Clinical Approaches for Shoulder Injuries in Sports

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Abstract: Shoulder injuries in sports can be divided roughly into two types, sports related injuries and injuries caused by overuse. For injuries such as dislocation, fracture, and injury of the soft tissues, ordinary treatment is effective and sufficient. However, in the case of overuse, the disorders cannot be healed completely without repairing damaged organic portions, and without a functional analysis of the mechanism by which it occurred. Conventional treatments for the disorders are not always satisfactory, because the rest alleviates symptoms in some subjects, and the symptom reoccurs after the patient returns to the sport. The reason why appropriate treatment is not provided, is the lack of understanding of the disorders by athletes, the people around them, and insufficient correspondence from the medical side. Their chief complaints are mainly pain and instability of the shoulder, however, the complaints can not be evaluated and understood easily with ordinary examinations. In this paper, we will discuss the diagnostic methods and treatments for main shoulder injuries in sports, including rotator interval lesion, tendinitis of the long head of the biceps tendon, infraspinatus tendon lesion, Bennett lesion, and latissimus dorsi syndrome.

Key words: Sports injury; Joint distention; Rotator interval lesion; Latissimus dorsi syndrome

Introduction

Shoulder injuries in sports are divided roughly into types caused by injuries and by overuse. For injuries such as dislocation, fracture, or injury of the soft tissues, the treatment can be traumatologic. However, the cases due to a disorder can be healed completely only when causative pathologic changes are repaired and their recurrence is prevented after the mechanism of the occurrence is elucidated. As for treatment of the disorder, although the symptoms are alleviated by taking rest, they recur after exercising again in many cases. Thus, satisfactory results are not always obtained.

For critical disorders, although there is a pas-
sive measure that advises changes in exercise regimen, it is not easy to obtain the consent of the athletes. Even if surgical repair is actively recommended, many athletes reject it because they fear reduced abilities. The reasons why appropriate treatment is not provided are the lack of understanding of the disorder among the athletes and the people around them and inappropriate correspondence from the medical side. As a result, the prevailing notion is that they will not be able to return to their original sports activities if they undergo surgery. What is important is that physicians understand causative lesions accurately, clarify causes of the occurrence at the same time, and build a reliable relationship with the patients by providing them with adequate information.

Diagnostic Methods

The main complaints are pain and instability of the shoulder joint. However, both the complaints are obscure and cannot be understood easily. To deduce a site with a disorder, a tender point is first found (Fig. 1). Anteriorly, the rotator interval, which is prone to injury or disorder, the bicipital groove at which tendinitis of the long head of the biceps tendon is likely to occur, and the greater and lesser tubercles attaching the rotator cuff are investigated, and the joint space is examined for injuries of the glenohumeral ligaments. The posterior outer part of the humeral head is examined for the tendinitis and injury of the infraspinatus tendon. Further, the quadrilateral space where vessels pass through and the medial superior angle of the scapula in which tenderness that is specific to shoulder stiffness may be present are investigated.

It is better to understand the instability under dynamic conditions. First, the upper arm is pulled downward to investigate the downward instability. A typical positive finding is the hollow (dimple) of the deltoid muscle just inferior part of the acromion, and differential diagnosis is made between loose shoulder (multidirectional instability) and rotator interval lesion in which the hollow disappears by
maintaining the upper arm in an externally rotated position. The anteroposterior instability is investigated for the presence or absence of a spring sensation when the humeral head is compressed, or by the apprehension test in which the upper arms are elevated laterally and the humeral head is compressed posteriorly. Moreover, the instability at the upper arm in the elevated position is investigated. The Zero Position test, which investigates the presence or absence of pain that occurs when the upper arm is rotated at the maximally elevated position, is useful in identifying the presence of a rotator interval lesion or obliteration of the subscapularis bursa.\textsuperscript{1,2})

### Diagnosis and Treatment

The tendency to diagnose the injury with complex equipment in the beginning should be avoided. CT and MRI images taken under a static condition sometimes do not correspond to actual clinical findings, and false positive results are shown in many cases. The pain block test is a simple method of evaluating a site with pain when an anesthetic is infused to the site and sedated. At the same time, the addition of a small dose of steroids or drugs can have treatment effects. The recommended injection is administered one-finger breadth lateral from the coracoid process toward the subacromial bursa, but not to the bicipital groove because it causes bleeding easily.

An arthrography of the shoulder joint is primarily used as a procedure to diagnose pathologic changes in the joint. However, it can be also be an effective method that alleviates pain.\textsuperscript{3}) This method is used to reduce high intraarticular pressure by joint distension. It is based on the phenomenon that “intraarticular pressure changes according to the position of the upper extremities and it reaches the maximum at an upraised position.” In particular, the obliteration of the subscapularis bursa is found in 34% of painful shoulders, and the increase in intraarticular pressure induced by this causes severe pain. Due to this, the clinical effects of this method, where a mixture of 10 cc of contrast medium (or physiological saline solution) and 10 cc of anesthetic is infused to the joint and the obliteration of the subscapularis bursa is opened by infusion pressure or movement pressure, are valuable. The most effective motion is forced abduction and internal rotation, and pain relief and improved shoulder function can be obtained immediately after this method is conducted.

Although physical therapy is given priority in conservative treatment, it is important to evaluate pathologic conditions and confirm the treatment effects. Continuously treating patients through aimless surgery should be avoided. Postoperative rehabilitation has a similar significance to surgery.

