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Risk factors for symptomatic retears after arthroscopic repair of full-thickness rotator cuff tears.

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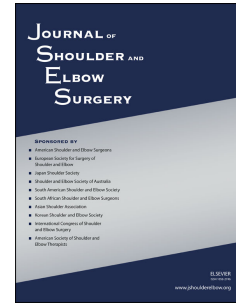
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**Title: Risk factors for symptomatic retears after arthroscopic repair of full-thickness rotator cuff tears.**

**Running title: Risk factors for symptomatic retears of rotator cuff tears.**

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**CONFLICTS OF INTEREST:**

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

-The study has been performed in accordance with the ethical standards in the 1964 Declaration of Helsinki, and the hospital Ethical Committee approved the study, to conform with Spanish law.

**Institutional Review Board (IRB):** Ethical Committee for Clinical Research in the CEIC idcsalud in Catalunya. **Internal Code (study number):** 2016/49-COT-ASEPEYO

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1 **ABSTRACT**

2 **Background:** Factors affecting a rotator cuff symptomatic retear after arthroscopic  
3 repair have yet to be clearly identified, since they usually influence the surgical  
4 decisions.

5 **Methods:** Consecutive patients with full-thickness tear of the supraspinatus who  
6 underwent arthroscopic repair were retrospectively analyzed. Cases of symptomatic  
7 retear, defined as Sugaya type IV and V on MRI, associated with intensive pain and/or  
8 functional impairment were identified at follow-up. The patients with no symptomatic  
9 retear were selected as the control group. Information from potential risk factors of  
10 symptomatic retear, including depression and subacromial corticoid injections, was  
11 extracted from the medical records. The statistical analysis included multivariate  
12 logistic regression.

13 **Results:** The symptomatic retear rate was 9.5% in 158 patients. Patients in the  
14 symptomatic retear group were more likely to be smoking, to have massive tears, short  
15 acromiohumeral distance and moderate to severe fatty infiltration. They also had had  
16 more frequently subacromial corticoid injections and depression. However, following  
17 the multiple logistic regression analysis, only massive tears and moderate-severe fatty  
18 infiltration remained significantly associated. Similarly, in relation to the study  
19 hypothesis, both corticoid injections (OR= 6.66; IC 1.49-29.81; p= 0.013) and  
20 depression (OR= 8.26; IC 1.04-65.62; -p= 0.046) were significantly associated with  
21 symptomatic retear risk.

22 **Conclusions:** This study found support for the hypothesis that both depression and  
23 corticoid infiltration before surgery are independent risk factors for symptomatic retear  
24 after arthroscopic repair of rotator cuff.

25

26 **Level of evidence:** Level III; Retrospective Cohort Comparison; Treatment Study

27 **Keywords:** arthroscopy; rotator cuff; symptomatic re-tear; depression; corticoid

28 infiltration

29

30

31 Retears after rotator cuff repair have been documented in numerous studies<sup>20,21,29</sup> but the  
32 wide discrepancies in the reported rates may indicate different definition criteria  
33 used<sup>3,23,33,39</sup>. Specifically, some studies with high re-tear rate reported include those cases  
34 diagnosed on the bases of MRI findings, but having no symptoms such as pain and  
35 functional impairment<sup>7</sup>. However, those retears with clinical symptoms (symptomatic  
36 retears) have particular interest, since they usually influence the surgical decisions.  
37 Moreover, in view of different surgical alternatives<sup>32</sup>, surgical decisions would be  
38 facilitated by information on risk factors of symptomatic retears, since this improves the  
39 clinical utility.

