J Shoulder Elbow Surg (2020) 29, 784–793

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

Surgical outcomes in the Frequency, Etiology, Direction, and Severity (FEDS) classification system for shoulder instability

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Background: The Frequency, Etiology, Direction, and Severity (FEDS) system was developed as a simple but reliable method for classifying shoulder instability based on 4 factors attainable by history and physical examination: frequency (solitary, occasional, or frequent); etiology (traumatic or atraumatic); direction (anterior, posterior, or inferior); and severity (subluxation or dislocation). This study investigated the epidemiology and 2-year surgical outcomes for the FEDS categories in the prospective Multicenter Orthopaedic Outcomes Network (MOON) Shoulder Instability cohort.

Methods: At the time of surgery, 1204 patients were assigned to the FEDS categories. Follow-up data were available for 636 of 734 patients (86.6%) who had undergone surgery at least 2 years prior to analysis. The most common categories were further analyzed by patient-reported outcomes (PROs) (American Shoulder and Elbow Surgeons, Western Ontario Shoulder Instability index, Single Assessment Numeric Evaluation scores) and rates of recurrent subluxation, recurrent dislocation, and revision surgery.

Results: Of the 36 FEDS categories, 16 represented at least 1% of patients. Occasional traumatic anterior dislocation (OTAD) was the most common category, with 16.4% of patients. Five other anterior categories (solitary traumatic anterior subluxation, occasional traumatic anterior subluxation [OTAS], frequent traumatic anterior subluxation [FTAS], solitary traumatic anterior dislocation, and frequent traumatic anterior dislocation) and one posterior category (solitary traumatic posterior subluxation [STPS]) represented at least 5% of patients. PROs improved significantly for each category. The highest rates of recurrent subluxation occurred in FTAS,

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This study was approved by the Institutional Review Board at the University of Iowa (Department of Health and Human Services registration no. IRB00000099).

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1058-2746/$ - see front matter
https://doi.org/10.1016/j.jse.2019.12.002

OTAS, and OTAD cases; dislocation, OTAS and FTAS cases; and further surgery, OTAD cases. The lowest rates of failure occurred in STPS cases. Downward trends in PROs and higher failure rates were noted with an increasing number of preoperative dislocations.
Conclusion: Different FEDS categories showed varying degrees of improvement and failure rates, indicating that the system can be used to provide prognostic insight for presurgical education. Overall, outcomes decreased with a higher number of preoperative dislocations.
Level of evidence: Level II; Prospective Cohort Design; Treatment Study

Keywords: Shoulder; instability; dislocation; subluxation; FEDS classification; PROs

Shoulder instability is a common orthopedic condition, especially in a young active population.[9,19] However, instability of the glenohumeral joint is a heterogeneous entity in terms of history, presentation, and optimal treatment. Consequently, multiple classification schemes have been developed. Perhaps the most commonly used system is TUBS (traumatic, unilateral, Bankart, surgery) vs. AMBRI (atraumatic, multidirectional, bilateral, rehabilitation, inferior), described by Thomas and Matsen.[28] This system includes 2 overarching categories, broadly defined by their preferred treatment of surgical vs. nonsurgical. Other classifications systems, such as that published by Silliman and Hawkins,[25] use an algorithmic method based on factors deemed clinically important. Gerber and Nyffeler[5] described a classification scheme defining dynamic glenohumeral instability by the direction and presence of hyperlaxity.

The Frequency, Etiology, Direction, and Severity (FEDS) classification system for shoulder instability was developed in 2010 by Kuhn[11] after reviewing 18 proposed systems to determine which criteria were most commonly included. Only the 4 namesake FEDS variables were included by at least 50% of the reviewed classification systems. In the FEDS system, frequency is defined by episodes per year: solitary (1 episode), occasional (2-5 episodes), or frequent (>5 episodes). Etiology is defined as traumatic or atraumatic. Direction is defined as anterior, posterior, or inferior. Severity is defined as dislocation or subluxation and is determined by whether the patient required assistance from another person for reduction. The advantages of the FEDS system stem from both simplicity of classification and the agreed-on importance of each component.

The FEDS system was validated in 2011, showing high intrarater agreement and inter-rater agreement, ranging from 84% to 97% and from 82% to 90%, respectively, for the 4 individual factors.[12] Overall, the system allows for 36 possible combinations, represented by the first letter of each variable in order (eg, solitary traumatic anterior dislocation [STAD]); however, fewer categories are commonly seen. Previous work has described epidemiologic data from a cohort consisting of all patients seen for shoulder instability treated with or without surgery at 3 institutions over a 6-year period.[7] Of the categories, 16 represented greater than 1% of the cohort whereas 6 represented greater than 5%. Lebus et al[13] looked at the same retrospective cohort to determine which FEDS variables were associated with operative intervention.

The purpose of this study was to investigate the epidemiology of the FEDS classification system and 2-year outcomes in a prospective, multicenter cohort of patients undergoing operative treatment for glenohumeral instability. Epidemiology, patient-reported outcomes (PROs), and failure rates were investigated.

