

All-suture anchors in arthroscopic acetabular labral repair: our experience

Paolo Di Benedetto^{1,2}, Giovanni Gorasso¹, Luigi Castriotta⁴, Francesco Mancuso³,
Piero Giardini¹, Araldo Causero^{1,2}

¹Clinic of Orthopaedics, Friuli Centrale Healthcare and University Trust (ASUFC) – Udine, Italy; ²DAME - University of Udine; ³ Orthopaedics and Traumatology Unit, ASUFC - Tolmezzo General Hospital, Tolmezzo (UD), Italy; ⁴ Institute of Hygiene and Clinical Epidemiology, Friuli Centrale Healthcare and University Trust (ASUFC) – Udine

Summary. *Background:* Over the past years, the role of the acetabular labrum in hip joint biomechanics and its relations with joint health has been of particular interest. There is a good clinical improvement of patients in whom the acetabular labrum is preserved during arthroscopic hip surgery. The purpose of this study is to report the results of arthroscopic repair of labral tears at a medium term follow up. *Materials and methods:* We performed a retrospective review of all cases that underwent hip arthroscopy at our Institution from January 2013 until December 2018. There were 24 patients, 13 males and 11 females, and their mean age at the time of surgery was 29, 42 years (range, 19 to 43 years). All patients were treated by the same surgeon with an extracapsular OUT-IN approach. Suture was performed using a non-absorbable suture anchor all-suture. Clinical assessment was performed at December 2019 using a modified Harris hip score (mHHS), hip outcomes score activities of daily living (HOS ADL), hip outcomes score activities of sport scale (HOS SS). All patients with acetabular labrum injury had femoro-acetabular impingement. *Results:* The mean overall values in the preoperative period were 67.21 ± 10.31 for mHHS, 70.04 ± 12.11 for HOS-ADL and 60.06 ± 14.58 for HOS-SS. The results obtained in the re-evaluations of patients in December 2019 with a mean follow-up of 38, 3 months (minimum 1 year) are on average 82.17 ± 11.36 for mHHS, 83.00 ± 12.80 for HOS-ADL and 76.09 ± 18.52 for HOS-SS. *Conclusions:* The progress of knowledge and the advancement of diagnostic and therapeutic skills has led to a greater awareness of the importance of treating acetabular labrum tears. Arthroscopic treatment with suture appear to be a good option for these patients and we had encouraging results in our center. (www.actabiomedica.it)

Key words: labral, repair, arthroscopy, hip, all-suture, anchors

Introduction

Over the past years the role of the acetabular labrum in hip joint biomechanics and its relations with joint health has been of particular interest (1, 2). This is motivated by its role in the degenerative process of hip arthritis (3), and by the significant clinical improvement of patients in whom the acetabular labrum is

preserved during arthroscopic hip surgery.

The acetabular labrum is a soft-tissue structure that lines the acetabular rim of the hip joint. In normal hip joint bio-mechanics, the labrum is essential for retaining a layer of intra-articular pressurized fluid for the lubrication of the hip joint and the load distribution (1). In a human cadaveric model, in a series of papers Ferguson et al. (4-6) demonstrate that with an

intact labrum a layer of pressurized fluid remains to last for several minutes in the articulation supporting load and keeping apart articular surfaces.

Its role of seal all around the femoral head contributes to hip stability (1). There is also a suction effect that creates an intrarticular low pressure gradient. Indeed complete partial resection was harmful, reducing distractive force by approximately 70% mean (7, 8). It was suggested that joint instability and micro instability caused by labrum insufficiency may accelerate and exacerbate degenerative changes in the labrum and cause premature cartilage degeneration. Furthermore the labrum is also important by increasing contact area between articular surfaces reducing contact stress.

Lee et al. (9) found in their *in vitro* study that labral resection decreases significantly contact area and increases significantly contact pressure relative to the intact state under 700 N compression. In the same study, after reconstruction of the acetabular labrum with iliotibial band autografts and semitendinosus allografts they were able to improve contact area and reduce contact pressure comparing with the intact state.

The acetabular labrum function can be impaired by deterioration caused as a result of hip pathologies: femoro-acetabular impingement (FAI), dysplasia, capsular laxity, acute trauma, degeneration as a result of repetitive movement at extreme ranges (10-14). More specifically, in FAI caused by cam lesion, labral tears are situated at the transition zone antero-superiorly, where the labrum divorces from the cartilage because of the impingement of the pistol grip of the neck with the labrum. In pincer impingement damage is observed antero-superiorly on the labrum itself due to linear impact between the femoral head-neck junction and acetabular rim (1, 15). Often post-traumatic labral tear is a result of a trauma involving a lot of energy and causing subluxation or dislocation of the femoral head. Commonly there is an association with chondral injuries of the femoral head or of the acetabular side (10).

