

Original Article

Position of the sciatic nerve and effect of gluteus maximus release during hip arthroplasty

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ARTICLE INFO

Article history:

Received 20 November 2016

Received in revised form 26 January 2017

Accepted 21 March 2017

Available online xxx

Keywords:

sciatic nerve

hip

total hip replacement

ABSTRACT

Eight Thiel embalmed hips were dissected. The distance between the sciatic nerve and the femoral neck was measured before and after hip dislocation, and before and after release of the gluteus maximus tendon. There was a significant reduction in the mean distance between the neck of femur and the sciatic nerve in both the gluteus maximus tendon release and the unreleased groups at 60° and 90° of hip flexion, $p < 0.05$. The mean distance between the neck of femur and sciatic nerve was greater in the release group for all positions.

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1. Introduction

The aetiology of sciatic nerve injury after total hip arthroplasty is a poorly understood phenomenon, which is associated with considerable morbidity. During total hip arthroplasty the anatomy of the gluteal region becomes distorted, particularly following dislocation of the hip and positioning during femoral preparation and implant insertion. Our previous study showed that during the posterior approach to the hip, following hip dislocation and femoral neck osteotomy, the sciatic nerve moves significantly closer to the femoral neck with progressively increasing hip flexion.¹ The use of formalin-embalmed cadavers, with stiffness requiring gluteus maximus tendon release to facilitate hip dislocation, may have had an uncertain impact on these results. It is not known whether the relationship demonstrated between the femoral neck and the sciatic nerve predisposes to an increased risk of nerve injury. This relationship may be significant given that the cause of the sciatic nerve palsy after THA in approximately one half of patients is unknown.²

To supplement our previous study, the aim of current study is to determine the effect gluteus maximus tendon release on the position of the sciatic nerve during the posterior approach to the hip. This study also differs from our previous study in that it utilises cadavers that are embalmed using Thiel's method which have tissue-handling characteristics similar to living subjects.³

2. Material and Methods

We obtained four cadavers, which had been embalmed using Thiel's method, giving a total of eight hips, of which six were male and two were female.

None of the specimens had prior leg, hip or spine pathology. They were placed in the lateral position and a classical posterior approach was performed with a curved incision over the posterior aspect of the greater trochanter. The fascia lata and gluteus maximus muscle were incised in line with the skin incision. A Charnley self-retaining retractor was used to retract the fascia lata and gluteus maximus muscle. The sciatic nerve was identified from the lower border of the piriformis to the upper border of the gluteus maximus tendon. The fat surrounding the nerve was removed to enable visualisation, but the nerve itself was not mobilised and the surrounding loose connective tissue and local anatomy were otherwise undisturbed. Two independent observers (AK, PL) conducted serial measurements using digital calipers, with measurements made to the nearest millimetre (Figs. 1–3). The mean values of these measurements were recorded for statistical analysis. The anatomy and each measurement was recorded with still digital photography. The short external rotators of the hip and posterior capsule were detached from the proximal femur. Measurements at each position were taken from the closest identifiable margin of the nerve to the closest identifiable edge of the medial femoral cortex, one centimeter proximal to the lesser trochanter. The measurements which were made before the hip was dislocated were performed with the hip in 0° of flexion (0° F), 0° of abduction (0° Ab) and neutral rotation. The hip was dislocated