Methods

All patients enrolled in the Multicenter Orthopaedic Outcomes Network (MOON) Shoulder Instability cohort between November 5, 2012, and November 30, 2018, were included. The MOON Shoulder Instability cohort is an institutional review board–approved prospective multicenter cohort consisting of patients undergoing surgical stabilization of the glenohumeral joint. It consists of 25 sports medicine or shoulder and elbow fellowship-trained surgeons at 11 institutions. Data were recorded by surgeons at the initial visit, at the time of surgery, and at 6 months postoperatively. PROs were obtained at the initial visit and 2 years after surgery. The overall epidemiology of the cohort has been previously described.[10]

Demographic characteristics of the entire cohort were analyzed along with the 4 FEDS variables and sport participation. The patients were then assigned to the FEDS categories to determine which were most clinically relevant to our operative cohort. A power analysis was performed to determine the minimum number of patients in a given FEDS category necessary to detect preoperative to postoperative changes in PROs. By use of a paired t test design and an α level of .05, 34 patients would be needed to detect a moderate effect size (Cohen $d = 0.50$) (G*Power, version 3.1.9.3; Heinrich Heine University, Dusseldorf, Germany). On the basis of this calculation, we only assessed preoperative to postoperative changes in PRO scores for FEDS classifications with at least 34 patients (7 categories). Patients with 2-year follow-up were included in the analysis. PROs included the American Shoulder and Elbow Surgeons (ASES) shoulder score, the Western Ontario Shoulder Instability index (WOSI), and the Single Assessment Numeric Evaluation (SANE). Recurrent subluxation, recurrent dislocation, and revision surgery were also analyzed to evaluate rates of failure.

All data were captured and stored via Teleform (OpenText, Waterloo, ON, Canada) or REDCap (REDCap, Nashville, TN,

USA).[6] Statistical analysis was performed using SPSS Statistics (version 25.0.0.0; IBM, Armonk, NY, USA). Paired *t* tests were used to compare baseline and 2-year PRO scores.

Results

Epidemiology

A total of 1204 patients were enrolled at the time of analysis and included in the baseline (time-zero) analysis. The study cohort consisted primarily of young male patients (82.0% male patients; mean age, 24.6 ± 8.9 years) with traumatic (82.9%) anterior (76.3%) instability. In 71.6% of the cohort, injury occurred while participating in sports. Table I summarizes the demographic characteristics.

All 1204 patients were classified using the FEDS system. Nineteen FEDS categories represented at least 1% of the cohort, as shown in Figure 1. Occasional traumatic anterior dislocation (OTAD) represented the most common category, with 16.4% of patients, followed by solitary traumatic anterior subluxation (STAS) and STAD, with 12.8% and 11.4%, respectively. Four other categories consisted of more than 5%: occasional traumatic anterior subluxation (OTAS), frequent traumatic anterior subluxation (FTAS), frequent traumatic anterior dislocation (FTAD), and solitary traumatic posterior subluxation (STPS). The top 7 categories encompassed 74.9% of all patients, with the top 19 comprising 97.1%.

For the 7 largest categories, additional demographic data are reported in Table II. Average age was similar across categories, although age was highest in STAD cases, at 26.8 years, likely reflecting older patients who had a dislocation from a fall or trauma. The STAS and OTAS categories had the highest percentages of female patients, at 20.8% and 20.7%, respectively, whereas the STPS category had the lowest, at 10.0%. Moreover, the OTAS category had the highest percentage of sports injuries, at 87.1%, whereas the STPS category had the lowest, at 65.0%.

Postoperative PROs

At the time of analysis, 734 of 1204 patients were eligible for 2-year follow-up based on the date of surgery. Two-year outcome data were available for 636 of 734 (86.6%). Analysis of PROs was limited to categories that contained at least 34 patients based on power analysis; 7 categories were eligible (STAS, OTAS, FTAS, STAD, OTAD, FTAD, and STPS). Each of the top 7 FEDS categories showed significant improvement ($P < .001$) from baseline to 2-year scores on the ASES score, WOSI, and SANE, as shown in Table III. Trends for the traumatic anterior subluxation and dislocation categories stratified by frequency are illustrated in Figure 2.

Table I Demographic characteristics of all enrolled patients

Characteristic	Data
Sex	
Male	82.0 (987)
Female	18.0 (217)
Age, yr	24.6 ± 8.9 (12-66)
Affected arm	
Right	51.7 (622)
Left	48.3 (582)
Injured during sport	
Yes	71.6 (855)
No	28.4 (339)
Frequency	
Solitary	41.4 (498)
Occasional	35.3 (425)
Frequent	23.3 (281)
Etiology	
Traumatic	82.9 (998)
Atraumatic	17.1 (206)
Direction	
Anterior	76.3 (919)
Posterior	23.2 (279)
Inferior	0.5 (6)
Severity	
Subluxation	54.6 (655)
Dislocation	45.4 (549)

Data are reported as percentage (number) or mean ± standard deviation (range).

