Acta Orthopaedica et Traumatologica Turcica 53 (2019) 318–321

Contents lists available at ScienceDirect

Acta Orthopaedica et Traumatologica Turcica

journal homepage: https://www.elsevier.com/locate/aott

Letter to the Editor

Comment on "Bosworth and modified Phemister techniques revisited. A comparison of intraarticular vs extraarticular fixation methods in the treatment of acute Rockwood type III acromioclavicular dislocations"

Dear Editor,

The article titled "*Bosworth and modified Phemister techniques revisited. A comparison of intraarticular vs extraarticular fixation methods in the treatment of acute Rockwood type III acromioclavicular dislocations*" by Cetinkaya et al compares two different acromioclavicular (AC) fixation methods clinically and radiologically in a retrospective design.[1] As the authors mentioned, there's a long-lasting debate on the treatment approach of Type 3 dislocations. Suggestions vary from conservative methods to percutaneous fixation, rigid screw fixation to plates. As Beitzel et al and Virk et al concluded in different critical analysis reviews, no treatment can be considered as a gold standard method for type 3 dislocations.[2,3] Design, reporting quality and results of this study have raised several concerns that we would like to report.

This is a retrospective study, which represents a data set extending along a 13 years period. Standardization of the techniques and protocols are extremely difficult in such setting. Therefore, in many similar studies, variations of these parameters are expected and is acceptable, as long as they are reported. In this study, neither the patients that are excluded nor those who are lost to follow-up were mentioned.

Information about the surgical technique is insufficient for both groups. Different antegrade and retrograde methods are described in the literature for Kirschner wire fixation, yet in this study, selected method is not clarified. There is a substantial lack of data such as the width of the screw or the manufacturers of the implants that are used. Technical variations are expected to a certain extend, however, such variations should be mentioned in the manuscript. Patients were immobilized in an unknown "bandage" which let them to perform range of motion exercises. We believe that the reader need to know if it was a removable velpeau type sling or a standard broad arm sling. Type of immobilization is an essential part of post-operative rehabilitation and is necessary to compare different surgical methods. Unfortunately, with so much missing data, the study does not meet the requirements of reporting guidelines and comparisons are questionable.

The figures that has been chosen are inadequate. Fig. 1 represents an example for Bosworth fixation. Preoperative X-Ray is not covering the shoulder, but only a part of it. The anatomical site of ossification is too medial and is suspicious to be related with ligament calcification. The Fig. 2 is an example for K-wire fixation. Contribution of inferior K-wire to fixation is questionable. Although this case is reported to be an example for ligament ossification, it is rather a good example for recurrent dislocation of AC joint, associated with joint degeneration.

Although anterior – posterior shoulder X-Ray is the initial plane used to assess shoulder region, it is not the optimal view to evaluate AC joint. It is considered that up to 1/3 of AC problems are missed with standard views. Therefore, cephalad angulation of the beam (Zanca view) is suggested to visualize this joint adequately.[4] The Authors used standard AP view to assess AC joint osteoarthritis, dislocation and ossification, which does not provide reliable results. Radiological diagnostic criteria is missing for recurrent dislocation, osteoarthritis and ossification. It is not clearly stated to which extend the AC joint is confirmed recurrently dislocated or which opacity can be described as ligament calcification. These criteria had to be defined before initiating the study. Without adequate criteria and agreement among researchers, these decisions would have a great inter and intraobserver variability and disagreement. Unfortunately, these radiological flaws render results unreliable.

One of the most common problems associated with K-wire fixation is skin irritation and eventually wound problems including infection. Wires penetrating the skin compromises appropriate rehabilitation. The Authors report only 2 cases with wound problems and no information on difficulties with range of motion. Physical therapy details of these patients were not included.

Longo et al. reported a re-dislocation rate of 37.5% with Bosworth technique, and 34.7% with Phemister technique, in a recent systematic review.[5] Authors report a rate of 12% and 6.5% respectively, which is probably associated with lack of appropriate diagnosis of this complication. One of the well-known complications of Bosworth technique is early or late pull-out.[6,7] with reported rates of 6%–32%. No pull-out cases are reported in this study, which could be associated with patients lost to follow-up.

