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ORIGINAL ARTICLE

Retrospective Study

Incidence of sports-related sternoclavicular joint dislocations in the United States over the last two decades

Alexis B Sandler, Michael D Baird, John P Scanaliato, Ayden LW Harris, Sorana Raiciulescu, Clare K Green, John C Dunn, Nata Parnes

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Abstract

BACKGROUND

Epidemiological understanding of acute sternoclavicular (SC) dislocations secondary to sports across the United States is poorly defined.

AIM

To identify and assess epidemiological trends of SC dislocations occurring secondary to sports-related mechanisms across United States over the past two decades.

METHODS

This cross-sectional, descriptive epidemiological study evaluates epidemiological trends of SC dislocations from sports that present to emergency departments (EDs) across the United States. Data were obtained from the National Electronic Injury Surveillance System database spanning two decades. Data on incidence,

patient demographics, mechanisms of injury, dislocation types, incident locales, and patient dispositions were collected.

RESULTS

1622 SC dislocations occurred nationwide from 2001 to 2020 [incidence = 0.262/1000000 people, confidence interval (CI) = 0.250-0.275], comprising 0.1% of shoulder/upper trunk dislocations. Most patients were male (91%, *n* = 1480) and aged 5-17 (61%, *n* = 982). Football, wrestling, and biking were the most frequently implicated sports, with contact sports responsible for 59% of athletic injuries (*n* = 961). Recreational vehicle-related sports injuries, such as all-terrain vehicles, dirt bikes, and mopeds accounted for 7.8% of all injuries (*n* = 126), with dirt bikes specifically comprising 3.7% (*n* = 61). Ultimately, 82% were discharged from the ED (*n* = 1337), 12% were admitted (*n* = 194), and 6% were transferred (*n* = 90). All recorded posterior dislocations were admitted or transferred from the ED. Patients sustaining SC dislocations from contact sports had a significantly increased risk of hospital admission or transfer rather than discharge from the ED as compared to patients whose injuries were from non-contact sports (incidence rate ratio = 1.46, CI: = 1.32-1.61, $P < 0.001$).

CONCLUSION

SC dislocations from sports continue to be rare with a stably low incidence over the past two decades, likely comprising a smaller proportion of shoulder dislocations than previously thought. Contact sports are a frequent source of injury, especially among school-aged and teenage males. Most patients are discharged directly from the ED; however, a substantial number are hospitalized, many of which had documented posterior dislocations. Ultimately, understanding the epidemiology and mechanism-related trends of acute SC dislocations is important given the potential severity of these injuries, concentration in a specific population, and uncertainty linked to rare presentation.

Key Words: Sternoclavicular dislocation; Sternoclavicular joint; Epidemiology; Football; Contact sports

Core Tip: Sternoclavicular (SC) dislocations from sports continue to be rare with a stably low incidence over the past two decades, likely comprising a smaller proportion of shoulder dislocations than previously thought. Contact sports are a frequent source of injury, especially among school-aged and teenage males. Most patients are discharged directly from the emergency department; however, a substantial number are hospitalized, many of which had documented posterior dislocations. Ultimately, understanding the epidemiology and mechanism-related trends of acute SC dislocations is important given the potential severity of these injuries, concentration in a specific population, and uncertainty linked to rare presentation.

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INTRODUCTION

Dislocations of the sternoclavicular (SC) are rare: In 1958, Cave *et al*[1] reported that this diarthrodial saddle joint accounts for less than 3% of joint dislocations involving the shoulder[1-3]. The rarity of these injuries imputes why many orthopedic surgeons will not treat an SC dislocation during their career[4]. Even among shoulder and elbow surgeons, SC dislocations are uncommon: An international survey of these pertinent subspecialists reveals only half treat at least one anterior SC dislocation annually[4,5]. Subsequently, there is limited consensus regarding the epidemiology of SC dislocations, which is further exacerbated by how published data is often limited to smaller observational studies given the low SC dislocation volume at individual institutions[6,7].