Solitary Traumatic Anterior Subluxation 12.8	Solitary Traumatic Anterior Dislocation 11.4	Solitary Traumatic Inferior Subluxation 0.2	Solitary Traumatic Inferior Dislocation 0	Solitary Traumatic Posterior Subluxation 8.3	Solitary Traumatic Posterior Dislocation 0.7
Solitary Atraumatic Anterior Subluxation 2.7	Solitary Atraumatic Anterior Dislocation 0.7	Solitary Atraumatic Inferior Subluxation 0.1	Solitary Atraumatic Inferior Dislocation 0	Solitary Atraumatic Posterior Subluxation 4.2	Solitary Atraumatic Posterior Dislocation 0.3
Occasional Traumatic Anterior Subluxation 9.6	Occasional Traumatic Anterior Dislocation 16.4	Occasional Traumatic Inferior Subluxation 0.1	Occasional Traumatic Inferior Dislocation 0.1	Occasional Traumatic Posterior Subluxation 2.7	Occasional Traumatic Posterior Dislocation 1.2
Occasional Atraumatic Anterior Subluxation 1.6	Occasional Atraumatic Anterior Dislocation 2.2	Occasional Atraumatic Inferior Subluxation 0	Occasional Atraumatic Inferior Dislocation 0	Occasional Atraumatic Posterior Subluxation 1.2	Occasional Atraumatic Posterior Dislocation 0.2
Frequent Traumatic Anterior Subluxation 7.0	Frequent Traumatic Anterior Dislocation 9.5	Frequent Traumatic Inferior Subluxation 0.1	Frequent Traumatic Inferior Dislocation 0	Frequent Traumatic Posterior Subluxation 1.9	Frequent Traumatic Posterior Dislocation 1.1
Frequent Atraumatic Anterior Subluxation 1.1	Frequent Atraumatic Anterior Dislocation 1.4	Frequent Atraumatic Inferior Subluxation 0	Frequent Atraumatic Inferior Dislocation 0	Frequent Atraumatic Posterior Subluxation 1.0	Frequent Atraumatic Posterior Dislocation 0.3

Figure 1 Frequency, Etiology, Direction, and Severity distribution of Multicenter Orthopaedic Outcomes Network Shoulder Instability cohort. Data are reported as the percentage of the entire surgical cohort; *blue boxes* represent more than 5% of surgical cases, whereas *gray boxes* represent fewer than 1%.

Table II Demographic characteristics for most common FEDS categories

	Solitary Traumatic Anterior Subluxation	Occasional Traumatic Anterior Subluxation	Frequent Traumatic Anterior Subluxation	Solitary Traumatic Anterior Dislocation	Occasional Traumatic Anterior Dislocation	Frequent Traumatic Anterior Dislocation	Solitary Traumatic Posterior Subluxation
Total	12.8 (154)	9.6 (116)	7.0 (84)	11.4 (137)	16.4 (197)	9.5 (114)	8.3 (100)
Age, yr	23.6 ± 8.6	23.9 ± 8.2	23.8 ± 8.9	26.8 ± 9.7	25.4 ± 9.2	23.6 ± 8.5	23.8 ± 8.5
Female	20.8 (32)	20.7 (24)	14.3 (12)	16.8 (23)	16.8 (33)	13.2 (15)	10.0 (10)
Sport	76.0 (117)	87.1 (101)	78.6 (66)	67.2 (92)	71.4 (140)	72.8 (83)	65.0 (65)

FEDS, Frequency, Etiology, Direction, and Severity.
Data are reported as percentage (number) or mean ± standard deviation.

Table III Patient-reported outcomes by FEDS category

	Solitary Traumatic Anterior Subluxation (n = 98)	Occasional Traumatic Anterior Subluxation (n = 72)	Frequent Traumatic Anterior Subluxation (n = 48)	Solitary Traumatic Anterior Dislocation (n = 67)	Occasional Traumatic Anterior Dislocation (n = 90)	Frequent Traumatic Anterior Dislocation (n = 49)	Solitary Traumatic Posterior Subluxation (n = 61)
ASES score							
Baseline	65.5 ± 18.0	69.1 ± 19.5	71.1 ± 21.0	68.5 ± 19.6	66.7 ± 20.5	65.8 ± 23.0	61.5 ± 20.3
2 yr	92.6 ± 10.4	92.8 ± 11.0	91.6 ± 9.8	92.5 ± 11.6	91.8 ± 12.6	88.7 ± 15.9	88.3 ± 15.0
MCID, %	82.7	81.7	74.5	80.6	86.9	79.2	89.8
WOSI score							
Baseline	46.3 ± 18.3	44.5 ± 19.3	46.9 ± 19.5	45.4 ± 20.0	43.3 ± 20.6	39.5 ± 18.1	46.4 ± 19.3
2 yr	79.5 ± 22.4	77.1 ± 22.8	77.7 ± 20.2	79.2 ± 21.2	77.5 ± 19.8	71.4 ± 21.0	79.8 ± 19.9
MCID, %	81.6	81.7	87.2	79.1	83.0	87.5	86.4
SANE score							
Baseline	46.8 ± 22.4	50.9 ± 24.7	50.9 ± 22.3	44.4 ± 23.8	46.3 ± 25.1	36.9 ± 26.6	53.0 ± 23.8
2 yr	83.4 ± 17.1	83.4 ± 16.2	82.4 ± 13.0	81.0 ± 20.8	82.0 ± 16.8	79.3 ± 19.2	83.1 ± 17.4
MCID, %	81.6	71.8	76.1	71.6	76.1	85.1	74.1

