Incidence and Outcomes of Intraoperative Periprosthetic Acetabular Fractures in Cementless Total Hip Arthroplasty: A Prospective Three-Dimensional CT-based Study.

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INTRODUCTION: Unlike periprosthetic femoral fractures, periprosthetic fractures of the acetabulum in total hip arthroplasty (THA) have not been fully understood. Furthermore, published studies have been conducted in a nonprospective fashion with highly selected patient groups, and it is unclear if outcomes vary with location and type of the fractures. We aimed to prospectively identify the incidence, patterns, and clinical outcomes of intraoperative periprosthetic acetabular fractures with the use of pre- and postoperative CT scans, as well as risk factors for these fractures.

METHODS:

From January 2016 to January 2018, 234 consecutive patients (250 hips) who underwent THA with hemispheric acetabular components and who routinely underwent three-dimensional CT before and after surgery within a week were eligible for this prospective study. We assessed the incidence and pattern of fractures, outcomes for each fracture pattern, and reoperation and revision rates. A Harris hip score and a visual analog scale (VAS) pain score were also evaluated. Multivariate regression models were used to identify risk factors for periprosthetic acetabular fractures while adjusting for age, sex, body mass index (BMI), preoperative diagnosis, surgeon, size and orientation (inclination and anteversion) of the cup, and fixation of dome screws. There were 94 men and 140 women with a mean age of 58.5 ± 15.4 years (range, 20-92 years). The minimum followup was 2 years (mean, 2.8 years; range, 2-4.1 years).

RESULTS:

There were 18 periprosthetic femoral fractures (7.2%) and 40 periprosthetic acetabular fractures (16%) identified on CT scan; among those, 3 periprosthetic acetabular fractures (1.2%) were visible on plain radiographs. Fractures occurred most frequently at the posterior column (15 hips), followed by anterosuperior wall (11 hips), superolateral wall (8 hips), posterior wall (2 hips), combined location (2 hips), medial wall (1 hip), and anterior column (1 hip). Early cup migration occurred in 3 hips (2 displaced posterior column fractures, 1 medial wall fracture), with stabilization prior to 1-year followup in all hips. At the last followup, no radiographic evidence of component loosening or nonunion was observed and no patients underwent revision surgery for acetabular loosening. On regression modeling, patients with rheumatoid arthritis (odds ratio [OR], 7.00 compared to primary osteoarthritis; 95% confidence interval [CI], 1.37 to 35.68; p = 0.019) and osteonecrosis of the femoral head (OR, 3.64; 95% CI, 1.19 to 11.14; p = 0.024) were found to be significant predictors for periprosthetic acetabular fracture.

DISCUSSION AND CONCLUSION: Periprosthetic fractures of the acetabulum during cementless THA are not infrequent and are more common in patients whose diagnosis is rheumatoid arthritis or osteonecrosis. Although no revisions were required due to these surgical complications in outcome analyses, surgeons need to closely follow patients when the fractures are detected on plain radiograghs with a displacement postoperatively. These findings may help understand unexplained pain after THA surgery.

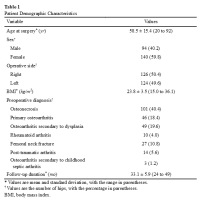

Table 1
Patient Demographic Characteristics

Variable	Values
Age at surgery* (yr)	58.5 ± 15.4 (20 to 92)
Sex†	
Male	94 (40.2)
Female	140 (59.8)
Operative side†	
Right	126 (50.4)
Left	124 (49.6)
BMI* (kg/m²)	23.8 ± 3.5 (15.0 to 36.1)
Preoperative diagnosis†	
Osteonecrosis	101 (40.4)
Primary osteoarthritis	46 (18.4)
Osteoarthritis secondary to dysplasia	49 (19.6)
Rheumatoid arthritis	33 (13.2)
Femoral neck fracture	27 (10.8)
Post-traumatic arthritis	14 (5.6)
Osteoarthritis secondary to childhood septic arthritis	3 (1.2)
Follow-up duration* (mo)	33.1 ± 5.9 (24 to 49)

* Values are mean and standard deviation, with the range in parentheses.
† Values are the number of hips, with the percentage in parentheses.
BMI, body mass index.

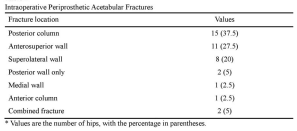

Table 2
Intraoperative Periprosthetic Acetabular Fractures

Fracture location	Values
Posterior column	15 (37.5)
Anterosuperior wall	11 (27.5)
Superolateral wall	8 (20)
Posterior wall only	2 (5)
Medial wall	1 (2.5)
Anterior column	1 (2.5)
Combined fracture	2 (5)

* Values are the number of hips, with the percentage in parentheses.

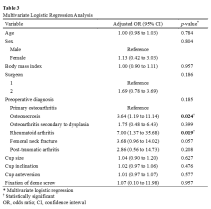

Table 3
Multivariate Logistic Regression Analysis

Variable	Adjusted OR (95% CI)	p-value*
Age	1.00 (0.98 to 1.03)	0.784
Sex		0.804
Male	Reference	
Female	1.13 (0.42 to 3.03)	
Body mass index	1.00 (0.90 to 1.11)	0.957
Surgeon		0.186
1	Reference	
2	1.69 (0.78 to 3.69)	
Preoperative diagnosis		0.185
Primary osteoarthritis	Reference	
Osteonecrosis	3.64 (1.10 to 11.14)	0.024*
Osteoarthritis secondary to dysplasia	1.78 (0.48 to 6.44)	0.389
Rheumatoid arthritis	7.00 (1.37 to 35.68)	0.019*
Femoral neck fracture	3.68 (0.90 to 14.62)	0.057
Post-traumatic arthritis	2.84 (0.56 to 14.73)	0.208
Cup size	1.04 (0.90 to 1.20)	0.627
Cup inclination	1.02 (0.97 to 1.08)	0.470
Cup anteversion	1.01 (0.97 to 1.07)	0.577
Fixation of dome screw	1.07 (0.10 to 11.08)	0.957

* Multivariate logistic regression
† Statistically significant
OR, odds ratio; CI, confidence interval