Epidemiology of primary shoulder dislocations requiring surgery: A cohort study from a major trauma center during 7 years

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Abstract

Purpose: The epidemiology of shoulder instability in the general population is lacking. The aim of the current study was to determine the incidence rate of primary shoulder dislocations requiring surgical interventions in a major trauma center within a large maintenance organization.

Methods: A retrospective cohort analysis of electronic health records database from 1 January 2014 and 31 December 2020 was conducted in major rural trauma center. This study included all patients aged 10 years or older with a primary shoulder dislocation that were treated with closed reduction in the emergency room department. An overall incidence density rates (IDR) (per 100,000 person-years) of primary shoulder dislocations and stabilization surgeries were determined for the entire cohort. The data was used to evaluate the age-specific and gender-specific epidemiology.

Results: During the study period of 7 years there were 1,302 patients who underwent closed reduction after a primary shoulder dislocation (mean age 45 years). Of those, a total of 106 shoulder stabilization surgeries (8\%) were performed. The IDR of primary shoulder dislocations was 179 per 100,000 person-years. The IDR of primary shoulder stabilizations was 15 per 100,000 person-years. The peak in number of dislocations was observed in the age groups of 20–29 years and over 60 years. In the age groups under 59 years dislocations were more common in men while in ages over 60 years dislocations were more common in women. The vast majority of shoulder stabilization surgeries were performed in young patients (age under 39 years).

Conclusion: The IDR of primary shoulder dislocations calculated from a major trauma center of the largest health maintenance organization in Israel was 179 per 100,000 person-years. Shoulder dislocations had bimodal age distribution. Overall, eight percent of the patients (mainly young) with shoulder dislocations underwent shoulder stabilization surgery during the study period.

Keywords
Shoulder, shoulder dislocation, shoulder reduction, incidence, epidemiology, shoulder instability

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Introduction

Traumatic shoulder dislocations often result in pain, dysfunction, and delayed return to work and sport activities. Despite comprehensive information in the literature regarding shoulder dislocations prognosis and treatment, basic epidemiological characteristics are still deficient. Previous studies were mainly single-institution case series with relatively small sample sizes followed for short-term periods. Only few studies presented information retrieved from large databases regarding shoulder dislocations. According to these reports, performed in North America and Europe, the incidence of shoulder dislocations in the general population varied from 12.3 to 26.2 per 100,000 person-years. In addition, previous studies lack information regarding the incidence of shoulder stabilization procedures. Since shoulder dislocations are relatively common and their management depends on various factors such as age, sex and level of activity, it is clinically important to identify high-risk populations. Understanding the epidemiology of shoulder dislocations could improve patient care and help in developing prevention plans. The primary objective of the study was to determine the incidence rate of shoulder dislocations presenting to a major trauma center within the largest maintenance organization in Israel. Another objective was to determine the incidence rate of stabilization procedures in this population.

Materials and methods

The study was performed in the largest health maintenance organization (HMO) in Israel (Clalit Health Services, CHS) that provides comprehensive health care to most of the Israeli population. Data was extracted from CHS patients’ records of a major trauma center in a rural district (Tel-Aviv) using Clalit’s Data sharing platform powered by MDCClone (https://www.mclone.com). With the use of the CHS computerized database we were able to identify all shoulder closed reduction procedures performed on patients during their visit in the emergency department together with all shoulder stabilization surgeries between 1 January 2014 and 31 December 2020. Demographic information at the patient’s age was 45 years (range 18–89 years) and 69% were males. Of the 106 patients who had stabilization surgeries during the study period, 96 (91%) were males. The characteristics of first-time shoulder dislocation patients by age groups is given in Table 1. The peak in number of dislocations was observed in the age groups of 20–29 years and over 60 years. In the age groups under 59 years dislocations were more common in men while in ages over 60 years dislocations were more common in women. The vast majority of shoulder stabilization surgeries were performed in ages under 39 years.

