Original Research

Comparison of Knotless Versus Knot-Tying Suture Anchors for Arthroscopic Repair of Hip Labral Tears

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Background: Both knotless and knot-tying anchors are commonly employed in the arthroscopic repair of hip labral tears.

Purpose: To compare the midterm clinical results of arthroscopic hip labral repair using knot-tying versus knotless suture anchors.

Study Design: Cohort study; Level of evidence, 3.

Methods: Patients who underwent arthroscopic hip labral repair between January 2017 and January 2021 and who had at least 2 years of follow-up were included. The patients were divided into 2 groups based on the suture anchor type: a 2.9-mm knotless suture anchor (knotless group) or a 1.8-mm knot-tying suture anchor (knot-tying group). All patients underwent femoroplasty for cam lesions and acetabular rim trimming for pincer lesions. The modified Harris Hip Score (mHHS), Hip Outcome Score–Sport-Specific Subscale (HOS-SSS), Hip Outcome Score–Activities of Daily Living (HOS-ADL), 12-item International Hip Outcome Tool (iHOT-12), and visual analog scale (VAS) for pain were administered both preoperatively and postoperatively. The consistency of the outcome scores was assessed using the minimal clinically important difference and Patient Acceptable Symptom State. The statistical significance between groups was evaluated using the Mann-Whitney test and quantile-based analysis of variance.

Results: A total of 413 patients were included: 256 patients in the knotless group (median age, 35 years [interquartile range, 31-38 years]; median follow-up, 34 months) and 157 patients in the knot-tying group (median age, 34 years [interquartile range, 30-38 years]; median follow-up, 25 months). There were no significant differences in postoperative mHHS, HOS-ADL, or iHOT-12 scores between the 2 groups. However, there were significant differences, favoring the knotless group over the knot-tying group, in postoperative HOS-SSS (87 $\pm$ 2 vs 86 $\pm$ 1, respectively) and VAS pain (1 vs 2, respectively) scores ($P < .0001$ for both). Postoperative synovitis was found in significantly more patients in the knot-tying group than in the knotless group (17 vs 5, respectively; $P = .01$).

Conclusion: In this study, patients who underwent arthroscopic hip labral repair with knotless suture anchors had slightly better postoperative HOS-SSS and VAS pain scores and a lower incidence of postoperative synovitis compared with patients who underwent repair with knot-tying suture anchors.

Keywords: hip arthroscopic surgery; hip labral tears; femoroacetabular impingement syndrome; knotless anchors; knot-tying anchors; clinical outcomes

The anatomic and biomechanical importance of the acetabular labrum has been well established.[20,24] The labrum's triangular cross-sectional geometry allows for improved contact with the femoral head and increases the volume of the acetabulum, thereby playing a critical role in hip function and preservation. This creates a perfect suction seal, facilitates lubrication, and enhances cartilage nutrition; additionally, the labrum contributes to stability, load bearing, and the slow consolidation of cartilage.[11,28] The most common cause of labral injuries is femoroacetabular impingement.[33] Over the past decade, the use of surgical interventions for femoroacetabular impingement has increased 25 fold because of mounting evidence supporting the effectiveness of surgical treatment.[25]

Various techniques have been described for treating the hip labrum, such as arthroscopic debridement, partial

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labrectomy, repair, and even reconstruction.[4,14,18,28] While nonanatomic treatment approaches have been reported in the literature, studies have shown that attempting to restore the hip labrum's geometry leads to better outcomes.[14,17] Jackson et al[14] found no difference in clinical outcomes after labral repair with knotless suture anchors versus knot-tying suture anchors. Knotless anchor repair has several potential advantages such as secure placement and practical usage.[2,28,30] Because even experienced surgeons may encounter difficulties with knot tying, as it is a challenging technique, knotless anchors have the potential to streamline the process and potentially shorten operative times.[15,26,28] Furthermore, using knotless anchors can eliminate knot-related suture reactions, which may be a cause of postoperative synovitis, adhesions, or abrasions.[2,3,7,27] On the other hand, one disadvantage of knotless anchors is the potential for gap formation between soft tissue and bone.[8,26] Also, when treating a torn labrum, the knot-tying technique, which allows for adjusting the knot's tension, may be easier to manage.[2,26] Consequently, both repair techniques have their own set of advantages and disadvantages.