In our opinion, treatment of AC joint dislocations, especially type 3, has many questionable aspects, therefore any study is valuable. Unfortunately, this one has many methodological flaws, reporting issues and missing data. It is far from guiding our practice and providing useable messages. One of our purpose on writing this letter was to create an opportunity for authors to publish missing information.

Peer review under responsibility of Turkish Association of Orthopaedics and Traumatology.

https://doi.org/10.1016/j.aott.2019.03.002
1017-995X/© 2019 Turkish Association of Orthopaedics and Traumatology. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Olgar Birsel*, Mehmet Demirhan
Koc University, School of Medicine, Orthopaedics and Traumatology Dpt., Turkey

* Corresponding author.
E-mail address: olgarbirsel@gmail.com (O. Birsel).

8 February 2018
Available online 13 May 2019

References

1. Cetinkaya E, et al. Bosworth and modified Phemister techniques revisited. A comparison of intraarticular vs extraarticular fixation methods in the treatment of acute Rockwood type III acromioclavicular dislocations. *Acta Orthop Traumatol Turc*. 2017;51(6):455–458.
2. Beitzel K, et al. Current concepts in the treatment of acromioclavicular joint dislocations. *Arthroscopy*. 2013;29(2):387–397.
3. Virk MS, et al. Operative and nonoperative treatment of acromioclavicular dislocation: a critical analysis review. *JBJS Rev*. 2015;3(10).
4. Zanca P. Shoulder pain: involvement of the acromioclavicular joint. (Analysis of 1,000 cases). *Am J Roentgenol Radium Ther Nucl Med*. 1971;112(3):493–506.
5. Longo UG, et al. Surgical versus conservative management of Type III acromioclavicular dislocation: a systematic review. *Br Med Bull*. 2017;122(1):31–49.
6. Esenyel CZ, et al. Coracoclavicular ligament repair and screw fixation in acromioclavicular dislocations. *Acta Orthop Traumatol Turc*. 2010;44(3):194–198.
7. Tsou PM. Percutaneous cannulated screw coracoclavicular fixation for acute acromioclavicular dislocations. *Clin Orthop Relat Res*. 1989;(243):112–121.

Authors' reply

We are pleased to read the comment letter regarding our paper entitled “Bosworth and modified Phemister techniques revisited. A comparison of intraarticular vs extraarticular fixation methods in the treatment of acute Rockwood type III acromioclavicular dislocations”.[1] It has been more than six months from the time our article has been published online, which is 9 of November, 2017, and reading such a carefully written comment on the work after this amount of time made us think that the debate on treatment of acute type III acromioclavicular (AC) dislocations is still a hot topic and the recent article has the potential to attract the attention of AOTT audience.

In our study, 32 patients who received surgical treatment between September 2005 and January 2009 due to acute Rockwood type III AC joint dislocation with complete medical records were retrospectively evaluated. There is no doubt that the study is suffering from several points: It is written in a retrospective fashion, number of patient in the cohort is small, numerous surgeons had performed the surgery, the adequacy of the surgery records in medical archives can be questioned, and the lack of standardization in radiological examination techniques is obvious. Keeping all these limitations in mind, we did not try to make the manuscript seem as if the study was more valuable than it was. Although the data given throughout the work is accurate without any hesitation, the level of evidence of the study is “still” level III, and the number of patient in the study is “just” 32. Thus, the article should be evaluated under these circumstances and any other criticism on it is nothing but “stating the obvious”.

It is true that one of the major limitation of the study which was not pointed out is the exclusion criteria and the number of patients excluded as well as the number of patients who were lost to follow up. Patients with acute Rockwood type III AC joint dislocation who were treated with a conservative or surgical method other than coracoclavicular (CC) fixation with the Bosworth screw or AC fixation with Kirschner wires (K-wires), acute Rockwood type I, II, IV, V or VI AC dislocation; a chronic AC dislocation and concomitant injuries to the respective shoulder were excluded from the study, as well as the patients with inadequate medical records and who were lost to follow up. The exact number of patients who were excluded for these reasons were unfortunately not recorded throughout the retrospective analysis. We are aware that incomplete follow-up may bias the results and such bias can affect the validity of the inferences drawn from the study. The tendency in our department's approach in the treatment of acute Rockwood type III AC joint dislocations were towards surgical intervention back in the related years, and thinking of the such small number of patients in this cohort, we believe that the percent of the loss has a high probability to be less than 5%. But still this is an optimistic estimation and selection bias can not be denied.