Results

From an annual average of 103,618 annual visits in the emergency department during the study period of 7 years there were 1,302 patients who underwent physician-performed closed reduction after a primary shoulder dislocation (Figure 1). Of those, a total of 106 shoulder stabilization surgeries (8%) were performed. The IDR of primary shoulder dislocations was 179 per 100,000 person-years. The IDR of primary shoulder stabilizations was 15 per 100,000 person-years. Overall, the mean patient’s age was 45 years (range 18–89 years) and 69% were males. Of the 106 patients who had stabilization surgeries during the study period, 96 (91%) were males. The characteristics of first-time shoulder dislocation patients by age groups is given in Table 1.
Discussion

The important epidemiological findings of the current study retrieved from a major trauma center of the largest health maintenance organization (CHS) in Israel database were as follows. Primary shoulder dislocations IDR was 179 per 100,000 person-years. Shoulder stabilization surgery IDR was 15 per 100,000 person-years. Shoulder dislocations had a bimodal distribution which peaked in two age groups (20–29 years and over 60 years). However, shoulder stabilization surgeries were performed mainly in the younger population (under 39 years). In the age groups under 59 years shoulder dislocations were more common among men while in older ages they were more common among women. Overall, 106 (8%) shoulder stabilization surgeries were performed during the study period.

IDR of shoulder dislocations in large populations has been previously studied.5–8,11–13 IDR depends on various characteristics of a given population such as age, sex and level of activity. Two large population-based studies in the UK and Canada showed that the IDR of primary anterior shoulder dislocation requiring closed reduction was highest among young male patients (80 and 98 per 100,000 person-years, respectively).6,7 Other studies demonstrated different IDR; however, they included both primary and recurrent events of dislocations together with related diagnoses such as acromioclavicular joint dislocations.8 The IDR in the present study (179 per 100,000 person-years) is higher than the rates observed in the Canadian, US and Oslo cohorts.5,8,11 Differences in incidence rates may be explained by the inclusion of larger cohort of patients followed for longer periods in the current study. Health services in Israel are mainly public and very accessible to provide immediate treatment to acute trauma in the setting of emergency departments or primary clinics. Therefore, almost all primary shoulder dislocations are treated and documented in these facilities which may also explain higher rates than other countries. In addition, previous reports excluded patients over the age of 70 years where a second peak of primary shoulder dislocations occur. Another Israeli epidemiological study found the prevalence of recurrent shoulder dislocations to be 50–424 per 100,000.14

The study examined army recruits and reserves up to the age of 33 between the years 1978–1995. In comparison to the current study, they focused on a high-risk younger aged subpopulation. In addition, much has changed in military training methods, medical knowledge, injury prevention programs, demographics and lifestyle since the 1980s and 1990s. Lastly, they calculated prevalence, not incidence, and included recurrent dislocations in their cohort.

The majority of shoulder dislocations in the present study occurred in males (69%). This finding is similar to previous studies (53%–78%).5,15,16 The mean age of patients with a shoulder dislocation in our study was 45 years which is higher than studies from the US (mean age 35–36) and lower than a study from the UK (mean age 51).8,15,17 One possible explanation of the lower mean age in US studies may be the high numbers of young men playing ice hockey and American football at school and colleges. In the present study dislocations demonstrated an age-sex bimodal distribution with peaks in the third and 7th decades of life. Most shoulder dislocations between the ages 20–29 were among males and the majority of dislocations over 60 occurred among females. This phenomenon was seen in other large population cohorts.5,8,11,15 Studies examining the etiology of shoulder dislocations showed dislocations in young males are related to sports and recreational activities,8 with male sex and young age being two of the main risk factors for injury.18-20 Studies further dividing age groups over 60 found a gradual increase frequency with increasing

![Figure 1. Annual number of first-time shoulder dislocations.](image)

