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ORIGINAL STUDY

Dynamic hip screw fixation of intertrochanteric fractures without using traction table

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To evaluate a new technique of Dynamic hip screw (DHS) fixation without using traction table.
From july 2006 to july 2012, 328 patients undergoing DHS fixation using manual traction technique were evaluated in terms of Tip apex distance (TAD), quality of fracture reduction, operation time, preoperative preparation time.
In 97% cases good to moderate reduction could be achieved. The mean TAD was 19.2 millimeters, mean operation time 37 minutes and screw cutout rate was only 0.91%.
This technique is easy, reproducible, cheap do not sacrifice reduction alignment, screw position and is extremely beneficial in polytrauma patients where multiple surgeries are to be done.

Keywords : dynamic hip screw ; traction table ; hip fractures ; polytrauma.

INTRODUCTION

The Dynamic Hip Screw (DHS) is considered to be the gold standard for the treatment of intertrochanteric fractures (*1,2*). The DHS implant is designed to allow a controlled collapse of the proximal fragment on the distal one to achieve bone on bone stability. This is usually achieved with the help of a traction table, which is designed to achieve and maintain satisfactory reduction of the fracture prior to DHS fixation. However, significant amount of time is required to set up a traction table preoperatively. Moreover it is challenging to perform multiple surgeries in a patient in the same setting while using a traction table. Although, there have not been many reports of traction table associated complications while doing DHS fixation, complications such as pudendal, sciatic or femoral nerve injury have been reported due to excessive traction or direct pressure during femoral nailing in patients (*3, 4,5*).

Moreover a traction table may not be available in hospitals with limited resources. Hence we have devised a manual traction technique with the patient in supine position on a radiolucent table to do away with the need for a traction table. The rationale for not using the traction table includes ease of set up, the ability to perform multiple procedures with a single positioning and draping, and the elimination of morbidities associated with use of traction table. In the study,we evaluated the patients with intertrochanteric fractures (AO/OTA grade A1, A2.1) undergoing DHS fixation using manual traction technique.

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MATERIALS AND METHODS

All patients with intertrochanteric fractures grade A1, A2.1 (AO/OTA classification) undergoing DHS fixation using manual traction technique without use of traction table from July 2006 to July 2012 were included in the study. Patients who did not undergo a complete follow-up or died within three months postoperatively were excluded.

Clinical data collected included sex, age at surgery, operating time, type of implant, and date of death (if death occurred).The fracture classification, quality of fracture reduction, position of the screw, and tip apex distance were determined with use of preoperative and postoperative anteroposterior and lateral digital radiographs. All specifications were measured in the picture archiving and communication system (PACS). An earlier study showed that the PACS is suitable for measuring the tip apex distance (6).

The patients included in the study were followed up for three months after the operation. We expected screw cut-out to occur within three months after the operation, as seen in previous studies (7), which correlates with the fact that fracture healing can be expected at three months postoperatively. We ensured that every patient was followed for at least three months, thus minimizing the chances of missing a patient with screw cut-out.

The postoperative quality of fracture reduction was described as good, acceptable, or poor, according to the definitions of the three-grade classification system proposed by Baumgaertner *et al* (7). A good reduction was classified as normal or slight valgus alignment on the anteroposterior radiograph, < 20 degrees of angulation on the lateral radiograph, and < 4 mm of displacement of any fragment. An acceptable reduction had to meet the criteria for a good reduction, but for either the alignment or the displacement, not for both. A poor reduction met none of the criteria.The measurement of the tip apex distance, as developed by Baumgaertner *et al* (7), was also performed. The tip apex distance is the sum of the distance, in millimeters, from the tip of the screw to the apex of the femoral head, on the anteroposterior and lateral radiographs. It has been demonstrated that the tip apex distance is a predictor for cut-out. A tip apex distance < 25 mm is protective of the screw cutting out of the femoral head (7). The first postoperative radiographs were used to measure the tip apex distance.

One independent observer who was consultant trauma surgeon performed tip apex distance measurements and determined screw position and fracture reduction.

OPERATIVE TECHNIQUE

Positioning the patient

The most important part of the surgical technique, needless to say is the positioning of the patient on the radiolucent operating table. In the supine position, the most common problem faced by the surgeon is how to visualise the affected hip in the image intensifier. Since the patient is supine, in the image intensifier we get overlapping images of both the hips, thereby making the job of the surgeon very difficult. To solve this problem we position the patient with a bolster under the affected hip, thereby rotating the patient by approximately 15 degrees towards the normal hip (Fig. 1a and b). This ensures that the image of affected hip does not superimpose over the normal hip in the image intensifier.

After satisfying ourselves that the position of the patient is satisfactory, the surgeon attempts closed reduction of the fracture by applying manual traction on the affected side. Under the image intensifier we confirm the reduction.

