Research Square

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Superior Outcomes of Arthroscopic Extensor Carpi Radialis Brevis Repair Over Debridement for Refractory Lateral Epicondylitis

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Abstract

Background

To compare the outcomes after arthroscopic repair versus debridement of the extensor carpi radialis brevis (ECRB) in patients with refractory lateral epicondylitis.

Methods

Patients who underwent arthroscopic debridement or repair of the pathologic ECRB were enrolled. Clinical outcomes were assessed using Disabilities of the Arm, Shoulder and Hand (DASH) scores, visual analog scale (VAS) pain scores, Mayo Elbow Performance Scores (Mayo score), and Return-to-Work Duration at minimum 1-year follow-up. Postoperative Magnetic resonance imaging (MRI) evaluated ECRB tendon healing.

Results

A total of 41 patients participated in this study. 23 patients accepted ECRB debridement procedure (Debridement group), and the other 18 accepted ECRB repair procedure (Repair group). At the final follow-up, there were no significant differences between the Debridement group and the Repair group regarding the DASH score (36 ± 9 vs 32 ± 3; MD: 4.0, 95%CI: -0.5 to 8.5; *p* = NS), or Mayo score (88 ± 8 vs 93 ± 8; MD: -5.0, 95%CI: -10.2 to 0.2; *p* = NS). However, there was a statistically significant difference in VAS score (1.1 ± 0.8 vs 0.6 ± 0.7; MD: 0.5, 95%CI: 0.1 to 0.9; *p* = 0.02) between the debridement group and the Repair group after surgery. The Repair group had a significantly shorter Return-to-Work Duration than the Debridement group (2 ± 1 vs. 6 ± 3 weeks; MD: -4.0 weeks, 95%CI: -5.3 to -2.7; *p* < 0.001). MRI revealed complete ECRB healing (Grade 0/1) in 100% of repair patients versus 85% in the debridement group.

Conclusion

Compared to arthroscopic ECRB debridement, arthroscopic ECRB repair produced better outcomes. Arthroscopic ECRB repair provided a minimally invasive technique with quicker return-to-work than ECRB debridement for refractory lateral epicondylitis.

Level of Evidence:

Level III, retrospective comparative case series.

1. Background

Lateral epicondylitis, a prevalent musculoskeletal disorder affecting 1%-3% of the general population[1, 2], manifests as debilitating elbow pain primarily attributed to chronic overuse injuries and repetitive microtrauma of the extensor carpi radialis brevis (ECRB) tendon[3, 4]. While conservative treatment can provide pain relief and improved function for most patients[5–7], about 10%-16% of patients develop refractory symptoms necessitating surgical intervention after 6 months of failed nonoperative care[8, 9].

The surgical paradigm for recalcitrant lateral epicondylitis remains contentious, with ongoing debate regarding optimal procedural selection[10–13]. Some studies reported that ECRB debridement is effective in terms of elbow function and pain relief[14–17]. Arthroscopic ECRB debridement has gained traction as a minimally invasive approach, offering advantages in symptom resolution and accelerated postoperative recovery[18–21]. Nevertheless, emerging evidence highlights limitations of this technique, including residual pain and suboptimal functional restoration during early rehabilitation phases[22, 23]. In contrast, some other surgeons supported that ECRB repair had a faster recovery for recalcitrant lateral epicondylitis in terms of strength, return to previous activities, and pain relief [13, 24–26]. Recently, Moran et al.[27] compared open ECRB debridement alone versus open ECRB repair for Lateral epicondylitis, and they found that the 5-year reoperation rates were significantly higher in the debridement group compared with the repair group.

Despite these advancements, critical knowledge gaps persist regarding arthroscopic approaches. No comparative studies have systematically evaluated outcomes between arthroscopic ECRB debridement and repair. This current study therefore aims to address this evidence gap by comparing clinical outcomes between arthroscopic ECRB debridement and repair in refractory lateral epicondylitis. We hypothesize that arthroscopic ECRB repair confers superior functional recovery and pain mitigation compared to debridement alone.

2. Materials and Methods

2.1. Study Design and Participants

This retrospective cohort study received ethical approval from the institutional review board of our hospital. We reviewed consecutive patients who underwent arthroscopic treatment for refractory lateral epicondylitis between October 2018 and December 2023. A detailed flowchart of patient enrollment is provided in Fig. 1.

