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Conservative management of first-time traumatic anterior shoulder dislocation

Introduction

Recurrent instability after first-time traumatic anterior shoulder dislocation is still a major concern after both conservative and operative treatment. Since Rowe reported in 1963 on recurrence rates of up to 95% in patients under the age of 20 years, these rates have not changed over time, at least if the dislocation is managed conservatively [1–8]. Young (15–30) and active male patients are still the group with both the highest incidence ($\approx 50\%$ of all dislocations) and highest risk of recurrence ($\approx 65\%$) after conservative treatment of traumatic anterior shoulder dislocation [9].

To date, there is no clear consensus on which patients should be treated conservatively. However, there is clear evidence in the literature that surgical treatment is superior to conservative treatment for anterior shoulder instability: the most recent systematic review and meta-analysis revealed that, overall, the recurrence rate is significantly lower after surgical treatment (9.7% vs. 67.4%) [8]. Moreover, the risk of secondary interventions is significantly higher after initial conservative management (5.9% vs. 46.7%). This indicates that successful surgical intervention is the most effective treatment. However, the risk of recurrence decreases with higher age and lower activity levels, indicating that there is a group of patients that may be suitable for successful conservative management. Given that the overall recurrence rate is no higher

than 50%, conservative treatment strategies will prevent unnecessary surgery in the other half of the patients [10].

Internal vs. external rotation

Immobilization in internal rotation

Since its early description by Hippocrates, the reduced shoulder was immobilized in internal rotation, fixed to the trunk, later referred to as the Gilchrist position (named after the US dermatologist Thomas C. Gilchrist). It was assumed that with the arm in adduction and internal rotation, the shoulder remains safely reduced, since it is the opposite of the abduction-external rotation position in which dislocation usually occurs. If the treatment remains conservative, immobilization in internal rotation is usually carried out for 1–3 weeks [9, 11, 12]. Longer immobilization was not able to reduce the risk of recurrence [13, 14]. However, the high recurrence rates reported in the literature relate to this method of immobilization. This is attributed to failure of the anteroinferior labroligamentous complex to heal in its anatomic insertion site at the glenoid rim. The labrum will remain in a medialized position and finally heal to the scapular neck. Therefore, the labrum loses its function as a static restraint against anterior dislocation. This indicates that the rehabilitation protocol is of great importance, since active stabilizers such as the rotator cuff and other surrounding muscles of the shoulder girdle need to compensate for the

missing stabilization by the labrum. Unfortunately, in most of the studies dealing with instability, post-immobilization rehabilitation is only poorly described [11]. More detailed rehabilitation protocols are only available for patients that underwent surgical treatment [9]. In general, rehabilitation should comprise guided physiotherapy followed by self-exercise until range of motion and strength are comparable to the healthy shoulder [15]. The risk of recurrence is not affected by physiotherapy [16].

Immobilization in external rotation

Since the first description by Itoi et al., many efforts have been made to assess the effect of external rotation immobilization and to prove its superiority over conventional immobilization in internal rotation [17]. Theoretically, external rotation leads to a reduction of the labrum to the glenoid rim by tensioning of the anterior capsule and subscapularis tendon and a subsequent shift of the joint effusion to the posterior compartment (Fig. 1).

In their primary clinical study, Itoi et al. found a recurrence rate of 26% after external rotation immobilization vs. 42% in the internal rotation group [17]. Since then, many authors have performed similar studies with differing results [5, 6, 14, 18–21]. In general, external rotation alone did not significantly reduce recurrence rates. It is worth noting that most external rotation braces are not able to maintain their specific rotation. Sullivan

Hier steht eine Anzeige.

Fig. 1 ◀ MRI after anterior dislocation shows a Bankart lesion (a). Reduction of the Bankart lesion with external rotation (b). In addition, the joint effusion shifted to the posterior compartment, allowing the torn labrum to heal

Fig. 2 ▲ Conventional external rotation brace (Ultrasling ER, DJO, Lewisville, TX, USA; a, b) in comparison to an abduction/external rotation brace (Bledsoe Arc-XR, Bledsoe brace, Pinewood, TX, USA; c, d). (Modified from [18])

et al. assessed different external rotation braces and their ability to achieve and maintain shoulder external rotation [22]. One of the most frequently used braces (Ultrasling ER 15°) only maintained 9.4° of external rotation (■ Fig. 2). However, even after immobilization in only slight external rotation, some patients did not sustain a re-dislocation. This indicates that not every type of anterior capsulolabral lesion is suitable for external rotation immobilization [23]. The initial enthusiasm for external rotation immobilization dwindled with the first randomized trials that failed to demonstrate

any advantage over internal rotation immobilization [5, 6].

