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Complex Injuries of the Shoulder – Floating Shoulder

Komplexní zranění ramenního kloubu – plovoucí rameno

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ABSTRACT

Complex injuries of the shoulder are comparatively rare. Within the field of complex shoulder injuries this article particularly deals with the diagnosis and therapy of the „floating shoulder injury“ as a review article. This term describes a discontinuation of the osseus and soft tissue suspension of the upper extremity from the axial skeleton. By literature review and involvement of recent biomechanical studies this article will show the injury patterns that lead to instability of the shoulder girdle and the therapeutic to be employed in respective cases.

Key words: shoulder, floating shoulder, clavicle fracture, scapula fracture.

INTRODUCTION

The term „complex injury“ can have different meanings. On the one hand, it is used when talking about multiple injuries of a single body region (for example a fractured collar bone in combination with a vascular lesion). On the other hand, a complex injury can involve injuries of different body regions; for example a scapular fracture in combination with an ipsilateral fracture of the collar bone, and this article deals with such injuries. These patterns result in a significant decrease in stability of the shoulder girdle since the continuity of the upper extremity suspension apparatus affected. One of the possible long term complications is inferior and medial displacement of the glenoid leading to loss of the physiologic lever arm of the rotator cuff. This situation favours development of an abduction weakness of the arm with a subacromial pathology resembling impingement syndrom (Table 1 summarizes the different complex injuries of the shoulder belt). This article particularly deals with floating shoulder injuries (Fig. 1), a term introduced in 1992 by Hersovici (7).

He described an injury often undertreated because of its association with other severe injuries that may dominate diagnostic and therapeutic efforts. Besides, the difficulty of repair may make surgeons favour a conservative approach. The floating shoulder can be devided into different types depending on localisation of the anatomic structures affected. Table 2 gives a brief summary.

Tab. 1. Complex injuries of the shoulder belt (Hempfling, 6)

1. Scapular dislocation (Type 1 with /Type 2 without fracture (De Palma, 3)
2. scapulo-thoracic dissociation (Damschen, 2)
– Type I muskulo-skeletal
– Type IIa with vascular lesion
– Type IIb with neurologic deficits
– Type III with both vascular lesion and neurologic deficits
3. Floating shoulder
4. Forequarter amputation

Tab. 2. Floating shoulder (Hempfling, 6)

1. Type I scapular fracture with AC dislocation
– Tear of the acromio-clavicular and coraco-clavicular ligaments
– Lateral clavicular fracture with tear of the coraco-clavicular ligament
– Tear of the acromio-clavicular ligament or lateral clavicular fracture with fracture of the coracoid process
2. Type II scapular fracture with medial clavicular fracture
3. Type III scapular fracture with SC dislocation
4. Type IV scapulo-thoracic dissociation

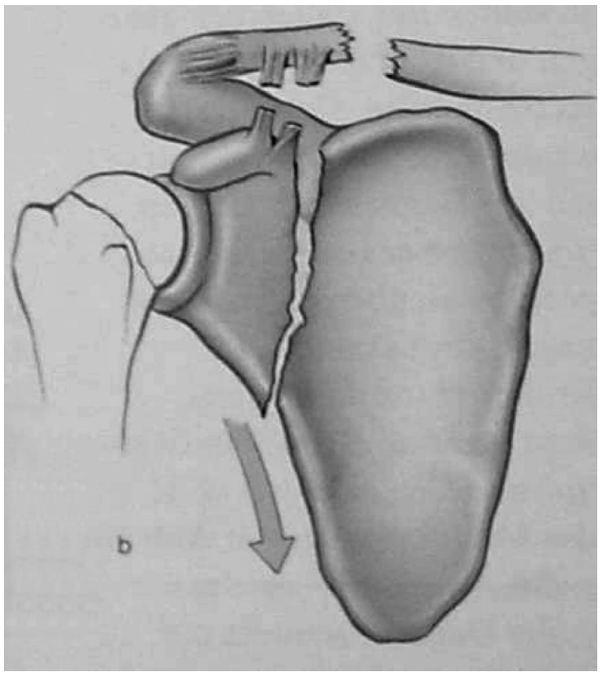


Figure 1. Schematic sketch of a floating shoulder (taken from Mutschler/Haas, 10)

