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Hip abductor repair improves patient outcome, function, and satisfaction in patients without and with total hip arthroplasty

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ABSTRACT

Purpose: Determine whether patient pain and function are similar following hip abductor repair in patients without and with total hip arthroplasty (THA).
Methods: Patients who underwent hip abductor repair were categorized as to whether they had a THA or not. Pre- and postoperative pain and Harris Hip Score (HHS) were recorded and compared between groups.
Results: There were no differences in improvement in pain level, improvement in HHS, satisfaction with surgery.
Conclusions: Hip abductor repair leads to similar pain, function, and satisfaction in patients without and with THA.

1. Introduction

Generalized hip pain affects anywhere between 11 and 19% of elderly patients over 65, and is a common complaint causing decreased function. It affects women more than men and peaks in the fourth to sixth decades of life.[1] Lateral hip pain is a common clinical complaint often referred to as trochanteric bursitis. However, the differential diagnosis for lateral hip pain in the elderly is broad and may reflect gluteal tendinopathy, with tendon disruption from the greater trochanter.

The prevalence of hip abductor tears varies between studies but is likely higher than previously thought. The majority of tears occur in middle-aged to elderly females and result from a degenerative process likely due to a combination of mechanical factors including a tight iliotibial band causing increased friction on the insertion of the gluteus medius and minimus tendons.[2] Repetitive microtrauma appears to contribute to a degenerative pathology similar to rotator cuff tears of the shoulder.[3,4] The basic pathological process is an attritional tendinopathy similar to other chronic degenerative conditions such as rotator cuff tears.[4] There are also potential roles for intrinsic degeneration due to fatty atrophy of the abductors evidenced on MRI in symptomatic patients with THAs.[5]

Physical exam of the patient with a hip abductor tear often reveals tenderness to palpation of the proximal and lateral hip, usually directly over the greater trochanter. The patient may have exacerbation of pain with lying directly on the affected side or with ambulation, and may also walk with a limp or Trendelenburg gait. Side-lying abduction will often show weakness and reproduction of the pain. The presence of a Trendelenburg gait can often differentiate hip abductor tears from trochanteric bursitis. The symptoms and clinical findings of hip abductor tears and trochanteric bursitis are similar and can lead to an incorrect diagnosis; however, the objective findings of a Trendelenberg gait are usually not present in trochanteric bursitis.[6,7]

Initial treatment of laterally localized hip pain often consists of nonsteroidal anti-inflammatory agents and physical therapy for strengthening and stretching of the hip abductors. If unsuccessful, one to two corticosteroid injections directly into the greater trochanteric bursa can be attempted. If the patient continues to experience severe pain and the above modalities do not result in improvement, an MRI of the hip without contrast should be considered to rule out hip abductor tear. If there is strong clinical suspicion that a patient has a hip abductor tendon tear based on history or physical exam findings an earlier MRI could be warranted if surgical repair would be pursued. Use of MRI to diagnose gluteus medius tears has previously shown a thickened appearance of the tendon along with increased signal intensity on T2-weighted images is diagnostic of partial thickness tears, and discontinuity of tendon fibers with or without muscle retraction consistent with full-thickness tears.[3]

After failure of nonoperative management, surgical management of hip abduction tears with repair using transosseous sutures or suture

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anchors to a bleeding trochanteric bed should be considered. Several studies show excellent pain relief and improved functional outcome after hip abductor tendon repair.[2,4,8–10] There is a paucity of data on outcomes after gluteal tendon repair in patients with total hip arthroplasty (THA),[11,12] and to date no study has compared outcomes of patients without a THA and those patients with a THA following hip abductor tendon repair. Accordingly, we performed a retrospective review of patients with hip abductor tendon tears who failed nonoperative management in order to: 1) determine whether patient pain and function improve following hip abductor repair in patients without and with THA, 2) determine whether satisfaction and improvement in pain and function are similar between patients without and with THA, and 3) determine whether the mechanism of repair or the hip abductor pathology influences the outcome of patients undergoing hip abductor tendon repair.

2. Methods

2.1. Patient selection

After institutional review board approval, a retrospective analysis of all patients who underwent surgical repair of hip abductor mechanism at a single institution from March 2011 and April 2018. Included all subjects 18–90 years of age, had a preoperative MRI documenting hip abductor mechanism pathology, failed nonoperative treatment, and at least one-year postoperative follow-up. Patients were grouped as to whether they had a THA (performed either at or before the hip abductor repair) and those that had no THA. Our review identified 44 patients (ages 63 ± 11; 36 females, 8 males) over the seven-year period who had hip abductor tendon repair. Twenty-seven patients had no THA and had hip abductor mechanism repair and seventeen patients had a THA and hip abductor mechanism repair (Table 1). All patients in the THA group had a posterior approach and were treated at an average time of 22 ± 31 months from index THA while nine patients had abductor tendon repair at time of THA.

