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ORIGINAL STUDY

Clinical and radiologic outcomes after arthroscopic rotator cuff repair: Single-row versus Speed-Bridge technique

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We compared clinical outcome between the Speed-Bridge technique and single-row techniques in patients with full-thickness rotator cuff tears and figured out the patterns of retear by computed tomography (CT) arthrogram and ultrasonography follow-up.

In total 209 patients with full-thickness rotator cuff tears who underwent arthroscopic rotator cuff repair and were followed up for at least 2-year were enrolled retrospectively (group 1: single-row repair, group 2: Speed-Bridge repair). Pre- and postoperative data were reviewed to assess clinical and radiologic outcomes.

There were no significant differences in clinical outcome between the 2 groups. The retear rates of medium and large-sized rotator cuff tear groups were higher in group 1 than in group 2 ($p < 0.05$). There was no significant difference in the medial row failure rate between the 2 groups.

Present study showed that the knotless suture Bridge technique may be a considerable alternative method for treating full-thickness rotator cuff-tears.

Level of evidence: Level III, Retrospective comparative study.

Keywords : Speed Bridge technique ; single-row repair ; rotator cuff ; knotless ; medial-row failure ; arthroscopic repair.

INTRODUCTION

Since the Suture-Bridge double-row technique was introduced, numerous studies have reported good biomechanical properties of this technique compared to the single-row technique *(10,18,19,24)*. Although the Suture-Bridge technique has stronger biomechanical stability than the single-row technique, some authors have reported that clinical outcome between the 2 techniques show no significant difference *(2,5,13)*. It seems likely that there might be other factors affecting clinical outcome results, such as biologic properties.

Medial-row tying of the Suture-Bridge technique could improve postoperative biomechanical stability *(1,14)*. However, there was also concern about biomechanical problems resulting from tendon strangulation with medial-row tying *(7,8,15,23,26,30)*. The Speed-Bridge technique is the knotless modified suture-bridge double-row technique without medial-row tying. Some authors *(4,20,22)* reported

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that biomechanical stability in the Speed-Bridge technique without medial-row tying was lower than in the classical suture-bridge technique with medial-row tying. However, the Speed-Bridge technique also offers an advantage over the classical suture-bridge double-row technique in minimizing the risk of reduced tendon blood supply caused by suture tying *(9,28)*. Although, double row technique has higher biomechanical repair stability than single row technique, many studies reported that there were no differences between two methods *(27,29)*. Some factors including blood supply might affect the postoperative repair stability in vivo.

The aims of this study were 1) to evaluate the surgical outcome of the Speed-Bridge technique for rotator cuff tear and 2) to compare the clinical and radiologic outcomes between both techniques without medial row suture tying; Knotless modified suture bridge technique and single row technique for at least postoperative 2-year follow-up. We hypothesized that the Speed-Bridge technique might have the advantages 1) with lower medial strangulation risk comparing with classical suture bridge technique and 2) with higher mechanical stability from many suture configurations comparing with single row technique. We investigated that the biologic and mechanical factors could contribute to improve the surgical outcome comparable results with the single-row technique.

MATERIALS AND METHODS

This study followed the World Medical Association Declaration of Helsinki and KGCP guidelines, and was approved by the Institutional Review Board of our university hospital (PNUYH IRB 05-2014-093).

Our inclusion criteria were *(1)* patients with full-thickness tears of the supraspinatus or combined tear of supraspinatus and infraspinatus tendons without subscapularis tendon tear, *(2)* those with tendon tears that were fully repaired after surgery, *(3)* those who were followed up clinically for at least 2 year, and *(4)* those who were followed up radiologically for at least 1 year . Exclusion criteria were *(1)* partially repaired tears, *(2)* revision cases, *(3)* irreparable rotator cuff tears, *(4)* partial rotator cuff tears, *(5)* full-thickness rotator cuff tears, including subscapularis tendon tear or labral lesions. Finally, 209 patients who met all the inclusion criteria were included in the study. The single-row technique was performed on 104 patients, and the Speed-Bridge technique without medial-row tying was performed on 105 patients. Table I shows preoperative demographic data of the patients.

