■ CHILDREN'S ORTHOPAEDICS

Recurrent posterior shoulder instability starting in childhood and adolescence

IS IT WORTH STABILIZING SHOULDERS IN VOLUNTARY INSTABILITY BECOMING INVOLUNTARY AND UNCONTROLLABLE?

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Aims

We aimed to address the question on whether there is a place for shoulder stabilization surgery in patients who had voluntary posterior instability starting in childhood and adolescence, and later becoming involuntary and uncontrollable.

Methods

Consecutive patients who had an operation for recurrent posterior instability before the age of 18 years were studied retrospectively. All patients had failed conservative treatment for at least six months prior to surgery; and no patients had psychiatric disorders. Two groups were identified and compared: voluntary posterior instability starting in childhood which became uncontrollable and involuntary (group VBI); and involuntary posterior instability (group I). Patients were reviewed and assessed at least two years after surgery by two examiners.

Results

In all 38 patients (40 shoulders) were included: group I (20 shoulders), with involuntary posterior instability (onset at 14 years of age (SD 2.3), and group VBI (20 shoulders), with initially voluntary posterior instability (onset at 9 years of age (SD 2.6) later becoming involuntary (16 years of age (SD 3.5). Mean age at surgery was 20 years (SD 4.6 years; 12 to 35). A posterior bone block was performed in 18 patients and a posterior capsular shift in 22. The mean follow-up was 7.7 years (2 to 18). Recurrence of posterior instability was seen in nine patients, 30% in group VBI (6/20 shoulders) and 15% in group I (3/20 shoulders) ($p > 0.050$). At final follow-up, the shoulder's of two patients in each group had been revised. No differences between either group were found for functional outcomes, return to sport, subjective, and radiological results.

Conclusion

Although achieving stability in patients with so-called voluntary instability, which evolves into an involuntary condition, is difficult, shoulder stabilization may be undertaken with similar outcomes to those patients treated surgically for involuntary instability.

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Introduction

The condition of recurrent posterior shoulder instability in children and adolescents is infrequently described.[1-4] Additionally, the natural history is unclear and there is often a delay in establishing a proper diagnosis. Several factors in childhood and adolescence (such as constitutional shoulder hyperlaxity and psychiatric disorder)[5,6] are thought to be associated with a higher risk of voluntary instability. Surgery is contraindicated[1] in patients with voluntary posterior instability as defined by pain-free posterior displacements without apprehension in the absence of abnormal findings on imaging.[7]

However, some patients present initially with voluntary instability that later becomes involuntary and symptomatic.[7,8] While their posterior instability was controlled and pain-free during childhood and adolescence, they later become uncontrolled and

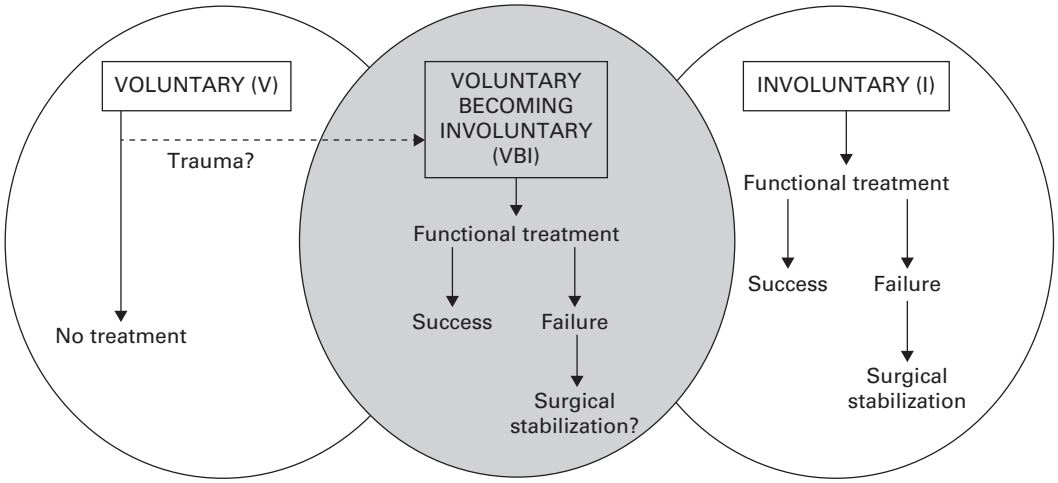

Fig. 1

Classification of recurrent posterior subluxations.

