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Labral Resection or Preservation During FAI Treatment? A Systematic Review

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Abstract
Background: Open and arthroscopic treatment of femoroacetabular impingement and resultant labral pathology has increased significantly over the past decade. Although the functional importance of the labrum and the labral seal has been established in biomechanical studies, good clinical results have been reported for both labral debridement and labral refixation.
Questions/Purposes: The purpose of this paper is to summarize existing literature on the surgical treatment of labral pathology to provide treatment recommendations and direct future research. A systematic review was performed with the following research question in mind: Does preservation of the hip labrum improve outcomes as compared to labral debridement for the treatment of labral pathology?
Methods: The MEDLINE database was searched for level I, II, or III articles in English or German comparing labral debridement to labral refixation. Five studies were included in the analysis.
Results: Good short-term results were reported for both groups. Three out of five papers report improved outcomes after labral refixation as compared to labral debridement.
Conclusions: In short-term follow-up, labral refixation appears to have slightly better outcomes than labral debridement. Studies with prospectively defined cohorts and longer follow-up are, however, necessary to provide definitive recommendations for labral treatment.

Keywords hip labrum · labral repair · labral refixation · labral debridement · FAI · femoroacetabular impingement

Introduction

The acetabular labrum is a nearly circumferential fibrous ring around the acetabulum, composed of type I collagen [21, 24, 28]. The intact labrum creates the labral seal, which is important for joint lubrication, cartilage nutrition, and maintenance of a pressurized fluid layer that improves load distribution within the joint [8–11]. The labrum and labral seal may also contribute to the stability of the hip, although this function is more debated [4, 19].

Labral tears were initially recognized as a potential source of hip pain in the dysplastic hip [13]. In the last decade, improvements in hip arthroscopy and the development of the concept of femoroacetabular impingement (FAI) as a cause of early damage to the hip have changed the treatment options for young patients with hip pain. As part of this process, labral pathology has received increased attention in both open and arthroscopic procedures. Animal models [22] and biomechanical studies [12] indicate that refixation can restore the labral seal and that the labrum can heal to the acetabular rim. The ultimate question, though, is the clinical outcome of labral refixation. Some have proposed that, like the meniscus in the knee, good results can also be obtained with labral debridement [1]. From the biomechanical data available about the function of the labrum, however, a reattached and functional labrum should be better for joint stability and cartilage preservation both in the short and long term following surgery. Therefore, the purpose of this paper is to summarize existing literature on the surgical treatment of labral pathology to provide

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treatment recommendations and direct future research. A systematic review was performed with the following research question in mind: Does preservation of the hip labrum improve outcomes as compared to labral debridement for the treatment of labral pathology? We hypothesized that labral refixation or labral reattachment would result in improved clinical outcomes as compared to labral debridement.

Materials and Methods

A MEDLINE literature search of articles published or in publication in English or German from January 1980 to October 2011 was performed. The following search terms were used: hip labrum, FAI, hip dysplasia, hip labral tear, labral debridement, labral resection, labral repair, labral refixation, labral reconstruction, hip arthroscopy, surgical hip dislocation, periacetabular osteotomy, and hip joint preservation. Searches were limited to studies performed in humans, and review articles were excluded. The reference lists of three recently published systematic reviews [1, 20, 25] were hand searched for additional pertinent articles. Studies were selected for inclusion if they were considered to be level I, II, or III evidence according to the system described by Wright et al. [32] and directly compared labral debridement to labral refixation. Articles were excluded if they were level IV evidence, did not use validated clinical outcomes scores to report the results of treatment, or did not specifically compare the results of labral debridement to labral refixation (Table 1). The initial search was performed by one author (LT); articles selected for inclusion were reviewed by both authors. Six studies were appropriate for inclusion [7, 15–17, 27]; however, the results for one cohort were published twice—once in English [17] and once in German [16]. The English version was selected for inclusion because the data regarding the statistical methods used in the analysis were available in the English paper but not in the German. Thus, five studies were included in this review (Table 2). The majority of abstracts reviewed were excluded for being level IV evidence or not directly comparing the outcomes of labral refixation with those for labral debridement.