Despite limited epidemiological data, injury biomechanics are well-defined in the existing literature. Due to the presence of a strong, stabilizing posterior capsule as well as intrinsic and extrinsic ligamentous structures, SC dislocations typically occur in the anterior rather than posterior direction[3,4,

6,8-10]. Injury may occur as a result of direct forces applied to the anteromedial clavicle that cause posterior migration behind the sternum or by indirect forces applied to the anterolateral or posterolateral shoulder[10,11]. Sports and athletic activities are frequent sources of SC dislocations, with contact sports notably increasing an athlete's risk of sustaining direct blows to the medial clavicle or, more commonly, indirect rolling and compression forces on the shoulder[8,10,11]. The potential for posterior dislocation increases the risk of mediastinal penetration that may require emergency operative management with a vascular or cardiothoracic surgeon on standby, increasing the general clinical concern surrounding the acute injury[4,5,9,10,12].

The purpose of the present study is to provide an updated epidemiological analysis of primary, acute SC dislocations secondary to athletic activities that presented to emergency departments (EDs) across the United States over the last two decades. We hypothesize that SC dislocations from sports are rare and comprise less than 1% of estimated shoulder dislocations that present to EDs in general. Given existing concern for injury to structures surrounding the SC joint and the risk that reduction of the SC joint may entail, we further hypothesize that a substantial portion of patients presenting to EDs is admitted or transferred to another facility rather than directly discharged and that patients with injuries secondary to contact sports are more likely to be hospitalized than those from non-contact sports, reflective of greater potential for severe injury.

MATERIALS AND METHODS

This epidemiological study is a cross-sectional, descriptive assessment of SC dislocations from athletic activities presented to EDs across the United States over the past 20 years. Data were sourced from the National Electronic Injury Surveillance System (NEISS) database, a creation of the United States Consumer Product Safety Commission to track and estimate product-related injuries occurring nationwide. NEISS data are collected and deidentified by a hospital coordinator assigned to one of approximately 100 facilities across the United States that are purposefully selected to create a probability sample of EDs across the country. Data is sourced from both clinical information and follow-up telephone communication as needed.

Database query

The NEISS database was queried for all primary and secondary "upper trunk" and "shoulder" dislocations occurring over the twenty years from 2001 to 2020, although secondary injuries were only coded beginning in 2019. All narrative summaries were reviewed. Patients were excluded if the qualitative description did not reflect SC dislocation related to sports participation.

Data collection

National incidences were calculated from census numbers based on the injuries reported in the NEISS. Patient demographics included age and sex, with age-stratified into categories of patients less than five, 5-17, 18-44, 45-64, and over 65 years old. Dislocations were classified as anterior or posterior if this information was explicitly available in the narrative summary. Mechanisms of injury as identified by product involvement, incident locale, hospital size, and disposition from the ED were also collected and reviewed.

Statistical analysis

Weighted descriptive statistics were calculated for included patients based on population estimates. Incidence rates per 1000000 persons at risk and corresponding 95% confidence intervals (CIs) were also calculated based on United States census data population and by demographic-based distribution numbers. Mid-p two-sided P values were calculated for all incidence rate ratios and Poisson approximations to construct incidence rate CIs. Trends regarding injury rates over the two-decade period were assessed with linear regression. χ^2 tests were used to compare dislocation rates in comparable patient cohorts. All analyses were conducted in Stata 17 software[13].

RESULTS

Cumulatively, 1622 SC dislocations occurred nationwide over the twenty-year study period from 2001 to 2020, comprising 0.10% of upper trunk and shoulder dislocations (n = 1616268). In total, there were 0.262 dislocations per 1000000 people (95%CI: 0.250-0.275) from 2001 to 2020 (Figure 1). All SC dislocations were primary injuries. There was no appreciable linear trend among injury incidence compared between relevant years (P = 0.338).

Demographics

A majority of patients with SC dislocations were male (91%, n = 1480) (Table 1). The incidence of sports-

Table 1 Patient demographics, incident locale, and emergency department disposition

	% (Estimated *n*)
Sex	
Male	91% (1480)
Female	9% (142)
Age	
< 5	-
5-17	61% (982)
18-44	28% (456)
45-64	11% (184)
> 65	-
Incident locale	
Home	14% (235)
Street	3% (49)
Other public property	2% (32)
School	5% (82)
Place of recreation/sports	57% (917)
Unspecified	19% (307)
Disposition	
Released	82% (13370)
Transferred	6% (90)
Admitted	12% (194)

