

# TRANSVERSAL STUDY ABOUT ACUTE ACROMIOCLAVICULAR LESIONS

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## ABSTRACT

The objective of the present transversal study is to check how Brazilian orthopedists treat these injuries, their criteria for choosing the treatment, results and complications. Methods: During the 6th Brazilian Congress of Shoulder and Elbow Surgery (CBOC) and the 38th Brazilian Congress of Orthopaedics and Traumatology (CBOT) 507 questionnaires were distributed (148 CBOC and 359 CBOT), with 478 being considered for analysis. Results: Regarding type-I and -II ACIs, most of the respondents use traditional non-surgical methods. On the other hand, for type-IV, V and VI injuries, 475 (99.4%) of the respondents indicate surgical

methods. Concerning type-III injuries, there is no consensus in the selection between traditional and surgical treatment for 386 (80.7%) respondents, with the most important factor for selecting a given treatment method being the patient's level of sports practice and age. Conclusion: There is no consensus regarding type-III ACIs, and the selection of the best treatment method is made according to patient's individual characteristics. However, current literature shows a trend towards non-operative methods.

**Keywords:** *Acromioclavicular joint/lesions/surgery. Shoulder dislocation. Shoulder.*

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## INTRODUCTION

Acromioclavicular dislocations (ACD) account for 3.2% of all dislocations of the scapular waist, most frequently prevailing in the second decade of life.<sup>1</sup>

Tossy et al.<sup>2</sup> described three types of acromioclavicular dislocations based on ligament injuries, physical and X-ray examination, and Rockwood<sup>3</sup>, modified that classification by adding three other types, according to clavicular dislocation degree and orientation.

Treatment has been controversial<sup>4-6</sup>, since the first published reports<sup>7</sup>. Over 50 immobilization techniques and over 30 kinds of surgical treatment<sup>8</sup> have been described with variable results.

According to Rockwood et al classification, types I and II should be treated by conventional methods, while types IV, V VI should be operated, because they present strong deviations and associated muscle injuries.<sup>9</sup> However, type III dislocations - which are quite frequent - are usually controversial.<sup>9-11</sup>

The objective of the present study is to check which criteria are adopted by Brazilian orthopaedic doctors when addressing these injuries.

## METHODOLOGY

Congress attendants participated on this study on a volunteer basis, and the questionnaires were randomly distributed among the participants. Questionnaires filled by non-doctors, foreign participants, by those who had previously filled them, or incom-

plete questionnaires were excluded from this study.

507 participants were interviewed. 359 filled the forms during the 38th Brazilian Congress of Orthopaedics and Traumatology (CBOT) in Fortaleza/ 2006, and 148 responded the questionnaire during the 6th Brazilian Congress of Shoulder and Elbow (CBOC) in Goiânia/ 2006.

The number of interviews required for a significant sample combining both congresses is 124 ( $n = (1.96 \times \text{standard deviation} / 0.25 \text{ standard deviation})^2 = 62$ ), considering a 95% confidence interval and a standard deviation corresponding to four times the sample error.

This was a pre-structured questionnaire (Annex 1), composed by six questions subdivided into some sub items addressing topics such as: number of acute acromioclavicular dislocations treated each year, most important criteria for determining therapy approach, surgical or non-surgical treatment of injuries according to Rockwood<sup>9</sup> classification, and, specifically for type III injuries; suggested surgery, the bloodless treatment employed, results concerning range of motion, deformity correction and residual pain, as well as the most frequent complications. At the end of the questionnaire, an illustrated self-explanatory folder with the Rockwood<sup>9</sup> classification was included.

## RESULTS

507 questionnaires were collected, 29 of them were excluded because the respondents were foreign orthopaedists (Germany

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and Portugal) and 27 were incomplete. As a result, 478 questionnaires were validated.

### Participants' Characteristics

Concerning participants' characteristics, 393 (82.6%) were orthopaedic doctors, and 83 (17.4%) were residents. There were 275 (81.6%) orthopaedic doctors and 62 (18.4%) residents at CBOT, and 118 (84.9%) orthopaedic doctors and 21 (15.1%) residents at CBOC.

