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Research on Shoulder Injuries in Athletes and Treatment Methods

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ABSTRACT Sports injuries have increased today due to the rise in interest towards every branch of sports. Injuries can occur in any part of the body. Sports injuries should highly be considered in terms of both the athletes' future and the medicine. This study aims to research shoulder injuries and treatment methods within the scope of upper extremity as a result of athlete injury, and accordingly to present the researchers' incidence applications. Anatomical structure of the shoulder joint and its intense usage set ground for injury. Many conservative and surgical methods exist for shoulder injuries. While some of these have become conventional (like physical therapy, and injections), some of them have become quite popular in recent years. In the researchers' clinical application for 204 athlete patients they are treated for various shoulder problems, and the methods enabled the athlete patients to return to sports in a short time through the short-range fruitful surgical applications and physiotherapy methods supported with injection. In this study, the methods used for going back to sports in a short time are explained.

INTRODUCTION

The sports injuries concept corresponds to the situations resulting from exceeding the endurance limit of the tissues as a result of the fact that the whole body or a part of the body faces a force, which is above normal limits. As it can be understood from this definition, sports injuries can be seen among people who do not perform sports (Diniz and Ketenci 2000: 377; Imren 2010: 6; Erol and Karahan 2006; Uslu 2005). The term "sports injuries" is the common name given to all kinds of injuries that occur while performing sports activities (Hasçelik 2007). These kinds of damages resulting from the physical activities in the body might emerge due to a variety of reasons.

A sports injury, a situation that occurs during the involvement in the sports,

a) Causes a reduction in the sports activity level and intensity
b) Requires medical recommendation or treatment
c) Has negative social and economic impacts (Ergen 1986: 63; Imren 2010: 6).

In addition to the injuries encountered in sports activities due to external factors or external powers, the injuries that occur related to the body itself are considered as sports injuries. These damages occur as a result of physical activities that might arise for various reasons (Sakalli 2008: 144; Imren 2010: 6).

There are various kinds of injuries with regard to sports types (Önçag et al. 1998: 122). Groh states that the probability of developing injury among people who do sports is one in 4,000, the mortality rate is one in 40,000 and the probability of experiencing a big accident is one in 40 people. Besides, it was identified that the sports branches where sports injuries mostly occur are football (10%), wrestling (6%), handball (3%), boxing (3%), athletics (1%), and skiing (0.5%). It was found that spinal cord injuries mostly occur when diving (21.6%) or skiing (13.4%). These are followed by football (12.7%), rugby (10.6%), American football (9.4%), air sports (7%), judo (6.8%) and gymnastics (6.6%), respectively (Sakalli 2008: 148). It is possible to classify sports injuries as primary injuries resulting from being exposed to sports stress directly and as secondary injuries that occur with the previous injuries (Aydin 2006: 11). Strain (injury occurring on musculotendinous structure), sprain (injury that might occur on the ligaments at different degrees), subluxation dislocation, muscle or tendon ruptures, fractures, hemarthrosis, synovitis, tendinitis and bursitis as well as overuse syndromes (the injuries that occur due to recurrent submaximal overload/friction forces) are the problems that are widely encountered.

These problems might arise out of the physical activities performed in everyday life and due to special sports activities as well (Sakalli 2008: 144).

In contact sports, tissue damage might occur by itself, and particularly in endurance sports it might arise as a combination of another mechanism. These factors facilitate the occurrence of the injuries (Aydin 2006: 11). These factors are separated in two groups as intrinsic (personal/ individual) factors and extrinsic (environmental) factors (Can 1997: 15). Intrinsic factors are the individual factors that are associated with the athlete. It accounts for forty percent of these factors. These are as follows:

1. Age, gender
2. Anatomic problems like joint restriction or loss of range of joint motion, which emerges later
3. The injuries experienced previously that are not treated properly
4. Physical impairments such as muscle weakness or muscle elasticity insufficiency resulting from the past injuries and insufficient training
5. Strength imbalance between agonist and antagonist muscles
6. Fatigue and overuse
7. Insufficient warm up and insufficient physical preparation
8. Muscle rigidities resulting from excessive exercise or infection (Uluöz 2007: 23-24).

Extrinsic (environmental) factors are as follows:

1. Training errors
2. Wrong training techniques
3. Sports-related factors
4. Areas in which sports is done
5. Equipment used
6. Climate conditions (heat, humidity, wind)
7. Trainer-Coach
8. Match management (match rules, referees) (Imren 2010:7).

