

Case Presentation

Rare Findings and Simple Surgical Procedure: Secondary Impingement with Plica Syndrome in the Dominant Shoulder of a Dancer - A Case Study

Wanke EM^{1*}, Ohlendorf D², Leslie-Spinks J², Groneberg DA¹ and Pieper HG³

¹Institute of Occupational, Social- and Environmental Medicine, Goethe-University Frankfurt, Germany

²School of Performing Arts, University of Wolverhampton, United Kingdom

³Department of Shoulder and Elbow Surgery and Sports Trauma, Paracelsus Klinik, Bremen, Germany

*Corresponding author: Wanke EM, Institute of Occupational, Social and Environmental Medicine, Goethe-University Frankfurt, Germany

Received: July 18, 2017; Accepted: August 11, 2017;

Published: August 18, 2017

Abstract

An internationally successful (world champion), 32 year-old female formation dancer is presented with chronic pain in her right shoulder joint. A plica-like - locally irritating-cord-shaped in duration at the intersection region of the long biceps tendon was diagnosed. In addition, Hyperlaxity with secondary dorsocranial impingement symptoms, as well as secondary chronic subacromial overuse resulting from dance-sport-specific overuse of the right shoulder - comparable with overhead sport loads - were diagnosed. Following an in comparison to other surgical procedures technically easy arthroscopic resection of the plica-like structure, synovectomy and subacromial bursectomy, a symptom-free load-bearing capacity, and the ability to resume sports and competitive activities could rapidly be achieved through postoperative additional musculo-coordinative stabilization. This case shows that sometimes comparatively rare reasons for chronic shoulder pain exist that can be easily treated by arthroscopic surgery.

Keywords: Dance Sport; Chronic Overuse; Secondary Impingement; Plica Syndrome

Introduction

Competitive and performance-orientated Latin American formation dance sport ranks among the technical compositional types of sports. Due to its rapidly growing popularity it has evolved since the fifties to its present performance discipline with a competition system (league system) and annual national and international championships.

Despite its high degree of popularity, and a movement profile favouring injuries, there have still been few studies of the health hazards and damages in Latin American formation dance.

Each formation team consists of six to eight couples, characterized by a uniform appearance. The aim of the couples is to move in a synchronic, precise and basically symmetrical manner around the dance floor [1].

Formation-dance-specific loading

Unlike single couple dance, presentation lasts a total of 6 minutes, with 4.5min, for the main, rating-relevant, part. Particularly during the fast Latin American dances (e.g. Jive), cardiovascular stress rises to near maximal intensity, with lactate concentrations within exhaustion range [2-4].

Over and above choreographic elements (Figure 1) and dance steps which are basically identical with single couple dance, formation dance is characterized by numerous specifically rated steps of virtuosity (e.g. Lankenau-Pirouette, walked or spun round about, pot stirrer). In all these special elements, the steps are initiated and finished by the male dancer. In addition, these movements are performed unilaterally, with the right arm of the male dancer

functioning as the holding arm. This is accompanied by heavy loading of the right arm and shoulder girdle of both dance partners.

The movement patterns are characterized by a position of the arm in abduction/maximal elevation with unilateral forces acting on the shoulder region which are generated either by the dance partner or by the dancer's own body weight. These forces are mainly axial and ventro-dorsal tractive-compressive-and centrifugal forces. As these elements vary widely, both in their choreographic content and in their high degree of difficulty the effects of these forces are not fully calculable, despite intensive training and rehearsal.

Whilst the specific requirement profile in this most injury-prone discipline in dance sport [5] results in significant differences of power level, favouring the right-sided shoulder-, arm- and spine muscles, no specific laterality of injury patterns has yet been proven [6].

It cannot be ruled out that, besides certain carelessness towards one's own body, other specific factors for the benefit of a team's performance are involved. These include in particular dance couples not mutually compatible in terms of height, weight and performance level, and the internationally increasing focus on steps of extreme difficulty, and a very high training frequency (>15h/week). Furthermore, professionalization of formation dance sport - as opposed to single couple dance - is capable of still further development.

All of the aforementioned factors may favour traumatic injuries as well as inappropriate loading and overuse of the musculoskeletal system [7-10]. According to Mergenthaler [8] and Strauss [5], formation dance sport is classified as the discipline with the highest injury risk. Formation dance sport differs from single couple dance



Figure 1: Choreographic element with extreme load to the shoulder region.