FEDS, Frequency, Etiology, Direction, and Severity; *ASES*, American Shoulder and Elbow Surgeons; *MCID*, percentage of patients improving by minimal clinically important difference (ASES score, 6.4; WOSI score, 220; and SANE score, 9.5); *WOSI*, Western Ontario Shoulder Instability index; *SANE*, Single Assessment Numeric Evaluation.
Data are reported as mean ± standard deviation; we found $P < .001$ for change between baseline and 2 years for each patient-reported outcome.

Mean baseline ASES scores for the top 7 categories ranged from 61.5 (STPS) to 71.1 (FTAS). Mean 2-year scores showed a narrow distribution of 88.3 (STPS) to 92.8 (OTAS). Mean improvement ranged from 20.6 (FTAS) to 27.0 (STAS), with each category showing mean improvement greater than the published minimal clinically important difference (MCID) of 6.4 for the ASES score.[17] At least 80% of patients in each category improved by the MCID, except the FTAS category, in which 74.5% of patients improved by at least 6.4 points. The STPS category showed the highest percentage of MCID improvement, with 89.8% of patients.

Mean baseline WOSI scores converted to a 100-point scale ranged from 39.5 (FTAD) to 46.9 (FTAS). Mean 2-year scores ranged from 71.4 (FTAD) to 79.8 (STPS), the widest distribution of the 3 reported PROs. MCID improvement on the WOSI, reported as 220 on the 2100-point scale and converted to 10.5 of 100, was reached at the highest rate by the FTAD category, at 87.5%.[8] The STAD category showed the lowest percentage of patients improving by the MCID, with 79.1%.

Mean baseline SANE scores ranged from 36.9 (FTAD) to 53.0 (STPS). Two-year scores showed a narrow distribution of 79.3 (FTAD) to 83.4 (OTAS). The FTAD category showed the greatest percentage of patients improving by the MCID of 15.0, with 85.1%, but had the lowest 2-year SANE scores.[27] The STAD category showed the lowest MCID improvement, with 71.6%.

Failure

Failure, determined by 3 separate benchmarks of recurrent subluxation, recurrent dislocation, or revision surgery, was calculated using data from patients who had a minimum

