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A retrospective cohort study: risk factors for hip abductor disruption in patients undergoing total hip arthroplasty and hemiarthroplasty

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ABSTRACT

Background: Hip abductor pathology is increasingly recognized as a contributor to impaired mobility and suboptimal outcomes following total hip arthroplasty (THA) and hemiarthroplasty. However, the prevalence and clinical significance of abductor disruption across fracture-related and elective indications remain unknown.
Methods: We conducted a retrospective cohort study of 67 patients who underwent total hip arthroplasty, hemiarthroplasty, or hip abductor repair between 2017 and 2023, identified using CPT codes from the AthenaOne healthcare system and Alpine Ortho Spine Clinic database.
Results: Fracture patients were significantly older than elective total hip arthroplasty patients (76.8±8.2 versus 66.4±7.9 years, $p<0.001$) and demonstrated a higher proportion of Dorr type C femora ($p=0.02$). Both iliopsoas and quadriceps strength improved postoperatively across the cohort (iliopsoas: 2.7±0.9 to 3.4±0.8, $p<0.01$; quadriceps: 3.0±0.8 to 3.6±0.7, $p<0.01$). Elective patients showed greater strength gains than fracture patients (iliopsoas Δ0.9 versus Δ0.5, $p=0.03$; quadriceps Δ0.8 versus Δ0.4, $p=0.04$). Trendelenburg gait was more prevalent preoperatively in fracture patients (38% versus 19%, $p=0.04$) and remained higher at follow-up (24% versus 12%, $p=0.05$).
Conclusions: Pre-existing hip abductor disruption is common in both fracture and elective arthroplasty populations. These findings highlight the importance of recognizing abductor pathology as a modifiable factor influencing recovery and support the role of targeted perioperative management and rehabilitation strategies.

Keywords: Total hip arthroplasty, Hemiarthroplasty, Hip abductor disruption, Risk factors

INTRODUCTION

Total hip arthroplasty (THA) is one of the most successful orthopedic procedures for alleviating pain and restoring mobility in patients with hip osteoarthritis (OA), femoral neck fractures, and other degenerative conditions. Despite advances in surgical technique and implant design, functional outcomes after THA remain influenced not only by implant-related factors but also by the integrity of periarticular soft tissues, particularly the hip abductors. Disruption of the gluteus medius and minimus tendons may manifest clinically as a Trendelenburg gait, impaired mobility, or compromised stability, thereby limiting postoperative recovery.[1,2]

The prevalence of preexisting abductor tendon pathology in patients undergoing THA is higher than previously recognized. Howell et al reported that 20% of patients with OA presenting for elective THA demonstrated tears of the abductor mechanism on intraoperative assessment.[3] Similarly, Bunker et al identified rotator-cuff-like abductor tears in 22% of patients undergoing THA for femoral neck fractures.[4] More recent imaging-based studies corroborate the utility of magnetic resonance imaging (MRI) in diagnosing abductor tears, while contemporary series report tears in up to 28% of patients and tendinosis in nearly 90% of hips awaiting arthroplasty.[5] Importantly, abductor pathology appears more common in women, with reported female-to-male

ratios as high as 4:1 and prevalence reaching 25% in women over 60 years of age.[6]

The recognition of abductor disruption in both elective and fracture-related THA populations is clinically significant, as hip fractures carry high morbidity and mortality, with 1-year mortality rates approaching 20%.[9,10] Addressing abductor dysfunction in these patients may improve postoperative functional recovery and mitigate gait-related complications. However, despite the clinical importance of abductor tears, the prevalence of disruption across different surgical indications remains poorly defined. The purpose of this study was to identify the prevalence of preexisting hip abductor disruption in patients undergoing hemiarthroplasty or THA for fracture indications compared with elective THA for degenerative joint disease. By characterizing this burden, we aim to contribute to a more comprehensive understanding of the factors that influence postoperative mobility and outcomes.

METHODS

Database selection

This retrospective case series study utilized data from the AthenaOne healthcare system and the Alpine Ortho Spine Clinic database, spanning from 2017 to 2023. The study focused on patients who underwent hip abductor repair, THA, or hemiarthroplasty during this period.