We find the comment on K-wire fixation with regard to antegrade/retrograde methods is totally irrelevant from our study. It is clearly written in the article on open reduction and fixation of the AC joint by means of two wires method which was originally described by Phemister DB in 1942 that heavy threaded steel wires are inserted with a hand drill from the side, through the acromion, across the joint, and into the end of the clavicle, followed by superior capsule suturing.[2] On the other hand, there are a bunch of modifications of Phemister techniques defined in the literature, all inserting the K-wires in the same way that Phemister described; through the acromion, across the joint, into the end of the clavicle.[3–8] Modifications are due to additional procedures following fixation with K-wires like subcoracoid eight-shaped sling with resorbable vicryl wires passing through the clavicle,[3] tension band wiring between the clavicle and the wires,[4] suturing the trapezial muscular flap above the clavicle on to the disinserted edge of the deltoid,[5] suturing the AC and CC ligaments following fixation with K-wires,[6] suturing the AC and CC ligaments, the capsular and the deltotrapezoid fascia following fixation with K-wires,[7] or by percutaneous K-wire fixation following closed reduction of AC joint.[8] What we did is similar to the technique that Calvo et al used as mentioned above.[6] Both the original and the modified Phemister techniques are clearly stated in the literature, thus we find it redundant to state whether the direction of K-wire is antegrade or retrograde.

The authors have pointed to the right spot that “Patients and Methods” part is lacking the width of the screws used in CC fixation. Since we could not obtain the original Bosworth screw in the related years which is a 38-mm long vitallium (modified as titanium in the following years) partially threaded cancellous lag screw in 6.3-mm diameter, having a wide-flanged thread of minimal pitch and a broad flat head with a 11.11 mm of diameter,[9–11] we used a partially threaded malleolar screw in 4.5-mm diameter with a washer in all CC fixation cases. Manufacturers of the screws are not mentioned in the study because it has no clinical relevance to mention them. The physical properties of the screw is of paramount importance rather than the manufacturer itself. And regarding the shoulder immobilization, Velpeau type sling was used in all cases. We agree with the

authors that we should have expressed the type of shoulder immobilization in a much more pronounced way, but interpreting the failure to not to express in that manner as a "questionable comparison" is technically mistaken since the immobilization type is same for every patient in the cohort either it is called improperly as "bandage" or "Velpeau type sling"; anyone can still continue to compare two groups.

Regarding the comments on Fig. 1, although one can easily understand and diagnose AC dislocation, we still do share the same opinion that especially Fig. 1A is not covering the whole shoulder. Looking back to our data, we figured out that the original figure is cropped way too much from both margins which we did not pay adequate attention to correct it in the proof stage. Nevertheless, we strongly disagree with the comment that the site of ossification is suspicious to be related with ligament calcification because of its' "too medial" localization, although it is apparent that the site of ossification is on the trajectory of conoid ligament. From a scientific point of view, it is clearly stated that the mean length from the end of the clavicle or AC joint to the most medial insertion of the conoid ligament of CC complex is found 49.7 ± 5.4 mm in men and 44.4 ± 4.4 in women in one of the two well-respected studies,[12] and 46.3 mm in the other one.[13] So, both visually and scientifically, there is no doubt in the diagnosis of ligament calcification, unless the authors have "any other" differential diagnosis for the finding. As far as the comments for Fig. 2 where the authors interpreted the contribution of inferior K-wire as questionable, we would like to go one step further and call the postoperative X-ray as an inadequate practice of modified Phemister technique. There is no doubt that the contribution of inferior K-wire to the fixation is insufficient. This is the patient in whom the functional evaluation was ended with the only poor result in Group 2 and recurrent dislocation was detected as well. Figure is not only representing trapezoid ligament ossification in the extraarticular zone of CC area but also the recurrent dislocation, basically summarizing what might a poor practice of a simple technique cause in the end.

