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Original article

## Medial acetabular wall breach in total hip arthroplasty – is full-weight-bearing possible?

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### ABSTRACT

**Background:** A breach of the medial acetabular wall is a phenomenon seen frequently due to over-reaming during total hip arthroplasty (THA). The consequences of this issue are not fully understood particularly in cementless THA. A retrospective study was performed to answer whether: immediate postoperative full-weight-bearing in the presence of a medial acetabular wall breach after THA results in more short-term revisions of the acetabular component, and increases the risk for migration of the acetabular component?

**Hypothesis:** Immediate full-weight-bearing in the presence of a medial breach is not associated with an increased likelihood for acetabular-related revision surgery or migration of the cup.

**Patients and methods:** In this retrospective cohort study, consecutive patients ( $n = 95$ ; mean age  $68 \pm 13$  years; 67 female) who underwent THA with an uncemented acetabular component were identified and a retrospective chart review was performed (follow-up  $23 \pm 17$  months, range 6 to 79 months). The presence of a postoperative radiographic medial acetabular breach was documented and the need for revision surgery and the rate of acetabular component migration were assessed during follow-up.

**Results:** Some extent of radiographic medial acetabular wall breach was seen in 26/95 patients (27%). With regard to the primary outcome, 2/95 patients (2%) required revision surgery during follow-up. All revision surgeries occurred in the group without a medial breach ( $p = 0.280$ ) for causes related to the femoral or the head components. Persistent pain was present in 1/26 patients (3.8%) in the medial breach group and 8/69 patients in the control group (11.6%;  $p = 0.436$ ). In the radiographic follow-up ( $n = 81$ ), there was no significant difference between the control group and the medial breach group with regard to cup migration ( $\Delta$  ilio-ischial overlap [distance between the ilio-ischial line and a parallel line tangential to the acetabular cup on AP views]:  $-0.5 \pm 0.9$  mm [range,  $-2.9$  to  $0.8$ ] vs.  $-0.3 \pm 1.7$  mm [range,  $-1.9$  to  $2.2$ ],  $\Delta$  overlap tangent [defined as the distance between the two crossings of ilio-ischial line and the acetabular component on AP views]:  $-2.2 \pm 6.1$  mm [range,  $-21.4$  to  $0.0$ ] vs.  $0.4 \pm 6.9$  mm [range,  $-6.2$  to  $17.6$ ]). Similarly, according to variation in the ilio-ischial overlap distance between postoperative and follow-up on pelvic AP views, 0/56 hips (0%) had cup migration  $\geq 5$  mm in the control group versus 1/25 (4%) in the medial breach cohort ( $p = 0.3$ ).

**Discussion:** In this retrospective observation of patients with immediate postoperative full-weight-bearing after THA, a radiographic breach of the medial acetabular wall was not associated with an increased risk for short-term revision surgery or radiographic migration at follow-up. According to the findings of this study and in the light of previous biomechanical studies, there is no clear evidence for post-operative partial weight-bearing in case of a medial breach as far as the surgeon feels that the acetabular component is stable.

**Level of Evidence:** IV, Retrospective cohort study.

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### 1. Introduction

Reaming of the acetabulum is one of the key steps in THA [1,2]. Over-reaming or reaming to medially can cause a bone defect in the medial wall of the acetabulum. It remains unclear, however, whether this determines a higher risk of implant dislocation or

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periprosthetic fractures [3–5]. Too medial positioning of the acetabular cup with a medial breach may lead to a secondary migration of the implant, implant impingement, pain and sometimes revision surgery because of a possible weakness of the construct due to excessive removal of medial acetabular wall.

Usually, patients can be allowed full-weight-bearing after THA [6,7], but recent biomechanical studies concluded that a medial wall breach of 2 cm is associated with 26% decrease in load to failure of acetabular components in human cadavers [8] and a lower load to failure in canine acetabula [9]. However, the authors concluded that this difference was not clinically relevant since the applied breaking forces exceeded the normal physiologic loads in the dog during the gait. Neither of these findings has been confirmed in vivo.

What remains unclear is the relevance of a medial defect and how it should influence our intra-operative and postoperative strategy, since the majority of the stability of the acetabular component is determined by contact with the acetabular rim [10]. There is little evidence regarding the best surgical solution in case of a medial wall breach during hip total arthroplasty. Salvati et al. [11] stressed the importance of an intact acetabular medial wall and, in case of a defect, suggested immediate support by intra-operative bone grafting. Other solutions are acetabular revision cages and acetabular line-to-line cups with screw fixation and many surgeons recommend postoperative partial weight-bearing. At the authors' institution, no intra-operative repair of the defect nor a change of the postoperative rehabilitation protocol with immediate full-weight-bearing is performed as long as the cup intra-operatively shows to be stable under direct manipulation. Particularly, it remains unclear whether protected weight-bearing is really needed in patients with a medial breach after THA. Therefore we performed a retrospective study to investigate whether immediate postoperative full-weight-bearing in the presence of a medial acetabular wall breach after THA increases the risks for complications related to the acetabular component. The questions to be answered by this study were:

Does immediate postoperative full-weight-bearing bearing in the presence of a medial acetabular wall breach after THA:

- result in more short-term revisions of the acetabular component?
- Increase the risk for migration of the acetabular component?

