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Case Report

Pelvic Roll Back Can Trigger Functional Psoas Impingement in Total Hip Arthroplasty

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ABSTRACT

In most cases, impingement of the iliopsoas tendon after total hip arthroplasty is caused by acetabular component retroversion. The present case report describes a patient with functional iliopsoas impingement following total hip arthroplasty. With increasing flexibility of the hip joint after surgery, the functional adjustment to the stiff thoracolumbar spine in this patient with diffuse idiopathic skeletal hyperostosis resulted in progressive pelvic roll back. This roll back resulted in a functional iliopsoas impingement as the psoas tendon travels over the front of the pecten ossis pubis. Since excessive roll back is usually also addressed in primary total hip arthroplasty by decreasing anteversion of the acetabular component, surgeons should be aware to avoid the combination of roll back and decreased anteversion and their potential impact on iliopsoas impingement.

Introduction

Total hip arthroplasty (THA) is one of the most successful surgeries of the century [1,2] with reported patient satisfaction rates of over 90% [1,2]. Complications of THA are rare but can be challenging for the patient and the treating physician [3]. Persistent pain after THA can have a variety of causes and can also be related to spine disorders, vascular diseases, or intra-abdominal causes [3,4].

In addition, iliopsoas impingement can be a possible cause of groin pain [5,6]. The incidence of iliopsoas impingement after THA is reported in the literature to be between 0.4% and 8.3% [7-10]. It can be caused by protruding screws or cement, excessively increased offset, acetabular retroversion resulting in overhang of the anterior aspect of the acetabular component or on the femoral side: leg lengthening, an overhanging femoral collar, or large diameter femoral heads [5,9-16].

Clinically, patients present predominantly with groin pain, when lifting up the leg or when climbing stairs and getting up from a sitting position, whereas normal walking is usually possible without pain [17]. A snapping phenomenon can occur [18]. The onset of symptoms after THA can vary from immediately after surgery to up to 96 months after surgery [5,17]. The patient presents with pain in the groin and pain with straight leg raise or hip flexion in a sitting position against resistance [19,20]. The clinical examination may also reveal pain during passive hyperextension and active external rotation [8].

Imaging to diagnose iliopsoas impingement includes native radiographs (anteroposterior and cross-table views) as well as computed tomography with artifact suppression to accurately assess the positioning of the acetabular component [21,22] and identify any anterior cup overhang [23-25]. In addition, a magnetic resonance imaging, especially Metal Artifact Reduction Sequences-magnetic resonance imaging, can be utilized to assess the iliopsoas tendon [18,26,27]. Ruling out periprosthetic joint infection is always an essential part of the initial workup of a painful THA. A routine screening is usually blood work including a C-reactive protein level [4].

Another important diagnostic step is an image-guided injection of a local anesthetic into the iliopsoas tendon sheath [9,21,28,29]. Conservative treatment is the gold standard for psoas impingement and includes anti-inflammatory medications, physical therapy, and repeat local injections [5,18,29,30].

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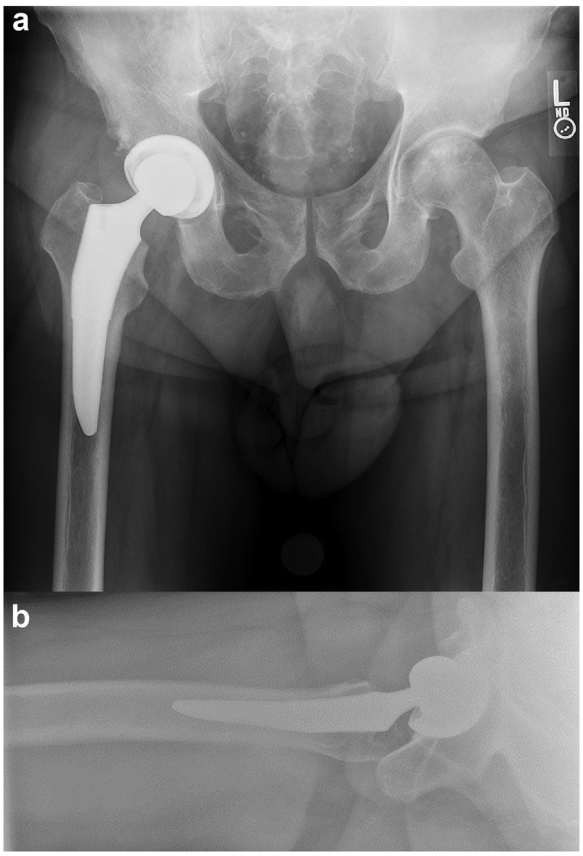

