Spontaneous Hip Labrum Regrowth After Initial Surgical Débridement

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Abstract

Background Anecdotal evidence from second-look hip arthroscopies and animal studies has suggested spontaneous labral regrowth may occur after débridement. However, these observations have not been systematically confirmed.

Questions/purposes We (1) determined whether labral regrowth occurs after débridement in human hips; (2) if so, described the characteristics of the reconstituted labrum; and (3) determined the association, if any, of age with the presence and quality of labral regrowth.

Methods We retrospectively reviewed all 24 patients who previously had open hip surgical dislocation with labral débridement for treatment of femoroacetabular impingement (FAI) and concomitant hip arthroscopy 2 years after

index procedure in association with planned removal of trochanteric hardware between January and December 1999. Data recorded included amount of labral resection at the index procedure using the clockface method, presence and quality of any labral regrowth, presence of any labral scarring or inflammation, and WOMAC® scores. Minimum clinical followup was 11 years (average, 12 years; range, 11–12 years).

Results All patients demonstrated labral regrowth at arthroscopy at 2 years. Homogeneous regrowth of labral height was seen in 21 of 24 patients, with labral scarring noted in four of 24. Average WOMAC® score was 98 points (range, 90–100 points) at the time of hardware removal. Increasing patient age was independently associated with decreased WOMAC® score and inhomogeneous regrowth of the labrum.

Conclusions Labral regrowth after resection was seen in all patients at 2 years from index operation. Increasing age, however, was associated with poorer quality of the reconstituted labrum.

Level of Evidence Level IV, therapeutic study. See Instructions for Authors for a complete description of levels of evidence.

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All ICMJE Conflict of Interest Forms for authors and *Clinical Orthopaedics and Related Research* editors and board members are on file with the publication and can be viewed on request. Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained. This work was performed at Clinique Montchoisi, Lausanne, Switzerland.

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Introduction

Hip pain in the athletically active population is a frequent entity [1, 5]. It has become increasingly recognized that acetabular labral tears associated with femoroacetabular impingement (FAI) are a common cause of hip pain in this group and may contribute to the formation of degenerative arthritis of the hip [18, 22]. The labrum's importance reportedly derives from its ability to increase the articular surface area and acetabular volume in addition to acting as a

seal to restrict fluid flow between the central and peripheral compartments [6–8]. This seal keeps fluid within the central compartment and allows for a more uniform distribution of forces within the hip and improved cartilage nutrition. In the damaged labrum, this sealing function is compromised, leading to inconsistent loading of the articular cartilage and diminished nutrition to chondrocytes [7, 8].

Management of FAI with associated labral pathology includes both open [9] and arthroscopic techniques [27]. When possible, preference is given to labral repair rather than débridement [15], with the goal of trying to preserve the sealing function of the labrum. Tears at the chondral-labral junction are amenable to repair as there is blood flow from the acetabulum for healing of the labral attachment site [17]. Tears within the labral substance, however, have limited healing capacity due to the labrum's relative hypovascularity [12]. These lesions commonly undergo débridement to remove this structure as a pain generator and to prevent propagation of the tear, with results demonstrating good short- and intermediate-term clinical outcomes [2–4, 21, 22].

After initial labral débridement, the senior authors (MRS, HS) have anecdotally noted labral regrowth during second-look arthroscopies. A literature search revealed a report of labral regrowth after resection in an ovine model [19], but this phenomenon has not been confirmed in humans.

We therefore (1) determined whether labral regrowth occurs in human hips; (2) if so, described the characteristics of the reconstituted labrum; and (3) determined the association, if any, of age with the presence and quality of labral regrowth.

Patients and Methods

From January to December 1999, 96 patients underwent open surgical dislocation for the treatment of FAI. All patients had toe touch partial weightbearing for 6 weeks. No particular hip mobilization exercises, such as continuous passive motion or cycling motions of the hip, were encouraged after the procedure. For this study, we included those patients who had previously undergone labral débridement at the index operation and a radiographically healed trochanteric osteotomy. Radiographic healing of the trochanteric osteotomy site was defined as osseous union on at least two separate radiographic views of the hip and/or pelvis. We excluded 70 patients who underwent labral repair or had no labral intervention during the index procedure and patients who did not consent for repeat arthroscopy at the time of hardware removal. Patients who received cheilectomy (femoral osteoplasty) or acetabuloplasty (rim trimming) during the initial index procedure were not excluded as long as they had received concomitant

labral débridement. These exclusions left 24 patients. The average age at the time of arthroscopy (2 years after index procedure) was 29 years (range, 15–57 years). There were 11 left hips and 13 right hips involved. All patients had Tönnis Grade 0 arthritis [26] on hip radiographs (no joint space narrowing) at the time of the index operation. The patients had a minimum clinical followup of 11 years (average, 12 years; range, 11–12 years).