Patients were treated with either bony tunnels or with suture anchors. Patients who had a THA performed at time of abductor tendon repair were treated with bony tunnels as this was the method used to repair the capsule. For those that did not receive a THA at the time of surgery, the abductor tendon repair was done primarily with bony tunnels at the start of the study but transitioned to suture anchors as the operative surgeon found them easier and quicker to perform the repair.

To perform the repair with bony tunnels, after identifying the tear or avulsion of the tendon, the tendon was elevated and the bone underneath the tendon was decorticated and two drill holes were made through the greater trochanter. A Krakow stitch was then placed into the anterior portion and another in the posterior portion of the tendon. The suture was then passed through the drill holes and tied down over bone. To perform the repair with the suture anchors, after identifying the tear or avulsion of the tendon, the tendon was elevated and the bone underneath the tendon was decorticated and at least two anchors were used and were placed into the greater trochanter. A Krakow stitch was then used in the anterior portion and another in the posterior portion of the tendon and sutured back down to bone. Post-operatively patients were weight-bearing as tolerated, received deep vein thrombosis prophylaxis with aspirin, received physical therapy with crutch or walker ambulation for 4 weeks and were restricted from active abduction for 4 weeks.

Chart review was performed to identify patient demographics, hospital length of stay (LOS), hip abductor pathology identified on MRI, and method of repair. Before surgery subjects were asked to rank their pain level on a scale of 1–10 as well as to complete the Harris Hip Score (HHS). At a minimum of one-year postoperatively, subjects were asked about their pain level after surgery (1–10), HHS, satisfaction with walking after surgery (1 - Dissatisfied, 2 - Mildly Dissatisfied, 3 - Mildly Satisfied, and 4 - Satisfied), satisfaction with surgery (1 - Dissatisfied, 2 - Mildly Dissatisfied, 3 - Mildly Satisfied, and 4 - Satisfied), and would they have the surgery again (yes/no). Last follow-up note was reviewed for presence or absence of a Trendelenburg gait.

2.2. Statistical analysis

A power analysis estimated the minimum sample size needed to observe a significant difference between subjects that underwent hip abductor repair in patients without and with a THA. The analysis used a clinically important difference in the HHS of 18 points, a standard deviation of 17 points, $\alpha = 0.05$, and a power = 0.80.[13] Thirty-one subjects achieve this degree of power. Therefore, the enrollment of 44 patients adequately powered the present study.

Mean ± standard deviation was reported for continuous variables (i.e., age) and discrete variables (i.e., satisfaction with surgery) were reported as a percentage. A Wilcoxon Signed Rank test was used to compare preoperative to postoperative pain level and HHS. Categorical data (sex, hip abductor pathology, mechanism of repair, satisfaction) were analyzed for statistical differences using Fisher's exact test. Differences between patient groups were determined using a Wilcoxon *t*-test for continuous variables. Computations were performed with statistical software (JMP Pro, 14.0, http://www.jmp.com). Significance was set at $p < 0.05$.

3. Results

3.1. Patient demographics

The mean age was 63 ± 10 for patients without THA and 63 ± 12 for patients with THA (p = 0.981) (Table 1). There were 81% females in the group without THA and 82% females in the group with THA (p = 1.000). Patients without THA discharged on average 1 day earlier (2 ± 1) than those with THA (3 ± 1) (p = 0.018). There was no differences in pathology between the two groups with a tear occurring in 67% of patients without THA and 47% of patients with a THA (p = 0.225). The method of repair was also not different between groups with bony tunnels used in 48% of patients without THA and 65% of patients with THA (p = 0.359). No patients required gluteus maximus transfer or augmentation with allografts or xenografts. There were two abductor tendon repair failures (one in both group) both of which were initially repaired with bony tunnels and were revised with suture anchors.

Table 1
Patient demographics that underwent hip abductor mechanism repair in patients without and with total hip arthroplasty.

	Patient Without THA	Patient With THA	P-Values[a]
Number of Patients	27	17	
Age (years)	63 ± 10	63 ± 12	0.981
Gender	81% Female	82% Female	1.000
	19% Male	18% Male	
Hospital Length of Stay (days)	2 ± 1	3 ± 1	0.018
Abductor Mechanism Pathology			0.225
Avulsion	33%	53%	
Tear	67%	47%	
Method of Repair			0.359
Anchors	52%	35%	
Tunnels	48%	65%	

Age and hospital length of stay reported in means ± standard deviations.
[a] Statistical analysis performed with Wilcoxon *t*-test for continuous variables. Fisher's exact test was used for categorical data.

