Instability Following Total Hip Arthroplasty is Associated with a Higher Degree of Gluteus Medius Degeneration

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INTRODUCTION:

Dislocation is a leading complication following Total Hip Arthroplasty (THA). This study investigates the association between degeneration of the hip abductor muscles and THA dislocation using Magnetic Resonance Imaging (MRI) to evaluate the degree of muscle atrophy.

METHODS:

22,214 unilateral Primary THA procedures were performed between February 2016 and September 2021 and 116 experienced a dislocation (0.52% dislocation rate). Of those, 1434 non-dislocators and 19 dislocators met inclusion criteria of an MRI within a 180-day window around the procedure and, if applicable, a dislocation event within 90 days of THA. These 19 dislocators, cohort [D], were matched 1:5 with 95 non-dislocators, [ND], based on age, sex, BMI, approach, and time to MRI. The MRIs of both cohorts were reviewed in a blinded and randomized fashion by fellowshiptrained musculoskeletal radiologists. Four main hip abductors muscles—gluteus minimus, gluteus medius, gluteus maximus, and tensor fasciae latae (TFL)—were graded using the Goutallier Classification System, a 0 – 4 scale measuring increased fatty atrophy of each muscle.

RESULTS:

A total of 114 cases comprised the 1:5 matched cohort used for analysis (D = 19, ND = 95). Analysis was performed on the entire matched cohort as well as on subset matched cohorts separated by time to MRI, pre- or post-THA. In the matched subset of 30 patients whose MRIs were performed post-THA (D = 5, ND = 25), 60% of cohort D had a Goutallier score of 2 or 3 for the gluteus medius muscle, indicating more fatty infiltration—a rate 3.75 times greater than ND (D = 60%, ND = 16%)—and a significant difference in median score was observed (D = 2, ND = 1; P = 0.05). For the entire matched cohort of 114, D patients were approximately 2.5 times more likely to have received a Goutallier score of 2 or 3 than ND, and a trend towards a higher score for fatty infiltration of the gluteus medius was observed (D = 31.6%, ND = 12.6%; P = 0.08). Importantly, no significant differences were observed in any other abductor muscles or in other riskfactors for dislocation such as history of lumbar spinal fusion and certain prosthesis details e.g., the use of standard offset.

DISCUSSION AND CONCLUSION:

This novel study identifies gluteus medius degeneration as a specific risk factor for THA instability. As there was no significant difference in the Goutallier scores of any of the other muscles examined, it appears that the degeneration of the gluteus medius predisposes the THA to dislocation. Prophylactic therapy to target gluteus medius strengthening may be of benefit for THA patients at risk for instability, and those with gluteus medius degeneration identified pre-operatively may be candidates for specific management to decrease the risk of instability.

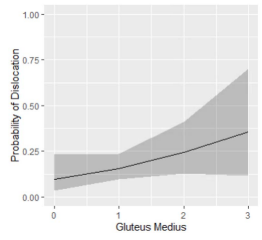

Figure 1. Probability of dislocation by Goutallier Classification grade given to gluteus medius.
See Table 3 for corresponding values.

Table 1. Goutallier Grading classification of fatty infiltration

Grade	Classification
0	Normal Muscle Tissue
1	1% to 25% fatty infiltration
2	26% to 50% fatty infiltration
3	51% to 75% fatty infiltration
4	76% to 100% fatty infiltration

Table 5. Goutallier Score results of the gluteus medius

Variable	Entire matched cohort: Non-dislocation (ND) (n = 95)	Entire matched cohort: Dislocation (D) (5 : 1) (n = 19)	P-value
Scores 0 and 1 (%)	83 (87.4)	13 (68.4)	0.08
Scores 2 and 3 (%)	12 (12.6)	6 (31.6)	
Median [IQR]	1.00 [1.00, 1.00]	1.00 [1.00, 2.00]	0.13
Variable	**Post-op MRI matched cohort: Non-dislocation (ND) (n = 25)**	**Post-op MRI matched cohort: Dislocation (D) (5 : 1) (n = 5)**	**P-value**
Scores 0 and 1	21 (84.0)	2 (40.0)	0.07
Scores 2 and 3	4 (16.0)	3 (60.0)	
Median [IQR]	1.00 [1.00, 1.00]	2.00 [1.00, 2.00]	0.05

Table 3. Corresponding table to Figure 1

Goutallier Grade	Estimate	Lower 95% CI	Upper 95% CI
1	16%	10%	24%
2	24%	12%	41%
3	36%	12%	70%