<h1>Stable fixation and successful bone graft integration in uncemented acetabular revisions with large amounts of bone allograft.</h1>

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INTRODUCTION:
Acetabular revision surgery using large amounts of bone graft remains controversial because of concerns regarding bone graft integration and implant stability, especially in situations with severe bone defects. The primary aim of this study was to evaluate bone graft integration and implant migration in patients undergoing uncemented acetabular revision combined with bone grafting using large amounts of morselized bone.
METHODS:
Between April 2018 and May 2020, 15 patients underwent a bone grafting procedure of the acetabulum with large amounts of bone graft. Of these, 11 patients underwent acetabular revision surgery with bone graft, *revision group*, and four patients received bone graft to treat peri-implant osteolysis during liner exchange, o*steolysis group* (Table 1). Bone mineral density (BMD) and implant motion was assessed using dual-energy CT postoperatively and at 6, 12 and 24 months.
RESULTS:
On average 80.3 cm^3 (SD 52.6 cm^3) bone graft was used in the *revision group* and 55.6 cm^3 (SD 32.2 cm^3) in the *osteolysis group* (Table 1). In the revision group, the BMD in the graft increased from 331 mg/cm^3 postoperatively to 443 mg/cm^3 at 24 months, p= 0.02, while BMD in host-bone ileum remained almost unchanged (91 mg/cm^3, and 104 mg/cm^3, p= 0.36). In the osteolysis group BMD increased from 390 mg/cm^3 postoperatively to 425 mg/cm^3 at 24 months. No translation occurred in the *osteolysis group*. Median proximal translation in the *revision group* was 1.4 mm (IQR 0.7-1.5 mm) after 24 months. Cups with >50 cm^3 bone graft migrated more in the proximal direction, median 1.5 mm (IQR 1.4-1.9 mm), than those with < 50 cm^3, median 0.6 mm (IQR 0.3-1.0 mm), p= 0.07. Cups in the *osteolysis group* did not migrate (Figure 1). Both bone graft and surrounding pelvic bone showed radiographical signs of bone integration and bone remodeling (Figure 2). No cup was revised or showed signs of loosening during follow-up. The median Merle d'Aubigné-Postel score increased in both groups; from preoperative score of 13.0 (IQR 8.0–14.0) to 17.5 (IQR 15.0–18.0) at 1 year postoperatively in the *revision group* and from 14.0 (IQR 10.5–15.5) to 17.0 (IQR 14.0–18.0) in the *osteolysis group*.
DISCUSSION AND CONCLUSION:
Uncemented acetabular revisions using large amounts of bone graft show a migration pattern comparable with the cemented bone graft impaction technique. Despite large amounts of bone graft, bone density increases over time and the bone bed shows remodeling.

Figure 1: Implant migration in the proximal-distal direction for all 11 patients in the *revision group* compared to the *osteolysis group*.

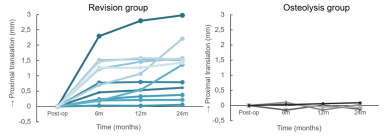

Figure 2: Coronal CT-reconstructions in three patients in the *revision group* (A-C) and one patient from the *osteolysis group* (D). The impacted bone graft proximal to the acetabular cup is shown post-operatively and 24 months after surgery. The bone graft and pelvic bone shows clear signs of remodeling.

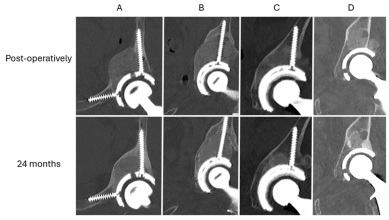

Table 1: Patient characteristics

Characteristic	Revision group N=11	Osteolysis group N=4
Sex, n (%)		
Female	6 (54.5)	2 (50.0)
Age, median [IQR]	74.0 [62.5;82.0]	70.5 [63.0;75.2]
BMI, median [IQR]	25.1 [24.0;28.4]	29.8 [25.0;34.1]
ASA grade, n (%)		
I	3 (27.3)	0 (0.0)
II	4 (36.4)	3 (75.0)
III	4 (36.4)	1 (25.0)
Cause of revision, n (%)		
Aseptic loosening	10 (90.9)	0 (0.0)
Pseudotumor and osteolysis	1 (9.1)	3 (75.0)
Wear and osteolysis	0 (0.0)	1 (25.0)
Paprosky classification, n (%)		
2A	2 (18.2)	2 (50.0)
2B	1 (9.1)	1 (25.0)
2C	1 (9.1)	1 (25.0)
3A	1 (9.1)	0
3B	6 (54.5)	0
Bone graft used in cm^3, mean (SD)	80.3 (52.6)	55.6 (32.2)
Implant used, n (%)		
LINK Partial Pelvis Replacement	1 (9.1)	
aMace Mobelife; custom made	1 (9.1)	
Trident HA Multihole	1 (9.1)	
Trident Tritanium	8 (72.7)	
Cup size in mm, mean (SD)	58.6 (5.17)	N/A
Number of screws, median [IQR]	5.00 [4.25;5.00]	N/A
Blood loss in ml, mean (SD)	655 (559)	912 (805)

ASA, American Society of Anesthesiologists; BMI, Body mass index.