Surgical steps

Standard lateral approach for fixation of trochanteric fractures is used. With an assistant maintaining the reduction by manual traction, a guidewire is passed under image intensifier and its position is checked in both anteroposterior (AP) (Fig. 1c) and lateral (LAT) views (Fig. 1d). Once the position of the guidewire is satisfactory a derotation wire is placed in the neck of femur parallel to the initial guidewire and a partially threaded cancellous screw is inserted into the femur as the derotation screw. Reaming of the bone is done over the guidewire with a triple reamer followed by standard DHS instrumentation.

RESULTS

Six hundred and eighty patients who had intertrochanteric fracture were identified, two hundred fifty six patients did not meet inclusion criteria,thirty four patients did not had complete followup and sixty two patients died within three months post-

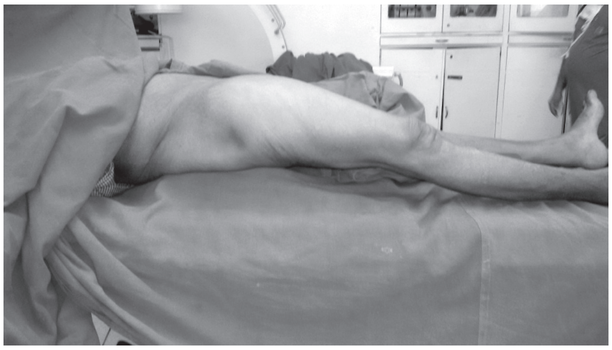

Fig. 1a. — Positioning of the patient with bolster under affected hip : side view.

Fig. 1b. — Positioning of the patient with bolster under affected hip : front view.

operatively, therefore, 328 patients who had fracture were suitable for our study. There were 231 women (70%) and eighty one men (30%) in our study. The mean age (and standard deviation) was 68.2 ± 11.9 years. In total, three patients (0.9%) had failed fixation due to screw cutout. Six patients had superficial infection and delayed wound healing. Three patients had symptomatic DVT and were treated successfully.

DISCUSSION

Nailing for fracture femur without using a traction table has been widely discussed in literature (*8, 9*). However, very few studies of DHS fixation for intertrochanteric fracture femur without using a fracture table have been reported till date (*10*). We believe that reduction of intertrochanteric fractures

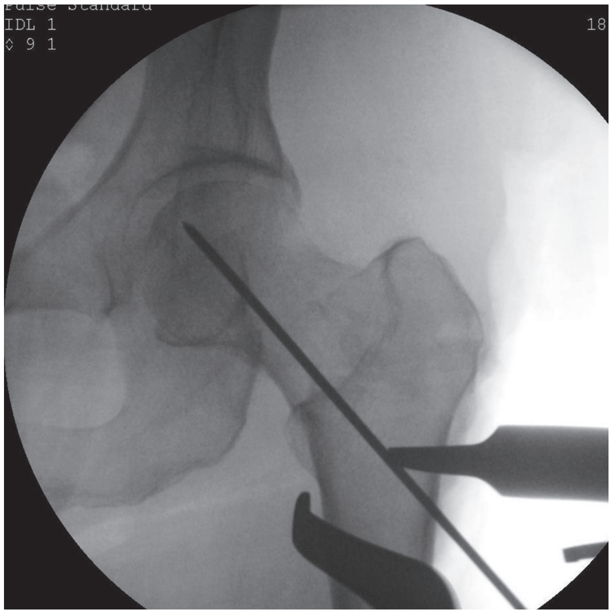

Fig. 1c. — Passing guide wire under image intensifier control AP view.

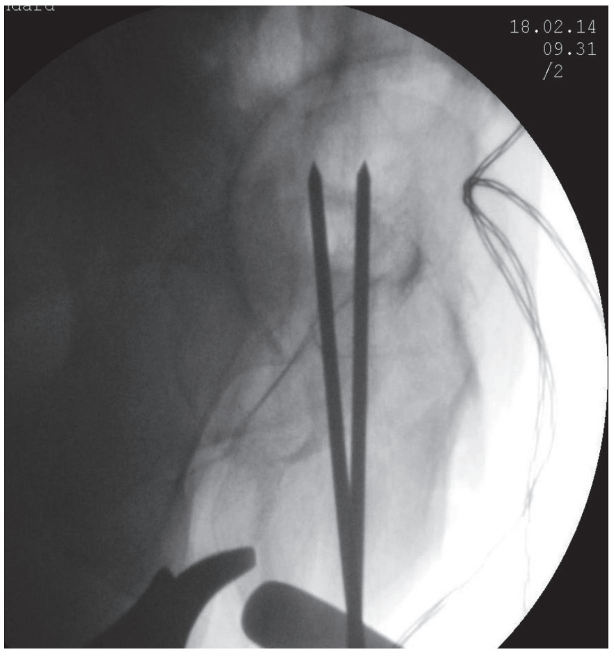

Fig. 1d. — Passing guide wire under image intensifier control lateral view.

of femur without a traction table is an indispensable skill which needs to be mastered by an orthopaedic surgeons. One of the biggest challenges in DHS