The reasons for sports injuries can be listed as follows:

1. Fatigue, overuse
2. Past and not fully treated injuries
3. Muscle and joint rigidities related to cold
4. Excessive stretching and infection
5. Muscle weaknesses resulting from past injuries or lack of proper education
6. Strength imbalance between the muscles
7. Inadequacy of the sports equipment
8. Body not being fully prepared
9. Insufficient warm up
10. The fact that the sports may not be appropriate for the individual
11. Insufficient technique
12. Not being prepared psychologically
13. Excessive rivalry
14. Competitive sports and diseases (Uslu 2005 cited by Sakalli 2008).

Upper Extremity Injuries

Upper extremity injuries are very frequently seen among the athletes. While there is no precise information in Turkey with regard to this subject, it is indicated that about 1.9 to 2.5 million athletes get admitted to the emergency service due to upper extremity injuries annually in USA (Durmaz 2006: 18). If the muscles and bonds of the person doing sports are weak, the injury becomes inevitable. There are bonds, cartilage structures, muscles and tendons within the upper extremity complex. During the daily life activities and sports activities, upper extremity complex faces overload within physiological and biomechanical limits. Sports injuries emerge when the overload exceeds physiological and biomechanical limits and the upper extremity complex cannot respond.

In upper extremity regions, shoulder and acute shoulder injuries, elbow and acute elbow injuries, acromioclavicular sprains, clavicle fractures (Fig. 1), glenohumeral dislocations are frequently seen (Kocher et al. 2000; Nowak et al. 2000; Lawton et al. 2002; Nichols 1996, quoted in

Fig. 1. Direct radiographic image of a patient we treated due to clavicle fracture
Source: Author

Sakalli 2008:144). Majority of the upper extremity injuries are seen in shoulder joint. Initially, it manifests itself as shoulder dislocation. It is necessary to check whether or not there is a fracture in shoulder dislocations (Brewin et al. 2000; Yildiz and Göçgeldi 2002). Various researchers indicated that the overload on the shoulder increases ligament and muscular damage risk and causes increased pain in this region (Brüggeman 1994; Caraffa et al. 1996; Nissinen 1995 quoted in Sakalli 2008: 144-154).

Upper extremity injuries generally occur due to falling on the outstretched hand or due to direct trauma. They are most frequently seen in football, volleyball, handball, tennis, swimming and gymnastics. The injury types seen in the upper extremities can be classified as the following.

Shoulder Injuries and Treatment Methods

The problems seen in the shoulder region are problems associated with instability (shoulder dislocation, subluxation), rotator cuff lesions and tendon rupture (Fig.2).

Fig. 2. Direct radiographic image of our athlete patient with glenohumeral joint anterior luxation *Source:* Author

Subacromial Impingement Syndrome (SIS)

It is the inflammation of subdeltoid bursa, an important bursa in the shoulder. Bursitis might vary from slight inflammation to abscess formation causing excessive pain. It may develop in contact sports in relation to the insufficient muscle condition, insufficient warm up before the training and not using adequate amount of protective material that can lead to injury (Griffith 2000: 304 quoted in Imren 2010). The structures forming subacromial region, RK, are long head of biceps tendon and subacromial bursa. There is the coracoacromial arch, which consists of coracoid process, acromion and coracoacromial ligament above and humerus located below. Normally, coracoacromial arch protects humeral head and rotator cuff from direct trauma. However, these structures in the subacromial region, supraspinatus tendon in particular, can be impinged between humerus and coracoacromial arch due to structural reasons like acromial spur, degenerative acromyoclavicular joint presence or functional reasons as in migration of humeral head into superior during abduction and elevation (Fu et al. 1991: 162-173; Hawkins and Abrams 1987: 373-382; Neer 1983: 70-77; Rodgers and Crosby 1996: 127-134, quoted in Saglam 2004). In brief, subacromial impingement syndrome (SIS) occurs as a result of the impingement of the soft tissues, supraspinatus tendon and subacromial bursa between coracoacromial arch which are produced by acromion, coracoacromial ligament and coracoid process on humeral head (Ewald 2011:22 quoted in Kelle and Kozanoglu 2013). Structural and functional reasons, which narrow subacromial space, lead to SIS.

The most common symptom in SIS is pain and it is generally localized on anterior face of the shoulder. Patients generally report sharp pain. It can spread downwardly and it increases with the activities performed against the gravity in throwing movements and at night (Bayam et al. 2011: 353-358; Blevins 1997: 205-220, quoted in Kelle and Kozanoglu 2013). Patients complain about muscle spasm and sense of stiffness during shoulder movements (Poppen 1993: 1651-1671).

Radiographic examination, ultrasonography, arthrography and MRG methods are used in diagnosis. In radiography osteophytes and scleroses increase, which narrows subacromial space are found. MRG can present the changes in rotator cuff at early stages (Paynter 2004: 511-528 quoted in Kelle and Kozanoglu 2013: 59-65)

Impingement can develop primarily or secondarily. Primary impingement depends on rigid coracoacromial arch, while secondary impingement depends on the instability. Since rotator cuff degeneration is asymptomatic, early diagnosis gets harder.