40

41 Many factors have been implicated in rotator cuff re-tear<sup>10,30,34</sup>, but abundant, between-  
42 study discrepancies are also observed<sup>9,29,33</sup> and result in a general view that the factors  
43 affecting a rotator cuff re-tear have yet to be clearly identified. In fact, on the bases of a  
44 literature search, a recent, systematic review concluded that it was not possible to reach  
45 any definitive conclusion regarding the most relevant predictors of outcome of rotator  
46 cuff<sup>41</sup>. Furthermore, the previous studies have generally been conducted in  
47 heterogeneous samples with high proportion of elderly patients. It is therefore important  
48 to identify factors that predict 'symptomatic retears', after arthroscopic repair of the  
49 rotator cuff in a sample of younger, working-age patients.

50

51 Interestingly, two potential risk factors for retears, which were not included in prior  
52 studies, may merit special consideration in view of insufficient and contradictory  
53 available information. The first one is related to corticoid infiltrations. There is  
54 considerable evidence of the association of corticoid use and tendon rupture risk<sup>17,26,44</sup>  
55 but only few studies have approached this association in relation specifically to rotator  
56 cuff retears. Bjorkenheim et al<sup>5</sup> reported a failed end result in two thirds of those  
57 patients receiving more than three preoperative local steroid injections, and the  
58 increased rotator cuff revision rates have more recently been reported in some  
59 studies<sup>43,45</sup>. However, the study by Baverel et al concluded that “preoperative CSIs had  
60 no influence on retear rates”<sup>3</sup>.

61

62 The second potential risk factor of special interest refers to depression. Perruccio et al  
63 <sup>40</sup>, and more recently Christino et al<sup>11</sup> have underlined the relevance of studying mental  
64 well-being and psychosocial factors in relation to the outcome of surgery in this field.  
65 Specifically, depression has been associated with a negative outcome of several  
66 orthopedic disorders<sup>14,25,46</sup>, but the available evidence is scarce and controversial in  
67 relation to rotator cuff repair. Kennedy et al<sup>28</sup>, found in their review that most studies  
68 support that psychosocial factors, including depression, are associated with a negative  
69 outcome of the surgery, but some showed significant improvements in postoperative  
70 pain and function. A relevant study by Cho et al<sup>8</sup> suggested that depression has an  
71 impact on clinical outcome, but the same authors have more recently reported that  
72 depression did not influence the clinical course during the first postoperation year<sup>9</sup>.

73

74 The purpose of this study is to try to confirm, in working-age patients, that factors  
75 reported in prior studies increase the risk of symptomatic retears after arthroscopic

76 rotator cuff repair; and test specifically the hypothesis that both depression and corticoid  
77 infiltration are independent risk factors.

78

## 79 **MATERIAL AND METHODS**

### 80 **Patient selection**

81 A retrospective review in the hospital database of general data prospectively collected  
82 for this study identified all consecutive patients who underwent arthroscopic RCT repair  
83 in the institution from January 2008 through December 2010, when a suitable form of  
84 computerized registration began operating. The study was done in agreement with the  
85 ethical standards of the institutional review board covering the hospital and the Helsinki  
86 Declaration of 1975 (2013 revision) and informed consent was obtained from the  
87 patients.

88

### 89 **Inclusion and exclusion criteria**

90 Among the patients who underwent arthroscopic RCT repair, only patients with full-  
91 thickness tear of the supraspinatus with or without a combined tear of other rotator cuff  
92 tendon were included. The patients with isolated subscapularis injury, margin  
93 convergence rotator cuff repair, calcifying tendonitis association and patients who  
94 underwent revision repair surgery were all excluded.

95

96 A total of 185 patients with rotator cuff tear were operated within the recruitment  
97 period. Following the inclusion/ exclusion process, 158 of them were selected for the  
98 study. The reasons for exclusion were isolated subscapularis injury (6 cases), margin  
99 convergence rotator cuff repair (7 cases), calcifying tendonitis association (4 cases),  
100 irreparable rotator cuff tear (2 cases) and previous revision repair surgery (8 cases).

101 Mean age of the patients included was  $52.3 \pm 6.8$  (range 31-63 y/o), and men  
102 predominated in this sample (n= 109; 69%).