While numerous biomechanical studies have compared knot-tying and knotless suture anchors in shoulder surgery, there is limited research in the context of arthroscopic hip labral repair.[8] Hence, the objective of this study was to evaluate the midterm clinical outcomes of knot-tying and knotless suture anchors in the arthroscopic treatment of hip labral tears. Our hypothesis was that there would be no significant difference in terms of clinical outcomes and complications between knotless and knot-tying suture anchors at a minimum follow-up of 2 years.

METHODS

Patient Selection

After institutional review board authorization was obtained for the study protocol, a retrospective analysis of patients who underwent hip arthroscopic surgery with labral repair at a single institution between January 2017 and January 2021 was performed. Patients were required to have a minimum follow-up of 2 years to be included. Patients were excluded if they had a history of ipsilateral hip surgery; a lateral center-edge angle $\leq 25°$; Tönnis grade >1; a hip labrum size <3 mm; or previous hip conditions such as neoplastic diseases, fractures, avascular necrosis, Legg-Calve-Perthes disease, slipped capital femoral epiphysis, infectious diseases (septic joint), inflammatory diseases, and connective tissue diseases.

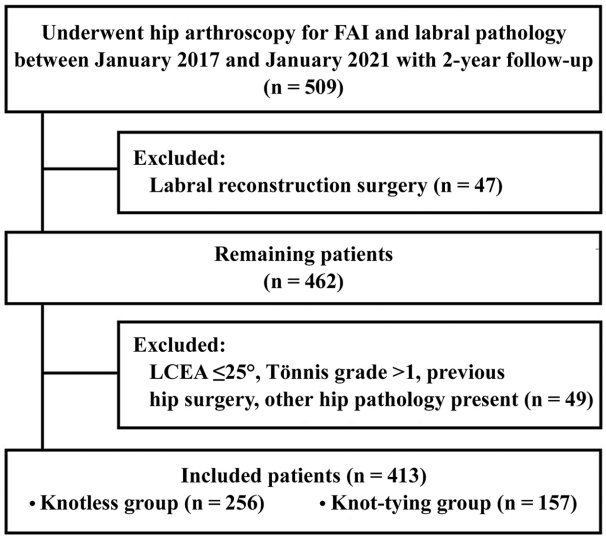

Figure 1. Flowchart of the patient- selection process.

All patients had undergone nonoperative therapy including rest, medications, and physical therapy for symptoms, with or without corticosteroid and hyaluronic acid injections. Patients who were refractory to at least 6 months of nonoperative treatment were recommended for arthroscopic surgery.

Of 509 patients who were considered, we included 413 patients: 256 patients who underwent surgery using knotless suture anchors (knotless group) and 157 patients who underwent surgery using knot-tying suture anchors (knot-tying group) (Figure 1).

Radiographic Evaluation

Before all procedures, patients underwent a radiographic evaluation that included an anteroposterior pelvic view to determine the stage of osteoarthritis (according to the Tönnis classification) and to measure the lateral center-edge angle (according to the Wiberg method modified by Ogata et al[23]); 45° Dunn view to measure the alpha angle, AP pelvis view to measure the Lateral center-edge angle and and false-profile view to measure the anterior center-edge angle. In addition, the patients underwent computed tomography to detail pincer and cam deformities.[5,22]

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Ethical approval for this study was obtained from Acibadem University (ref No. ATADEK-2023/14).

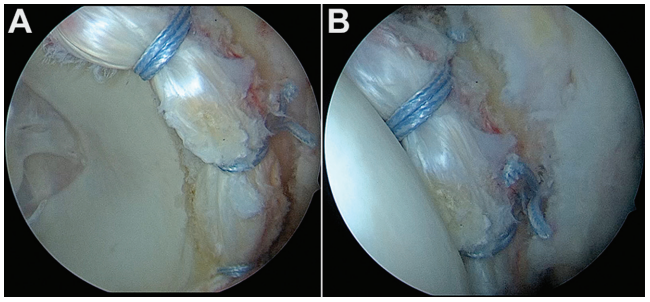

Figure 2. (A) Intraoperative arthroscopic image of a labrum that was anatomically repaired with 2.9-mm knotless biocomposite anchors (Arthrex). (B) Efficacy of the suction seal after the release of traction after labral repair with knotless anchors.