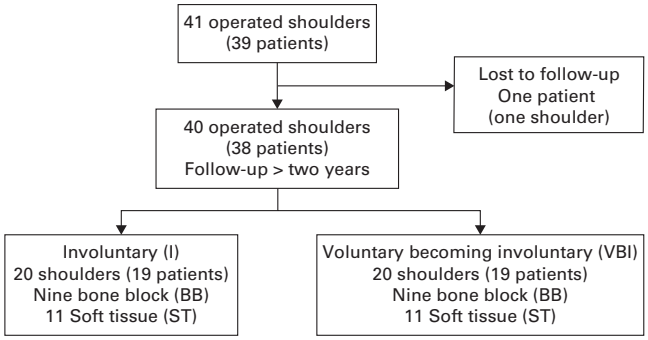

Fig. 2

Flowchart.

painful. Controlled posterior instability is defined as patients actively displacing their own shoulders, whereas a posterior displacement against the patient's own volition is defined as an uncontrolled posterior instability. Some authors have reported a higher rate of recurrence of instability after surgery in patients with voluntary posterior instability which has become involuntary.[9–11] As a result, surgical stabilization remains controversial in this population and is generally not advised. Nonetheless, the natural history of this condition is different than pure involuntary instability and these patients, after the loss of shoulder control, may be painfully disabled and may not respond to continued nonoperative management. To date, no study has reported long-term outcomes of instability initially occurring in a paediatric population.

The purpose of this long-term follow-up study was to report the functional outcomes after surgical stabilization of recurrent posterior shoulder instability starting in childhood and adolescence. The question we have addressed is whether there is a place for shoulder stabilization surgery in patients who had voluntary posterior instability starting in childhood and adolescence, but later becoming involuntary and uncontrollable.

Methods

Classification and definitions. Although there is no general agreement regarding the classification and the terminology associated with posterior instability, the senior author (PB) in this study has classified recurrent posterior instability into three categories: "voluntary" (V), "involuntary" (I), and "voluntary that became involuntary" (VBI). Voluntary posterior instability can occur in childhood and this entity should not be treated surgically as it can be associated with psychiatric disorders.[1,6] Involuntary posterior instability usually starts after an episode of trauma (an externally applied force causing displacement of the shoulder joint) and shoulder stabilization may be indicated. Between these two groups, there is a third group of patients with voluntary instability starting in childhood who later lose control of their shoulder stability.[7,8] This loss of control occurs with the arm in flexion and can be disabling at school when raising the arm, writing on a board, placing a forearm on the desk, or during sports. Voluntary shoulder instability was classified as involuntary when patients reported a posterior displacement against their own volition. These patients represent the group of patients with "voluntary posterior instability that have become involuntary". This classification is useful in clinical practice, to assist in the decision for surgical correction of posterior instability (Figure 1).

Study design. This was a retrospective comparative study, in which all patients operated on for recurrent posterior shoulder instability, before the age of 18 years, were included. All patients had undergone failed conservative treatment and rehabilitation for at least six months prior to surgery. Conservative treatment was conducted by a physiotherapist and the patients were followed up twice within six months by the referring clinician. The physiotherapy programme involved strengthening the stabilizing muscles of the rotator cuff and improving humeroscapular co-ordination.[12] Patients operated on for voluntary posterior instability starting in childhood which became uncontrollable and involuntary (group VBI) were compared with those who were operated on for involuntary posterior instability (group I). Depending on the absence or presence of bony lesions, patients were treated with either a soft

Table I. Population demographics.

