Modified posterior soft tissue repair for the prevention of early postoperative dislocation in total hip arthroplasty

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Abstract

Purpose Dislocation following total hip arthroplasty (THA) with the posterior approach has been quite a common and bothering complication. Previous researches suggest that careful repair of the posterior structures significantly reduces this risk. The purposes of the present study were to describe a modified posterior soft tissue repair procedure in THA using a suture anchor (TwinFix Ti 5.0, Smith & Nephew, Andover, MA) and evaluate the early postoperative dislocation rate.

Methods From July 2004 to June 2008, 220 consecutive primary total hip arthroplasties were performed using the modified surgical approach. The average age in the group was 46.4 years (range from 21 to 90) at the time of the procedure. The rate of postoperative hip dislocation, as well as any signs of complications related to the technique, has been observed and analyzed in this study.

Results There was no postoperative dislocation following primary THA in 220 cases, and no signs of complications related to the technique, such as greater trochanteric fractures and sciatic nerve palsy, have been noted in any of the cases at their most recent follow-up.

Conclusions These initial results demonstrate that the modified repair in THA using the suture anchor can serve as an effective and reliable mean for prevention of early postoperative dislocation

approaches, postoperative dislocation following arthroplasty (THA) has been quite a common and bothering complication [2, 3]. The risk of dislocation is greatest in the first 12 weeks after hip arthroplasty with approximately 60 % to 70 % occurring during the first six weeks [4]. Over time, a number of different attempts have been made to enhance the stability of the hip joint. Researches suggest that careful repair of the posterior structures significantly reduces the risk of dislocation [2, 3, 5, 6]. We describe a modified posterior soft tissue repair using suture anchor to obtaining a rigid and anatomical tissue reconstruction.

Materials and methods

From July 2004 to June 2008, 220 consecutive primary total hip arthroplasties were performed by one senior surgeon, using the surgical approach to be described. The same prosthesis was used, and all stems and cups uncemented. This accounted for almost all primary arthroplasties performed during this time. The average age in the group was 46.4 years (range from 21 to 90) at the time of the procedure. Diagnoses included osteoarthritis (79), rheumatoid arthritis (64), acute femoral neck fracture (23), avascular necrosis (23), adult DDH (18), posttraumatic arthritis (13).

Introduction

The posterolateral approach is the most popular approach for primary THA [1]. Though technically simpler than other

Surgery technique

The patient is positioned in the lateral decubitus position. The lower extremity is draped free and wrapped from the foot to mid thigh with a bias cut bandage. A standard posterolateral incision is used. The subcutaneous tissue and fascia are divided, and the gluteus maximus fibers are split. The gluteus maximus tendon is partially released for better exposure. The posterior margin of gluteus medius is

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defined. The fibers of the quadratus femoris are divided at their femoral insertion with electrocautery, allowing visualization of the lesser trochanter. The gluteus medius is retracted superiorly and anteriorly. It is important to identify the posterior margin of gluteus minimus. And its posterior margin is elevated from the underlying capsule. This will protect the minimus when short rotators and superior capsule are cut later in the procedure.

We then place the hip in slight extension and maximum internal rotation.

The piriformis tendon and external rotators are detached from the greater trochanter using electrocautery and the underlying capsular tissue is separated using sharp dissection. With the gluteus minimus retracted and thus protected, we perform a T-shaped capsulotomy; an incision is made in a longitudinal fashion along the posterior edge of the greater trochanter, from the level of the lesser trochanter to the superior rim of the acetabulum, and then we open the capsule from the greater trochanter to the posterior rim of the acetabulum.

The piriformis muscle, one part of conjoined tendon (obturator internus and superior gemellus), and the superior portion of capsule are peeled off as one single flap along their insertion. The other one flap is comprised of inferior gemellus, quadratus and the posterior portion of capsule. Two 4# silk sutures are then passed through the ends of the capsule and short external rotators to serve as marks and aid in retraction. During insertion of the acetabular component, the flaps are retracted for providing excellent exposure of acetabulum.

After the prosthetic components are inserted, the leg internally rotated. Two small holes are made over the greater trochanter using 2.3-mm drill bit. The entry point should be

placed so that the exiting drill bit is in the piriformis fossa, which is the junction between the posterior one third and middle one third of the trochanter width in the anteroposterior plane. The superior stitch is placed at the apex of the T-shaped capsulotomy with the direction of piriformis muscle. The other hole is drilled approximately 1.5 cm apart (Fig. 1). A suture anchor (TwinFix Ti 5.0, Smith & Nephew, Andover, MA) is inserted into lateral rotation of the greater trochanter at 45° angles (Fig. 2). After anchor insertion, it was preloaded by hand to verify that it was adequately secured.

Sutures in the same pattern are combined as a double strand (Fig. 3). One bifilar cord of sutures is taken through the superior hole, the superior one of the flaps (the piriformis muscle, obturator internus, superior gemellus, and the superior portion of capsule) and finally the inferior hole (Fig. 4). Then, the other twin-cord is taken through the inferior hole, the inferior flap (inferior gemellus, quadratus and the posterior portion of capsule) and the superior hole (Fig. 5). Each limb of the thread is passed through holes using suture passer. We then placed the hip in slight abduction and maximum external rotation. And sutures are tied tightly over the great trochanter (Fig. 6). After repairing the gluteus maximus tendon, the wound is then closed over suction drains in routine manner.