The inclusion criteria: (1) Diagnosis confirmed by clinical examination (localized tenderness over the lateral epicondyle and positive Thomsen test) and Magnetic resonance imaging (MRI) evidence of ECRB tendinopathy.; (2) Full preoperative range of motion in the elbow and wrist joints; (3) no younger than 18 years; (4) Failure of over 6 months of conservative management (including physical therapy, nonsteroidal anti-inflammatory drugs, and corticosteroid injection); (5) Minimum postoperative follow-up of 12 months.

The exclusion criteria: (1) Prior surgical intervention for lateral epicondylitis; (2) Radiographic evidence of elbow osteoarthritis (Kellgren-Lawrence grade ≥ 2); (3) Concurrent neurologic pathologies (e.g., radial tunnel syndrome, cervical radiculopathy).

2.2. Surgical Technique

All procedures were performed by a senior orthopedic surgeon specializing in elbow arthroscopy. Patients were positioned laterally under general anesthesia with the affected elbow flexed to 90° and stabilized using a customized arm holder. First, patients underwent an arthroscopic evaluation before ECRB treatment, and the intra-articular pathologies were exposed. Next, arthroscopic ECRB debridement or repair was performed according to the following procedure. The selection of surgical technique followed a chronological protocol: debridement was predominantly performed during the initial study phase, while repair became the main approach from May 2020 onward.

For the debridement group (Fig. 2), a proximal anteromedial portal and a proximal anterolateral portal were established. Through the proximal anteromedial portal, the lateral capsule and ECRB tendon were visualized through a 30° arthroscope. The ECRB tendon was exposed and partially released. Pathological tendinopathic tissue at the ECRB origin on the lateral epicondyle was debrided. Finally, all the skin incisions were closed with 3 – 0 nylon sutures.

For the repair group (Fig. 3), a posterior-lateral portal, a soft-spot portal, and an accessory lateral portal were established. The arthroscope was introduced through the posterolateral portal into the potential space superficial to the ECRB tendon. Synovial tissue overlying the ECRB was debrided to achieve tendon exposure. Subsequently, pathological insertion tissue was electrocoagulated using radiofrequency ablation. A 3.0-mm double-loaded suture anchor (Gryphon™; DePuy Mitek) was implanted at the ECRB footprint midpoint. Using a tissue-penetrating device analogous to rotator cuff instruments, sutures were passed through the tendon in Mason-Allen stitch configuration. Following suture fixation, skin closure was accomplished with 3 – 0 nylon sutures.

All patients in both groups were instructed to follow the identical standardardized rehabilitation protocols. Postoperatively, elbows were managed with soft dressings without immobilization. Active-assisted range of motion exercises commenced immediately as tolerated. Progressive strengthening and resistive activities were systematically initiated 6 weeks after the surgery.

2.3. Outcome Measures

Clinical and radiological outcomes were evaluated preoperatively and at the final follow-up using standardized instruments and imaging protocols.

Clinical assessments included (1) Disabilities of the Arm, Shoulder and Hand (DASH)[28]: Patient-reported disability scale (0-100; higher scores = greater impairment); (2) Visual Analog Scale (VAS)[29]: Pain intensity quantified from 0 (no pain) to 10 (maximum pain); (3) Mayo Elbow Performance Score (Mayo

score)[30]: Objective assessment of elbow function (0-100; ≥90 = excellent); (4) Return-to-Work Duration: Days from surgery to full occupational duty resumption.

MRI was utilized to assess ECRB tendon integrity postoperatively. Following our previous study[31], the examination was performed at the final follow-up using 1.5T/3.0T scanners (GE Healthcare) with standardized sequences and the ECRB tendon healing was graded according to Table 1.

Table 1
MRI grading Criteria for ECRB tendon healing.