264 participant doctors (55.2%) were specialists. Of these, 121 (45.9%) were shoulder and elbow specialists and 143 (54.1%) acted in other specialties. And this proportion is higher when we individually assess CBOC participants, with 101 (93.5%) specialists and 7 (6.5%) from other specialties, respectively.

As for the region of activity, most of the participants were from the Southeast 171 (35.8%). (Table 1)

**Table 1** – Distribution of participants according to region, at CBOT, CBOC and overall

Region	CBOT n (%)	CBOC n (%)	TOTAL n (%)
North	24 (7.1)	5 (3.6)	29 (6.1)
Northeast	70 (20.7)	17 (12.2)	87 (18.2)
Mid-West	99 (29.2)	43 (30.9)	142 (29.7)
Southeast	102 (30.0)	69 (49.6)	171 (35.8)
South	44 (13.0)	5 (3.6)	49 (10.3)
Total	339(100)	139(100)	478(100)

### Number of dislocations treated per year

At total, 170 participants (35.6%) treat over ten ACD each year, 146 (30.5%) treat six to ten cases, and 162( 33.9%) treat 5 or less ACD cases. (Table 2)

**Table 2** – Number of acute ACDs treated each year at CBOT, CBOC and overall

ACDs / year	CBOT n (%)	CBOC n (%)	TOTAL n (%)
0 - 5 cases	134 (39.5)	28 (20.1)	162 (33.9)
6 - 10 cases	102 (30.1)	44 (31.7)	146 (30.5)
Over 10 cases	103 (30.4)	67 (48.2)	170 (35.6)
Total	339 (100)	139 (100)	478 (100)

### Most important criteria for determining therapy approach

Deviation degree was regarded as the most important criterion for determining a treatment approach by 389 (81.4%) respondents, followed by: age, occupation and comparative X-ray image of the shoulders, mentioned by 240 (50.2%), 230 (48.1%) and 218 (45.6%), respectively. (Table 3)

**Table 3** – Criteria regarded as most important for determining acute ACD treatment approach at CBOT, CBOC and overall. In this question, the respondent could check more than 1 alternative

Criteria for determining treatment approach	CBOT n (%)	CBOC n (%)	TOTAL n (%)
Mechanism of trauma	76 ( 22.4)	9 (6.5)	85 ( 17.8)
Age	169 ( 49.9)	71 ( 51.1)	240 ( 50.2)
Deviation degree	260 ( 76.7)	129 ( 92.8)	389 ( 81.4)
Athletes	130 ( 38.4)	46 ( 33.1)	176 ( 36.8)
Patient's occupation	154 ( 45.4)	76 ( 54.7)	230 ( 48.1)
Dominant limb injury	76 ( 22.4)	19 ( 10.8)	95 ( 19.9)
X-ray of the shoulder alone	15 ( 4.4)	19 ( 10.8)	34 ( 7.1)
Comparative X-ray image of the shoulders	148 ( 43.7)	70 ( 50.4)	218 ( 45.6)
Tomography or Magnetic Resonance	17 ( 5.0)	0 ( 0.0)	17 ( 3.6)

### Treatment of acute type I and II ACD

Considering CBOT, 328 (96.8%) respondents treat this kind of injury using a bloodless approach, while 11 (3.2%) indicate surgical treatment. At CBOC, no respondent uses surgical approaches to treat patients.

### Treatment of acute type III ACD

Conservative treatment is indicated by 20 (4.2%) respondents, and surgical approach by 72 (15.1%), the other 386 (80.7%) couldn't reach to a consensus regarding surgical or conservative approach. Separately taking CBOT and CBOC 56 (16.5%) and 16 (11.5%) participants adopt surgical approaches, 14 (4.1%) and 6 (4.3%) use bloodless methods, and 269 (79.4%) and 117 (84.2%) adopt surgical approaches or according to patients' characteristics.

