

Clinical Results of Arthroscopic Rotator Cuff Repair with a Tape-Attached Anchor

Noriaki Shimada¹, Jun'ichi Inoue², Katsuhiko Shiraki¹, Kazuo Saita¹

¹Department of Orthopaedic Surgery, Saitama Medical Center, Saitama Medical University, Kawagoe, Japan

²Department of Orthopaedic Surgery, Kamifukuoka General Hospital, Fujimino, Japan

Email: shima-50@live.jp

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Abstract

Objective: The purpose of this study was to evaluate the clinical results of arthroscopic rotator cuff repair with a tape-attached anchor: The HEALICOILRG with ULTRATAPE. We hypothesised that performing arthroscopic rotator cuff repair with tape-attached anchors would result in better clinical outcomes and reduce the retear rate compared with conventional suture anchors. **Methods:** We included 83 patients treated by arthroscopic rotator cuff repair with a minimum 1-year follow-up. We divided them into two groups: Use of the HEALICOILRG with ULTRATAPE (group T: 41 shoulders; mean patient age, 64.3 years) and use of the conventional suture anchor (group S: 42 shoulders; mean patient age, 68.9 years). We compared the University of California Los Angeles scores, Japanese Orthopaedic Association scores, range of motion, and retear rate between the two groups. The Student t test and chi-square test were used in statistical analyses. **Results:** At the 1-year postoperative follow-up, both groups showed improvement in the average University of California Los Angeles score, Japanese Orthopaedic Association score, and range of motion, although no significant difference was found in the retear rate between the two groups. **Conclusions:** Results of arthroscopic rotator cuff repair with the HEALICOILRG with ULTRATAPE were generally good. However, our results could not demonstrate efficacy of the HEALICOILRG with ULTRATAPE. Further detailed studies are needed to determine its treatment result.

Keywords

Arthroscopic Rotator Cuff Repair, Transosseous-Equivalent Technique, Suture Anchor, Tape-Attached Anchor, Retear

1. Introduction

Arthroscopic rotator cuff repair (ARCR) has an established place in treating ro-

tator cuff tears. Many studies have reported methods, results, and availabilities of ARCR [1]-[9]. The transosseous-equivalent (TOE) technique has been popularised in many methods of ARCR because it can hold down the cuff widely [5]-[12]. Strong tape, which is wider than a strong suture, was developed, so we became able to use a tape-attached anchor. The efficacy of the tape compared with the suture has been demonstrated in some biomechanical studies [13] [14] [15] [16]. However, the efficacy of the tape has not been clarified in the clinical setting, as there are few reports about its clinical result [16].

This study aimed to evaluate the clinical results of ARCR with tape-attached anchors. We hypothesised that performing ARCR with tape-attached anchors would result in better clinical outcomes and reduce the retear rate compared with conventional suture anchors.

2. Materials and Methods

Our inclusion criteria were patients with a full-thickness rotator cuff tear who underwent ARCR with the TOE technique between December 2015 and December 2016; those who received a tape-attached anchor, the HEALICOILRG with ULTRATAPE (HCUT; Smith & Nephew, Memphis, TN, USA) as the medial anchor (group T) or a conventional suture anchor as the medial anchor (group S); and those who had a minimum 1-year follow-up. We excluded patients with a massive rotator cuff tear and those who underwent partial repair, fascia lata patch repair, and revision surgery. We used a conventional suture anchor until June 2016 and then used HCUT since July 2016. Informed consent was obtained from all the patients who participated in this study.

We compared the University of California Los Angeles (UCLA) scores, Japanese Orthopaedic Association (JOA) scores, range of motion (ROM), and retear rate between the two groups. We also compared the UCLA and JOA scores and ROM between preoperation and the 1-year postoperative follow-up. Sugaya's classification was used to evaluate the cuff integrity by magnetic resonance imaging 6 months postoperatively, with types IV and V classified as rotator cuff retears.

All surgeries were performed under general anaesthesia and an interscalene block with the patient in the beach-chair position. After the arthroscopic examinations and assessment of the rotator cuff tear, all patients underwent synovial tissue removal to mobilise the rotator cuff and acromioplasty before repair rotator cuff. All surgeries were performed using the TOE technique. We used suture anchors in the medial row and knotless anchors in the lateral row with the TOE technique.

