



Methods used to assess the severity of acromioclavicular joint separations in Japan: a survey



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ARTICLE INFO

Keywords:

Acromioclavicular joint separations
vertical displacement
posterior displacement
severity assessment

Level of evidence: Survey Study; Experts

Background: In acromioclavicular joint (ACJ) separations, patient characteristics determine the indications for surgery. However, in Japan, classification methods used to assess the severity of ACJ separations differ between institutions, and even within a classification method, different interpretations can lead to different assessments of severity. Therefore, in this study, we conducted an email survey of Japan Shoulder Society (JSS) members regarding their assessment methods for ACJ separation severity.

Methods: A questionnaire about methods for assessing the severity of ACJ separations was emailed to JSS members (1655) including 59 JSS councilors. The survey focused on diagnostic imaging methods, classifications of severity assessments, and methods of assessing severity.

Results: In total, 183 responses were received. All respondents used an anteroposterior view of the ACJ. Severity assessments were classified by the Tossy classification (57 respondents), Rockwood classification (141 respondents), and other classifications (7 respondents) including duplication. Of the 141 respondents using the Rockwood classification, 119 diagnosed type III as ACJ dislocation when the inferior clavicle border translated above the superior acromial border, whereas 56 used the coracoclavicular distance. However, to diagnose type V, 118 respondents used the coracoclavicular distance whereas 38 used palpation. To diagnose type IV, 57 respondents considered all cases in which the clavicle translated posterior to the acromion, even when vertical ACJ dislocation occurred simultaneously. However, 88 respondents did so in the presence of posterior clavicle displacement and ACJ subluxation.

Conclusion: The Rockwood classification is commonly used for severity assessments in Japan; however, there is some disagreement regarding the assessment for the diagnosis of type IV. Methods to diagnose both superior and posterior translation of the clavicle need further debate.

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The stabilization mechanism of the acromioclavicular joint (ACJ) includes a static stabilization mechanism composed of the acromioclavicular (AC) ligament and coracoclavicular ligament (trapezoid ligament and conoid ligament) and a dynamic stabilization mechanism composed of the trapezius and deltoid muscles.⁶ The severity of damage to these soft tissues has a major influence on the extent of clavicle translation with respect to the acromion and surgical indications.

The questionnaire survey was approved by the Japan Shoulder Society. No institutional review board approval was required for this basic science study.

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<https://doi.org/10.1016/j.jseint.2019.11.006>

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The severity of ACJ separations is usually assessed using radiography. The Tossy classification¹¹ or Rockwood classification⁷ is commonly used to categorize assessments, although the criteria for assessing subluxation and dislocation can differ between examiners. The Tossy classification is a simple categorization into 3 grades: sprain, subluxation, and dislocation. The Rockwood classification further differentiates injuries into types I to VI. It covers not only superior translation but also posterior and inferior translation. Rockwood type I (sprain) is damage to the AC ligament, type II (subluxation) is rupture of the AC ligament and damage to the coracoclavicular ligament, type III (superior dislocation) is rupture of the AC ligament and coracoclavicular ligament, type IV is posterior dislocation of the ACJ, type V is high-grade superior dislocation with rupture of the

Table 1
Survey items

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1. Assessment with radiography
 - A. Imaging method
 - a. Anteroposterior view
 - b. Axial view
 - c. Scapula Y view
 - d. Other (_____)
 - B. Limb position
 - a. Standing
 - b. Sitting
 - c. Supine
 - C. Weight bearing
 - a. Yes
 - b. No
 2. Additional imaging required
 - A. Yes
 - a. Computed tomography
 - b. Magnetic resonance imaging
 - c. Ultrasonography
 - d. Other (_____)
 - B. No
 3. Method of assessing severity
 - A. Tossy classification
 - B. Rockwood classification
 - C. Other (_____)
 4. For respondents who said they used Rockwood classification in question 3
 - A. Reason for not using Tossy classification
 - a. Ambiguous assessment of superior clavicle translation
 - b. Cannot assess clavicular translation from multiple directions
 - c. Other (_____)
 - B. Method of assessing type III (superior translation of acromioclavicular joint)
 - a. Inferior border of clavicle translated above superior border of acromion
 - b. Coracoclavicular distance (ratio to unaffected side)
 - ① $\geq 125\%$
 - ② $\geq 150\%$
 - ③ Other (_____)
 - c. Other
 - C. Method of assessing type IV
 - a. Diagnostic method
 - ① Axial radiographic images
 - ② CT images
 - ③ Other (_____)
 - b. Basis for diagnosis
 - ① All cases of posterior translation of clavicle to acromion are diagnosed as type IV, regardless of degree of superior translation
 - ② Only when there is posterior translation with acromioclavicular joint contact surface (subluxation)
 - ③ Other (_____)
 - D. Assessment of type V
 - a. Coracoclavicular distance (ratio to unaffected side)
 - ① $\geq 200\%$
 - ② $\geq 250\%$
 - ③ Other (_____)
 - b. Palpation (check for incarceration of distal clavicle in trapezius)
 - c. Other
-

Multiple answers are allowed for all items.

dynamic stabilization mechanism, and type VI is inferior dislocation of the ACJ.