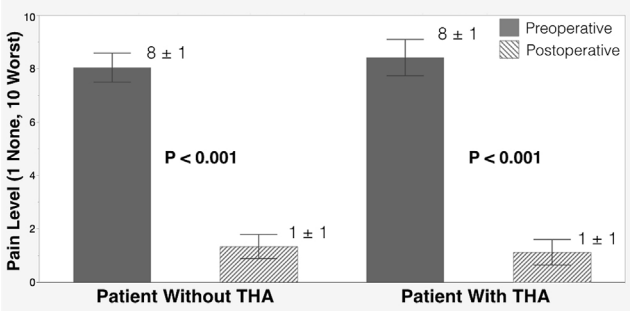

Fig. 1. Column graph with 95% confidence intervals showing Pain Level (0 – no pain, 10 – worst pain) before and after hip abductor repair in patients without and with a total hip arthroplasty. Patients without THA had a preoperative pain level of 8 ± 1 and decreased postoperatively to 1 ± 1 (P < 0.001). Patients with THA had a preoperative pain level of 8 ± 1 and decreased postoperatively to 1 ± 1 (P < 0.001).

3.2. Patient outcomes

In general, patients with and without THA had improvement in their pain level and in their function. Patients without THA had a 7-point decrease in their pain level from 8 ± 1 preoperatively to 1 ± 1 postoperatively (p < 0.001) (Fig. 1). Patients with THA had a 7-point decrease in their pain level from 8 ± 1 preoperatively to 1 ± 1 postoperatively (p < 0.001). Patients without THA had a 43-point increase in their HHS, increasing from 46 ± 11 preoperatively to 89 ± 10 postoperatively (p < 0.001) (Fig. 2). Patients without THA had a 41-point increase in their HHS, increasing from 40 ± 11 preoperatively to 81 ± 15 postoperatively (p < 0.001).

Overall there were no differences in improvement in pain level, HHS, satisfaction with walking, satisfaction with surgery, and willingness to have the surgery again (Table 2). Patients without THA had a 7 ± 2 point decrease in their pain level compared to a 7 ± 2 point decrease in those with a THA (p = 0.293). Patients without THA had an increase of 43 ± 14 points in their HHS compared to a 41 ± 16 point increase in those with a THA (p = 0.673). Patients were mildly satisfied/satisfied with walking after surgery 96% of the time in patients without THA and 94% of the time in patients with a THA (p = 0.602). Patients were mildly satisfied/satisfied with their surgery 96% of the time in patients without THA and 94% of the time in patients with a THA (p = 1.000). Approximately 93% of patients without a THA would have hip abductor repair again compared to 94% of patients with a THA (p = 1.000). Postoperatively, 4/27 (15%) patients without a THA were found to have a Trendelenburg gait while 3/17 (18%) patients with a THA had a Trendelenburg gait which was not different between the groups (p = 1.000).

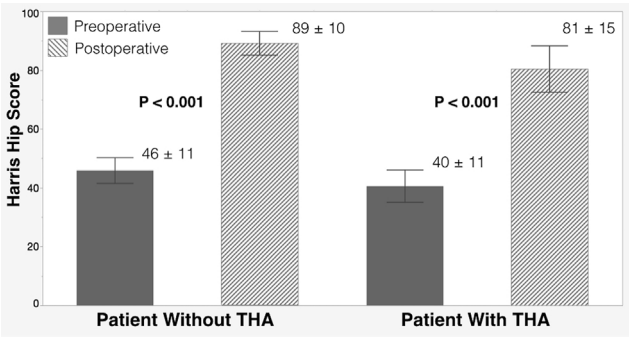

Fig. 2. Column graph with 95% confidence intervals showing Harris Hip Score (HHS) before and after hip abductor repair in patients without or with a total hip arthroplasty. Patients without THA had a preoperative HHS of 46 ± 11 and increased postoperatively to 89 ± 10 (P < 0.001). Patients with THA had a preoperative HHS of 40 ± 11 and increased postoperatively to 81 ± 15 (P < 0.001).

Table 2
Improvement in pain level, Harris hip score, satisfaction with walking, and satisfaction with surgery in patients that underwent hip abductor mechanism repair in patients without and with total hip arthroplasty.