Figure 1. Postoperative radiographs 4 weeks after surgery: anteroposterior (AP) view (a) and cross-table view (b) show a well-positioned THA with restoration of leg lengths (LLD = 5 mm) and adequate Anteversion on cross table lateral view of 39 degrees.

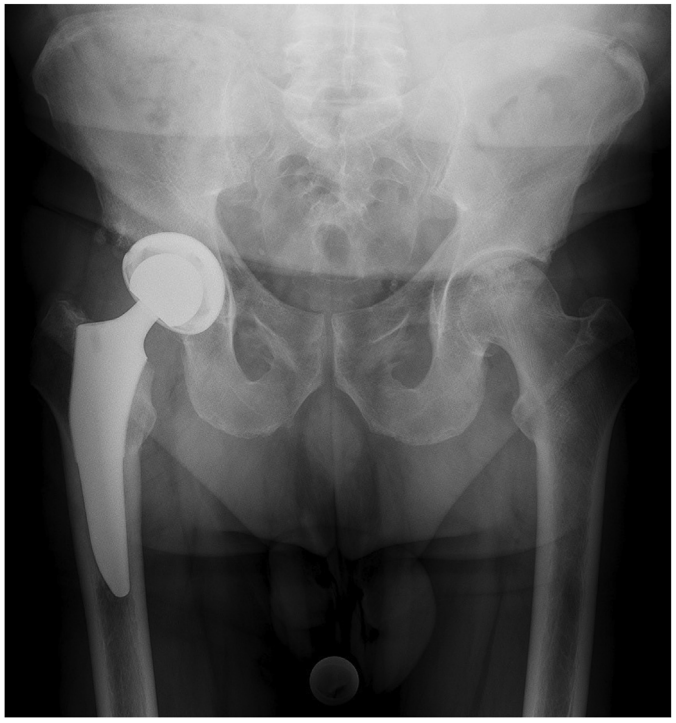

Figure 2. AP Pelvis 1 year after surgery. AP, anterior-posterior.

Surgical treatment may be considered for patients in whom conservative therapy does not lead to an improvement in symptoms [18,31,32]. Various surgical procedures have been reported and include: Acetabular component revision and open or arthroscopic debridement or tenotomy of the iliopsoas tendon [5,25,33-36]. In their treatment algorithm, Chalmers et al. [6] recommend that surgical treatment should be based on the extent of anterior acetabular prominence. Overall, in most cases, impingement of the iliopsoas can be attributed to acetabular retroversion as well as lateralization or oversizing of the acetabular component [8,24,37].

In this case report we describe a rare cause of functional iliopsoas impingement after THA, which is not caused by a malpositioned acetabular component. The patient provided informed written consent for data concerning his case to be submitted for publication.

Figure 3. EOS x-ray in a standing position, more than 1 year after THA.