Variable	Global population (n = 40)	Group I (n = 20)	Group VBI (n = 20)	p-value
Sex, n (%)				
Male	26 (65)	13 (65)	13 (65)	N/S
Female	14 (34)	7 (33)	7 (35)	N/S
Bilateral, n (%)	17 (42)	8 (40)	9 (45)	N/S
Dominant side, n (%)	26 (65)	13 (65)	13 (65)	N/S
Practice sport, n (%)	34 (85)	18 (90)	16 (80)	N/S
Type of instability, n (%)				
Subluxation	35 (88)	18 (90)	17 (85)	N/S
Subluxation + dislocation	5 (12)	2 (10)	3 (15)	N/S
Painful, n (%)	29 (72)	14 (70)	15 (75)	N/S
Trauma event, n (%)	31 (77)	17 (85)	14 (70)	N/S
MDH, n (%)	21 (52)	9 (45)	12 (60)	N/S
Mean glenoid version, ° (SD)	-9.2 (4.8)	-9.5 (4.9)	-8.9 (5.1)	N/S
Posterior labrum tear, n (%)	30 (75)	16 (80)	14 (70)	N/S
Posterior glenoid bone erosion, n (%)	23 (57)	10 (50)	13 (65)	N/S
Mean age of onset of the recurrent posterior instability (SD)	12 (3.6)	14 (2.3)	9 (2.6)	< 0.001*
Mean interval between onset of the recurrent posterior instability and surgery, yrs (SD)	8.6 (5.6)	7 (6)	10 (4.7)	0.032*
Mean age becoming involuntary, yrs (SD)	N/A	N/A	16 (3.5)	N/A
Mean interval between onset of involuntary instability and surgery, yrs (SD)	5 (5)	7 (6)	3.2 (3.5)	0.043*
Mean age at surgery, yrs (SD)	20 (4.6)	21 (4.6)	19 (4)	N/S
Bone block procedure, n (%)	18 (45)	9 (45)	9 (45)	N/S
Soft tissue procedure only, n (%)	22 (55)	11 (55)	11 (55)	N/S
Mean follow-up, yrs (SD)	7.7 (4.9)	7.2 (4.6)	8.2 (4.7)	N/S

*Mann-Whitney test.
I, involuntary; MDH, multidirectional hyperlaxity; N/A, not applicable; N/S, not significant; VBI, voluntary became involuntary.

Table II. Characteristics of recurrent posterior instability after surgery stabilization.

Variable	Global population	Group I	Group VBI
Total, n (%)	9/40 (22)	3/20 (15)	6/20 (30)
Mean delay post-surgery, yrs (SD)	1.6 (1.4)	0.8 (0.4)	1.9 (1.6)
Surgical procedure, n			
Soft tissue procedure only	5/9	1/5	4/5
Bone block porcedure	4/9	2/4	2/4
Mode, n			
Recurrent subluxation	8	3	5
Locked dislocation	1	0	1
Trauma	4/9	2/3	2/6
Revision surgery, n (%)	4/40 (10)	2/20 (10)	2/20 (10)

Differences between groups were no significant for all variables (p > 0.050).
I, involuntary; VBI, voluntary became involuntary.

tissue procedure only (posterior Bankart with capsular shift) or a posterior bone block.[13] Patients were excluded who had: voluntary posterior instability (group V); multidirectional instability (a posterior displacement associated with an anterior and/or an inferior displacement);[14] those with a previous failed stabilization; those with static posterior subluxation (index of glenohumeral subluxation greater than 55% in the supine position and with the arm in a neutral position on CT-scan);[15] those with glenoid dysplasia;[16] those with underlying connective tissue pathology; those whose medical history revealed a neurological problem (epileptic seizures, neuromuscular disorders); those who had a psychiatric disorder (i.e. a patient who had been diagnosed with a psychiatric disorder by a psychiatrist and/or was being treated with an antidepressant or anxiolytic drugs); and those operated on after the age of 35 years. Patients were reviewed and assessed for at least two years after surgery by two examiners (MBH, TL) who were not the operating surgeon. This study was approved by the Institutional Review Board (no. 2017-01) and all patients provided informed consent to participate.

