Radiologically silent loosening of the acetabular component in total hip arthroplasty

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Introduction: Total hip arthroplasty (THA) is an excellent option for the treatment of osteoarthritis of the hip. Modern implants show survivorships of greater than 90% at 10 years in numerous studies. Infection, component wear, and periprosthetic fracture are common causes of revision surgery. Polyethylene (PE) wear and subsequent osteolysis are a major obstacle to the long-term success of THA. Osteolysis can be diagnosed radiologically using plain radiographs or computed tomography (CT). Osteolysis is radiologically defined as a region devoid of bone that communicates with the joint and which was not seen on the initial postoperative radiographs after surgery. CT has been found to be more sensitive for the diagnosis of osteolysis than plain radiographs and is better able to determine the size and location of osteolytic lesions. In our study we sought to determine the prevalence of patients with loose acetabular components without radiologic or clinical findings that would necessitate urgent revision arthroplasty. Radiologically silent loosening (RLS) was defined as an acetabular component that was loose at time of revision surgery but that did not show frank signs of loosening on either plain radiographs or CT imaging. Although these patients make up a small minority of the revision population, understanding the prevalence of RLS can help raise a surgeon’s awareness of this potentially dangerous situation.

Methods: In this retrospective, Institutional Review Board (IRB)-approved study, we evaluated patients who had undergone revision THA and had preoperative plain radiographs and CT imaging prior to the revision. Inclusion criteria were patients who were confirmed to have undergone revision total hip arthroplasty. Patients were also confirmed as having had plain radiographs and CT imaging of the THA prior to revision. Exclusion criteria included patients who were not imaged with CT scan prior to revision surgery. These patients were diagnosed by clinical history and/or by plain radiographs. Patients who were revised for periprosthetic infection or periprosthetic fracture were also excluded. All plain radiographs and CT images were evaluated by both the orthopaedic surgeon performing the revision surgery and had been evaluated by a radiologist. Any patient whose imaging showed signs of component movement or migration as seen either by the attending surgeon or the attending radiologist were excluded. The remaining patients were then stratified into two groups, comparing those who had stable vs. those who had loose acetabular components at time of revision surgery. The two groups were then compared with respect to age, gender, and most common presenting symptoms and diagnoses. Fischer’s exact test and Student’s t-test were used to statistically compare the two groups.

Results: Overall, 393 patients underwent revision arthroplasty at one institution between 2000 and 2012 for the ICD codes indicated (Figure 1). Of those patients, 189 (48.1%) had a CT scan performed prior to revision arthroplasty. Eighty-five of these patients were excluded for various diagnoses that were either evident on plain radiographs or necessitated urgent revision arthroplasty (Figure 2). One hundred four patients met inclusion criteria for the study. The average patient age was 65.1 years with 54 males and 50 females. Eighty-eight of these patients were found to have a stable acetabular shell at time of revision surgery (84.6%). The remaining 16 (15.4%) patients were diagnosed with radiologically silent loosening of the acetabular shell. Between the two groups, age (p = 0.961) and gender distribution (p = 0.185) was not significantly different between patients with stable and unstable acetabular shells. All patients in the RSL group were diagnosed with osteolysis radiologically and 15 of 17 patients (88%) presented with pain as the primary complaint compared to only 54 of 87 (62%) patients in the group with stable shells.
Discussion: In our study we define *radiologically silent loosening* (RSL) as an acetabular component that was loose at time of revision surgery but that did not show frank signs of loosening on either plain radiographs or CT imaging. Of 104 patients included in the study, 17 (16.3%) met the diagnosis of RSL of the acetabular component. The most common complaint was pain and the most common diagnoses were osteolysis or PE wear. Age and gender were not associated with an increased likelihood of RSL. By raising awareness of RSL and its prevalence, hopefully we can increase our ability to detect these patients with RSL. If RSL is detected before gross migration or movement of the acetabular component occurs, it may allow the surgeon a greater ability to plan for revision arthroplasty prior to the occurrence of a catastrophic event that may necessitate a larger, more complex procedure. As the number of patients requiring revision arthroplasty continues to rise, we believe surgeons should be aware of the prevalence of RSL and its potential to impact a patient’s care and our surgical options.