As SIS syndrome becomes chronic, inflammation begins to develop in subacromial bursa. Uhtoff illustrated that bursa gets thicker secondarily compared to RK cuff irritation and it adheres on cadavers. This thickening and swelling on the bursa leads to impingement on the subacromial region, a limited space. If the process is allowed to continue, the injury in the tendon develops progressively and results in micro tears and incomplete tears. Generally, these tears become complete tears in the 5th or 6th decade of life. They participate in the pathological process on the acromyoclavicular joint in the following stages of impingement syndrome. Subacromial space is narrowed due to osteophyte formation and erosions on joint subsurface and the impingement progresses more (Saglam 2004).

Principally, conservative methods are used in the treatment of this syndrome. There are different conservative treatment approaches such as resting, activity regulation, non-steroid anti-inflammatory (NSAI) medicines, superficial hot and cold applications, deep heaters such as ultrasound and short wave, therapeutic exercises, laser and electromagnetic field treatments, subacromial steroid injection and suprascapular nerve blocks. Surgical treatment is applied in case conservative methods fail (Özturan et al. 2009: 264-267).

Arthroscopic acromioplasty is increasingly used in the impingement syndrome surgical treatment. It was reported that this surgery has advantages over open surgery in early stages. There are some studies in the literature indicating that arthroscopic surgery had advantages over open surgery in terms of short term effects like eliminating pain, hospital stay and length of return to work (Altchek et al. 1990: 1198-1207; Valenti 2006: 22-28). With regard to long-term effects, in functional evaluations no difference was found in pain, range of motion, and strength (Bezer et al. 2004: 115-119; Altchek et al. 1990:1198-1207; Özturan et al. 2009: 264-267).

Spangehl et al. (2002: 101-107) illustrated in a study in which they evaluated the two techniques that while open surgery has the same results in UCLA score and patient satisfaction with arthroscopic surgery, it yielded better results with respect to decrease in pain complaints and function. It is also reported that by some of the compilations regarding these two techniques in the literature, same results were obtained in the early and late periods (Checroun et al. 1998: 145-151; Barfield and Kuhn 2007: 64-71 quoted in Özturan et al. 2009: 264-267). Özturan et al. stated that surgery is a method that can be used safely, and arthroscopic surgery is advantageous in the evaluation of intra-articular pathologies and in terms of smaller cosmetic scar formation. However, it did not create a difference in long term results (Özturan et al. 2009: 264-267).

Rotator Cuff Tear

"Rotator cuff" tears can be seen acutely in contact sports while they are chronic damages generally seen on supraspinatus muscle (Doral, www.nuveforum.net). A solid rotator cuff is required for the proper functioning of the shoulder joint. Rotator cuff has three major effects on the shoulder. These are compressing the humeral head to glenoid, increasing contact pressure of the joint and focussing the humeral head to the glenoid center (Bassett et al. 1990: 405-415). The deltoid muscle enables the shoulder to make abduction movements by working with supraspinatus and infraspinatus (Bechtol 1980: 37-41; Chen 1994: 165-169; Cotton 1964: 314-328; Deutsch et al. 1996: 186-193 quoted in Bezer et al. 2006). At the beginning of abduction, deltoid muscle vectorial force pulls humeral head upwards. Rotator cuff applies inverse power and prevents glenoid from going up (Akpinar et al. 2003: 4-12). In case of rotator cuff tear and weakness, the humeral head slides upwards during abduction due to the fact that deltoid force is not countered (Gerber and Krushell 1991: 389-394 quoted in Bezer et al. 2006).

The vascular studies conducted illustrated that avascular area called "critical zone" located 1-2 cm proximal to the area where supraspinatus tendon is attached to tuberculum majus is prone to degeneration. Recurrent elevation and abduction of the arm creates relative hypovascularity in this region and leads to inflammation and tendinitis (Frieman et al. 1994: 604-609 quoted in Kelle and Kozanoglu 2013). Recurrent ischemic and inflammatory attacks result in rotator cuff degeneration. In degenerated rotator cuff tendinitis, blood vessels and fibroblast anomalies, glycosaminoglycan infiltration and fibrocartilaginous transformation were illustrated.