In Japan, the classification methods used to assess the severity of ACJ separations differ between institutions, and even when the same methods are used, different interpretations can lead to differing assessments of severity. Moreover, there is some confusion regarding the assessment of ACJ separation severity in the form of different interpretations of Rockwood types III and V, as well as different interpretations of the presence of both vertical and horizontal translation of the clavicle with respect to the acromion in Rockwood type IV. In this study, we conducted an email survey of Japan Shoulder Society (JSS) members regarding their methods for assessing the severity of ACJ separations.

Methods

We conducted an email survey of all JSS members regarding their methods for assessing the severity of ACJ injuries. These assessments consisted of radiographic methods, additional imaging except plain radiographs, and methods assessing severity. In addition, for the members using the Rockwood classification to assess the severity of ACJ injuries, we asked the reason they opted not to use the Tossy classification and what their evaluation method was for types III, IV, and V. The survey via a questionnaire was approved by the JSS. In January 2018, a questionnaire on the methods of assessing ACJ separations (Table 1) was emailed to all JSS members, including 59 JSS councilors and 1596 JSS members, with instructions to return the completed questionnaires via email.

Results

Responses were received from 56 of the 59 councilors of the JSS (94.9% response rate) and 127 of 1596 regular members (8.0%), giving a total of 183 responses. A response rate of over 90% was obtained from the shoulder surgeons (councilors of JSS) who play a leading role in the JSS.

Radiography was the first form of diagnostic imaging used by the respondents to evaluate the severity of ACJ separations. An anteroposterior (AP) view of the ACJ was used by all 183 respondents, while 102 respondents used an axial view and 70 respondents used a scapular Y view. Various patient positions were used by respondents during imaging: sitting (27 respondents), standing (152 respondents), and standing position with weight bearing (89 respondents) and without weight bearing (59 respondents). Four respondents did not answer this question. The AP view was used by all the respondents to assess severity. To obtain more information regarding ACJ injuries, 98 respondents used 3-dimensional (3D) computed tomography (CT), 38 used magnetic resonance imaging, and 3 used ultrasonography. Additional imaging was performed to check for horizontal translation of the clavicle with respect to the acromion,^{3,4} cuff tear,¹⁰ and coracoclavicular ligament rupture.⁹

To classify the severity of assessments, 57 respondents used the Tossy classification, 141 used the Rockwood classification, and 7 used another classification (Fig. 1). The reasons for not using the Tossy classification were ambiguity in assessment of vertical translation (65 respondents) and lack of evaluation of horizontal translation (85 respondents). Of the 141 respondents who used the Rockwood classification, 119 said they diagnosed type III as ACJ dislocation when the inferior border of the clavicle translated above the superior border of the acromion, whereas 56 used the coracoclavicular distance¹² (ratio to unaffected side), showing that fewer respondents express assessments numerically (Fig. 2). However, to diagnose type V, 118 respondents used the coracoclavicular distance (ratio to unaffected side) whereas 38 respondents used palpation, showing that the overwhelming majority express assessments numerically (Fig. 3). When using coracoclavicular distance, 110 of the 118 respondents diagnosed type V when the ratio to the unaffected side was 200% or greater. To diagnose type IV, 119 respondents used CT, 54 used axial radiographs, and 11 used ultrasonography (Fig. 4). This finding shows that most respondents used radiography or CT, which places the limb in different positions. For diagnosing type IV, 57 respondents considered all cases in which the clavicle was translated posterior to the acromion, even when vertical ACJ dislocation occurred at the same time. In contrast, 88 respondents did so in the presence of posterior clavicle displacement and ACJ subluxation in the form of mild vertical translation, and another 8 respondents inspected for

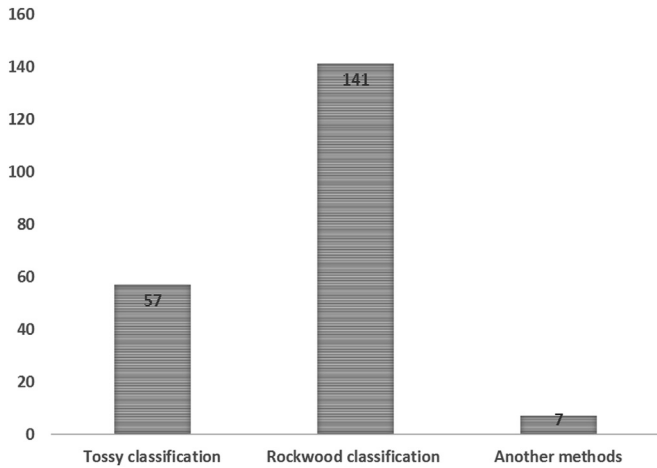


Figure 1 Classification to assess severity.