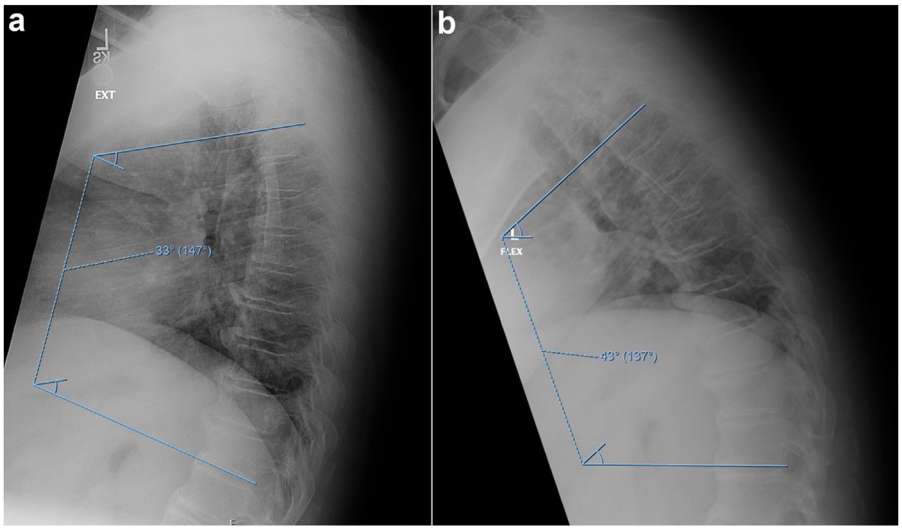

Figure 4. Functional radiographs of the thoracic spine in extension (a) and flexion (b) more than 1 year after THA: Thoracic kyphosis increased from 33 degrees to 43 degrees from extension to flexion.

Case history

The current case report describes a 64-year-old man (body mass index 33.2 kg/m^2, 96.2 kg, 170.2cm) status post cardiac catheterization (anticoagulation with clopidogrel and aspirin) with a history of ulcerative colitis (chronic ulcerative colitis, in clinical remission, currently treated with mesalamine) and diffuse idiopathic skeletal hyperostosis (DISH). He continued to participate in sports (tennis, cycling and swimming) and underwent a posterior-approach THA for moderate to advanced osteoarthritis of the right hip (size #54 press fit no-hole shell (R3, Smith&Nephew, Memphis, TN), size 8 cementless short bone preserving femoral component (Tri-Lock, DePuy, Warsaw, IN)). The procedure and the immediate postoperative course were without complications.

The immediate follow-ups after surgery (after 3 and 8 weeks) showed adequate progress with minimal pain in the right hip joint. He presented with 110 degrees of hip flexion and did not display a flexion contracture. External rotation of the right hip joint was possible up to 45 degrees and he was ultimately able to reach his shoes and socks. The radiographic images are shown in Figure 1.

At the 1-year follow-up, he started to report a more pronounced right groin pain that had been present for 3 to 4 weeks. There was no triggering pain event or trauma. Pain was most pronounced when lifting the leg and flexing the hip. During the clinical examination, the groin pain was provoked with straight leg raise and hip flexion against resistance. Anterior-posterior pelvis imaging showed a well-positioned components without signs of loosening or evidence of a periprosthetic fracture (Fig. 2). There was no clinical or laboratory evidence of periprosthetic infection. Anti-inflammatory medication (Diclofenac) was prescribed for symptomatic relief of groin pain and flexor muscle stretches were added as home exercise program.

One month later, he presented again for a follow-up examination. The anti-inflammatory medication did not resolve the symptoms.

Due to the persistence of the symptoms, imaging was expanded to include the spine. There were signs of a fusion of the thoracic segments with syndesmophytes in the setting of a DISH on the imaged sections of the thoracic spine. Clinically he presented with a reduced expansion of the thoracic spine when bending forward from 10 cm to only 10.5 cm (normal 17 cm). The thoracic spine image showed the typical findings of DISH [38]: Bridging hyperostosis over at least 4 contiguous vertebral bodies without significant changes in the intervertebral disc height and absence of ankylosis of the facet- and sacroiliac joints. In addition, he was given an EOS (EOS Imaging, Paris, France) radiograph in a standing position to assess his overall posture (Fig. 3). In addition, functional radiographs of the thoracic spine in extension and flexion were ordered to assess the overall flexibility of the thoracic spine. The thoracic kyphosis increased only 10 degrees from 33 degrees to 43 degrees during forward flexion (Fig. 4). Normal values in the literature are 30 degrees [39].

