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COMPLICATIONS OF TREATMENT FOR ACROMIOCLAVICULAR JOINT INJURIES

Ruziev Shaxzod Olimjon ugli[1],
Shorustamov Mukhamad Todjalievich[2]
Clinical resident of the Kashkadarya branch of the Scientific
Center of the Republican Center for Emergency Medical Care[1]
Tashkent Medical Academy Multidisciplinary
Clinic Tashkent, Republic of Uzbekistan[2]

Abstract
The article examines complications in the treatment of acromioclavicular (AC) joint injuries, including both common and rare cases. Emphasis is placed on the anatomical features of the joint, damage classification, and modern approaches to the prevention and treatment of complications. The advantages of contemporary diagnostic methods such as MRI and 3D imaging, as well as the effectiveness of minimally invasive surgical techniques, including arthroscopy and bioresorbable implants, are discussed. The importance of rehabilitation in preventing long-term complications, such as chronic instability and post-traumatic arthritis, is highlighted. Recommendations for optimizing medical care based on the latest advancements in traumatology and orthopedics are provided.

Keywords: Acromioclavicular joint, fracture, dislocation, minimally invasive techniques, arthroscopy, rehabilitation, physiotherapy, TightRope, intramedullary osteosynthesis, complication.

INTRODUCTION

Acromioclavicular (AC) joint injuries are one of the most common shoulder girdle injuries, especially in athletes and people engaged in physical labor. Given the anatomical and functional significance of the AC joint, these injuries require timely diagnosis and effective treatment to prevent serious complications such as chronic instability, posttraumatic arthritis, and functional impairment of the upper limb.

The AC joint, being a diarthrodial articulation with a fibrocartilaginous disc, provides a significant portion of the shoulder complex motion. The main stabilizing elements are the acromioclavicular and coracoclavicular ligaments, which play a key role in maintaining vertical and anteroposterior stability [14–16]. However, the complex structure of the joint makes it vulnerable to various types of injuries, which can be aggravated by late diagnosis or improper treatment.

In recent decades, significant progress has been made in the diagnosis and treatment of AC joint injuries due to the introduction of modern imaging techniques such as magnetic resonance imaging (MRI) and computed tomography (CT) and the development of minimally invasive surgical technologies. However, treatment remains challenging, especially in cases accompanied by complications such as soft tissue damage, distal clavicle osteolysis or neuropraxia. The purpose of

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this article is to analyze the most common and rare complications of AC joint injury treatment, highlight key aspects of their prevention and offer recommendations based on current data. Such an approach will not only optimize treatment tactics, but also improve long-term patient outcomes.

Anatomy of the acromioclavicular joint

The acromioclavicular joint is a unique diarthrodial articulation that includes a perforated fibrocartilaginous disc. Its articular surfaces are covered with hyaline cartilage, and the disc remains incomplete in more than 90% of the population, which reflects age and individual anatomical features [15]. This joint provides up to 20% of the rotation of the shoulder complex, playing a critical role in ensuring the mobility and stability of the upper limb [14].

The structural stability of the AC joint is maintained by the acromioclavicular and coracoclavicular ligaments, which are functionally divided into two subgroups: conical and trapezoid. They provide vertical and anteroposterior stability, preventing displacement of the distal clavicle under mechanical loads [16]. Studies by Fukuda et al. have shown that the AC ligaments provide up to 90% of anteroposterior translational stability and also play an important role in limiting joint distraction. At the same time, the coracoclavicular ligaments are responsible for 60–75% of resistance to vertical displacement, especially under significant loads [15,17]. In children, due to the peculiarities of ossification and weakness of the periosteum, AC joint injuries are often accompanied by displacement of the distal clavicle in the growth area, which is manifested by the so-called "pseudodislocation". This condition is more often observed in adolescence, before the completion of the ossification process, which is usually completed by the age of 19. Understanding the anatomical features of the AC joint is key to choosing the tactics of treating injuries and preventing complications, especially in the context of surgical interventions that require restoration of normal joint biomechanics [6,15,18,19,20].