Overall, 317 (66.3%) use surgical approaches, 266 (55.7%) young patients and 263 (55.0%) heavy duty workers and the non surgical treatment is employed for elderly patients by 165 (34.5%) respondents.

Concerning the kind of surgery, 289 respondents (63.1%) use coracoclavicular fixation (anchors, cords or screws), followed in frequency by acromioclavicular fixation with transfixing wires by 234 respondents (51.1%), ligament transfer from coracoacromial to coracoclavicular by 172 (35.6%), suturing of acromioclavicular and coracoclavicular ligaments by 141 (30.8%) and other techniques by 15 (3.3%), all associated to other methods or not. When we review each congress separately, we notice that this trend remains. (Table 4)

Simple arm sling is the conservative approach most used, 288 (71.0%) respondents use this method, followed by thoraco-brachial immobilization by 91 (22.4%), rehabilitation only by 43 (10.6%), bloodless reduction followed by any kind of immobilization by 19 (4.7%) and other methods by 13 (3.2%). The results from CBOT and CBOC are described on Table 5.

**Table 4** – Surgical treatment methods of choice for respondents in cases of acute type-III ACDs at CBOT, CBOC and overall. The respondents could select more than one procedure. Percentages relate to the total number of respondents applying surgical treatment (CBOT n=325 and CBOC n=133)

Indicated surgery	CBOT n (%)	CBOC n (%)	Total n (%)
Suturing of acromioclavicular and coracoclavicular ligaments	108 (33.3)	33 (24.8)	141 (30.8)
Acromioclavicular joint fixation with transfixing wires	167 (51.4)	67 (50.4)	234 (51.1)
Clavicle fixation to coracoid process (anchors, cords or screws)	189 (58.2)	100 (75.2)	289 (63.1)
Transfer of coracoacromial ligament to coracoclavicular	109 (33.6)	63 (47.4)	172 (37.6)
Other	5 (1.6)	10 (7.5)	15 (3.3)

**Table 5** – Conservative treatment methods of choice for the respondents in cases of acute type-III ACDs at CBOT, CBOC and overall. The respondents could select more than one procedure. Percentages relate to the total number of respondents applying conservative treatment (CBOT n=283 and CBOC n=123)

Indicated conservative treatment	CBOT n (%)	CBOC n (%)	TOTAL n (%)
Ordinary sling	180 (63.6)	108 (87.8)	288 (71.0)
Thoracobrachial immobilization	80 (28.3)	11 (9.0)	91 (22.4)
Bloodless reduction followed by any immobilization method	17 (6.0)	2 (1.6)	19 (4.7)
Rehabilitation only	34 (12.0)	9 (7.3)	43 (10.6)
Other	8 (2.8)	5 (4.1)	13 (3.2)

### Acute ACD treatment complications

Range of motion subjectively evaluated by the respondents after acute ACD show excellent results for 215 (45.0%) of the respondents, good for 229 (47.8%), fair for 31 (6.5%) and poor for 3 (0.7%). (Table 6)

Concerning deformity correction, 123 (25.8%) participants report excellent results after acute ACD treatment, 262 (54.8%) good, 72 (15.1%) fair and 21 (4.4%) poor results. (Table 7)

Concerning pain, 124 (26.0%) of the respondents report excellent results, 298 (62.3%) good, 53 (11.1%) fair and 3 (0,6%) poor results. (Table 8)

**Table 6** – Results after acute type-III ACD treatment concerning range of motion, according to respondents' opinion at CBOT, CBOC and overall.

Result concerning range of motion	CBOT n (%)	CBOC n (%)	TOTAL n (%)
Excellent	119 (35.1)	96 (69.1)	215 (45.0)
Good	191 (56.4)	38 (27.3)	229 (47.8)
Fair	27 (8.0)	4 (2.9)	31 (6.5)
Poor	2 (0.5)	1 (0.7)	3 (0.7)
TOTAL	339 (100)	139 (100)	478 (100)

**Table 7** – Results after acute type-III ACD treatment concerning deformity correction, according to respondents' opinion at CBOT, CBOC and overall.