To finally evaluate the exact position and rule out the possibility of anterior overhang of the acetabular component, a computed tomography scan of the pelvis was performed (Fig. 5): This revealed a regular implant position without evidence of component loosening, acute periprosthetic fracture or osteolysis. There was no evidence of anterior overhang of the right acetabular component. With this suspected diagnosis, he received an infiltration of the right iliopsoas tendon (1 mL of 1% lidocaine, a total of 2 mL of Depo-Medrol 40 mg/mL (80 mg total)). He reported pain relief with the injection, however, the pain relief lasted only for a few days. He was

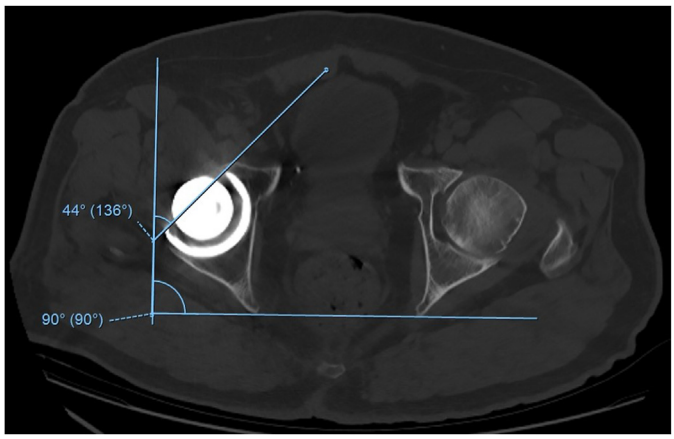

Figure 5. Computed tomography (CT) of the pelvis more than 1 year after THA: Anteversion of the acetabular component is 44 degrees.

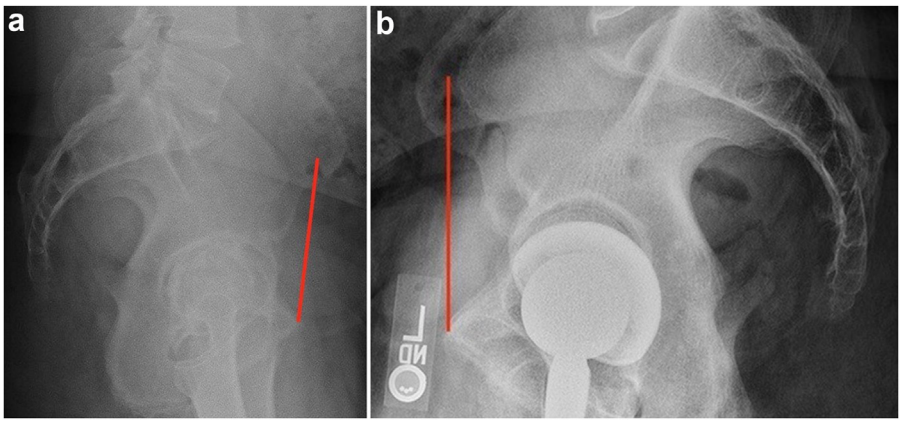

Figure 6. Lateral pelvic radiograph showing pelvic inclination prior to surgery (a) and 1 year after THA (b) (measured angle created between line on symphysis and anterior superior iliac spine [ASIS] vs vertical line): Pelvic inclination changed from 7 degrees anterior tilt to 2 degrees posterior tilt from preoperative to 1 year postoperative.

instructed to continue lumbar and thoracic spine mobilization exercises. His symptoms have improved but are not resolved completely.

Discussion

The current case report describes a patient with DISH of the thoracic spine. DISH is a systemic disease characterized by ossification and calcification of ligaments and joints [40]. The thoracic spine is affected in 76% of cases [41]. Typically, DISH begins at the lower thoracic segments and then spreads to the upper thoracic spine and lumbar spine [38].

