

AUTHOR VERSION

The immediate and subsequent impact of a first-time traumatic anterior shoulder dislocation in people aged 16-40: Results from a national cohort study

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Abstract

Background

Limited evidence exists which details changes in quality of life, shoulder activity level, kinesiophobia, shoulder pain and disability following a first-time traumatic anterior shoulder dislocation (FTASD) in people treated non-operatively. This study had three objectives; (1) to examine quality of life, pain, disability, and kinesiophobia after a FTASD within 12 weeks, (2) to examine whether these variables were different in people with and without recurrent shoulder instability and (3) to assess how these variables changed over 12 months.

Methods

A prospective cohort study was undertaken in people with a FTASD aged between 16 and 40 years. Measures of quality of life, kinesiophobia, shoulder activity, shoulder pain and disability were recorded within 12 weeks of a FTASD and at 3, 6, 9 and 12 months.

Results

A FTASD negatively impacted quality of life, shoulder pain and function and these variables improved over time. People with recurrent shoulder instability had poorer quality of life 12 months after a FTASD. Across the entire cohort, kinesiophobia did not significantly change across time in people following a FTASD.

Discussion:

Quality of life was significantly affected by a FTASD in people with recurrent shoulder instability. Across the entire cohort of people with a FTASD, kinesiophobia remained elevated in people following a FTASD.

AUTHOR VERSION

Level of Evidence

Level1 Prognostic study

Introduction

Background

Rates of recurrent shoulder instability after a first-time traumatic anterior shoulder dislocation (FTASD) range from between 26% to 100%, with heterogeneity of these results primarily dependent upon study methods, age and pathological lesions.^{1,2} People who have a FTASD are interested in how long their shoulder will be painful for, and how it will affect their level of function and quality of life. While recurrent shoulder instability is a much-studied topic,³⁻⁵ there is limited literature available regarding the impact of recurrent shoulder instability on quality of life, shoulder pain and disability, shoulder activity levels, and kinesiophobia. Patients' self-reported shoulder function was examined in a large prospective study in Sweden, and found to be similar in people with recurrent shoulder instability who did not receive surgical intervention and became 'stable over time' when compared to those with a single dislocation and those that were treated surgically.⁶ Shoulder pain following a FTASD has been examined in a prospective cohort study and pain greater than 8/10 on the numeric pain rating scale (NPRS) was a statistically significant multivariate predictor for subsequent recurrent shoulder instability.⁷ However, the time for resolution of shoulder pain and function after a FTASD is currently unknown.

Some authors have shown decreased quality of life two years after a shoulder instability event.⁸ Others have shown decreased quality of life in people who

AUTHOR VERSION

have recurrent shoulder instability when compared to people who do not have recurrent shoulder instability or stabilisation surgery^{7,9} while some have shown no difference.¹⁰ Thus, further examination of the time course, and the effect of recurrent shoulder instability on quality of life is required.

Furthermore, while fear of reinjury after shoulder instability has been reported in the literature,^{11,12} there is limited evidence regarding the degree of kinesiophobia (defined as fear of movement and reinjury¹³) immediately post-injury or over time after a FTASD.¹⁴

There is a plethora of research that has examined the effects of recurrent shoulder instability following shoulder dislocation, but the systematic reviews that examine recurrent shoulder instability^{3-5,15} have not examined reported time frames for recovery after a FTASD, such as how long their shoulder will be painful for, how long their function will be affected, and what the impact will be on their quality of life. Additionally, while kinesiophobia has been reported in the literature after a shoulder instability event,¹⁴ the trajectory of kinesiophobia following a FTASD is currently unknown. As part of a large national cohort study of risk factors for recurrent shoulder instability, we aimed to also examine the impact of a shoulder dislocation on pain, function, quality of life and kinesiophobia, and the trajectory of these variables over the subsequent 12 months.

There were three main objectives of this part of the study:

- (1) to examine the level of quality of life, pain and disability, and kinesiophobia within 12 weeks following a FTASD;
- (2) to examine whether these variables were different in people with and without recurrent shoulder instability managed non-operatively over the 12

AUTHOR VERSION

months post-injury;

(3) to assess how these outcome variables changed over the following 12 months for the entire non-operative cohort who had a FTASD.