Results concerning deformity correction	CBOT n (%)	CBOC n (%)	TOTAL n (%)
Excellent	86 (25.4)	37 (26.6%)	123 (25.8)
Good	181 (53.4)	81 (58.3)	262 (54.8)
Fair	53 (15.6)	19 (13.7)	72 (15.1)
Poor	19 (5.6)	2 (1.4)	21 (4.4)
Total	339 (100)	139 (100)	478 (100)

**Table 8** – Results after acute type-III ACD treatment concerning deformity correction, according to respondents' opinion at CBOT, CBOC and overall.

Results concerning deformity correction	CBOT n (%)	CBOC n (%)	TOTAL n (%)
Excellent	91 (26.8)	33 (23.8)	124 (26.0)
Good	199 (58.7)	99 (71.2)	298 (62.3)
Fair	46 (13.6)	7 (5.0)	53 (11.1)
Poor	3 (0.9)	0 (0.0)	3 (0.6)
Total	339 (100)	139 (100)	478 (100)

Complications most frequently found in decreasing order: residual deviation reported by 254 (53.1%) respondents, followed by 172 (36.0%) cases of early acromioclavicular arthrosis, and 122 (25.5%) of failure of the fixation technique. (Table 9)

**Table 9** – Most frequent complications found by respondents when treating acute type-III ACDs at CBOT, CBOC and overall. In this question, the respondent could check more than one complication.

Complications	CBOT n (%)	CBOC n (%)	TOTAL n (%)
Clavicle instability	56 (16.5)	22 (15.8)	78 (16.3)
Infection	25 (7.4)	13 (9.6)	38 (8.0)
Implant failure	98 (28.9)	24 (17.3)	122 (25.5)
Early acromioclavicular arthrosis	151 (44.6)	21 (15.1)	172 (36.0)
Acromioclavicular subdislocation	150 (44.3)	104 (74.8)	254 (53.1)
No complication	12 (3.5)	6 (4.3)	18 (3.8)
Other	8 (2.4)	11 (8.0)	19 (4.0)

### Acute Type IV, V, VI ACD Treatment

Overall, 475 (99.4%) respondents use surgical approach to treat these injuries. At CBOC alone, 100% treat them surgically, while at CBOT, only three respondents (0.9%) do not indicate surgery for their patients.

### DISCUSSION

At CBOC, as expected, we found a much higher percentage of

shoulder and elbow specialists (93.5%) as compared to CBOT (12.8%), suggesting that the data collected at CBOC reflect the opinion of shoulder and elbow specialists.

Most of the respondents were from Southeast region (171 - 35.8%) reflecting a concentration of physicians and schools in that region. The percentages found for Mid-West and Northeast regions may seem overestimated, since both congresses took place in cities of those regions.

Thorndike and Quigley<sup>12</sup> reported the involvement of acromioclavicular joint in 223 of the 578 shoulder injuries of athletes, evidencing the importance of these injuries.

In our study, a similar distribution is found in our study between those treating 0-5, 6-10 and over 10 ACD a year, respectively: 33.9%, 30.5% and 35.6%. By assessing both congresses separately, we notice that CBOC distribution is greater for those treating over 10 injuries a year: 48.2%, versus 30.4% for CBOT, the latter showing a prevalence of those treating 0-5 injuries a year: 39.5%.

Deviation degree was regarded as the most important factor for determining ACD treatment approach by the respondents, both at CBOT (76.7%) and at CBOC (92.8%), and this is a critical factor for determining Rockwood<sup>9</sup> classification. This classification is better defined by means of comparative X-ray images of the shoulders<sup>13</sup>, mentioned by 45.6% of the respondents on both congresses as another decisive factor for treatment.

Conservative treatment of acute type I and II ACD is a consensus.<sup>11,14</sup> In our study, all respondents at CBOC reported treating these kinds of injuries with a non-surgical approach, while, at CBOT, 3.2% treat them with surgery.

