

## Surgical technique

## Shoelace capsular and external rotators closure techniques in posterior (southern) approach to hip joint

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## ABSTRACT

The possible increased risk of dislocation with a posterior approach for femoral hemiarthroplasty is attributed to disruption of the posterior soft-tissue structures, including the posterior capsular ligament structure and short external rotators of the hip. In this surgical technical note, we demonstrate the surgical technique for shoelace suturing of the external rotators and the capsule with use of ULTRATAPE. After prosthesis stem insertion, shoelace suturing using ULTRATAPE was performed between the great trochanter and the external rotators for preventing the external rotators from tearing. Also, ULTRATAPE was sewed alternately on the split capsule like shoe lacing, and it was laced up from proximal to distal in line with the split as shoelaces tied down. The shoelace suturing technique using ULTRATAPE after a posterior approach to the hip joint, possibly lowers risks of tearing hip capsular ligament and external rotators and stabilizes the posterior wall.

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## Introduction

Femoral hemiarthroplasty (FHP) has been frequently performed for treating femoral neck fractures, which is one of the most common fractures in the elderly population [1]. Surgical approaches for FHP are mainly categorized into 4 approaches: anterior, anterolateral, lateral, and posterior [2]. The posterior approach (Moore or Southern approach) has the advantages of preserving the hip abductor musculature and providing good visualization during femoral preparation and component insertion, whereas some extent of increasing a possible risk of postoperative dislocation compared with anterior or lateral approaches [3]. The possible increased risk of dislocation after posterior approach hip surgery is attributed to the disruption of the posterior soft-tissue

structures, including the short external rotators of the hip and the posterior capsular ligament structure [4].

The most common techniques for the posterior soft-tissue repair are drilling holes in the great trochanter with nonabsorbable ligatures [5]. However, there are some risks such as possible great trochanter avulsion fractures [6] and potential threads of cutting the soft-tissues.

For preventing tearing of the posterior soft-tissue structures, we developed a surgical technique for posterior capsular and external rotators suturing named the “shoelace technique” using smooth suture tape. Hence, the purpose of this technical note was to describe the shoelace suture technique using ULTRATAPE after FHP.

## Surgical technique

The shoelace capsular and external rotators closure techniques are illustrated and described in Figures 1 and 2.

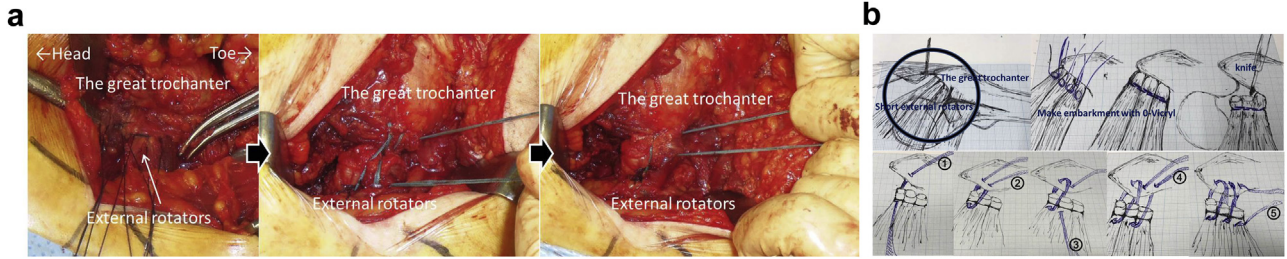
## Case example

An 87-year-old female patient with right femoral neck fracture underwent FHP for the right hip under general anesthesia. The patient was placed in a lateral decubitus position. With the

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**Figure 1.** (a and b) Surgical findings of shoelace suturing technique of the external rotators. The external rotators were tied down with 0-Vicryl on external rotators tendon 10 mm proximal to the site of external rotators attachment to the great trochanter to make embankment, and the external rotators were cut in attachment with the great trochanter. After insertion of prosthesis, the shoelace suturing using ULTRATAPE was sewed between the great trochanter and the external rotators more medial to the embankment on the external rotators tendon.