103

#### 104 **Indications for surgery and description of techniques**

105 Initially, patients with shoulder pain and functional impairment were advised to start a  
106 conservative treatment: limitation of physical activity, even immobilization, and oral,  
107 anti-inflammatory drugs. If the functional impairment persisted after 2-3 weeks, a  
108 rehabilitation treatment was recommended. A subacromial bursa steroid injection was  
109 required in some cases because of the intensity of pain. Rotator cuff repair was  
110 indicated when the conservative treatment did not result in improvement after 3 months.  
111 The surgery was in all cases preceded by magnetic resonance imaging (MRI) exams. All  
112 images were reported by a radiologist specialized on musculoskeletal disorders, but two  
113 independent, experienced shoulder surgeons reviewed the images to reach a consensus.  
114 Inter- or intraobserver reliability were not calculated. Some cases required an  
115 intraoperative decision to proceed with arthroscopic repair or alternative procedures.

116

117 All patients were operated under general anesthesia and interscalene block. They were  
118 positioned in lateral decubitus with  $30^\circ$  of abduction of the upper extremity and under 4-  
119 5 kg of traction. Rotator cuff tear was confirmed within the procedure after sub-  
120 acromial bursa excision. Most of full-thickness RCT smaller than 1cm were repaired by  
121 single row (SR), using traditional double-row (DR) and suture bridge (SB)/trans-  
122 osseous equivalent for 1cm or larger tears. During the operation, some cases were  
123 considered to be irreparable and were therefore excluded. All operations were  
124 performed by the same team of shoulder specialists, using the same surgical criteria for  
125 rotator cuff repair.



126

127 For rehabilitation (RHB), the same procedure was followed in all cases: abduction  
128 pillow immobilization was applied immediately and for 3 weeks after surgery, and  
129 pendular and passive motion were started in the 4<sup>th</sup> week. Active assisted motion with  
130 pulley was performed, starting in the 6<sup>th</sup> week, increasing active range of motion in the  
131 7<sup>th</sup> -8<sup>th</sup> weeks. Strengthening exercises were not allowed before 10-12 weeks.

132

133 Postoperative MRI was performed when the clinical evolution was unsatisfactory  
134 (persistent pain and/or weakness), and/or when retears were suspected, particularly after  
135 the strength exercise was initiated. A total of 25 postoperative MRI were obtained in a  
136 mean time of 8.3 +/- 3.5 months.

137

**138 Study criteria: Symptomatic retears**

139 Cases with full-thickness symptomatic retear after repair were identified and selected  
140 during the follow-up period. Symptomatic retear was defined as Sugaya type IV and V  
141 on MRI<sup>42</sup>, associated with intensive pain (Visual Analogue Scale  $\geq 5$ ) and/or functional  
142 impairment (positive Jobe test and/or external rotation lag sign<sup>24</sup>). All patients included  
143 in the study who underwent the RCT repair, but had no symptomatic retear were  
144 selected as the control group.

145

**146 Risk factors considered**

147 Information from the following potential risk factors of symptomatic retear of the  
148 repaired tendon was extracted from the medical records: age and sex; body mass index,  
149 BMI; diabetes mellitus, DM; cardiovascular disease, CV; smoking; demanding work  
150 (manual work usually requiring the upper extremities); previous RHB (preoperative

151 RHB completed); symptom duration before surgery (months); injured long head of  
152 biceps, LHB and/or subscapularis SSC tendon; tenotomy/tenodesis in long head of  
153 biceps; SSC tendon surgical repair (procedure completed); massive tear (> 5 cm or  
154 involving 2 or more tendons); surgery time (minutes); and repair technique (single row/  
155 double row/suture bridge).