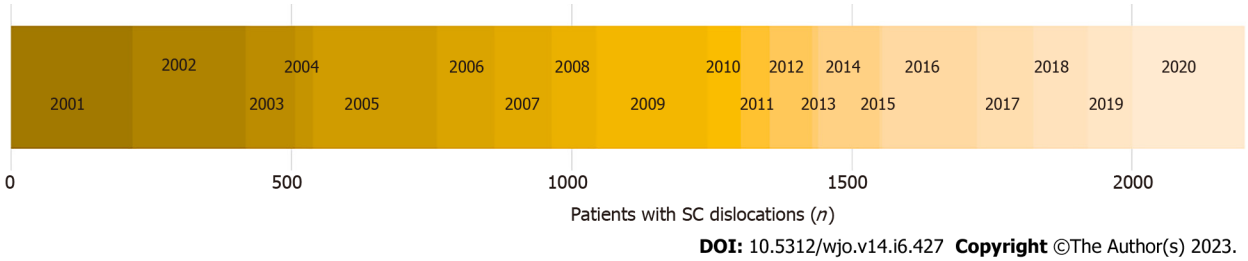

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Figure 1 Annual sternoclavicular dislocations over two decades. SC: Sternoclavicular.

related dislocations in male patients was 0.471 per 1000000 person-years (CI: 0.447-0.496), ultimately tenfold higher than the incidence among female patients (0.046 dislocations per 1000000 person-years, CI: 0.039-0.055) with statistical significance (ratio = 10.1, CI: 8.49-12.1, $P < 0.001$). Trends in age revealed that 61% of dislocations occurred in patients aged 5-17 (n = 982) followed by 28% in patients 18-44 (n = 456). Among patients aged 5-17, the incidence rate was 0.913 dislocations per 1000000 people (95%CI: 0.856-0.971), which represents a substantially higher incidence in this population than both 18-44-year-old patients (0.200 dislocations per 1000000 people, CI: 0.182-0.219) as well as all other age groups combined (0.317 dislocations per 1000000 people).

Mechanism of injury

Football-related injuries were the most common and accounted for 49% of all sport-related SC dislocations (n = 795), followed by wrestling (n = 151) and biking (n = 121) injuries (Figure 2, Table 2). The three contact sports linked to SC dislocations - football, wrestling, and hockey - accounted for two-thirds of all injuries (59%; n = 961). All contact sport-related dislocations occurred in male patients. While SC dislocations from sports were uncommon in women, general exercise-related injuries and horseback riding-related injuries (n = 120; n = 22, respectively) were the most common mechanisms among female patients. Recreational vehicle-related sports injuries, such as all-terrain vehicles, dirt

Table 2 Mechanisms of injury

Sport	% (Estimated *n*)
Football	49% (795)
Wrestling	9% (151)
Bicycle	8% (121)
General exercise	7% (120)
Weightlifting	5% (79)
Trampoline use	4% (71)
Dirt bike	4% (61)
All terrain vehicle	3% (48)
Skateboard	3% (47)
Swimming	2% (39)
Horseback riding	1% (22)
Soccer	1% (21)
Moped	1% (17)
Gymnastics	< 1.0% (15)
Hockey	< 1.0% (15)
Total	1622