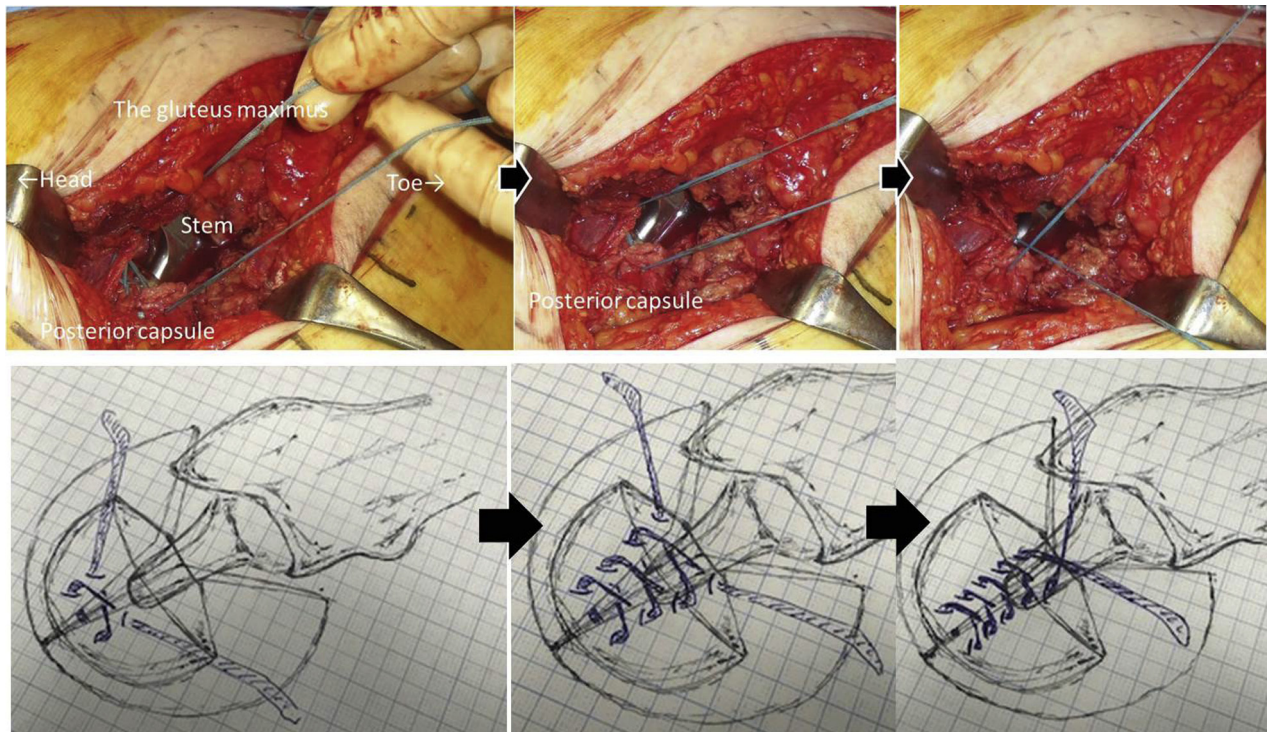
posterior approach, the fascia lata and gluteal fascia were disclosed in line with skin incision, and the fibers of the gluteus maximus were separated bluntly in line with skin incision, and the short external rotators were clearly visualized. Before dissecting the external rotators from the great trochanter, 0-Vicryls were sutured on external rotators tendon 10 mm proximal to the site of external rotators attachment on great trochanter as shown in Figure 1a and b, and then the external rotators were cut in line with the attachment on the great trochanter. The external rotators were retracted medially to protect the sciatic nerve, and the capsule was exposed. The capsule was incised vertically, and the femoral head was completely exposed.