Preoperative physical examination was performed 1 day before surgery, and postoperative physical examination was performed in the outpatient clinic at 3, 6, and 12 months after surgery and at the last follow-up. Muscle strength was quantitatively measured using a portable, hand-held dynamometer (Lavisen, Seoul, Korea). Preoperative and postoperative pain levels were evaluated using the visual analogue scale (VAS) in all patients. The Constant score (CS) and Western Ontario Rotator Cuff (WORC) index were measured to assess clinical outcome. Clinical outcomes, including ROM, pain level, shoulder score at the outpatient clinic, were measured by single shoulder fellow.

Preoperative MRI was performed in our hospital or other hospitals where patients visited initially. All preoperative MRI were interpreted by very experienced musculoskeletal radiologists. Our cases were categorized according to the classification system of DeOrio and Cofield: 33 small tears (<1 cm), 89 medium tears (1-3 cm), 58 large tears (3-5 cm), and 29 massive tears (>5 cm). All patients underwent ultrasonography (iU22 Vision 2010; Philips, Seattle, WA, USA) at 3 months and 1 year postoperatively. Ultrasonography was performed by experienced musculoskeletal radiologists. CT arthrograms were evaluated at 6 months postoperatively. Arthrographic contrast was injected into the glenohumeral joint with fluoroscopic guidance through the anterior approach by radiologists. Fifteen milliliters of diluted (60%) iodinated contrast material (Telebrix 30 Meglumine; Guerbet, Aulnay-sous-Bois, France) was injected. CT was performed using a 64-channel multidetector-row CT scanner (LightSpeed VCT XT; General Electric, Fairfield, CT, USA). The following parameters were used as the standardized MDCT protocol: 120 kVp; 300 mA; 113 and 2.5-mm section thickness. The axial, coronal, and

Table I. — Preoperative demographic data of patients

	Group 1	Group 2	p value
No. of patients	104	105	
Age at surgery, year	60.3 ± 9.5 (34 - 78)	61.8 ± 9.2 (45 - 85)	0.250
Gender, male, No.	50 (48.1)	44 (41.9)	0.406
Affected shoulder, Right, No.	69 (66.3)	66 (62.9)	0.345
Duration of symptom, mo	18.3 ± 14.5 (3 - 60)	15.7 ± 12.6 (2 - 60)	0.178
Smoker, No	35 (33.7)	26 (24.8)	0.173
Follow up, months	38.0 ±10.2 (26 - 51)	33.4 ± 7.0 (25 - 39)	0.133
Tear size, cm	2.6 ± 1.8 (0.5 – 5.0)	2.9 ± 1.4 (0.5 – 5.0)	0.258
ROM, degree			
Forward flexion	130.3 ± 23.0 (70 - 180)	132.7 ± 22.2 (70 - 180)	0.457
External rotation	63.0 ± 18.8 (0 - 90)	66.8 ± 15.3 (15 - 90)	0.113
Internal rotation	37.9 ± 15.7 (0 - 80)	37.0 ± 13.4 (10 – 60)	0.644
Abduction	90.3 ± 27.9 (20 - 170)	95.6 ± 32.8 (30 - 170)	0.211
Muscle power, kg			
Forward flexion	6.1 ± 2.0 (3 - 10)	5.6 ± 1.9 (3 - 11)	0.149
External rotation	7.1 ± 2.0 (3 - 12)	6.7 ± 1.7 (4 - 10)	0.078
Internal rotation	8.7 ± 2.4 (5 - 13)	8.4 ± 2.1 (4 - 12)	0.442
VAS score	4.1 ± 1.5 (1 - 8)	4.5 ± 1.9 (1 - 8)	0.170
Constant score	50.2 ± 9.7 (36 - 68)	48.4 ± 9.4 (28 - 65)	0.170
WORC	44.6 ± 7.4 (26 - 58)	45.8 ± 7.1 (28 - 54)	0.235