Magnetic resonance imaging was used to diagnose labral and chondrolabral junction abnormalities.

Surgical Procedure

Hip arthroscopic surgery was performed using the Hip Distraction System (Arthrex) with the patient in a modified supine position. The 3-portal approach was used (anterolateral, midanterior, and distal anterolateral), and a posterolateral portal was added when necessary. A diagnostic arthroscopic examination was always performed to assess labral, cam, and pincer abnormalities. Intraoperatively, the labrum was categorized according to the classification system of Seldes et al[29] and the acetabular labrum articular disruption (ALAD) grading system.[19] All cases required femoroplasty for cam lesions and acetabular rim trimming or acetabuloplasty for pincer lesions. Microfracture was performed based on surgeon preference. In the knotless group, the labrum was anatomically repaired with 2.9-mm knotless biocomposite hard-body anchors (Arthrex) (Figure 2), and in the knot-tying group, the labrum was repaired with 1.8-mm knot-tying Q-FIX soft-body anchors (Smith+Nephew) (Figure 3).

The number of anchors used for each patient ranged from 3 to 7. The labral loop technique and labral base technique was used to repair all labrums. Capsule repair was carried out in all patients, and the distal leg was completely repaired according to a recent study.[31] The surgical procedures were performed by 2 highly experienced surgeons (A.K., B.K.) who specializes in high-volume hip arthroscopic surgery, each with a track record of more than 500 cases before the commencement of this study.

Postoperative Rehabilitation

The postoperative rehabilitation protocol was standardized for all patients in both groups. Physical therapy was initiated during the first postoperative week with active and passive range of motion exercises. Toe-touch weightbearing was allowed immediately after surgery with the use of forearm crutches and continued for 2 weeks

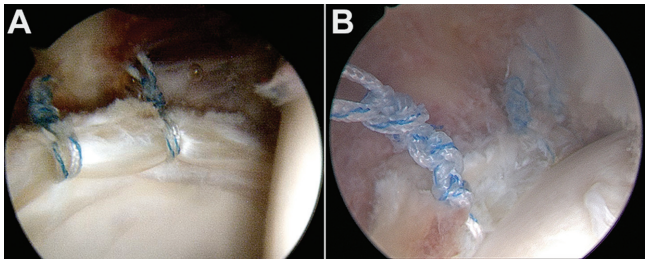

Figure 3. (A) Intraoperative arthroscopic image of a labrum that was repaired with 1.8-mm knot-tying Q-FIX anchors (Smith+Nephew). (B) Efficacy of the suction seal after the release of traction after labral repair with knot-tying anchors.

postoperatively. Physical therapy was continued for 4 to 6 weeks, focusing on strengthening exercises and functional activities. In addition, all patients were prescribed oral anti-inflammatory drugs twice a day to manage pain and inflammation and for prophylaxis of heterotopic ossification. The medications were continued for 2 weeks postoperatively. Patient-reported outcomes were collected at postoperative visits of 3, 6, 9, and 12 months and yearly thereafter.

Data Collection

We collected patient-reported outcomes recorded preoperatively and postoperatively at a minimum 2-year follow-up. The outcome scores included those for the modified Harris Hip Score (mHHS), the Hip Outcome Score–Sport-Specific Subscale (HOS-SSS) and Hip Outcome Score–Activities of Daily Living (HOS-ADL), the 12-item International Hip Outcome Tool (iHOT-12), and the visual analog scale (VAS) for pain.[1] The minimal clinically important difference (MCID) and Patient Acceptable Symptom State (PASS) were used to assess the consistency of outcome scores. The MCID was calculated as half of the standard deviation for each group.[21] The PASS was calculated using the optimal cutoff that yielded the best accuracy metric.[32]