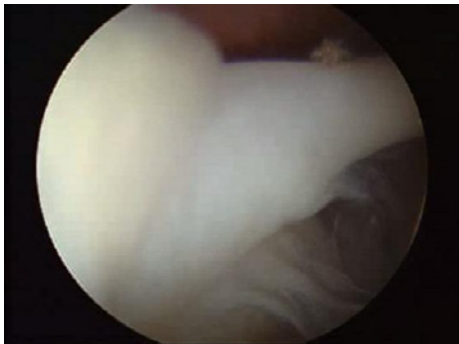


Figure 2: Shoulder arthroscopy: Shelf-like structure crossing the long head of biceps insertion.

mainly in a higher incidence of inappropriate load and overuse of the upper extremity, which heightens the significance of the following case study [8-12].

Case Presentation

Patient information

An internationally successful healthy female formation dancer (Latin American style), aged 32 years, BMI 18.5, previously active competition for 13 years, dancing practice for 20 years, and about 20 hours of practice weekly, complained of chronic pain in her right shoulder without any initial trauma depending on range of movement and amount of strain required. Symptoms of physical discomfort had initially appeared eight months earlier following extensive dance practice six times per week in addition to weekend competitions (n=15/year). These symptoms persisted despite conservative treatment including multiple cortisone injections into the subacromial space (n=3) over the last 4 months and Physiotherapy (n=18 treatments in total, 20 minutes/treatment) by her family physician without consultation of a specialist, accompanied by non-steroidal antiphlogistics up to 600mg Ibuprofen 3 times a day during stretches of competition for several weeks.

Clinical findings and diagnostic assessment

Due to persistent pain, the athlete was first presented to our orthopedic department approximately 8 months following the onset of symptoms. Clinical examination showed a general (genetically determined) hyperlaxity of capsules and ligaments in multiple joints,



Figure 3: Arthroscopic synovectomy and shelf resection by vaporization.

among them to both shoulder joints. While the left shoulder joint was found to be normal, the right shoulder exhibited positive rotator cuff impingement indications according to Neer [13,14] as well as Hawkins and Kennedy [15]. The anterior apprehension tests as well as O'Brian test were perceived as uncomfortable. Crank test and Yergason test were negative. Main local pressure pain occurred in the region of the long head of biceps tendon.

Right shoulder X-rays in 2 planes yielded normal, age-appropriate bony tissue results. Neither Ultrasound nor MRI (without arthrography) yielded any evidence of rotator cuff tear or labral lesion. Both diagnostic procedures indicated an inflammation of the subacromial bursa, and fluid around the long head of biceps tendon (so-called 'Halo').

During the pre-operative examination under anesthesia a bilateral multidirectional hyper mobility of grade 1-2 anterior and grade 1 posterior according to Tibone [16] as well as a positive sulcus sign were confirmed.

Operative intervention - intraoperative findings

Arthroscopic examination revealed that the cranio-ventral labrum presented a comparatively rare (7%) anatomical variation (sublabral hole) which was peripherally roughened up, but was not detached, either from the insertion of the long head of the biceps tendon or from the anterior glenoid rim. A cord-shape Plica-like structure barely 2cm. wide crossed the insertion of the long head of the biceps tendon and became tense during external shoulder rotation (Figure 2).

In the contact area between the biceps tendon and the undersurface of the rotator cuff at the transition from the supraspinatus to the infraspinatus tendon an inflammatory synovial reaction like a posterior superior impingement as described by Jobe [17] was found.

Surgical procedure was simple: An arthroscopic resection of the cord-shaped structure (Figure 3), a synovectomy at the undersurface of the supraspinatus and infraspinatus tendons respectively and the long head of biceps tendon, as well as a smoothing of the labrum were performed. In addition, an endoscopic subacromial bursectomy without bony decompression (flat and smooth undersurface of the acromion) was carried out, considering the bursal inflammation as secondary to instability (non-outlet impingement).

The existing hyperlaxity was not addressed surgically, because a major athletic event (world championship) in which the athlete

wanted to take part, was coming up shortly after the time of surgery.

Post-operative treatment

The surgical procedure yielded no complications. On the first post-operative day a rehabilitation protocol was started for muscular stabilisation and proprioceptive training specifically addressing the posterior muscle groups. In addition to this daily protocol, ice treatment was performed up to 4 times a day. Using this rehabilitation protocol, just a short time later a pain-free return to training units and competitions was possible and the original aim to win the World Championship in Latin-American Formation Dancing realized.