Values are presented as mean ± standard deviation (range), or number (%). Group 1: a group underwent single row repair technique, Group 2: a group underwent speed bridge technique.
ROM, range of motion; VAS, visual analogue scale; WORC, Western Ontario Rotator cuff Index.

sagittal reconstructions were generated on a 3-dimensional workstation. Postoperative tendon integrity was evaluated by ultrasonography and computed tomography *(12,25)*. Sugaya et al. *(25)* classified postoperative rotator cuff integrity into 5 types: type I indicating sufficient thickness with homogeneously low intensity, type II indicating sufficient thickness with partial high intensity, type III indicating insufficient thickness without discontinuity, type IV indicating the presence of a minor discontinuity, and type V indicating the presence of a major discontinuity. In CT arthrograms, tendons without discontinuity (types I, II and III) were categorized as the healed group, and tendons with any discontinuity (types IV and V) were categorized as the re-tear group regardless of tendon thickness. Patients were divided into 2 groups according to ultrasonographic findings : those who showed postoperative full-thickness tears with tendon discontinuity (retear group) and those who showed tendon continuity (healed group). Medial-row failure was defined as a tear with the remnant cuff tissue at the footprint of the greater tuberosity, and lateral-row failure was defined as a tear without any remnant tissue at the insertion site.

All procedures were performed by a single surgeon. All surgeries were performed under general anesthesia and interscalene block with

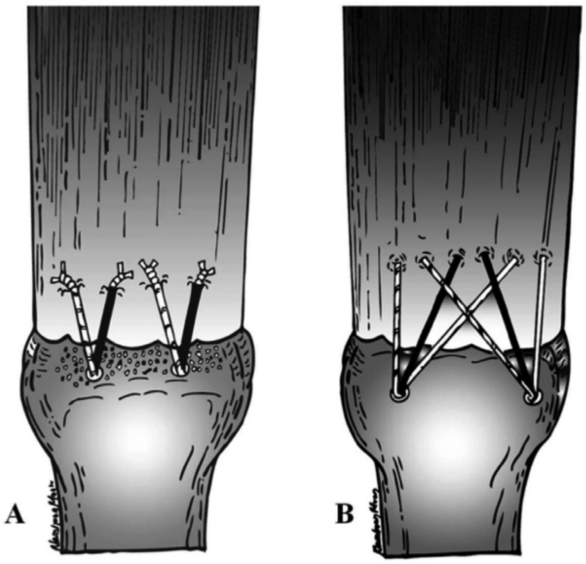

Fig. 1. — Diagram of rotator cuff repair construct. (A) Single row repair technique. (B) Speed-Bridge technique