Our hypothesis was that there is no increased likelihood for acetabular-related revision or migration of the cup with immediate full-weight-bearing in the presence of a medial breach.

## 2. Materials and methods

### 2.1. Patients

This retrospective cohort study was carried out in accordance with the local institutional ethics committee's terms of reference (Kantonale Ethikkommission Zürich, Switzerland. KEK-ZH-Nr. 2014-0557). Consecutive patients aged more than 18 years who underwent THA at a University Trauma Center between 10/2008 and 04/2016 were identified by a search of the hospital's database and a retrospective chart review was performed ( $n = 287$ ). Patients with a cemented acetabular component ( $n = 101$ ), a preoperative *Coxa protrusio* ( $n = 5$ ) [12], or a follow-up of less than 6 months ( $n = 81$ ), and patients who underwent THA through an approach other than an anterior approach ( $n = 5$ ) were excluded (Fig. 1). Final analysis was performed in 95 patients (mean age  $68 \pm 13$  years, range 39 to 92 years; 67 female), baseline characteristics are provided in Table 1. The mean follow-up for all patients was 23 months  $\pm$  17 months (range, 6 to 79 months).

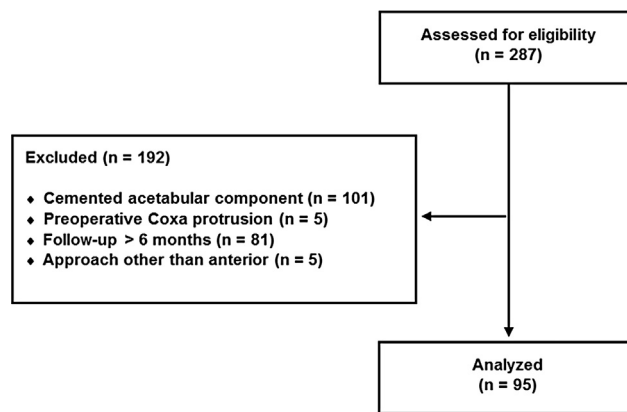


Fig. 1. Patient selection flowchart.

Table 1

Baseline characteristics.

	No breach	Medial breach	<i>p</i>
<i>n</i>	69	26	
Follow-up (months)	24 $\pm$ 18 (6 to 71)	21 $\pm$ 14 (6 to 65)	0.357 <sup>a</sup>
Age (years)	67 $\pm$ 13(39 to 86)	70 $\pm$ 13(42 to 92)	0.211 <sup>a</sup>
Gender (female)	42 (60.9%)	25 (96.2%)	0.001 <sup>b</sup>
<i>Coxa profunda</i>	23 (33.3%)	15 (57.7%)	0.031 <sup>b</sup>

<sup>a</sup> *t*-test.

<sup>b</sup> Chi<sup>2</sup> test. Data is presented as mean  $\pm$  standard deviation (range) or frequencies (percentage).

### 2.2. Methods

The indication for THA was a femoral neck fracture in 73/95 patients (76.8%, 69 primary and 4 after internal failed fixation), primary or secondary (after acetabular fractures) osteoarthritis of the hip in 19 patients, and idiopathic femoral head necrosis in three patients.

All patients received the same acetabular component (Versafit CC Trio, Medacta International SA, Switzerland) and were operated through a minimal-invasive anterior (modified Smith-Petersen) approach by one of three board-certified orthopaedic surgeons trained with this approach. The used acetabular component with an elliptical shape and 0.7 mm diameter circular retaining splines had a titanium and hydroxyapatite coating. Cup size was chosen 4 mm larger than the femoral head. The mean cup size in the medial breach group was  $51 \pm 3$  mm (range, 48 to 58 mm) and  $52 \pm 3$  mm (range, 48 to 60 mm) without medial breach. After impaction, cup anchorage was tested by pulling with a strong forceps. Reaming was performed under fluoroscopic imaging and it was tried to ream medially until touching Kohler's tear drop and cranially until bleeding from the subchondral bone was seen [2,13]. No screws were used for additional fixation of the acetabular cup. The femoral component (Quadra, Medacta International SA, Switzerland) was cemented in patients aged over 65 years (59/95 patients, 62.1%), otherwise cementless stems were used if sufficient bone stock was present [14]. Femoral head sizes of 28 mm and 32 mm were used. Postoperatively, all patients were allowed to immediately full-weight-bear but were given crutches for balance and gait stability.

### 2.3. Methods of assessment

The primary endpoint was the need for revision surgery of the acetabular component, excluding exchange of the polyethylene inlay. In addition, the presence of persisting pain at latest follow-up

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