Discussion

Chronic shoulder pain has often been reported in sports medicine literature [18,19]. It is often observed in such overhead sports as handball or other types of throwing and stroke sports (e.g. throwing the javelin, baseball, tennis, volleyball) and as a result of repetitive overhead movements under load such as swimming or weight lifting. Sport-specific loading of this type is comparable in all these athletes, and gives rise to the expressions, 'Throwers' - or 'Swimmers' shoulder [20,21]. These chronic complaints are seldom precipitated by acute traumata, such as falling or opponent action, and significantly more frequently by effects of recurrent micro trauma to capsules, ligaments or tendons occurring from counter movements or acceleration processes [22]. In professional tennis, for example, speeds exceeding 230k/hr have been measured, with a world record service of 263km/hr held since 2012 by the Australian tennis professional Sam Groth. Professional handball players perform about 48,000 throwing movements annually, at an average speed of 110k/hr - in exceptional cases up to 130k/hr - with a ca. 450g ball. Although exact scientific studies on the extent of generated force to the shoulder joint in dance sport or other comparable types of sport (e.g. figure skating/ice-dancing/artistic) are still lacking it is possible to compare the sports-specific repetitive sudden load to the right shoulder joint of either dance partner of a couple with micro trauma occurring in other types of sport.

The performance of repetitive accelerated shoulder-arm-movements in abduction/external rotation such as the special elements in formation dance, affect the anterior capsule with the band-like stabilizers (glenohumeral ligaments) in particular, as well as the glenoid labrum and long biceps tendon.

In the course of time, an initially insignificant, however, subsequently gradually intensifying shoulder joint instability may occur as a result of this chronic overuse. In contrast to complete dislocations, athletes are usually not aware of this process. However, due to the head of the humerus no longer being centred in the articular cavity, this chronic overuse often results in a functional impingement syndrome of the rotator cuff beneath the acromion (secondary subacromial syndrome) [23-26] or in excessive loading of the posterior and superior labrum (postero-superior impingement, SLAP-lesion) [17,27-29].

In this case, the shoulder of a female formation dancer was unstable, resulting in an excessive strain on the postero-superior region between the undersurface of the external rotators and the insertion of the long head of biceps tendon, leading to repetitive compression and shearing strain on the shelf (plica)-like structure

running across the biceps tendon. Since in this type of sports - independent from the individual handedness of athletes - only the right shoulder joint is specifically overused, further research with higher numbers of subjects would be desirable, in order to establish a specific lateralization in Latin American formation dance.

Conclusion

In the present case, it might have been helpful to consult a specialist early on instead of relying on a family physician and somewhat unspecific physiotherapy. At that this example supports those typical and gender-specific movement elements in this sports discipline may result in acute injury or chronic damage to the upper extremity. This needs to be taken into consideration in the development of preventive measures.

In addition, there is a need for further studies to allow a more detailed analysis. Comparisons with other types of sport are hardly possible, as on the one hand no objects are thrown in formation dance, and on the other hand the loading - in contrast to gymnastics - is unilateral.

Although the patient can not be identified (Figure 1 shows a different dancer), patient consent for publication was obtained before submission of this article.