**Table 1.** Characteristics of first-time shoulder dislocation patients by age groups.

| Age group | First shoulder dislocation, n (%) | Male:Female, (%) | Shoulder stabilization surgery, n (%) |
|-----------|----------------------------------|------------------|---------------------------------------|
| 10–19 years | 65 (5)                            | 59:6, (91:9)     | 9 of 65, (14)                         |
| 20–29 years | 381 (29)                           | 344:37, (90:10) | 63 of 381, (17)                       |
| 30–39 years | 209 (16)                           | 181:28, (87:13) | 21 of 209, (10)                       |
| 40–49 years | 127 (10)                           | 101:26, (80:20) | 8 of 127, (6)                         |
| 50–59 years | 109 (8)                            | 64:45, (59:41)  | 1 of 109, (1)                         |
| ≥60 years   | 411 (32)                           | 144:267, (35:65) | 4 of 411, (1)                         |
| All patients | 1302 (100)                         | 893:409, (69:31) | 106 of 1302, (8)                      |
Older people most frequently dislocate their shoulder while falling on their arm at home, whereas young people dislocate during sports activities. In the present study the increase in shoulder dislocations seen over the age of 60 was mainly among women. This finding is supported by previous studies. The reasons for this latter finding are unknown, but several explanations exist. One possible explanation is an age and sex-related difference in both fall and injury risk. There is evidence to suggest that older women (≥65 years) are at an increased risk for falls, injury, fracture and hospitalizations as compared with men of similar age. Reasons for sex-related difference in fall and injury risk are likely to be multifactorial and may include biological variances between ageing men and women such as differences in joint proprioception, soft tissue quality and protective muscle bulk.

Although the epidemiology of shoulder dislocations was previously investigated, evidence regarding the incidence of recurrent shoulder dislocations is lacking. Data on shoulder dislocations was retrieved from the CHS database where diagnoses are coded according to ICD-9-CM. Although the information regarding recurrent dislocations has clinical implications, there was no accurate method to calculate it. Recurrent dislocations rates could not be estimated from the current cohort, but it was found that 8% of primary shoulder dislocations underwent shoulder stabilization surgery. Many recurrent dislocations are referred to surgical treatment. It is interesting to notice that in this cohort the proportion of dislocations referred to surgery was similar to previously published data which found an 8% shoulder re-dislocation rate in urban population.

To the best of our knowledge this is the first study on the epidemiology of shoulder dislocations representing the Israeli population. Most previous studies were based on European or US populations, which may differ from the Israeli population in treatment modalities. The strengths of this study are its well-defined cohort analysis limited to the first occurrence of shoulder dislocation, performed on a large population with a relatively long follow-up. Nevertheless, it has several limitations related mainly to the use of computerized database. First, some patients who suffer from shoulder dislocation reduce the joint without presenting to a medical facility. As a result, the reported rate of shoulder dislocations in the general population may be an underestimate. Another limitation is that coding for “shoulder dislocation” potentially allow inclusion of related diagnoses (such as acromioclavicular and sternoclavicular dislocations) in the initial sample data. However, patients presenting to the emergency department with shoulder dislocations were treated by orthopedic surgeons which normally report the appropriate code. For ethical reasons in this study the data retrieved was anonymous and was limited to diagnostic codes without an option to look at detailed patients’ files and surgical reports.

Therefore, information regarding the direction of dislocation and type of surgical repair was not available. An important limitation is the difficulty in determining a recurrent injury. It remains possible that some “primary” dislocations were in fact recurrent dislocation or subluxation events. The presence of recurrences within the data set may have erroneously increased the incidence rate. Previous studies indicate that beyond a 2 years follow-up the incidence of re-dislocation plateaus. Given the lengthy study period, we believe that few primary events were mislabeled. Databases are limited by their initial formatting. The coding protocols lacked information regarding the mechanism of injury, occupation and participation in sports. Narrative sections could be utilized to characterize the latter variables, but the resulting data was inherently prone to reporting and interpretation bias and was not addressed in the study.

Conclusion

The IDR of primary shoulder dislocations calculated from a major trauma center of the largest health maintenance organization in Israel was 179 per 100,000 person-years. Shoulder dislocations had bimodal age distribution. Overall, eight percent of the patients (mainly young) with shoulder dislocations underwent shoulder stabilization surgery during the study period.

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