Supraspinatus, infraspinatus, teres minor and subscapularis muscles make the shoulder rotate and they are called as rotator cuff muscles since they wrap the shoulder like a waistband (Saglam

2004: 7). Rotator cuff tear is the tear and strain in the muscles and tendon groups, which surround the shoulder joint and facilitate the movement. Depending on the overload on the shoulder in sports such as swimming, basketball and tennis where movements made above the head are repetitively used, falling on the arm, or lifting a heavy object might result in the arm bone fracture. It generally manifests itself with the symptoms like weakness, sensitivity and motion loss on the shoulder, and pain in the arm and shoulder (Baltaci et al. 2003: 68; Imren 2010: 20). In subscapular tendon, pectoralis major and biceps tendons surrounding shoulder partial and complete tears might occur and therefore, surgery treatment is required for elite athletes (Doral www.nuveforum.net).

Rotator cuff tears might be complete or partial. Partial tear occurs at every age group following a trauma, and it occurs in young adults following excessive shoulder movements or falling. Acute complete tear might develop following a fall on an outstretched arm, hyperabduction injury or falling on the shoulder. In this case, on the upper shoulder, ecchymosis, abduction and in external rotation, weakness and drop arm findings are observed. When the rotator cuff falls short in stabilizing and depressing the humeral head, humeral head migrates into the superior. Rotator cuff atrophy causes degenerative changes on subacromial joint and secondarily on glenohumeral joint (Dalton 1994: 1-16).

In direct graphy, in chronic rotator cuff degeneration, osteophyte on lower front face of acromion along with potential acromyoclavicular joint arthrosis and narrowing in the subacromial space are observed. It points out to a tear of less than 6 mm. MRI is superior to arthrography in complete tears but it is less consistent and difficult to be interpreted in the evaluation of partial tears. Arthroscopy is particularly beneficial in evaluating the instability and has a role in estimating the preoperational rotator cuff tear dimensions (Dalton 1994: 1-16).

Treatment is primarily conservative. Within 4-6 weeks upon acute injury, corticosteroid injection is not recommended. Age, physical activity and severity of the trauma are of importance in treatment choice in patients with complete tear. Young and active patients with acute rupture should be operated in an early period. If the older and less active patients do not respond to the quarterly conservative treatment, subacromial decompression and primary repair are recommended. In chronicle complete tear, the basic surgical indication is persistence of the pain. In surgical approach, cuff debridement is performed (Dalton 1994: 1-16 quoted in Saglam 2004).

Bicipital Tendinitis

Biceps tendinitis might result from various reasons like repeated strain (swimming, throwing sports), multidimensional instabilities of the shoulder, tendon calcifications and direct trauma. In general, there is pain complaint on the front face of the shoulder, which worsens with movement. It also worsens after a long immobilization at night (Durmaz 2006: 21; Imren 2010).

Biceps tendon is closely related to humerus and at the same time it has also the task of attaching biceps, a very strong muscle, to the bone. The long head of the biceps can be attached intracticularly while passing through glenohumeral joint where it attaches to glenoid labrum or extraarticularly in the bicipital groove (Dalton 1994 quoted in Saglam 2004). Biceps tendinitis is characterized with anterior region pain during elbow and shoulder flexion (Mitra et al. 2011: 392). Patient use his/her hand in a way, which is attached to his/her body and holds the elbow in flexion. Patient pays great attention not to force his shoulder to make any kind of rotation movement (Bateman 1972 quoted in Saglam 2004). Abduction and internal rotation might be limited. Anterior shoulder, biceps region is painful with palpitation. After brining the elbow to flexion, the suspension test (Yerggeson-zergason) of the elbow against a resistance (Bateman 1072 quoted in Saglam 2004) is positive. In Yergason test, pain is felt in the anteromedial region of the shoulder (Barenson et al. 1996; Hollander et al. 1972 quoted in Saglam 2004). Passive shoulder extension creates pain by stressing the biceps (Saglam 2004).

Repetitive vaccine use and trauma are the major reasons. Primary biceps tendinitis is substantially rare and predominantly seen among young athletes (Paynter 2004: 511-528 quoted in Kelle and Kozanoglu 2013: 59-65). Secondary biceps tendinitis is more common and is seen among the older population. This situation is rather associated with rotator cuff pathologies (Harwood and Smith 2004: 831-855 quoted in Kelle and Kozanoglu 2013: 59-65).

In the diagnosis, special radiographic examinations help the current hypertrophic spurs and bicipital groove to be imaged. It is possible to monitor synovial fluid concentration around the tendon with arthrography. Ultrasonography (USG) helps the diagnosis (Middleton et al. 1985: 211 quoted in Kelle and Kozanoglu 2013: 59-65). It is possible to monitor the attachment point on labrum and intra-articulary part of the tendon via magnetic resonance imaging (MRI) or arthroscopy. (Campbell and Grainger 2001: 253-267 quoted in Kelle and Kozanoglu 2013: 59-65)

Bicipital lesions are separated into three general groups;

1. Biceps tendon dislocation and recurrent subluxations,
2. Biceps tendon ruptures,
3. Bicipital tendinitis or tenosynovitis (Bland et al. 1977: 2-21; Saglam 2004).