Patient selection

Patients were initially identified using current procedural terminology (CPT) codes. THA was identified using CPT code 27130, while hemiarthroplasty was identified using CPT code 27125. Hip abductor repair procedures were identified using the unlisted procedure code 27299. A total of 67 patients met the inclusion criteria for hip abductor repairs and were included in the final analysis. Inclusion criteria encompassed patients aged 18 years or older at the time of surgery, with complete medical records available in the AthenaOne system or Alpine Ortho Spine Clinic database. Patients were excluded if they had incomplete medical records, concurrent major lower extremity injuries or surgeries, or neuromuscular disorders affecting gait.

Abductor dysfunction

Abductor dysfunction was defined based on preoperative clinical and/or imaging findings consistent with impaired gluteus medius or minimus function. Clinical evidence of dysfunction included the presence of a Trendelenburg gait or positive Trendelenburg sign on physical examination, consistent with definitions used in prior studies.[1,3] Imaging examples are shown in Figure 1 (plain radiograph) and Figure 2 (MRI) to illustrate the criteria for abductor dysfunction. Radiographs demonstrated features such as lateral hip pain with calcific tendinosis or trochanteric irregularity, while MRI demonstrated tendon discontinuity, partial tearing, or fatty infiltration of the gluteus medius and minimus.

Figure 1: Plain film X-ray of the left hip. Anteroposterior radiograph of the left hip demonstrating postoperative alignment and implant position.

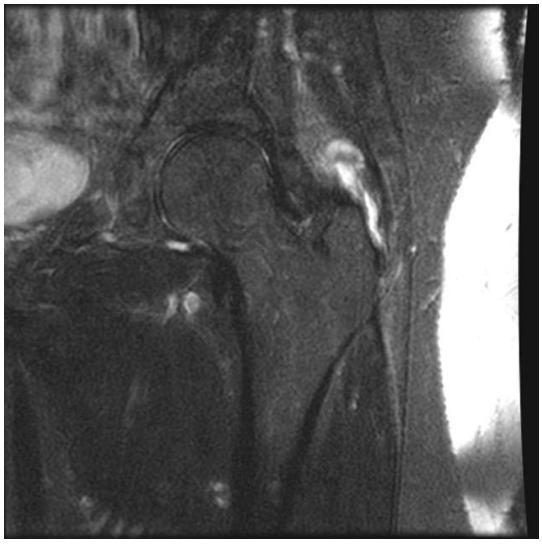

Figure 2: MRI of the left hip demonstrates tendon discontinuity, partial tearing, or fatty infiltration of the gluteus medius and minimus.

Data extraction

For each included patient, the following was extracted: demographic information such as age, sex, and BMI. Preoperative diagnoses and indications for surgery were documented, along with detailed surgical information including procedure type, approach, and any complications. Postoperative outcomes were carefully recorded, including functional status (assessed by the use of assistive devices), ASA classification, Dorr classification, perioperative muscle strength measures

(iliopsoas and quadriceps), and the presence or absence of the Trendelenburg sign or gait. The duration and frequency of follow-up were noted, as well as any complications or reoperations that occurred post-surgery (Table 1).

Table 1: Demographic characteristics of the hip arthroplasty cohort by fracture status.

Variable	Total cohort (n=67)	Fracture (n=29)	Osteoarthritis (n=38)
Age, mean±SD (years)	68.0±13.8	75.1±13.9	62.7±11.2
Sex – male, n (%)	32 (48)	12 (41)	20 (53)
ASA class I–II, n (%)	19 (28)	7 (24)	12 (32)
ASA class III–IV, n (%)	28 (42)	14 (48)	14 (37)
Dorr classification type A/B/C	29/29/9	7/15/7	22/14/2

Statistical analysis

To compare pre- and postoperative functional scores, paired t-tests were utilized for normally distributed data, while Wilcoxon signed-rank tests were employed for non-normally distributed data. Subgroup analyses were conducted to compare outcomes between different age groups and procedure types. R version 4.3.2 was used for statistical analysis.

Ethical considerations

This study received exemption and approval from the Institutional Review Board of Washington State University. Throughout the data collection and analysis process, patient confidentiality was strictly maintained. Due to the retrospective nature of the study, the requirement for informed consent was waived.