Preoperative assessment. All patients were examined clinically by the operating surgeon. If there was any doubt about the onset of symptoms, the patient was excluded from the study. The clinical history, level of pain, subjective shoulder value and range of movement were recorded in all patients. Multidirectional hyperlaxity (MDH) was defined as the combination of an excessive external rotation (> 85°)[7,17] and an excessive internal rotation (> T8).[18] Each patient had a shoulder radiograph and a CT-scan before surgery. Muscle-patterning feature was assessed on CT-scan using the Goutallier classification.[19] Glenoid version was measured according to Friedman's technique.[20]

Surgical technique. All patients were operated on by the senior author (PB). In the absence of posterior glenoid bone erosion on CT-scan,[21] a posterior Bankart procedure with posteroinferior capsular shift was performed, whereas in cases with posterior bone erosion in CT-scan, we performed a posterior bone block procedure. Prior to 2002, an open approach was used, and after 2002, soft tissue or bone block procedures were performed via arthroscopy. In the arthroscopic approach the posterior bone block was fixed using suture anchors,[13] and when performed openly the fixation was with bicortical screws. The bone block procedure was always associated with a labral repair using suture-anchors and a posteroinferior capsulolabral shift. Postoperative care consisted of immobilization in a neutral rotation sling for four weeks. Passive pendulum mobilization was commenced two weeks after surgery and the patients were advised to perform these exercises for five minutes five times a day. Active physiotherapy was started one month after surgery and return to sports was allowed between three and six months following surgery.

Outcomes assessment. Clinically, we assessed the range of movement, the visual analogue pain, the Constant and Murley,[22] the Rowe,[23] the Walch and Duplay,[24] and the Western Ontario Shoulder Instability index (WOSI).[25,26] Active forward elevation and external rotation were measured using a goniometer, whereas the amount of active internal rotation was determined according to which spinous process could be reached by the

Table III. Functional outcomes, return to sports, subjective results, complications, and reoperations comparing group I and VBI at final follow-up.

Variable	Global population (n = 40)	Group I (n = 20)	Group VBI (n = 20)
Functional outcomes			
Mean VAS pain* (SD; range)	1.5 (2; 0 to 6)	1.5 (1.9; 0 to 6)	1.4 (2.2; 0 to 6)
Mean Rowe score† (SD; range)	80 (22; 30 to 100)	83 (20; 30 to 100)	76 (23; 30 to 100)
Mean Walch-Duplay score† (SD; range)	80 (22; 5 to 100)	86 (14; 55 to 100)	72 (32; 5 to 100)
Mean WOSI‡ (SD; range)	574 (458; 0 to 1,785)	608 (465; 76 to 1,785)	541 (450; 0 to 1,555)
Adjusted Constant§ (SD; range)	91 (9; 74 to 116)	90 (8; 75 to 105)	92 (10; 74 to 116)
Return to sports, %	72.5	75	70
Mean SSV sport† (SD; range)	76 (22; 0 to 100)	75 (26; 0 to 100)	77 (18; 50 to 100)
Subjective results			
Mean SSV§ (SD; range)	80 (20; 25 to 100)	78 (22; 25 to 100)	81 (19; 40 to 100)
Very satisfied or satisfied, %	73	71	76
Accept surgery again, %	81	88	75
Recommend surgery, %	91	83	100
Complications, n (%)	3 (7.5)	2 (10)	1 (5)
Reoperations, n (%)	6 (15)	3 (15)	3 (15)