Grade	Characteristics
0	Homogeneous low signal intensity with intact tendon architecture
1	Tendon thickening/thinning with intrasubstance hyperintensity on fat-saturated T2-weighted imaging
2	Moderate tendon tears (20–80% tendon discontinuity)
3	Severe tendon tears (> 80% tendon discontinuity)

2.4. Statistical analysis

Statistical analyses were conducted using Stata 17.0 (StataCorp, USA). Continuous variables are expressed as mean ± standard deviation (SD), with normality assessed via Kolmogorov-Smirnov testing. For between-group comparisons of continuous outcomes, mean differences (MD) with corresponding 95% confidence intervals (95% CI) were calculated using linear regression models adjusted for baseline values. Intergroup comparisons utilized independent *t*-tests for parametric data or Mann-Whitney *U* tests for nonparametric continuous variables, while categorical variables were analyzed with chi-square or Fisher's exact tests. A post hoc power analysis confirmed 80% power ($\alpha = 0.05$, $\beta = 0.20$) to detect a clinically significant 10-point DASH difference[32]. Statistical significance was defined as two-tailed $p < 0.05$.

3. Results

Participants' demographic data is shown in Table 2. Finally, 41 patients participated in this study, including 23 patients in the Debridement group and 18 patients in the Repair group (Fig. 1). No significant difference was found in age, body mass index, sex, duration of symptoms, or number of previous treatments (ns) between groups. Concomitant injuries were identified at arthroscopy. No significant difference was found between the Debridement group and the repair group regarding the incidence of osteochondritis dissecans (OCD) (ns).

Table 2
Demographic information of the participants.

Age, years	**Debridement Group (n = 23)**	**Repair Group (n = 18)**	***P* value**
	49 ± 7	**46 ± 10**	**ns**
Female sex, %	48	50	ns
Body mass index, kg/m^2	25 ± 3	23 ± 2	ns
Duration of symptoms, months	16 ± 19	14 ± 8	ns
Surgery on the dominant side, %	78	78	ns
Diabetes mellitus, n (%)	2 (9%)	1 (6%)	ns
Smoker, n (%)	3 (13%)	3 (17%)	ns
Labor-intensive work, %	87%	94%	ns
Trauma in affected elbow, n (%)	0 (0)	0 (0)	ns
Previous treatment, n			
Physical therapy	23 (100%)	18 (100%)	ns
Steroid injection	13 (57%)	11 (61%)	ns
Concomitant injuries, n			
Plica	4	3	ns
osteochondritis dissecans	2	2	ns
Loose body	1	0	ns
Follow-up time, months	24 ± 5	17 ± 4	0.001

3.1. Complications

At final follow-up, no operative complication was noted from this cohort. All the patients reported normal elbow range of motion at final follow-up. No patient in either group underwent revision surgery.

3.2. Clinical outcomes

Preoperatively, there was no significant difference between the Debridement group and the Repair group regarding DASH score (100 ± 5 vs 98 ± 3; MD: 2.0, 95%CI: -1.2 to 5.2; *p* = NS), Mayo score (59 ± 3 vs 60 ± 2; MD: -1.0, 95%CI: -2.8 to 0.8; *p* = NS), VAS (4.6 ± 0.6 vs 4.6 ± 0.5; MD: 0.0, 95%CI: -0.3 to 0.3; *p* = NS) respectively. After surgery, both groups had an improvement in Mayo score, decrease of DASH and VAS (Fig. 4). At the final follow-up, there were no significant differences between the Debridement group and

the Repair group regarding the DASH score (36 ± 9 vs 32 ± 3; MD: 4.0, 95%CI: -0.5 to 8.5; *p* = NS), or Mayo score (88 ± 8 vs 93 ± 8; MD: -5.0, 95%CI: -10.2 to 0.2; *p* = NS). However, there was a significant difference in VAS score (1.1 ± 0.8 vs 0.6 ± 0.7; MD: 0.5, 95%CI: 0.1 to 0.9; *p* = 0.02) between the debridement group and the Repair group after surgery. Critically, Return-to-Work Duration was significantly shorter in the repair group (2 ± 1 vs. 6 ± 3 weeks; MD: -4.0 weeks, 95%CI: -5.3 to -2.7; *p* < 0.001).

3.3. MRI evaluation

At the final follow-up, 13 patients in the Debridement group and 10 patients in the repair group underwent MRI scans of the operated elbows. In the Debridement group, the ECRB insertional site postoperatively revealed Grade 0 in 1 patient, Grade 1 in 10 patients, and Grade 2 in 2 patients. The healing rate (Grade 0 and Grade 1) was 85%. In the Repair group, the ECRB insertional site postoperatively revealed Grade 0 in 7 patients, Grade 1 in 3 patients (100%).