Classification of Acromioclavicular Joint Injuries

Acromioclavicular (AC) joint injuries range from mild ligament sprains to complex dislocations with significant clavicle displacement. A clear classification is necessary for accurate diagnosis and treatment decisions.

The most common classification proposed by Rockwood takes into account anatomical injuries and clavicle displacement. Table 1 below shows the main types of injuries, their characteristics, and appropriate treatment decisions.

Table 1

Type of damage	Characteristic	Recommended treatment	Prognosis
Type I	Stretching of the acromioclavicular ligaments without rupture.	Conservative: immobilization, NSAIDs, rehabilitation..	Full recovery, minimal risk of complications.
Type II	Rupture of the acromioclavicular ligaments with subluxation of the clavicle (vertical displacement up to 50%).	Conservative: immobilization, NSAIDs, rehabilitation.	Possible residual instability, rare risk of arthritis.
Type III	Complete rupture of the acromioclavicular and coracoclavicular ligaments with complete dislocation of the clavicle.	Conservative or surgical (depending on the patient's activity).	Moderate risk of post-traumatic arthritis.
Type IV	Posterior displacement of the clavicle into the trapezius muscle.	Surgical: open or arthroscopic stabilization.	Repeated intervention may be necessary if fixation is insufficient.
Type V	Extreme superior displacement of the clavicle (more than 300% of the clavicle width).	Surgical: ligament reconstruction with fixation.	High risk of complications, including soft tissue damage.
Тип VI	Inferior displacement of the clavicle to the subacromial or subcoracoid position.	Surgical: open reduction, stabilization with ligament reconstruction.	Rare type, high risk of neurovascular complications.

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Additional factors for severity assessment

• Patient age: Children are more likely to experience pseudo-dislocations due to incomplete ossification of the clavicle [18,19].

• Patient activity: In athletes, surgical methods are preferred to preserve function.

• Associated injuries: Soft tissue, nerve, or vascular injuries may require an individualized approach [52].

The Rockwood classification takes into account not only anatomical aspects but also the individual needs of the patient, making it a key tool in clinical practice.

Complications of acromioclavicular joint injury treatment

Complications of acromioclavicular (AC) joint injury treatment may occur with both conservative and surgical therapy. Knowledge of these complications is important for choosing the optimal treatment strategy, preventing adverse outcomes, and improving long-term results.

Main complications

1. Complications of non-surgical treatment:

o Post-traumatic arthritis. According to the data, 36-48% of patients develop signs of degenerative changes in the joint after type I-II injuries [35,37].

o Distal osteolysis of the clavicle. Characterized by pain syndrome, osteopenia and osteophyte formation. Diagnosis is made by radiography and scintigraphy [47,48].

o Chronic instability. Leads to pain and functional impairment.

2. Complications of surgical treatment:

o Infections. Occurs when aseptic rules are not followed or with severe damage to soft tissues.

o Implant migration. Considered one of the most serious complications, it can lead to damage to blood vessels, lungs or spinal cord [56,57].

o Neurovascular complications. Traction neuropraxia of the brachial plexus may occur as a result of shoulder girdle instability [51].

Table 2

Type of treatment	Complication	Frequency	Causes	Treatment tactics
Conservative	Post-traumatic arthritis	36–48% [35,37]	Long-term instability, chronic joint load.	Modification of activity, NSAIDs, corticosteroid injections.
	Distal osteolysis of the clavicle	~10–15% [47,48]	Chronic microtrauma, stress fractures.	Resection of the distal end of the clavicle.
	Chronic instability	~20%	Insufficient rehabilitation, inadequate fixation.	Physiotherapy, surgical stabilization.
Surgical	Infections	~5–10%	Failure to observe asepsis, severe soft tissue damage.	Antibiotic therapy, wound debridement.
	Antibiotic therapy, wound debridement.	<5% [56,57]	Incorrect fixation, use of pins or wires.	Removal of implants, re-stabilization.
	Neurovascular complications	Rare (~1–2%) [51,52]	Traction load, damage to nerves and vessels due to trauma or surgery.	Surgical correction, neurorehabilitation.

