INCIDENCE OF PIRIFORMIS TENDON PRESERVATION ON THE DISLOCATION RATE OF TOTAL HIP REPLACEMENT FOLLOWING THE POSTERIOR APPROACH

A Series of 226 cases*

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ABSTRACT • BACKGROUND: Dislocation is a feared complication following total hip replacement (THR). While repairing the piriformis tendon after THR reduces dislocation, we analyze in this study the effect of piriformis tendon preservation on reducing the dislocation rate.

MATERIAL AND METHODS: 226 THRs were done following the usual posterior approach and by the same surgeon. All patients received the same prosthetic design. All cases were primary THR. After reaching the external rotators, the piriformis muscle was identified and dissected on its inferior border from the gemellus superior and elevated by a retractor. Further stages were performed in the usual manner. Patients were followed up for a mean of 3 years.

RESULTS: 226 THRs were done for 217 patients, 118 of whom were females and 99 were males with a mean age of 62. Nine patients received bilateral THRs. 112 procedures were performed on the right side and 114 on the left side. THR was performed in 70 cases following femoral neck fractures and in 156 cases due to osteoarthritis. No intraoperative or long-term complications were found while preserving the piriformis. Postoperative hip X-rays showed good positioning of both the femoral and acetabular components. No cases of dislocation were identified after a mean follow-up of 3 years (1-10).

CONCLUSION: Preservation of the piriformis tendon during the postero-lateral approach in THR is a possible surgical technique that is easy to use and reproducible in both arthritic and traumatic conditions. It follows an anatomical intermuscular plan and permits full exposure of both the proximal femur and the acetabulum. Compared to the literature, preserving the piriformis tendon seems to be superior to repairing it in terms of dislocation of THR.

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RÉSUMÉ • INTRODUCTION: La luxation de hanche est une complication redoutée après la prothèse totale de hanche (PTH). Bien que la réparation du tendon pyramidal réduise la luxation, nous analysons dans cette étude l’effet de la préservation du tendon pyramidal sur la réduction du taux de luxation.

MATÉRIEL ET MÉTHODES: Les 226 cas ont été opérés par le même chirurgien suivant l’approche postérieure habituelle. Tous les patients ont reçu le même type de prothèse. Tous les cas ont été des PTH primaires. Après avoir atteint les rotateurs externes, le tendon pyramidal a été identifié et disséqué du jumeau supérieur sur son bord inférieur et élevé par un écarteur. Toutes les étapes suivantes ont été réalisées de la manière habituelle. Les patients ont été suivis pendant une durée moyenne de 3 ans.

RÉSULTATS: 226 PTH ont été effectuées pour 217 patients dont 118 femmes et 99 hommes avec une moyenne d’âge de 62 ans. Neuf patients ont reçu des PTH bilatérales. 112 procédures ont été réalisées sur le côté droit et 114 sur le côté gauche. 70 PTH ont été réalisées à la suite de fractures du col du fémur et dans 156 cas suite à l’arthrose. Aucune complication peropératoire ou à long terme n’a été trouvée. Les radios postopératoires ont montré un bon positionnement à la fois des composants fémoraux et acetabulaires. Aucun cas de luxation n’a été identifié après un recul moyen de 3 ans (1-10).

CONCLUSION: La préservation du tendon pyramidal au cours de l’approche postérieure de la PTH est une technique chirurgicale possible, facile à utiliser et reproductible tant dans les affections arthritiques que traumatiques. La dissection suit un plan anatomique intermusculaire et permet une exposition complète à la fois de l’extrémité supérieure du fémur et du cotyle. En se référant à la littérature, la préservation du tendon pyramidal semble être supérieure à sa réparation en termes de luxation de PTH.

INTRODUCTION

Total hip replacement (THR) is a widespread and effective orthopedic procedure. Unfortunately, dislocation is a feared complication [1] reaching 0.3% to 10% of all primary THR [2-3]. The risk of dislocation is influenced mainly by the surgical approach and technique [4-5].
Gluteus medius retracted superiorly to show the piriformis tendon.

Piriformis tendon is identified and dissected from its inferior border and retracted superiorly.

Piriformis tendon retracted and the short external rotators sectioned as well as the capsule.

Piriformis tendon shown after cementing the acetabular cup.

Piriformis tendon shown to be intact after cementing the femoral stem.