RESULTS

A total of 67 patients met the inclusion criteria, including both fracture-related hemiarthroplasty/THA and elective THA cases. The mean age of the cohort was 71.2±9.4 years, with fracture patients significantly older than elective THA patients (76.8±8.2 versus 66.4±7.9 years, p<0.001). The age distribution demonstrates a marked rightward shift for fracture patients compared with the more balanced age spread observed in the elective group (Figure 3). Females accounted for the majority of cases in both cohorts, with a female-to-male ratio of approximately 3:1, consistent with the known higher prevalence of abductor pathology in women.

Radiographic morphology also differed significantly between groups. Dorr classification demonstrated higher frequencies of type C femora among fracture cases, whereas elective THA patients were more commonly classified as type A or B (Figures 4 and 5). The difference in Dorr type between fracture and elective groups was statistically significant (p=0.02).

Functional measures showed improvement across the cohort but differed by surgical indication. Both iliopsoas and quadriceps strength increased significantly postoperatively compared with baseline (iliopsoas: 3.4±0.8 versus 2.7±0.9, p<0.01; quadriceps: 3.6±0.7 versus 3.0±0.8, p<0.01, Figure 6). However, fracture patients demonstrated smaller mean gains than elective patients (iliopsoas Δ0.5±0.4 versus Δ0.9±0.5, p=0.03; quadriceps Δ0.4±0.5 versus Δ0.8±0.6, p=0.04, Figure 6). A Trendelenburg gait was observed preoperatively in 38% of fracture patients versus 19% of elective patients (p=0.04), and while the prevalence decreased postoperatively in both groups, fracture patients continued to demonstrate higher rates at follow-up (24% versus 12%, p=0.05).

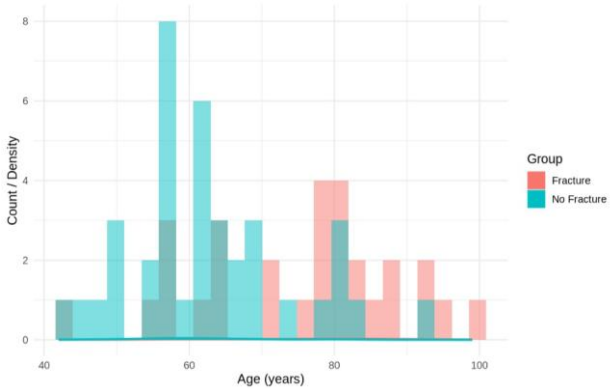

Figure 3: Overlaid histograms with density curves showing the age distributions for fracture versus no-fracture groups. Fracture cases skew older compared with non-fracture cases.

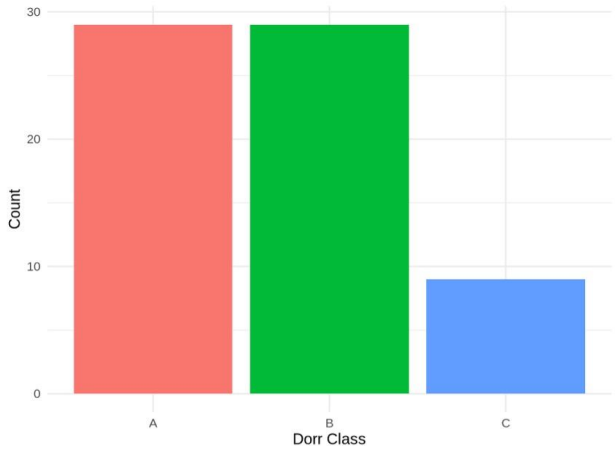

Figure 4: Stacked bar chart showing Dorr classes within fracture and no-fracture groups.

Perioperative characteristics were otherwise similar. ASA distribution centered on classes II and III in both cohorts, with no significant differences (p=0.41). Mean operative time was 92±18 minutes for elective THA and 95±21 minutes for fracture-related cases (p=0.62), while estimated blood loss was 286±84 ml and 304±91 ml, respectively (p=0.47). Intraoperative complication rates were low, and no significant differences were observed between groups. At final follow-up, reoperation was required in 2 patients (3.0%), both in the fracture group, although this difference did not reach statistical significance (p=0.18).