Methods

A national prospective cohort study was undertaken in New Zealand with people who had sustained a FTASD between August 2015 and March 2017. In New Zealand, people who have a traumatic accident present to health professionals who record their details using a specified coding system (including injury details) with the Accident Compensation Corporation (ACC), a government owned corporation responsible for administering the country's universal no-fault accidental injury scheme. The ACC database was reviewed by an ACC employed administrator who was independent to the study, to identify people with injury codes relevant to a shoulder dislocation. The administrator sent a letter of invitation to all those with an injury code denoting shoulder instability who had not received surgery for their injury. Those who did not opt-out were contacted by telephone by the first author, who explained the study, checked for eligibility, and if in agreement, took informed consent. People were included in the study if they were aged between 16 and 40 years (as rates of recurrent instability decrease after 40 years of age), sustained a FTASD in New Zealand between May 2015 to April 2016 which was registered with ACC, had a shoulder X-Ray following their FTASD, had a New Zealand contact address, and had not undergone surgical intervention for their shoulder injury within 12 weeks of the injury. The initial X-Ray and any other radiological imaging were reviewed to confirm the anterior shoulder

AUTHOR VERSION

dislocation. People were excluded if they had a previous shoulder instability episode or if they did not speak conversational English (as they were unable to participate in the telephone interview). People were also excluded if radiological records showed an injury of the isolated acromio-clavicular joint injury without an anterior dislocation, a posterior or inferior dislocation, or a previous instability event. People with a Bony Bankart lesion, or greater tuberosity fracture were included in the study.

Consenting participants were followed for 12 months after their FTASD. Quality of life, level of shoulder activity, shoulder pain and function, and kinesiophobia were assessed over the phone via the following outcome measures respectively: Western Ontario Shoulder Instability Index (WOSI), Shoulder Activity Scale (SAS), Shoulder Pain and Disability Index (SPADI), Numeric Pain Rating Scale (NPRS) and Tampa Scale of Kinesiophobia (TSK-11). Baseline shoulder activity was reported as the level prior to the FTASD, to enable investigation of the length of time taken to regain previous shoulder activity after a FTASD. Baseline measures for the remaining variables were measured at the initial interview, subsequent to the FTASD to assess the immediate impact of a FTASD. Phone calls were made to participants within 12 weeks of their FTASD and at 3, 6, 9, and 12 months post-injury.

A summary of recruitment figures can be seen in Figure 1. Of the 711 people referred to the study 205 were not contactable (29%). Of the remaining 506, 24% declined to participate, 34% were ineligible, and 42% were eligible and provided consent (n=213).

Ethical approval was obtained from the ethics committees of the XXXX University (approval number 14/256) and the Accident Compensation

AUTHOR VERSION

Corporation (ACC) (approval number 272). This study was part of a larger study which examined predictive variables for recurrent shoulder instability after a FTASD. Linear mixed-effects models were undertaken to assess the difference between the outcomes of interest at the relevant follow-up time points compared with baseline values. A p-value ≤ 0.05 indicated statistical significance. Post-hoc power analysis (with alpha set at 0.05 (two-sided), power=80% to see a difference between people with recurrent instability compared to those without recurrent shoulder instability within 12 months follow-up) revealed the study was powered at 91% for quality of life (WOSI total), and 66% for both kinesiophobia (TSK-11) and shoulder pain (SPADI-Pain). Post hoc power analysis over time for the entire cohort revealed the study was powered at 85% for all variables.

Results

Baseline data was collected from 213 participants, with data concerning recurrent instability status at 12 months available for 186 participants (87%). Data was collected within 12 weeks of a dislocation (mean number of days from dislocation to data collection was 66.75 (21.53) days, range = 22-120 days). Not all those who remained in the study and provided recurrence data wished to complete the outcome measures. Therefore, follow-up data was available for 76 (36%) at 3 months, 76 (36%) at 6 months, 65 (31%) at 9 months, and 86 (40%) at 12 months. The mean age was 25 years and 15% were female. People who were aged 16-25 years had increased rates of recurrent instability ($p=0.02$) compared with people aged 26-40 years. There was no difference in baseline kinesiophobia ($p=0.06$) or quality of life ($p=0.42$)

AUTHOR VERSION

between these age groups. Of the 213 people who were recorded at baseline, 164 (77%) had received physiotherapy for an average of 7 sessions.