Clinically, DISH initially manifests itself as stiffness of the spine or limited mobility of the affected region [42-44]. Restricted mobility of the thoracic spine is one of the most frequently reported symptoms [44]. Furthermore Dysphagia, unstable vertebral fractures, postoperative heterotopic ossifications, difficulties during intubation, aspiration pneumonia, myelopathy, airway obstruction and reduced lung capacity can occur as complications [45-48]. The most common definition of DISH, as described above, includes 3 native radiologic diagnostic criteria: Bridging hyperostosis over at least 4 contiguous vertebral bodies without significant changes in the intervertebral disc height and absence of ankylosis of the facet and sacroiliac joints [38].

The values for the prevalence of the disease in the literature show a very wide range between 2.9% and 42.0%, depending on the population and demographics [49-51]. DISH is often seen in older men [49,52] and is associated with obesity, diabetes mellitus and cardiovascular events [53-55]. DISH can affect the posture of affected patients [56]. These postural abnormalities may resemble those of long-standing ankylosing spondylitis [56]. DISH can thus also influence the sagittal spinal alignment [42,57,58]. Studies primarily describe an increase in thoracic kyphosis [42,57,58]. Especially when DISH is limited to the thoracic spine, it is associated with increased thoracic kyphosis [58]. Increased kyphosis is associated with a loss of spinal mobility and can impair upright spinal posture [59-63].

The increase in thoracic kyphosis in patients with DISH is explained in the literature by the characteristic ossification of the anterior longitudinal ligament [58,64]. This ossification can influence the position and curvature of the spine [58]. In DISH, the anterior longitudinal ligament is fused with the anterior parts of the vertebral bodies [58]. The result of this ossification and fusion with the vertebral bodies is a very limited mobility of the thoracic spine without the ability to straighten the spine [58].

The current case report describes a patient with DISH with an extremely stiff thoracic spine as described previously. It has been described that patients with increased thoracic kyphosis make adjustments to their posture in order to maintain a stable center of gravity and a horizontal eye view projection [65-69]. These postural adjustments are aimed at counteracting the ventral shift of the body mass [67,69]. One of these adjustments is rolling the pelvis backwards [67,69]. Normally the pelvic tilt does not change after

Figure 7. Angle of action of the iliopsoas depending on the position of the pelvis.

THA [70]. In our patient, due to the constellation described above with the existing, increased thoracic kyphosis in DISH and the associated reactive pelvic roll back to achieve a horizontal eye view, the pelvic tilt due to the increased flexibility of the hip after THA has changed from 7° anterior tilt preoperatively to 2° posterior roll back postoperatively (Fig. 6). The rollback of the pelvis changes the angle of action of the iliopsoas (Fig. 7) and leads to a functional psoas impingement as the tendon travels over the front of the acetabular component even if the acetabulum has a completely normal anteversion, as the computed tomography scan of the pelvis in this patient confirms.

Summary

In summary, the patient presents with a functional iliopsoas impingement that is not caused by acetabular component overhang but rather by functional iliopsoas secondary to progressive pelvic roll back as a result of functional adjustment secondary to a stiff thoracic spine and DISH. In an attempt to keep his plane of view the improved range of motion after THA accommodates pelvic roll-back. This pelvic roll back contributes to impingement of the psoas tendon as it travels over the front of the pecten ossis pubis and over the front of the acetabular component (Fig. 7). The current case illustrates that acetabular roll back can be a source of functional iliopsoas impingement in THA. Since excessive roll back is usually also addressed in primary THA by reducing anteversion of the acetabular component surgeons should be aware to avoid the combination of increasing postoperative roll back and decreased anteversion and their potential impact on iliopsoas impingement.

Acknowledgments

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Conflicts of interest

The authors declare there are no conflicts of interest.

For full disclosure statements refer to https://doi.org/10.1016/j.artd.2024.101375.

Informed patient consent

The author(s) confirm that written informed consent has been obtained from the involved patient(s) or if appropriate from the parent, guardian, power of attorney of the involved patient(s); and, they have given approval for this information to be published in this case report (series).

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