### Shoulder Sports Disorders

Most of the shoulder disorders are due to inflammation caused by overuse or pathologic changes caused by accumulated overuse. Increasing non-specific pain was usually thought to accompany a lesion at the rotator cuff. Subsequently, as the concept of impingement came to the forefront, it was believed for a long time that all sports related pains could be explained by this concept. Recently, however, the idea that many athletes have basic instability and impingement, which is secondary to basic instability, has been gradually accepted. We have experienced that in shoulder disorders in sports, not only do many cases have pathologic changes, but the pathologic conditions are also functional disorders. Pain induced by increased intraarticular pressure and instability due to lack of centripetal force of the humeral head to the glenoid are such cases.

#### 1. Rotator interval lesion

The rotator interval is the space between the subscapularis tendon and the supraspinatus tendon (Fig. 2). It is formed by a thin, elastic, membranous tissue and its function is to make
the movement of the upper arm smooth by adjustable extension and contraction. This region directly receives the effect of changes in the intraarticular pressure caused by positional changes of the upper arm or has a structure known as the so-called safety valve. Therefore, injury occurs easily in this area when the athlete quickly returns to an internal rotation position from an excessively externally rotated position like pitching in baseball and spiking in volleyball.

The chief complaint is pain, and severe tenderness is found at the rotator interval in 99% of patients. Severe pain during motion is induced by elevation and external rotation, and this is probably because the intraarticular pressure rises to the maximum in this position and a strong stimulus of intraarticular pressure is added to the rotator interval. Regarding complaints of instability, anteroinferior instability is observed in 90% of the patients. The degree was slight, but a dimple sign is positive in the internal rotation position, disappearing in external rotation because of the fitting of the humeral head to the glenoid. There is instability in the pivotal position, and the slipping phenomenon is found at a high rate of 82%. This lesion occurs mostly in young males due to overuse of the upper arms. A definite diagnosis is made by understanding deviating findings of the rotator interval with a contrast medium on dynamic arthrograms. Because 90% of the patients are healed by conservative treatment, although it is not harmful for them to be treated as distortion or rotator inflammation, when the injury is fresh, it becomes problematic when the lesion is overlooked and left without treatment to become chronic. If a case resists conservative treatment and has persistent symptoms, it is an indication of the need for surgery.\(^5\)

2. Tendinitis of the long head of the biceps tendon

The long head of the biceps tendon is in the bicipital groove and it controls subtle movements of the humeral head. However, during the throwing motion, sudden rotary force is imposed, friction occurs at the bicipital groove, and a strong traction force is imposed on the attachment site. Moreover, because this tendon holds down the humeral head at abduction at an externally rotated position, and functions as a support mechanism of the humeral head, the shoulder with anteroposterior instability is especially subjected to a strong load.

Tendinitis of the long head of the biceps tendon occurs when an excessive force is exerted on the upper arm, and it is more likely to occur in amateur athletes who perform forced actions of throwing a ball rather than in professional athletes.

3. Infraspinatus tendon lesion

When an atrophy is present in the infraspinatus tendon, the case is diagnosed as entrapment neuropathy of the suprascapular nerve. However, rupture of the infraspinatus tendon occurs in a relatively large number of athletes. This occurs when a strong traction force acts on the upper arm during the follow-through phase of the throwing.

4. Bennett lesion

This is an osteophyte or bony spur on the glenoid described by Bennett — a characteristic changes found in throwing athletes. As for
the development mechanism, the posterior portion of the joint capsule and triceps tendon are pulled due to overuse of the upper arm, and an osteoarthritic change occurs in the attachment site. The brachial circumflex nerve causes a strange sensation and pain, and radiating pain in the deltoid is experienced at times. When pain is present, although inflammation at the concerned site is suspected, conservative treatment is sufficient.\(^5\) This disease, which is seen frequently in throwing athletes, is diagnosed based on radiographic findings. Surgical treatment may cause the instability of the shoulder to occur.

5. Latissimus dorsi syndrome

The latissimus dorsi is a muscle that originates from the 6th to the 12th thoracic vertebrae and ends in the rest of lesser tubercle. It adducts the arm posteromedially, and also participates in its internal rotation by pulling posteromedially. In the posture involving an abduction and external rotation position, such as in the throwing motion, the latissimus dorsi expands and exhibits a strong internal action power like a spring. When the latissimus dorsi contracts, abduction of the scapula and abduction and external rotation of the shoulder joint will be limited, and in consequence, the throwing motion will be hindered. However, most of the patients do not know the existence of this important muscle-tendon function. They only understand this symptom as problematic when lowering the elbow in the throwing form. Since the latissimus dorsi syndrome may be accompanied by the pathologic conditions of shoulder pain and disorder, clinicians should pay attention to the presence of this syndrome due to fatigue.

**Conclusion**

It is likely that a shoulder disorder is induced by disturbance of the other parts such as an action of the hip joint, knee joint, and ankle joint or the vertebral column. It is impossible for athletes to return to their sports activities even if the shoulder is treated sufficiently, unless they are undergoing integrated treatment. However, finding the responsible lesion by various examinations is given priority so excessively that there are only a few occasions for the mechanism of the occurrence to be analyzed. However, it is important to note that most shoulder disorders due to sports are functional disorders induced by inflammation caused by overuse or prolonged overuse.

**REFERENCES**