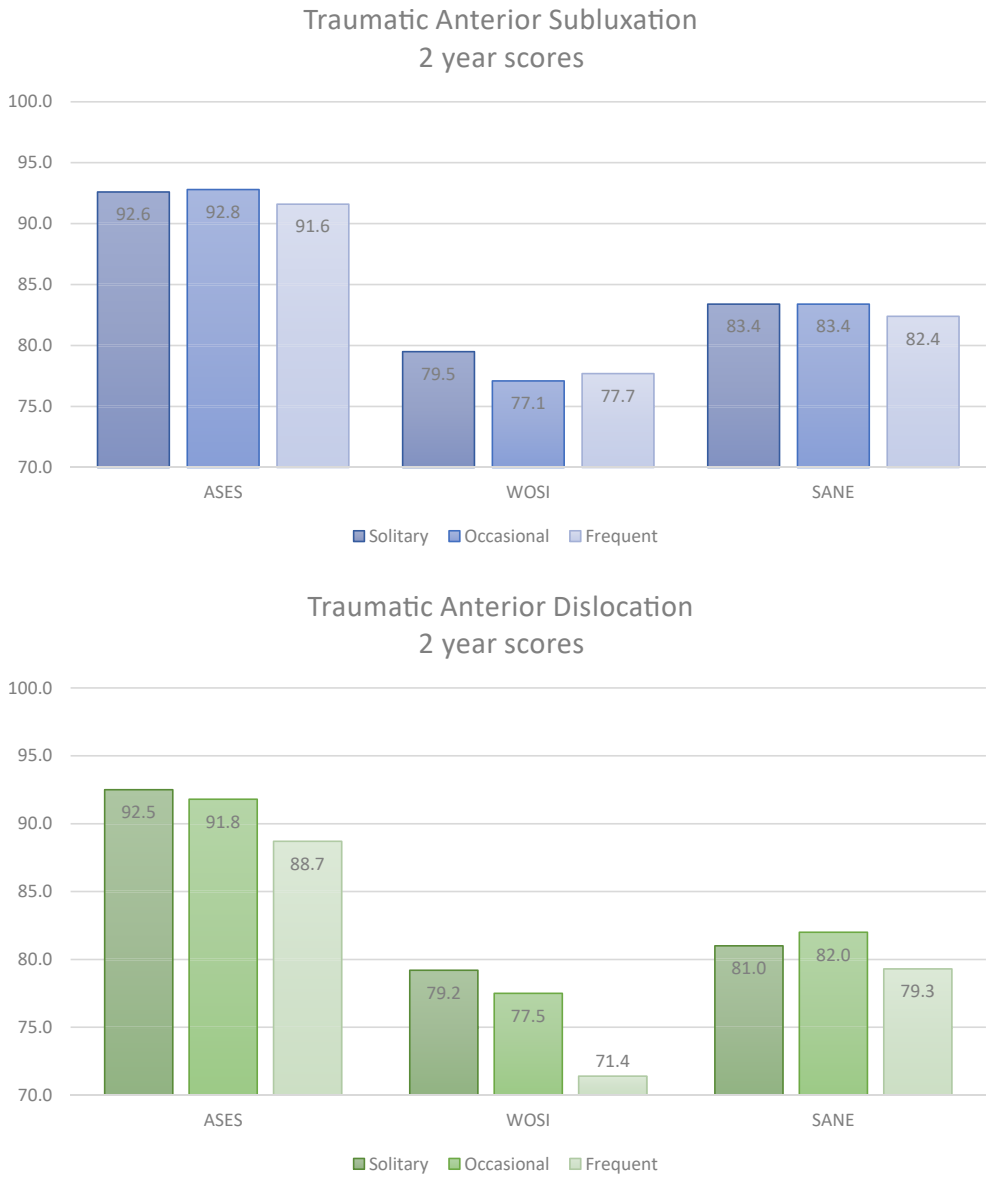

Figure 2 Traumatic anterior subluxation and dislocation 2-year patient-reported outcomes by frequency: American Shoulder and Elbow Surgeons *(ASES)*, Western Ontario Shoulder Instability index *(WOSI)*, and Single Assessment Numeric Evaluation *(SANE)* scores.

2-year follow-up period. Overall, 28.9% of patients experienced recurrent subluxation, 7.0% experienced recurrent dislocation, and 3.9% underwent revision surgery. Patients who required further surgery because of failure underwent revision at a mean of 21.4 months (range, 7.1-60.8 months).

Rates of failure for the FEDS categories analyzed at 2 years are summarized in Table IV, with trends for traumatic anterior subluxations and dislocations shown in Figure 3. Rates of recurrent subluxation ranged from 19.0% (STPS) to 50.0% (FTAS), whereas rates of dislocation ranged from 3.1% (STAS) to 11.4% (FTAS). The FTAS and OTAD categories contained the highest percentage of patients underwent further surgery (6.5% each), followed by the FTAD category (6.0%). No patients in the STPS group underwent further surgery.

Discussion

Compared with the study by Hettrich et al[7] looking at the epidemiology of the FEDS system in all patients with a diagnosis of shoulder instability (operative and nonoperative patients), we found our cohort to be younger (24.6 years vs. 30.1 years) and consist of more male patients (82.0% vs. 71.5%) with more injuries during sport (71.6% vs. 50.1%). These results are in agreement with those of Lebus et al,[13] who found age and sport participation to be significantly associated with surgical management in patients with glenohumeral instability. Hettrich et al reported 16 clinically relevant categories with greater than 1% of all patients. In their study, 6 categories comprised greater than

Table IV Failure by FEDS category

	Solitary traumatic anterior subluxation	Occasional traumatic anterior subluxation	Frequent traumatic anterior subluxation	Solitary traumatic anterior dislocation	Occasional traumatic anterior dislocation	Frequent traumatic anterior dislocation	Solitary traumatic posterior subluxation
Recurrent subluxation	20.8 (20)	37.1 (26)	50.0 (22)	25.8 (17)	32.6 (28)	29.2 (14)	19.0 (11)
Recurrent dislocation	3.1 (3)	10.0 (7)	11.4 (5)	9.1 (6)	5.8 (5)	6.3 (3)	3.4 (2)
Revision surgery	4.0 (4)	2.7 (2)	6.5 (3)	3.0 (2)	6.5 (6)	6.0 (3)	0.0 (0)

FEDS, Frequency, Etiology, Direction, and Severity.
Data are reported as percentage (number).

