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Joint Preservation

Nonoperative Management of Hip Labral Tears Yields Similar Total Hip Arthroplasty Conversion Rate to Arthroscopic Treatment

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ABSTRACT

Background: Arthroscopic treatment of hip labral tears has increased significantly in recent years. There is limited evidence comparing nonoperative management to arthroscopic treatment. The purpose of this study is to evaluate the progression to total hip arthroplasty (THA), as well as the cost associated with arthroscopic management of labral tears compared to nonoperative treatment.

Methods: The Humana claims database was queried from 2007 through 2016. International Classification of Diseases and Current Procedural Terminology codes were used to identify patients with hip labral tears and hip arthroscopy and THA procedures. Two cohorts were created: a nonoperative group and an operative group. Following propensity score matching, the rate of conversion and time to THA conversion were calculated. Cost was calculated using the total cost reimbursed for encounters within 6 months. Continuous variables were analyzed using Student *t*-test and Mann-Whitney test, and categorical variables were analyzed using chi-square test.

Results: After propensity matching, 864 patients were included in the analysis. The conversion rate to THA in the operative group (6.7%) and the nonoperative group (5.3%) was not statistically different ($P = .391$). The operative group had a longer time to THA (21.5 ± 16.8 months) than the nonoperative group (15.9 ± 19.5 months; $P = .044$). The cost for the operative group was significantly higher ($14,266.55 ± $7187.96) compared to the nonoperative group ($2941.96 ± $2664.00; $P < .001$).

Conclusion: This study did not find a difference in the rate of conversion to THA for operative vs nonoperative groups. Time to THA in the operative group was longer, however, at the expense of higher costs.

Arthroscopic treatment of hip labral tears has increased significantly in recent years [1–3]. From 2007 to 2011, the incidence of hip arthroscopy increased 250%, including a 200% increase in patients older than 60 years [4]. The literature has followed a similar trend with many small case series evaluating outcomes of hip arthroscopy and large cross-sectional studies evaluating trends in hip arthroscopy [5–9].

There is limited evidence comparing nonoperative management to arthroscopic treatment for hip pathology and few specifically addressing the underlying pathology of hip labral tears. Recent randomized trials have compared nonoperative management in younger patients with femoroacetabular impingement (FAI) with labral tears looking at hip outcome scores showing both treatment arms improved functional scores with one study finding the arthroscopic group to have better outcomes, while the other study showed no difference [10,11]. An additional randomized study with patients older than 40 years of age has published an abstract with limited numbers of patients showing improved patient-reported outcomes in the arthroscopic surgery group [12]. While the majority of comparative studies have limited their focus to FAI with associated labral tear and functional score outcomes, no studies to our knowledge have focused

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on labral tears, regardless of underlying pathology, and compared nonoperative management to arthroscopic treatment with conversion to total hip arthroplasty (THA) or time to THA as the outcome measures.

The purpose of this study is to evaluate (1) the progression to THA overall and specifically in patients ≥50 years compared to nonoperative treatment, as well as (2) the cost associated with arthroscopic management of labral tears compared to nonoperative treatment.

Materials and Methods

The PearlDiver Research Program (PearlDiver Inc, Fort Wayne, IN) was used to query the Humana administrative claims database from 2007 through 2016. The records within this database are Health Insurance Portability and Accountability Act compliant and were deemed exempt from institutional review board review.

Patients with a diagnosis of hip labral tear were identified using relevant International Classification of Diseases, Ninth Revision (ICD-9) and ICD-10 codes (Appendix A). In order to narrow the diagnosis to only those with labral tears, patients with concomitant ICD-9 or ICD-10 codes of fracture, loose body, osteochondral defect, infection, osteoarthritis, and avascular necrosis were excluded. Included patients were required to have had at least 2 years of subsequent database activity following initial hip labral tear diagnosis in order to allow for adequate follow-up. Patients were then dichotomized based on operative status and were propensity score matched for age, gender, Charlson comorbidity index (CCI), race, obesity, diabetes, and smoking status. Patients assigned to the operative group were determined to have an ICD-9 or ICD-10 code of hip labral tear linked to the same record as a hip arthroscopy Current Procedural Terminology (CPT) code (Appendix B). The rate of conversion and time to conversion to THA were calculated for each cohort, defined from time of diagnosis of hip labral tear to THA (Appendix A). Analysis of cost was performed using the sum of the cost reimbursed for all encounters for the given hip labral tear diagnosis code within 6 months of surgery for the operative group and within 6 months of diagnosis for the nonoperative group. Cost analysis included all reimbursement for which the ICD code was listed in the inpatient or outpatient setting, including arthroscopic surgery for the operative group, and all encounters for clinic visits, physical therapy, intra-articular injections, and alternative medicine approaches, such as acupuncture, for both operative and nonoperative groups for their defined 6-month period. A breakdown of procedures performed based on primary billing codes for the matched operative cohort and interventions used for conservative management in the matched nonoperative cohort is provided in Figures 1 and 2. Patient demographics including age, gender, and CCI were reported for each cohort.