Powers and Bach<sup>15</sup> interviewed all medical residence services certified in the United States on the treatment of full ACDs, with preference being reported for surgical treatment of the injuries, but they used the Tossy<sup>2</sup> classification, which probably included injuries grade IV and V of Rockwood classification.

More recently, Cox<sup>16,17</sup> conducted a similar study, using the Rockwood<sup>9</sup> classification and sending a survey questionnaire to two groups of orthopaedic doctors; the first group regularly treated athletes and was composed by 62 doctors, while the second group was constituted of 231 orthopaedic residency coaching directors in North America. The study concluded that conservative treatment is preferred over surgical for type III ACDs.

McFarlan et al.<sup>18</sup> surveyed 42 sportive traumatologists working for major baseball teams, aiming to evaluate what would be the treatment adopted for a hypothetical pitcher experiencing a type-III ACD one week before the kick-offs. 29 orthopaedic doctors (69%) reported that they would treat the injury with a conservative approach, while 13 (31%) said that they would operate the player immediately. 20 respondents (48%) reported having treated 32 injuries like that in baseball players. 20 injuries (62.5%) had been treated using a surgical approach and 12 (37.5%) conservatively. No difference was found on the results of both groups.

Phillips et al.<sup>19</sup>, in a meta-analysis, suggest that there is no current evidence in literature pointing out to surgical treatment any type-III injury.

Conservative treatment for type III ACDs was successfully described on several studies.<sup>4,11,20-23</sup>

Despite of the studies mentioned above, conservative treatment for all cases of acute type-III ACD is indicated by only 4.2% of the respondents.

Countless conservative treatment methods for full ACDs have been reported, including strapping with adhesive tape, slings, strapping, supports, traction, compressive bandage and plas-

tered casts. Devices keeping bloodless reduction are rarely employed, because these cause a great deal of discomfort for the patient and the ability to maintain reduction has never been proved. Conservative treatment more frequently consists on short term support with sling, drug therapy for symptoms relief and early movimentation.<sup>9</sup> In our study, ordinary sling was the method of choice for 71% of the respondents and only 4.7% use bloodless reduction and then immobilization. If we assess CBOC separately, this becomes more evident, with sling being the method of choice for 87.8%, while bloodless reduction followed by immobilization was employed by only 1.6%.

During the 19th and early 20th century, almost all possible surgical interventions have been made addressing acromioclavicular dislocation. These procedures included coracoclavicular and acromioclavicular joint reconstitution, the combination of both, coracoclavicular fusion and dynamic transposition of muscles using an end of the coracoid process and the joint tendon. Nowadays, procedures are performed using combinations or modifications of previously described procedures.<sup>24,25</sup> In our study, 15.1% of the participants would indicate surgical treatment for any acute type III ACD. Concerning the most frequently employed method, clavicle fixation to the coracoid process (anchors, cords or screw) if the most frequently used one, accounting for 63.1% of the answers, followed by acromioclavicular joint fixation with transfixing wires in 51.1% and ligament transfer from coracoacromial to coracoclavicular in 37.6%.

Most respondents (80.7%) treat type-III ACDs according to patient's characteristics. In his randomized controlled prospective study, Bannister<sup>25</sup>, suggests that, in young patients with significant dislocations, surgical treatment must be indicated. In our study, 55.7% of the respondents pointed age as the determinant factor for treating acute type-III ACDs. In another prospective, randomized, controlled study, Larsen<sup>26</sup> suggests that the surgical treatment of acute ACDs should be selected for heavy duty workers, and for those working with the shoulder in over 90° of flexion and abduction. Patients' occupation, in our study, was regarded as an important criterion for determining treatment approach by 55.1% of the respondents.

Residual joint deviation is expected with conservative treatment.<sup>19</sup> In surgical treatment, there is also a loss of the reduction achieved with surgery in 20 to 40% of the patients.<sup>19</sup> In our study, this was the complication most frequently mentioned (53.1%).

Due to the severe posterior dislocation of distal clavicle in type-IV injuries and to the gross upper dislocation, on type-V injuries, most authors recommend surgical repair.<sup>27,28</sup> All type-VI injuries described on literature were treated with surgery.<sup>29</sup> The great majority of the respondents (99.4%) in our study treat these injuries with surgery.

