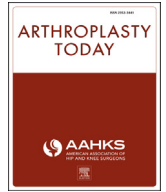




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Case report

Muscle activation pattern during gait and stair activities following total hip arthroplasty with a direct anterior approach: a comprehensive case study

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ABSTRACT

Muscle activation following total hip arthroplasty with a direct anterior approach has not previously been reported in the literature. This case report details the electromyography outcome of a 60-year-old male patient with unilateral direct anterior approach-total hip arthroplasty during walking and stair activities. Outcome reports the continuation of altered muscle activation 12 months postoperatively, even with a good clinical outcome.

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Introduction

Total hip arthroplasty (THA) is one of the most common and successful surgical procedures in orthopaedics [1]. Various approaches for THA exist, with direct anterior approach (DAA) considered to be the least traumatic to the soft tissues and thus exhibiting faster recovery. Following DAA, patients are expected to recover within 2 weeks postoperatively, so are therefore not prescribed postoperative physical therapy [2]. Studies objectively assessing all THA approaches have found no significant difference 1–2 years postoperatively [3,4], but report inconsistent outcomes in the early postoperative gait [5–7]. One study assessing muscle structure 2 years postoperatively reported a persistent reduction in the cross-sectional area and density of the muscles around the hip joint [8]. Moreover, muscle function following DAA-THA was and has not previously been presented. As such, the following case

report presents an empirical outcome analysis of muscle function recovery following DAA-THA.

Case history

A 60-year-old male with symptoms of severe right hip pain and stiffness is presented. Anteroposterior (AP) and cross-table lateral radiographs diagnosed bilateral advanced hip arthritis with bone-on-bone changes. The arthritic pattern was consistent with cam-type femoroacetabular impingement with secondary arthritis. The left hip, however, was asymptomatic. The patient reported no other joint or chronic health problems. The patient was a power lifter as a young adult.

DAA-THA was performed on the right hip in 2014 at the Mayo Clinic in Rochester, MN. Based on the previously described standardized surgical technique [9], an oblique incision was made over the anterior margin of the tensor muscle ~2 cm lateral from the anterior superior iliac spine and extending 8–12 cm. The fascia of the tensor muscle was identified and incised. The muscle was swept digitally-laterally and a retractor was placed over the superior aspect of the femoral neck. A retractor was then placed beneath the inferior femoral neck. The ascending branch of the lateral femoral circumflex artery was identified and cauterized. The hip capsule was then incised and retracted. A measured resection of the

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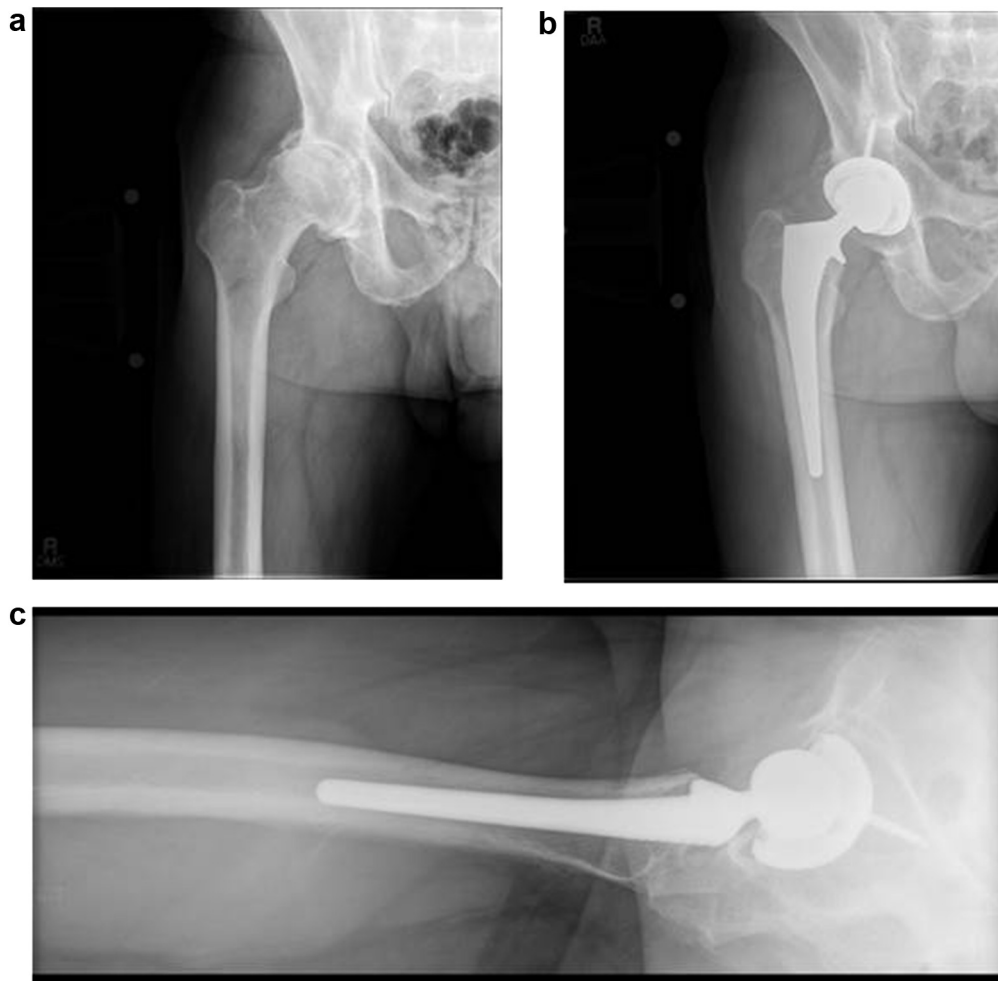