	Patient without THA	Patient with THA	P-Values[a]
Improvement in Pain Level	−7 ± 2	−7 ± 2	0.293
Improvement in HHS	43 ± 14	41 ± 16	0.673
Satisfaction with walking			0.602
1 - Dissatisfied	1 (4%)	0 (0%)	
2 – Mildly dissatisfied	0 (0%)	1 (6%)	
3 – Mildly satisfied	3 (11%)	3 (18%)	
4 - Satisfied	23 (85%)	13 (76%)	
Satisfaction with surgery			1.000
1 - Dissatisfied	0 (0%)	0 (0%)	
2 – Mildly dissatisfied	1 (4%)	1 (6%)	
3 – Mildly satisfied	2 (7%)	1 (6%)	
4 - Satisfied	24 (89%)	15 (88%)	
Would you have the surgery again?			1.000
Yes	25 (93%)	16 (94%)	
No	2 (7%)	1 (6%)	

[a] Statistical analysis performed with Wilcoxon *t*-test for continuous variables. Fisher's exact test was used for categorical data.

Neither method of repair nor the pathology of the hip abductor mechanism influenced the outcome. There was no difference in HHS (p = 0.127) or pain level (p = 0.409) between patients treated with bony tunnels or those treated with anchors. There was no difference in HHS (p = 0.266) or pain level (p = 0.271) between patients with avulsion injury or those with either full or partial thickness tears.

4. Discussion

Abductor tendon tears or avulsions are a commonly under-treated cause of hip pain. Although hip abductor repair has been described in patients without and with THA, no previous study has compared the outcomes between these patient groups after surgical repair. The results of this retrospective review are the first to our knowledge that directly compare outcomes after hip abductor repair in patients without and with previous THA which is important to be able to council patients preoperatively and throughout the rehabilitation process. The most important findings of the present study are: 1) hip abductor repair results in improvement in pain, functional scores, and satisfaction in patients without and with THA, 2) patient satisfaction and improvement in pain and function are similar among the two groups, and 3) neither the method of repair nor the pathology influenced outcomes.

Although numerous studies show favorable outcomes in patients who undergo hip abductor repair, little can be found regarding outcomes of hip abductor repair in patients with prior THA.[11,12] Weber in 1997 retrospectively reviewed 9 patients with hip abductor tears after THA who underwent repair using suture through bone tunnels.[14] Their results were fairly inconsistent with only 1 patient achieving an excellent result, 3 with good results, 2 with fair, and 3 patients considered failures. Of note however the main indications for operation were Trendelenburg gait and hip instability, and their sample size was small. Apart from Weber, Lubbecke in 2008 retrospectively reviewed 19 patients who underwent hip abductor repair an average of 19 months after primary THA. Nearly all patients had an improvement in pain but only half of the patients in their cohort had substantial improvements in pain and limp.[12] They did find however that improvement in limp and functional outcome markedly improved with early repair within 15 months and use of an orthotic device post operatively. Obesity on the other hand was associated with less improvement in limp and HHS. Although the above study addresses patients who had tears noted after the index THA, there is a role for repairing tears found incidentally at

the time of index procedure.[15]

There are limitations that affect the generalization of these findings that should be discussed. First, this was a retrospective study performed at one institution, and therefore could predispose to selection bias. However, demographics between both cohorts were similar and as expected, there was a higher proportion of women in both groups. Since there were no demographic difference between cohorts, it is reasonable to compare the outcomes between the two populations. Second, this is a relatively small sample size; however, our power analysis showed the 44 patients enrolled adequately powered the study. Third, there were differences in repair technique, with the majority of repairs completed with sutures through bone tunnels. Future studies could aim to grade the abductor tendon tears and determine which method provides optimal tendon fixation for this pathology.

5. Conclusions

This is the first study comparing pain and functional outcomes following repair of the hip abductor mechanism in patients with THA to those without THA. The patients in our study had decreased pain and increased HHS following surgery and there were no differences in outcomes in those that had a THA versus those that did not. This is important information so that surgeons performing gluteal tendon repairs can council patients preoperatively and during the rehabilitation process regarding expectations. Both those with avulsion of the abductor tendon and those with full or partial thickness tear benefit from repair. Based on our results we believe hip abductor repair leads to improved pain and outcome in patients without and with THA, and patients who have failed conservative management and have documented pathology by imaging will likely benefit from open repair. In addition, patients undergoing a THA in which a tear of the abductor tendon is noted, would likely benefit from repair during the index procedure.

Conflicts of interest

The authors declare that they have no conflict of interest.
The study was approved by our ethical committee.

Disclaimers

The authors' views expressed in the submitted article are the authors' own and not an official position of the institution.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jor.2019.08.009.

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