Continuous variables were analyzed using Student *t*-test and Mann-Whitney test, and categorical variables were analyzed using chi-square test. Significance was set at $P \leq .05$. An a priori sample size calculation was performed to ensure an adequate sample was available after excluding concomitant hip diagnoses and before conducting further analyses. Conventional values of 0.80 for power and 0.05 for alpha were used. With literature reported rates of conversion to THA after hip arthroscopy of roughly 10% [13,14], the detection of an absolute 5% difference between the operative and nonoperative group would require a total of 868 patients. Statistical analysis was performed using R software (version 3.5.0, Vienna, Austria).

Results

There were a total of 14,447 patients with a hip labral tear after excluding patients with other concomitant hip pathology diagnoses. Of these patients, 449 underwent operative management, while 13,998 did not. A higher proportion of male-to-female patients existed within the nonoperative group; however, this was not statistically different from the operative group (36.5% vs 34.1%, respectively; $P = .287$). The nonoperative group was older and had a higher average CCI than the operative group (Table 1).

Propensity score matching resulted in 864 total patients for analysis. After matching, there were no significant differences

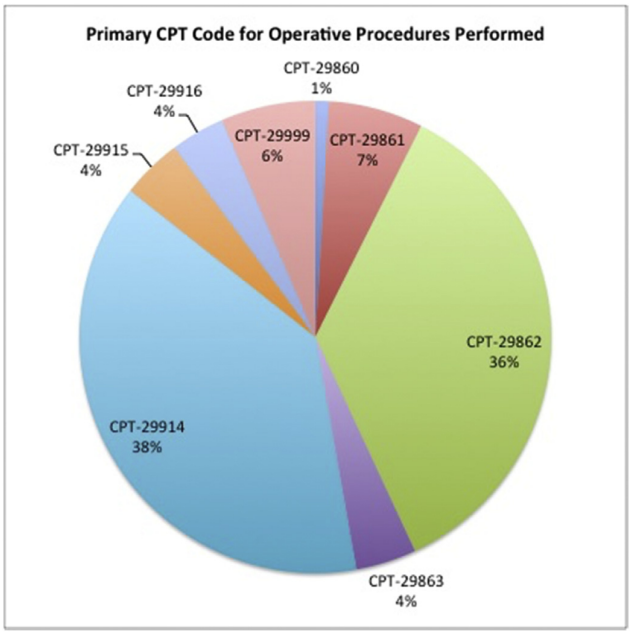

Fig. 1. Breakdown of procedures performed for matched operative cohort. CPT, Current Procedural Terminology.

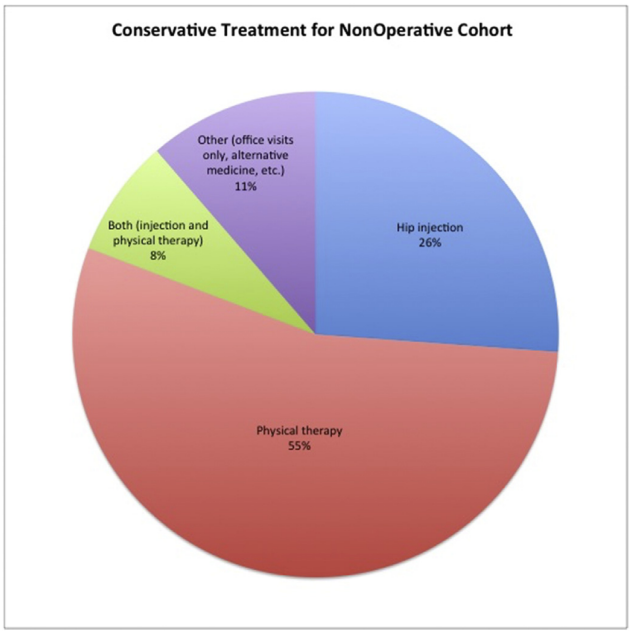

Fig. 2. Breakdown of interventions used for conservative management in matched nonoperative cohort.