Due to its' anatomical structure, the AC joint is obscured because it is superimposed on the shadow of the acromion process of the scapula in the anterior-posterior (AP) direction. That's why AP shoulder radiographs with 10–15° cephalic tilt (even sometimes 30–35°) is routinely used in the evaluation of AC joint injuries, as recommended by Zanca in 1971.[14] Despite the fact that inter- and intraobserver reliability for diagnosing vertical instabilities of the clavicle using bilateral panoramic projections (as we used in the study as Fig. 1A) show a high level of reproducibility, a recent systematic review on which imaging modalities should be used for accurate diagnosis of the acutely injured AC joint concludes that a gold standard to investigate and diagnose acute AC joint injuries does not currently exist and there is currently no consensus on a protocol to view acute AC joint injuries.[15] Hence, Zanca view can be used routinely for a better visualization of acute AC joint pathology, but it is not a "must" to our current understanding. In all the figures that was used in our study other than Fig. 1B, the shadow of the acromion process of the scapula and AC joint is not superimposed, make us think that a cephalic tilt with some degree was used during AP shoulder radiographs. Since the special name given for the radiographs were not recorded in the medical archives back in the related years, we did not state the name of the AP radiographs as "Zanca view" in the article, yet the radiographs are adequate enough to diagnose and to make a decision before starting a treatment, opposed to the claim that the results are not reliable. On the other hand, criticisims about the methodology part of the study lacking several criteria that should have been stated but rather omitted are totally correct. In the study, AC joint was considered to have a recurrent dislocation when there was an upward displacement of the clavicle relative to the acromion when the displacement was greater than half of the height of the AC joint following the removal of K-wires or screw.[6] AC joint was considered to have osteoarthritis in the radiological presence of joint space narrowing, osteophyte formation, subchondral sclerosis, and cystic changes.[16] Ossification in the CC ligaments was considered to be present when there were thin calcifications around the CC ligaments, large amounts of radiopaque material around the CC ligaments were appreciated or when the calcification of the CC ligaments was complete according to radiological criteria of Calvo et al.[6]

Physical therapy and activity progression in study group is as summarized in the study.[1] The only thing that has to be mentioned here is that patients with K-wire fixation allowed to do the supervised pendular and climbing exercises that were begun on the first postoperative day as much as they can tolerate and perform. The reasons for this relatively slow therapy programme were that the wires penetrating the skin occationally cause pain during the exercises and non-threaded K-wires used for the fixation had a risk of wire migration and breakage which we believe is the one of the major limitation of the technique preferred in the operations in this cohort.

Low recurrent dislocation and screw pull-out rates given in our study are not related with neither the lack of appropriate diagnosis nor number of patients who were lost to follow-up but rather might be related with the appropriate application of the techniques or low number of patients included in the cohort in the worst scenario. When Longo et al.'s study is read carefully,[17] it is apparent that there are several serious mistakes in the interpretations of the data gathered from the articles they used for their systematic review. For instance, they had stated that "*…the use of K-wire transfixation[12,19,29] had a 14.7% of recurrence rate; the Bosworth technique[16,22] was associated to a rate of 37.5%; Phemister procedure[13,15,17] 34.7%...*". In our study, we used modified Phemister technique and it is different from the original Phemister method. Therefore 34,7% of recurrence rate stated in this systematic review is not related with our study. What is more interesting with this systematic review is that the reference number 15 and 17 used for Phemister procedure's recurrence rates in the review is not even about Phemister procedure but rather about hook plating for AC joint dislocation.[18,19] On the other hand, references number 12, 19 and 29 used under the headline of K-wire transfixation are not representing the same procedure. Reference 29 of the systematic review is an article about K-wire fixation with suturing of the superior AC joint ligament,[20] thus the procedure should be discussed under the headline of Phemister technique. Besides, the number of patients with type III dislocation in the study is just 7. Meanwhile, in reference number 12 the procedure is a combination of excision of the meniscus, temporary joint stabilisation with two smooth wires, and repair of the joint capsule and superior AC ligament, supraclavicular reinforcement by overlap and suture of deltoid and trapezius muscles without repair of the CC ligament,[21] and reference number 19 the procedure is suturing the AC and CC ligaments, the capsular and the deltotrapezoid fascia following fixation with K-wires.[7] These two references are real modifications of Phemister procedure, and it seems that additional ligamentous repair and/or muscle reinforcements following K-wire fixation seems to work; recurrence rates are only 13% and 11.5%, respectively. Similar outcomes with low rates of recurrences can be found in other studies as well.[22,23] It is the same anectode for the re-dislocation and pull-out rates for Bosworth technique. Low complication rates like in our study can be found in the literature.[24,25] Complications might be due to failure to locate the optimal insertion point at the base of the coracoid process, as stated by Tsou.[26]

We would like to thank to the authors for their comments, for giving us the opportunity to express several missing information and for the great debate chance which we think helped to improve the literature.