In group T, we placed 1 to 2 HCUTs as medial anchors at the articular cartilage margin. These tapes and sutures of the anchors were passed through the rotator cuff using a suture hook, and we added several independent sutures as needed. We used 1 to 2 lateral knotless anchors (Swive Lock; Arthrex, Naples, FL, USA) to fix these tapes and sutures at the lateral cortex below the greater tu-

berosity. Finally, medial row knots were created with the remaining sutures. In group S, we performed almost the same method as in group T, but we used conventional anchors as the medial anchors instead of HCUT.

Postoperatively, the operative arm was supported for 6 weeks in a sling with a small abduction pillow. At 3 weeks, passive ROM exercises were started. At 6 weeks, active ROM exercises were begun. Shoulder-strengthening exercises were performed at 9 to 12 weeks.

Statistical analysis was performed by using IBM SPSS statistics 24 (IBM Corp., Armonk, NY). Differences between the two groups were analysed using the Student t test and chi-square test. For all analyses, a *P*-value <0.05 was considered significant.

3. Results

The study included 83 patients (41 patients in group T and 42 patients in group S). Patient demographic characteristics are presented in **Table 1**. Group T consisted of 23 men and 18 women, with a mean age of 65.3 ± 8.9 years. Group S consisted of 21 men and 21 women, with a mean age of 68.9 ± 5.6 years. In group T, the right shoulder was operated on in 26 patients and the left in 15. In group S, the right shoulder was operated on in 24 patients and the left in 18. The average durations of symptoms were 6.1 ± 3.8 months in group T and 5.9 ± 3.6 in group S. There were 19 patients with a small tear, 12 with a medium tear, and 10 with a large tear in group T. In group S, there were 17 patients with a small tear, 13 with a medium tear, and 12 with a large tear.

There were no significant differences in age, sex, the affected shoulder, duration of symptoms, and tear size between the groups.

Both groups showed postoperative improvement in the UCLA score, JOA score, and ROM. Between the two groups, there were no significant differences preoperatively or at the 1-year postoperative follow-up, and no significant differences in the changes from before the operation to the 1-year postoperative follow-up (**Table 2**).

Both groups showed postoperative improvement in the range of anterior elevation and external rotation. There were no significant differences preoperatively or at the 1-year postoperative follow-up and no significant differences in the changes from before the operation to the 1-year postoperative follow-up between the two groups (**Table 3**).

There were also no significant differences in the retear rate between the two groups (**Table 4**).

4. Discussion

With the evolution of the arthroscopic technique, ARCR is now the standard treatment for rotator cuff tears. Surgeons have sought to improve the clinical result of ARCR with the development of instruments and technical advancements. Many studies have reported a good clinical result of ARCR with the TOE

Table 1. Patient demographic data.

	Group T (n = 41)	Group S (n = 42)	<i>P</i> -value
Age, years	65.3 ± 8.9	68.9 ± 5.6	0.087
Sex (male/female)	23/18	21/21	0.621
Affected shoulder (right/left)	26/15	24/18	0.667
Duration of symptoms, months	6.1 ± 3.8	5.9 ± 3.6	0.552
Tear size (small/medium/large)	19/12/10	17/13/12	0.323

Group T, use of the HEALICOILRG with ULTRATAPE; group S, use of the conventional suture anchor.

Table 2. Comparison of the clinical outcome between group T and group S.

	Preoperatively		Postoperatively		<i>P</i> -value
	Mean ± SD	<i>P</i> -value	Mean ± SD	<i>P</i> -value	
UCLA score					
Group T	13.4 ± 4.4	0.723	32.7 ± 3.9	0.668	<0.001
Group S	13.8 ± 4.0		33.3 ± 3.6		<0.001
JOA score					
Group T	63.8 ± 7.4	0.656	88.4 ± 8.2	0.523	<0.001
Group S	62.5 ± 7.4		87.4 ± 8.1		<0.001

Group T, use of the HEALICOILRG with ULTRATAPE; group S, use of the conventional suture anchor SD, standard deviation; JOA, Japanese Orthopaedic Association; UCLA, University of California Los Angeles.