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Modern approaches to minimizing complications

• The use of minimally invasive methods, such as arthroscopy, reduces the risk of infections and accelerates rehabilitation.

• Refusal of transfixation pins, such as Kirschner, in favor of bioresorbable implants reduces the risk of fixator migration.

• Regular monitoring and rehabilitation after treatment help reduce the risk of chronic complications.

Understanding the mechanisms of complications and their prevention play an important role in increasing the effectiveness of treatment and improving the quality of life of patients.

Modern approaches to the prevention and treatment of complications

Effective prevention and treatment of complications of acromioclavicular joint injuries require the introduction of innovative technologies and the use of evidence-based methods. The modern approach is based on the principles of integrating diagnostics, individualization of treatment and strategic rehabilitation.

New technologies and their application. In recent years, the main direction of development has been the introduction of digital technologies and minimally invasive methods. For example, the use of bioresorbable implants reduces the risk of material migration and complications associated with traditional metal fixators. Three-dimensional modeling systems are also actively used for planning surgical interventions, allowing for individual anatomical features of the patient to be taken into account.

Individualization of treatment. An individual approach includes not only the choice of treatment tactics, but also the adaptation of the rehabilitation program. For example, for patients with high physical activity, surgical fixation methods with restoration of the ligamentous apparatus are preferable, while in elderly people, conservative methods with an emphasis on functional restoration are more often used.

The role of rehabilitation. Modern rehabilitation programs focus on early mobilization and complex methods of restoration. This includes physiotherapy, exercise therapy and biofeedback (BFB), which help to reduce recovery times and minimize the risk of chronic complications such as joint stiffness or muscle atrophy.

Table 3

Approach	Technology/methodology	Main advantages	Expected results
Diagnostics	3D visualization, MRI	Increased diagnostic accuracy, early detection of hidden injuries.	Reduction in the number of diagnostic errors, reduction in the time before treatment.
Surgical treatment	Bioresorbable implants	Reduced risk of migration, minimized chronic complications.	Improved long-term results, reduced number of reoperations.
Rehabilitation	Biofeedback (BFB)	Optimization of motor activity restoration, improved coordination.	Reduction in rehabilitation time, increased functional activity of the patient.
Long-term monitoring	Telemedicine systems	Monitoring the patient's condition in the post-rehabilitation period.	Early detection of complications, reduced costs of subsequent treatment.
Educational programs	Continued education courses	Improving the professional level of medical personnel.	Reducing the number of treatment errors, improving the quality of medical care.

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Future Prospects

The development of technologies such as robotic surgery and personalized implants, as well as the introduction of artificial intelligence for risk assessment, will open up new treatment options. An important aspect remains the development of national protocols aimed at standardizing treatment methods and preventing complications depending on the degree of injury and the capabilities of regional medicine. Integration of modern approaches will minimize the number of complications, accelerate recovery and improve the quality of life of patients, which is the main goal of modern medicine.

Conclusion

Despite their apparent simplicity, acromioclavicular joint injuries are a complex problem that requires an integrated approach at all stages of treatment. Modern diagnostic methods such as MRI, CT and 3D visualization significantly increase the accuracy of injury detection, providing individualized planning of therapeutic measures.

Conservative treatment remains effective for mild injuries, but for significant injuries (types III–VI), preference is given to minimally invasive surgical methods, such as the use of bioresorbable implants and arthroscopic interventions. Rehabilitation focused on early mobilization and adaptation to physical activity is an integral part of successful recovery.

Despite significant progress in treatment, the risk of complications such as post-traumatic arthritis, chronic instability and distal osteolysis of the clavicle remains. Modern approaches to prevention, including the introduction of innovative technologies and educational programs for specialists, can reduce the incidence of adverse outcomes and improve treatment results.

The future of the treatment of acromioclavicular joint injuries is associated with the development of robotic surgery, the use of personalized implants and digital patient monitoring systems. These advances will not only improve the effectiveness of treatment, but also significantly reduce the rehabilitation period.