Despite few published reports we attempt to derive recommendations as to diagnostic and therapeutic options; as well as, will after treatment strategies. In first describing the folating shoulder injury Hersovici (1992) (7) reported of 11 patients treated over 12 years. Highlighting the rareness of the injury, this represented 0.1 % of all trauma patients treated in the respective period. Only 9 patients were followed up as two patients died. All of the 7 patients treated with osteosynthetic plating of the clavicula had an excellent outcome, one of the patients treated conservatively showed a good, the other a bad outcome.

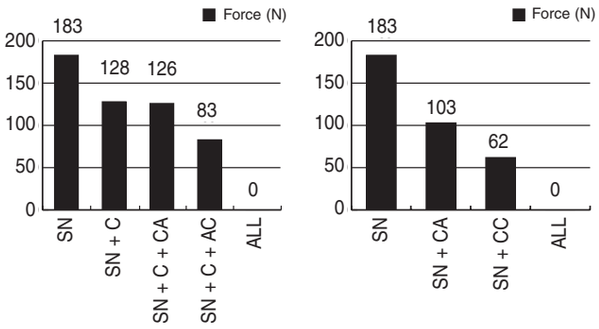
The 1993 publication from Leung (Hongkong) reported on 15 patients in a 7 year observation period. Out of these, 6 patients were polytraumatised with an average ISS of 30 (9). No ligamentary injuries of acromioclavicular- and sterno-clavicular joints were described. All the patients received operative treatment of clavicular and scapular fractures. Healing time was 7 to 8 weeks. According to Rowe¡s shoulder score 8 patients had excellent and 6 patients good outcomes with one patient¡s outcome described as satisfactory.

In 2000 Edwards reported on 20 patients treated between 1992 and 1996 (4). Dislocations of the clavicle exceeding 10 mm were seen in 11 patients. Scapular dislocations exceeding 5 mm were seen in 5 patients. All of the patients were treated conservatively. Physiotherapy was started after 3 to 14 days. One of the patients developed non-union of the clavicle following a shot injury. According to Hersivici's score 17 patients had excellent and 3 good outcomes. According to Rowe's scoring system 18 patients showed excellent, one patient good and one patient satisfactory results. Average Constant score was 96 points.

In the largest series to date, Van Noort published in 2001 the results of a multi-center trial that included 46 patients from the period between 1991 and 1996 (13). 35 of the patients were available for follow-up. 31 patients were treated conservatively in the initial phase. 28 of 31 patients finished conservative treatment, whereas 3 patients had to undergo secondary surgical treatment meaning 7 patients underwent surgical treatment. The 28 patients that received conservative treatment reached an average Constant score of 76, which is of relevant difference as compared to that described in the Edwards study. The 7 patients that received operative treatment reached a Constant score of 71 points. However, 6 of the 28 patients treated conservatively showed remaining caudal displacement of the scapula and they only reached an average Constant score of 42. The remaining 22 patients without residual displacement reached an average Constant score of 85 signifying the importance of restoring normal anatomy.

A retrospective clinical trial published by Egol in 2001 reported on 19 patients out of which 12 patients were treated conservatively whereas 7 patients received operative treatment (5). Two patients that underwent operative treatment suffered from nerve lesions, yet, no significant differences were found in follow up assessment with ASES score and SF 36.

