



Surgical technique

Reconstruction of the Anterior Acetabular Wall to Repair Symptomatic Defects Consecutive to Cup Malpositioning at Total Hip Arthroplasty

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ABSTRACT

Iliopsoas impingement (IPI) causes persistent groin pain and functional impairment after total hip arthroplasty (THA). It is caused most often by an overhang of the cup. Psoas tenotomy may successfully treat IPI in overhangs <8 mm. Cup revision usually is recommended for larger overhangs. Muscle sparing reconstruction of the anterior acetabular wall may be an alternative when malposition of the cup at THA caused a bony defect that would persist after simple cup revision. The surgical technique and results from one patient are presented. The patient rapidly became asymptomatic and remained pain free at 2-year follow-up. Any bone substance defect of the acetabulum should be considered when evaluating treatment options for IPI after THA.

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Introduction

Iliopsoas impingement (IPI) might cause persistent groin pain and functional impairment in up to 4.4% of patients after total hip arthroplasty (THA) [1–3]. Mechanical irritation of the iliopsoas tendon or muscle might have various causes, such as protruding screws, cement extrusion, malposition of the cup, as well as hypoplasia of the anterior wall of the acetabulum [1–4]. Nonoperative treatment might reduce pain and improve function in up to 50% of patients [2]. If operative treatment is required, small overhangs (<8 mm) can be treated successfully with a psoas tenotomy alone, whereas for larger overhangs, cup revision is recommended [1,2]. However, THA revision is associated with relevant morbidity and mortality [5,6]. As shown in the presented case, cup revision may fail to resolve symptoms, when IPI is caused by a lack of implant coverage by bone due to a defect of the anterior acetabular wall. We present an alternative technique, less invasive than revision of the implant, to address a large defect of the anterior acetabular wall due to overreaming at placement of the cup at THA. The same

technique may be applicable for defects caused by revision of the cup.

Surgical technique

A 67-year-old male patient was referred to our department because of persistent IPI 6 years after primary uncemented THA performed through an anterolateral approach with a threaded cup (Hofer-Imhof-Cup; Smith & Nephew, London, United Kingdom) and an anatomically shaped stem (SBG stem; Smith & Nephew) (Fig. 1). Psoas tenotomy had been performed arthroscopically already 3 years postoperatively because of IPI. He continued suffering from inguinal pain walking. Pain was worst with combined active flexion and abduction, like when getting into a car. Passive combined flexion and internal rotation provoked pain. An MRI showed inflammation of the bursa iliopectinea. Loosening of the implants was ruled out with a single-photon-emission-computer-tomography combined with a computer tomography. The opening of the threaded cup was well oriented, with an inclination of 46° and an anteversion measured on the CT scan in the plane of the inclination of 16° [7]. However, anterior overreaming of the acetabulum at placement of the cup caused a 20 × 25-mm defect of the anterior acetabular wall, with up to 3 turns of the thread protruding into the iliopsoas muscle (Fig. 2). Joint fluid aspiration showed no signs for

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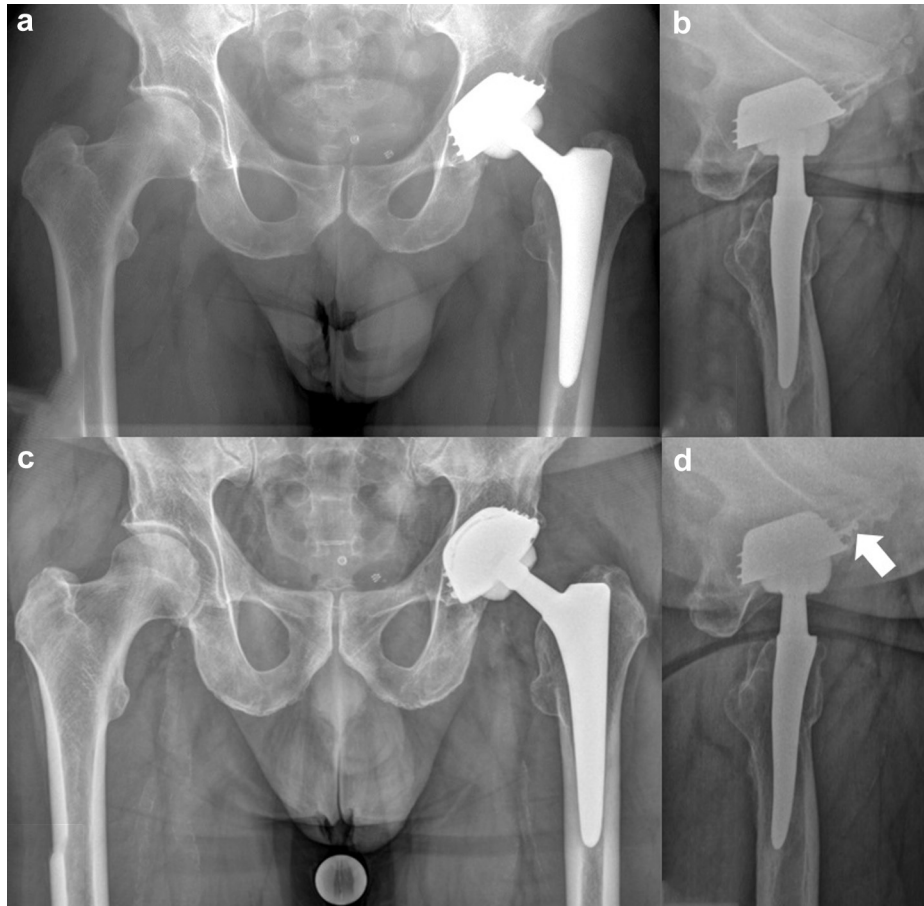