Table 1
Patient Baseline Demographics.

Variable	Operative	Nonoperative	*P* Value
Total, n	449	13,998	
Male (%)	153 (34.1)	5114 (36.5)	.287
≥50 y (%)	123 (27.4)	12,699 (90.7)	<.001
CCI (average ± SD)	0.43 ± 1.11	2.54 ± 3.07	<.001

CCI, Charlson comorbidity index; SD, standard deviation.

between the groups with respect to age, gender, and CCI (Table 2). The overall rate of conversion to THA in the operative group was 6.7%, which was not statistically different from the nonoperative group, 5.3% ($P = .391$). The conversion rate to THA within 2 years was also not significantly different, with 4.4% conversion to THA in the operative group and 3.9% in the nonoperative group ($P = .733$). In patients greater than 50 years of age, the conversion to THA was again not shown to be different between the groups; 16.1% of patients in the operative group and 13.0% in the nonoperative group were converted to THA overall ($P = .496$). Within 2 years of diagnosis of a hip labral tear for the patients older than 50 years, 11.0% of patients in the operative group and 10.6% of patients in the nonoperative group were converted to THA ($P = .911$). The time to conversion to THA was statistically significantly longer in the operative group at 21.5 ± 16.8 months compared to the nonoperative group at 15.9 ± 19.5 months ($P = .044$). For the patients older than 50, the trend remained; the operative group had an average time to THA of 22.1 ± 18.8 months compared to 13.0 ± 15.4 months in the nonoperative group ($P = .040$). The Kaplan-Meier survival estimates for operative and nonoperative groups are depicted in Figure 3. The cost of management of a hip labral tear was different between groups; the operative group had an average cost of $14,266.55 ± $7187.96 while the nonoperative group had an average cost of $2941.96 ± $2664.00 ($P < .001$; Fig. 4).

Discussion

In this study, the conversion rate to THA for the diagnosis of hip labral tear was not found to be different between the nonoperative group and the hip arthroscopy group overall or in the subgroup of patients older than 50 years. There was a longer time to THA in the hip arthroscopy group; however, this group also had a higher cost of care.

Previous studies have shown overall clinical improvement for hip arthroscopy with good patient-reported outcomes demonstrating a clear clinical utility of the procedure [8,15]. There is, however, no good method at the present to determine the subset of the population that would benefit from hip arthroscopy for labral tears. Many of the case series describe the clinical indication for hip arthroscopy as patients with clinical and radiographic findings consistent with a labral tear whom have failed some form of conservative therapy. Few studies elaborate on the extent of conservative management. Quinlan et al [16] reported a case series of patients undergoing 1 year of nonoperative management for labral tears, showing significant improvement in their modified Harris Hip Scores, despite persistent pain in 48% of the cohort.

There are some recent studies comparing hip arthroscopy and nonoperative management, but they have been conducted in a younger population with many limited to labral tears associated with FAI alone. Griffin et al [11] performed a randomized, controlled trial evaluating FAI in a younger population with a mean age of 35 years finding both treatments improved the patients' hip quality of life, with the arthroscopy group showing a greater improvement in international hip outcome tool scores at 12 months. Mansell et al [10] reported a randomized study in a military population finding improvements in the hip outcome scores and international hip outcome tool scores, but no difference between the operative and nonoperative groups. They did have 70% of the patients originally randomized to the nonoperative group crossover into the surgical group, resulting in limited statistical power comparing the as-treated groups. Stelzer et al [12] studied 72 patients with an average age of 47 years and compared patient-reported hip outcome scores between nonoperative and arthroscopic treatments. They noted larger improvement in the operative group at mean follow-up of 15.2 months; however, as the authors noted, longer follow-up in more patients is likely needed to draw real conclusions. None of these studies evaluated conversion to THA as an outcome measure. This is particularly meaningful for the older patients without significant osteoarthritis as was evaluated in this study.

Smaller case series and database studies have attempted to look at conversion to THA. Schairer et al showed an overall conversion rate from hip arthroscopy to THA of 11.7% in a population-based cohort [15]. Rosinksy et al demonstrated a 7.2% conversion rate to THA in their study cohort of patients with labral tears at a single high-volume center. Those patients who were converted had a mean time to THA of 28.4 ± 22.9 months, which is within the range of the time to THA shown in the present study [14].