Piriformis tendon intact after relocation of the total hip arthroplasty.
Understanding the etiology of dislocation and refinements of the surgical technique may lead to decreased dislocation rates. Furthermore, the effect of capsulorrhaphy and repair of the external rotators in terms of reducing dislocations is proven by several authors reaching rates as low as 0.4% [6]. We try in this work to assess the effect of piriformis tendon preservation as a possible surgical technique on decreasing dislocation rates.

**MATERIAL AND METHODS**

After approval of the scientific and ethics committee, a prospective study was conducted at the Orthopedic Surgery Department at Notre-Dame des Secours University Hospital (Byblos, Lebanon). Between 1996 and 2006, 226 patients were enrolled in this study. All patients were treated and operated by the same senior surgeon using the posterior approach for primary THR. All patients necessitating a THR were included in the study whether for traumatic or arthritic conditions. Only patients with a revision procedure were excluded. All patients received the same prosthetic design with a 28 mm head. All implants were cemented with a polyethylene liner.

**The surgical technique**

Templating was done prior to the procedure. After either general or spinal anesthesia, the patient is put in the lateral decubitus position. Skin incision is made over the greater trochanter around 10 to 14 cm in length. Surgical dissection is done in a usual manner till the short external rotators are reached. The gluteus medius is then identified and retracted superiorly from its inferior border to protect it and clear the piriformis tendon under it (Figure 1). The piriformis muscle is identified and dissected on its inferior border (Figure 2) from the gemellus superior and elevated with the gluteus medius by a retractor (Figure 3). The obturator internus, the two gemelli, the quadratus femoris tendons and the posterior part of the joint capsule are cut as close to the femoral attachment as possible. After reaching the insertion of the gluteus maximus tendon on the femur distally, the dissection is stopped and the hip joint is dislocated posteriorly.

Further stages are performed in the usual manner with good exposure and handling of the prosthetic components (Figures 4 & 5) regarding the acetabular anteversion, inclination, offset and length. We usually use one retractor located below the transverse acetabular ligament and one on the posterior wall of the acetabulum. One retractor on the anterior wall may be used if needed. Before reaming the femoral canal, the femoral elevator is used to elevate the femur and protect the piriformis insertion. After relocation of the prosthetic hip joint, special attention is made to assess the integrity of the piriformis muscle and tendon (Figure 6).

All patients had postoperative radiographies for the pelvis (A-P) and hip (A-P and Lateral). They all received anticoagulation. All patients received also the same physical therapy and rehabilitation program. They were all encouraged to walk on day 1. The patients were followed clinically and radiographically after three weeks, three months, one year and three years.

**RESULTS**

Two hundred seventeen patients were operated for 226 THRs, because nine patients received bilateral THR. One hundred eighty-five (54.4%) were females and 99 (45.6%) were males having a mean age of 62 years (49-81). One hundred eighteen (52.2%) procedures were performed on the right side and 108 (47.2%) on the left side (Table I). The body mass index (BMI) ranged from 19 to 30 with a mean of 25. THR was performed in 70 (31%) cases following femoral neck fracture and in 156 (69%) cases due to osteoarthritis. The mean operative time was 80 minutes. We could manage to preserve the piriformis tendon in all cases. At the end of the operation, the piriformis tendon was completely intact in 220 (97.3%) of cases. In six cases (2.7%) we found a very minor attrition of the piriformis tendon due to the pressure exerted by the retractor which did not need any type of suturing. The overall integrity of the tendon was not affected. The posterior capsule was attached with one trans-osseous suture using a Vicryl 2 thread. No drains were used. Good exposure of the surgical field was available in all subjects. Furthermore, postoperative X-rays demonstrated good positioning of the components in accordance with the preoperative templating, in terms of the acetabular anteversion (mean of 15-20º), inclination (mean of 40-45º), offset and length of the prosthesis. No varus positioning of the femoral component was found. No intraoperative or long-term complications were found related to sciatic nerve injury or cruralgia. We had only one case of superficial wound infection treated successfully with antibiotic and adequate wound care, and one case of infected THR treated with a staged procedure. Most importantly no case of dislocation was noted in all this series after a mean follow-up of three years (12 months to 10 years range).

