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ORIGINAL ARTICLE

Incidence of recurrence after shoulder dislocation: a nationwide database study

Jo-Ting Kao, MD[a], Chia-Li Chang, MBA[b], Wei-Ren Su, MD[a,c], Wei-Lun Chang, MD[d], Ta-Wei Tai, MD, PhD[a,c,*]

[a]*Department of Orthopedics, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan*
[b]*School of Health Care Administration, Taipei Medical University, Taipei, Taiwan*
[c]*Medical Device R & D Core Laboratory, National Cheng Kung University Hospital, Tainan, Taiwan*
[d]*Department of Orthopedics, National Cheng Kung University Hospital Dou-Liou Branch, College of Medicine, National Cheng Kung University, Tainan, Taiwan*

Background: The reported incidence of shoulder redislocation varies among different reports. This was a nationwide study to investigate the recurrence rate of shoulder dislocation after closed reduction.
Methods: We performed a cohort study to analyze the incidence of first dislocation as well as second and third repeated dislocations in a nationwide dataset from the National Health Insurance Research Database of Taiwan. Patients who had any shoulder dislocation event and received closed reduction from 2000 to 2013 were included.
Results: From this dataset of 1 million persons, we identified 1074 patients who had a shoulder dislocation. Of these, 210 had a second shoulder dislocation and 93 had a third shoulder dislocation. The shoulder redislocation rates were 9.4%, 12.7%, and 17.0% at 1 year, 2 years, and 5 years, respectively, after the first shoulder dislocation and 19.6% at overall follow-up. Patients in the youngest age group and male patients had higher risks of redislocation (adjusted hazard ratios, 3.28 and 1.41, respectively). The mean time to recurrence was 13.1 months. However, the patients who had a second shoulder dislocation had a shorter time to recurrence and a higher risk of redislocation (44%), with no statistical differences in risk among any age or sex groups.
Conclusions: After the first shoulder dislocation, male patients and younger patients had higher shoulder redislocation rates. However, after the second shoulder dislocation, all groups shared a similar high shoulder redislocation rate regardless of age or sex. Surgical treatment should be considered for patients with multiple episodes of shoulder dislocation.
Level of evidence: Epidemiology Study; Large Database Analysis
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Keywords: Shoulder dislocation; redislocation; incidence; NHIRD; database; repeated dislocation

This protocol was approved and given exempt status by the Institutional Review Board of National Cheng Kung University Hospital (No. A-EX-104-004).

*Reprint requests: Ta-Wei Tai, MD, PhD, Department of Orthopedics, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, 138 Sheng-Li Road, Tainan 70428, Taiwan.
E-mail address: david0803@gmail.com (T.-W. Tai).

The glenohumeral joint of the shoulder is the most frequently dislocated joint because of its unstable structure. Anterior shoulder dislocation, the most common type, accounts for 90% of cases.[1] The incidence of first shoulder dislocation in the general population ranges from 12.3 to 26.2

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per 100,000 person-years.[9,15] Currently, the most common treatment for an uncomplicated first shoulder dislocation is nonoperative management.[7] However, the recurrence rate of shoulder instability is high.

The recurrence rate of shoulder dislocation ranges from 4% to 100%.[3,4,19,20,24] Adolescent patients have the highest risk of recurrence among all age groups. The reported recurrence rate reached 75% in 1 study.[4] Another retrospective study showed recurrence rates as high as 92% to 100% in younger populations.[24] There have also been studies focusing on shoulder dislocation in elderly persons. The reported recurrence rate of shoulder dislocation in elderly patients ranges from 4% to 31%, and there is a higher incidence of rotator cuff tears in these patients.[3,19,20]

Most of the previous studies were single-institution case series, and the results were varied. The sample sizes were small, and the follow-up periods were short. In addition, there is little information about the incidence of repeated shoulder dislocation (recurrence more than once). With a nationwide population database, we could retrieve more comprehensive and long-term data for analysis. The purpose of this study was to evaluate the shoulder redislocation rate of patients treated nonoperatively in all age populations using large-scale, nationwide population-based data.