Furthermore, there have been several studies attempting to evaluate the risk factors associated with early conversion to THA, with many identifying preexisting arthritic changes as a predictor of failure. Redmond et al [17] described predictors of hip arthroscopy failure for labral tears, which included worse chondral damage scores. Skendzel et al [18] showed that patients with <2 mm of joint space had worse outcomes and shorter times to conversion to THA. The present study sought to evaluate patients without a preexisting clinical diagnosis of hip osteoarthritis before their diagnosis of hip labral tear. In doing so, no difference was found for

Table 2
Demographics, Costs, Conversion, and Time to THA After Propensity Matching.

Variable	Operative	Nonoperative	*P* Value
Total, n	432	432	
Male (%)	147 (34.0)	151 (35.0)	.775
≥50 y (%)	118 (27.3)	123 (28.5)	.704
CCI (Average ± SD)	0.43 ± 1.13	0.36 ± 0.84	.734
Cost	$14,266.55 ± $7187.96	$2941.96 ± $2664.00	<.001
Time to THA (All Patients) (mo)	21.5 ± 16.8	15.9 ± 19.5	.044
Conversion to THA (All Patients) (%)	29 (6.7)	23 (5.3)	.391
Conversion to THA within 2 y (All Patients) (%)	19 (4.4)	17 (3.9)	.733
Time to THA (≥50 y) (mo)	22.1 ± 18.8	13.0 ± 15.4	.040
Conversion to THA (≥50 y) (%)	19 (16.1)	16 (13.0)	.496
Conversion to THA within 2 y (≥50 y) (%)	13 (11.0)	13 (10.6)	.911

THA, total hip arthroplasty; CCI, Charlson comorbidity index; SD, standard deviation.

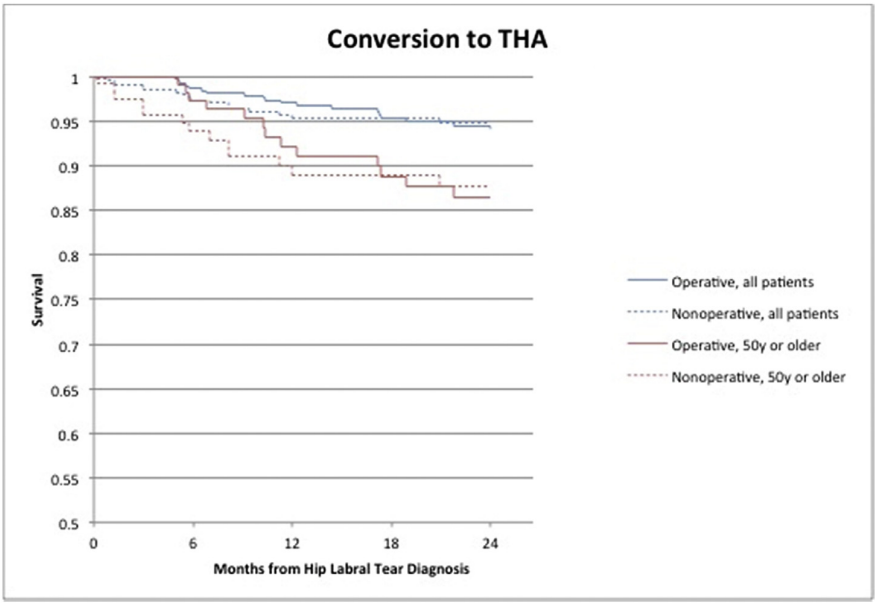

Fig. 3. Kaplan-Meier survival estimates of conversion to THA. THA, total hip arthroplasty.

overall conversion rate to THA or conversion rate within 2 years of diagnosis between the arthroscopic group and the nonoperative group. The rates of conversion to THA in this study corroborate what has been reported in the literature. There was a statistically significantly longer time to THA in the operative group with a mean difference of 6 months overall and 9 months in the group >50 years old. However, the study is unable to determine whether this difference is clinically meaningful.