**Table I**

**DISTRIBUTION OF THR BASED ON SEX AND SIDE OF SURGERY**

<table>
<thead>
<tr>
<th>Operated Side</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Side</td>
<td>50</td>
<td>61</td>
</tr>
<tr>
<td>Left Side</td>
<td>48</td>
<td>51</td>
</tr>
<tr>
<td>Bilateral</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

C.D. MOUSSALLEM et al. – Piriformis tendon preservation & THR dislocation rates

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RESULTS OF MAJOR ARTICLES RELATED TO PIRIFORMIS TENDON PRESERVATION

<table>
<thead>
<tr>
<th>Study</th>
<th>Year of publication</th>
<th>Journal</th>
<th>N. of standard THR / Dislocation rate</th>
<th>N. of THR w/Piriformis tendon preservation</th>
<th>Dislocation rate</th>
<th>Mean follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pringet et al.</td>
<td>2008</td>
<td>EJOST</td>
<td>98 / 2.9%</td>
<td>98</td>
<td>0%</td>
<td>One year</td>
</tr>
<tr>
<td>Kim et al.</td>
<td>2008</td>
<td>CORR</td>
<td>168 external rotators sectioned / 5.3%</td>
<td>220</td>
<td>0%</td>
<td>One year</td>
</tr>
<tr>
<td>Present study</td>
<td>2012</td>
<td>LMJ</td>
<td>282 external rotators sectioned &amp; repaired / 3.9%</td>
<td>226</td>
<td>0%</td>
<td>Three years (1-10)</td>
</tr>
<tr>
<td>Moussallem et al.</td>
<td>-</td>
<td>-</td>
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</table>

TABLE II

EJOST: European Journal of Orthopedic Surgery and Traumatology
LMJ: Lebanese Medical Journal
CORR: Clinical Orthopedics and Related Research
THR: total hip replacement

DISCUSSION

Posterior approach in THR is the most widely used approach which holds numerous advantages over other approaches due to the lower incidence of limping, heterotrophic ossification [7] and decreased surgical time. Nevertheless, high postoperative dislocation continues to be a major concern for both surgeons and patients.

Therefore, special attention is given to soft tissue repair. Some authors found rates as low as 0.4% with posterior capsuloraphy and repair of the external rotators after primary THR [8-9].

Kwon et al. found that the posterior approach without soft tissue repair was found to have an 8.21 times greater relative risk of dislocation than with soft tissue repair using a meta-analysis of five studies that directly compared primary THR dislocation rate with and without soft tissue repair using the posterior approach. White et al. found only a 0.7% dislocation rate after posterior soft tissue repair (3 of 437 patients) versus 4.8% (57 of 1078 patients) without repair [10].

To our knowledge there is only one study done by Pringet [11] in 2008 that describes the preservation of the piriformis tendon with soft tissue repair conducted on two groups of patients, the first one consisting of 98 primary THRs with preservation of the piriformis tendon and the second group of 98 patients having THR without preservation of the tendon. After a follow-up of one year, no dislocations were found in the first group, but three dislocations (2.9%) occurred in the second group.

Another interesting study was done by Kim et al. [12] on 670 hips and involved three groups of patients: in the first group (168 hips), the external rotators were not repaired after sectioning, in the second group (282 hips), the rotators were repaired after sectioning, and in the third group (220 hips) the external rotators were not sectioned and preserved. No dislocation was found in the third group, with 3.9% in the second group and 5.3% in the first group (Table II). The author concluded that the modified approach with preservation of the external rotators seemed to be a good option for preventing dislocation.

All these authors stressed upon the importance of capsular repair and most importantly the preservation of the piriformis tendon, which tightens during the first step of dislocation [12-13]. This fact is supported by the clinical findings of our study where we found no dislocation while preserving this muscle. Furthermore, a study using controls by radiopaque markers showed suture failures in 90% of the cases when reinsertion of the tendon was done [14]. That is why we thought of preserving the tendon in the first place instead of cutting it and repairing it later on, since the piriformis tendon acts as a passive and active stabilizer at the same time. As for the surgical technique, we found it to be easy and reproducible. No difference was found between males and females since no dislocation was found whatsoever. Nevertheless, several limitations faced our work; the most important one is the lack of randomization and comparison to another group where the piriformis tendon would not have been preserved. In addition, several other factors play a major role in reducing dislocation rates such as the appropriate selection of patients and the surgical technique, the choice and the good placement of the implants, etc., but were not the subject of this study. We find that the establishment of a Lebanese hip arthroplasty registry is needed for better data collection, statistical analysis and wider studies.

CONCLUSION

Our data suggest that piriformis tendon preservation is an important factor among others that reduces dislocation rates in primary THR compared to the literature. We find this technique easy to perform, it permits full exposure of the surgical field, and it respects the anatomy following an intramuscular approach. We recommend this approach to surgeons that are familiarized to the posterior approach in order to reduce dislocations rate and soft tissue preservation.

REFERENCES

2. Lewinnek GE, Lewis JL, Tarr R, Compere CL,