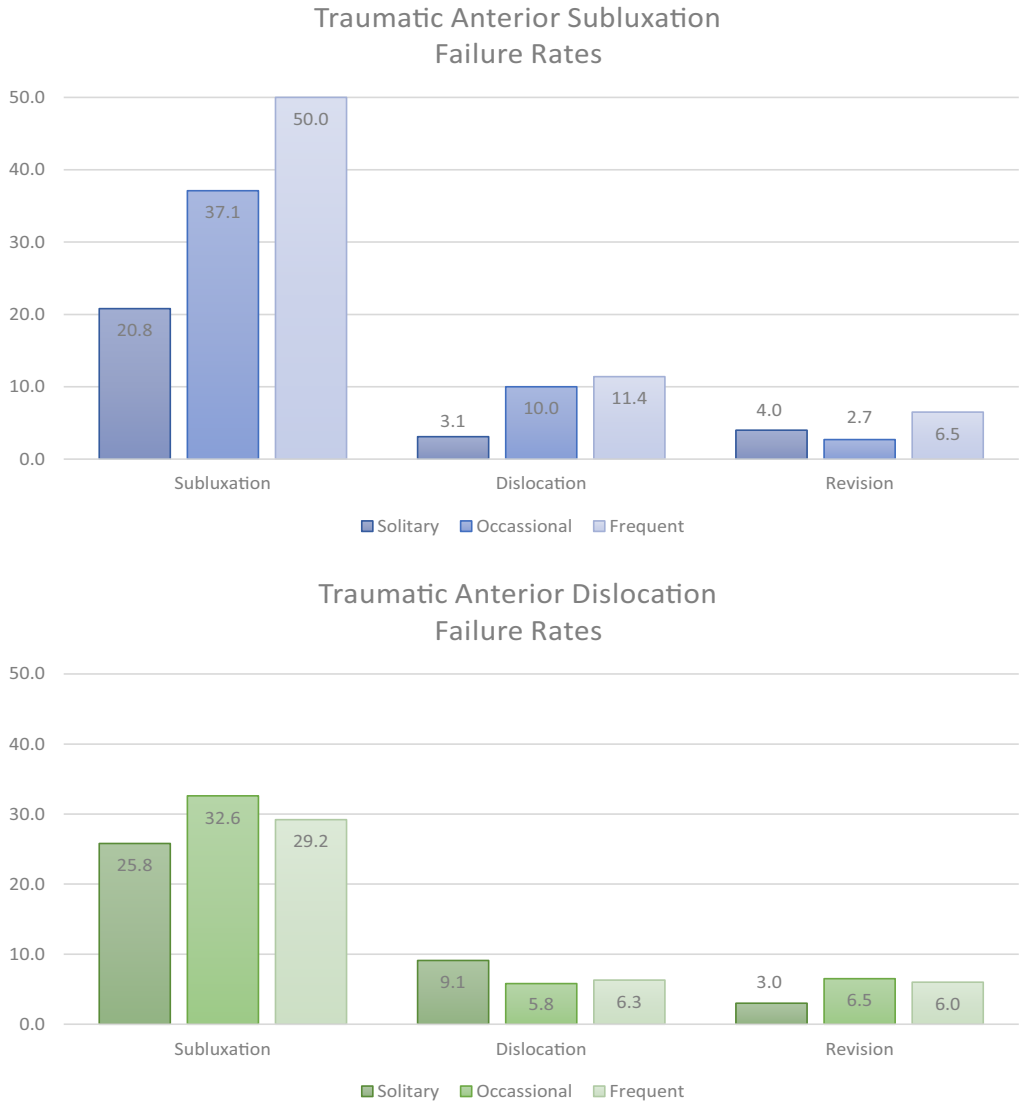

Figure 3 Traumatic anterior subluxation and dislocation 2-failure rates by frequency, reported as percentages.

5% of patients, representing 72.1% of the cohort—STAD, OTAD, STAS, FTAS, FTAD, and OTAS—ranging from 24.8% to 6.8%. These 6 categories correspond to the classic definition of TUBS by Thomas and Matsen.[12,28] These 6 categories were also the most common among surgical patients, but the STPS category also had more than 5% of patients. The addition of this category is also in agreement with the study by Lebus et al, who found a significantly

greater proportion of posterior instability in their surgical group compared with nonsurgical cases. These findings support recent evidence demonstrating a higher prevalence of posterior instability requiring surgery than previously recognized.[26]

As the FEDS system requires a primary direction, multidirectional instability is not directly accounted for, although the frequent atraumatic anterior subluxation (FAAS), frequent atraumatic inferior subluxation (FAIS), and frequent atraumatic posterior subluxation (FAPS) categories most closely resemble the definition. These categories accounted for a total of 2.1% of surgical cases in the cohort, similarly to previous findings. McFarland et al[15] reported the rate of multidirectional instability treated surgically to range from 1.2% to 8.3% based on different definitions used to classify patients within the same cohort, noting a significant effect of the definition on determining rates, demonstrating the effect of having ambiguity in the definition.

When developing the FEDS system, Kuhn[11] described frequency as an indirect measure of the severity of pathology. This was further strengthened by the findings of Rugg et al,[23] who showed that a higher frequency of preoperative dislocation was associated with a higher rate of anterior glenoid bone loss and biceps pathology in the MOON cohort. In addition, they found that a higher frequency was associated with a longer duration from the onset of symptoms and a higher incidence of open surgery, suggesting that bone loss may be a direct result of untreated longstanding instability.[23] Lebus et al[13] reported a significant difference in the distribution of frequency between surgical and nonsurgical groups, with solitary predominating in the nonsurgical group but a nearly even split among solitary, occasional, and frequent in the surgical group. In contrast, our study showed 41.4% of patients in solitary categories and only 23.4% with a classification of frequent. This predominance of solitary instability managed operatively could possibly result from the trend toward earlier intervention before patients experience additional events.