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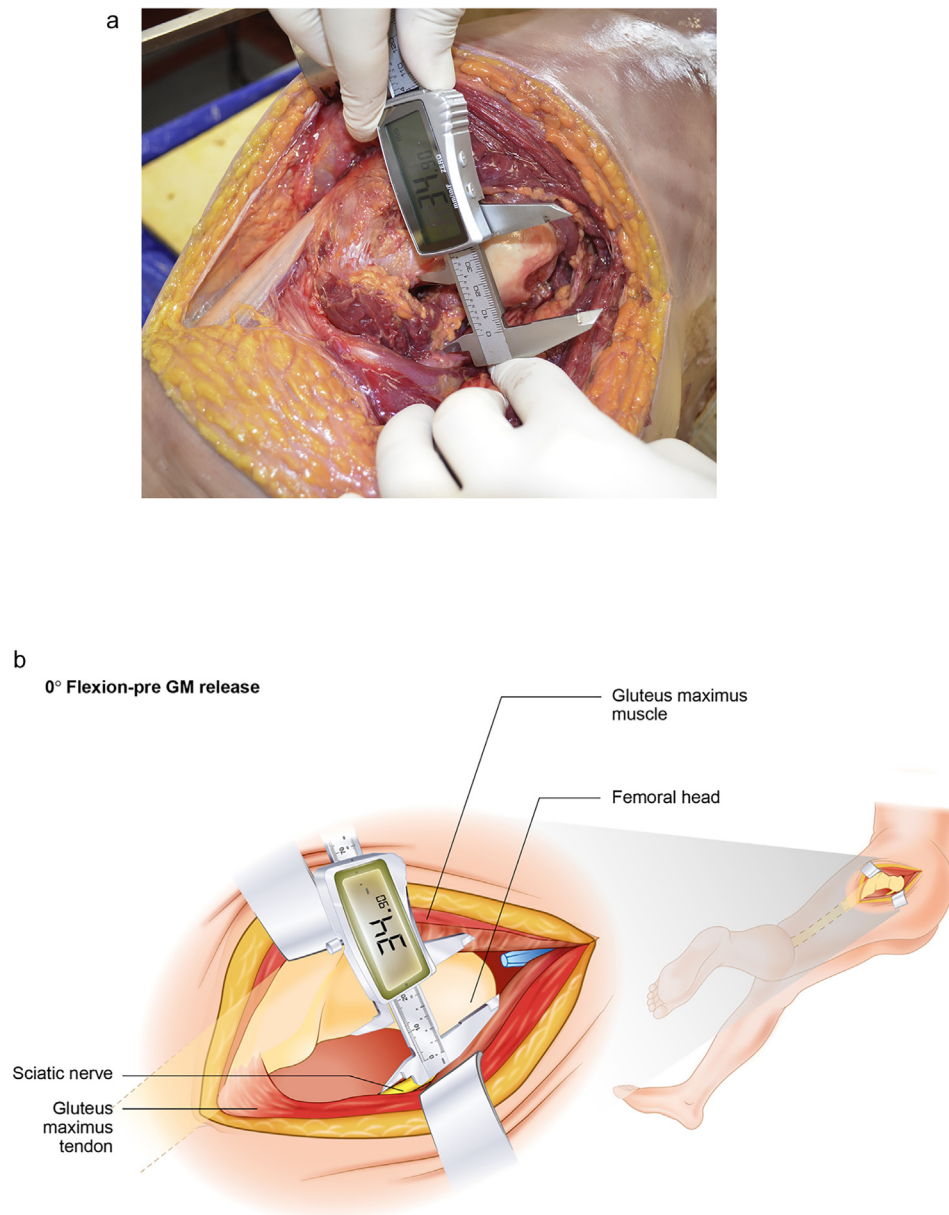


Fig. 1. a) Photograph and b) diagram of the left posterior gluteal region demonstrating how measurements between the femoral neck and sciatic nerve were taken in one representative specimen. The fat around the sciatic nerve has been removed. The hip is dislocated posteriorly and positioned at 90° internal rotation and 0° flexion. The gluteus maximus tendon is intact. The sciatic nerve was measured to be 34.9mm from the femoral neck.

and the limb was maintained at 0° Ab and 90° of internal rotation (90° IR) from this point onwards. Further measurements were taken with the hip in 0° F (Fig. 1), then flexed to 30°, 60° and 90° (30° F, 60° F and 90° F, respectively) (Fig. 2). The femoral neck was osteotomized one centimeter proximal to the lesser trochanter at an angle of 45° to the femoral shaft. The osteotomy was performed with 90° IR and 60° F because the femoral head came into contact with the nerve and obscured its position at this stage. The knee was maintained flexed in 90° F following dislocation. The gluteus maximus tendon released one centimeter from its insertion point at the gluteal tuberosity, and repeat measurements were taken at 0° F, 30° F, 60° F and 90° F (Fig. 3).

Statistical analysis was performed using SPSS version 23.0 software (IBM-SPSS, Armonk, New York). Student's *t*-test for independent and paired samples was used for statistical calculations with a *p*-value <0.05 considered significant. All data are summarised as means with standard deviations (SD).

3. Results

The mean distance between the femoral neck and the sciatic nerve at the pre-dislocation starting position was 31.0 ± 5.4 mm. After dislocation, the distance between the neck of femur and the sciatic nerve distance was a mean of 32.5 ± 3.8 mm, 25.6 ± 3.9 mm, 17.4 ± 5.5 mm, and 8.8 ± 3.8 mm, with 0° F, 30° F, 60° F and 90° F respectively, whilst maintaining 90° IR (Table 1, Figs. 1 and 2). The closest distance between the sciatic nerve and the femoral neck was 3 mm at 90° IR and 90° F before gluteus maximus release (Graph 1).

After the release of gluteus maximus was performed, the mean distance between the femoral neck and the sciatic nerve was 34.8 ± 6.5 mm, 27.5 ± 8.0 mm, 21.0 ± 6.5 mm, and 13.2 ± 6 mm at 0° F, 30° F, 60° F and 90° F respectively, while maintaining 90° IR (Fig. 3). The closest distance between the sciatic nerve and the femoral neck was 8 mm at 90° IR and 90° F after gluteus maximus release (Graph 1).

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