Optimization of approaches to diagnosis, treatment and prevention of complications will ensure a higher quality of medical care, which will be the key to successful recovery and improved quality of life for patients.

References

[1] Abbott LK, Lucas DB. Function of the clavicle: its surgical significance. Ann Surg 1954; 140:583–99.

[2] Gardner E. Embryology of the clavicle. Clin Orth 1968;58:9–16.

[3] Ogata S, Uchthoff HK. Early development and ossification of the human clavicle: an embryologic study. Acta Orth Scan 1990;61:330–4.

[4] Webb PA, Suchy JM. Epiphyseal fusion of the anterior iliac crest and medial clavicle in a contemporary multiracial sample of American men and women. Am J Phys Anthropol 1985;68:457–66. [5] Ogden JA, Conlogue GJ, Bronson ML. Radiology of postnatal skeletal development. III. Clavicle. Skel Radiol 1979;4:196–203.

[6] Todd TW, D'Errico Jr J. Clavicular epiphyses. Am J Anat 1928;41:25–50.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

[7] Abbott LK, Lucas DB. Function of the clavicle: its surgical significance. Ann Surg 1954;140:583–99.
[8] Mosley HF. The clavicle: its anatomy and function. Clin Orth 1968;58:17–27.
[9] Inman WT, Saunders JB, Abbott LS. Observations on shoulder function. JBJS 1944;26:1–30.
[10] Chung SMK, Nissenbaum MM. Congenital and developmental defects of the shoulder. Orth Clin North Am 1975;6:381–92.
[11] McClure JG, Rainey RB. Anomalies of the scapula. Clin Orth 1975;110:22–31.
[12] Galpin RD, Birch JG. Congenital elevation of the scapula (Sprengel's deformity). Orthopedics 1987;10:965–70.
[13] Lieberson F. Os acromiale: a disputed anomaly. JBJS 1937;19:683–9.
[14] DePalma AF. The role of the sternoclavicular and acromioclavicular joint discs. Clin Orthop 1959;13:222–33.
[15] Nuber GW, Bowen MC. Disorders of the acromioclavicular joint: pathophysiology, diagnosis, and treatment. In: Ianotti JP, Williams GR, editors. Disorders of the Shoulder: Diagnosis and Treatment. Philadelphia: Lippincott Williams & Wilkins; 1999. pp. 739–62. 402 JR Rudzki et al. / Clin Sports Med 22 (2003) 387–405.
[16] Salter Jr. EG, Nasca RJ, Shelley BS. Anatomical observations on the acromioclavicular joint and its supporting ligaments. Am J Sports Med 1987;15(3):199–206.
[17] Fukuda K, Craig EV, Ahn KN, Caufield RH, Chao EY. Biomechanical study of the ligamentous apparatus of the acromioclavicular joint. JBJS [Am] 1986;68(3):434–40.
[18] Kwon I, Sarwark JF. The proximal humerus, scapula, and clavicle. In: Beaty JH, Kasser JR, editors. Rockwood and Wilkins fractures in children. 5th edition. Philadelphia: Lippincott Williams & Wilkins; 2001. pp. 754–64.
[19] Falsti-Jensen S, Mikkelsen P. Pseudodislocation of the acromioclavicular joint. JBJS 1982;64: 368–9.
[20] Ogden J. Distal clavicle injury. Clin Orthop 1984;188:68–73.
[21] Wirth MA, Rockwood Jr C. Sternoclavicular joint disorders: pathophysiology, diagnosis, and treatment. In: Ianotti JP, Williams GR, editors. Shoulder disorders: diagnosis and treatment. Philadelphia: Lippincott Williams & Wilkins; 1999. pp. 765–813.
[22] Flatow EL. Biomechanics of the acromioclavicular, sternoclavicular, and scapulothoracic joints. In: Heckman JD, editor. Lecture Notes 42. Rosemont, IL: American Academy of Orthopaedic Surgeons; 1993. pp. 237–45.
[23] Eskola A. Sternoclavicular joint dislocations: a call for open treatment. Acta Orthop Scand 1986; 57:227–8.
[24] Eskola A, Vainionpää S, Vastamki M, Slatis P, Rokkanen P. Operation for old sternoclavicular joint dislocation: results of 12 cases. J Bone Joint Surg 1989;71B:63–5.
25] Zuckerman JD, Matsen III FA. Biomechanics of the shoulder. In: Nordin M, Frankel WH, editors. Fundamentals of Musculoskeletal Biomechanics. 2nd edn. Philadelphia: Lea & Febiger; 1989. pp. 225–47.
[26] Bearn JG. Direct observations of the function of the sternoclavicular joint capsule in the clavicular bearing. Anat 1967;101:159–70.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