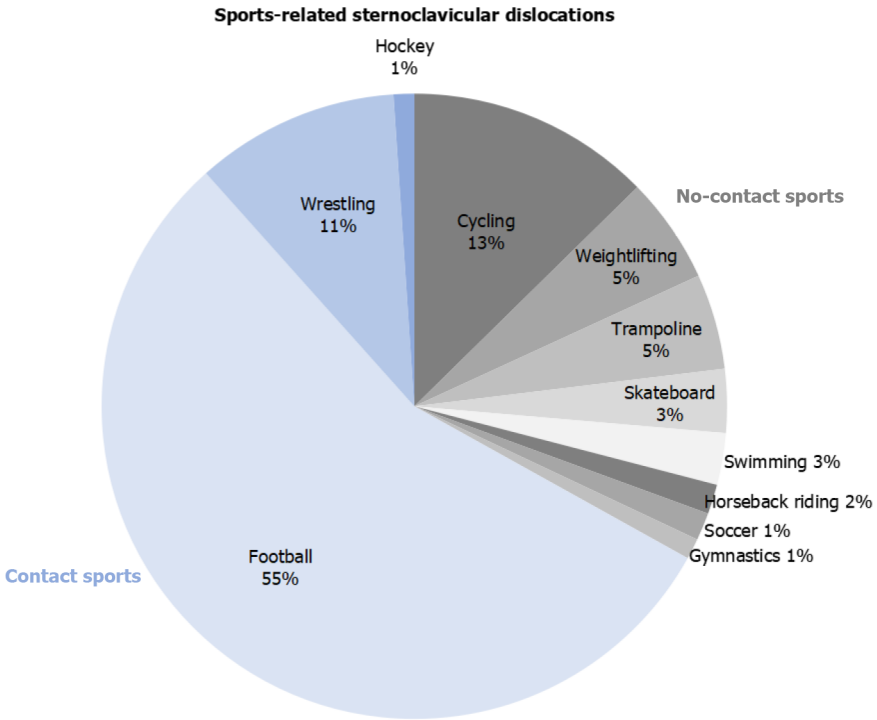

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Figure 2 Sports-related sternoclavicular dislocations.

bikes, and mopeds, accounted for 7.8% of all injuries (n = 126), with dirt bikes specifically comprising 3.7% (n = 61).

Dislocation type

Anterior *vs* posterior dislocations were not specified in NEISS data in most patients (71%; n = 1552). Anterior dislocations were specifically reported in 0.26% of cases (n = 6,), while posterior dislocations were reported in 2.9% of cases (n = 64). All posterior dislocations specified in NEISS occurred in 15- to

17-year-old males during athletic activity, with half of the raw reported dislocations sustained in football (n = 28). Other patients sustained posterior SC dislocations during wrestling (n = 16), hockey (n = 5), and skateboarding (n = 15).

Incident locale

SC dislocations were most commonly sustained at places of recreation or sport (57%; n = 917). Injuries in homes were the second most common (14%; n = 235). Of patients whose dislocations occurred at recreational facilities, 85% were male (n = 782) with an average age of 19 SD = 10. This reflects a similarly aged but less predominantly male population as compared to the patients who sustained sports-related SC dislocations in homes, of which all were male (n = 235) with an average age of 18 (SD = 14).

Patient disposition

Overall, disposition for 82% of patients occurred as discharge directly from the ED (n = 1337). Otherwise, 12% of patients were admitted to the facility (n = 194) and 6% underwent transfer to another facility (n = 90). Although very few dislocations were coded as anterior *vs* posterior, all that were coded as posterior were admitted or transferred and all that were coded as anterior were discharged directly from the ED. Patients sustaining SC dislocations from contact sports had a significantly increased risk of hospital admission or transfer rather than discharge from ED as compared to patients whose injuries were from non-contact sports (incidence rate ratio = 1.46, CI: 1.32-1.61, P < 0.001).

DISCUSSION

SC dislocations from sports are rare, with only 1622 cases presenting to United States ED's over the last two decades. A majority of afflicted patients are male and between 5-17 years old. Dislocations are frequently sustained during contact sports and often occur at places of recreation or sporting activity. For the few patients with specified anterior *vs* posterior dislocations, all posterior dislocations occurred in males aged 15-17 and were admitted or transferred upon presentation to the ED. In total, 82% of patients were discharged directly from the ED with the remainder admitted or transferred to another facility.

Given that SC dislocations are consistently reported as rare injuries, much of the published literature can only report small case series, rendering an injury burden across the United States more difficult[10]. However, there is evidence that most patients with concern for SC pathology present to medical care early after injury, with approximately 80% of patients in a case series by Laffosse *et al*[14] receiving a diagnosis and undergoing a closed reduction within the first 48 hours of injury. Because of the rarity of these injuries and the relative promptness after which patients present to medical attention, the larger and nationally representative NEISS database enables a more targeted assessment of the epidemiology of acute and traumatic SC dislocations.