Data recorded at the index procedure included age, sex, presence of radiographic arthritis (based on Tönnis grade), and amount and location of labrum resected based on the clockface methodology with 6 o'clock representing the transverse acetabular ligament and 3 o'clock representing directly anterior [25]. One of us (HS) graded the amount and location of labral resection at the time of index operation. The indication for labral resection was the presence of an intrasubstance labral tear. Débridements were performed through an open surgical dislocation and under direct visualization with sharp dissection. No additional procedure to promote labral regrowth was performed (ie, marrow stimulation). The average amount of labral resection was 4.2 hour units (range, 3–8 hour units) centered near the 12 o'clock position based on the clockface method.

Per the senior surgeon's (HS) protocol, all patients were followed regularly and at the 2-year interval after initial surgery and underwent routine removal of hardware at the site of the previous trochanteric osteotomy. After informed consent was obtained, those who underwent surgical removal of the trochanteric hardware agreed to undergo concomitant hip arthroscopy to evaluate the status of the previously resected labrum.

At the time of second-look arthroscopy, one of us (HS) determined the presence or absence of labral regrowth, reconstituted labral height [28], quality of labral regrowth, and presence of any labral scarring [14] or inflammation. One previous report [20] has shown moderate to substantial intraobserver reliability for the reporting of labral pathology during hip arthroscopy. Labral height was measured using a standard laser-etched arthroscopic probe with known length. The quality of regrowth was defined categorically as homogeneous (complete regrowth at the site of previous débridement) or inhomogeneous (incomplete regrowth at the site of previous débridement). Labral scarring was defined as adhesions between the labrum and capsule [14] while labral inflammation was noted if there were any signs of hyperemia within the regenerated tissue substance. WOMAC[®] scores [13] were recorded at the time of second-look arthroscopy while clinical followup (ie, need for further surgical intervention on the hip due to pain) was continued on a yearly basis.

We used parametric statistical analyses and descriptive statistics for data reporting. Regression analyses were

carried out between both age and amount of labrum resected versus WOMAC® score, presence of scarring or inflammation, and need for further surgery to the involved hip.

Results

At followup arthroscopy, all patients showed labral regrowth along the entire length of acetabular rim where the previous resection had taken place (Fig. 1).

The average reconstituted labral height was 6 mm (range, 5–8 mm). Homogeneous regrowth was seen in 21 of 24 patients, with inhomogeneous regrowth noted in three of 24 patients. Labral scarring (Fig. 2) was noted in four of 24 hips and labral inflammation in two of 24 hips. Average WOMAC® score was 98 points (range, 90–100 points) at the time of arthroscopy. One patient had concomitant labral scarring and inflammation and went on to have additional surgical intervention (THA) during the clinical followup period. There were no complications associated with the arthroscopy at 2-year followup: no nerve injuries, infections, wound complications, or deep venous thromboses.

We found no association ($p = 0.358$) between WOMAC® score and amount of labrum débridement. Age was associated with inhomogeneous regrowth ($p = 0.037$) but not with WOMAC® score ($p = 0.492$) or the presence of labral adhesions ($p = 0.084$). The amount of labrum débridement was not associated with inhomogeneous regrowth ($p = 0.343$), scarring ($p = 0.997$), or inflammation ($p = 0.775$). The WOMAC® score at the time of arthroscopy inversely correlated ($p < 0.001$) with age.

Fig. 1 An arthroscopic view from the anterolateral portal demonstrates a fully reconstituted labrum with homogeneous regrowth. The reconstituted labrum is identified with an asterisk (*) and the acetabular cartilage with a pound sign (#).

Fig. 2 An arthroscopic view of the hip shows labral regrowth with adhesions between the regenerated tissue and the capsule.

Discussion

The hip labrum serves the important functions of increasing articular surface area and providing a seal between the central and peripheral compartments. There have been reports of tendon regrowth, particularly after harvesting of hamstring tendons for ACL reconstruction [10, 16], but there have been no reports of regrowth after hip labrum débridement in humans. Anecdotal evidence has suggested labral regrowth is possible, but this has not yet been confirmed. We therefore (1) determined whether labral regrowth occurs in human hips; (2) if so, described the characteristics of the reconstituted labrum; and (3) determined the association, if any, of age with the presence and quality of labral regrowth.