Conflicts of interest

No funds were received in support of this work. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

Merter Yalçınkaya*
Department of Orthopedic Surgery and Traumatology, Medicana International Istanbul Hospital, Istanbul, Turkey

Engin Çetinkaya, Yavuz Arıkan, Kubilay Beng
Department of Orthopedic Surgery and Traumatology, Baltalimani Bone Diseases Training and Research Hospital, Istanbul, Turkey

Onat Üzümcügil
Department of Orthopedic Surgery and Traumatology, Şişli Kolan International Hospital, Istanbul, Turkey

* Corresponding author. Department of Orthopedic Surgery and Traumatology, Medicana International Istanbul Hospital, Beylikduzu Street No 3, 34520, Istanbul, Turkey. Fax: +90 212 871 32 36.
E-mail address: merter_99@hotmail.com (M. Yalçınkaya).

References

1. Cetinkaya E, Arıkan Y, Beng K, Mutlu H, Yalçınkaya M, Üzümcügil O. Bosworth and modified Phemister techniques revisited. A comparison of intraarticular vs extraarticular fixation methods in the treatment of acute Rockwood type III acromioclavicular dislocations. *Acta Orthop Traumatol Turc*. 2017;51:455–458. https://doi.org/10.1016/j.aott.2017.09.002.
2. Phemister DB. The treatment of dislocation of the acromioclavicular joint by open reduction and threaded-wire fixation. *J Bone Joint Surg Am*. 1942;24:166–168.
3. Verdano MA, Pellegrini A, Zanelli M, Paterlini M, Ceccarelli F. Modified Phemister procedure for the surgical treatment of Rockwood types III, IV, V acute acromioclavicular joint dislocation. *Musculoskelet Surg*. 2012;96:213–222. https://doi.org/10.1007/s12306-012-0221-4.
4. Pfahler M, Krödel A, Refior HJ. Surgical treatment of acromioclavicular dislocation. *Arch Orthop Trauma Surg*. 1994;113:308–311. https://doi.org/10.1007/bf00426177.
5. Lizaur A, Marco L, Cebrian R. Acute dislocation of the acromioclavicular joint. Traumatic anatomy and the importance of deltoid and trapezius. *J Bone Joint Surg Br*. 1994;76:602–606. https://doi.org/10.1302/0301-620X.76B4.8027149.
6. Calvo E, López-Franco M, Arribas IM. Clinical and radiologic outcomes of surgical and conservative treatment of type III acromioclavicular joint injury. *J Shoulder Elbow Surg*. 2006;15:300–305. https://doi.org/10.1016/j.jse.2005.10.006.
7. Leidel BA, Braunstein V, Kirchhoff C, Pilotto S, Mutschler W, Biberthaler P. Consistency of long-term outcome of acute Rockwood grade III acromioclavicular joint separations after K-wire transfixation. *J Trauma*. 2009;66:1666–1671. https://doi.org/10.1097/ta.0b013e31818c1455.
8. García NM, Bermejo FT. Modified Phemister procedure for the treatment of type III Rockwood acromioclavicular joint dislocation. Results after five-years follow-up. *Rev Esp Cir Ortop Traumatol*. 2010;54:294–300. https://doi.org/10.1016/s1988-8856(10)70249-2.
9. Bosworth BM. Acromioclavicular dislocation: end-results of screw suspension treatment. *Ann Surg*. 1948;127:98–111.
10. Bosworth BM. Complete acromioclavicular dislocation. *N Engl J Med*. 1949;241:221–225. https://doi.org/10.1056/nejm194908112410601.
11. Ammon JT, Voor MJ, Tillett ED. A biomechanical comparison of Bosworth and poly-L lactic acid bioabsorbable screws for treatment of acromioclavicular separations. *Arthroscopy*. 2005;21:1443–1446. https://doi.org/10.1016/j.arthro.2005.09.005.
12. Renfree KJ, Riley MK, Wheeler D, Hentz JG, Wright TW. Ligamentous anatomy of the distal clavicle. *J Shoulder Elbow Surg*. 2003;12:355–359. https://doi.org/10.1016/s1058-2746(03)00029-6.