Differences between groups were not significant for all variables (p > 0.050)
*Score out of 10.
†Score out of 100.
‡Score out of 2,100.
§Score out of 100%.
I, Involuntary; N/S, not significant; SSV, subjective shoulder value; VAS, visual analogue scale; VBI, voluntary became involuntary; WOSI, Western Ontario Shoulder Instability index.

thumb. The recurrence of posterior instability was defined as an episode of postoperative dislocation or any subjective subluxation. Subjective satisfaction was evaluated with the Subjective Shoulder Value (SSV)[27] and return to sports with the SSV sport. In addition, patients were asked three questions at their final review:

1. Are you very satisfied, satisfied, somewhat satisfied, disappointed, or dissatisfied with the surgery?
2. Would you choose to undergo this surgery again if you had the same symptoms?
3. Would you recommend this surgery to anyone else?

Anatomical lesions were based on preoperative CT arthrography and from the operative findings. The Samilson and Prieto classification[28] was used to evaluate the severity of pre- and postoperative osteoarthritis.

Statistical analysis. All data are expressed as mean and standard deviation (SD). Chi-squared test, Fisher's exact test, the Mann-Whitney U test, and the Wilcoxon signed rank test were used, depending on the conditions (quantitative or categorical data, data following a normal distribution or not, matched or unmatched data), to evaluate the differences in the clinical features. Using multiple logistic regression analysis (generalized linear model), the patients' relative risks of recurrent posterior instability after surgical stabilization were calculated. From this model, we calculated a predicted probability of having a recurrence of posterior instability after surgical stabilization. Statistical analysis was performed using EasyMedStat software (Neuilly-Sur-Seine, France) and by an independent expert using RStudio software.

Results

Demographic characteristics. Between 1999 and 2015, there were 41 consecutive shoulders in 39 patients with recurrent posterior shoulder instability, which had occured before the patients were 18 years of age, and who had undergone surgical reconstruction. Only one patient could not be contacted leaving 38 patients (40 shoulders) in this retrospective review (Figure 2). Surgery consisted of either soft tissue stabilization only in 22 patients (one open/21 arthroscopic) or a posterior bone block in 18 patients (three open/15 arthroscopic) using autograft (17/18) or allograft (1/18). The mean age at surgery was 20 years (SD 4.6; 12 to 35).

Epidemiological and anatomical comparison. Two groups of patients were identified and resumed in Table I. In group I (20 shoulders), whose posterior instability was involuntary, and started at the age of 14 years (SD 2.3; 7 to 17), and group VBI (20 shoulders), whose posterior instability was initially voluntary (starting at the age of 9 years (SD 2.6; 6 to 13), and later became involuntary at the age of 16 years (SD 3.5; 11 to 25). All patients were grade 0 in preoperative according to Goutallier classification.

Stability comparison. At a mean follow-up of 7.7 years (2 to 18), nine patients (22%) experienced recurrent posterior instability, five after soft tissue stabilization only and four after bone block (Table II). The risk of instability recurrence after surgery was 30% (6/20 shoulders) in group VBI and 15% (3/20 shoulders) in group I (p > 0.050). Using multivariate analysis for all recurrent instability (40 shoulders), an absence of trauma, the presence of bilateral shoulder instability and MDH led to an 88% recurrence rate (p < 0.050).

Functional outcomes. The average Rowe score (out of 100) was 80 (SD 22; 30 to 100), the Walch-Duplay (out of 100) was 80 (SD 22; 5 to 100), the WOSI (out of 2,100) was 574 (SD 458; 0 to 1,785), and the adjusted Constant (out of 100%) was 91% (SD 9%; 74 to 116) (Table III). For groups pooled, pain decreased from 4 (SD 3; 0 to 8) to 1.5 (2; 0 to 6) (p = 0.0001) without any differences between I and VBI. Table IV shows that patients lost some external and internal rotation after surgery.