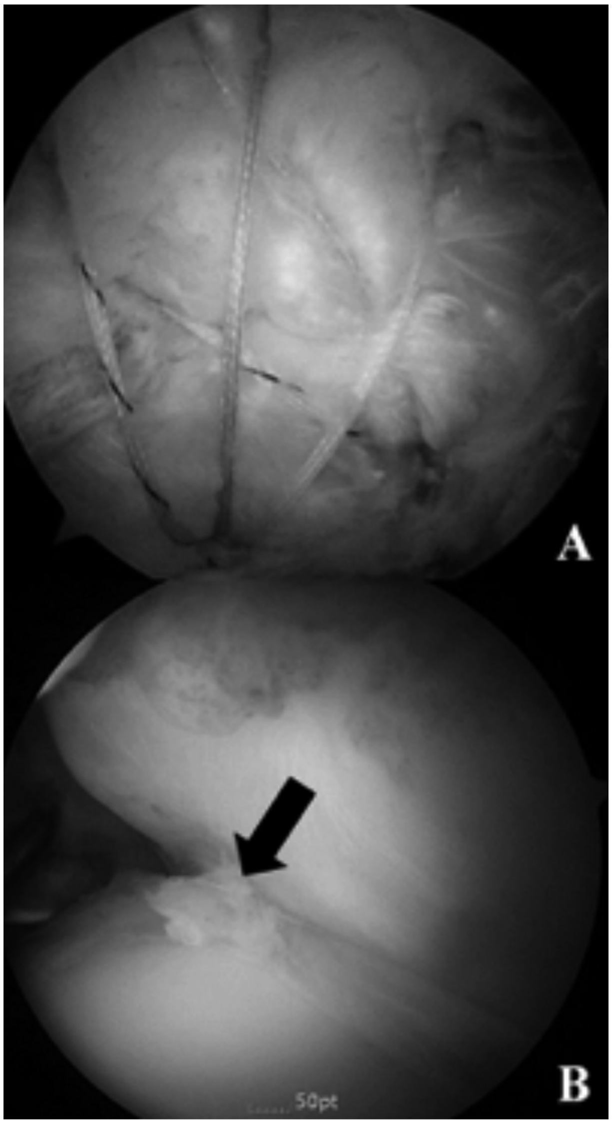

Fig. 2. — (A) The right-side arthroscopic view through the posterolateral portal shows the repair configuration of the Speed-Bridge technique with the patient in the beach chair position. (B) The rigth-side arthroscopic view through the posterior portal shows no gap formation with the patient in the beach chair position

the patient in the beach-chair position and the arm forward flexed using 3 kg of traction. Five portals were produced. Posterior and lateral portals were used for viewing portals, anterior and anterolateral portals for working portals, and superolateral portals for positioning medial-row anchors in the Speed-Bridge technique. In our patients, a 4.5-mm BioComposite Corkscrew FT anchors (Arthrex, Naples, FL, USA) were used for medial-row sutures, and 4.75-mm BioComposite SwiveLock knotless anchors (Arthrex, Naples, FL, USA) were used for lateral-row sutures. TigerWire and FiberWire from medial row anchors were used in all cases.

Before repairing rotator cuff tendons, we performed acromioplasty. For each shoulder, anterior, posterior, and medial adhesiolysis were performed to reduce tension of the repaired tendon. Sutures were used in the most medial tendon (near the musculotendinous junction) using a suture-hook needle (CONMED Linvatec). For vertical sutures of the middle tendon (apart from the anterior or posterior margin), the Scorpion® SL (side-loading) suture passer (Arthrex, Naples, FL, USA) was used. For the single-row technique, suture anchors were placed at the foot print of rotator cuff, which is medial to the greater tuberosity. Non-sliding knotting technique was used to avoid cuff tear during the single row technique. For the Speed-Bridge technique, medial-row suture anchors were placed at the articular cartilage-footprint junction at 45 degrees to the longitudinal axis. One or two medial anchors were placed anteriorly and posteriorly at about 10 mm apart. The anterior anchor was placed 5 mm posterior to the bicipital groove to prevent irritation of the long head biceps

Table II. — Comparison between preoperative and postoperative results in both groups