Our epidemiological assessment of acute sports-related SC dislocations suggests that the incidence may be lower than previous literature suggests[1,10,12,15,16]. Estimates by Cave *et al*[1] from 1958 indicate that SC dislocations account for less than 3% of all shoulder-related dislocations and continue to be quoted throughout current literature[4]. Comparatively, our assessment of weighted NEISS data suggests that SC joint injuries comprise approximately a tenth of a percent of shoulder and upper trunk dislocations. A meta-analysis by Tepolt *et al*[16] found that 71% of SC dislocations injuries in existing literature were linked to athletics while Cave *et al*[1] estimated that SC dislocations comprise 3% of shoulder and elbow dislocations overall; subsequently, our findings indicating that SC dislocations from sports comprise 0.1% of overall shoulder dislocations suggest that SC dislocations from athletics are even rarer than previously estimated. In our assessment of sports-related SC dislocations, there is a notably strong tendency for SC injury from contact sports. The link between SC dislocations in football players, rugby players, and wrestlers is well-documented in literature[11,14,17-19], with a 1996 study published in the British Journal of Sports Medicine going so far to title their paper, "Posterior SC dislocation: an American football injury." Football-related injuries are not limited to high-school-aged or recreational athletes, and there are documented accounts of professional football players treated for SC dislocations[19]. The strong link between SC dislocations and American football offers a potential explanation for why American shoulder and elbow surgeons report seeing proportionally more SC dislocations than Canadian or Flemish surgeons, as a small survey of international shoulder and elbow surgeons revealed that 25% of the 53 American shoulder specialists reported at least three anterior dislocations per year compared to 19% of the 28 Flemish surgeons and 5% of the 128 Canadian surgeons [5]. Due to the rarity of these injuries and the frequent lack of obvious physical deformity, early diagnosis of SC dislocations can be challenging[19]. Consequently, establishing specific sports as frequently implicated mechanisms appropriately increases clinical suspicion for this rare injury pattern in these specific patient populations at a greater risk of injury.

Aligning with trends of increased SC dislocations in adolescents identified in prior literature[7,11,16], the majority of SC dislocations in our study occurred in young males between 5-17 years of age. One cause of increased risk in these patient populations may lie in sports participation, as football and wrestling are male-dominated sports often played by high-school or college-aged athletes. However, biomechanical factors may also play a role. The medial clavicular epiphysis may remain unfused up until age 25, rendering younger patients at increased risk for epiphyseal disruption causing posterior displacement[11,14]. Clavicular physeal fractures are radiographically indifferentiable from SC dislocations and present with similar immediate complications[11,14]; subsequently, the role of the late-fusing clavicular physis in predisposing young patients to these injuries may denote other physis-related risk factors. Interestingly, a study by Laffosse *et al*[14] reports that the only statistically significant difference between epiphyseal disruption *vs* SC dislocations was in patient age: The average age for patients presenting with epiphyseal disruption was 16.9 and ranged from 15-20 years *vs* those with SC dislocation was 24.2 and ranged from 17-41. With the knowledge that contact sports are a common mechanism of injury, the tendency for SC dislocations to present in young males raises a question regarding the degree to which increased exposure from contact sport participation *vs* preexisting biomechanical factors drive this increased risk.

Although much of the anterior *vs* posterior dislocation data is unavailable in our study group, there were 64 patients with specified posterior dislocations, confirming that a minimum of 2.9% of the SC dislocations that presented to EDs occurred posteriorly, reflecting an unexpectedly high percentage of posterior SC dislocations in the last 20 years. Historically, posterior dislocations are exceptionally uncommon: the classic epidemiological case series by Cave *et al*[1] of 1603 shoulder girdle injuries included only one posterior SC dislocation; the 50-year case series by Nettles *et al*[15] reports only three posterior injuries out of 60 SC dislocations; and 1996 literature review by Wirth *et al*[10] yielded fewer than 110 cases of posterior dislocations worldwide. Possible explanations include improved imaging techniques leading to fewer missed posterior diagnoses, increased rates of injuries caused by the specific activities that accrue a high risk of posterior dislocations, or increased frequency of presentation of the more severe posterior dislocations to EDs while anterior dislocations present to lower acuity facilities, possibly as chronic injuries. Regardless, future data collection that includes dislocation direction at a multi-institutional level could help better elucidate these trends.

Regarding disposition, most patients presenting to EDs with SC dislocations are discharged directly from the ED. In concordance with our hypothesis, all patients in our study presented with documented posterior dislocations were admitted or transferred. The limited availability of anterior *vs* posterior dislocation data in NEISS renders it difficult to compare the rates of these injury patterns in our data set; however, anterior dislocations are well-documented to be more common and less severe than posterior dislocations, implying that 82% of patients who were discharged from the ED more likely sustained anterior rather than posterior dislocations. Furthermore, patients with contact sports-related mechanisms were significantly more likely to be admitted or transferred compared to those with injuries from non-contact sport mechanisms, suggesting that injuries from sports with physical contact require more resources and may be more severe than those from other athletic activities.