Figure 1. Preoperative and postoperative radiographs. Anteroposterior radiographs of the pelvis (a and c) and axial views of the left hip (b and d), with the preoperative images in the upper (a and b) and the images after anterior wall reconstruction in the lower (c and d) row. Both the cup and the stem show no signs of loosening. Inclination and anteversion of the cup are within desirable ranges. Reconstruction of leg length and offset are symmetric. On the postoperative images, the screws used for fixation of the bone graft are visible only on the axial view (d, white arrow).

periprosthetic joint infection as the cause of the persistent pain. The clinical suspicion of IPI was confirmed by temporary pain suppression after CT-guided corticosteroid infiltration of the bursa iliopsoas anteriorly to the acetabulum.

Conservative treatment already had been attempted during the last years, without success. Considering the size of the protrusion of the cup, repeat infiltration would not be a successful option [1,2].

Cup revision as well as reconstruction of the anterior acetabular wall were discussed with the patient. As there was no loosening of the implants on the conventional radiographies as well as on single-photon-emission-computer-tomography combined with a computer tomography, and as the cup was correctly oriented regarding inclination and version, only reconstruction of the bone defect was planned. Revision of the cup would have caused a

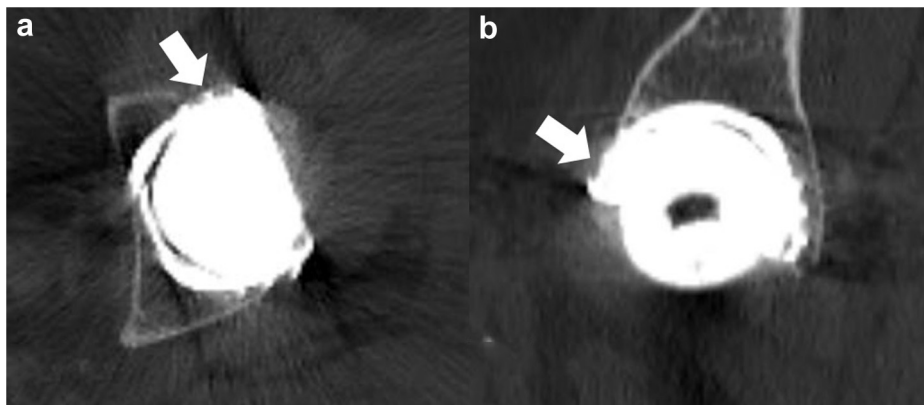


Figure 2. Preoperative computed tomography images. Preoperative axial (a) and sagittal (b) computed tomography images of the left hip, displaying the threaded cup and head of a THA. On both images, a bone substance defect of the anterior acetabular wall with protrusion of up to 3 turns of the threaded cup (white arrows) is clearly visible.