4. Discussion

The most important finding from the current study was that ECRB repair produced better outcomes compared with ECRB debridement. Moreover, arthroscopic ECRB repair provided a minimally invasive technique with quicker return-to-work than ECRB debridement for lateral epicondylitis. Recurrent lateral epicondylitis or tennis elbow remains challenging, which may require surgery in order to make pain relief and improved function at early time. Surgeons should pay attention to making patients early return to work or return to sports when making the treatment strategy.

Currently, arthroscopic surgery has become increasingly popular as a less invasive alternative, and it is also able to address concomitant intra-articular pathology [21, 22, 33]. The references supported that arthroscopic debridement of ECRB insertion technique offered advantages of symptoms improvement, with satisfactory functional scores [18, 20, 34]. However, it was noticed clinically that some patients still had pain at early time (particularly 3 months) after arthroscopic debridement surgery [31]. Previously, Lattermann et al.[35] investigated the outcome of arthroscopic debridement of the ECRB tendon in 36 patients, and they found 10 patients (31%) reported mild pain with strenuous activities and 2 (6%) received no benefit from the procedure. Kwon et al.[22] also found that two patients (6.9%) still had poor outcomes after arthroscopic debridement treatment of chronic lateral elbow tendinopathy even at a mean follow-up of more than 31 months.

Previously, it was reported that some risk factors, particularly residual microscopic tendinopathy, were found to be weak predictors of poor outcome [36–38]. Firstly, the arthroscopic debridement technique may fail to fully resect tendinopathic tissue at the ECRB origin due to compromised visualization of its lateral epicondyle insertion when accessed through an anterolateral portal with a 30° arthroscope.[23] Secondly, synovitis on the surface of the ECRB tendon might be another cause of pain, as the arthroscopic debridement cannot remove the synovitis. In the present study, the arthroscopic repair technique could not only fully visualize and address the tendinopathy of the ECRB but also debride the synovitis around

the tendon insertion. Importantly, radiofrequency-based microtenotomy was considered as one of the surgical procedures for treating recalcitrant lateral epicondylitis, with the advantages of reliable elbow functional restoration and significantly shorter operation time [12].

Previously in one case series study, Thornton et al.[25] treated recalcitrant lateral epicondylitis with suture anchor repair in an open manner and they observed the mean pain score decreased from 8.1 preoperatively to 0.41 postoperatively. Moreover, Li et al.[39] compared the outcomes between the arthroscopic debridement of the ECRB tendon alone and repairs to the ECRB tendon with suture anchor for the treatment of refractory lateral epicondylitis. They found that the repair group showed better functional results (Mayo score, DASH score) compared with the debridement group than the debridement group while the VAS revealed no significant difference between groups. In the present study, it was also found the repair group had better outcomes compared with the debridement group particularly in terms of VAS score. The difference in VAS score might be due to the different repair techniques. Li et al.[39] repaired the ECRB through the anterolateral portal and did not debrided the synovitis on the tendon surface. In the present study, we not only repaired the ECRB but also debrided the synovitis around the tendon insertion, just like the open repair technique.

Previously, Li et al. reported that the normal rate of ECRB (grade 0 and grade 1) was 90.9% (10/11) in the debridement group and 83.3% (5/6) in the repair group based on the MRI images at 6 months after surgery. Similarly in the present study, MRI revealed the ECRB insertional site had mostly healing in both groups, since most patients had Grade 0 and Grade 1 ECRB insertion. To be noticed, the repair group had no Grade 2 ECRB insertion, indicating the present technique can completely reattach the ECRB tendon to the insertional site.

This study has several limitations. Firstly, the sample size was relatively small. Further studies need to be performed in a larger sample size when more patients' data are available. Furthermore, the follow-up time was different between groups. Given the established association between extended follow-up duration and improved clinical outcomes[38], the heterogeneity in observation periods may introduce temporal confounding in outcome interpretation. Interestingly, it was found the repair group had a better result even with a shorter follow-up time when compared with the debridement group. Thus, the follow-up time may not influence the results. Finally, this study only addressed the arthroscopic treatment of lateral epicondylitis. It is unclear if the result would be different with open manner repair of ECRB. Previously, various studies have demonstrated that there were no clinically significant differences between open and arthroscopic techniques in terms of DASH, pain intensity, and patient satisfaction at one year after lateral epicondylitis surgery [40–42].