	Preoperative	Last follow up	p value
Forward flexion, deg			
Group 1	133.3 ± 22.0 (70 - 180)	153.8 ± 15.8 (120 - 150)	< 0.001
Group 2	132.7 ± 22.2 (70 - 180)	154.1 ± 14.7 (120 - 150)	
External rotation, deg			
Group 1	63.0 ± 18.8 (0 - 90)	73.2 ± 15.6 (30 - 90)	< 0.001
Group 2	66.8 ± 15.3 (15 - 90)	74.2 ± 14.0 (45 - 90)	
Internal rotation, deg			
Group 1	37.9 ± 15.7 (0 - 80)	50.0 ± 11.5 (30 - 80)	< 0.001
Group 2	37.0 ± 13.4 (10 – 60)	50.0 ± 10.5 (30 - 80)	
Abduction, deg			
Group 1	90.3 ± 27.9 (20 - 170)	117.4 ± 19.6 (90 - 170)	< 0.001
Group 2	95.6 ± 32.8 (30 - 170)	118.5 ± 23.9 (60 - 170)	
VAS score			
Group 1	4.1 ± 1.5 (1 - 8)	0.3 ± 0.6 (0 - 2)	< 0.001
Group 2	4.5 ± 1.9 (1 - 8)	0.4 ± 0.6 (0 – 2)	
Constant score			
Group 1	50.2 ± 9.7 (36 - 68)	80.0 ± 6.8 (45 - 89)	< 0.001
Group 2	48.4 ± 9.4 (28 - 65)	79.8 ± 4.4 (70 - 89)	
WORC			
Group 1	44.6 ± 7.4 (26 - 58)	72.9 ± 4.8 (62 - 78)	< 0.001
Group 2	45.8 ± 7.1 (28 - 54)	72.6 ± 4.5 (65 - 78)	
Muscle strength			
Forward flexion, kg			
Group 1	6.0 ± 2.0 (3 - 10)	8.1 ± 2.2 (4 - 12)	< 0.001
Group 2	5.6 ± 1.9 (3 - 11)	7.6 ± 1.5 (4 - 10)	
External rotation, kg			
Group 1	7.1 ± 2.0 (3 - 12)	8.4 ± 1.8 (4 - 12)	< 0.001
Group 2	6.7 ± 1.7 (4 - 10)	8.1 ± 2.1 (4 - 12)	
Internal rotation, kg			
Group 1	8.7 ± 2.4 (5 - 13)	10.3 ± 2.4 (6 - 15)	< 0.001
Group 2	8.4 ± 2.1 (4 - 12)	10.2 ± 1.8 (5 - 14)	

Values are presented as mean ± standard deviation (range). Group 1: a group underwent single row repair technique, Group 2: a group underwent speed bridge technique.
ROM, range of motion; VAS, visual analogue scale; WORC, Western Ontario Rotator cuff Index.

tendon. The medial sutures were placed at 5-mm intervals in the sagittal plane. Lateral-row fixation was performed with 2 suture ends from each medial-row anchor with SwiveLock knotless anchors. The sutures were tensioned carefully and fixed with lateral-row anchors (Fig. 1) (Fig. 2).

All patients followed the same postoperative rehabilitation protocol. Abduction braces were applied immediately following arthroscopic repair for 6 weeks. Six weeks postoperatively, a passive range of motion was permitted. Active assisted exercise was allowed 9 weeks postoperatively, followed by gradual muscle strengthening exercise. Return to sports activities or to labor were delayed for 6 months.

The Student t test and the Mann-Whitney u test were used to compare age, duration of symptoms, follow-up period, tear size, range of motion, muscle strength, and clinical assessment scores between the 2 groups. Fisher's exact test and the Chi-square test were used to compare gender, affected shoulder, smoker, and retear rate between the 2 groups. The paired t test and Wilcoxon sign's rank

Table 3. — Comparison of the clinical outcomes in the 2 groups

	Group 1	Group 2	p value
ROM, degree			
Forward flexion	153.8 ± 15.8 (120 - 150)	154.1 ± 14.7 (120 - 150)	0.870
External rotation	73.2 ± 15.6 (30 - 90)	74.2 ± 14.0 (45 - 90)	0.663
Internal rotation	50.0 ± 11.5 (30 - 80)	50.0 ± 10.5 (30 - 80)	1.000
Abduction	117.4 ± 19.6 (90 - 170)	118.4 ± 23.9 (60 - 170)	0.723
Muscle power, kg			
Forward flexion	8.1 ± 2.2 (4 - 12)	7.2 ± 1.7 (4 - 15)	0.080
External rotation	8.4 ± 1.8 (4 - 12)	8.1 ± 2.1 (4 - 12)	0.301
Internal rotation	10.3 ± 2.4 (6 - 15)	10.2 ± 1.8 (6 - 15)	0.792
VAS score	0.3 ± 0.6 (0 - 2)	0.4 ± 0.6 (0 – 2)	0.495
Constant score	80.0 ± 6.9 (45 - 89)	79.8 ± 4.4 (70 - 89)	0.792
WORC	72.9 ± 4.8 (62 - 78)	72.6 ± 4.5 (65 - 78)	0.683

Values are presented as mean ± standard deviation (range). Group 1: a group underwent single row repair technique, Group 2: a group underwent speed bridge technique.
ROM, range of motion; VAS, visual analogue scale; WORC, Western Ontario Rotator cuff Index.

test were used to compare between the preoperative and postoperative range of motion, muscle strength, VAS score, constant score, and WORC index. Significance was set at a level of 0.05 with 95% confidence intervals. SPSS software package (version 21.0; SPSS Inc, Chicago, IL, USA) was used for all statistical analyses.

