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RADIOLOGY & IMAGING CORNER

CT Evaluation of Total Hip Arthroplasty Complication: Dissociation of Acetabular Component

Eric A. Bogner, MD · Carolyn M. Sofka, MD

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Introduction

The computed tomographic (CT) evaluation of patients with orthopedic implants has traditionally been limited due to considerable artifact from the prosthesis. With proper parameter modifications, however, the artifact can be diminished and diagnostic images can be produced. This is a report on the preoperative CT evaluation of a dislocated total hip replacement and dissociated acetabular component.

Case report

Two weeks prior to presentation, the patient had a noncemented total hip arthroplasty placed at an outside institution. The patient reported having an uneventful postoperative course, with acute nontraumatic onset of right hip pain.

Standard anteroposterior pelvic and right hip radiographs demonstrated complete dislocation of the right total hip prosthesis with, of note, complete dislodgment of the acetabular component (Fig. 1). Due to extreme pain, the patient was unable to move the leg significantly for a Lauestein lateral radiograph. CT examination was requested.

CT examination of the right hip again demonstrated complete dislocation of the right hip with dislodgement of the acetabular component (Fig. 2). Of greater note, given the tomographic nature of CT, the relationship between the acetabular component and the dislodged femoral component could be discerned. The acetabular component was posteriorly located within the pseudocapsule and was rotated approximately 90 degrees in both the coronal and axial planes (Fig. 3). In addition, the morphology of the acetabulum could be evaluated, with subtle fractures observed in both the anterior and posterior walls (Figs. 4 and 5). The patient went on to have a total hip replacement revision, with a constrained acetabular liner (Fig. 6).

E. A. Bogner, MD · C. M. Sofka, MD (✉)
Department of Radiology & Imaging, Hospital for Special Surgery,
Weill Medical College of Cornell University,
535 East 70th Street, New York, NY 10021, USA
e-mail: sofkac@hss.edu

Discussion

The use of CT for evaluation of arthroplasty complications can be limited due to considerable artifact from the prosthesis. With proper parameter modifications, however, the artifact can be diminished and diagnostic images can be produced.

The musculoskeletal radiologist can alter the technical imaging parameters in the setting of orthopedic implants, producing diagnostic images for the evaluation of the regional osseous and soft tissue structures [1, 2]. Recent software innovations allow the viewing of images in an essentially infinite number of imaging planes, further improving diagnostic quality and yield.

Fig. 1. Anteroposterior view of the pelvis clearly demonstrates the dislodgement and dislocation of the acetabular component; however, the presence of a periprosthetic fracture is uncertain

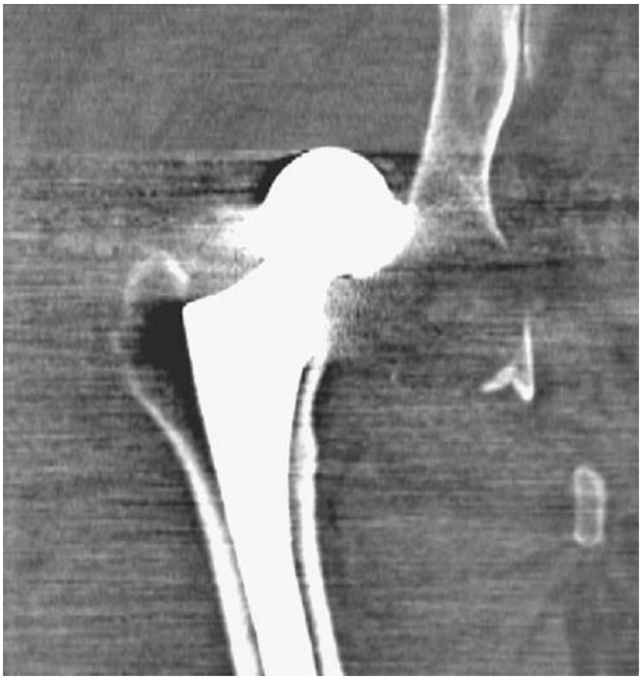

Fig. 2. Coronal reformatted CT image demonstrates the dislocated prosthesis. Viewing CT images in multiple orthogonal planes helps to diminish the regional metallic artifacts and improves diagnostic quality

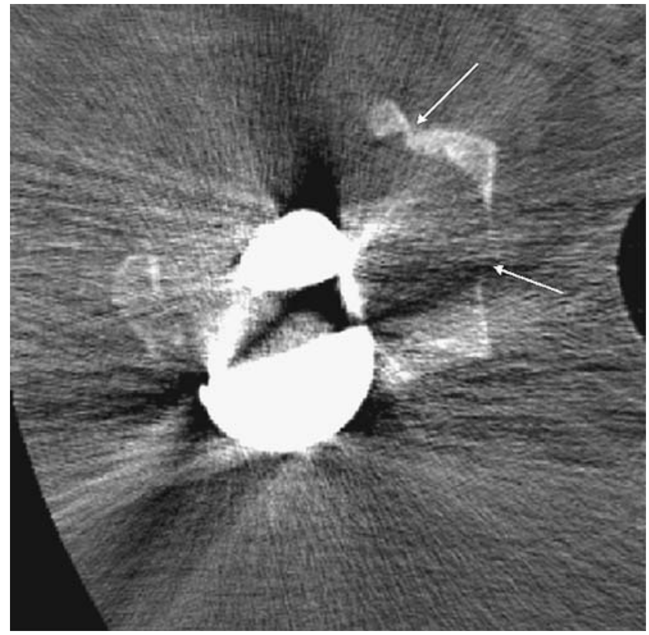

Fig. 4. Axial CT scan demonstrates the dislocated prosthesis in addition to fractures through the quadrilateral plate and anterior wall (*arrows*)

