

Total Hip Arthroplasty After Dynamic Hip Screw Failure: Descriptive Results of a 10 Years Retrospective Study

Babak Siavashi,^{1,*} Seyyed Mersad Moosavi,¹ and Dariush Gouran Savadkoohi¹

¹Joint Reconstruction Research Center, Sina Hospital, Tehran University of Medical Sciences, Tehran, IR Iran

*Corresponding author: Babak Siavashi, Joint Reconstruction Research Center, Sina Hospital, Tehran University of Medical Sciences, Tehran, IR Iran. Tel: +98-2166701041, E-mail: siavashi@tums.ac.ir

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Abstract

Background: One of implants which is used for fixation of hip fracture (HF) is dynamic hip screw (DHS). Because of the destruction of the head of femur, or even acetabulum, during the cut out process or because of severe osteoporosis, re-fixation of fracture may be impossible. In this time, total hip arthroplasty (THA) is a good option.

Objectives: In this study, we try to retrospectively evaluate the results THA after DHS failure.

Materials and Methods: This retrospective study was undertaken in Sina hospital, Tehran, Iran, from 2004 to 2014, and included all patients with intertrochanteric HF which was initially fixed with DHS and failed, that was further treated with THA.

Results: In the total of 52 patients, nail cut out was responsible for 49 cases (94%) of DHS failure, whereas in three cases (6%) it was the fracture of the side plate. Pre-operative Harris hip score ranged from 30 to 50 (average 36) and post-operative score ranged between 65 and 90 (average 85). There were 12 cemented cups and 40 cementless cups. Fourteen standard stem and 38 long stem were used. Twelve of the 14 standard stems were cemented. Posterior approach was used in 45 cases and direct lateral approach was used in the remaining seven cases. Prophylactic wiring was done in 46 cases. Intraoperative penetration of the floor of acetabulum occurred in two cases. Constrained liner was necessary in five cases, three of which because of severe osteoporosis of trochanter and insecure fixation of it after fracture and two because of recurrent dislocation.

Conclusion: For achieving good results, the THA, after failure of DHS, requires the use of posterior approach, extremely careful acetabular reaming, prophylactic wiring of femur and the passing of the holes of screws with long stems.

Keywords: Hip Joint, Arthroplasty, Hip Fractures, Bone Screws

1. Background

Today, with increasing life expectancy, a huge number of individuals reach old age. In older age, because of osteoporosis, low energy trauma like simple falling leads to an increased frequency of intertrochanteric hip fractures (HF) (1). One of the implants which is used for fixation of this fracture is the dynamic hip screw (DHS) (2, 3). After several months, in spite of perfect insertion of nail of DHS, there may be DHS cut out or implant failure (3). Because of destruction of head of femur or even acetabulum, during the cut out process or because of severe osteoporosis, re-fixation of fracture may be impossible (4, 5). In this situation, total hip arthroplasty (THA) is a good option (6, 7). Among its advantages is the fact that the patient can return soon to his ordinary activities, without the need to wait for bony union (8). Also, it does not need fixation in the osteoporotic head of the femur. On the other hand, it has several disadvantages and problems to address. At first, it is performed as a second operation and the rate of infection is higher (9) than for the surgery on virgin tissue. Because of scar tissue from previous surgery, the approach is more difficult (10). For exposure and

during approach, because of bone defect at the site of nail insertion, there is an inherent weak point in proximal femur, which predisposes the greater trochanter to fracture or avulsion. During reaming of acetabulum for insertion of cup, because of underlying osteoporosis and also because of long time non-weight bearing and disuse osteoporosis after surgery, acetabular bone stock is weak, increasing the risk for the reamer to easily penetrate the medial wall (11) of acetabulum. For broaching of femur, because of DHS side plate screw holes, risk of intraoperative fracture of femoral shaft is high and prophylactic wiring is necessary (12).

2. Objectives

In this study, we tried to retrospectively evaluate the results and functional outcomes of THA after DHS failure, in a tertiary referral hospital, from 2004 to 2014. This study aims to describe the functional results and, also, the intraoperative and postoperative complications of THA after failure of DHS.

3. Materials and Methods

This retrospective descriptive study was performed in Sina hospital, Tehran, Iran. All patients with intertrochanteric HF from 2004 to 2014, which undergone DHS that failed and were consequently treated with THA were entered in the study. The following variables were analyzed in the study: age, sex, type of failure of DHS (nail cut out, side plate fracture), preoperative and postoperative Harris hip scores, type of prosthesis (acetabular side/femoral side, cemented/uncemented, long stem/standard stem), femoral or sciatic nerve palsies, approach, prophylactic wiring of femur, acetabulum penetration during reaming, acetabular and femoral bone defects, reconstruction of acetabulum with autograft or allograft, reinforcement ring use, constrained liner use, greater trochanter avulsion fracture, intraoperative fracture of femur or acetabulum, postoperative infection, prosthesis dislocation. The Medical Ethics Committee of the Orthopedic Ward of Sina Hospital, Tehran, Iran, approved this study.