Tab. 3



Taken from Williams et al. (14), SN = scapular neck, C = clavicle, CA = coraco-acromial ligament, AC = acromio-clavicular ligament, CC = coraco-clavicular ligament

In 2001 a biomechnical study by Williams (14) highlighted the importance of multiple bony and soft-tissue injuries on the force needed to dislocate the shoulder suspension complex. First, the stability of cadaveric specimen with isolated fracture of the scapular neck was measured. A defined dislocation was found at a force of 183 N. In this setting there were no accompanying injuries of neither the clavicle nor suspensory ligaments. When combined with a clavicular fracture, dislocation was found at a force of 128 N and a similar decrease in stability was found when an additional lesion of the coraco-acromial ligament was performed (123 N). The combination of scapular fracture, a clavicular fracture and a tear of the acromio-clavicular ligament lead to a further decrease in stability (83 N). The stability dropped to 0 N upon disruption of all structures mentioned (Table 3).

Comparatively, a fracture of the scapular neck combined with a discontinuation of the coraco-acromial ligament resulted in a remaining stability of 103 N. The combination of a scapular neck fracture and a lesion of the coraco-clavicular ligament resulted in a remaining stability of only 62 N. It remains unclear why a combination of a scapular neck fracture and an isolated tear of the coracoacromial ligament decreases stability to 103 N, but the combination of a scapular neck fracture, a clavicular fracture and a tear of the coraco-acromial ligament results in a remaining stability of 126 N. The author does not comment on these adverse findings in his article.

Nevertheless, it is clear that the mere combination of a clavicular fracture and fracture of the scapular neck does not automatically result in a floating shoulder, i.e. an unstable situation.

To summarize one can come to the conclusion that the instability of an injury has to be evaluated in the individual case. In our hospital we perform stress X-Ray examinations. These are panoramic projections of both shoulder joints with 10 kg weight loading at each wrist. Caudal dislocation of the glenoid exceeding 5 mm or a medial dislocation of more than 25 mm, in our opinion, is an indication for operative treatment. For a fracture of the scapular neck with an isolated clavicular frac-

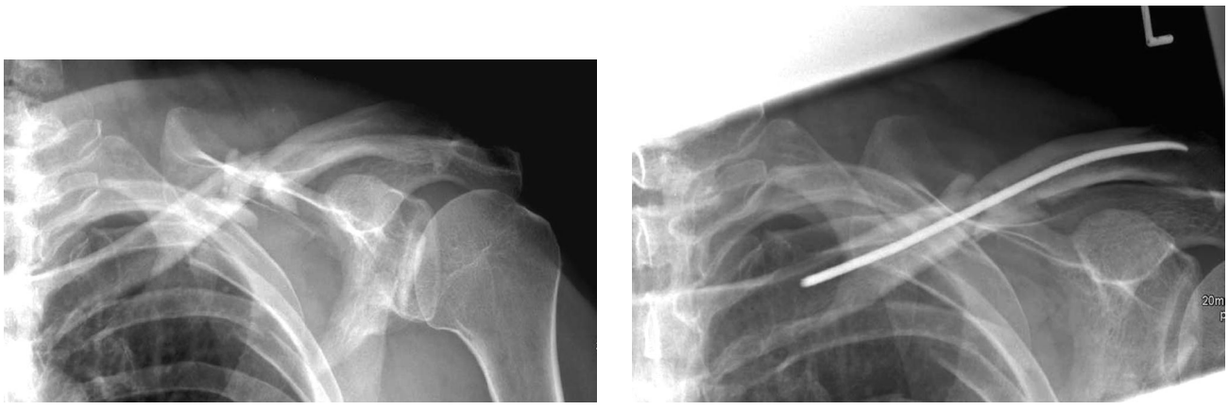


Figure 2a, b. Radiograph of a floating shoulder before (a) and after (b) operative stabilisation by Titan elastic nail (TEN)

Fig. 3. MR imaging of a shoulder: the coraco-acromial ligament is shown very clearly

ture, the stability has to be evaluated individually. Additional injury of the acromio-clavicular ligaments is an indication for operative treatment. In absence of indication for operative stabilisation of scapula or glenoid, the primary goal is stabilization of the clavicle. If possible, intramedullary implants should be favoured. In our hospital we use a Titan elastic nail (TEN) (Fig. 2). Stabilisation of the AC joint is achieved with Kirschner wires and a cerclage.