5. Conclusion

The present study demonstrates that arthroscopic ECRB repair achieves superior clinical outcomes compared to debridement. These findings position arthroscopic ECRB repair as a minimally invasive yet biomechanically optimized intervention in managing refractory lateral epicondylitis.

Abbreviations

ERCB, Extensor carpi radialis brevis;

MRI, magnetic resonance imaging;

DASH, Disabilities of the Arm, Shoulder and Hand score;

VAS, visual analog scale;

SD, standard deviation;

MD, mean differences;

95% CI, 95% confidence intervals.

Declarations

Ethics approval and consent to participate:

This retrospective cohort study was approved by the institutional review board of Huashan Hospital Fudan University (KY2024-729). Written informed consent was obtained from all the participants. All procedures were performed in accordance with the relevant guidelines. This research was conducted in compliance with the Declaration of Helsinki.

Consent for publication:

Not applicable.

Competing Interests:

The authors declare no competing interests.

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Author Contribution

WBC and KLX carried out the study design, and statistical analysis, and manuscript writing; FQL carried out the data collection; XAX carried out the manuscript reviewing; HL carried out the study design, supervision of the research, and manuscript reviewing. WBC and KLX contributed equally to this study as

co-first authors. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

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Data Availability

Data are available upon request. Must include description of which data are available, from whom the data are available and how they should be contacted, and how data may be reused.

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Figures

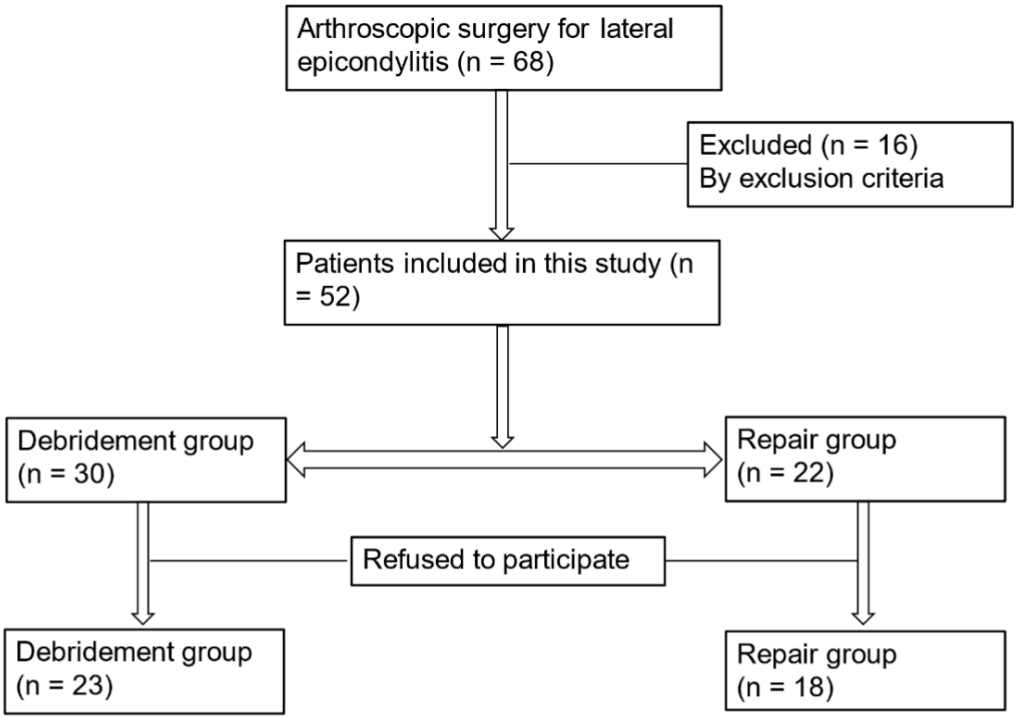


Figure 1

Patient selection flowchart involvement in the study.