Limitations to the present study stem from the paucity of SC dislocations and the resultant low sample size. While the NEISS database enables a more comprehensive and nationwide pool of acute traumatic injuries, it does not capture patients who present to urgent care or outpatient facilities, which means that the incidence of anterior and/or chronic dislocations may be higher as any severe injuries that presented to those facilities would likely be transferred to an ED. Furthermore, injury details such as anterior *vs* posterior dislocations were rarely present. Regarding population estimates, calculations relied on available census data, which necessitated projection statistics for the 2020 year.

CONCLUSION

SC dislocations from sports continue to be rare with a stably low incidence over the past two decades, likely comprising a smaller proportion of shoulder dislocations than previously thought. Contact sports are a frequent source of injury, especially among school-aged and teenage males. Most patients are discharged directly from the ED; however, a substantial number are hospitalized, many of which had documented posterior dislocations. Ultimately, understanding the epidemiology and mechanism-related trends of acute SC dislocations is important given the potential severity of these injuries, concentration in a specific population, and uncertainty linked to rare presentation.

ARTICLE HIGHLIGHTS

Research background

Epidemiological characterization of acute sternoclavicular (SC) dislocations is sparse, with classic epidemiology of injury dating back to the 1950s.

Research motivation

Characterize the epidemiology of acute SC dislocations over the last two decades.

Research objectives

This study aims to describe the epidemiological trends of SC dislocations that present to United States Emergency Departments (EDs) related to sports participation.

Research methods

Data for this cross-sectional, descriptive epidemiological study were obtained from the National Electronic Injury Surveillance System database spanning two decades.

Research results

The incidence of SC dislocations nationwide was found to be 0.262 per 1000000 people and comprised 0.1% of shoulder and upper trunk dislocations. The majority of patients were male (91%, n = 1480) and between ages 5-17 (61%, n = 982), and most sustained injuries in contact sports (59%, n = 961) with football the most frequently implicated sport. Most patients (82%, n = 1337) were discharged from the ED. Patients with SC dislocations from contact sports had a significantly increased risk of hospital admission or transfer rather than discharge from the ED (incidence rate ratio = 1.46, CI: 1.32-1.61, P < 0.001).

Research conclusions

SC dislocations sustained during sports are rare. Ultimately, contact sports are a frequent source of injury and the majority of patients are discharged directly from the ED.

Research perspectives

Future research will further clarify incidence of anterior *vs* posterior SC dislocations and characterize trends in treatment over time.

FOOTNOTES

Author contributions: Sandler AB contributed to the data collection, statistical analysis, presentation of data, writing of manuscript, presentation of figures and tables, and revisions of manuscript; Baird MD and Scanaliato JP contributed to the statistical analysis, and the writing, editing, and revision of the manuscript; Harris AL contributed to the writing and editing of the manuscript; Raiciulescu S contributed to the statistical analysis and editing of the manuscript; Green CK and Dunn JC contributed to the editing of the manuscript; Parnes N contributed to the conception of the idea for the manuscript, oversight throughout the course of the study, and writing, editing, revisions of the manuscript.

Institutional review board statement: All data used in the above study were obtained from a free, publicly-accessible database: The National Electronic Injury Surveillance System.

Conflict-of-interest statement: The authors declare that they have no conflict of interest.

Data sharing statement: Data were obtained from the United States Consumer Product Safety Commission at the following website: https://www.cpsc.gov/Research--Statistics/NEISS-Injury-Data.