After inserting the implant (SL-PLUS MIA stem: Smith & Nephew, Memphis, TN), posterior shoelace capsular suture using ULTRATAPE (Smith & Nephew, Inc., Andover, MA) was performed to stabilize the posterior wall and prevent the soft tissue from tearing as shown in Figure 2.

Second, short external rotators were repaired using the shoelace technique as well. The sutures on the external rotators with 0-Vicryl were made perpendicular to the external rotators fibers, and the ULTRATAPE was passed through medial to the sutures on the external rotators as shown in Figure 1a.

The shoelace suture technique using ULTRATAPE was carried out alternately and repeated between the great trochanter and the short external rotators. Suture was conducted on the surface of the great trochanter including the periosteum, and any holes in the great trochanter were not made.

Postoperative care included no weight-bearing restriction or no range of motion restriction, except 90° flexion and 60° internal rotation for fear of posterior dislocation. As shown in Figure 3, her ranges of motion in right hip joint examined 3-month post-operatively were flexion 90°, abduction 30°, and internal rotation 20°, although internal rotation in right hip (affected side) was more restricted as compared with that in her left hip joint, suggesting the posterior soft tissues were tightly reconstructed.



**Figure 2.** Suturing the hip capsule with shoelace technique. In insertion, the hip capsule was split vertically without peeling off the labrum. In closing, this shoelace technique using ULTRATAPE was initiated (left in Fig. 2) and laced up from proximal to distal in line with the split (central in Fig. 2).



**Figure 3.** Range of motion examined at 3-month postoperative visit. Active ranges of motion in the right hip joint were flexion 90°, abduction 30°, and internal rotation 20° without any complaints. Internal rotation in right hip joint (affected side) was more restricted as compared with that in left hip (unaffected).

## Discussion

This is a technical note showing posterior capsular and external rotators closure by shoelace suture technique using ULTRATAPE. Postoperative dislocation is uncommon but one of the most devastating and disconcerting complications after FHP by posterior approach [7]. Several studies have shown that suturing the soft tissues is one of the most challenging techniques because of high risks of soft-tissue tear. In the field of hip arthroscopy, there is a subset of patients having pain and dysfunction after hip arthroscopic surgery, which are most likely due to disruption or redundancy at the site of capsular repair. Recently, Uchida et al [8] have innovated shoelace capsular suture technique using ULTRATAPE. The shoelace capsule repair ensured strong capsule suturing preventing the soft-tissue tearing. In addition, Suzuki et al [9] also demonstrated a shoelace side-to-side rotator cuff repair technique for a longitudinal midsubstance rotator cuff tear.

This shoelace suture technique has several theoretical advantages over a more traditional osseous repair. The shoelace technique sutured the soft tissue in plane rather than traditional suturing in line, which definitely reduces the risk of soft-tissues tearing with suturing. In addition, by suturing the posterior capsule and the external rotators including piriformis, dynamic stabilization may be conferred with the reconstruction of the posterior wall of the femoral head. This surgical technique has 3 advantages. First, the mechanical property of the ULTRATAPE material that makes it stronger than Ethibond (Ethicon Inc., Somerville, NJ) sutures. Second, ULTRATAPE captures soft tissues in plane rather than in line, which reduces the risk of soft-tissue tear. Finally, this shoelace repair technique is quite simple and is as quick to perform as we tie shoelaces. In contrast, the possible disadvantage of this technique is surgery time delay. The surgery time in this case was prolonged by 10 minutes as compared with usual cases

with FHP. In addition, the use of ULTRATAPE became a burden on the surgical cost, approximately US \$600. As a study limitation, we have not yet enough cases to evaluate whether this surgical technique is cost-effective for preventing hip dislocation.

## Summary

We demonstrated a surgical technique for shoelace closure of capsule and external rotators in posterior (southern) approach for FHP. This technique potentially reduces the risk of soft-tissue tear and posterior wall instability. We believe that patients undergoing FHP would benefit from the shoelace technique for closing capsular and the external rotators.

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