Dislocation vs. subluxation, another indirect measure of pathology that intuitively would seem to be a significant factor in the preferred treatment, appears to be the FEDS variable least associated with surgery. Lebus et al[13] found no association between severity and surgical treatment, with 60% of their cohort experiencing dislocations. Our study found dislocation to only occur in 45.4% of surgical cases, with subluxation accounting for the remaining 54.6%. The 3 traumatic anterior dislocation categories, STAD, OTAD, and FTAD, accounted for 37.1% of dislocators. OTAD was the most common individual category in our cohort (16.3%), compared with STAD (24.8%) in the cohort described by Hettrich et al[7] containing both operative and nonoperative patients.

The 7 most common FEDS categories all showed significant improvement in the ASES evaluation, in the WOSI, and in the SANE at 2-year follow-up. The highest mean baseline and 2-year scores for each category were found on the ASES evaluation, which places more emphasis on pain and activities of daily living than instability.[22] High ASES scores across all categories suggest that pain and daily function improved to a high level after stabilization. The WOSI, our primary instability outcome, showed mean 2-year scores of less than 80% for each category. Of note, the WOSI scores decreased with increasing frequency of the traumatic anterior dislocation groups (Fig. 2). The FTAD category, despite showing improvement by the MCID in 87.2% of patients, had a 2-year mean WOSI score of 71.1, indicating improvement but less favorable absolute outcomes for patients with frequent instability after dislocation. The same trend of a decreasing WOSI score was not observed in the traumatic anterior subluxation groups. Two-year SANE scores showed a tight distribution, with mean scores between those of the ASES evaluation and WOSI. Interpretation of the SANE is not as specific as either of the shoulder tools but has been shown to correlate well with multiple shoulder PROs including the ASES score.[29]

Overall rates of recurrent subluxation, recurrent dislocation, and revision surgery were similar to those in previous studies, although as Owens et al[20] elucidated, patients may have good long-term outcome scores and return to sport despite some degree of recurrent instability.[18] In our cohort, recurrent subluxation represented a substantial concern in certain categories. Subluxation occurred in greater than one-third of OTAS and OTAD patients and in half of those classified as having FTAS. More than 10% of OTAS and FTAS patients also reported a dislocation event after surgery, despite indicating that their shoulder problems began with subluxation. The highest rate of revision surgery occurred in the OTAD group, followed by the FTAS and FTAD groups. The most noteworthy trend regarding failure was the finding of less favorable outcomes in the occasional and frequent groups.

Of particular interest regarding failure, a trend appeared within the 3 categories of traumatic anterior subluxation: STAS, OTAS, and FTAS. Rates of recurrent subluxation, recurrent dislocation, and revision surgery increased with increasing frequency (Fig. 3). In addition, the FTAS category showed the lowest improvement in ASES scores. Together, these findings may suggest a role for earlier intervention before progression to more severe categories with poorer outcomes, which is supported by the aforementioned findings of a greater prevalence of glenoid bone loss with increasing frequency.[23] Future work should investigate pathologic findings in these groups and whether differences exist between outcomes in the solitary and occasional or frequent categories for each corresponding combination of etiology, direction, and severity.

As noted previously, the higher prevalence of STPS was a new finding within our cohort of exclusively surgical patients. In addition, STPS patients had favorable outcomes, with the lowest rate of recurrent subluxation, second lowest rate of recurrent dislocation, and no revision surgical procedures. PROs also suggested a high level of

success from surgery within the category. Previous studies on arthroscopic treatment of posterior instability have demonstrated overall good results but varying levels of failure, although some discrepancy may be because of relative rarity plus the inclusion of multidirectional instability.[4,14,16,21] A recent study by Bernhardson et al[2] found anterior instability to have superior outcomes to posterior instability. Our study only analyzed posterior instability in solitary traumatic subluxations, which showed good results that were comparable to those of the STAS category.

Boileau et al[3] identified factors associated with recurrent instability following Bankart repair, noting bone loss, hyperlaxity, and number of anchors to be associated with higher rates. Similarly, Ahmed et al[1] described patient age, severity of glenoid bone loss, and engaging Hill-Sachs lesions as significant factors associated with recurrence following Bankart repair or capsular shift. Notably, these studies focused primarily on pathology associated with the development of instability. The results of our study supplement the current literature by investigating the prognosis of surgical treatment of the labrum or capsule based on a simple classification that can be determined on initial presentation. Because of the importance of joint pathology, Shea[24] suggested a modification to the FEDS system to include the primary anatomic lesion leading to instability, specifically the capsule, labrum, glenoid, humerus, or rotator cuff. Such an addition could provide further valuable insight into outcomes based on the FEDS system but at the cost of detracting from its innate simplicity by using patient history and physical examination alone to classify patients.