In regard to the specific study objectives:

1) to examine the level of quality of life, pain and disability, and kinesiophobia after a FTASD within 12 weeks

Within 12 weeks of a FTASD, people had low levels of quality of life, indicated by a mean WOSI Total score of 844.2 of a possible 2100 (Table 1). A WOSI score of 0 indicates no impact on quality of life, whereas a score of 2100 indicates an extreme impact on quality of life.¹⁶ Within 12 weeks of a FTASD, people had some pain and disability with a mean SPADI score of 20.82, where a score of 0 indicates no pain or disability and 100 represents the maximum level of impairment (Table 1).¹⁷ Likewise, people experienced some kinesiophobia with mean TSK-11 values of 25.92 within 12 weeks of a FTASD, where 11 represents the minimum level of kinesiophobia and 44 the maximum level.¹⁸ People were asked in their initial interview to recall the amount of pain they experienced at the time of dislocation. They recalled that the pain experienced at the time of the FTASD was an average NPRS of 7.99 out of 10. At the time of the initial interview, this had decreased to an average NPRS of 1.68.

2) to examine whether these variables were different in people with and without recurrent shoulder instability over the following 12 months

The rate of reported recurrent shoulder instability (10.3% at 3 months, 19.3% at 6 months, 22.1% at 9 months and 30.5% at 12 months) can be seen in Figure 2. Differences in outcome scores of quality of life, shoulder pain and disability, kinesiophobia and shoulder activity, between people with and

AUTHOR VERSION

without recurrent shoulder instability are shown in Table 2. People who had recurrent shoulder instability had significantly more shoulder pain (SPADI Pain) compared to people without recurrent shoulder instability (Table 2). Kinesiophobia (TSK-11) was not significantly different in people with recurrent shoulder instability compared to those who did not suffer recurrence (Table 2). Shoulder related quality of life (WOSI Total) was significantly decreased in people who had recurrent shoulder instability when compared to those who had no recurrent episodes (Table 2). Higher WOSI scores indicate worse quality of life. Physical, recreational, and emotion quality of life domains, of the WOSI, were significantly decreased in those people who had recurrent shoulder instability compared to those who had no recurrent episodes (Table 2). Post-hoc power analysis with respect to recurrent instability status showed results for the difference in TSK-11 and SPADI-Pain were powered at 66%, while results for differences in WOSI scores were powered at 91%

3) to assess how these outcome variables changed over the following 12 months for the entire cohort who had a FTASD

Across the cohort, shoulder activity decreased significantly at 3 and 6 months after injury. Compared with pre-injury values, there was no significant difference at 9 and 12 months after a FTASD ($p > 0.05$). Levels of shoulder pain (SPADI Pain) decreased significantly across all time periods compared to the level of shoulder pain experienced after the FTASD (Table 2). Shoulder function (SPADI Function) improved over time and was significantly better compared to baseline at 9 and 12 months ($p < 0.01$ and $p < 0.00$ respectively) (Table 2). There was no statistically significant change in kinesiophobia (TSK-11) across all time points compared with baseline (Table 2). Quality of

AUTHOR VERSION

life (WOSI scores) was significantly improved across all time points when compared to baseline values (Table 2).

Discussion

This study sought to examine patient reported outcome measures for people following a FTASD and to see whether these variables changed over time.

This study has shown that quality of life and shoulder pain were significantly affected in people who reported recurrent shoulder instability at 12 months after a FTASD. Kinesiophobia did not significantly change over time within 12 months after a FTASD.

1) to examine the level of quality of life, pain and disability, and kinesiophobia after a FTASD within 12 weeks

For the entire cohort (irrespective of whether they went on to develop recurrent shoulder instability), the immediate (within 12 weeks) influence of a FTASD was significant. Quality of life, kinesiophobia, and shoulder pain and function were all negatively influenced. Other authors have reported a negative impact of a shoulder dislocation on quality of life,¹⁹ shoulder pain⁷ and kinesiophobia.^{11,14} This finding speaks to objective one of this study, where the descriptive analysis of these patient reported variables indicated the detrimental impact of a FTASD. Clinicians commonly examine levels of pain and dysfunction in people with a FTASD.²⁰ They should also be aware of the immediate impact of a FTASD on quality of life, and kinesiophobia, and adjust their assessment and treatment accordingly.