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REFERENCES

1 **Cave E**. Shoulder girdle injuries. In: Fractures and other injuries, Chicago: Year book publishers; 1958: 258-259

2 **Moore KL**, Dalley AF, Agur AMR. Clinically Oriented Anatomy. 7th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2014

3 **Spencer EE**, Kuhn JE, Huston LJ, Carpenter JE, Hughes RE. Ligamentous restraints to anterior and posterior translation of the sternoclavicular joint. *J Shoulder Elbow Surg* 2002; **11**: 43-47 [PMID: 11845148 DOI: 10.1067/mse.2002.119394]

4 **Groh GI**, Wirth MA. Management of traumatic sternoclavicular joint injuries. *J Am Acad Orthop Surg* 2011; **19**: 1-7 [PMID: 21205762 DOI: 10.5435/00124635-201101000-00001]

5 **Van Tongel A**, McRae S, Gilhen A, Leiter J, MacDonald P. Management of anterior sternoclavicular dislocation: a survey of orthopaedic surgeons. *Acta Orthop Belg* 2012; **78**: 164-169 [PMID: 22696984]

6 **Garcia JA**, Arguello AM, Momaya AM, Ponce BA. Sternoclavicular Joint Instability: Symptoms, Diagnosis And Management. *Orthop Res Rev* 2020; **12**: 75-87 [PMID: 32801951 DOI: 10.2147/ORR.S170964]

7 **Kraus R**, Zwingmann J, Jablonski M, Bakir MS. Dislocations of the acromioclavicular and sternoclavicular joint in children and adolescents: A retrospective clinical study and big data analysis of routine data. *PLoS One* 2020; **15**: e0244209 [PMID: 33370356 DOI: 10.1371/journal.pone.0244209]

8 **Kiel J**, Ponnarasu S, Kaiser K. Sternoclavicular Joint Injury. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2021

9 **Morell DJ**, Thyagarajan DS. Sternoclavicular joint dislocation and its management: A review of the literature. *World J Orthop* 2016; **7**: 244-250 [PMID: 27114931 DOI: 10.5312/wjo.v7.i4.244]

10 **Wirth MA**, Rockwood CA Jr. Acute and Chronic Traumatic Injuries of the Sternoclavicular Joint. *J Am Acad Orthop Surg* 1996; **4**: 268-278 [PMID: 10797194 DOI: 10.5435/00124635-199609000-00005]

11 **Lee JT**, Nasreddine AY, Black EM, Bae DS, Kocher MS. Posterior sternoclavicular joint injuries in skeletally immature patients. *J Pediatr Orthop* 2014; **34**: 369-375 [PMID: 24172671 DOI: 10.1097/BPO.0000000000000114]

12 **Obremskey WT**, Rodriguez-Baron EB, Tatman LM, Pesantez RF. Acute Dislocations of the Sternoclavicular Joint: A Review Article. *J Am Acad Orthop Surg* 2022; **30**: 148-154 [PMID: 34898528 DOI: 10.5435/JAAOS-D-20-01239]

13 **StataCorp**. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC

14 **Laffosse JM**, Espié A, Bonnevialle N, Mansat P, Tricoire JL, Bonnevialle P, Chiron P, Puget J. Posterior dislocation of the sternoclavicular joint and epiphyseal disruption of the medial clavicle with posterior displacement in sports participants. *J Bone Joint Surg Br* 2010; **92**: 103-109 [PMID: 20044687 DOI: 10.1302/0301-620X.92B1.22186]

15 **Nettles JL**, Linscheid RL. Sternoclavicular dislocations. *J Trauma* 1968; **8**: 158-164 [PMID: 5645243 DOI: 10.1097/00005373-196803000-00004]

16 **Tepolt F**, Carry PM, Heyn PC, Miller NH. Posterior sternoclavicular joint injuries in the adolescent population: a meta-analysis. *Am J Sports Med* 2014; **42**: 2517-2524 [PMID: 24569702 DOI: 10.1177/0363546514523386]

17 **Kendal JK**, Thomas K, Lo IKY, Bois AJ. Clinical Outcomes and Complications Following Surgical Management of Traumatic Posterior Sternoclavicular Joint Dislocations: A Systematic Review. *JBJS Rev* 2018; **6**: e2 [PMID: 30399119 DOI: 10.2106/JBJS.RVW.17.00157]

18 **Marker LB**, Klareskov B. Posterior sternoclavicular dislocation: an American football injury. *Br J Sports Med* 1996; **30**: 71-72 [PMID: 8665125 DOI: 10.1136/bjsm.30.1.71]

19 **Yang JS**, Bogunovic L, Brophy RH, Wright RW, Scott R, Matava M. A Case of Posterior Sternoclavicular Dislocation in a Professional American Football Player. *Sports Health* 2015; **7**: 318-325 [PMID: 26137177 DOI: 10.1177/1941738113502153]

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