Table 3. Comparison of range of motion between group T and group S.

	Preoperatively		Postoperatively		<i>P</i> -value
	Mean ± SD	<i>P</i> -value	Mean ± SD	<i>P</i> -value	
Anterior elevation					
Group T	118.2 ± 26	0.422	148.3 ± 13	0.536	<0.001
Group S	113.8 ± 25		144.8 ± 18		<0.001
External rotation					
Group T	37.8 ± 12	0.512	51.8 ± 6.8	0.861	<0.001
Group S	40.2 ± 20		52.7 ± 12		<0.001

Group T, use of the HEALICOILRG with ULTRATAPE; group S, use of the conventional suture anchor SD, standard deviation.

Table 4. Comparison of the retear rate between group T and group S.

	Group T (n = 41)	Group S (n = 42)	<i>P</i> -value
Rtear	8	7	0.782
Intact	33	35	
Rtear rate (%)	19.5	16.7	

Group T, use of the HEALICOILRG with ULTRATAPE; group S, use of the conventional suture anchor.

technique [10] [11] [12] [17] [18] [19] [20] [21]. Recently, a tape material was developed as a substitution for the suture of the anchor. We began using the

tape-attached anchor HCUT instead of the conventional suture anchor. HCUT has one strong tape and one strong suture; therefore, stable restoration is expected. Some biomechanical studies have reported that the tape was superior to the suture in construct strength [13] [14] [15] [16]. Bisson *et al.* reported that the tape was three times as stiff as the suture, and it failed at three times the loads of the suture [13]. Carli *et al.* reported that the tape is biomechanically stronger than a suture, and the tape structure does not have a weak point [14]. Barber *et al.* reported that repair using the tape and suture had a greater mean ultimate failure load than repair using the suture only in their biomechanical study [15]. Liu *et al.* reported that the tape provided a three-fold increase in the footprint contact pressure and a one and a half-fold increase in construct strength compared with the suture in biomechanical study [16]. However, there have been very few reports on the clinical result of using the tape material with ARCR, so its clinical usefulness has not been clarified yet.

We used HCUT to improve clinical results, in particular to reduce retears. We think that the tape material can provide better restoration by the fixing the rotator cuff more widely, and it can provide good results, as reported by some biomechanical studies [13] [14] [15] [16]. In fact, significant improvements were seen in both the clinical score and ROM with ARCR using HCUT. However, there were no clinical differences in the clinical scores, ROM, and retear rate between the ARCR using HCUT and the conventional method. By using HCUT, we could not achieve a better clinical result or reduce the retear rate. The efficacy of the tape, which has been demonstrated in biomechanical studies [13] [14] [15] [16], was not effective based on the clinical outcomes in our study. Liu *et al.* reported an advantage of tape in their biomechanical study, but they reported that this advantage did not translate to better clinical outcomes; there was no clinical difference in the retear rate between the tape and suture groups [16]. Deranlot *et al.* reported the abrasive properties of some different sutures and tape materials [22]. They suspected that the tape material is less irritating inside the tendon and would decrease the abrasive effects, but results of their biomechanical study did not support their hypothesis; the abrasive effects of the tape material were increased compared with some sutures. We thought that the tape material disperses the pressure and is less invasive because it holds the rotator cuff widely. It is noteworthy that Deranlot *et al.*'s study stated that the tape was rather invasive to the rotator cuff. We need to further investigate the effect and invasion of tape material on the rotator cuff. We also must consider the initial strength improvement and the abrasive properties of the tape. In addition, we need to examine the effect of tape and the suture on the base bed of the humerus, haemodynamics of repaired rotator cuffs, and durability of the sutures and tapes. In order to improve the clinical result of ARCR, we have to consider many more issues. In any case, the improvement of initial strength of the tape confirmed by biomechanical studies was not directly related to improvement of the clinical results in our study. Our study suggested that there is something more important than initial strength in the healing rotator cuff.

Our study has limitations. The study sample was relatively small and the follow-up period was short, which might be the reasons why there was no significant difference in the clinical results and retear rates between the two groups.

5. Conclusion

Our results could not demonstrate the efficacy of HCUT. Further detailed studies are needed to determine its treatment result.

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Conflicts of Interest Statement

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