Osteolysis with Total Hip Prosthesis

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History

A 22-year-old female patient, suffering from bilateral developmental hip dysplasia, underwent bilateral total hip arthroplasty at the age of 15. Seven years later, she was referred to an orthopedic consultation due to prolonged hip pain on the right side. Physical examination revealed a right hip "click" and a CT examination was ordered to evaluate the hip arthroplasty.

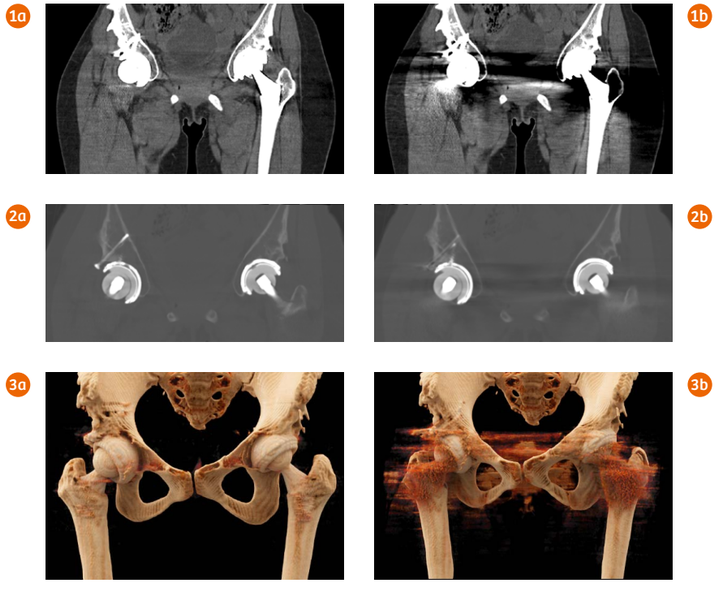
Diagnosis

CT images depicted the prosthetic components to be correctly positioned without signs of fracture or dislocation. Nevertheless, low-attenuation areas between the uncemented acetabular cup and the bone suggested osteolysis and loosening.

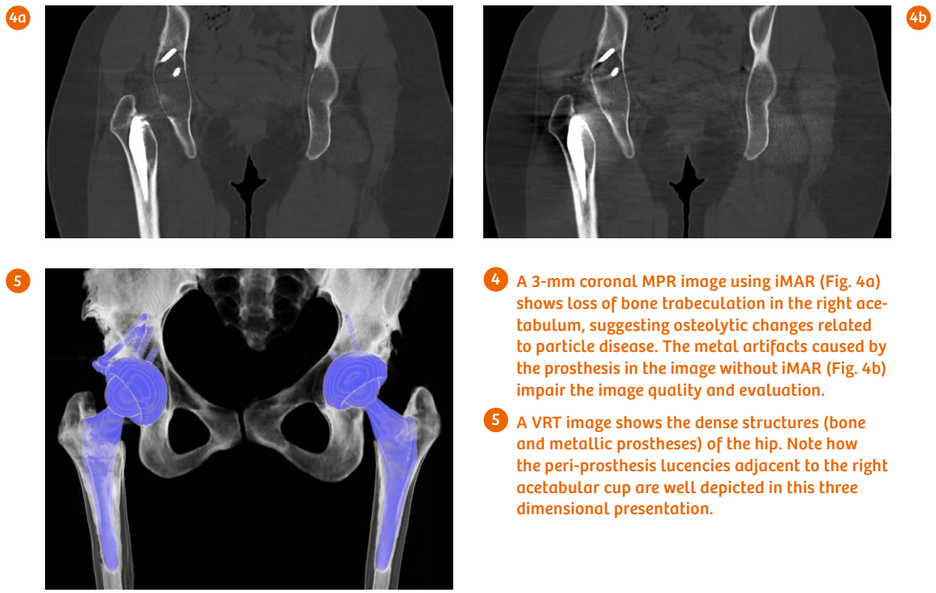
Given the image findings and taking into consideration patient complaints, an arthroplasty revision was performed. This confirmed prosthesis failure with loosening and a small loculation of fluid. An anatomo-pathological evaluation of submitted peri-prothesic tissue revealed metallosis and foreign body reaction thus histologically confirming particle disease.

Comments

Total hip arthroplasty is a surgical replacement of the hip joint with an artificial prosthesis. Although radiography is the initial imaging modality of choice for evaluating symptomatic hip implants for potential complications, CT is an excellent supplementary imaging tool for assessing the implant hardware, component fixation, the host bone and soft tissue. This especially applies when the CT system is optimized to reduce metal artifacts. The iterative metal artifact reduction (iMAR) is designed to yield images with a reduced level of metal artifacts compared to conventional reconstruction, when the underlying CT data is distorted by metal being present in the scanned object. The amount of metal artifact reduction and corresponding improvement in image quality depends on a number of factors including composition and size of the metal object, patient size, anatomical location and clinical practice. In this case, severe metal artifacts caused by bilateral prostheses are significantly reduced by the use of iMAR, thus allowing the physicians to make an effective evaluation and a confident decision regarding an arthroplasty revision. ●



1 – 3 Coronal MPR (Fig. 1, soft window setting and Fig. 2, extended bone window setting) and cinematic VRT (Fig. 3) images show that the components of both prostheses are correctly positioned, with no signs of fracture or displacement. Severe metal artifacts caused by bilateral prostheses (B) are significantly reduced when using iMAR (A).



4 A 3-mm coronal MPR image using iMAR (Fig. 4a) shows loss of bone trabeculation in the right acetabulum, suggesting osteolytic changes related to particle disease. The metal artifacts caused by the prosthesis in the image without iMAR (Fig. 4b) impair the image quality and evaluation.

5 A VRT image shows the dense structures (bone and metallic prostheses) of the hip. Note how the peri-prosthesis lucencies adjacent to the right acetabular cup are well depicted in this three dimensional presentation.

Examination Protocol

Scanner	SOMATOM go.Up		
Scan area	Pelvis	**DLP**	146 mGy cm
Scan mode	Spiral	**Effective dose**	2.2 mSv
Scan length	22.8 mm	**Rotation time**	1.25 s
Scan direction	Cranio-caudal	**Pitch**	1
Scan time	12 s	**Slice collimation**	32 × 0.7 mm
Tube voltage	130 kV	**Slice width**	3 mm
Effective mAs	51 mAs	**Reconstruction increment**	3 mm
Dose modulation	CARE Dose4D™	**Reconstruction kernel**	Br44
CTDIvol	5.57 mGy		

The outcomes by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.