However, a combination of external rotation and abduction has proved to be more effective in labral reduction, at least from a biomechanical point of view: In a cadaveric model, Miller et al. investigated the relation between arm position and the contact force between the labrum and the glenoid and found a maximum contact force in 45° abduction [24]. In contrast, no contact force at all was seen in internal rotation. In addition, Hart and Kelly found the most sufficient reduction of the labrum with a combination of 60° external rotation

and 30° abduction [25]. This considerable difference is supported by the experimental study by Itoi et al., who assessed the influence of arm position on reduction of the anterior and inferior labrum [26]. Whereas external rotation effectively reduced the anterior labrum, copation of the inferior labrum could only be achieved with abduction. Consequently, the only published randomized controlled trial (RCT), by Heidari et al., comparing immobilization in external rotation and abduction to internal rotation in 102 patients found a significantly different recurrence rate, favoring external rotation/abduction (3.9% vs. 33.3%) [27]. In a prospective-randomized multicenter trial by the German Society of Shoulder and Elbow Surgery (DVSE), immobilization in abduction/external rotation was compared to primary arthroscopic labrum repair in 102 patients with an average age of 26 years. After a follow-up of 2 years, the recurrence rate was 19.1% after immobilization vs. 2.3% after labrum repair (accepted for publication). No differences could be found for functional scores. In conclusion, the current literature supports immobilization in abduction/external rotation as the most effective approach when conservative management is indicated in younger patients.

With regard to the uncomfortable arm position, compliance with external rotation immobilization is always a major concern. Hatta et al. compared four different braces with regard to comfort and patient acceptance (1, adduction and internal rotation; 2, adduction and external rotation; 3, 30° abduction and 30° external rotation; and 4, 30° abduction and 60° external rotation) [28]. After completing immobilization for 24 h, subjects were asked to evaluate the discomfort of bracing for overall and individual activities. As expected, 60° abduction and external rotation immobilization was rated the most uncomfortable. Thus, the authors of nearly every systematic review claim that external rotation braces provide less comfort and, therefore, patient compliance will be poor [7, 10, 13, 29, 30]. However, in most of the RCTs included in these reviews, the compliance rate of patients treated with external rota-

tion braces is higher than, or at least equal to, that in the internal rotation group (■ **Table 1**). Therefore, it is of the utmost importance to explain to the patient the benefits of this uncomfortable arm position with regard to the decreased risk of recurrence and, consequently, the decreased risk for surgical interventions. Usually, 3 weeks of immobilization are recommended. Longer immobilization periods are not associated with better results [14].

External vs. internal rotation

Since the first study by Itoi et al., more RCTs have been published in the literature [5–7, 17, 19, 21, 27]. While follow-up is consistently around 24 months, the number of patients included varies considerably from 30 to 180, and power analyses are lacking in some studies. As mentioned above, the compliance rate was always high in both internal and external rotation groups. Although similar braces were used, the recurrence rate differs between the studies. Approximately half of the studies report better results and lower recurrence rates for the external rotation group, whereas the other half did not find any advantage for external over internal rotation immobilization. ■ **Table 1** provides an overview of the RCTs published on external vs. internal rotation.

Similarly, the most recent reviews on the topic come to different conclusions: while the Cochrane review by Braun and McRobert could not provide evidence that external rotation is superior, the most recent meta-analysis found that external rotation immobilization significantly reduces the recurrence rate in patients older than 20 years of age [11, 30]. Interestingly, only the latter review incorporated the most recent RCT by Murray et al., who found a lower recurrence rate for the external rotation group (29.2% vs. 47.8%) [19]. This indicates that every other RCT will considerably influence the results of subsequent systematic reviews.

Again, it must be mentioned that the only study that compared internal rotation immobilization with combined immobilization in abduction/external rotation showed the most obvious difference in the recurrence rate, favoring abduc-

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Conservative management of first-time traumatic anterior shoulder dislocation

Abstract

Traumatic anterior shoulder dislocation is a common injury in young and active patients and the proper treatment is still a matter of debate. The recurrence rate after conservative management remains high and, therefore, primary surgical intervention is sometimes recommended in very young patients whose risk of recurrences is highest. Immobilization in external rotation, first described by Itoi, is a promising conservative option as it provides adequate labral reduction and low recurrence rates. Recent meta-analyses could not unequivocally demonstrate its superiority over internal rotation immobilization. However, biomechanical and early clinical results show a better effect on reduction of the labrum

and lower recurrence rates for immobilization in a combination of abduction/external rotation than for external rotation alone. The present article aims to provide an overview of the conservative management of first-time traumatic shoulder dislocation in order to provide the treating physician or surgeon with the best current evidence as a basis for developing the appropriate treatment strategy for the patient.

Keywords

Anterior shoulder dislocation · External rotation · Recurrent instability · Internal rotation · Conservative treatment

Konservative Behandlung der traumatischen vorderen Schultererstluxation

Zusammenfassung

Die traumatische vordere Schulterluxation ist eine häufige Verletzung bei jungen und aktiven Patienten. Die optimale Behandlung bleibt strittig. Die Rezidivrate nach konservativer Behandlung ist weiterhin hoch. Daher wird bei sehr jungen Patienten, die das höchste Rezidivrisiko haben, manchmal eine primäre operative Intervention empfohlen. Die von Itoi erstbeschriebene Immobilisation in Außenrotation ist eine vielversprechende konservative Option, da sie eine ausreichende Labrumreposition bewirkt und mit geringen Rezidivraten assoziiert ist. Jedoch konnten aktuelle Metaanalysen die Überlegenheit des Verfahrens gegenüber der Immobilisation in Innenrotation nicht eindeutig belegen. Biomechanische und frühe klinische Ergebnisse

zeigen aber einen besseren Effekt bezüglich der Labrumreposition und geringere Rezidivraten bei Immobilisation mit kombinierter Abduktion und Außenrotation verglichen mit der alleinigen Außenrotation. Der vorliegende Beitrag soll die konservative Versorgung bei traumatischer Schultererstluxation zusammenfassen und dem behandelnden Arzt oder Chirurgen die beste aktuelle Evidenz bieten, damit er auf dieser Grundlage die geeignete Behandlungsstrategie für den jeweiligen Patienten entwickeln kann.

