failure rate of more than 50% and in such cases DHS should not be the first choice of treatment [8].

Sadowki et al. in 2002 performed a comparative study between dynamic condylar screw (DCS) and PFN. Patients treated with an intramedullary nail had shorter operative time, fewer blood loss and shorter hospital stay compared with those treated with a 95° DCS. Implant failure and/or non-union was noted in seven of the nineteen cases who had been treated with 95° DCS. Only one of the twenty fractures that had been treated with an intramedullary implant did not heal. Their study supported the use of an intramedullary nail rather than a 95° screw-plate for the fixation of reverse oblique and transverse intertrochanteric fractures in elderly patients [9].

Zickel et al. in 2002 advocated that circumstances that favour the use of cephalomedullary implant include fracture pattern that extends from intertrochanteric region into subtrochanteric region without comminution of proximal fragment, particularly in the region of greater trochanter [10].

Valverde et al. reported a series of 224 fractures of the proximal femur in which Gamma nail was used. They found, the Gamma nail to provide adequate stability and to represent an efficient technique in the management of these fractures. The device allowed for early mobilisation and full weight bearing of the affected hip regardless of the type of fracture. They concluded that with adequate surgical technique and experience, the advantages of the Gamma nail increases as the complication rate diminishes [11] (Table 1).

Lorich et al. in 2004 stated that a cephalomedullary implant has biomechanical advantage in the treatment of unstable intertrochanteric fracture by virtue of its intramedullary placement and inhibition of excessive sliding. Cephalomedullary implants provide the functional advantage of early patient mobility at one or three months postoperatively [12].

Babhulkar in 2006 concluded in his study that stable fractures can be easily dealt with DHS but unstable trochanteric fractures needs to be fixed with cephalomedullary implant to prevent rotational instability [13]. Similarly, Kulkarni et al. in 2006 concluded that DHS is still the gold standard for treatment of stable trochanteric fractures but unstable trochanteric fractures should be treated with cephalomedullary implant [1].

Haidukewych et al. in 2009 summarised 10 simple tips to minimise failure and improve outcomes when treating intertrochanteric fractures of the hip. They are: Measurement of the Tip to Apex distance; No lateral wall: no use of hip screw; Know the unstable intertrochanteric fracture patterns and nail them; Beware of the anterior bow of the femoral shaft; When using a trochanteric entry nail, start slightly medial to exact tip of greater trochanter; Do not ream an unreduced fracture; Be cautious about the nail insertion trajectory and do not use a hammer to seat the nail; Avoid varus angulation of the proximal fragment- Use the relationship between the tip of trochanter and centre of femoral head; When nailing, lock the nail distally if the fracture is axially or rotationally unstable; Avoid fracture distraction when nailing. They concluded that intramedullary nail fixation has become more common, even for fractures that are stable or nondisplaced [14].