Acute rupture of transverse humeral ligaments may result in tendon dislocation or subluxation. The symptoms are similar to biceps tendinitis. However, the most specific complaint is click formation on the shoulder.

Chronic biceps tendinitis becomes thinner by growing fibrotic and even a rupture may develop. Acute rupture is seen among heavy weight lifters (Dalton 1994: 1-16; Bland et al. 1977: 2-21; Saglam 2004).

Palpable tendon absence and normal bicipital contraction loss during the resistance against suspension confirm this diagnosis. Tendon rupture is characterized with upper arm deformity seen on the lateral side of biceps in the form of a bundle, which manifests itself in the Yergason test at the highest level.

While biceps tendinitis is diagnosed frequently, it is not seen in an isolated way mostly. It occurs with wear and inflammation in the tendon with continuous friction within the intertubercular groove. In general, rotator cuff tendinitis occurs along with impingement or glenohumeral instability (Dalton 1994: 1-16; Bland et al. 1977: 2-21; Saglam 2004).

Biceps tendinitis can be treated with easy methods, which are as follows:

- Resting: The first and foremost step is resting. The activities should be restricted and the patient should stop performing sports for at least three weeks.
- Drugs: Anti-inflammatory and neuromuscular blocking drugs are used with the aim of removing edema and pain.
- Ice: Every application should be 20 minutes and it should be applied for a few times during the day. It would reduce the edema.
- Physical Therapy: Specific exercises, in particular, stretching is of significant importance. Ultrasound, ice, massage and electricity stimulation are beneficial methods.
- Local Injections: Injections like cortisone and ozone should be performed locally. Cortisone is a highly effective inflammatory drug.
- ESWT: It triggers tissue healing by increasing local blood circulation with shockwave therapy (http://www.eortopedi.com).

If non-surgical methods do not yield fruitful results, surgery can be recommended. Biceps tendon is evaluated with shoulder arthroscopy and it becomes possible to perform therapeutic intervention.

There are different surgical interventions in the current pathology of the patient:

- Primary repair: In general, if there is a tear in the bone attachment area it is treated with arthroscopy.
- Tenodesis: The attachment place of the biceps tendon that has a severe tear and advanced level of deformation is extracted and is adapted to a new point on a different and new place on the arm bone.
- Tenotomy: If it is not possible to perform tenotomy in old patients with an advanced level of tendon deformation, tendon is cut in its the attachment point to scapula and it becomes free (http://www.eortopedi.com).

Calcified Tendinitis

Calcified tendinitis is a common pathology. Lesion place is mostly close to the critical zone region of the supraspinatus muscle (Avancini-Dobrovic et al. 2011: 221-225 quoted in Kelle and Kozanoglu 2013: 59-65). In physiopatogenesis matrix accumulation is indicated in degenerated supraspinatus muscle (Ogan 2009: 2978-2984 quoted in Kelle and Kozanoglu 2013: 59-65). In symptomatic or asymptomatic shoulders, radiologically detected calcification prevalence in tendons of rotator cuff muscles is reported as 2.7-7.5 percent. 1/3 of the asymptomatic ones become symptomatic within three years (Ewald 2011: 417-422). Non-steroidal anti-inflammatory medicines (NSAII), local injections, physical treatment applications are performed and if a re-

sponse is not obtained, surgery is performed (Avancini-Dobrovic et al. 2011: 221-225 quoted in Kelle and Kozanoglu 2013: 59-65).

Acute calcified tendinitis manifests itself with sudden and very severe pain and with nearly full restriction of the active and passive shoulder movements in young and active people. Symptoms become clear when calcified masses reach 1-1.5 caliber. In general, calcium accumulations are located in supraspinatus tendon region and sometimes are localized in infraspinatus, subscapularis and teres minor regions (Bateman 1972; Hollander 1972). Calcium accumulations within these regions might not have symptoms when they are together with rotator cuff tears. Bosworth claimed that thirty-five to forty-five percent of the individuals whose radiographies showed calcification (prevalence, 7-7.5%) are asymptomatic.

In calcified tendinitis, pain is experienced mostly in humeral head and in subacromial region. The pain is so severe that the sleep is disturbed. Since all the motions of the joint are painful, they hold the patient arms in a way, which is attached to the body with solid hands (Bateman 1972; Hollander 1972). Sometimes, acute period of the pain might last 48 hours and in this period, there is swelling on the shoulder and the shoulder is hot (Bland et al. 1977: 2-21; Saglam 2004).

Acute period is finalized when the calcium accumulation is no longer pasty and becomes powder-like and is opened to the bursa cavity (Bland et al. 1977: 2-21; Saglam 2004).