Figure 1. Preoperative anteroposterior (AP) (a), postoperative AP (b), and cross-table lateral (c) radiographic imaging of the right hip. Implant positioning postoperatively is found to be optimal.

femoral neck was performed with the assistance of fluoroscopy and preoperative templates. The traction was released and the leg was left in a slightly externally rotated position. Retractors were then placed to expose the acetabulum. Acetabular reaming was performed with the fluoroscopic assistance and direct visualization. After placement of the acetabular component and fluoroscopic confirmation of the position, attention was directed to the femur. A retractor hook was placed beneath the femur in the recess of the vastus lateralis ridge. This hook was contoured to avoid soft tissue injury. The operative extremity was externally rotated, extended, and adducted, allowing axial access to the proximal femur. Releases typically include superior capsular release, inferior capsular release, and often piriformis release in the piriformis fossa. The posterior muscular structures remain intact. Surgical implantation of the femoral implant trial was followed by a trial reduction. The femoral component sizing, offset, and leg length was evaluated fluoroscopically. After appropriate sizing, the final femoral implant was placed. Trial head sizes were performed. After placement of the final arthroplasty head, closure included reapproximation of the anterior capsule and interrupted Vicryl suture closure of the tensor fascia. Subcutaneous closure and skin closure were per routine. Components utilized included the following: a hemispherical uncemented acetabular component, pinnacle, an uncemented hydroxyapatite-coated femoral stem, corail, and ceramic femoral heads on highly cross-linked ultra-high molecular weight

polyethylene acetabular bearing surfaces (DePuy). All components have been approved by the U.S. Food and Drug Administration.

The patient was trained to use crutches and a cane and was asked to bear as much weight as tolerable on the operated side. Physical therapy was not prescribed to the patient following discharge from the hospital. The patient was discharged 2 days after surgery. Patient consent was taken to publish the medical records as a case report.

The patient's preoperative and postoperative subjective Harris hip scores were 64/100 and 100/100, respectively. Radiographic preoperative and 3-month postoperative outcome is shown in [Figure 1](#). Objective biomechanical assessment, including comprehensive bilateral gait and stair climbing assessments, was carried out preoperatively as well as 3 and 12 months postoperatively.

Table 1
Average walking speed (m/s).

Speed	Level walking	Stair ascend	Stair descend
Preoperative	1.17	0.59	0.57
Three-month DAA-THA	1.28	0.56	0.52
Twelve-month DAA-THA	1.30	0.62	0.59
Normal older control average (SD) [14]	1.31 (0.23)	0.55 (0.11)	0.67 (0.11)

SD, standard deviation.

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