RESULTS

Cohen's weighted kappa coefficient was 0.988 (95% CI, 0.983-0.991; $p < 0.001$). Postoperative CT arthrography and ultrasonography results were interpretated by two experienced radiologist trained in musculoskeletal radiology. Interobservor reliability was found to be Cohen's unweighted kappa = 0.821 (95% CI, 0.686-0.960; $p < 0.001$).

Table II and III show the pre- and postoperative range of motion, muscle strength, and clinical outcomes in the 2 groups. Forward flexion, external rotation, internal rotation, and abduction at the 2 year follow-up were improved in the 2 groups ($p < 0.001$). The mean muscle strength for forward flexion, external rotation, and internal rotation at the 2 year follow up were also significantly improved in the 2 groups ($p < 0.001$). However, there was no significant difference in the range of motion (forward flexion, external rotation, internal rotation, abduction) or mean muscle strength (forward flexion, external rotation, internal rotation) between the 2 groups (p = 0.885, 0.332, 0.363, 0.896, 0.232, 0.173, and 0.114, respectively). The VAS score at 2-year follow up was significant decreased in the 2 groups ($p < 0.001$). The Constant score and WORC index at 2 year follow up were significantly improved in the 2 groups ($p < 0.001$). However, there was no significant difference in the VAS score, CS score, or WORC index at the 2-year follow-up between the 2 groups (p = 0.255, 0.158, and 0.095, respectively)

At the 1-year follow-up, there was statistically higher retear rate in group 1 (31 retears (29.8%)) compared with in group 2 (13 retears (12.4%))(p < 0.05) (Table IV). Nine group 1 patients (23.7%) with medium tears and four group 2 patients (7.4%) with a medium-sized tear showed retears, and the difference was statistically significant ($p < 0.05$). There was statistically significant difference in retear rate of large-sized tear between 2 groups (group 1 : 14 cases (40.4%) ; group 2 : 3 cases (13.0%)) ($p < 0.05$). There was no significant difference of medial cuff failure between 2 groups (Table V) (Fig 3). It has been shown that the retear pattern after the single-row technique is of type I which has no remnant tendons at the greater tuberosity, whereas that after the conventional suture-bridge technique is of type II which has remnant tendons with suture material at the greater tuberosity (13).

Table 4. — Comparison of retear rate in 2 groups

Subgroup	Group 1		Group 2		p value	Risk ratio (95% CI)
	Events	Total	Events	Total		
Small	2 (10.0)	20	0 (0)	13	0.247	0.900 (0.778 – 1.042)
Medium	9 (23.7)	38	4 (7.4)	51	0.037	0.274 (0.077 – 0.972)
Large	14 (40.4)	35	3 (13.0)	23	0.029	0.225 (0.056 – 0.903)
Massive	6 (54.5)	11	6 (33.3)	18	0.438	0.417 (0.089 – 1.942)
Total events	31 (29.8)	104	13 (12.4)	105	0.002	0.333 (0.162 – 0.681)

Values are presented as number, number (%). p-value using Fisher's exact test and chi-square test. Significance at $p<0.05$.
Group 1: a group underwent single row repair technique, Group 2: a group underwent speed bridge technique.