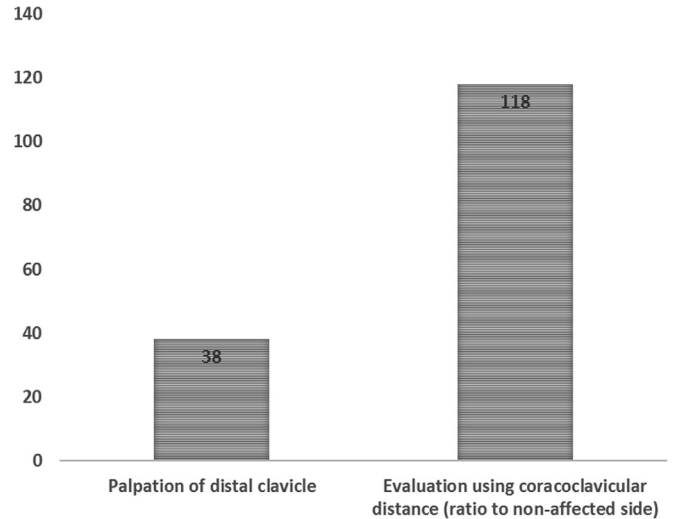


Figure 3 Method of diagnosing type V as high-grade acromioclavicular joint dislocation.

the presence of clavicle translation into the trapezius muscle belly by palpation (Fig. 5).

Discussion

We emailed a questionnaire about the assessment and classification of ACJ separation severity to JSS members. A total of 1655 questionnaires were emailed, and 183 responses (11.1%) were received. Although this is an overall low response rate, it is significant to note that responses were received from 56 of the 59 councilors of the JSS, who have at least 10 years of clinical experience as shoulder surgeons and play leading roles in the JSS.

Diagnostic imaging is essential for assessing the severity of ACJ separations. All respondents used the AP view of the ACJ on radiographs, with most patients in the sitting or standing position, primarily to assess vertical translation of the clavicle with respect to the acromion. To assess horizontal translation, 102 respondents used axial images and 70 used scapular Y images, demonstrating that there is no standard assessment method. Furthermore, 98 respondents used 3D CT to evaluate posterior translation of the ACJ more accurately. However, radiography and 3D CT are performed in different body positions, making it impossible to perform equivalent assessments of clavicle translation. In other words, vertical

translation is likely to decrease on 3D CT performed in the supine position. Moreover, the degrees of horizontal translation are likely to change because of the different body positions used during 3D CT, considering the presence or absence of connectivity between the clavicle and trapezius. We infer that this would make it impossible to assess the relative predominance of vertical and horizontal translation.

Whereas 57 respondents used the Tossy classification, which only evaluates vertical translation, 141 respondents used the Rockwood classification, which evaluates both vertical and horizontal translation. Of these 141 respondents, 119 defined ACJ dislocation (types III and V) not by the ratio of coracoclavicular distances but rather when the inferior border of the clavicle is translated above the superior border of the acromion. In contrast, 118 respondents quantified the difference between types III and V using the ratio of coracoclavicular distances.

Although the clavicle is translated posterior to the acromion into the trapezius in the definition of the Rockwood classification of type IV, there is not necessarily an increase in the coracoclavicular distance compared with the unaffected side. In other words, in these cases, the trapezius and deltoid, which comprise the

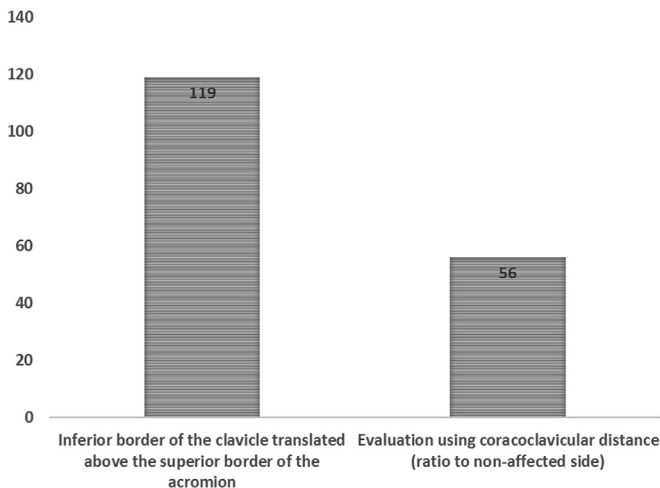


Figure 2 Method of diagnosing type III as acromioclavicular joint dislocation.