Statistical Analysis

The data were analyzed using R statistical software (R version 4.2.1; R Foundation for Statistical Computing) with the *GFD* (general factorial design) and *cutpointr* packages.[12] The data were presented as the frequency and percentage for the categorical variables and the median with interquartile range (IQR) for the continuous variables. The Anderson-Darling and Shapiro-Wilk tests were performed to check if the continuous variables were normally distributed. The chi-square test of homogeneity was performed on the categorical variables to compare the proportions of responses from the 2 groups. The statistical significance between groups was determined using the Mann-Whitney test and quantile-based analysis of variance.[9,32] Quantile-based analysis of variance provides inference procedures suitable for factorial designs with

TABLE 1
Patient Characteristics and Preoperative Radiological Measurements[a]

	Knotless Group (n = 256)	Knot-Tying Group (n = 157)	*P*
Female sex, n (%)	122 (47.7)	77 (49.0)	.78
Age, y	35 (31-38)	34 (30-38)	.46
Body mass index, kg/m^2	24 (23-28)	24 (22-26)	.16
Follow-up, mo	34 (31-38)	25 (24-26)	**.01**
Anterior center-edge angle, deg	32 (31-35)	32 (30-36)	.11
Alpha angle, deg	58 (56-62)	58 (55-62)	.16
Lateral center-edge angle, deg	33 (31-34)	32 (30-33)	.49

[a]Data are presented as median (interquartile range) unless otherwise specified. Boldface *P* values indicate a statistically significant difference between groups ($P < .05$).

TABLE 2
Intraoperative Findings[a]

	Knotless Group (n = 256)	Knot-Tying Group (n = 157)	*P*
ALAD grade			.93
0	33 (12.9)	18 (11.5)	
1	101 (39.5)	62 (39.5)	
2	94 (36.7)	60 (38.2)	
3	27 (10.5)	17 (10.8)	
4	1 (0.4)	0 (0.0)	
Seldes type			.56
1	146 (57.0)	85 (54.1)	
2	110 (43.0)	72 (45.9)	
Labrum size			.92
3-5 mm (labral loop technique)	109 (42.6)	70 (44.6)	
>5 mm (labral base technique)	147 (57.4)	87 (55.4)	

[a]Data are presented as n (%). ALAD, acetabular labrum articular disruption.

any linear combinations of quantiles that do not require normality and homoscedasticity or homogeneity.[9] The IQR and median were used to examine the statistical significance of the continuous variables. $P > .05$ indicated a normal distribution, and differences were considered statistically significant at $P < .05$.

RESULTS

The patients in both the knotless and knot-tying groups had similar characteristics, and the radiological measurements were also similar between groups (Table 1). The knotless group had a significantly longer follow-up duration than the knot-tying group (median, 34 vs 25 months, respectively; $P = .01$). The median number of anchors used was 4 (IQR, 3-7) in both groups.

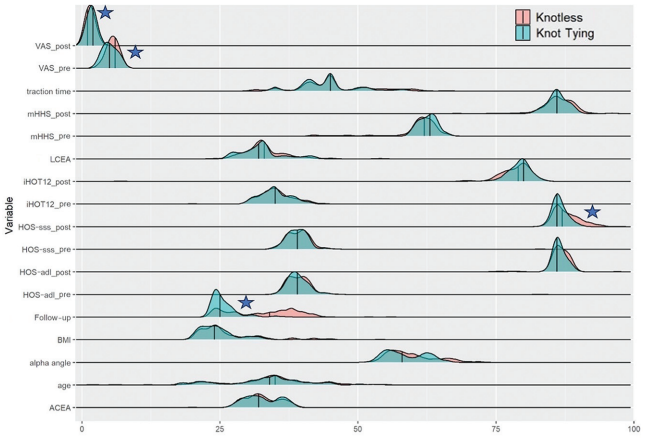

Figure 4. Distribution of study variables between the knotless and knot-tying groups. Stars represent statistically significant differences between groups ($P < .05$).

Intraoperative Findings

Table 2 presents the intraoperative findings. The majority of patients in both groups had Seldes type 1 tears, and the largest proportion of patients had grade 1 ALAD cartilage damage. There were no differences between groups in terms of ALAD grades of cartilage damage or Seldes types of labral tears.

