# Can Successful Outcomes be Achieved Using the Single-Row Rather Than the Double-Row Technique for Repair of a Rotator Cuff Tear?

## Rotator Manşet Yırtığı Onarımı İçin Çift Sıra Tamir Tekniği Yerine Tek Sıra Tamir Tekniği Kullanılarak Başarılı Sonuçlar Elde Edilebilir Mi?

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Geliş Tarihi / Received : **19.11.2018** Kabul Tarihi / Accepted : **14.01.2019**

**Abstract**

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| Objective | To compare the outcomes of patients grouped according to the intraoperative size of the anteroposterior tear treated using double- or single-row repair techniques. ( **Sakarya Med J 2019, 9(1):68-73** ) |
| Materials and Methods | We examined the outcomes of 112 patients who met our inclusion/exclusion criteria by using the preoperative and postoperative Constant scores. We divided the patients treated using single- or double-row techniques into 4 groups based on the intraoperative size of the anteroposterior tear, including both the supraspinatus and infraspinatus tears. Further, we divided the patients in these 4 groups into two additional subgroups treated using single- and double-row techniques. |
| Results | The single-row group included 64 patients and the double-row group included 48 patients. The mean follow-up time for the single- and double-row groups was 35.61 and 33.46 months, respectively. We observed a significant improvement in the outcomes of patients in the single- and double-row groups. The preoperative and postoperative Constant scores of patients in the single-row groups were 35.96 and 81.23, respectively ($p<0.001$). The preoperative and postoperative Constant scores of patients in the double-row groups were 31.60 and 74.31, respectively ($p<0.001$). Patients with an intraoperative tear size of 1-3 cm treated using the single-row technique showed better outcomes than those treated using the double-row technique (postoperative Constant scores 81.22 and 71.86, respectively, $p=0.005$). |
| Conclusion | Thus, the single-row repair technique was used successfully in patients with supraspinatus and infraspinatus tears ranging from 1-3 cm. |
| Keywords | constant score; double row; single row; size of the anteroposterior tear; rotator cuff tear; rotator cuff repair |

**Öz**

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| *Amaç* | *Cerrahi sırasındaki rotator manşetteki anteroposterior yırtık ölçüsüne göre oluşturulan gruplardaki tek sıra ya da çift sıra tamir yöntemi ile opere edilen hastaların klinik sonuçlarını karşılaştırmak. ( **Sakarya Tıp Dergisi 2019, 9(1):68-73** ).* |
| *Gereç ve Yöntemler* | *Dâhil etme ve etmeme kriterlerine uyan 112 hastanın cerrahi öncesi ve sonrası sonuçları Constant Skoru kullanılarak değerlendirildi. Hem supraspinatus hem de infraspinatus yırtığına aynı anda sahip olan, tek sıra ya da çift sıra tamir yöntemi ile ameliyat edilen hastalar cerrahi sırasında saptanan anteroposterior yırtık ölçüsüne göre 4 gruba ayrıldı. Ayrıca bu 4 grup çift sıra ve tek sıra olmak üzere 2 alt gruba daha ayrıldı.* |
| *Bulgular* | *Hastaların 64'ü tek sıra, 48'i çift sıra grubu içindedir. Ortalama takip süresi tek sıra grubu ve çift sıra grubu için sırası ile 35.61 ve 33.46 aydır. Hem tek sıra hem de çift sıra grubundaki hastaların sonuçlarında istatistiksel olarak anlamlı ilerleme saptandı. Tek sıra grubunda cerrahi öncesi ve sonrasındaki Constant skorları sırası ile 35.96 ve 81.23 olarak saptandı ($p<0.001$). Çift sıra grubunda cerrahi öncesi ve sonrasındaki Constant skorları sırası ile 31.60 ve 74.31 olarak saptandı ($p<0.001$). Cerrahi sırasında yırtık ölçüleri 1 cm ile 3 cm arasındaki grupta yer alan hastalardan tek sıra tekniği ile tedavi edilen hastaların sonuçlarının çift sıra tekniği ile tedavi edilenlere göre daha iyi olduğu saptandı. (Cerrahi sonrasında Constant skorları sırası ile 81.22 ve 71.86 olarak saptandı, $p=0.005$).* |
| *Sonuç* | *Cerrahi öncesi AP yırtık ölçüleri 1 cm ile 3 cm arasında hem supraspinatus hem de infraspinatus yırtığının ikisine de sahip olan hastalarda tek sıra tamir uygulaması başarılı bir şekilde uygulanmıştır.* |
| *Anahtar Kelimeler* | *constant skoru; tek sıra; çift sıra; anteroposterior yırtık ölçüsü; rotator manşet yırtığı; rotator manşet tamiri* |