Following the procedure, partial, toe-touch weight bearing with crutches or a walker was allowed for a period of six weeks and followed standard dislocation precautions. Subsequently, full weight bearing was allowed. 15 patients with bone grafts were mobilized non-weight bearing for six weeks. Postoperative cares, including routine positional restrictions as precaution against dislocation, are performed in all patients for four weeks.

Fig. 1 The greater trochanter is at the top of the picture. Cephalad is *right*, caudad is *left*. Two small holes are made over the greater trochanter using 2.3-mm drill bit

Fig. 2 A suture anchor (TwinFix Ti 5.0, Smith & Nephew, Andover, MA) is inserted into lateral potation of the greater trochanter at 45° angles

Results

In all 220 cases, there was no early postoperative dislocation following primary THA and no apparent complications related to the technique at minimum two years clinical follow-up (mean, 31 months; range, 24–37 months).

Discussion

Since it involves division of all short external rotators from piriformis down to the quadratus femoris, the posterolateral approach has been reported with a higher rate of postoperative

posterior dislocation than a direct lateral or anterolateral approach [3, 8, 9].

Proposed attempts to prevent dislocation include using an abduction brace, strict limitation of range of motion, increased offset femoral components, elevated or offset acetabular liners, and formal posterior capsular repair.

Various techniques of posterior capsular repair following THA have been reported and the rate of dislocation was degraded to varying degrees [3, 6, 7, 10]. According to those literatures, the following three factors contribute to the prevention of posterior dislocation. First, the posterior capsular muscle flaps serve as a

Fig. 3 Sutures in the same pattern are combined as a double strand

Fig. 4 One bifilar cord of sutures is taken through the superior hole, the superior one of the flaps (the piriformis muscle, obturator internus, superior gemellus, and the superior portion of capsule)

mechanical block. Second, reattachment of the posterior capsule and muscles allows early readherence and does not depend on complete capsule regeneration. Third, the repair of short rotators restricts excessive internal rotation.

In comparison, the modified procedure we described above has several advantages. Firstly, it is more efficient and simple. Our technique is similar to that of a using 2.3 mm drill, but less holes generated, which could save more time and reduce bleeding. To date, the average time of repair was less than

Fig. 5 The Schematic diagram describes detailed technique of the modified posterior soft tissue repair using TwinFix 5.0 suture anchor. Two bifilar sutures are taken through hole-flap-hole respectively

Fig. 6 Place the hip in slight abduction and maximum external rotation. And sutures are tied tightly over the great trochanter

ten minutes. Secondly, it offers excellent rigid fixation of the hip capsule on the greater trochanter. FiberWire, 2# Vicryl, 2# or 5# Ethibond sutures were used popularly in previous literatures [3, 6, 7, 10]. However, Stähelin et al. [11] reported a 70 % failure rate of Reinserted Short External Rotator Muscles using 2# Ethibond Excel. Researches in recent years showed more favourable results [3, 6, 7, 10]. To our knowledge, suture anchor was first used for repair the posterior hip capsule and rotators. According to an experimental laboratory biomechanical study in 2003 [12], screw anchors, including the TwinFix Ti 5.0, showed higher load to failure values than non-screw designs. All anchors were stronger than the suture for which they are designed. The double strand sutures and anchor would offer much more strength and rigid stability. Since December 2004 when this approach was adopted, there was no postoperative dislocation following primary THA in more than 200 cases. Thirdly, two holes were drilled in particular location and direction in accordance with the piriformis insertion. It takes the maximum anatomical reconstruction of posterior capsule and rotators.

There are complications should be noticed and prevented in this procedure. A 0.9 % incidence of greater trochanteric fractures had been reported by White et al. [3]. Osmani et al. [10] reduced the diameter of drill from 2.7 mm to 2.3 mm for a lower incidence of greater trochanteric fractures. We use the same 2.3 mm drill and generate two holes that is 50 % less than the one did by Osmani et al. No fractures of the greater trochanter have occurred using our technique.

The sciatic nerve injury is one another potential risk, which has been well recognized in literatures [13, 14]. But the incidence of sciatic nerve palsy during soft tissue repair for THA is thought to be under-reported. Lohana et al. [15] reported one palsy case caused by a size 2 Ethibond suture.

Two months after removal of the suture transfixing sciatic nerve, the patient was very satisfied with the results of reoperation. They recommend that early referral, exploration and visualization of the nerve are mandatory in cases of sciatic nerve palsy following hip replacement, especially when posterolateral approach is used. While taking sutures, we further recommended checking each time that the sciatic nerve is well avoided. We believe that meticulous care during soft tissue closure and limiting the number of sutures might theoretically decrease the risk of the sciatic nerve injury.

Summary

In this study, we have recommended a modified posterior soft tissue repair as an important step in THA surgery. It may not only serve as an effective and rigid means for reconstructing the anatomical posterior block, but also prevent excess internal rotation, and therefore minimize the likelihood of early post-operative dislocation following THA surgery using a posterolateral approach.

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