Table 5. — Comparison of medial cuff failures in 2 groups

Subgroup	Group 1		Group 2		P-value	Risk ratio (95% CI)
	Medical cuff failure	Retear	Medial cuff failure	Retear		
Small	0 (0.0)	2	0 (0.0)	0	-	-
Medium	2 (22.2)	9	1 (25.0)	4	0.916	1.167 (0.074 – 18.346)
Large	3 (21.4)	14	1 (33.3)	3	0.669	1.833 (0.121 - 27.797)
Massive	1 (16.7)	6	2 (33.3)	6	0.523	2.500 (0.162 – 38.599)
Total events	6 (19.4)	31	4 (30.8)	13	0.449	1.852 (0.423 – 8.110)

Values are presented as number, number (%). p-value using Fisher's exact test and chi-square test. Significance at $p<0.05$.
Group 1: a group underwent single row repair technique, Group 2: a group underwent speed bridge technique.

DISCUSSION

After 209 patients with full-thickness rotator cuff tears were divided into 2 groups, one group underwent the single-row technique and the other group underwent the knotless-suture Speed-Bridge technique without medial-row typing. Clinical outcome was compared between the 2 groups, and retear rates and patterns were evaluated after surgery using radiological imaging studies. This study indicated that clinical outcome was not significantly different between the 2 groups. However, the retear rate was significantly higher in group 1 with medium or large size tears, although there were more large-sized cuff tear in group 1 compared with group 2.

With advances in arthroscopic rotator cuff repair, double-row repair, the transosseous equivalent technique, and the suture-bridge technique have been shown to have clinical advantages in terms of ultimate tension load, gap formation, and footprint reconstruction as compared to the single-row repair *(11,16-18)*. However, it is controversial whether double-row repair and the suture-bridge technique would have lower retear rates than single-row repair *(2,5,19,21)*.

From these results, it is assumed that some factors in addition to biomechanical stability would involve healing mechanisms in vivo and in vitro

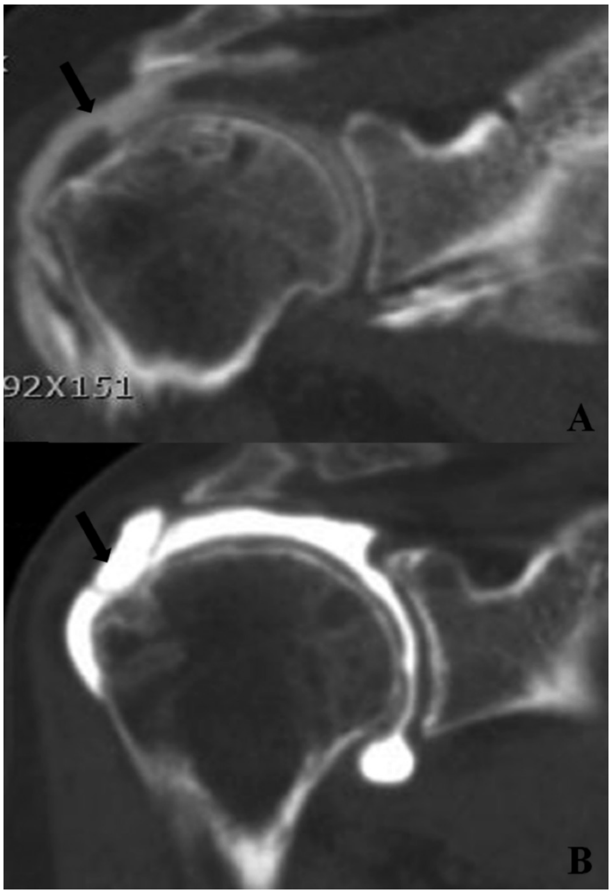

Fig. 3. — CT arthrography were evaluated at 6 months after arthroscopic rotator cuff repair. (A) Medial-row failure with the remnant cuff tissue at the footprint of the greater tuberosity. (B) Lateral-row failure without any remnant tissue at the insertion site

(7,8,15,23,26,30). Trantalis et al. *(26)* reported some cases of medial cuff failure following double-row repair. Cho et al. *(7)* reported a high retear rate following conventional suture-bridge repair, which was attributed to the strangulation and necrosis of the rotator cuff tendon at the medial row that received suture passage and knot typing.