Return to sport. Overall preoperatively 85% (n = 34) of the patients practiced sports; three professional, 13 competitive, and 18 recreational, while postoperatively 72.5% (n = 29) returned to sports; two professional, seven competitive, and 20 recreational with a mean SSV sport of 76% (SD 22%; 0% to 100%). Four

Table IV. Functional results comparing preoperative and final follow-up outcomes in the global series (n = 40).

Variable	Preoperative	Final follow-up	p-value
Mean active forward flexion, ° (SD)	175 (14)	177 (7)	N/S
Mean active internal rotation (vertebral level) (SD)	T4 (3)	T7 (2)	< 0.001*
Mean active external rotation, ° (SD)	80 (16)	61 (23)	< 0.001*

*Wilcoxon signed rank test.

Table V. Outcomes by procedure at final follow-up.

Variable	Soft tissue procedure only (n = 22)	Posterior bone block (n = 18)
Recurrent posterior instability, n (%)	5/22 (22)	4/18 (22)
Complication, n (%)	2/22 (9)	1/18 (5)
Mean VAS pain, (SD)	1 (2)	2 (2)
Mean SSV* (SD)	80 (20)	77 (20)
Mean SSV sport* (SD)	80 (17)	68 (29)
Satisfaction (very satisfied or satisfied), %	63	83
Mean follow-up, yrs (SD)	8 (5)	7 (5)

Differences between groups were no significant for all variables (p > 0.050).
*Score out of 100%.
SSV, subjective shoulder value; VAS, visual analogue scale.

patients stopped playing sports for a reason other than their shoulder condition, and one patient had to stop playing professional handball (Table III).

Subjective results. 73% (n = 29) were very satisfied or satisfied, 81% (n = 32) stated that they would undergo surgery again, and 91% (n = 36) would recommend surgery. For groups pooled, SSV increased from 53 (SD 17; 20 to 80) to 80 (SD 20; 25 to 100) (p = 0.0003) without differences between I and VBI (Table III).

Surgical procedures. Table V provides details of the recurrence and complication rate, functional outcomes, and subjective results following soft tissue procedure only and bone block procedures. In those patients who had soft tissue procedure only, there are no difference for recurrent posterior instability according to the approach (5/21 in arthroscopy stabilization vs 0/1 in open stabilization; p = 0.512) or number of anchors inserted (p = 0.523). In the bone block procedure, no differences were found for the approach (3/15 recurrent posterior instability in arthroscopy stabilization vs 1/3 in open stabilization; p = 0.603), mode of fixation (p = 0.615) or type of graft (p = 0.523).

Radiological results. In the 24 radiographs available at final follow-up, there was no evidence of osteoarthritis (Samilson 0) in 83% of patients (vs 93% in preoperative; p > 0.050) with no difference between the groups or surgical procedure. Four shoulders in three patients developed radiological evidence of osteoarthritis at final follow-up (9.6 years after soft tissue procedure only; 8.2, 4.7 and 2.6 years after a bone block procedure). In 18 bone block procedures, we analyzed 16 CT scans at mean follow-up of 5.1 years (SD 6.2. A complete lysis of the graft was observed in 25% of patients (4/16 shoulders; three arthroscopic/anchor-suture procedure and one open/cortical screw procedure) with two patients experiencing recurrent posterior instability.

Re-operations and complications. Four patients were re-operated on to stabilize their shoulders. The characteristics of the surgical revisions for recurrent instability are summarized in Table VI. Five shoulders in five patients (one in group I and four in the VBI group) with recurrent posterior instability in the form of subluxation only, did not undergo further surgery. The VAS pain decreased from 4.3 to 1.7 and the SSV was stable from 62% to 61% for these patients. The contraindication for revision surgery was controlled and painless instability (three in the VBI group). The other patients (one in each group) did not consider their symptoms as sufficiently disabling for reoperation. Additionally, three patients were re-operated upon because of a persistent pain after shoulder stabilization (two after soft tissue stabilization only and one after a bone block procedure). In two patients, this was related to intra-articular loose bodies which had to be removed arthroscopically (one cartilaginous fragment and one overhanging metallic anchor). In the third patient, a tenodesis for tenosynovitis of the biceps was performed. The three patients were stable and pain free at the final follow-up.