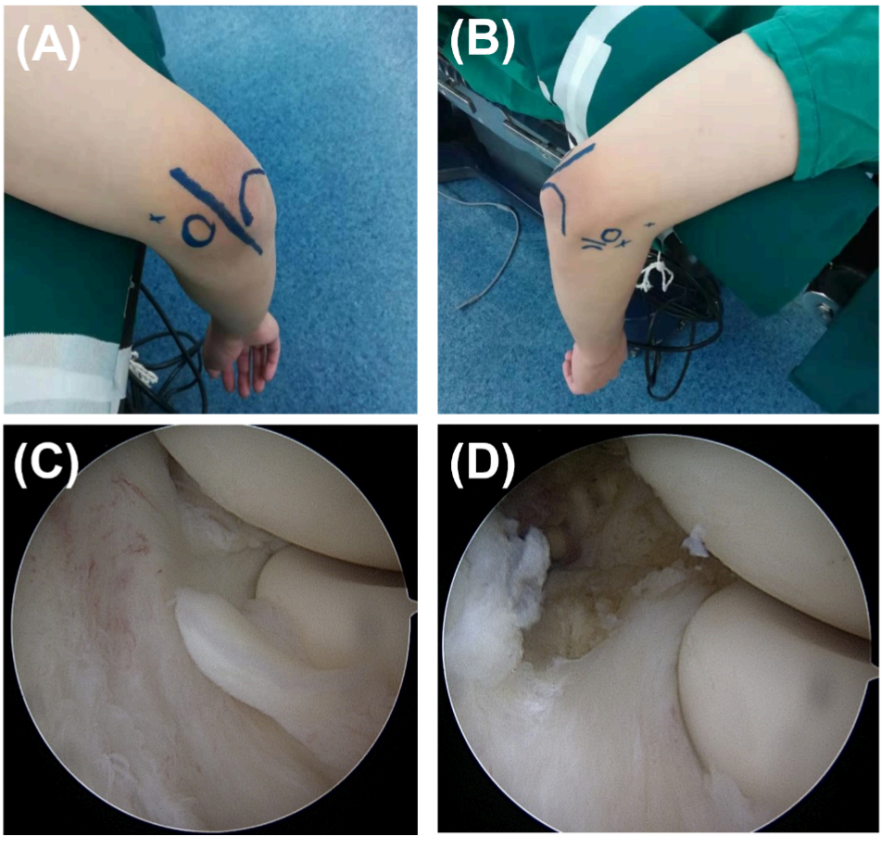


Figure 2

Surgical images of extensor carpi radialis brevis (ECRB) debridement procedure. (A) medial portal; (B) lateral portal; (C) arthroscopic image of the ruptured lateral capsule; (D) ECRB was debrided through an anterior-lateral portal.