2) to examine whether these variables were different in people with and without recurrent shoulder instability over the following year

AUTHOR VERSION

Those people who went on to have recurrent shoulder instability had significantly greater levels of shoulder pain compared to the group without recurrence. There was no difference in kinesiophobia in those who had recurrent shoulder instability compared with those who did not, which is in agreement with the findings of Eshoj et al.¹⁴ Quality of life was decreased in people with recurrent shoulder instability, which indicated the significant impact that recurrent shoulder instability has on an individual. Thus, low rates of recurrent instability and improving quality of life one year after a FTASD in this cohort, indicates that primary shoulder stabilisation is unwarranted.

3) to assess how these outcome variables changed over the following 12 months for the entire cohort who had a FTASD

When looking across the entire cohort of people who had suffered a FTASD, shoulder function was significantly improved at 9 months after a FTASD when compared with initial injury levels. Shoulder pain steadily improved from baseline and was improved at all time points from the initial injury. There was a statistically significant improvement in quality of life from baseline at all time points over the entire 12 months. There was a statistically significant decrease in shoulder activity levels from pre-injury levels at both 3 and 6 months post-injury. However, shoulder activity levels were not significantly different from pre-injury levels at 9 and 12 months post-injury, which indicated a return to similar pre-injury activity levels. Overall, kinesiophobia did not significantly change across the entire 12 months. While quality of life, pain, function and shoulder activity in the total cohort improved across time, kinesiophobia in the total cohort showed no statistically significant decrease across the 12 months following a FTASD. This is in contrast to Johnston and Carrol²¹ who reported

AUTHOR VERSION

a 'U' effect where kinesiophobia was affected initially after an injury, improved over time with treatment, and then worsened again as people planned to return to sport²¹. However, Johnston and Carroll²¹ specifically studied athletes who were returning to sport, while the population in our study was a general population that included both sporting and non-sporting people.

Other relevant findings

Parr et al.²² reported TSK-11 scores in males and females prior to a painful stimulus (males 18.00(4.98) and females 17.99 (3.96)) and 48 hours after exercise-induced pain (males 18.59 (5.38) and females 19.19(4.96)). Prugh et al.²³ reported that people with elbow valgus overload scored a TSK-11 of 20, while those with traumatic elbow hyperextension scored 26 of the TSK-11.

The mean TSK-11 score at baseline in our study in people with a FTASD (25.92) was higher when compared with people without sudden onset traumatic injuries²² but similar to people with traumatic elbow injuries.²³

A possible explanation for the elevated TSK-11 levels at baseline and across time is that the traumatic nature of the injury resulted in increased levels of kinesiophobia. Alternatively, the TSK-11 score may not be a responsive measure of change in kinesiophobia over time in a population of people with an acute FTASD.

When compared to other people with anterior shoulder instability, the quality of life scores in this study (WOSI: 65.7% +/-22.4%) were higher than other studies which have examined quality of life in people with anterior shoulder instability (50.8% +/- 21.5%²⁴) and those about to undergo shoulder stabilisation surgery (43.3% +/- 19.9%²⁵). Both these studies reported quality

AUTHOR VERSION

of life in people who were presenting for further medical intervention, while our study measured quality of life in all people who had had a FTASD. People who present for medical intervention following a FTASD may have poorer quality of life and be different from the total population of people who have suffered a FTASD. The levels of quality of life in this study one year after a dislocation (65.7% +/- 22.4%) were slightly lower than those reported following anterior shoulder stabilisation (76% +/- 21%) at least 2 years after the surgery. Given that the MCID for the WOSI is 220 (10.4%)²⁶, and that the WOSI trajectory was improving at one year follow-up, there appears to be little justification for surgical intervention for people with a FTASD to improve quality of life. The SPADI has not been widely used in people with shoulder instability²⁷. The SPADI Total scores in our population with a FTASD were 20.82 shortly after their FTASD and decreased to 8.37 at 12 months following their injury, indicating decreased levels of shoulder pain and dysfunction over this time period.