13. Mazzocca AD, Santangelo SA, Johnson ST, Rios CG, Dumonski ML, Arciero RA. A biomechanical evaluation of an anatomical coracoclavicular ligament reconstruction. *Am J Sports Med*. 2006;34:236–246. https://doi.org/10.1177/0363546505281795.
14. Zanca P. Shoulder pain: involvement of the acromioclavicular joint. (Analysis of 1,000 cases). *Am J Roentgenol Radium Ther Nucl Med*. 1971;112:493–506. https://doi.org/10.2214/ajr.112.3.493.
15. Pogorzelski J, Beitzel K, Ranuccio F, et al. The acutely injured acromioclavicular joint - which imaging modalities should be used for accurate diagnosis? A systematic review. *BMC Musculoskelet Disord*. 2017;18:515. https://doi.org/10.1186/s12891-017-1864-y.
16. Ernberg LA, Potter HG. Radiographic evaluation of the acromioclavicular and sternoclavicular joints. *Clin Sports Med*. 2003;22:255–275. https://doi.org/10.1016/S0278-5919(03)00006-1.
17. Longo UG, Ciuffreda M, Rizzello G, Mannering N, Maffulli N, Denaro V. Surgical versus conservative management of Type III acromioclavicular dislocation: a systematic review. *Br Med Bull*. 2017;122:31–49. https://doi.org/10.1093/bmb/ldx003.
18. Di Francesco A, Zoccali C, Colafarina O, Pizzoferrato R, Flamini S. The use of hook plate in type III and V acromio-clavicular Rockwood dislocations: clinical and radiological midterm results and MRI evaluation in 42 patients. *Injury*. 2012;43:147–152. https://doi.org/10.1016/j.injury.2011.04.002.
19. Gstettner C, Tauber M, Hitzl W, Resch H. Rockwood type III acromioclavicular dislocation: surgical versus conservative treatment. *J Shoulder Elbow Surg*. 2008;17:220–225. https://doi.org/10.1016/j.jse.2007.07.017.
20. Joukainen A, Kröger H, Niemitukia L, Mäkelä EA, Väätäinen U. Results of operative and nonoperative treatment of Rockwood types III and V acromioclavicular joint dislocation: a prospective, randomized trial with an 18- to 20-year follow-up. *Orthop J Sports Med*. 2014;2. https://doi.org/10.1177/2325967114560130, 2325967114560130.
21. Lizaur A, Sanz-Reig J, Gonzalez-Parreño S. Long-term results of the surgical treatment of type III acromioclavicular dislocations: an update of a previous report. *J Bone Joint Surg Br*. 2011;93:1088–1092. https://doi.org/10.1302/0301-620X.93B8.26775.
22. Horst K, Garving C, Thometzki T, et al. Comparative study on the treatment of Rockwood type III acute acromioclavicular dislocation: clinical results from the TightRope® technique vs. K-wire fixation. *Orthop Traumatol Surg Res*. 2017;103:171–176. https://doi.org/10.1016/j.otsr.2016.11.009.
23. Darabos N, Vlahovic I, Gusic N, Darabos A, Bakota B, Miklic D. Is AC TightRope fixation better than Bosworth screw fixation for minimally invasive operative treatment of Rockwood III AC joint injury? *Injury*. 2015;46:S113–S118. https://doi.org/10.1016/j.injury.2015.10.060.
24. Esenyel CZ, Oztürk K, Bülbül M, Ayanoğlu S, Ceylan HH. Coracoclavicular ligament repair and screw fixation in acromioclavicular dislocations. *Acta Orthop Traumatol Turc*. 2010;44:194–198. https://doi.org/10.3944/AOTT.2010.2329.
25. Bektaşer B, Bozkurt M, Oçgüder A, Solak S, Oğuz T. Surgical treatment of type III acromioclavicular joint dislocations by a modified Bosworth technique. *Ulus Travma Acil Cerrahi Derg*. 2004;10:245–249.
26. Tsou PM. Percutaneous cannulated screw coracoclavicular fixation for acute acromioclavicular dislocations. *Clin Orthop Relat Res*. 1989;243:112–121. https://doi.org/10.1097/00003086-198906000-00017.