The median traction time was 45 minutes (IQR, 41-50 minutes) in the knotless group and 52 minutes (IQR, 41-55 minutes) in the knot-tying group, with no significant difference between groups ($P = .66$). All patients in the knotless group (n = 256) underwent cartilage debridement with microfracture for focal cartilage lesions at the acetabulum, femoral head, or both compared with 129 patients (82.2%) in the knot-tying group ($P < .01$).

Patient-Reported Outcomes

Statistically significant improvements were seen in both groups in terms of preoperative versus postoperative scores on the mHHS, HOS-ADL, HOS-SSS, iHOT-12, and VAS pain ($P < .01$ for all), as shown in Figure 4. There were small but significant differences, favoring the knotless group over the knot-tying group, in postoperative HOS-SSS (87 ± 2 vs 86 ± 1, respectively) and VAS pain (1 vs 2, respectively) scores ($P < .0001$ for both) (Table 3 and Figure 4).

MCID and PASS

The rates of MCID and PASS achievement for the outcome measures are shown in Table 4. Almost all patients achieved the MCID, regardless of the technique of surgery. The percentages of patients who achieved the PASS for the HOS-ADL, HOS-SSS, mHHS, and iHOT-12 were similar between the groups; however, a considerably greater percentage of patients achieved the PASS for the VAS pain

TABLE 3
Patient-Reported Outcome Scores[a]

	Knotless Group	Knot-Tying Group	P
VAS pain			
Preoperative	6 (5-6)	5 (4-6)	**<.0001**
Postoperative	1 (1-2)	2 (1-2)	**<.0001**
HOS-ADL			
Preoperative	39 ± 3 (38-41)	39 ± 2 (38-40)	.06
Postoperative	86 ± 2 (86-88)	86 ± 2 (86-87)	.06
HOS-SSS			
Preoperative	39 ± 3 (38-40)	39 ± 2 (38-40)	.41
Postoperative	87 ± 2 (86-89)	86 ± 1 (86-87)	**<.0001**
mHHS			
Preoperative	62 (61-63)	63 (61-64)	.11
Postoperative	86 (85-88)	86 (85-87)	.06
iHOT-12			
Preoperative	35 (33-37)	35 (33-37)	.60
Postoperative	79 (77-80)	80 (78-80)	.15

[a]Data are presented as mean (95% CI) or mean ± SD (95% CI). Boldface *P* values indicate a statistically significant difference between groups ($P < .05$). HOS-ADL, Hip Outcome Score–Activities of Daily Living; HOS-SSS, Hip Outcome Score–Sport-Specific Subscale; iHOT-12, 12-item International Hip Outcome Tool; mHHS, modified Harris Hip Score; VAS, visual analog scale.

TABLE 4
Rates of MCID and PASS Achievement[a]

	Knotless Group (n = 256)		Knot-Tying Group (n = 157)	
	MCID	PASS	MCID	PASS
VAS pain	255 (99.6)	118 (46.1)	152 (96.8)	102 (65.0)
HOS-ADL	256 (100.0)	254 (99.2)	157 (100.0)	156 (99.4)
HOS-SSS	256 (100.0)	251 (98.0)	157 (100.0)	153 (97.5)
mHHS	256 (100.0)	255 (99.6)	157 (100.0)	154 (98.1)
iHOT-12	256 (100.0)	254 (99.2)	156 (99.4)	156 (99.4)

[a]Data are presented as n (%). HOS-ADL, Hip Outcome Score–Activities of Daily Living; HOS-SSS, Hip Outcome Score–Sport-Specific Subscale; iHOT-12, 12-item International Hip Outcome Tool; MCID, minimal clinically important difference; mHHS, modified Harris Hip Score; PASS, Patient Acceptable Symptom State; VAS, visual analog scale.

in the knot-tying group (65.0%) compared with the knotless group (46.1%).

Complications

Complications were seen in 30 patients in the knotless group and 39 patients in the knot-tying group. There were no significant differences observed between the groups in terms of complications, which included paresthesia, perineal skin injuries, stiffness, and suture reactions. However, a statistically significant difference between the groups was found in the occurrence of synovitis (Table 5). At 6 months postoperatively, 22 patients (5 in the knotless group, 17 in the knot-tying group) with unresolved pain underwent magnetic resonance imaging and were diagnosed with synovitis. These patients received ultrasound-guided injections of 1 mL of corticosteroids and 1 mL of local anesthetics. Subsequently, revision hip arthroscopic surgery was performed in patients in whom patient-reported outcome scores did not improve at 12-month follow-up (1 in the knotless group, 5 in the knot-tying group).