This study had a number of limitations. Considerable effort was made to establish contact with all participants at each follow-up point. However, continual contact with a relatively young mobile population across the 12 month follow-up period was difficult. New Zealanders have high migration rates²⁸ and this may have contributed to these challenges. While we were able to contact 186 of the original 213 participants to establish the presence of recurrent shoulder instability, only 86 were willing to answer questionnaires to record the patient reported outcomes. People who did not complete questionnaires at 12 months, had significantly different levels of shoulder pain and function and kinesiophobia at baseline (Table 2). It was not possible to

AUTHOR VERSION

establish whether the people who did not want to answer the questionnaires were different from those who did at the time of contact. For example, those that did respond may not accurately represent the quality of life, shoulder pain and disability, level of activity, and kinesiophobia for the entire available cohort at each time point. Additionally, other unmeasured variables such as level of education and number of hours worked in a week may have influenced a person's willingness to complete the questionnaires.

Post-hoc analysis for 12 month follow-up data demonstrated that with 86 participants we were sufficiently powered to detect a difference between recurrent instability status only for quality of life analysis (91%). This study was not adequately powered for analyses of shoulder pain (66%) or kinesiophobia (66%), and had limited power for shoulder function (4%), SPADI Total scores (23%) or shoulder activity (5%). Therefore, further studies of larger sample size are required to examine the effect of recurrent shoulder instability in those managed non-operatively. However, the study was powered at 85% to assess change over time in the entire cohort of people with a FTASD, regardless of instability status.

There may be some systemic measurement error as the questionnaires may not have accurately measured these psychosocial variables. Self-reported questionnaires are proxy measures of an individual's actual state as these measures, by their very nature, are unobservable and must be inferred^{29,30}. Additionally, limitations in the capture of intended constructs may have arisen. For example, as the SAS measures only the frequency of activity, people who were engaged for intense efforts of activity on a weekly basis would score lower in activity level than a person who engaged in moderate levels of

AUTHOR VERSION

activity on a daily basis. Additionally, the SAS was recorded retrospectively, as a measure of pre-injury status. Therefore, the SAS may not accurately represent shoulder activity levels in this population.

Undertaking this study throughout all of New Zealand, necessitated the recording of data over the telephone. This precluded the addition of clinical tests such as an apprehension test as a baseline variable. Future studies should examine whether a positive apprehension test impacts on quality of life, and kinesiophobia. Further studies should also examine whether the presence or size of a labral tear affects quality of life, shoulder pain and function, and kinesiophobia in a non-operative population. Future studies could also examine whether kinesiophobia is significantly different in people managed operatively or non-operatively.

Conclusions

Quality of life, and shoulder pain were significantly affected in people who reported recurrent shoulder instability 12 months following a FTASD. In the entire cohort of people with a FTASD, kinesiophobia did not significantly change across the 12 months following a FTASD and may require longer follow-up.

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Figure 1 Flow of people through the study