## INTRODUCTION

With the technological improvements in arthroscopic instruments, arthroscopic repair has been increasingly used over the open technique for repair of the rotator cuff tear.[1-4] To date, however, no consensus has been established about the preferred technique for rotator cuff tendon tears.[4-7] Biomechanical studies have shown that the double-row repair technique is superior to the single-row repair technique in the extent of footprint coverage, strength of the repaired tendon, gap formation, pressure under the repaired tendon, and the number of cycles to failure, and to date, no clinical differences have been observed between the double- and single-row repair techniques.[4, 5, 8-11]

Previous studies indicate that factors such as the shape of the tear, preoperative anteroposterior (AP) size of the tear, fatty degeneration of the tendons, the tendon quality and age have been evaluated to decide whether the double- or single-row technique should be used for repair of the rotator cuff tear.[2,12-17] However, the most important factor for selecting an appropriate suture technique for avoiding damage to the rotator cuff has not been established thus far.[1,3,4,7,9-11,16,18] The double-row repair is recommended, particularly for tears greater than 3 cm. No clinical differences are observed between the single- and double-row repair techniques for tears smaller than under 3 cm.[5,6,8,19,20] This study aimed to evaluate the results of patients grouped according to the intraoperative sizes of the AP tear undergoing rotator cuff repair by using the single- or double-row techniques.

## MATERIALS and METHODS

Our study was approved by our institutional review board (No: 17-1124-18) and informed consent forms were obtained from all participants before commencement of the study. This study is a descriptive cross-sectional study. The inclusion criteria were as follows: 1) persistent pain despite 6 months of conservative treatment and 2) full-thickness tear, including both the supraspinatus and the infraspinatus tendons. The exclusion criteria were as follows: 1) presence of shoulder injuries such as instability, glenohumeral arthritis, 2) presence of an irreparable or a partial rotator cuff tear, 3) presence of inflammatory diseases such as rheumatoid arthritis, 4) a history of shoulder surgery, 5) presence of an active infection at the shoulder joints, 6) presence of a neurologic deficit, and 7) having a teres minor and/or a subscapularis tear.

A total of 287 patients underwent arthroscopic rotator cuff repair at our clinic from January 2010 to November 2017. Supraspinatus and infraspinatus tears were present in 112 (39%) patients. The remaining patients were excluded from the study because of infraspinatus, supraspinatus, and subscapularis tears (n=93, 32.40%), only supraspinatus tear (n=60, 20.91%), supraspinatus and subscapularis tears (n=20, 6.97%), and only infraspinatus tears (n=2, 0.69%). Single-row repair and double-row repair was performed in 64 (57.14%) and 48 (42.85%) patients, respectively.

We divided the patients in our study into 4 groups according to Cofield's classification of rotator cuff tears by measuring the intraoperative size of the AP tear using a ruler during the arthroscopic surgery. [21,22] Subsequently, patients in these 4 groups were divided into two subgroups as a single- and double-row repair group (Table 1). We evaluated the Constant score of the patients and duration before the operation to the last follow-up at least 6 months after the surgery (Table 2 and 3). A minimal clinically important difference (MCID) for the Constant score has been used to assess the success of the treatment of patients with a rotator cuff tear[23, 24], and an improvement of 10.4 points in the Constant score is required for a minimum significant clinical difference.[23]