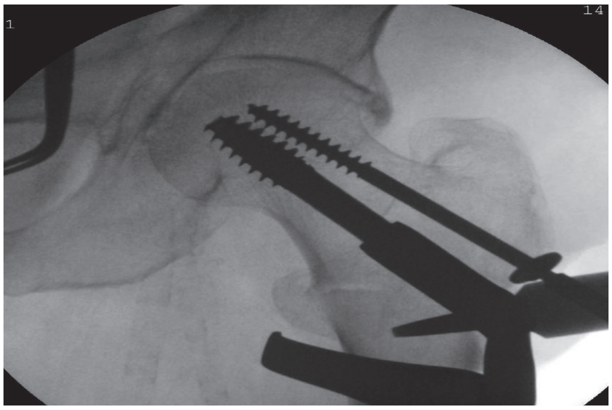

Fig. 1e. — Peroperative AP view : DHS fixation completed

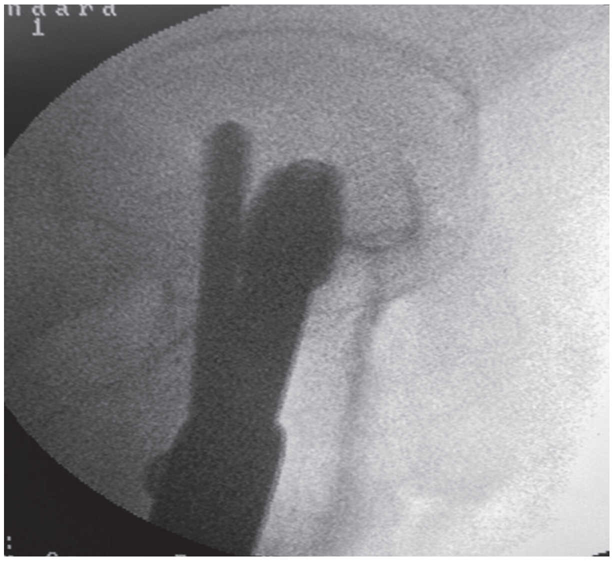

Fig. 1f. — Peroperative lateral view :DHS fixation completed

Table I. — Overview of the results

Preoperative preparation time (minutes) After anaesthesia	12.3 ± 7.4 (mean ± SD)
Operation time (minutes)	37 ± 22 (mean ± SD)
Length of hospital stay (days)	5 ± 3.5 (mean ± SD)
Tip Apex Distance (millimetre)	19.7 ± 6.1 (mean ± SD)
AO classification A1 A 2.1	 177 (54%) 151 (46%)
Fracture reduction : Good Moderate Poor	 212 (64.6%) 106 (32.3%) 10 (3%)
Reoperation due to failed fixation	3 (0.91%)

instrumentation is to obtain satisfactory reduction in both AP and lateral views during the placement of the guide wire. In the conventional technique, using a fracture table both views can be obtained easily. The lateral view can be achieved after positioning the contralateral lower limb in a lithotomic position.

In the manual traction technique, however, in the lateral view, the contralateral hip superimposes on the fracture site in supine position making it very difficult for the surgeon to correctly position the guide wire. Certain authors have suggested taking a frog leg lateral view to circumvent this problem (*10*). However this technique has several drawbacks. To prevent displacement of the reduction the authors have suggested passing 3 mm Steinman pins or multiple guide wires across the fracture site to maintain the reduction. They have observed that frequently the pins would get bent while maintaining the frog leg position thereby jeopardising the reduction. Moreover, they have recommended that the guide wire should not be introduced in the frog leg position thereby depriving the surgeon of a real time radiological picture. Also an advanced arthritic hip/ knee that has reduced range of motion may not be a suitable candidate for this technique, since satisfactory frog-leg view may be impossible to achieve.

We do not encounter any of the above problems, the patient who is supine on the operating table is slightly tilted (by putting a bolster under the affected hip) towards the contralateral side, it is possible to obtain a lateral view of the affected side without any interference from the normal hip (Fig. 1a and 1b). In this position we can also introduce a guide wire under fluoroscopic guidance thereby getting a real time radiological picture.

A disadvantage of manual traction technique was the need of an extra assistant who had to maintain relatively constant traction to prevent displacement of the reduction.

Achieving reduction through manual traction results in significant shorter preoperative preparation time (*10*). The preoperative preparation time was 12.3 ± 7.2 minutes and is shorter than in the conventional technique (31 minutes described in some early studies) (*10*), where more time is spent setting traction table and achieving reduction under fluoroscopic guidance. Thus, the patient is exposed to a minimum of anaesthetic medication thereby reducing the chances of intra and post operative anaesthetic complications.

In our series mean TAD was 19.7 mm, this points to a comparable effectiveness of the technique (*11*). The postoperative cut-out rate of conventional technique ranges from 1 to 6% (*13,14,15*), this was 0.9% in our series, outcomes were not inferior to the traction table technique.

CONCLUSION

The technique of DHS fixation for intertrochanteric fractures without use of traction table is simple, effective, reproducible, saves time, and is low cost. It is especially beneficial under circumstances where traction table is not available or in polytrauma patients where multiple procedures are necessary.

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