Espinosa et al. [7] retrospectively compared the 2-year postoperative results of labral resection or refixation after surgical hip dislocation for treatment of femoroacetabular impingement. Clinical outcomes were assessed with Merle d'Aubigné scores [18] and range of motion on physical examination. Radiographic progression of the Tönnis grade of arthrosis [29, 30] was compared on AP pelvis radiographs obtained pre- and postoperatively.

Table 1 Search results

Phase of search	Number
Initial MEDLINE search	6,870
Review articles excluded, limited to adults only	3,439
Abstracts selected for further review	110
Articles selected for inclusion	5

Larson and Giveans [15] retrospectively compared the 1-year postoperative results after arthroscopic labral resection or labral refixation with concomitant management of FAI. Clinical outcomes were assessed with the modified Harris Hip Score mHHS [2], while the radiographic outcomes were evaluated with AP pelvis radiographs obtained pre- and postoperatively. The Tönnis grading system [29, 30] was used to quantify radiographic arthrosis.

Laude et al. [17] reported the results of hips treated for FAI with an arthroscopic-assisted mini-open anterior approach with a minimum of 28 months follow-up. The non-arthritic hip score [3] was used to compare clinical outcomes pre- and postoperatively and to compare outcomes of labral debridement and labral refixation. The authors stated that the Tönnis grade was assessed on pre- and postoperative radiographs, however no comparison of Tönnis grades between labral treatment cohorts was reported.

Philippon et al. [23] reported the 2-year outcomes of arthroscopy for the treatment of FAI. The modified Harris Hip Score [2] was used to assess clinical outcomes. The joint space was measured on preoperative anteroposterior pelvic radiographs, however, not on postoperative radiographs, and progression of arthrosis was not assessed radiographically.

Schilders et al. [27] also reported the 2-year outcomes of labral refixation as compared to labral debridement for hips undergoing arthroscopic treatment of FAI. The modified Harris Hip Score was used to assess clinical outcomes, and the score improvement preoperatively to postoperatively was compared between groups. Patients with Tönnis grade arthrosis >2 on preoperative radiographs or Outerbridge grade 4 cartilage defects seen during arthroscopy were excluded. Radiographic outcomes were not evaluated postoperatively.

Results

All five studies reported improved outcomes for patients undergoing treatment of FAI, regardless of surgical approach or outcomes measure used [7, 15, 17, 23, 27]. Three out of five studies observed statistically significant differences in clinical outcomes between patients undergoing labral refixation as compared to patients undergoing labral repair (Table 3) [7, 15, 27]. The other two studies observed a trend towards improved outcomes with labral refixation although the differences were not statistically significant [17, 23].

Radiographic outcomes were assessed in two studies. Espinosa et al. observed radiographic progression of arthrosis, with the labral debridement group having an increased Tönnis grade of arthrosis 1 year postoperatively that was stable 2 years postoperatively. The labral repair group also had mild radiographic progression of arthrosis on the 2-year postoperative radiographs, with the difference between groups being statistically significant (Table 3) [7]. Larson and Giveans also assessed postoperative radiographs for progression of arthrosis. They observed a trend toward increased Tönnis grades in the labral debridement group, although the difference between groups was not statistically significant [15].

Table 2 Articles selected for inclusion in the review

Reference (year published)	Number of hips	Level of evidence [32]	Type of surgery	Length of follow-up
Espinosa et al. (2006) [7]	35 labral refixation, 25 labral debridment	III	Open (surgical dislocation)	24 months
Larson and Giveans (2009) [15]	39 labral refixation, 36 labral debridement	III	Arthroscopic	12–36 months
Laude et al. (2009)[a] [17]	40 labral refixation, 53 labral debridement	III	Arthroscopic-assisted mini-open	28.6–104.4 months
Philippon et al. (2009) [23]	58 labral refixation, 54 labral debridment	III	Arthroscopic	16 months–2.9 years
Schilders et al. (2011) [27]	69 labral refixation, 32 labral debridment	III	Arthroscopic	2–4 years