156

157 Other potential risk factors analyzed include the acromiohumeral distance (AHD),  
158 which was measured from the inferior surface of the acromion to the superior aspect of  
159 the humeral head, and was dichotomized into patients with or without AHD less than  
160 7mm (AHD< 7 mm); and the degree of fatty infiltration, which was classified according  
161 to the Goutallier stages<sup>22</sup>, and was dichotomized into patients with Goutallier 3-4 fatty  
162 infiltration and those with Goutallier 0-2 changes.

163

164 Corticoid (CSI) use was considered when the patient received one or more preoperative  
165 injections; and depression when the patient had a medical diagnosis of depression  
166 at the time of the surgical assessment and/or was receiving antidepressant  
167 treatment because of depression. The patients were not assessed with specific  
168 instruments. This information was determined by retrospective review of the medical  
169 records, which includes all visits to the patients' family doctor.

170

### 171 **Statistical methods**

172 Continuous variables were described using means and standard deviations. Categorical  
173 variables were tabulated with absolute and relative frequencies. First, a bivariate  
174 analysis was performed to compare technical and clinical factors between symptomatic  
175 retear and control groups. Pearson's chi-squared test was used for categorical variables

176 and Fisher correction as appropriate if frequencies in any group were less than 5.  
177 Continuous variables were analyzed by the Student t test. Kolmogorov–Smirnov test  
178 was applied to identify absence of normal distribution of continuous variables, using  
179 Mann-Whitney U test for the analysis.

180 Then, a multivariant logistic regression analysis was performed to study the association  
181 of all potential predictive factors with symptomatic retears. Symptomatic retear was the  
182 dependent variable and all variables with significant differences between groups in the  
183 bivariate analysis were included as independent ones. Age and sex were also included  
184 as potential confounders.

185

186 Throughout the statistical analysis,  $p < 0.05$  values were considered to be statistically  
187 significant. Statistical analyses were conducted using IBM SPSS Statistics (version  
188 20.0; IBM, Armonk, NY, USA) and RStudio version 0.99.896 2009-2016.

189

## 190 **RESULTS**

191 Fifteen of the 158 patients selected for the study (9.5%) were identified as suffering  
192 symptomatic rotator-cuff retear (symptomatic retear group). The remaining 143 cases  
193 with uneventful postoperative courses comprised the control group. Five patients who  
194 had symptoms showed healed cuffs on MRI.

195

196 The mean follow-up time was  $42.2 \pm 10.6$  months, and mean time from surgery to  
197 symptomatic retear diagnosis was  $7.9 \pm 3.7$  months.

198

199 Table 1 displays demographic and clinical characteristics of symptomatic retear cases  
200 and the no-symptomatic retear, control group. No between-group, significant  
201 differences by age or sex were observed in the univariate analysis. Similarly, no  
202 differences were observed in relation to having a demanding job/work or in parameters  
203 such as symptom duration, surgery time, or type of surgical technique, medical history  
204 (DM or CV) or tendons injured (LHB, SSC). On the contrary, significant differences  
205 between the patients in the symptomatic retear group and the controls were observed in  
206 different variables. Specifically, in relation to the hypothesis, patients in the retear group  
207 had had more frequently CSI injections and a medical diagnosis of depression  
208 and/or were taking antidepressants.

209  
210 The results of the logistic regression analysis are shown in Table 2. In the univariate  
211 analysis, smoking, massive tear, AHD <7mm, and moderate-severe fatty infiltration, as  
212 well as depression and CSI were all associated with symptomatic retear risk. However,  
213 the results of the multiple logistic regression analysis show that the associations  
214 between smoking or AHD and symptomatic retear were no longer significant. On the  
215 contrary, they remained significant for both massive tears and moderate-severe fatty  
216 infiltration. Similarly, in relation to the study hypothesis, both CSI (OR= 6.66; IC 1.49-  
217 29.81; p= 0.013) and depression (OR= 8.26; IC 1.04-65.62; p= 0.046) were significantly  
218 associated with symptomatic retear risk.