## CONCLUSION

Brazilian orthopaedic doctors treat type-I and II ACDs conservatively, and types IV, V and VI with surgical procedures, which is consistent with current literature.

For type-III ACD, there is no consensus, with treatment being determined according to each patient's characteristics; however, in current literature<sup>25,26,30</sup>, there is a trend towards conservative treatment of these injuries.

## Implications to practice and future researches

Further studies with proper methodologies are warranted for providing subsidies regarding the effectiveness of surgical therapy versus conservative treatment and addressing the best surgical and conservative method for treating acute type-III ACDs.

**ANNEX 1**

<p><b>CROSS SECTIONAL STUDY ON ACUTE ACROMIOCLAVICULAR DISLOCATION TREATMENT</b></p> <p><b>1. Personal data:</b></p> <p>Orthopaedist ( ) Resident ( )          Sub-specialty          No ( )          Yes ( ) → Shoulder &amp; Elbow ( ) Other ( )          Region          North ( ) Northeast ( ) Mid-West ( )          Southeast ( ) South ( )</p> <p><b>2. How many cases of Acute Acromioclavicular Dislocations do you treat on a yearly basis?</b></p> <p>0 - 5 ( ) 6 - 10 ( ) over 10 ( )</p> <p><b>3. Which criteria below do you think is the most important for determining a treatment approach? (maximum: 03 alternatives)</b></p> <p>Mechanism of trauma ( ) Age ( )          Deviation degree ( ) Athletes ( )          Patient's occupation ( ) Dominant limb injury ( )          XRay of the shoulder alone ( ) Comparative XRay of the shoulders ( )          Tomography or Magnetic Resonance ( )</p> <p><b>4. How do you treat Rockwood grade I and II Acute Acromioclavicular Dislocations?</b></p> <p>Surgically ( ) Conservatively ( )          What is your surgical approach? _____</p> <p><b>5. How do you treat Rockwood grade III Acute Acromioclavicular Dislocations? - Please check two alternatives -</b></p> <p>Surgically ( ) Conservatively ( )          For what kind of patient? For what kind of patient?          Any kind ( ) Any kind ( )</p>	<p>Athletes ( ) Athletes ( )          Elderly ( ) Elderly ( )          Young ( ) Young ( )          Heavy duty workers ( ) Heavy duty workers ( )          Other ( ) _____ Other ( ) _____</p> <p><b>Indicated surgery:          (Consider 03 Alternatives at most)</b></p> <p>Suturing of Acromioclavicular and          Coracoclavicular ligaments ( ) Ordinary sling ( )          Acromioclavicular joint fixation with          transfixing wires ( ) Thoracobrachial immobilization ( )          Clavicle fixation to Coracoid          Thoracobrachial immobilization after          Process (anchors, cords or screw) ( ) bloodless reduction ( )          Transfer of coracoacromial ligament to          Rehabilitation only ( )          Coracoclavicular ( )          Other ( ) _____ Other ( ) _____</p> <p><b>5.1 How do you rate the Results concerning:</b></p> <p><b>LIMB'S RANGE OF MOTION:</b>          Excellent ( ) Good ( ) Fair ( ) Poor ( )</p> <p><b>DEFORMITY CORRECTION:</b>          Excellent ( ) Good ( ) Fair ( ) Poor ( )</p> <p><b>RESIDUAL PAIN:</b>          Excellent ( ) Good ( ) Fair ( ) Poor ( )</p> <p><b>5.2 What are the most frequent complications you usually find?</b></p> <p>Clavicle instability ( ) Infection ( )          Implant failure ( )          Early Acromioclavicular Arthrosis ( ) Acromioclavicular Subdislocation ( )          No complications ( ) Other ( ) _____</p> <p><b>6. How do you treat Acute Rockwood's grade IV, V and VI Acromioclavicular Dislocations?</b></p> <p>Surgically ( ) Conservatively ( )</p>
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