Wake Up Test in Total Hip Arthroplasty

Mikhail Kuznetsov[1], Gloria Shoshana Coden, Hannah Isabel Travers, Eric Louis Smith
[1]New England Baptist Hospital

Abstract
Introduction:
The wake up test is performed across multiple surgical disciplines to assess for intraoperative neurological damage. In total hip arthroplasty (THA) permanent damage to the peroneal division of the sciatic nerve is the most common site of neurological damage. Though uncommon (occurring in up to 3.7% of cases), it is a devastating sequela, and one of the most common sources of litigation following THA. Moreover, the medico-legal issues related to nerve injury tend to arise from a failure to diagnose and manage nerve palsies rather than the complication itself.[2] The purpose of this presentation is to provide the first video overview of the use of the wake up test in THA and disseminate the techniques employed by the author.

Case Presentation:

The video presents a 55-year-old woman with a past medical history of developmental dysplasia of the right hip characterized by avascular necrosis of the femoral head and acetabular collapse. The patient presented to clinic with years of right hip pain which sub acutely worsened after a fall onto the right hip. She failed conservative management and had been using crutches to ambulate for 8 months prior to surgery.

Physical examination of the right hip demonstrated 5 degrees of internal rotation and 20 degrees of external rotation. She was able to stand and transfer with difficulty, and there was a 3 cm limb-length discrepancy noted.

Radiographs demonstrated marked flattening of the right femoral head with extensive bone loss including complete degeneration of the hemisphere, a shallow and severely dysplastic right acetabulum, complete loss of joint space, and approximately 3 cm of superior translation of the femur, which abutted the upper-most aspect of the acetabulum.

Following placement of the acetabular and femoral components, intraoperative neuromonitoring with the wake up test was initiated. After a time out with the anesthesia team, the sedation was decreased to a level where the patient was able to follow commands and demonstrate intact dorsiflexion and plantarflexion of the right foot. Following demonstration of functional preservation of the entire motor distribution of the sciatic nerve, the procedure continued to closure without complication. The patient was able to bear weight the day of the surgery and was ultimately discharged on post-op day 2 following an uncomplicated course.

Discussion
Patients with developmental dysplasia of the hip, avascular necrosis of the femoral head, and revision arthroplasty are known to have higher rates of sciatic nerve motor dysfunction following hip arthroplasty. The functional and medico-legal ramifications of missing or misdiagnosing sciatic nerve dysfunction following THA in these at-risk populations can be devastating. Therefore, surgeons should be aware of the utility of intraoperative neuromonitoring.
The wake up test is a storied, cost effective, accurate, and simple intraoperative method for neuromonitoring in patients undergoing total hip arthroplasty for complex hip pathologies. As demonstrated in the described case, wake up test provides a real time intraoperative evaluation of nerve functionality. In a series of 9 total cases of THA with wake up test conducted by 2 surgeons at 2 institutions between 2020 and 2023, the wake up test reliably predicted the presence or absence of sciatic nerve palsy in 9/9 cases. One case in this series demonstrated sciatic nerve palsy intraoperatively, while 8/9 cases demonstrated in tact neurological function. Leverage of this methodology in high risk patient populations will facilitate safe and reliable diagnosis of nerve palsy for early intervention and proper management.

Bibliography
1. Chen KH, Wang HY, Sung CS, et al. Wake-up Test in Total Hip Arthroplasty With High-riding Developmental Dysplasia. *Orthopedics*. 2014;37(7). doi:10.3928/01477447-20140626-53
2. Hasija R, Kelly JJ, Shah NV, et al. Nerve injuries associated with total hip arthroplasty. *J Clin Orthop Trauma*. 2018;9(1):81-86. doi:10.1016/j.jcot.2017.10.011