TABLE 5
Complications[a]

	Knotless Group (n = 30)	Knot-Tying Group (n = 39)	P
Paresthesia	11	4	.07
Perineal skin injury	2	3	.65
Stiffness	7	2	.09
Suture reaction	5	13	.06
Synovitis	5	17	**.01**

[a]Data are presented as No. Boldface *P* values indicate a statistically significant difference between groups ($P < .05$).

DISCUSSION

The most significant finding of this study is that both knot-tying and knotless suture anchors led to notable improvements in outcomes after labral repair. There were no significant differences observed in clinical and radiological outcomes between the 2 groups, except for minor improvements in postoperative VAS pain and HOS-SSS scores, which favored the knotless group. It is postulated that the significant difference in these outcomes may be attributed to discomfort due to synovitis, which may occur more frequently with knot-tying suture anchors. It is also important to note that the knot-tying group had a greater rate of PASS achievement for the VAS pain compared with the knotless group (65.0% vs 46.1%, respectively). Considering the differences in synovitis rates and minor differences in postoperative VAS pain and HOS-SSS scores, the knotless technique is a secure and low-profile repair option without the complexities associated with the knot-tying technique in hip arthroscopic surgery. These findings highlight the efficacy and advantages of knotless suture anchors in hip labral repair, providing improved patient outcomes and minimizing complications. These findings also highlight the recommendation for using knotless anchors, particularly in high-level athletes.

Almost all patients achieved the MCID, regardless of the surgical technique used. However, there were slight differences in achievement of the MCID for certain outcome measures. Specifically, both groups for the VAS pain and the knot-tying group for the iHOT-12 came very close to achieving the MCID at 100% but fell slightly short. When comparing the proportions of patients who achieved the PASS, they were similar for the HOS-ADL, HOS-SSS, mHHS, and iHOT-12 and were all >97% with both

techniques of surgery. The only notable difference was observed in the percentage of patients who achieved the PASS for the VAS pain, which was in favor of the knotless group and which may not be clinically important .

The primary objective of arthroscopic hip labral repair is to re-establish the suction seal and restore the labrum to its anatomic location. The labral loop technique, which fully encloses the labrum, was thought to have potential drawbacks that could compromise the suction seal. In contrast, the labral base technique was considered a safer option.[17] However, previous research has demonstrated that the labral base approach may not always be feasible or could result in additional labral tears, especially in cases in which the labrum is thin.[5,10,13,22] Jackson et al[14] demonstrated that labral base repair and circumferential suture repair have similar outcomes at 2 years of follow-up. In the present investigation, we found that the suction seal effect was not compromised by the labral loop technique, there was no development of arthritis, both techniques performed well, and there was no significant difference in patient-reported outcome scores.

Previous research has predominantly focused on the labrum of the shoulder.[15] Yet, in a study related to hip arthroscopic surgery by Lee et al,[16] it was reported that knot-tying anchors presented a technical challenge even for experienced surgeons because of limitations associated with the implant, such as the use of thick suture material surrounding the labrum. However, that comparative study had a limited number of participants, preventing definitive conclusions from being drawn. In our comprehensive comparative study, which involved a large number of participants, we did not encounter any technical issues while utilizing either type of anchor. In addition, we did not observe gap formation between soft tissue and bone in any case. Our findings revealed that knotless anchors were more easily applied in anatomically appropriate areas, resulting in shorter surgical and traction times. Although we observed a shorter duration of traction time with the knotless anchors, we were unable to establish a statistically significant difference between the 2 types of anchors ($P = .66$). Less experienced surgeons may have more significant time differences between the 2 anchor types because of the technically demanding knot tying associated with knot-tying anchors.