Limitations of our study include the following. First, we had a small sample size, which limits the generalizability of our results. Our statistical power was limited in its ability to draw associations between age and labral scarring and/or inflammation and the risk of conversion to THA as there was only one patient who underwent THA during the clinical followup period. An a priori power analysis to mitigate this problem was not possible as there were no previous reports in the literature to guide us. Second, our followup findings are dependent on a single observer at a single time point and we are unable to assess the reliability and accuracy of these measurements. Further, as these data have not been previously reported in the literature, no prior data are available to guide us in the measure. The primary goal of the investigation, however, was to determine whether labral regrowth after débridement occurred and we believe the observations support that contention.

We found all patients demonstrated regrowth of the labrum in the area undergoing previous débridement.

Miozzari et al. [19] investigated the effects of hip loading after partial labrectomy in an ovine model. In evaluating loading biomechanics and labral histology, they found 16 of 18 hips that had undergone labrectomy showed evidence of labral regrowth with dense fibrous tissue in an anatomic distribution similar to that of the native labrum. They noted this connective tissue recreated the native triangular shape but did not possess the central band of circumferential fibers characteristic of the native labrum. They also noted the cross-sectional area of the reconstituted labrum was always larger, by roughly 130%, compared to that of the opposite control hip. Krueger et al. [14] performed hip arthroscopy for continued hip pain and dysfunction on 16 patients who had previously undergone surgical dislocation for treatment of FAI. They made no mention of labral regrowth; however, they noted 10 of the 16 patients had adhesions between the joint capsule and labrum. Synovitis was present in three hips, all of which had undergone previous labrum resection or débridement. In a separate investigation, Suzuki et al. [23] performed a combination of acetabular and femoral osteotomies on 38 hips for the treatment of dysplasia. Second-look arthroscopy was carried out an average of 18.9 months after the index procedure to evaluate the cartilage and labral changes. They found labral adhesions to the capsule in 11 of 38 hips, with patient age being a risk factor for the presence of adhesions. While we noted regrowth in all patients, this tissue was not studied biomechanically or histologically. Thus, the presence of this labral-like regrowth is of unknown biomechanical and kinematic importance. Miozzari et al. [19] showed the histologic structure of the reconstituted labrum did not contain the fiber structure of the contralateral control labrum. It is reasonable to speculate the reconstituted labrum seen in the study by Suzuki et al. [23] and in our investigation may not function as effectively as its native counterpart because of differences in histologic structure. However, the assertion that labral resection will increase intraarticular load by more than 90% [6–8] should be viewed with caution since all the hips we observed showed labral regrowth.

While age was not associated with the presence of labral regrowth, it did correlate with inhomogeneous regrowth and inversely correlated with the WOMAC[®] score. Although no previous data compare age and the quality of labral regrowth, age is reportedly associated with an increased incidence of labral lesions [11]. Kappe et al. [11] investigated the radiographs of 123 hips in patients with FAI and correlated the radiographic data with surgical findings. They found age was correlated with the presence of labral lesions and labral lesions were correlated with the presence of osteoarthritis. This is consistent with our findings as all three patients in our investigation with inhomogeneous regrowth (ages 37, 42, and 57 years) were

above the average age of patients included in this study. It is interesting to note, however, that the average height of the reconstituted labrum in this study was 6 mm, consistent with previous reports [24]. In addition, decreased WOMAC[®] scores were seen in this subgroup, supporting the previously reported associations between decreased labrum quality and increased rates of osteoarthritis and subsequent functional impairment.

Repeat arthroscopy on asymptomatic patients who had prior open labral resection is the ideal situation to assure these results. First, the patients had open resection of part of their labrum. This provided for improved visualization of bony landmarks and the opportunity to estimate the location and extent of labral pathology. Second, these patients were asymptomatic at the time of arthroscopy, an ideal population for which to investigate the parameters of interest. Arthroscopy at the second operation allowed a minimally invasive approach with minimal morbidity to assess and document the status of the labrum.

In conclusion, we found labral regrowth occurred in human hips after labral débridement. In addition, age was associated with decreased WOMAC[®] scores and inhomogeneous regrowth of the labrum. Further study is needed to determine the histologic and biomechanical properties of this regenerative tissue and long-term clinical outcome.

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