This damage causes pain, a restricted range of motion and finally degenerative changes of the acetabular labrum and cartilage. In patients complaining groin pain and restriction of the range of motion of the hip labral tears are diagnosed more frequently because of the development of imaging technique like MRI, arthro-MRI and arthroscopy (16).

The hip joint may progress to osteoarthritis prematurely if the injured labrum and the underlying etiology remains untreated, indeed the treatment aims not only to treat the current pain but also to prevent the onset of a premature degenerative disease. McCarthy et al. (3) showed that there is a group of typical cartilage damage in the presence of labral tears, and they postulate that failure of the labral-chondral junction is the first event in primary degenerative arthritis of the hip. There are many therapeutic possibilities for labral tears, from a conservative treatment until surgery, nowadays arthroscopic repair is increasingly the favored option because a preserved labrum leads to a superior outcome compared with debridement and conservative treatment. (17) The aim of the study is to evaluate the short and medium term follow-up results of the acetabular labral repair.

Materials and methods

We performed a retrospective review of all cases that underwent hip arthroscopy at our Institution from January 2013 until December 2018. The same senior surgeon performed all the procedures. We included only patients with complete medical records: clinical evaluation, MRI of the affected hip, specific radiographs of the hip, pre-operation and follow-up scores.

The first visit included the anamnesis in which the patient's history, the causes of the onset of pain, the presence of trauma are deepened. The physical examination included clinical examination of the hip also with specific tests for femoro-acetabular impingement such as FADDIR, FABER, log roll test. During this visit, specific radiological scans were requested and evaluated, if already available. The radiographs required were: weight bearing pelvis in antero-posterior view, axial of the hip, frog-leg side view, false-profile view and cross-table view, and Dunn at 45° view. In addition, all patients with suspected femoro-acetabular impingement were required to have an MRI of the hip. After the evaluation of MRI, in the suspicion of an injury of the acetabular labrum, patients were asked for an arthro-MRI of the hip. One patient did the arthro-MRI and the arthro-CT (Fig.1)



Figure 1. Arthro-CT shows the lesion of the acetabular labrum (white arrow)

Two weeks before the intervention, all patients were re-evaluated and underwent a visit with the compilation of the preoperative scores.

Hip arthroscopy was performed under general anesthesia on a traction bed. Arthroscopic findings of labral tears were classified according to the classification of Lage et al. (18). FAI was confirmed by checking impingement during hip motions in arthroscopy.

There were 24 patients, 13 males and 11 females, and their mean age at the time of surgery was 29, 42 years (range, 19 to 43 years). The lesion was located on the right side in 10 cases (42%) and the left side in 14 cases (58%). The mean body mass index was 23.8 kg/m² (19.3–34.2 kg/m²).

Surgical Technique

All patients were treated by the same surgeon with an extracapsular OUT-IN approach as described in a previous article by Di Benedetto P. et al. (19). Standard portals were used with the patient lying on the traction table in general anesthesia. We do not use X-ray during this procedure. Capsulotomy was performed between the anterior and antero-lateral parts of the femur neck using an arthroscopic knife. After confirming the lesion through arthroscopy, acetabular cartilage debridement was performed and suture was performed using a non-absorbable suture anchor all-suture ICONIX (Stryker, Kalamazoo, Michigan). The all suture anchors used in this series of cases can be

applied with 1.4mm–2.4mm diameter holes, this allows less bone sacrifice and also repair of small-sized injuries.

Measurement of Clinical Outcomes

Clinical follow-up evaluations were performed at 2 weeks, 2, 4 and 12 months. Patients who did not attend visits regularly were contacted by telephone. All the patients were followed up in the post-operation by a physiotherapist who followed the instructions given by the surgeon during the clinical check-ups. Clinical assessment was performed at December 2019 using a modified Harris hip score (MHHS), hip outcomes score activities of daily living (HOS ADL), hip outcomes score activities of sport scale (HOS SS). The mean follow-up was 38,3 months (range 12 to 83 months). The clinical results were compared with preoperative values. Data were analyzed using STATA software, version 13 (StataCorp, College Station, TX). Continuous variables are presented through mean and standard deviation (SD); normality of distribution was evaluated by the Shapiro-Wilk test. Group comparisons were performed through paired t-test or Wilcoxon signed-rank test as appropriate. An α -level of 0.05 was assumed as guide for significance.

Results

Of the cohort of these 24 patients, 23 have practiced sports in their life, 18 at a high level up to the detection of groin pain. Among these athletes, 3 patients have not resumed the usual sporting activity after the operation and 5 patients have opted for activities that stressed the hip less. The other patients return to practice the same sport as previous after the rehabilitation period.