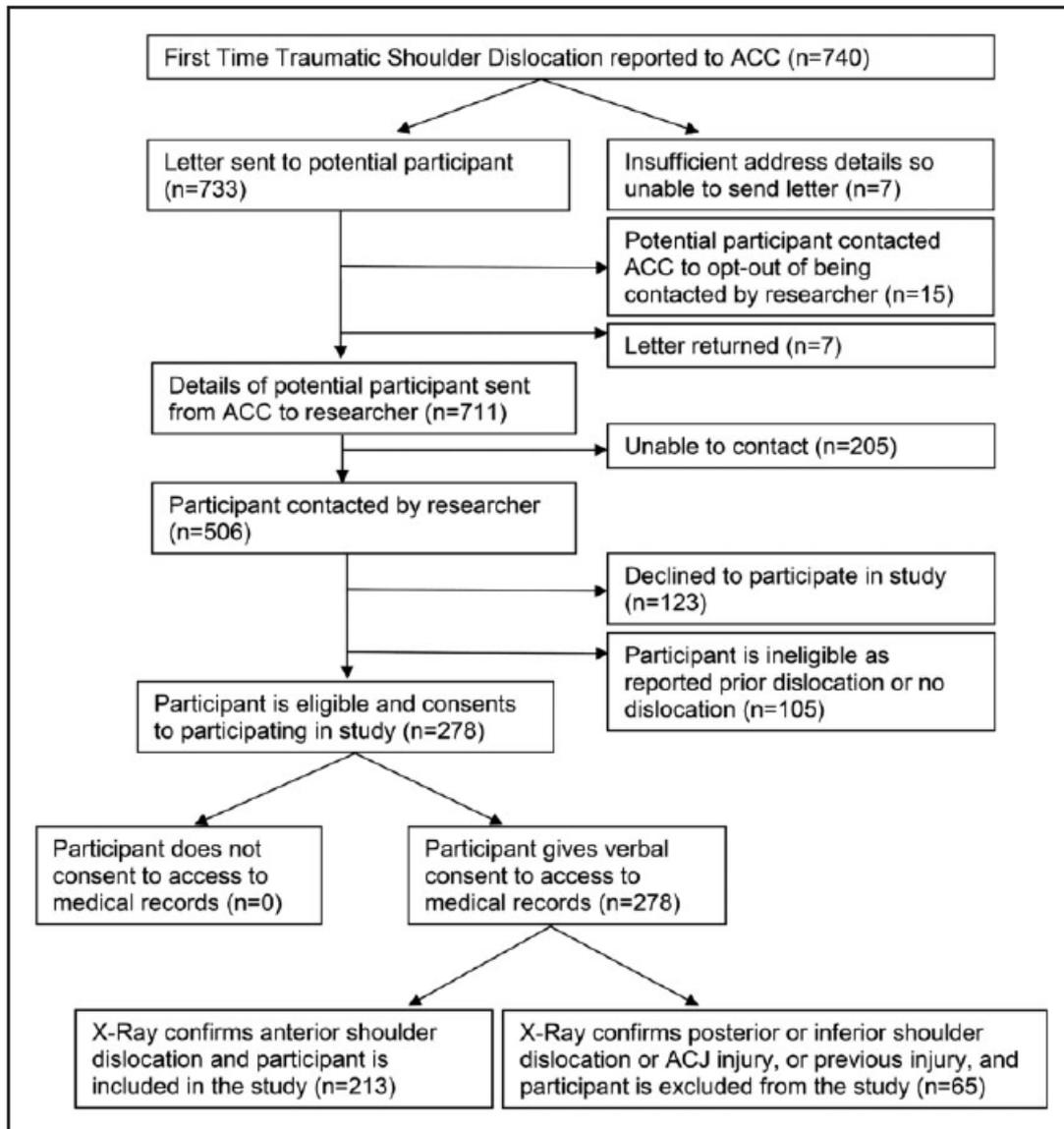


Figure 2 Percentage of recurrent and non-recurrent shoulder instability over 12 months after a FTASD