[27] Wirth MA, Rockwood Jr KA. Acute and chronic traumatic injuries to the sternoclavicular joint. JAAOS 1996;5:268–78.
[28] Cave AJE. Nature and morphology of the costoclavicular ligament. J Anat 1961;95:170–9.
[29] Tossey JD, Mead NC, Sigmond HM. Acromioclavicular separations: a useful and practical classification for treatment. Clin Orthop 1963;28:111–9.
[30] Allman Jr FL. Fractures and injuries of the ligaments of the clavicle and its articulations. JBJS 1967;49:774–84.
[31] Rockwood Jr CA, Young D. Disorders of the acromioclavicular joint. In: Rockwood Jr CA, Matsen FA, editors. Shoulder. Philadelphia: WB Saunders; 1990. pp. 413–76.
[32] Guttmann D, Paxima NE, Zuckerman JD. Complications of treatment of complete dislocations of the acromioclavicular joint. In: Price CT, editor. Course Lectures 49. Rosemont, IL: AAOS; 2000. pp. 407–13.
[33] Galatz LM, Williams Jr GR. Acromioclavicular joint injuries. In: Bucholtz RW, Heckman JD, editors. Rockwood and Greene fractures in adults. Philadelphia: JB Lippincott; 2001. pp. 1209–44.
[34] Allman Jr FL. Fractures and injuries of the ligaments of the clavicle and its articulations. JBJS 1967; 49:774–84.
[35] Cox JS. The fate of the acromioclavicular joint in sports injuries. Am J Sports Med 1981;9:50–3.
[36] Post M. Current concepts in the diagnosis and treatment of acromioclavicular joint dislocations. CORR 1985;200:234–47.
[37] Bergfeld JA, Andrisch PT, Clancy WG. Evaluation of the acromioclavicular joint after first- and second-degree sprains. Am J Sports Med 1978;6:153–9.
[38] Cook DA, Heiner JP. Acromioclavicular joint injuries. Orthop Rev 1990;19:510–6.
[39] Taft TN, Wilson FC, Oglesby JW. Acromioclavicular joint dislocation: an end-point study. JBJS 1987;69A:1045–51.
[40] Mumford EB. Acromioclavicular process dislocation: a new operative treatment. JBJS 1941;23:799–802. Rudzki JR, et al. / Clin Sports Med 22 (2003) 387–405. 403
[41] Flatow EL, Durald XA, Nicholson GP, Pollock RG, Bigliani LU. Arthroscopic resection of the distal clavicle with an upper approach. J Shoulder Elbow Surg 1995;4:41–50.
[42] Hartzmann GM. Arthroscopic resection of the acromioclavicular joint. Am J Sports Med 1993;21:71–7.
[43] Snyder S, Banas M, Karzel R. The arthroscopic Mumford procedure: an analysis of the results. Arthroscopy 1995;11:157–64.
[44] Nuber GW, Bowen MC. Acromioclavicular joint injuries and distal clavicle fractures. JAAOS 1997;5:11–8.
[45] Millborn E. About acromioclavicular joint injuries: treatment and results. Acta Orthop Scand 1950;19:349–82.
[46] Hessman M, Getzen L, Gehling H. Acromioclavicular reconstruction using polydioxanone sulfate bands: surgical technique and results. Am J Sports Med 1995;23:552–6.
[47] Murphy OB, Bellamy R, Wheeler W, Brauer TD. Posttraumatic osteolysis of the distal clavicle. Clin Orthop 1975;109:108–14.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