Rhee et al. *(23)* compared retear rates and patterns between the medial-row knotless and conventional knot-tying suture-bridge techniques using MRI in 110 patients with full-thickness rotator cuff tears. They described that the retear rate was lower in the medial-row knotless technique than in the conventional knot-tying suture-bridge technique and that retears occurred at the musculotendinous junction with medial-row tying in 8 of the 11 cases. The present study also showed that medial row failure rates of Speed-Bridge technique was not inferior to that of single row technique.

Numerous methods without medial-row knotting have recently been developed and widely used in clinical practice. Among these methods, the Speed-Bridge technique has clinical advantages in terms of shorter operating time due to simple surgical procedures and prevention of tissue strangulation, necrosis, and knot impingement probably induced by medial-row knotting *(4,9,22,28)*. We anticipated that although the Speed-Bridge technique has lower biomechanical stability than the conventional suture-bridge technique *(3,6,20)*, it maintains vascularity maximally at the musculotendinous junction and thus preserves postoperative cuff integrity for a considerably long time.

Hug et al. *(9)* compared clinical outcome and the retear rate between 22 consecutive patients with full-thickness rotator cuff tears who underwent the Speed-Bridge technique and 20 patients with full-thickness rotator cuff tears who underwent a modified suture-bridge technique. They reported that there were no significant differences between the 2 groups and that medial cuff failure was observed in 4 (80%) of the 5 patients who had Sugaya type IV retear following the modified suture-bridge technique, whereas it was observed in only 2 (40%) of the 5 patients who had Sugaya type IV retear following the Speed-Bridge technique. Based on their results, they also suggest that the Speed-Bridge technique may be a good method for avoiding medial strangulation and medial/lateral knot impingement.

Based on these results, we assumed that the single row and Speed-Bridge technique could maintain better postoperative vascularity and reduce medial row strangulation compared to the double row or modified suture bridge technique. Therefore, this study was performed to compare clinical outcome and the retear rate between the single-row and Speed-Bridge techniques. After surgery, muscle strength and the range of motion were not significantly different between the 2 techniques. The retear rates for small or massive tears were not significantly different between the 2 techniques; however, the retear rates for medium or large tears were significantly lower in the Speed-Bridge technique than in the single-row technique. It may be probable that more suture configurations on the footprint area with low vascularity damage in Speed-Bridge technique could contribute to improve the postoperative tendon continuity compared with the single-row technique. Further study for proper tendon compression pressure preventing vascular damage should be needed.

In this study, Speed-Bridge technique showed 4 patients (30.8%) with medial cuff failure retear. Busfield et al. (6) has demonstrated that the pattern of failure in the Speed-Bridge technique is lateral-row failure, which is consistent with our results. It is conceivable that the pattern of failure may be lateral-row failure due to tendon retraction or suture material passing through the tendon rather than medial-row failure due to mechanical stress and strangulation induced by medial-row tying. It is believed that the Speed-Bridge technique has the advantage for preserving medial-row vascularity over the single-row technique. The reason for this may be that knot-related problems, such as medial or lateral impingement by knot tying can be solved by the Speed-Bridge technique, not by the single-row technique.

The results of this study are subjected to some limitations. First, this study was conducted on patients with various types of tears, without controls. Second, this study has a limitation stemming from its small sample size, which may have caused α- or β-errors. Third, our follow up loss rate was 16%. We thought that rate was not significantly high, however, there could be a selection bias. Moreover, we performed speed bridge technique for the last 12 consecutive patients to get the identical comparative patients number between the group. These retrospective nature of the study could be significant limitation.

CONCLUSIONS

In summary, although clinical outcome was similar between the Speed-Bridge and single-row techniques, the Speed-Bridge technique preserved good cuff integrity after surgery in that it minimized medial row failure without mechanical stress and strangulation induced by medial-row tying. The results of this study suggest that the Speed-Bridge technique may be an alternative method for treating full-thickness rotator cuff tears.

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