Our study is limited to an epidemiologic investigation based on variables attained from history and physical examination and does not include intraoperative findings. In addition, the numerous categories of the FEDS system reduce the sample size for any given group; however, the overall size of the cohort minimizes these concerns. The FEDS system only includes data from patient history and physical examination and does not include data on specific pathology, which is both a strength and weakness of the classification. Moreover, future studies are necessary to establish the patient acceptable symptomatic state (PASS) score for PROs used for shoulder instability. Strengths of our study include the large size, prospective design, and enrollment from multiple private and academic centers, likely leading to a high degree of generalizability.

Conclusion

The FEDS system is a simple and reproducible method for classifying instability. Although overall outcomes were good for the entire cohort, certain categories yielded higher PRO scores and differing rates of improvement, recurrent subluxation, recurrent dislocation, and revision surgery. An increasing initial frequency of instability events led to lower WOSI scores and higher failure rates in the traumatic anterior dislocation groups (OTAD and FTAD), as well as higher failure rates in the traumatic anterior subluxation groups (OTAS and FTAS). These findings provide insight into the outcomes of patients based on factors determined during the initial patient presentation and may indicate a benefit of earlier recognition and operative treatment. These data can be used for patient education and shared decision making when patients are considering surgery.

Disclaimer

The MOON Shoulder Instability cohort is supported by the Orthopaedic Research and Education Foundation. This study was supported in part by research grants from the Orthopaedic Research & Education Fund (grant 14-003) and by the National Center for Advancing Translational Sciences (UL1TR001998) and the Dean of the College of Medicine, University of Kentucky. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health (NIH) or the University of Kentucky. The REDCap (Research Electronic Data Capture) database at Vanderbilt University in Nashville, Tennessee, was used for data collection.

Brian R. Wolf's institution received an Orthopaedic Research and Education Foundation grant for this study. He is a paid board member of United HealthCare and is a consultant for ConMed and SportsMed Innovate. His institution received educational grant money from ConMed, Smith & Nephew, and Arthrex unrelated to the submitted work.

John E. Kuhn has received honoraria as a visiting professor from multiple universities and organizations unrelated to this work. He is an editor for the *Journal of Shoulder and Elbow Surgery* and receives compensation for this role.

Keith M. Baumgarten is a paid consultant for Wright Medical outside of the submitted work; receives payment for lectures from Wright Medical and Arthrex; and receives royalties from Lippincott, Williams & Wilkins unrelated to the submitted work.

Jonathan T. Bravman receives money from the Western Orthopaedic Association unrelated to the submitted work; consults for Smith & Nephew and DJO Global unrelated to the submitted work; has given expert testimony outside the submitted work; has received payment for lectures related to his consultancy outside the related work; and receives royalties from Shukla Medical unrelated to the submitted work.

Robert H. Brophy receives payment for lectures from Arthrex unrelated to the submitted work.

Brian T. Feeley has an NIH grant pending outside the submitted work.

John A. Grant serves as the Chair of the Membership Committee of the Canadian Orthopaedic Association; this is an unpaid position. He consults for Ossur and JRF Ortho.

Grant L. Jones receives money related to board membership on the Musculoskeletal Transplant Foundation and is a member of the MTF Medical Board of Trustees. He was paid to review medical cases and give expert testimony in medical-legal cases unrelated to the submitted work. He has a clinical research grant pending from OrthoSpace unrelated to the submitted work.

C. Benjamin Ma receives money as a consultant for Zimmer, Medacta, Stryker, and Tornier. He has grants pending for projects outside the submitted work from Zimmer, Histogenics, and Samumed. He receives royalty payments from Slack.

Robert G. Marx receives money related to his role as the deputy editor of sports medicine and the associate editor of evidence-based orthopedics for *The Journal of Bone and Joint Surgery*. He receives royalties for books published by Springer and Demos Health. He has an International Society of Arthroscopy, Knee Surgery & Orthopaedic Sports Medicine grant pending outside the submitted work.

Eric C. McCarty consults for Zimmer Biomet. He receives grant money from Smith & Nephew, Arthrex, and DePuy for fellowship support unrelated to this project; receives money for patents unrelated to the submitted work; and receives royalties from Elsevier.

Matthew V. Smith consults for Arthrex and Flexion Therapeutics outside the submitted work.

Rick W. Wright serves on the boards of directors of the American Board of Orthopaedic Surgery and American Orthopaedic Association, which are not paid board positions. His institution receives research grant money from the NIH and National Institute of Arthritis and Musculoskeletal and Skin Diseases unrelated to the submitted work. He receives book royalties from Wolters Kluwer and Lippincott, Williams & Wilkins. He receives travel reimbursements when traveling with the St Louis Blues Hockey Club as the team physician, which is outside the submitted work.

Alan L. Zhang is a consultant for Stryker outside the submitted work. He has an American Orthopaedic Society for Sports Medicine grant pending outside the submitted work.

The other authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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