All operations were performed by the senior surgeon in a modified beach chair position. The single-row technique was performed using one, two, or three 4.5-mm titanium anchors. The double- row technique was performed using one, two, or three anchors for medial row fixation and one or two knotless anchors for lateral row fixation. If subacro-

| **Table 1: Demographics characteristics of patients** | | | | |
|---|---|---|---|---|
| | Single-row repair | Double-row repair | p value | Total |
| Age (mean±sd) | 59.07±8.60 | 60.85±7.64 | 0.130* | 59.84±8.22 |
| Gender F/M | 47/17 | 37/11 | 0.659** | 84/28 |
| Mean follow-up time (mean±sd) | 35.61±19.91 | 33.46±18.74 | 0.286* | 34.69±19.36 |
| Cuff repair | 64 (57.14%) | 48 (42.85%) | | 112 (100%) |
| Acromioplasty | 57 (58.76%) | 40 (41.23%) | | 97 (100%) |
| Tenotomy | 36 (53.73%) | 31 (46.26%) | | 67 (100%) |
| Tenodesis | 10 (52.63%) | 9 (47.36%) | | 19 (100%) |
| AC joint resection | 5 (62.5%) | 3 (37.5%) | | 8 (100%) |
| Preoperative tear size | | | | |
| <1 cm | 2 (50%) | 2 (50%) | | 4 (100%) |
| 1-3 cm | 59 (72.83%) | 22 (27.16%) | | 81 (100%) |
| 3-5 cm | 3 (11.11%) | 24 (88.88%) | | 27 (100%) |
| >5 cm | 0 | 0 | | 0 |
| * Student t-test, **chi-square test, AC: acromioclavicular, sd: standard deviation | | | | |

| **Table 2: Relationship between the Constant scores of patients in the single- and double-row subgroups** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| AP Tear Size Group | <1 cm | | | 1-3 cm | | | 3-5 cm | | |
| | S | D | p | S | D | p | S | D | p |
| Pre-CS | 38.50±4.95 | 29.00±1.41 | 0.060* | 35.98±13.89 | 33.09±13.34 | 0.201* | 34.00±3.46 | 30.46±6.92 | 0.198* |
| Post-CS | 68.50±0.71 | 89.50±2.12 | 0.003** | 81.22±9.16 | 71.86±15.28 | 0.005** | 90.00±1.73 | 75.29±11.58 | 0.020** |
| *Student t-test, S: single row, D: double row, p: p value, Pre-CS: preoperative Constant score, Post-CS: postoperative Constant score, AP: anteroposterior<br>Values are expressed as mean±standard deviation<br>** indicates a significant p value | | | | | | | | | |

| **Table 3: Relationship between the Constant scores of patients in the single- and double-row groups** | | | |
|---|---|---|---|
| | Preoperative | Postoperative | p value |
| Single–row | | | |
| Constant score | 35.96±13.37 | 81.23±9.28 | p<0.001 ** |
| Double-row | | | |
| Constant score | 31.60±10.25 | 74.31±13.54 | p<0.001 ** |
| p value | 0.031** | 0.008** | |
| * Student t test, Values are expressed as mean±standard deviation, ** indicates a significant p value | | | |

mial impingement was observed after cuff repair, we performed acromioplasty. Biceps tenotomy or tenodesis was performed if we observed biceps tendonitis, synovitis, or superior labrum from anterior to posterior (SLAP) lesions, and we performed acromioclavicular (AC) joint resection for symptomatic arthrosis (Table 1).

After the surgery, all patients used a Velpeau bandage for 4 weeks. The patients performed passive pendulum exercises on postoperative day 1. The patients were encouraged

to do these exercises 5 times a day for 10 min. After 4 weeks, all patients were given a predetermined physiotherapy program. Strengthening exercises were initiated between week 8 and week 12. Sporting activities were not allowed until postoperative month 6.

Statistical analysis: Continuous variables were expressed as mean  standard deviations (SD) and nominal variables were expressed as frequencies and percentages (%). Statistical analysis of two independent and dependent groups was performed using the paired t-test and independent t-test, respectively. The chi-square test was used to compare qualitative data between the two groups. The significance was set at $p<0.05$. Analyses were performed using the Number Cruncher Statistical System (NCSS) 2007 (Kaysville, Utah, USA).

## RESULTS

The single-row group included 64 patients (women, 47 and men, 17), and the double-row group included 48 patients (women, 37 and men, 11). The mean age of patients in the single- and double-row groups was 59.07±8.60 years (range 39-70) and 60.85±7.64 years (range 48-74), respectively. The mean follow-up time of the patients in single- and double-row groups was 35.61±19.91 months (range 6.90-79.91) and 33.46±18.74 months (range 7.33-73), respectively (Table 1). The Constant scores of the patients in single- and double-row groups were measured according to the intraoperative size of the AP tear (Table 2).