219

## 220 **DISCUSSION**

221 The symptomatic retear rate in this study was 9.5%. Similar, low rates have been  
222 reported in some studies<sup>34,47</sup>, but wide discrepancies are observed in the literature, and  
223 some surgeons report very high rates (41%<sup>37</sup>; 45.5%<sup>48</sup>). However, the higher rates

224 come from studies incorporating individuals with large lesions and older than in this  
225 study<sup>37</sup> or from studies including retears diagnosed on the basis of image findings<sup>38</sup>. On  
226 the contrary, only symptomatic retears were included in this study, which are  
227 particularly relevant because they are considered to be the ones that usually influence  
228 the surgeons' decisions.

229

230 The most important findings of the present study support the hypothesis that both  
231 depression and corticoid injections are independent risk-factors for symptomatic retear  
232 after arthroscopic rotator-cuff repair. In view of the paucity of studies addressing these  
233 factors, the findings may have special relevance. In the present study, the use of one or  
234 more corticoid injections was associated with more than 6-fold increase in the risk of  
235 symptomatic retears. Different studies have described the potential benefits of corticoids  
236 before surgical repair, such as to prevent the need for surgical intervention, alleviating  
237 pain and facilitating rehabilitation, or to prepare shoulders preoperatively, decreasing  
238 inflammation in the subacromial bursa<sup>3</sup>. However, concerns about potential risks have  
239 also been raised, such as the excitotoxic tendon damage<sup>13</sup>, and Bjorkenheim et al<sup>5</sup>  
240 reported “a failed result” in two thirds of those patients receiving more than three  
241 preoperative local steroid injections. Similarly, the studies by Traven et al<sup>43</sup>, and by  
242 Weber et al<sup>45</sup> have shown that preoperative shoulder injections, particularly if they are  
243 close to the time of surgery, increase the risk of revision rates. While, in a more recent  
244 and relevant study, Baverel et al<sup>3</sup> concluded that “preoperative CSIs had no influence on  
245 clinical scores and retear rates” and suggested that their findings “may resolve  
246 controversies about the administration of preoperative CSIs”, their conclusions can not  
247 be considered definitive in view of the present results and the studies reviewed. Baverel  
248 et al have underlined the importance of an adequate injection technique to avoid the

249 potential adverse events, but the discrepant results in this study can not be attributed to a  
250 deficient technique, which was performed by experienced surgeons. On the contrary, the  
251 differences with these authors might be due to the severity of the injurers in the patients  
252 in the present study, since close to half had ‘massive lesions’ and, contrary to Beverel et  
253 al, who had only 4% of their cases with stage 3 fatty infiltration the present study had  
254 22.2% of cases in stage 3 plus 15.8% in stage 4.

255 Depression in this study was associated with more than 8-fold increase in the risk of  
256 symptomatic retears, after controlling for a considerable number of factors reported to  
257 be of risk in different studies. It is remarkable that the subject of psychopathological  
258 aspects did not attract much attention in this field until recently, as suggested by  
259 Perruccio et al<sup>40</sup>. Depression has recently been considered a predictor of poor outcome  
260 in different orthopedic disorders<sup>14, 25, 46</sup>. In relation specifically to rotator cuff repair, the  
261 available evidence is scarce. Cho et al<sup>8</sup> reported that 26.2 % of patients scheduled for  
262 rotator cuff repair had depression, which was a strong predictor of self-assessed  
263 functional disability in preoperative measurements, but contrary to their expectations  
264 preoperative depression did not predict poor outcome after rotator cuff repair<sup>9</sup>. It is also  
265 difficult to compare the studies of Cho et al and this study. They assessed the patients  
266 with the Hospital Anxiety and Depression Scale<sup>49</sup>, a self-report screening instrument of  
267 proved consistency and reliability, which has been frequently used for the detection of  
268 depression in medical patients, including patients with musculoskeletal disorders. High  
269 scores in this instrument indicate greater likelihood of depression. However, the use of  
270 self-report instruments is limited by their rather low predictive value for clinically  
271 significant, treatable depression<sup>12,36</sup>. In relation to this, the effect sizes in the association  
272 of depression with medical conditions has been shown to be larger when full diagnosis  
273 rather than self-report questionnaires were used to assess depression<sup>1</sup>. While the patients