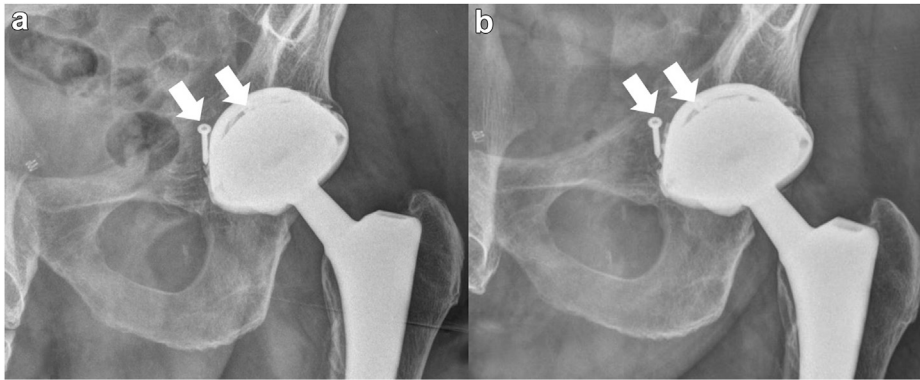


Figure 3. Postoperative radiographs. Obturator view radiographs of the left hip 1 month (a) and 1 year (b) after reconstruction of the anterior acetabular wall with an ipsilateral iliac crest autograft. The graft was fixated with 2 2.7-mm cortical screws (white arrows).

supplementary bone defect with potential persistence of IPI despite correct positioning of the implant. Reconstruction of the anterior acetabular wall was achieved by using an ipsilateral iliac crest autograft (Figs. 1 and 3-5). The operation was performed through the cranial part of the Smith-Petersen approach, with osteotomy of the anterior superior iliac spine, using a bikini incision [8] extended laterally to access the iliac crest. Intraoperative assessment of the cup confirmed absence of loosening and, as far as accessible through the chosen approach and limited capsulotomy, correct orientation regarding inclination and version, in accordance with the preoperative radiological findings. The graft was fixated with 2 2.7-mm cortical screws.

After the operation, pain resolved rapidly, encouraging the patient not to respect the prescribed postoperative limitations, namely no active flexion of the affected hip and no active lifting of the extended leg. Nevertheless, the reconstruction healed well. Up to the latest follow-up now 2 years postoperatively, the patient remained asymptomatic. Obtained radiographs showed no signs of loosening of the intact screws. Additional imaging studies to judge integration of the bone graft, such as a CT scan, have not been conducted. The patient now regularly performs sports, particularly hiking and fitness training. Despite repeated active flexion as required by these activities, the patient complains of neither pain nor any reduction of strength.

Discussion

IPI is a recognized complication after THA that affects up to 4.4% of patients [1,2]. It is mostly due to an anterior overhang of the cup [1-4]. In the herein presented case, IPI persisted after psoas tenotomy because of extensive protrusion of a threaded cup (Figs. 2 and 4a) [3]. Overreaming when the cup was placed, respectively anterior malpositioned, caused a large defect of the anterior acetabular wall. Previous studies concluded that larger overhangs of the cup require cup revision and may not be treated successfully with psoas tenotomy alone [1,2]. Pain relief is reported in 76% to 85% of cases after cup revision [1,2,9]. However, it was not reported if relevant bone substance defects were present or not [1,2,9]. Another treatment option is thickening of the articular hip capsule with a polyglactin mesh, but this was described for cup overhangs, and not for acetabular wall defects with protruding implants [10]. Considering the size of the bone defect, we do not think that thickening of the capsule alone would have solved the issue at hand successfully.

In our case, owing to the remaining bone defect, the iliopsoas muscle would have remained exposed to the edges of the new cup despite revision. Symptomatic IPI thus might not have resolved. Therefore, in our opinion, reconstruction of any defect of the anterior acetabular wall should be considered when surgery is evaluated for symptomatic IPI after THA.

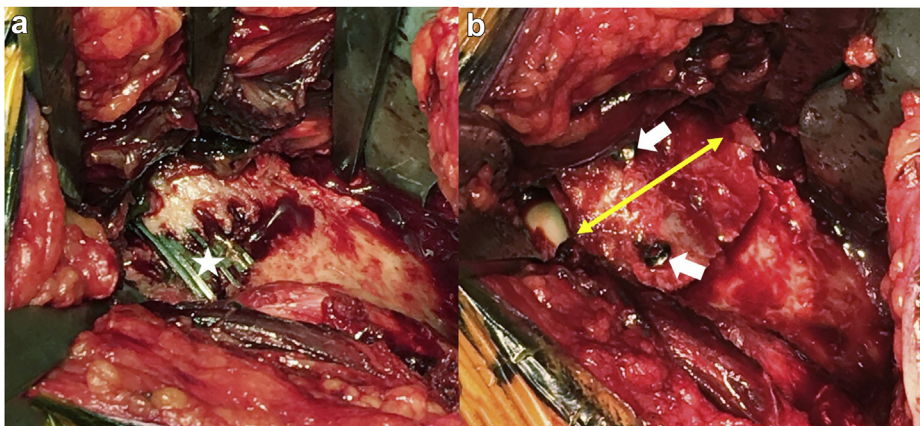


Figure 4. Pictures of the intraoperative situs displaying exposure of the left hip through the cranial part of a Smith-Petersen approach with osteotomy of the anterior superior iliac spine. (a) A 20 × 25-mm bony defect of the anterior acetabular wall with protrusion of the threaded cup (white star) is clearly visible. (b) The bony defect is covered with an autologous bone graft (yellow arrow showing the width of the graft) harvested from the internal cortex of the ipsilateral iliac crest and fixated with 2 diverging 2.7-mm cortical screws (white arrows).