All patients with acetabular labrum injury had femoro-acetabular impingement. Specifically, 6 patients with cam-FAI, 7 with pincer type and 11 mixed. 5 patients had acetabular chondral lesions of grade greater than 2 according to Outerbridge classification.

The arthroscopic treatment lasted 78 minutes on average, with a minimum of 56 minutes and a maxi-

mum of 103. The surgical procedure has always included the suture of the labrum, but also the treatment of the femoro-acetabular impingement through the rim trimming of the acetabular edge and the osteochondroplasty of the femoral head-neck junction according to the specific case.

It was investigated, during the re-evaluations, even if the patients had successfully completed the rehabilitation program. In 16 cases, no further procedures were needed, in other 8 cases additional physiotherapy was necessary, usually for a contracture of the iliopsoas muscle, which caused painful symptoms. 4 patients, after arthroscopic and rehabilitative treatment, continue to take NSAIDs as needed, 3 of whom were affected by cartilage injuries found during arthroscopy.

None of the patients included in this study needed a revision of the arthroscopic hip surgery or had to undergo a joint prosthesis.

The overall values of the three scores analyzed are mean in the preoperative period 67.21 ± 10.31 for mHHS, 70.04 ± 12.11 for HOS-ADL and 60.06 ± 14.58 for HOS-SS. (Tab.1)

The results obtained in the re-evaluations of patients in December 2019 with a mean follow-up of 38, 3 months are on average 82.17 ± 11.36 for mHHS, 83.00 ± 12.80 for HOS-ADL and 76.09 ± 18.52 for HOS-SS. (Tab. 2-3)

By comparing these results with those obtained from the pre-operative questionnaires, it can be seen that all patients significantly ($p < 0.001$) improved their score in the three different scales. Comparing between those of different degrees of improvement it results that 6 patients had a lesser benefit than the others from the operation, this minor improvement was not statistically significant, however 4 of the 5 patients with cartilage lesion found during arthroscopy are part of this group.

Discussion

The treatment of acetabular labrum lesions is constantly evolving (17). There are several approaches, ranging from conservative treatment to debridement, or repairing the lesion, from 2010 was described also reconstructing the acetabular labrum (20). Even within the surgical options there are both open and arthroscop-

Table 1. Results of m-HSS, HOS-ADL and HOS-SS score in the preoperative period

PRE-SURGERY			
Patient	mHHS	HOS-ADL	HOS-SS
1	59.40	77.94	47.22
2	77.00	76.47	83.33
3	60.50	58.82	50.00
4	64.90	80.88	69.44
5	82.50	82.35	75.00
6	63.80	50.00	59.37
7	57.20	47.06	30.55
8	67.10	73.53	72.22
9	79.20	85.29	61.11
10	77.30	72.06	69.44
11	48.40	67.64	58.33
12	73.70	67.64	44.44
13	58.40	77.94	47.22
14	76.00	76.47	82.33
15	60.50	58.82	51.03
16	64.90	81.88	69.44
17	83.50	82.35	75.00
18	62.80	51.00	59.37
19	54.20	47.06	30.55
20	67.10	71.53	72.53
21	76.20	86.29	62.11
22	79.30	71.06	69.44
23	48.40	67.64	57.33
24	70.73	69.12	44.66
<i>mean</i>	<i>67.21</i>	<i>70.04</i>	<i>60.06</i>
<i>SD</i>	<i>10.31</i>	<i>12.11</i>	<i>14.58</i>

ic approaches. Currently the tendency is to privilege arthroscopic treatment to open one, whenever possible.

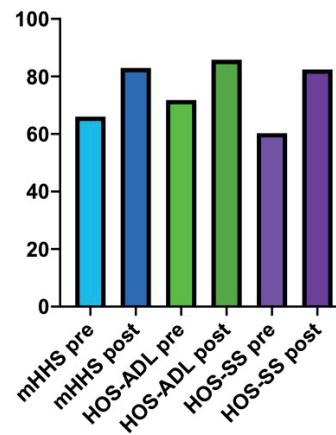
Conservative treatment includes the use of NSAIDs, painkillers, intra-articular infiltrations and FKT (21). The infiltrations can be of corticosteroids, hyaluronic acid or PRP. (22) Surgical treatment with arthroscopy is reported in the literature to be superior (21, 23) however the conservative one is always acceptable for all patients who cannot undergo surgery. In our center, we reserve conservative treatment only for pa-

Table 2. Results of m-HSS, HOS-ADL and HOS-SS score in the post-operative evaluation