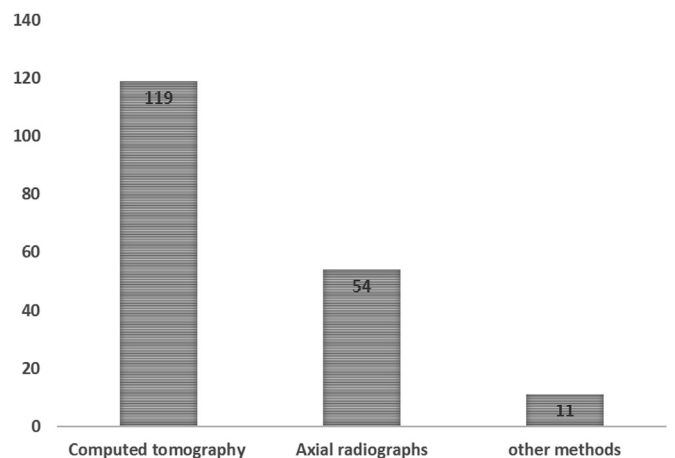


Figure 4 Diagnostic methods to evaluate type IV.

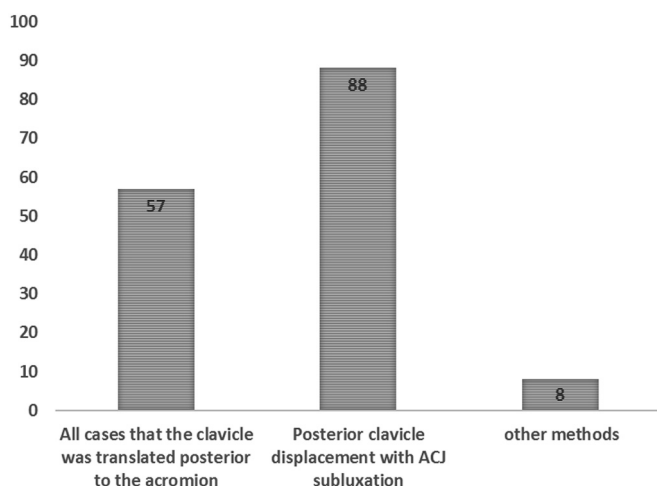


Figure 5 Method of diagnosing type IV ACJ, acromioclavicular joint.

stabilization mechanism, are peeled off the clavicle, causing it to penetrate the trapezius. Determining whether a posteriorly translated clavicle has penetrated the trapezius is difficult using radiography or CT. For type IV cases, it is important to use imaging and palpation to confirm whether the clavicle has translated into the trapezius.

On the survey, 54 respondents used axial radiographic images to diagnose type IV, whereas 119 used CT, including 3D CT. Regarding the diagnostic criteria, 57 respondents said that all cases of type III or V as ACJ dislocation with posterior translation were diagnosed as type IV, whereas 88 said that cases of type I or II as ACJ subluxation with posterior translation were diagnosed as type IV. The former may include cases in which connectivity remained between the clavicle and trapezius. Our view is that the former criteria not only leave the differences between types III and IV or between types IV and V unclear but also may lead to ambiguity regarding the pathology of type IV, which in the Rockwood classification involves posterior translation. Moreover, 5 respondents said they had never experienced a type IV case. However, there are many reports in the literature on the therapeutic outcomes of type IV cases diagnosed using the former criteria.^{1,2,5,13} In 2011, Scheibel et al⁸ reported that postoperative outcomes in cases of severe ACJ dislocation (type V) were worse in those with residual posterior instability of the ACJ. Therefore, emphasis has been placed on whether the clavicle is translated posterior to the acromion before and after surgery. However, the results of our survey highlight the lack of consensus on the diagnosis of type IV among shoulder surgeons in Japan.

Our study had several limitations. These findings may not be generalizable to the interventional community as a whole given the low survey response rate. However, a response rate of over 90% was obtained from the shoulder surgeons (councilors of JSS) who play a leading role in the JSS. Moreover, Japanese shoulder surgeons use preferred individual radiographic techniques to assess the severity or direction of ACJ separations. Therefore, even if they evaluate the same patient with ACJ separation, the severity or direction of ACJ separations may be different using these techniques.

Conclusion

We conducted an email survey of councilors and members of the JSS regarding their methods for assessing severity in ACJ separations. The Rockwood classification is commonly used in Japan to assess severity. Most members defined ACJ dislocation (types III and V) not by the ratio of coracoclavicular distances but rather when the inferior border of the clavicle is translated above the superior border of the acromion. In contrast, they quantified the difference between types III and V using the ratio of coracoclavicular distances. However, there is some disagreement regarding the assessment for the diagnosis of type IV. Methods to diagnose both superior and posterior translation of the clavicle need further debate.

Disclaimer

The authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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