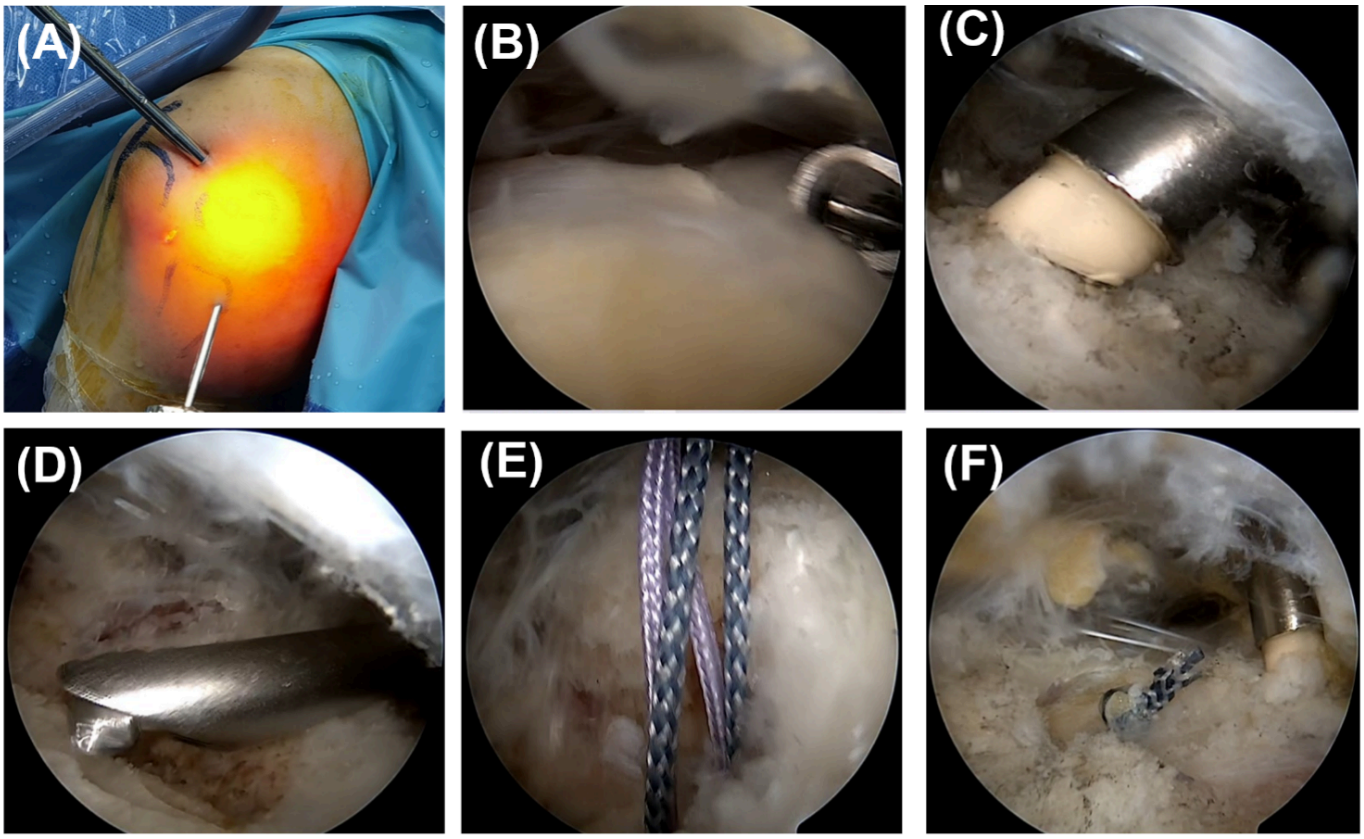


Figure 3

Surgical images of extensor carpi radialis brevis (ECRB) repair procedure. (A) arthroscopic portals; (B) synovitis was debrided; (C) the pathological ECRB insertion tissue was treated with radiofrequency-based microtenotomy; (D) ECRB insertional site was prepared with a bur; (E) one suture anchor was inserted; (F) The knot was tied in Mason–Allen method.

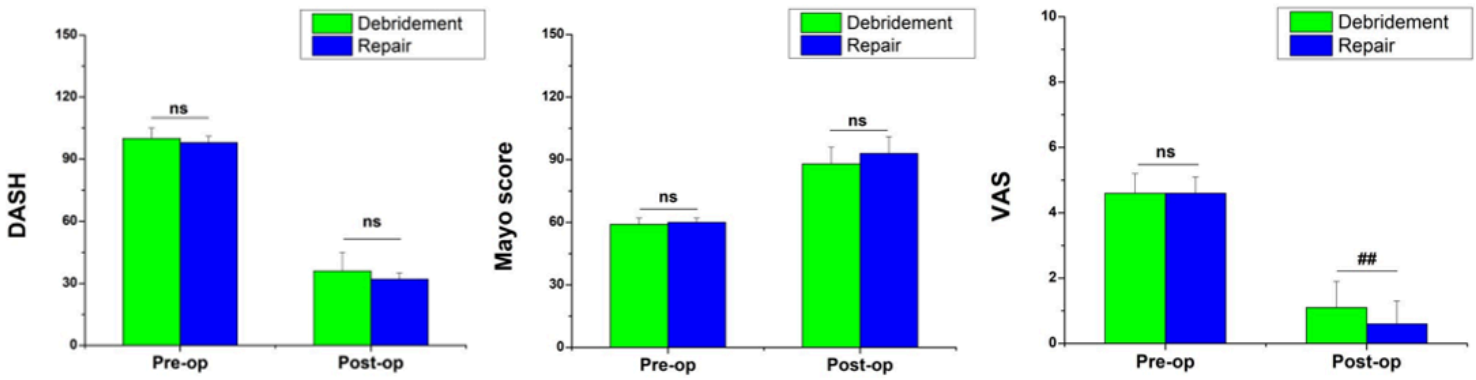


Figure 4

Preoperative and postoperative outcomes for the DASH, Mayo score, and VAS between the Debridement group and the Repair group. DASH, Disabilities of the Arm, Shoulder and Hand; Mayo score, Mayo Elbow Performance Score; VAS, visual analog scale. “ns” indicates there was no significant difference between groups. “##” indicates there was a significant difference between groups.