POST-SURGERY			
Patient	mHHS	HOS-ADL	HOS-SS
1	70,40	83,82	64,77
2	84,70	91,18	88,89
3	73,70	73,52	58,56
4	73,70	95,53	95,00
5	95,70	86,76	88,89
6	68,20	60,29	71,41
7	64,90	55,88	36,11
8	93,50	92,64	95,67
9	82,50	97,05	86,11
10	100,00	88,24	80,56
11	81,40	84,38	83,33
12	92,40	82,35	52,78
13	71,40	84,82	63,77
14	86,70	92,18	88,08
15	75,70	75,52	67,56
16	74,70	99,21	99,52
17	96,70	87,76	89,26
18	67,20	61,29	73,41
19	65,90	56,88	37,11
20	94,50	91,64	92,67
21	84,50	96,05	97,11
22	98,76	89,24	82,56
23	83,40	84,38	82,33
24	91,40	81,35	50,78
<i>mean</i>	<i>82,17</i>	<i>83,00</i>	<i>76,09</i>
<i>SD</i>	<i>11,36</i>	<i>12,80</i>	<i>18,52</i>

tients who decide not to undergo surgery or in those in which it is contraindicated.

Debridement of the acetabular labrum was the treatment of choice before the advancement of the technique allowed suturing and reconstruction. The results reported in the literature (24-27) show that suturing is a better treatment, probably because it restores the structure and therefore the function of the labrum, thus delaying osteoarthritis. Indeed, in studies that examine patients undergoing removal of the acetabular labrum at a long follow

Table 3. Pre and post-operative results of mHHS, HOS-ADL and HOS-SS score.**Pre- and post-operative scores**

up there is a considerable progression towards osteoarthritis and hip replacement (28). However, our follow up is not so long-term to be able to compare the results adequately. The repair by suture of the acetabular labrum lesions in arthroscopy seems to be the most successful option in literature to date (25-27), perhaps because it is associated with surgical acts that are also therapeutic for the resolution of the FAI, treating so both the lesion and one of the most frequent causes of the lesion.

As regards the reconstruction of the acetabular labrum, there is a heated debate in the literature about the indications even if the results appear encouraging both in high demand groups such as athletes (29) and in older patients (30, 31). In our cohort, no patients have been offered this treatment.

The results of our center have been compared with other works in the literature which report their own data analytically in their publications (32-35). The values found in our study are comparable with the results reported in the literature. Regarding the pre and post-operative HOS-ADL scale, results are consistent with those reported in literature, for HOS-SS, on the other hand, our findings are slightly lower than that reported by other studies both in the pre and post-operative period. Although there is a difference, this is present both in the pre and post-operative, while maintaining an improve-

ment in the score between pre and post-operative similar to the various patients and comparable to that obtained from the other studies. (32-35)

Various studies report a rate of surgical re-intervention, arthroscopic or not (31-36). In our series, no patients have undergone to a second surgery. We attribute this difference both to the low sample size compared to the other studies and to the follow up which is not particularly prolonged. However, we believe that in addition to the experience of the surgeon, the scrupulousness with which the surgical indication and the postoperative checks with close monitoring of the rehabilitation protocol is also important.

Our study has several limitations, including the fact of being a retrospective study, the number of the patients, not having considered further variables in the selection and classification of patients and finally the post-operative scores do not take into account the follow-up period which is different for the various patients.

Conclusions

In recent years, the progress of anatomical and pathophysiological knowledge and the advancement of diagnostic and therapeutic skills has led to a greater awareness of the importance of treating acetabular labrum tears.

The acetabular labrum plays an important role in the increase of the articular surface, in the best distribution of forces and thanks to its seal function, with the formation of negative pressure, improves the optimal functioning of the joint, ensuring an increase in joint longevity.

The suture of the acetabular labrum in arthroscopy is a therapy capable of significantly improving the symptomatology of the patients, being able, unlike debridement, to restore the functions of the labrum. In addition, arthroscopy often allows to resolve, together with the laceration of the labrum, also the femoroacetabular impingement, the most frequent cause of the pathology.

The results we obtained proved to be in line with the main studies reported in the literature concerning this procedure. Furthermore, it would certainly be interesting to re-evaluate patients at different times and for a longer post-operative period of time, to obtain a longer and more homogeneous follow-up, which can define more

precisely the effectiveness of the treatment.

In the coming years, it is hoped that the suture of the acetabular labrum will become an increasingly common procedure, guaranteeing a more favorable prognostic evolution, thanks to an early diagnosis of these lesions that, although frequent, to date are often overlooked

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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Correspondence:
Paolo Di Benedetto, MD, PhD
Clinica Ortopedica
Dipartimento di Area Medica – Università degli Studi di Udine
Azienda Sanitaria Universitaria Friuli Centrale di Udine
P.le S.Maria della Misericordia, 15 - 33100 Udine
Tel. +39 0432 559464
Fax +39 0432 559298
E-mail: paolo.dibenedetto@uniud.it