To the best of our knowledge, only one study by Rhee et al[26] has examined the short-term clinical results of arthroscopic hip labral repair using knot-tying and knotless suture anchors. The authors concluded that there were no clinical and radiological differences between knotless and knot-tying anchors in the treatment of hip labral tears.[26] Byrd et al[6] reported that using smaller anchors can reduce complications such as joint perforation. Ismailoglu et al[13] and Rhee et al[26] emphasized the importance of the angle of orientation to the acetabulum in hip labral repair to prevent anchor penetration into the joint and potential injuries to anatomic structures at risk. Despite these concerns, we were able to successfully perform hip labral repair using both types of anchors without any case of joint penetration or vascular injuries, which does not confirm the potential superiority of the 1.8-mm knot-tying Q-FIX anchors over the 2.9-mm knotless biocomposite anchors. To overcome possible joint and pelvic penetration, a perpendicular reference line was used, which was defined by Ismailoglu et al.[13] According to this perpendicular reference line, the drill bit was directed toward the joint minimally by 4° to avoid extra-articular perforation and maximally by 30° to avoid intra-articular perforation.[13]

Safran et al[28] conducted a biomechanical study that revealed variations in load displacement among 6 different knotless anchors and a single knot-tying anchor. Their study did not include the 1.8-mm Q-FIX anchor but included the 2.9-mm Arthrex anchor among the knotless anchors. The 2.9-mm PushLock (Arthrex) exhibited the highest stiffness, along with the SpeedLock HIP (Arthro-Care) and the Knotilus (Stryker). While Safran et al[28] described eyelet failure (failure of the locking mechanism) as a potential mode of failure for knotless designs, the present clinical study exhibited a negligible pullout rate for both types of anchors that we studied.

Domb et al[10] highlighted potential pitfalls in hip labral repair, such as overcompression with the labral loop technique or labral base technique in cases of a thin hip labrum or instrument-induced large holes in the labrum. However, Suarez-Ahedo et al[30] asserted that these complications can be effectively addressed through the implementation of a controlled-tension labral anatomic technique with knotless anchors. Even after 2-year follow-up in our study, no differences in patient-reported outcomes were observed, and there were no signs of arthritic changes. While the use of knot-tying anchors seldom resulted in overcompression of the labrum, it did not lead to arthritic changes. In contrast, the knotless anchor approach did not exhibit occurrences of overcompression. Nevertheless, in the present study, no statistically significant difference was observed between the 2 groups during the 2-year follow-up period except for postoperative VAS pain and HOS-SSS scores, which favored the knotless group. It is assumed that the significant difference in these outcomes may be attributed to discomfort due to synovitis that may be induced by the knot-tying anchors. Parallel to these results, there was a statistically significant difference in the occurrence of synovitis, with a greater incidence in the knot-tying group .

Strengths and Limitations

This study fills an important gap in the existing literature by providing valuable clinical insights into the performance and outcomes of knotless versus knot-tying anchor types. First, we conducted a comprehensive comparison of outcomes between the knotless and knot-tying anchor types, offering data on their performance within a large sample size, which increased the statistical strength and value of the study. Second, we employed a minimum 2-year follow-up period, ensuring a robust assessment of outcomes over an extended time frame. Furthermore, we carefully controlled for potential confounding factors by ensuring similarity between the study groups at baseline.

The present study has limitations that must be disclosed. It is important to acknowledge that as a nonrandomized trial, there is a possibility of extraneous factors that influenced the results. While our study had a minimum follow-up period of 2 years, longer term follow-up is necessary to evaluate the durability and sustainability of the observed outcomes. Additionally, it is worth noting that our analysis was based on patients treated by 2 high-volume surgeons specializing in hip arthroscopic surgery with extensive experience in knot-tying and knotless anchors, which may limit the generalizability of the findings. Therefore, further research with a longer term follow-up and a more diverse patient population is warranted to validate our findings and enhance the generalizability of the results.

CONCLUSION

The findings of this study suggest that both knotless and knot-tying anchors are reliable and effective solutions for arthroscopic repair of the hip labrum. While there was no significant difference in most postoperative patient-reported outcomes, the knotless group did have significantly better postoperative HOS-SSS and VAS pain scores and a lower incidence of postoperative synovitis compared with the knot-tying group. Knotless anchors can offer a secure and low-profile repair option without adding the complexities associated with knot-tying anchors.

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