A prime advantage of CT over radiographic evaluation is its tomographic nature. The ability to visualize structures about a prosthesis in multiple orthogonal planes provides a more sensitive method than radiographs for evaluating prosthesis alignment and bone quality, diagnosing osteolysis and periprosthetic fractures with greater sensitivity.

The two-dimensional nature of radiographs limits their ability to accurately determine component alignment, such as the true version of the acetabular component in a total hip arthroplasty. CT has been proven to be more reliable than radiographic analysis, as well as intraoperative estimation of component alignment, providing a direct three-dimensional evaluation of cup version in total hip arthroplasty [3–6].

CT can be used in both the preoperative and the postoperative evaluation of bone stock. Preoperatively, the tomographic nature of CT allows for a thorough morpho-

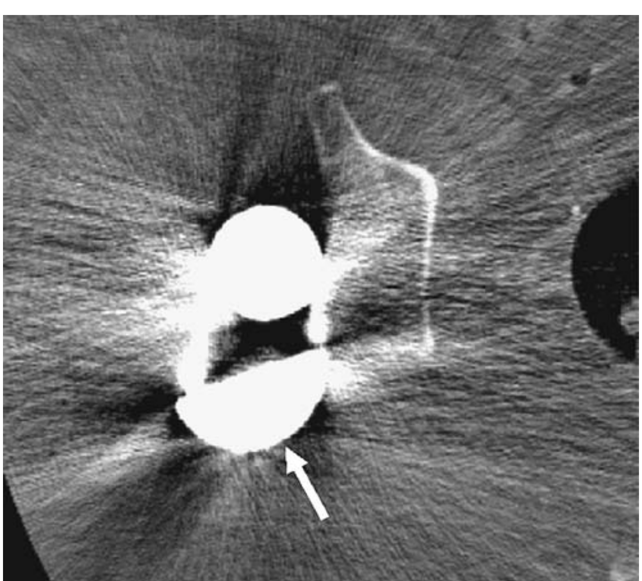

Fig. 3. Axial CT image viewed with soft tissue windows demonstrates the dissociated acetabular component, displaced posteriorly (*arrow*)

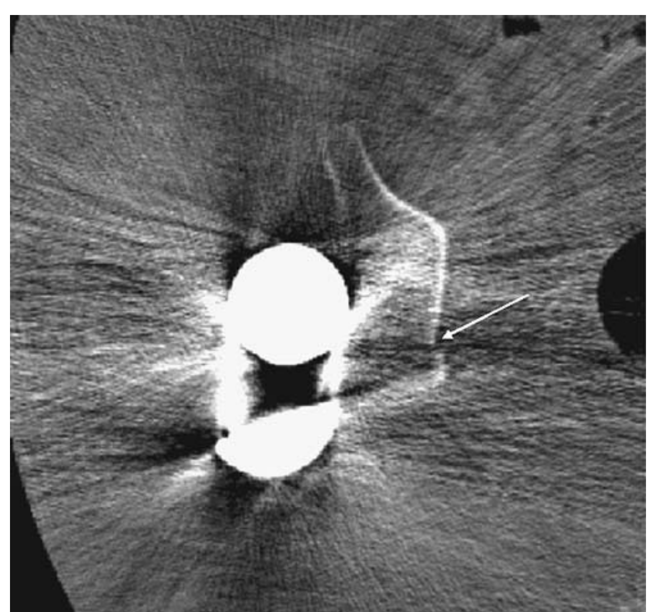

Fig. 5. Axial CT image demonstrates an additional fracture through the posterior wall (*arrow*)

Fig. 6. Anteroposterior (*AP*) radiograph of the pelvis after revision arthroplasty placement

logical analysis of regional bone quality, being of use, for example, in preoperative planning where there may be significant bone loss in the acetabulum or glenoid [7]. The ability of CT to evaluate bone density changes around arthroplasty components allows for the evaluation of stress shielding [8, 9]. CT has further been shown to be of use in the evaluation of bone stock after the placement of various bone substitutes, such as beta-tricalcium phosphate granules and calcium phosphate cement in the setting of revision arthroplasty [10]. Lastly, CT is more sensitive in the detection of osteolysis, as well as other signs of prosthesis failure such as liner wear and metallosis, as opposed to standard radiographs [1, 11].

In conclusion, properly modified CT scans, adjusted for the presence of metal, can produce diagnostic quality images that can diagnose periprosthetic fractures, bone loss, and component complications with greater sensitivity than radiographs.

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