[a] Cohort published twice

No intraoperative complications were reported in the series of open surgical dislocations by Espinosa et al. Although most patients in both groups did well, moderate or poor outcomes were only seen in the group that underwent acetabular rim trimming without labral refixation [7]. Larson and Giveans defined clinical failure in their series as an mHHS of less than 70, repeat operation for labral debridement, or conversion to total hip arthroplasty (THA). In their series, there was an 11.1% failure rate in the debridement group and a 7.7% failure rate in the refixation group, although this difference was not statistically significant. They observed three cases of heterotopic ossification in the debridement group before instituting routine nonsteroidal anti-inflammatory prophylaxis. No cases of heterotopic ossification were observed in the labral refixation group, all of whom had NSAID prophylaxis for heterotopic ossification. Two patients in the debridement group underwent revision arthroscopy for inadequate initial decompression of the osteochondroplasty, and one refixation patient underwent subsequent arthroscopic labral debridement after a repeat injury and failure of a labral suture anchor. One labral repair patient underwent conversion to total hip arthroplasty 1 year postoperatively but had a 2.5-cm^2 chondral defect at the time of the index arthroscopy [15]. Laude et al. reported 13 revision procedures in their series, with eight cases of failed labral refixation that underwent subsequent arthroscopic labral debridement and six cases that required revision osteochondroplasty. They observed an 11% conversion rate to THA (11 out of 100 hips) in the series as a whole. Other complications included one femoral neck fracture that was treated nonoperatively and healed in mild varus; two deep infections that were treated with irrigation, debridement, and antibiotics; and one case of heterotopic ossification [17]. Philippon et al. reported a 10% conversion rate to THA (10 out of 100 hips), all of whom had significantly less joint space on preoperative radiographs and moderate or poor cartilage at the time of the index arthroscopy. They also reported eight patients who showed no improvement in postoperative modified HHS but were electing not to undergo repeat surgery; the labral treatment for these patients was not mentioned. No other complications were reported [23]. Schilders et al. did not comment on complications or failures in their series [27].

Discussion

Awareness of hip labral pathology as a cause of hip pain and arthrosis has increased dramatically among both orthopedic surgeons and the general public [14]. Much is known about the biomechanical function of the labrum [4, 8–12, 19], and good outcomes have been reported for both labral debridement and labral refixation [1, 20]. Thus, this systematic review was performed with the following research question: Does preservation of the hip labrum improve outcomes as compared to labral debridement for the treatment of labral pathology? Our objective was to summarize the existing literature on surgical treatment of labral pathology to provide treatment recommendations and direct future clinical and basic science research.

Based on the literature that is currently available, clinical and radiographic outcomes appear to be slightly better after labral refixation as compared to labral debridement. The five studies included in this review treated labral tears in patients with FAI. Although we included dysplasia as a search term, no study to date has looked at the results of labral refixation as compared to labral debridement in this population.

As compared to other systematic reviews performed in recent years, the literature on labral treatment appears to have improved. We found five level III studies that directly compared outcomes following labral refixation and labral debridement. In contrast, a systematic review of arthroscopic labral treatment published in 2007 found only level IV evidence [25]. Nonetheless, the literature is still limited to short-term follow-up only. The series with the longest minimum follow-up reported results from 28.6 months [17]. Longer term follow-up is necessary to definitively address the issue of whether preservation of the labrum can prevent or slow the progression of hip arthrosis, which is one rationale for labral preservation.