Discussion

The classification used in this study allowed us to distinguish three types of posterior instabilities. In the classification by Gerber et al,[18] types B2 and B3 suffer from unidirectional involuntary dynamic posterior instability, while patients achieving voluntary reduction were classified as type B6 and those with pure voluntary instability were grouped into type C. Recently, Moroder et al[29] have described a new classification of functional shoulder instability based on both the mechanism of the pathology and controllability. Despite these descriptions, it would seem to us that a classification that emphasizes the natural history and condition of instability (i.e. the shoulder becoming uncontrollable against the patient's volition) to be important especially when designing a succesful treatment strategy.

The first relevant finding from our study is that patients with recurrent voluntary and involuntary posterior instability starting in childhood and adolescence share similar epidemiological and anatomical characteristics. A clear history of trauma was identified as a cause of involuntary instability in 70% in VBI group (vs 85% in I group). Our hypothesis was this additional trauma tips the shoulder from one in which displacement could be actively achieved by the patient, to one in which displacement may occur whether the patient wills it or not. We consider that this trauma could cause additional damage to the structure of the shoulder joint, whether this is to the capsule, labrum or bone. particularly the glenoid rim. Several series in the literature have reported similar epidemiological findings.[4,10,11,30] The fact that the clinical picture and the anatomical lesions are similar is an argument for considering surgery in patients with voluntary instabilities which have become uncontrollable and have lead to disability.

The second pertinent finding of our study is that surgical treatment of patients with recurrent posterior instability of the shoulder, starting in childhood or adolescence, yield satisfactory clinical results. We found that at a mean follow-up of 7.7 years, stability was restored in 78% of the patients. Although the risk of recurrence after stabilization surgery in patients with voluntary instability becoming involuntary was 30% versus adapted to posterior

Table VI. Description of revision surgery for recurrent instability.

Patient (group)	Initial procedure	Characteristic of recurrence	Delay of revision surgery	Anatomical lesions and findings	Revision procedure	Stable (FFU)
1 (I)	Arthroscopic posterior bone block with autograft	Traumatic subluxations	Seven months	Posterior and inferior labrum tears	Labrum repair	Yes
2 (I)	Arthroscopic posterior bone block with allograft*	Spontaneous subluxations	One year	Total lysis bone block	Open bone block with autograft	Yes
3 (VBI)	Capsular shift	Traumatic dislocation	Five years	Locked luxation	Open bone block with autograft	No (new trauma)
4 (VBI)	Open posterior bone block with autograft	Traumatic subluxations	12 years	Anterior, inferior, and posterior labrum tears	Labrum repair and capsular shift	Yes

*Allograft from the bone bank.
FFU, final follow-up; I, involuntary; VBI, voluntary became involuntary.

instability. The adjusted Constant reflects ageing rotator cuff function, the Walch-Duplay score is derived for overhead sports activities; and the WOSI and Rowe score are more pathology related and also are particularly structured for adults. The ceiling effects of all the scores means that any differences between the groups will be lost since the outcomes between groups are almost equivalent. A specific adolescent instability score which included our classification is under consideration. For pain, the visual analogue scale (VAS) level decreased significantly (from 4.3 to 1.7) but some patients still suffered from pain. Our hypothesis was that a subtle cartilagenous changes could occur and be a source of pain (particularly in VBI) where there is no preoperative radiological features either on radiograph or CT scan. Three-quarters of VBI patients (76%) were satisfied with their results, 75% stated that they would undergo the operation again, and all said they would recommend the same surgery to others. Overall, 83% in the posterior bone block group were satisfied or very satisfied vs 63% who had soft tissue procedures only. This finding, particularly in the VBI group, could be that they suffer from pre-existing structural lesions which were very disabling, and that these patients also had a lower expectation from the surgery.