Cases are separated into two as those who have acute pain and movement restriction without having any kind of shoulder symptom and those who have chronic pain without impingement syndrome (Dalton 1994: 1-16; quoted in Saglam 2004). In the graphics taken in slightly internal and external rotation of the joint, round or oval calcification is observed below the acromion and above humeral head at the same level with supraspinatus tendon in the form of a line (Bateman 1972; Hollander 1972; Katz 1977; Bland et al. 1977: 2-21; Saglam 2004).

At resorptive phase, deposit is observed in an irregular, blur and slightly intense way. Calcification can also be detected by radiology in rotator cuff degeneration and arthropathy. However, calcification is generally small with other clinical properties and is closely localized to the attachment point of tendon to the big tuberositas (Dalton 1994: 1-16; quoted in Saglam 2004).

While treatment is not required for the asymptomatic patients, conservative treatment is performed on the patients with chronicle symptoms. In acute period, sling, NSAII and local ice are used. Intra-articular corticosteroid injection should be avoided since it inhibits calcium resorption. However, some researchers support corticosteroid injection at acute phase. Deposit aspiration or arthroscopic aspiration is rarely needed (Dalton 1994: 1-16; quoted in Saglam 2004).

Shoulder Dislocation

Shoulder dislocation is the second mostly seen dislocation following the small and minor dislocation in the joints between the hand fingers (Fig. 3). Even if the shoulder dislocation, which is seen in the shoulders following the sports associated injuries seen among people between the ages groups of 20-25 years is treated properly, it can recur itself fifty-five to ninety-five percent of the time depending on the permanent damage done to the soft and bony tissue around the joint (Salci et al. 2007: 46-47).

Fig. 3. Shoulder dislocation
Source: Author

It can emerge following activities requiring throwing, lifting, hitting and spinning in sports like American football, wrestling, football or basketball in which hitting is highly probable (Griffith 2000: 308 quoted in Imren 2010). Anterior instability is the most widely seen instability. It is

very likely to recur in patients who had anterior shoulder dislocation at young ages. Therefore, treatment is necessary. In acute dislocations, early period reduction is required. In shoulder dislocations, classified as traumatic and atraumatic, atraumatic types responds well to physical therapy and conservative methods. Despite the high recurrence risks in acute dislocations, the treatment should be considered and should be determined according to the patient. In the recurrent dislocations, there is no need for immobilization that prolongs following the second dislocation. It is of importance to strengthen the rotator cuff and periscapular muscles. Acute subluxation can manifest itself in the form of a sudden and sharp pain in the external rotation called as "Phomopsis viticola" and can result in the difficulty in controlling the arm and incapability of the individuals. In posterior instabilities, subluxation is observed mostly. Most of them are atraumatic and are seen as a result of the recurrent microtraumas. They respond positively to the aggressive physical therapy. In multidimensional instabilities, the most important findings are laxity and enhanced joint volume. Athletes feel laxity and discomfort on their shoulders. In physical examination, laxity is present in all sides, but the most important component is inferior laxity and a cavity occurs in shoulder lateral when the arm is pulled below. This is called as Sulcus sign (Doral www.nuveforum.net).

The reason behind the very rarely seen bilateral anterior shoulder dislocation is generally convulsions developing in relation to the epilepsy, electrical shock, alcohol deprivation and hypoglisemy, which causes acute and excessive muscle contractions (Markel et al. 1994: 945-949; Hartney-Velazco et al. 1984: 1340-1341; Cottias et al. 2000: 95-97 quoted in Bostan et al. 2011: 247-250). Weight lifting, diving, traction injuries are other reasons (Dinopoulos et al. 1999: 128-130; Lin et al. 2007: 89-92; Maffulli et al. 1990: 254 quoted in Bostan et al. 2011: 247-250). Dislocation mechanism is the leaning of humerus on tuberculum majus acromion with forced abduction and external rotation and the formation of lever arm impact (Dinopoulos et al. 1999: 128-130; Bostan et al. 2011: 247-250).

Generally, the treatment of tuberculum majus fractures coexisting with anterior shoulder dislocation is conservative (Cottias et al. 2000: 95-97 quoted in Bostan et al. 2011: 247-250). The purpose in surgical treatment is the reduction of tuberculum majus, the prevention of posterosuperior displacement and impeding abduction, external rotation restriction by preventing the impingement syndrome formation (Neviaser 1962: 984-988; Flatow et al. 1991: 1213-1218 quoted in Bostan et al. 2011: 247-250).