Another limitation of the currently available literature is that the best studies are still only level III evidence [32]. The ideal study addressing this question would be a randomized clinical trial of labral debridement versus labral repair. Well-done randomized clinical trials are

Table 3 Summary of outcomes

Reference (year published)		Preoperative outcome scores	Final follow-up scores	Progression of arthritis	Complications or failures
Espinosa et al. (2006) [7]		Merle d'Aubigne [18]			
	Labral refixation	12 (5–16)	17 (13–18)	Tönnis gr increase from 0.5 to 0.8	None
	Labral debridement	12 (8–13)	15 (10–18)	Tönnis gr increase from 0.5 to 1.3	
Larson and Giveans (2009) [15]		Modified HHS [2]		Trend towards higher Tönnis gr in debridement pts, ns	3 cases of HO in debridement pts before NSAID prophylaxis was used routinely; 1 conversion to THA, 1 revision arthroscopy for debridement
	Labral refixation	62	94.3		
	Labral debridement	63	88.9		
Laude et al. (2009a) [17]		NAHS [3]		Not investigated	8 failed refixation, 1 femoral neck fracture, 2 deep infections, 1 case of HO, 11 converted to THA
	Labral refixation	54.8 ±12 (no distinction between groups)	86±11		
	Labral debridement		82±19[ns]		
Philippon et al. (2009) [23]		Modified HHS [2]		Not investigated	10 converted to THA at mean of 16 months postop
	Labral refixation	58 (no distinction between groups)	87		
	Labral debridement		81[ns]		
Schilders et al. (2011) [27]		Modified HHS [2]		Not investigated	No mention of complications or failures
	Labral refixation	60.2 (24–85)	93.6		
	Labral debridement	62.8 (29–96)	88.9		

HHS Harris Hip Score, *HO* heterotopic ossification, *THA* total hip arthroplasty, *ns* difference not statistically significant, *NAHS* nonarthritic hip score

difficult or impossible to carry out in many areas of surgery, given the differences in patient pathology and differences between surgeons. Furthermore, there is good evidence that most patients with labral tears have underlying bony anomalies contributing to the labral pathology [5, 31]. These must be addressed at the time of surgery to prevent recurrence or progression of the labral tear and arthrosis, further making it difficult to randomize patients to treatment groups. However, higher level studies of labral preservation also include case–control series and prospectively defined cohorts and research questions. Thus, it is possible to improve the overall level of available evidence, even if a randomized clinical trial is practically unfeasible.

Although it appears that labral refixation improves clinical and radiographic outcomes, the difference in outcomes scores is small and some patients who underwent labral refixation ultimately required revision debridement or conversion to arthroplasty. This indicates that there are still factors, including concomitant chondral pathology, that influence the clinical outcome and are incompletely understood. Furthermore, there may be technical factors that increase or decrease healing after labral refixation, including anchor placement, suture technique, and the need for acetabular rim trimming. The basic science in this area is lacking. To date, we know of one animal model that studied labral repair [22]. Thus, further studies about the time course of healing and function following labral fixation are also necessary to help optimize both intraoperative technique and postoperative care.

No long-term (>10 years) results comparing labral debridement and labral refixation have yet been published. Given what is known about the biomechanical function of the labrum, one would expect patients who undergo complete or even subtotal labral resection to progress earlier to hip arthrosis. In some respects, the acetabular labrum is analogous to the meniscus in that it has an important role in intra-articular load distribution, which subsequently protects the cartilage [6]. The long-term results of total or even subtotal menisectomy are clear, with definite progression of arthrosis as compared to patients who underwent partial menisectomy [26]. Thus, meniscal repair is strongly recommended for young patients with traumatic meniscal tears to prevent the rapid onset of arthrosis. Based on the experience with menisectomy in the knee, in combination with the important role of the labrum in maintaining the labral seal and load distribution in the hip, the long-term results of labral repair are likely to be much better than those for labral debridement.

The short-term clinical outcomes of labral refixation appear to be better than those of labral debridement, although the effect is small and follow-up is limited. Studies reporting the mid-term and long-term outcomes of both labral refixation and labral debridement are necessary to determine the progression of arthrosis following the treatment of labral pathology. To improve the

overall level of evidence in this area, future studies would, ideally, have prospectively defined cohorts as well as using validated clinical and radiographic outcomes measures.

Disclosures This systematic review did not involve the use of human or animal study subjects or data. The authors certify that no institutional review or ethical approval is required for the present study type in the authors' country.

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