An interesting finding in our study was that the absence of trauma, bilateral posterior shoulder instability, and MDH were all risk factors for recurrence of posterior instability after surgery. When present, these factors may represent a high risk of recurrence after surgical stabilization in patients with previous voluntary posterior instability. Our results have also shown that the outcome from stabilization varies with the surgical procedure (Table II). Among five patients with recurrent posterior instability who underwent soft procedure only, four were in the VBI group compared with one in group I. In addition, more patients with VBI suffered posterior bone loss (65% vs 50%). The question then arises, does this mean that patients with VBI had more acquired posterior structural damage and should have had a posterior bone procedure rather than an isolated soft tissue procedure? The answer to this remains unresolved, especially since the mode of recurrence was subluxation. To reach a definite answer, we would have to add other factors to the analysis such as the number of anchors used or the tension of the labrum repair. Finally, the age of onset of symptoms (Table I) is another potential factor that could explain why the recurrence rate in the VBI group is twice as high as the other group. In the VBI group, symptoms appeared in childhood at nine years of age and in adolescence for group I, 14 years of age. However, the VBI group lose control of their shoulder around the age of 16 years. The question whether operating on VBI patient earlier would reduce the recurrence rate unfortunately remains unresolved.

Although the literature regarding voluntary posterior instability starting in childhood and becoming involuntary is scare,[31] our results are similar to those reported,[4,9-11] which underlines the challenge of obtaining a stable shoulder in voluntary posterior instability patients. Fuchs et al[11] found a recurrence rate of 23% in 26 voluntary and involuntary shoulder instabilities with a mean age at surgery of 24 years and a follow-up of 7.6 years. Wooten et al[4] reported the results of recurrent involuntary shoulder instability in 25 adolescents (mean age at surgery 17 years) at five years after surgery and the recurrence rate of instability was 8% after a soft tissue procedure only. We agree with Fuchs et al[11] that the ability to subluxate the shoulder voluntarily does not constitute a contraindication to operative correction if a patient is sufficiently disabled and who does not obtain improvement from nonoperative treatment. The finding of a traumatic event and the presence of anatomical lesions (posterior Bankart, glenoid erosion) on imaging are factors that reinforce the indication for surgery.

This study has certain limitations. It is a retrospective study, but considering the low incidence of the condition studied and of the surgery performed, it is difficult to conduct a prospective study. We have not found a larger study population in the literature dealing with recurrent voluntary and involuntary posterior instability starting in childhood and adolescence. In our study, the data analysis included joint hyperlaxity assessment (MDH) and not a generalized hyperlaxity score. However, all patients with antecedent connective tissue pathology were excluded from the study. Further research into the presence of inappropriate muscle activation, or the absence of appropriate muscle activation, would be helpful to understand the pathomechanism of recurrent posterior shoulder imstability. However, we were unable to evaluate muscle activation because electromyographical assessment during rapid shoulder displacements remains both controversial and unreliable.[29,32]

We have found that recurrent voluntary and involuntary posterior instability starting in childhood and adolescence, share similar epidemiological and anatomical characteristics. Although it is difficult to achieve stability in patients with voluntary instability, which evolves into involuntary, especially after trauma, shoulder stabilization may be undertaken with similar outcomes to those patients treated surgically for involuntary instability. In conclusion, there a place for shoulder stabilization surgery in patients who had voluntary posterior instability starting in childhood and adolescence, which later becomes involuntary and uncontrollable.

Take home message

- Although it is difficult to achieve stability in patients with voluntary instability, which evolves into involuntary and uncontrollable, shoulder stabilization may be undertaken with similar outcomes to those patients treated surgically for involuntary instability.

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