Schlüsselwörter

Vordere Schulterluxation · Außenrotation · Rezidivierende Instabilität · Innenrotation · Konservative Therapie

tion/external rotation therapy (33.3 vs. 3.9%) [27].

Return to play after conservative treatment

Again, there is no consensus on when an athlete is able to return to play after conservative management of anterior shoulder dislocation [10]. After immobilization until the athlete is free of pain, physiotherapy should be started. As a main

criterion, range of motion and strength should be nearly normal and symmetric to the healthy shoulder [9, 10]. In particular, weakness in internal and external rotation seems to have a negative predictive value [31]. Return to play may be possible within as little as 2–3 weeks. In a study focusing on return to play of National Basketball Association athletes, all athletes could return to play. The average time from injury to return to play was 7.8 weeks after conservative

Table 1 Randomized controlled trials comparing immobilization in external rotation to internal rotation

Study	Year	n ER/IR (complete follow-up)	Age ER/IR	MRI (no/yes)	Follow-up (months)	Recurrence rate ER/IR (%)	Compliance rate ER/IR (%)	Specifics
Itoi et al.	2007	85/75	35/37	No	Min. 24	26/42 ($p = 0.033$)	88/70	Relative risk reduction overall 36.2%, age group < 30 y: 46.1%
Taskoparan et al.	2010	16/17	63.6% Between 21–30 years	Yes	24	6.3/29.4 ($p = 0.05$)	n/a	Subgroup 21–30: 0 (ER) vs. 5 (IR) re-dislocations ($p = 0.035$)
Heidari et al.	2014	51/51	35/36	No	24	3.9/33.3 ($p < 0.01$)	80/94	AbER! Subgroup aged 31–40 years: 44.8% in the AdIR group vs. 3.8% in the AbER group, ($p < 0.001$)
Murray et al.	2020	24/23	26.6/27.4	No (CT)	24	29.2/47.8 ($p = 0.188$)	92/87	20–40 Years subgroup: IR 50% vs. ER 6.4%; ($p = 0.044$)
Finestone et al.	2009	27/24	20.3 Overall	n/a	33 (35.8 ER vs. 30.8 IR)	37/41.7 ($p = 0.74$)	100/100	–
Livaag et al.	2011	91/93	26.8 Overall	n/a	29.1 (29.5 ER, 28.9 IR)	30.8/24.7 ($p = 0.036$)	67.7/47.4	–
Whelan	2014	27/25	23/23	No	25 (12–43)	22/32 ($p = 0.42$)	80/80	–

ER external rotation, IR internal rotation, MRI magnetic resonance imaging, CT computed tomography, AbER abduction/external rotation, AdIR adduction/internal rotation

management vs. 19 weeks after surgery. However, athletes who underwent conservative treatment were more likely to re-dislocate earlier [32]. This is similar for National Football League athletes: the mean interval between the dislocation and return to play after conservative management was only 3 weeks (39 weeks after surgical management). The recurrence rate was significantly higher (55% vs. 26%) and the interval between the index dislocation and the first recurrence was only 2.8 weeks [33]. Additionally, there is evidence that the outcome is worse if the athlete returns to sports before 6 weeks [34].

Practical conclusion

- The recurrence rate after conservative management of first-time traumatic anterior shoulder dislocation remains high and strongly correlates to the patient's age at the time of dislocation.
- Biomechanical and imaging studies indicate that immobilization in external rotation, particularly in combination with abduction, improves coaption of both the anterior and inferior labrum to the glenoid rim.
- Some types of lesion (i.e., Perthes) seem to be more suitable for external rotation immobilization than others.

- There is no clear evidence that surgical treatment after the first recurrence leads to poorer results than after first-time dislocation.
- Therefore, conservative treatment can generally be considered.
- However, young patients, particularly < 20 years of age, are prone to failure of conservative treatment and, therefore, primary surgical intervention must be discussed in these cases.
- Currently, immobilization in abduction/external rotation seems to be the most effective approach, although further research is required.
- Short immobilization for 3 weeks should be followed by a guided rehabilitation protocol.
- Shoulder range of motion and strength should be symmetrical when compared to the uninjured side prior to return to play.

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Compliance with ethical guidelines

Conflict of interest. B. Schliemann, M. Minkus, D. Seybold and M. Scheibel declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All studies performed were in accordance with the ethical standards indicated in each case.

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