We observed a significant difference in the preoperative (35.96±13.37 and 31.60±10.25) and postoperative (81.23± 9.28 and 74.31±13.54) Constant shoulder scores ($p<0.001$) of the single- and double-row groups, respectively (Table 3). In addition, the postoperative Constant score of the single-row group was significantly different from that of the double-row group ($p=0.008$). However, one patient in the double-row group had a lower postoperative Constant score than the preoperative score (from 63 to 29 points), and the symptoms of this patient showed no improvement during the follow-up. Moreover, the Constant score improved from 39 to 41 points in a patient in the double-row group. Apart from these patients, all patients in the single- and double-row groups (100% and 95.83%, respectively) showed a more than 10-point improvement in the Constant scores.

We observed a significant difference in the postoperative Constant scores between the single- and double-row subgroups (68.50±0.71 and 89.50±2.12, respectively) in patients with an intraoperative AP tear smaller than 1 cm ($p = 0.003$). Patients with an intraoperative AP tear smaller than 1 cm in the double-row subgroup had better outcomes than those in the single-row subgroup (Table 2). Moreover, patients in the single- and double-row subgroups with an intraoperative AP tear measuring 1-3 cm and those with AP tear measuring 3-5 cm showed a significant difference in the postoperative Constant scores ($p=0.005$ and $p=0.020$, respectively). The patients with AP tear measuring 1-3 cm and those with AP tear measuring 3-5 cm in the single-row subgroups (81.22±9.16 and 90±1.73, respectively) had better outcomes than those in the double-row subgroups (71.86±15.28 and 75.29±11.58, respectively) (Table 2).

## DISCUSSION

We evaluated the functional scores of patients with a rotator cuff tear repaired using a single-row or a double-row repair technique. We observed significant improvements in the scores of the patients after surgery with both techniques. Our results were consistent with those reported previously.[1-5,7,8,11,19] Given the MCID, 100% of patients in the single-row group and 95.8% of patients in the double-row group showed significant improvements after the surgery. Our results were similar to those reported by Nicholas et al.[11] The results of the study by Nicholas et al. showed a significant improvement of 89% in the American Shoulder and Elbow Surgeons Shoulder (ASES) score in 36 patients treated using single- or double-row techniques.

Our results of repair using the single- or double-row technique based on the intraoperative size of the AP tear of the rotator cuff were different from those reported previously.[5-8,19,20] Our results showed that patients with a tear size>1 cm in the single-row group had a better Constant score than those in the double-row group. However, patients with a tear size<1 cm in the double-row group had better Constant scores than those in the single-row group. Carbonel et al.[8] analyzed 160 patients undergoing arthroscopic cuff repair during a period of two years, and they did not observe any significant difference in the Constant scores of patients with tear a size 1-5 cm in the single- and double-row groups. The results of a study by Park et al.[19] in patients with a tear size>3 cm showed that patients in the double-row group had better outcomes than those in the single-row groups; however, no significant difference was observed in the single- and double-row groups in the case of patients with a tear size<3 cm. The results of a meta-analysis performed by Spiegl et al.[4] showed no significant difference in the outcomes of patients with small- and medium-size tears treated using double- and single-row techniques, whereas a significant difference was observed in patients with large or massive tears. Our study had 64 patients in the single-row group and 48 in the double-row group. We divided the patients further into subgroups for analyzing the effect of the intraoperative AP tear size on the Constant scores; however, the number of patients in each subgroup, particularly the subgroups of patients with a tear size smaller than 1 cm and those with a tear size of 3-5 cm, was not sufficient for statistical evaluation. The differences between our results and those reported previously may be attributed to the lack of a sufficient number of patients in each subgroup. However, we observed a significant difference in the outcomes of the subgroup of patients with tear size 1-3 cm in the double- and single-row groups, and patients in the single-row group had better outcomes. Thus, our results showed that single-row repair was successful in patients with a rotator cuff tear measuring 1-3 cm.

Our study had a few limitations. The number of the patients in each group was not sufficient for statistical evaluation, particularly the subgroups of patients with tear size<1 cm and 3-5 cm. Although we observed meaningful statistical differences in these subgroups, they were not sufficient to deem our results significant. Further, since this was a retrospective study, it may be associated with a bias during patient selection.

Consequently, our results showed that patients with an intraoperative tear of 1-3 cm, including the supraspinatus and infraspinatus tendons, could be successfully treated using the single-row repair technique.

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