274 in this study were not assessed with specific instruments, the clinicians considered that  
275 the patients had depression and/or had evidence that they were on antidepressant  
276 treatment. The advantage of having information on clinically significant, treatable  
277 depression, is that eventually it would be important to test to what extent successfully  
278 treating the depression prevents the development of symptomatic retear.

279

280 The present study has also supported a number of previous reports documenting the  
281 association of both massive tears<sup>18,48</sup>, and moderate-severe fatty infiltration and retear  
282 risk<sup>16,29,35,37</sup>. Some authors relate the fatty infiltration to molecular mechanisms of  
283 tendon-bone healing, such as recombinant human bone morphogenetic protein-12 and  
284 matrix metalloproteinases<sup>4,31</sup>. Kim et al could not confirm the association with fatty  
285 infiltration, but offered a possible reason because they excluded in their sample some  
286 severe cases with a high probability of retears<sup>29</sup>.

287

288 On the contrary, this study has not found support for the potential of smoking as a risk  
289 factor of symptomatic retear. There is generalized concern in the discipline about the  
290 negative influence of smoking, because of its negative effect in the wound-healing  
291 process in relation to the synthesis of subcutaneous collagen<sup>27</sup> or in the chronic  
292 inflammation and decreased cell proliferation<sup>19</sup>. Moreover, some previous reports found  
293 an association of smoking and tear risk<sup>6</sup> although a recent review found no effect on any  
294 structural outcome and only on functional outcome<sup>41</sup>. However, one important  
295 difference with studies suggesting a positive association of smoking with retear risk, is  
296 that depression was controlled in the present study. Smoking has been shown to be an  
297 important risk factor of depression<sup>15</sup>.

298

299 Similarly, this study has not found support for several elements previously reported to  
300 increase the risk of retears, including patient age, sex, having a demanding job/work,  
301 symptom duration; BMI, DM, CV; previous RHB, injured LHB and/or SSC tendon,  
302 tenotomy/tenodesis in long head of biceps, AHD < 7mm, SSC tendon surgical repair,  
303 surgery time or repair technique. Nevertheless, it is difficult to compare this study with  
304 previous reports, in view of important sampling and/or methodological differences. For  
305 example, the patients in this sample were in general younger than in most previous  
306 studies and probably in relation to this, the prevalence of DM and/or CV was much  
307 lower in this sample<sup>10,29</sup>. In any case, a relevant systematic review has concluded that,  
308 related to methodological questions and questions of design, “it was not possible to reach  
309 any definitive conclusion regarding the most relevant predictors of outcome of rotator  
310 cuff repair”<sup>41</sup>. The findings reported here may stimulate additional studies of the effect  
311 of corticoid injections and of the effect of treating depression to decrease the risk of  
312 symptomatic retears.

313

314 Among the strengths of this study is the sample, which contrary to most previous  
315 studies is limited to working-age patients, and emphasizes the potential risk associated  
316 with both corticoid injections and depression and controls for an important number of  
317 previously reported, potential risk factors. Among the limitations, it might be argued  
318 that sample size is limited in view of the number of variables analyzed. While this size  
319 fulfills common recommendations for regression analysis<sup>2</sup>, power analysis was not  
320 calculated and the possibility of Type 2 error can not be discarded. The retrospective  
321 determination of steroid injection and depression may contribute to inaccuracies,  
322 although the information on the medical records is considered to be reliable.



323 Furthermore, spurious correlation in a retrospective study can not be discarded. Finally,  
324 the influence of some factors uncontrolled in this study cannot be discarded.