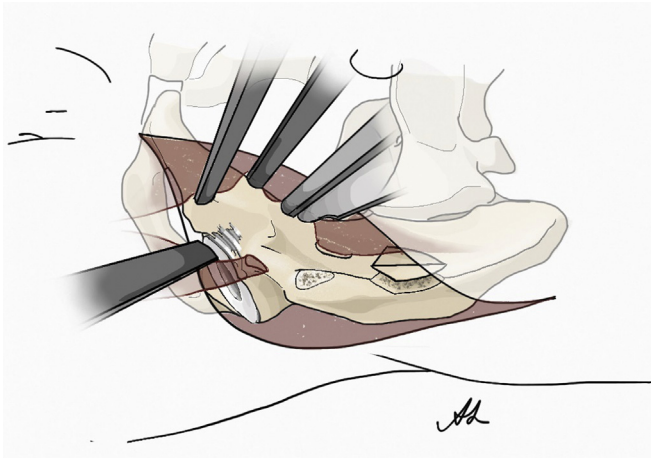


Figure 5. Schematic drawing of the intraoperative situs. The left inguinal region is displayed. A bikini incision is extended laterally, to access the iliac crest. Hohmann retractors are placed to expose the anterior acetabular wall. The most anteromedial retractor is hammered into the upper pubic branch, whereas the other medial retractors are placed medially to the pelvic brim. The anterior superior iliac spine is osteotomized to retract the inguinal ligament medially and to protect the lateral cutaneous femoral nerve. Note the bony defect of the anterior wall of the acetabulum with the protrusion of the cup after THA. The bone graft to cover this defect is harvested from the inner cortex of the ipsilateral iliac crest.

The defect of the anterior acetabular wall may be accessed through the cranial part of the Smith-Petersen approach with a bikini incision [8], the same approach as used for periacetabular osteotomy. Extending the approach somewhat laterally exposes the iliac crest for harvesting of the bone graft (Fig. 5). The incision combines functionality with an incision along Langer's lines of tension, known for better healing [8,11]. Osteotomy of the anterior superior iliac spine is recommended for better exposure and to protect the lateral cutaneous nerve of the thigh [12]. Nevertheless, this approach is muscle sparing, exploiting internervous and intermuscular planes. It may safely be performed even in obese patients [13]. Tenotomy of the rectus femoris is not required, as only the anterior column of the acetabulum has to be accessed. The bone graft can be harvested from the internal cortex of the iliac crest (Fig. 5). The shape of such a monocortical graft fits well to the anterior acetabulum, and the contour of the iliac crest is preserved. The same approach would also allow harvesting a vascularized bone graft from the iliac crest, if needed [14]. Screw placement for fixation of the bone graft may be somewhat difficult, as the cup forces divergent orientation of the screws (Figs. 3 and 4), and the soft tissues may hamper the respective orientation of the drill bit and screw driver, particularly at the medial aspect because retraction of the iliopsoas muscle is limited (Figs. 4 and 5). As the reconstruction causes an increase in volume of the anterior acetabular wall, increased tension of the iliopsoas muscle may also provoke IPI. In our case, no psoas tenotomy had to be performed despite the additional volume caused by the graft, as it already had been performed earlier. Additional psoas tenotomy should be considered after reconstruction of the anterior acetabular wall because of the added volume of the graft and may be accomplished

without any necessary extension of the applied approach as described previously (Fig. 5).

The proposed technique needs to be evaluated in further studies for a reliable assessment of its potential advantages and limitations. The described approach may minimize morbidity of anterior wall reconstruction of the acetabulum, compared with cup revision or exposures through the classic Smith-Petersen approach.

Summary

We recommend taking into consideration any bone substance defect when evaluating IPI after THA. Muscle sparing reconstruction for symptomatic bony defect of the anterior acetabular wall can be performed through the cranial part of the Smith-Petersen approach through a laterally extended bikini incision.

Conflicts of Interest

The authors declare there are no conflicts of interest.

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