Stabilization is necessary in cases of combined scapular neck fractures and lesion of either coraco-acromal or coraco-clavicular ligament. Scapular neck fracture is operatively stabilised according to the criteria mentioned above, and the coraco-clavicular ligament tear is stabilised with a coraco-clavicular cerclage.

The relevance of the coraco-acromial ligament has not been given enough attention in the above said. In our opinion it is associated with significant diagnostic difficulties. In order to gain undoubtful diagnostic accuracy MR imaging is sometimes sufficient to show the ligaments (Fig. 3). Arthroscopic or bursoscopic examination might become necessary, if appropriate. Up to now we have not performed operative reconstruction of the coraco-acromial ligament. With stable AC-ligament it seems to us that coraco-clavicular cerclage stabilization in terms of an indirect stabilization of the CA-ligament injury can be regarded sufficient. We think that upon operative stabilization of the scapula, clavicle, and ligamentous injuries an immediate functional physiotherapy with limitation of arm abduction to 90° is possible. When treating scapular neck fractures conservatively we start passive range of motion excercises up to 90° abduction after an immobilisation period in a Gilchrist bandage of 7 to 10 days.

DISCUSSION

The current literature contains conflicting views for outcomes of floating shoulder injuries. Publications in which very good results are achieved with operative treatment exist as well as publications with comparable results in which patients were treated conservatively (1, 4, 7–9, 11–13). Unfortunately, the assessment scores used in the respective trials are not identical in all publications making comparisons possible to only a limited extent. However, the differences in results in the publications dealing with conservative treatment is striking. Edwards describes the results of his trial with an average Constant score of 96 (4), whereas the patients treated conservatively in Van Noorts trial only reached an average Constant score of 76 (13). The worse results of the patients treated operatively in Van Noorts trial (average Constant score 71) could be the result of a negative selection. Upon a more thorough examination it becomes clear that in cases of good operative results without dislocation of the fracture region the results with an average Constant score of 85 are better than those achieved with conservative treatment. Patients with insufficient operative result and remaining caudal dislocation, however, only reach an average Constant score of 42 and therewith fall back behind those receiving conservative treatment. Finally, the partially high rate of

complications has to be mentioned, e.g. 1/3 of patients in the article of Egol (5).

According to the biomechanical experiments of Williams it is to be stated that the single injury components of the shoulder belt have to be subjected to a far more subtle and differentiated analysis than the way it has been delt with in the past. – especially when it comes to the floating shoulder. Surely, an unstable situation in terms of a floating shoulder can not be derived from the mere combination of a scapular neck fracture and a clavicular shaft fracture. Ligamentous injuries seem to have a far more important role to play, with the relevance of the coraco-acromial ligament not even having been made an issue in clinical trials so far. Further clinical and experimental trials are required to prove the relevance of accompanying ligamentous injuries in defining instability of the injured shoulder and their affect on outcomes.

ZÁVĚR

Komplexní zranění ramenního kloubu se vyskytují poměrně řídce. V tomto rámci pojednává tato přehledná práce zejména o diagnostice a terapii zranění známého pod pojmem „plovoucí rameno“. Tento termín popisuje odtržení kostních a měkkotkáňových závěsných struktur od osového skeletu. Na základě přehledu literárních údajů a s použitím poznatků nejnovějších biomechanických studií, pojednává tato práce o typech zranění, která vedou k nestabilitě ramenního pletence a o terapeutických přístupech vhodných pro jednotlivé typy zranění.

Klíčová slova: ramenní kloub, plovoucí rameno, fraktura klíční kosti, fraktura lopatky.

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