Lodhia et al [19] published the direct cost of arthroscopic hip labral tear management at an average of $18,468.09 compared to a rehabilitation cost of $9068.71. Their group used a Markov decision model to conclude that surgical management was more cost-effective for hip labral tears for patients in their second to seventh decades of life. Mather et al [20] analyzed the economic impact of hip arthroscopy for FAI finding the direct costs to be an average of $14,363 compared to the nonoperative group at $1669. Their group used inferred indirect costs to show hip arthroscopy to be more cost-effective for the management of FAI. The present study found the direct cost of hip care for the operative group, $14,266.55, to be significantly higher than the nonoperative group, $2941.96. However, this study was not designed to evaluate the indirect cost differences, which could show potential economic benefit for a subset of the surgical cohort as some of the previous literature suggests.

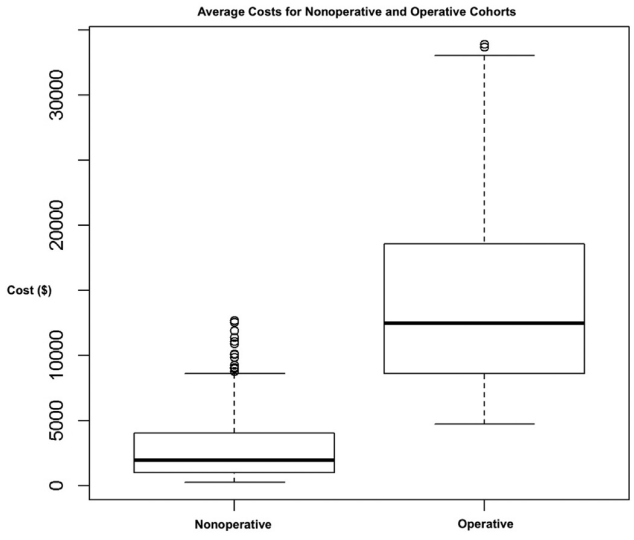

Fig. 4. Box and whisker plot of cost analysis.

There are several limitations to this study. The limitations inherent to large databases apply to this study, including the single-payer insurance database and the retrospective nature of the study, which relies on the accuracy of coding and billing information. Also, our final sample size was 4 patients short of the a priori sample size calculation; however, a post hoc power analysis revealed a power of 79.8%. Thus, while it is possible that a type II error occurred, it is unlikely that we missed a large effect. Furthermore, this study is limited by selection bias. The operative group tended to be younger and have fewer comorbidities. In an attempt to evaluate similar groups, the patients were propensity score matched; however, this can only adjust for certain factors leaving other potential confounders, such as severity of the labral tear. Additionally, patients with concomitant osteoarthritis were excluded in an attempt to compare more similar groups; however, it is not possible to perfectly control for severity of disease or symptoms with this type of study. Thus, the results of this study should be evaluated in the context of these limitations and serve as a springboard for further prospective studies evaluating the management of hip labral tears with a nonoperative comparison group, in particular seeking to identify the patients in the middle decades of life for whom arthroscopic management would truly be beneficial.

Conclusions

This study did not find a difference in the rate of conversion to THA for operative vs nonoperative groups with a hip labral tear. Time to THA in the operative group was longer, however, at the expense of higher costs.

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Appendices

Appendix A

Hip Labral Tear ICD-9 or ICD-10 Codes	CPT Codes for Hip Arthroscopy	CPT Codes for Total Hip Arthroplasty
ICD-9-D-71885	CPT-29860	CPT-27130
ICD-9-D-71985	CPT-29861	CPT-27132
ICD-10-D-M24851	CPT-29862	
ICD-10-D-M24852	CPT-29863	
ICD-10-D-M24859	CPT-29914	
ICD-10-D-M25851	CPT-29915	
ICD-10-D-M25852	CPT-29916	
ICD-10-D-M25859	CPT-29999*	

ICD, international classification of diseases; CPT, current procedural terminology.
* Limited to only those CPT codes listed on same record as hip pathology.

Appendix B

Hip Arthroscopy CPT Code	Description
CPT-29860	Arthroscopy hip diagnostic with or without synovial biopsy (separate procedure)
CPT-29861	Arthroscopy hip surgical, with removal of loose body or foreign body
CPT-29862	Arthroscopy hip surgical, with debridement/shaving of articular cartilage (chondroplasty), abrasion arthroplasty, and/or resection of labrum
CPT-29863	Arthroscopy hip surgical, with synovectomy
CPT-29914	Arthroscopy hip with femoroplasty
CPT-29915	Arthroscopy hip with acetabuloplasty
CPT-29916	Arthroscopy hip with labral repair
CPT-29999	Unlisted procedure arthroscopy

CPT, current procedural terminology.