[48] Madsen B. Osteolysis of the acromial end of the clavicle after trauma. Br J Radiol 1963; 36:822–8.
[49] Cahill B. Atraumatic osteolysis of the distal clavicle: a review. Sports Med 1992;13:214–22.
50] Zavadsky M, Marra G, Viater JM, Levine VN, Pollock RG, Flatow EL, et al. Osteolysis of the distal clavicle: long-term results of arthroscopic resection. Arthroscopy 2000;16:600–5.
[51] Meislin RJ, Zuckerman JD, Nainzadeh N. Type III acromioclavicular joint separation associated with late brachial plexus neuropraxia. J Orth Trauma 1992;6:370–2.
[52] Sturm JT, Perry JFJ. Brachial plexus injuries from blunt trauma: a precursor to vascular and thoracic injuries. Ann Emerg Med 1987;16:404–6.
[53] Bernard TN, Brunet ME, Haddad RJ. Coracoid process fracture in acromioclavicular joint dislocations: report of four cases and review of the literature. Clin Orthop 1983;175:227–32.
[54] Barber FA. Complete posterior acromioclavicular joint dislocation: report of a case. Orthopedics 1987;10:493–6.
[55] Wurtz LD, Lyons FA, Rockwood Jr CA. Midclavicular fractures and acromioclavicular joint dislocation. JBJS 1992;74A:133–7.
[56] Lindsay RW, Gutowski WT. Migration of a fractured pin after acromioclavicular joint fixation: case report and review of the literature. Orthopedics 1986;9:413–6.
[57] Norrell H, Llewellyn RC. Migration of a threaded Steinmann pin from the acromioclavicular joint into the spinal canal: a case report. JBJS 1965;47:1024–6.
[58] Eaton R, Cerletti J. Computed axial tomography—a method for localizing Steinmann pin migration: a case report. Orthopedics 1981;4:1357–60.
[59] Mazet RJ. Migration of Kirschner wire from the shoulder region to the lung: a report of two cases. JBJS 1943;25:477–83.
[60] Lyons F, Rockwood Jr CA. Migration of pins used in shoulder surgery. JBJS 1990;72-A:1262–7.
[61] Cappello T, Nuber GW, Nolan KD, McCarthy WJ. Acute upper extremity ischemia fifteen years after anterior shoulder dislocation and the modified Bristow procedure. JBJS 1996;78:1578–82.
[62] Nelson CL. Repair of the acromioclavicular separation with a knitted Dacron graft. Clin Orthop 1979;143:289.
[63] Kappakas GS, McMaster JH. Repair of the acromioclavicular separation with a prosthetic Dacron graft. Clin Orthop 1978;131:247–51.
[64] Park JP, Arnold JA, Coker TP, et al. Treatment of acromioclavicular joint tears: a retrospective study. Am J Sports Med 1980;8:251–6.
[65] Colosimo AJ, Hammer III KD, Heidt Jr RS. Aseptic foreign body reaction to Dacron graft used for coracoclavicular ligament reconstruction after type III acromioclavicular joint dislocation. Am J Sports Med 1996;24:561–3.
[66] Weaver JC, Dunn HC. Treatment of acromioclavicular joint injuries, especially complete acromioclavicular separation. JBJS 1972;54:1187–94. 404 J. R. Rudzki et al. / Clin Sports Med 22 (2003) 387–405.
[67] Cave EF. Fractures and other injuries. Chicago: Year Book Medical Publishers; 1958.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