Dinopoulos reported good results in cases that were treated conservatively and had 1 cm of tuberculum majus displacement following the reduction (Dinopoulos et al. 1999: 128-130; quoted in Bostan et al. 2011: 247-250). Platzer obtained very good results (86%) with conservative treatment in tuberculum majus fractures (Platzer et al. 2005: 1185-1189 quoted in Bostan et al. 2011: 247-250).

Besides, similar results were obtained in cases that had conservatively treated isolated tuberculum fractures and conservatively treated shoulder dislocations with coexistent tuberculum majus fractures (Platzer et al. 2005: 1185-1189 quoted in Bostan et al. 2011: 247-250). In a compilation by Kesmeazcar, it is reported that fairly good results were obtained with early surgery in acute anterior shoulder dislocations (Kesmezacar 2005: 40-47). However, it is of importance to evaluate each patient very well and choose the appropriate treatment by taking all the features of the patient into account (Bostan et al. 2011: 247-250). As a result, it is possible to treat these fractures and dislocations with conservative treatment by performing a detailed radiological evaluation before and after the reduction and with a delicate reduction maneuver (Bostan et al. 2011: 247-250)

Glenohumeral Joint Osteoarthritis

Glenohumeral joint osteoarthritis occurs with the damage done on the joint cartilage for any reason. It is also known as omarthrosis. Cartilage damage can occur due to excessive strain. Also, avascular necrosis, condrolisis, idiopathic focal defects, osteochondritis dissecans, trauma, surgery might have a role (Ruckstuhl 2008: 107). In physical examination, joint movement restriction, pain and crepitation are observed. Radiography is also effective in the diagnosis in addition to physical examination (Burbank et al. 2008: 453-460 quoted in Kelle and Kozanoglu 2013: 59-65).

Primary glenohumeral osteoarthritis is seen rarely, and generally glenoid cavity, and relatively less humeral head are affected. Subchondral

sclerosis and cyst formation are characterized with narrowing in joint space, osteophyte formation. Secondary degenerative joint disease develops in relation to trauma, endocrinopathies, and long-lasting rotator cuff tear. No shoulder involvement is seen in primary generalized osteoarthritis. Although radiographically clear degeneration is detected in majority of the patients, there are a few symptoms. The pain is felt in the shoulder and scapular region. In shoulder movements, especially in rotations, restriction and crepitation are detected. Passive range of joint motion also decreases. Conservative approaches such as corticosteroid injections are prioritized in the treatment. In the cases that do not respond to the treatments, there are alternatives like osteotomy, arthrodesis, and arthroplasty in surgery (Beyazova 2000) (Fig. 4).

Fig. 4. Our patient on whom the researchers performed shoulder partial arthroplasty due to glenohumeral osteoarthritis
Source: Author

Acromyoclavicular Joint (ACE) Osteoarthritis

Acromyoclavicular joint is a diarthrodial joint. There is a fibrose disc between the joint surfaces. Especially among young people, degenerative changes might take place on the cartilage tissue covering joint surface, which undergoes trauma as a result of falling and contact sports and on the middle disc. The secondary osteoarthritis or instability developing afterwards can cause distal clavicle osteolysis or bone reapportion. Acromyoclavicular joint dysfunction is widely seen among young people who are engaged in tennis, swimming or disc throwing. At older ages, degenerative changes might take place in the acromyoclavicular joint, osteophytic spurs may develop and ligaments may get thicker. Degenerative changes in the joints pave the way for inflammation on the subacromial bursa, tendinitis on the rotator cuff and tendon tears (impingement syndrome). In this process, they might result in a frozen shoulder by affecting the glenohumeral joint (Danielle et al. 1999: 251-271 quoted in Saglam 2004).

Isolated arthrosis is generally asymmetric and is most frequently seen on the right side. It could also be a part of the common osteoarthritic joint disease. When the arm is used in adduction or above the shoulder level (in complete abduction) the pressure on the joint surfaces increase and the pain emerges. The symptoms increase with age and radiological progression. In physical examination, asymmetric swelling, localized crepitation and sensitivity on the joint are detected depending on the synovitis or osteophyte. On the joint, a mass full of fluid (joint ganglion) might be observed. This formation reflects the rotator cuff pathologies. Degenerative changes like narrowing in the joint space, osteophyte formation and cystic changes in distal clavicle might be seen in the radiography (Dalton 1994 quoted in Saglam 2004). Bone scintigraphy and computed tomography are important in early and differential diagnosis. Treatment approach is generally conservative. Pain can be controlled by using NSAI medicines and physical therapy modalities. Functions can be restored with a specific range of joint motion exercises that protect the glenohumeral joint. In cases that did not give a response, surgical treatment can be performed. Clavicular distal end resection is the most frequently applied method in the appropriate cases (Craig 1994: 359; Kozin 1997: 1887-1922; Williams 1997: 97-108).