References

1. Deutscher Tanzsportverband e.V. (DTV) editor. Rahmentrainings plan (2. Aufl.) ed. Frankfurt/M: Tanzwelt. 2003.
2. Liiv H, Jurimae T, Klonova A, Cicchella A. Performance and recovery: stress profiles in professional ballroom dancers. *Med Probl Perform Art.* 2013; 28: 65-69.
3. McCabe TR, Wyon M, Ambegaonkar JP, Redding E. A bibliographic review of medicine and science research in dancesport. *Med Probl Perform Art.* 2013; 28: 70-79.
4. Wanke EM. Choreografie und Trainings in halbe. In: Wanke EM, editor. *TanzSportMedizin.* 1st ed. Köln: Sportbuch Strauß. 2011; 105-109.
5. Strauß B. Sportverletzungen und Sportschäden im Tanzsport. *Med. Hochschule Lübeck.* 1993.
6. Wanke EM, Gabrys L, Dalichau S, Wolff R. Morphologische Lateralität im lateinamerikanischen Formationstanz. 40. Deutscher Sportärztekongress, [Posterpräsentation]. Köln. 2007.
7. Berndt C, Strahler J, Kirschbaum C, Rohleder N. Lower stress system activity and higher peripheral inflammation in competitive ballroom dancers. *Biol Psychol.* 2012; 91: 357-364.
8. Mergenthaler K. Tanzen: Wenn selbst das Lächeln Stress ist. *TW Sport und Medizin.* 1992; 4: 401.
9. Strauß B, von Salis-Soglio G. Sportverletzungen und Sportschäden im Tanzsport. *Sportorthopädie- Sporttraumatologie.* 1997; 13: 173-176.
10. Wanke EM, Borchardt M, Fischer A, Groneberg DA. Injury profile in competitive senior ballroom dancers. *Sportverletz Sportschaden.* 2014; 28: 204-210.
11. Liiv H, Wyon M, Jürimäe T, Purge P, Saar M, et al. Anthropometry and somatotypes of competitive Dance Sport participants: A comparison of three different styles. *Homo.* 2014; 65: 155-160.
12. Pieper HG, Groneberg DA, Wanke EM. Chronische Schulterschmerzen bei einer lateinamerikanischen Formationstänzerin von Weltrang- eine Fallbeschreibung. *Sport Orthop. Traumatol.* 2014; 30: 33-36.
13. Neer CS 2nd. Anterior acromioplasty for the chronic impingement syndrome in the shoulder: a preliminary report. *J Bone Joint Surg Am.* 1972; 54: 41-50.

14. Neer CS 2nd. Impingement lesions. Clin Orthop Relat Res. 1983; 173: 70-77.
15. Hawkins RJ, Kennedy JC. Impingement syndrome in athletes. Am J Sports Med. 1980; 8: 151-158.
16. Tibone JE, Brewster CE. Posterior glenohumeral instability. In: Jobe FW, editor. Operative techniques in upper extremity sports injuries. St. Louis: Mosby. 1997: 273-284.
17. Jobe CM. Posterior superior glenoid impingement: expanded spectrum, Arthroscopy. 1995; 11: 530-536.
18. Kolber MJ, Corrao M, Hanney WJ. Characteristics of anterior shoulder instability and hyperlaxity in the weight-training population. J Strength Cond Res. 2013; 27: 1333-1339.
19. Siewe J, Rudat J, Rölinghoff M, Schlegel UJ, Eysel P, et al. Injuries and overuse syndromes in powerlifting. Int J Sports Med. 2011; 32: 703-711.
20. Heinlein SA, Cosgarea AJ. Biomechanical Considerations in the Competitive Swimmer's Shoulder. Sports Health. 2010; 2: 519-525.
21. O'Donnell CJ, Bowen J, Fossati J. Identifying and managing shoulder pain in competitive swimmers: how to minimize training flaws and other risks. Phys Sports med. 2005; 33: 27-35.
22. Reinold MM, Curtis AS. Micro instability of the shoulder in the overhead athlete. Int J Sports Phys Ther. 2013; 8: 601-616.
23. Kibler WB, Wilkes T, Sciascia A. Mechanics and pathomechanics in the overhead athlete. Clin Sports Med. 2013; 32: 637-651.
24. Kvitne RS, Jobe FW. The diagnosis and treatment of anterior instability in the throwing athlete. CORR. 1993; 291: 107-123.
25. Pieper HB, Quack G, Krahl H. Impingement of the rotator cuff in athletes caused by instability of the shoulder joint. Knee Surg Sports. Traumatol Arthrosc. 1993; 1: 97-99.
26. Radas C, Pieper HG, Quack G, Krahl H. Schulterengpaßsyndrom des Überkopfsportlers - primäres oder sekundäres Subakromialsyndrom? Dtsch Z Sportmed. 1997; 48: 379-384.
27. Kasten P, Kopkow C, Dixel J. Die schmerzhafte Werferschulter: evidenzbasiertes Übungsprogramm bei Scapuladyskinesie. Obere Extremität. 2013; 8: 164-169.
28. Walch G, Boileau J, Noel E, Donell ST. Impingement of the deep surface of the supraspinatus tendon on the posterior superior glenoid rim: an arthroscopic study. J Shoulder Elbow Surg. 1992; 1: 238-245.
29. Wilk KE, Macrina LC, Cain EL, Dugas JR, Andrews JR. The recognition and treatment of superior labral (slap) lesions in the overhead athlete. Int J Sports Phys Ther. 2013; 8: 579-600.