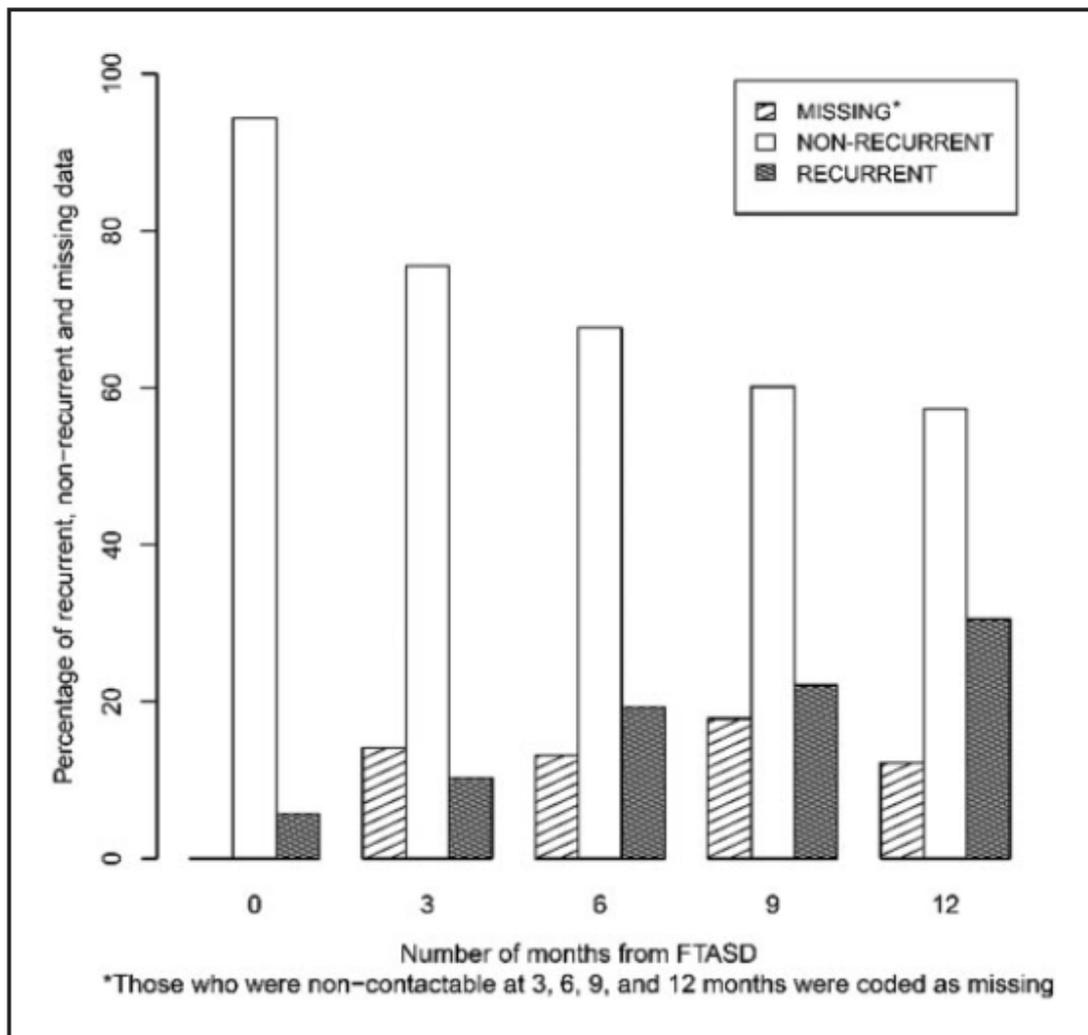


Table 1: Patient reported outcome measures within 12 weeks of a first-time traumatic anterior shoulder dislocation

Variable name	N	Overall mean (s.d.)	Range
SPADI PAIN	213	25.17 (20.91)	0-96
SPADI FUNCTION	213	18.80 (19.6)	0-93
SPADI TOTAL *	213	20.82 (19.39)	0-92
TSK-11 TOTAL	213	25.92 (4.38)	11-37
WOSI (physical)	213	362.30 (215.30)	0-880
WOSI (recreation)	213	182.40 (110.20)	0-400
WOSI (life)	213	144.80 (104.60)	0-380
WOSI (emotion)	213	154.60 (83.60)	0-300
WOSI TOTAL	213	844.20 (471.2)	0-1820

SPADI = Shoulder Pain and Disability Index (range 0-100, higher scores denote worse pain and function), TSK-11 = Tampa Scale of Kinesiophobia 11 (range 11-44, higher scores denote worse kinesiophobia), WOSI = Western Ontario Shoulder Instability Index (range 0-2100, higher scores denote worse quality of life)

Table 2 Change in patient reported outcome measures for the entire cohort over the 12 months after a FTASD compared to baseline (or pre-injury) values