[68] Waskowitz WJ. Disruption of the sternoclavicular joint: analysis and review. Am J Orthop 1961;3:176–9.
[69] Nettles JL, Linscheid R. Dislocations of the sternoclavicular joint. J Traumatology 1968;8:158–64.
[70] Omer GE. Osteotomy of the clavicle in the surgical correction of anterior sternoclavicular dislocation. J Traumatology 1967;7:584–90.
[71] Heinig CF. Retrosternal dislocation of the clavicle: early recognition, radiographic diagnosis, and treatment. J Bone Joint Surg 1968;50A:830.
[72] Mehta JK, Sachdev A, Collins JJ. Retrosternal dislocation of the clavicle. Trauma 1973;5:79–83. 1996;5(1):79–83.
[73] Rockwood Jr CA, Wirth MA. Injuries of the bittock-clavicular joint. In: Rockwood Jr CA, Greene DP, Bucholtz RW, et al., editors. Rockwood and Greene Fractures in Adults. 4th edition. Philadelphia: Lippincott-Raven; 1996. pp. 1415–71.
[74] Ohno K, Inagawa H, Kiyoto K, Terada T, Suzuki S, Maekawa K. Posterior sternoclavicular joint dislocation with innominate vein obstruction: a case report. J Trauma 1998;44:381–3
75] De Jong KP, Sukui DM. Anterior sternoclavicular joint dislocation: a long-term follow-up study. J Orthop Trauma 1990;4:420–3.
[76] Haas H, Blaut M. Acromioclavicular and sternoclavicular joint injuries—surgical versus conservative treatment. Orthopade 1989;18:234–45.
[77] Eskola A. Sternoclavicular joint dislocations: a call for open treatment. Acta Orthop Scand 1986;57:227–8.
[78] Eskola A, Vainionpää S, Vastamki M, Slatis P, Rokkanen P. Operation for old sternoclavicular joint dislocation: results of 12 cases. J Bone Joint Surg 1989;71B:63–5.
[79] Fery A, Sommele J. Sternoclavicular joint dislocation: a review of 49 cases. Int Orthop 1988;12:187–95.
[80] Brown JE. Anterior sternoclavicular joint dislocation: a method of reduction. Am J Orthop 1961;31:184–9.
[81] Haberneck H, Hertz H. Origin, diagnosis, and treatment of traumatic sternoclavicular joint dislocation. Aktuel Traumatol 1987;17:25–8.
[82] Kahle M, Filler RL, Forster R. Dislocations of the sternoclavicular joint. Aktuel Traumatol 1990;20:83–6.
[83] Booth CM, Roper BA. Chronic sternoclavicular joint dislocation: operative repair. Clin Orthop 1979;140:17–20.
[84] Burrows HJ. Subclavius tenodesis in the treatment of recurrent sternoclavicular joint dislocation. J Bone Joint Surg 1951;33B:240–3.
[85] Barth E, Hagen R. Surgical treatment of sternoclavicular joint dislocations. Acta Orthop Scand 1983;54:746–7.
[86] Lunseth PA, Chapman KW, Frankel WH. Surgical treatment of chronic sternoclavicular joint dislocation. J Bone Joint Surg 1975;57B:193–6.
[87] Salvatore JE. Sternoclavicular joint dislocation. Clin Orthop 1968;58:51–4.
[88] Omer GE. Clavicle osteotomy in surgical correction of anterior sternoclavicular dislocation. J Traumatology 1967;7:584–90.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

[89] Wirth MA, Rockwood Jr CA. Complications after sternoclavicular joint reconstruction. In: Bigliani LU, editor. Complications of shoulder surgery. Baltimore: Williams & Wilkins; 1993. pp. 139–53.

[90] Rockwood Jr CA, Groh GI, Wirth MA, Grassi FA. Resection arthroplasty of the sternoclavicular joint. J Bone Joint Surg 1997;79(3):387–93.

[91] Wirth MA, Rockwood Jr CA. Injuries of the sternoclavicular joint. In: Heckman JD, Bucholz RW, editors. Rockwood and Greene Fractures in Adults. 5th edn. Phil
iladelfia: Lippincott-Raven; 2001. pp. 1245–92.

[92] Medvetzky MJ, Zuckerman JD. Injuries and Disorders of the Sternoclavicular Joint. In: Price CT, editor. Course Lecture Notes 49. Rosemont, IL: AAOS; 2000. pp. 397–406. JR Rudzki et al. / Clin Sports Med 22 (2003) 387–405. 405.

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