325

## 326 **CONCLUSION**

327 This retrospective study has found support for the hypothesis that both depression and  
328 corticoid infiltration before surgery, which were infrequently studied until recently, are  
329 independent risk factors for symptomatic retear after arthroscopic repair of rotator cuff.  
330 Moreover, support has also been found for some, but not all studies documenting the  
331 risk associated with massive tears and fatty infiltration.

332

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1 **Table 1. Differences in demographic characteristics and in potential risk factors between**  
 2 **patients with and without symptomatic rotator cuff retear**

	Symptomatic retear (n=15)	No symptomatic retear (n=143)	<i>p-value*</i>
Age, y (range)	52.5 ± 7.2 (41-63)	52.3 ± 6.8 (31-63)	0.9
Male sex	8 (53.3)	101 (70.6)	0.168
Diabetes mellitus	1 (6.7)	11 (7.7)	1
Cardiovascular disease	3 (20)	21 (14.7)	0.7
Depression	6 (40)	6 (4.2)	<b>&lt;0.01</b>
Tobacco	11 (73.3)	61 (42.7)	<b>0.03</b>
Demanding work	13 (86.7)	117 (81.8)	1
Previous RHB	11 (73.3)	103 (72)	1
Corticosteroid injection	9 (60)	21 (14.7)	<b>&lt;0.01</b>
Symptom duration, mo	10.7 ± 5.4	8.7 ± 6.4	0.09
Surgery time, min	81 ± 9.7	85.2 ± 15.3	0.3
LHB tenotomy/tenodesis	8 (53.3)	55 (38.5)	0.263
SSC tendon injured	3 (20)	33 (23.1)	1
SSC tendon repair	1 (6.7)	20 (14)	0.69
Massive tear	12 (80)	54 (37.8)	<b>0.002</b>
AHD <7mm	8 (53.3)	7 (46.7)	<b>0.011</b>
Moderate-severe fatty infiltration	13 (86.7)	47 (32.9)	<b>&lt;0.01</b>
Repair technique:			0.08
Single row	0 (0)	33 (23.1)	
Double row	8 (53.3)	48 (33.6)	
Suture bridge	7 (46.7)	62 (43.4)	

Data are reported as mean ± SD or n (%). Bolded P values indicate statistically significant difference between groups. RHB: Rehabilitation. LHB: long head of biceps. SSC: subscapularis. AHD: acromiohumeral distance.  
 \*Chi<sup>2</sup> test for categorical data and the Mann-Whitney U test for continuous data.

1 **Table 2. Association of potential risk factors and symptomatic rotator cuff retears (Multiple**  
 2 **Logistic Regression Analysis).**

	Univariate		Multivariate	
	OR (95% CI)	<i>p-value</i>	OR (95% CI)	<i>p-value</i>
Age	1.01 (0.93-1.09)	0.9	0.94 (0.84-1.06)	0.303
Sex	2.1 (0.72-6.17)	0.168	2.98 (0.48-18.52)	0.240
Depression	14.54 (3.66-57.71)	<0.01	8.26 (1.04-65.62)	<b>0.046</b>
Tobacco	4.29 (1.27-14.6)	<b>0.03</b>	1.96 (0.39-9.65)	0.407
Corticosteroid injection	9.88 (3.06-31.95)	<0.01	6.66 (1.49-29.81)	<b>0.013</b>
Massive tear	8.68 (2.19-34.44)	<b>0.002</b>	7.59 (1.24-46.39)	<b>0.028</b>
AHD <7mm	4.38 (1.42-13.51)	<b>0.011</b>	1.49 (0.29-7.68)	0.634
Moderate-severe fatty infiltration	14.05 (2.92-67.6)	<0.01	7.72 (1.29-46.33)	<b>0.025</b>

Bolded P values indicate statistical significance. CSI: Corticosteroid injection. AHD: acromiohumeral distance. OR: Odds Ratio. CI: confidence interval.