Methods

This is a nationwide database study from the National Health Insurance Program of Taiwan to evaluate the shoulder redislocation rate of patients in all age populations.

Data sources

The National Health Insurance Program of Taiwan was launched in 1995. It provides universal and comprehensive health care for approximately 99% of residents.[8] We used a dataset (LHID2000) that contained all the registration and claim data from a randomly selected 1 million individuals from the National Health Insurance Research Database (NHIRD). There were no significant differences in age or sex between this dataset and all NHIRD enrollees.[11] We identified the diagnosis and procedure using the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) and *International Classification of Diseases, Ninth Revision, Procedure Coding System*.[23]

Study design and sampled participants

This study included all patients aged 10 years or older with a primary shoulder dislocation (ICD-9-CM code 831.X, dislocation of shoulder, and *International Classification of Diseases, Ninth Revision, Procedure Coding System* code 64074C, closed reduction for dislocation of shoulder joint) between January 1, 2000, and December 31, 2013, from NHIRD. The index date was set as the first episode of shoulder dislocation. Only patients who had a recorded episode of shoulder dislocation concomitant with receiving a closed reduction procedure were included. The included patients were followed up for at least 5 years. The exclusion criteria were as follows: (1) age at index date younger than 10 years; (2) sex unknown; (3) death within 1 week after shoulder dislocation; (4) documented shoulder dislocation and surgery prior to January 1, 2000; (5) diagnosis of clavicular fracture (ICD-9-CM code 810.X), scapular fracture (ICD-9-CM code 811.X), or humeral fracture (ICD-9-CM code 812.X) in the same episode; and (6) receiving any shoulder surgery during the same admission (ICD-9-CM procedure codes 64243B, 64244B, 64015B, 64065B, 64072B, 64121B, 64122B, 64163B, 64170B, 64259B, 64185B, 64235B, and 64239B).

The incidence of first-, second-, and third-time shoulder dislocations was calculated. The covariates included sex and age groups (10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and ≥80 years). In addition, we analyzed the effects of comorbidities including diabetes mellitus (ICD-9-CM code 250.X), hyperlipidemia (ICD-9-CM code 272.X), and hypertension (ICD-9-CM codes 401.X and 405.X). The Charlson Comorbidity Index, which contains 17 weighted comorbidities, was also calculated for each participant.[2]

Statistical analysis

We performed a survival analysis using the Kaplan-Meier method to analyze the overall survival from the first to the second shoulder dislocation, as well as from the second to the third episode. The difference in survival among age and sex groups was calculated using the log-rank test. Multivariable analysis (Cox proportional hazards regression model) was used at 1-, 2- and 5-year follow-up after the first shoulder dislocation. All statistical analyses were performed using SAS software (version 9.4; SAS Institute, Cary, NC, USA). The level of statistical significance was set at $P < .05$.

Results

Overall

In this 1 million–person dataset, we identified 1074 patients (589 male and 485 female patients) who had a primary shoulder dislocation and underwent closed reduction. Among these patients, 210 had a second episode of shoulder dislocation. Ninety-three patients had 3 or more episodes of shoulder dislocation (Table I). The overall shoulder redislocation rates were 9.4% at 1-year, 12.7% at 2-year, and 17.0% at 5-year follow-up. The overall redislocation rate was 19.6% (Table II, Fig. 1). The overall 5-year incidence rate of shoulder redislocation was 4.2 per 100 person-years (male patients, 5.2; female patients, 3.0) (Table S1).

Second dislocation

Among patients with a primary shoulder dislocation, 19.6% (210 of 1074) had a second shoulder dislocation. The overall shoulder redislocation rate within 2 years was high, and it became stable after 5 years of follow-up (Fig. 1). Male patients had higher shoulder redislocation rates than female patients at 1, 2, and 5 years following the first shoulder dislocation and at final follow-up (Table II; Fig. 2, *A*). Compared with female patients, male patients were more likely to have

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