4. Results

From 2004 to 2014, THA has been done for DHS failure in 52 patients (31 females and 21 males). Mean age was 68 ± 12 years. Mean follow up was 5 ± 4 years. Nail cut out was seen in 49 cases (94%) and in three cases (6%) fracture of side plate was the cause of failure. Mean preoperative Harris hip score was 38 ± 8 , while the mean postoperative score was 85 ± 7 . During the time interval of the study 18 patients have died. There were 12 cemented cups and 40 cementless cups. There was one case that necessitated reinforcement ring and cemented cup inside the ring. Totally, 14 standard stem and 38 long stem were used. Twelve of the 14 standard stems were cemented. Posterior approach was used in 45 cases and direct lateral approach was employed in the remaining seven cases. Two sciatic nerve palsy (peroneal part) were noted, although no complete sciatic nerve or femoral nerve palsy had been reported. None of these two cases had recovery in the follow up period. Prophylactic wiring were done in 46 cases. Intraoperative penetration of the floor of acetabulum occurred in two cases. One of them required reinforcement ring and the other had to be treated with medial bone graft and large cup, with peripheral fixation. In five cases, acetabular defects (marginal) from nail cut out were reconstructed with autograft of femoral head. No allograft was used. Five fractures of greater trochanter occurred, which were treated with wiring of trochanter. No hook plate was used. Constrained liner was employed in five cases, three of which because of severe osteoporosis of trochanter and insecure fixation of it after fracture and two because of recurrent dislocation. Three profound infections were recorded and treated by implant removal and antibiotic therapy. There were three postoperative dislocations, one of which was treated with closed reduction and abduction brace, while the other two requiring surgery and constrained liner. There was no intraoperative fracture of acetabulum or femur recorded.

5. Discussion

In the majority of patients, the cause of failure of DHS was nail cut out (13). This means that the insertion of nail is critical for achieving an optimum result in intertrochanteric fractures, fixed with DHS. Besides proper nail positioning (14), bone stock of head of femur is important for prevention of nail cut out (15). It needs another study to evaluate the underlying reason of nail cut out. Because of poor bone quality and strength, cemented cups were used in 12 cases. There were two cases of penetration of medial wall of acetabulum during reaming of acetabulum. In one case, because of penetration of medial wall of acetabulum and weak bone of peripheral walls of acetabulum, reinforcement ring, with cemented cup inside the ring, was used (16). In the other case of penetration of medial wall of acetabulum, segmental medial defect was covered with mesh wire and bone graft and peripheral fixation of cementless cup (17) could be achieved. In 12 cases we used cemented stems. All of them were standard stems. This implies that, if the surgeon wants to use standard stems, it is better to use cement for fixation (18). Cementless stems, which create hoop pressure (19) in the shaft of femur, may shatter it in the zone of screw holes of the side plate of DHS. Therefore, it is better to use long stems and get distal fixation (20) below the weak zone of screw holes. In seven cases, direct lateral approach was used. In five of them, greater trochanter fractures were avulsed, as a consequence of excessive pressure on the greater trochanter in lateral approach to hip (illustration of four position) (21). Therefore, it is advised to use posterior approach for THA after DHS failure. If fixation of greater trochanter is not secure or if the quality of abductor muscles is not satisfactory, the orthopedist should not hesitate to use constrained liner. Because the patients were old (average age 72 years) and required a relatively limited degree of mobility, it seems that constrained liner can work well for them. The rate of dislocation was high (6%), primarily because of loose attachment of greater trochanter with wire to shaft of femur, and was treated with constrained liner (22). Acetabular non-contained defects were reconstructed with autograft of femoral head. The head of femur is a high quality bone source, which is endogenous and has cancellous bone, good for fusion. Therefore, under no circumstance allograft could be regarded as a solution. The THA can improve the functionality of patients after DHS failure, dramatically. However, it may be accompanied by more complications, in comparison with primary THA. Difficulties in communication for follow up were the major limitation of this study.

5.1. Conclusions

The following conditions should be fulfilled when performing THA after failure of DHS, for optimal results: make use of a posterior approach, performing acetabulum reaming with care, performing prophylactic wiring of femur and passing the holes of screws with long stems.

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