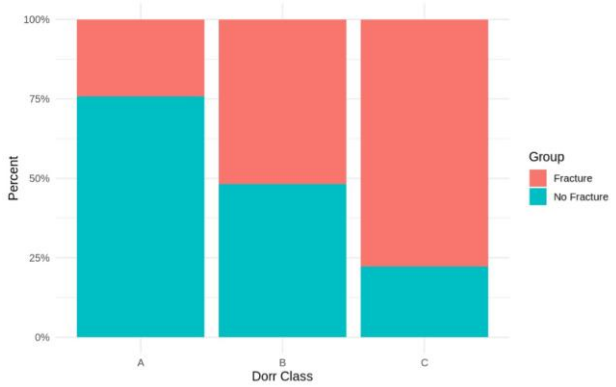

Figure 5: Bar chart of Dorr classification (A, B and C) across the entire cohort.

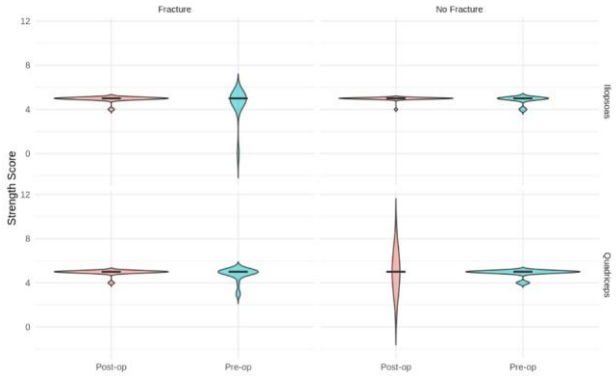

Figure 6: Violin and box plots of iliopsoas and quadriceps strength pre- and postoperatively, faceted by fracture status.

DISCUSSION

This retrospective study highlights the notable prevalence of hip abductor disruption in patients undergoing THA or hemiarthroplasty, with clinically significant rates in both fracture and degenerative joint disease populations. Our findings align with prior literature reporting abductor pathology in approximately 20–25% of patients at the time of hip replacement procedures.[3,4] The similarity in prevalence between fracture and OA cohorts underscores that abductor disruption is not merely a consequence of acute trauma but also a degenerative process that may coexist with end-stage arthritis.

The functional importance of the hip abductors cannot be overstated. Weakness or disruption of the gluteus medius and minimus can result in a Trendelenburg gait, reduced walking capacity, and dissatisfaction after THA.[1,2] Imaging studies confirm a substantial burden of pathology even in asymptomatic patients; Cvitanic et al described the MRI appearance of abductor tears, while others have demonstrated tendinosis or partial tears in 16–30% of hips awaiting arthroplasty.[5] These findings suggest that a significant proportion of patients present to surgery with occult soft tissue compromise that may affect functional recovery.

Our results also complement recent large-scale retrospective analyses. Gaillard-Campbell and Gross reported a 1.4% overall incidence of intraoperatively identified degenerative abductor tears across 4507 primary THAs, with higher rates in women over 60 years.[8] Importantly, surgical repair of these tears did not worsen functional outcomes, and postoperative Harris Hip Scores and limp severity were comparable to matched controls. Together, the data indicate that when identified and addressed, abductor disruption may not preclude good surgical outcomes, but failure to recognize these tears could contribute to persistent dysfunction.

From a clinical standpoint, the high mortality and functional decline following hip fractures emphasize the importance of optimizing every modifiable factor in perioperative care.[9,10] Given the prevalence of abductor pathology across indications, routine preoperative imaging or intraoperative inspection may be justified, especially in elderly female patients who are at greatest risk.[4] Additionally, rehabilitation protocols should incorporate targeted abductor strengthening to address both preexisting weakness and postoperative deficits.[12,13]

Limitations

The limitations of this study, including its retrospective design and modest sample size, limit its ability for generalizability. Furthermore, the severity of abductor tears was not stratified, and imaging confirmation was not available for all cases. Nonetheless, our findings contribute to the growing recognition of abductor dysfunction as a common and clinically relevant comorbidity in hip replacement surgery.

CONCLUSION

This study demonstrates that hip abductor disruption was common across fracture-related and elective THA. Older fracture patients, who had less favorable femoral morphology, showed smaller postoperative strength gains and had higher rates of persistent Trendelenburg gait. These findings underscore the importance of recognizing abductor pathology as a clinically significant factor influencing functional recovery. Routine consideration of abductor integrity through preoperative imaging, intraoperative inspection, and targeted rehabilitation may

optimize outcomes, particularly in high-risk elderly and female patients. Future research should focus on defining the long-term functional consequences of abductor tears, determining the role of surgical repair, and developing standardized perioperative strategies to address this common yet underappreciated comorbidity.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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