	Beta Coefficient	SE	p-value
	Shoulder Activity Level (SAS)	12.26	0.35
	Pre-injury		
Time	3-months	-1.62	0.48
(reference =	6-months	-1.12	0.48
Baseline)	9-months	-0.99	0.52
	12-months	-0.88	0.48
Recurrent	Recurrent vs. Non-recurrent	-0.03	0.56
Status	Missing at 12 months vs. No	<-0.01	0.79
	Shoulder pain (SPADI Pain)	21.36	1.68
	Baseline		
Time	3-months	-4.38	1.99
(reference =	6-months	-9.27	1.95
Baseline)	9-months	-9.78	2.09
	12-months	-11.92	1.98
Recurrent	Recurrent vs. Non-recurrent	7.66	2.19
Status	Missing at 12 months vs. No	10.07	3.63
	Shoulder function (SPADI	14.78	1.80
	Function) Baseline		
Time	3-months	2.50	2.70
(reference =	6-months	-4.70	2.69
Baseline)	9-months	-7.42	2.86
	12-months	-8.80	2.58
Recurrent	Recurrent vs. Non-recurrent	8.57	2.48
Status	Missing at 12 months vs. No	11.28	3.91
	Shoulder pain and function	16.85	1.61
	(SPADI Total) Baseline		
Time	3-months	2.16	2.14
(reference =	6-months	-5.94	2.11
Baseline)	9-months	-7.96	2.25
	12-months	-9.72	2.09
Recurrent	Recurrent vs. Non-recurrent	8.00	2.12
Status	Missing at 12 months vs. No	11.82	3.49
	Kinesiophobia (TSK-11)	25.46	0.40
	Baseline		
Time	3-months	-0.59	0.55
(reference =	6-months	-0.77	0.57
Baseline)	9-months	-0.20	0.63
	12-months	-0.96	0.58
Recurrent	Recurrent vs. Non-recurrent	0.78	0.64
Status	Missing at 12 months vs. No	1.82	0.90

	Quality of life - Physical (WOSI ^u Physical) Baseline	336.30	18.22	
Time (reference = Baseline)	3-months	-64.36	20.47	0.002*
	6-months	-93.51	19.81	<0.001*
	9-months	-127.77	21.39	<0.001*
	12-months	-137.44	19.29	<0.001*
Recurrent Status	Recurrent vs. Non-recurrent	58.52	26.82	0.029*
	Missing at 12 months vs. No	43.91	39.80	0.270
	WOSI_REC Intercept	168.37	9.53	
Time (reference = Baseline)	3-months	-39.49	10.74	<0.001*
	6-months	-66.41	10.57	<0.001*
	9-months	-78.16	11.68	<0.001*
	12-months	-82.38	10.97	<0.001*
Recurrent Status	Recurrent vs. Non-recurrent	30.46	13.98	0.029*
	Missing at 12 months vs. No	35.60	20.75	0.085
	Quality of life – Life (WOSI Life) Baseline	138.52	8.45	
Time (reference = Baseline)	3-months	-32.43	9.51	0.001*
	6-months	-52.03	9.31	<0.001*
	9-months	-61.39	10.21	<0.001*
	12-months	-71.26	9.49	<0.001*
Recurrent Status	Recurrent vs. Non-recurrent	14.98	12.25	0.221
	Missing at 12 months vs. No	7.91	18.39	0.667
	Quality of life – emotion (WOSI Emotion) Baseline	143.39	6.95	
Time (reference = Baseline)	3-months	-30.00	8.88	0.001*
	6-months	-39.40	8.80	<0.001*
	9-months	-52.40	9.73	<0.001*
	12-months	-57.99	8.99	<0.001*
Recurrent Status	Recurrent vs. Non-recurrent	28.71	10.55	0.007*
	Missing at 12 months vs. No	15.28	15.34	0.319
	Quality of life (WOSI Total) Baseline	784.65	39.89	
Time (reference = Baseline)	3-months	-177.98	44.01	<0.001*
	6-months	-244.92	43.44	<0.001*
	9-months	-318.73	47.68	<0.001*
	12-months	-332.33	44.58	<0.001*
Recurrent Status	Recurrent vs. Non-recurrent	140.10	59.15	0.018*
	Missing at 12 months vs. No	99.90	86.96	0.251

SPADI = Shoulder Pain and Disability Index (range 0-100, higher scores denote worse pain and function), TSK-11 = Tampa Scale of Kinesiophobia 11 (range 11-44, higher scores denote worse kinesiophobia), SAS = Shoulder Activity Scale (range 0-20, higher score denotes increased activity level), WOSI = Western Ontario Shoulder Instability Index (range 0-2100, higher scores denote worse quality of life), * indicates significant at $p \leq 0.05$