The most important injuries in the range of joint motion are traumatic sprains or dislocations (acromyoclavicular joint separation). Injury is separated into 3 in line with the deformation degrees of the joint capsule and ligaments. 1st injury is minor wear in the joint capsule without any ligamental deformation, 2nd injury is the strain of the subluxation acromioclaviular ligament in the joint with the downward position change of the acromion and partial tear in the coracoclavicular ligament, 3rd injury is complete dislocation de-

pending on the coracoclavicular ligament rupture. Distal clavicle fractures accompany these kinds of injuries. Injury generally occurs in the form of falling directly on the shoulder. Acromyoclavicular joint pain is the most common symptom depending on the chronic instability. Pain is localized on the top of the shoulder. Sensitivity and abduction restriction can be detected with palpation. Acromyoclavicular joint stress tests can reveal the symptoms. In complete joint dislocation, step deformity can be seen. Symptoms can be removed with local steroid injection and various treatment modalities. In the first and second injuries, shoulder strap and analgesic and exercise are given with the alleviation of the pain. In the third injury, improvement is generally seen within a period of 6-10 weeks. If the conservative treatment fails, patient can be considered as a surgery candidate. Stabilization failure and complications rate is high with internal fixation. However, surgical methods are applied. The persistent pain following joint injuries might result from fibrocartilage damage. Intra-articular corticosteroid injection might be applied on these patients. Distal clavicle fractures are prone not to knit or knit at a later period. Therefore, Neer recommends early surgical treatment in many cases (John 1998: 26-32 quoted in Saglam 2004).

Subacromial Bursitis

It develops secondarily to rotator cuff tendinitis. In its treatment, resting, cold application and local injections are recommended. In chronic cases, fibrotic thickening may develop in the bursa. In the case, it should be removed surgically (Gorkiewicz 1984: 46-47 quoted in Kelle and Kozanoglu 2013: 59-65).

Adhesive Capsulitis (Frozen Shoulder)

Adhesive capsulitis is a syndrome, which is still not understood totally, which starts with pain, causes restriction in all active and passive movements of the shoulder joint in all sides. It may develop primarily, while it can develop secondarily to other causes. The most important factor is immobility (Arcuri 2000: 65-66). Adhesive capsulitis is referred to as frozen shoulder, scapulohumoral periarthritis, adhesive bursitis, periarticular fibrocyte, Duplay periarthritis, and adherent obliterative bursitis in literature (Bateman 1972; Hollander 1972 quoted in Saglam 2004). Adhesive capsulitis is in the final appearance of a complex of symptoms and should be considered as a clinical appearance. It is not a pathological situation. Holding the arm in adduction for a long time due to pain, the adherences made in the broad areas where the capsule makes folds resulting in the restriction of the shoulder movement in all dimensions.

Additionally, it can develop secondarily to the factors like diabetes mellitus, hypothyroidism, myocardial infarction, acromyoclavicular and glenohumeral joint osteoarthritis. The diagnosis can be made clinically and the imaging methods could also be used (Ewald 2011: 417-422 quoted in Kelle and Kozanoglu 2013: 59-65).

Patient avoids doing all shoulder movements. Painful shoulder is the first finding. Passive joint movement had already decreased on all sides. The first restricted movement is the external rotation of the shoulder. Patients suffer from sleep disorder due to pain and they are described as the people with low pain threshold, who are anxious, who have passive aphatic irritable appearance, which is called as the periarthritic person accordingly. Immobility decreases the venous drainage and as a result, edema occurs. The edema that occurs in the hand can lead to carpal tunnel syndrome by increasing the carpal tunnel pressure (Saglam 2004: 13-26).

Various researchers, define three phases:

1. Pain Phase: Mildly painful period under development and progress (3-8 months)
2. Adhesive Phase: The period in which there is pain and restriction (4-6 months)
3. Resolution Phase: The period when the pain alleviates, but the movement is completely restricted (1-3 years)

The duration of the painful and adhesive period determine the functional loss degree. In a physical examination, severe pain at early period, restriction in the passive movement, global restriction in the active and passive movement in painful period, increase in the compensatory and scapulothoracic movement during flexion and abduction in the later periods, significant restriction in the glenohumeral movement are observed. Common atrophy might be seen in rotator cuff and trapezius muscles. Local anesthetic injection can reduce the pain, but it is not effective on the mobility (Kozin 1997; Saglam 2004: 13-26).

The objective of the treatment in the adhesive capsulitis is pain control and gaining joint

range of motion. Non-steroid anti-inflammatory medicines, analgesics, heat modalities and TENS might be administered. Passive stretching exercises are applied with the aim of removing joint capsule contracture. Codman exercises are the exercises used in gaining joint range of motion. Excessive strain of the joint during exercise is contraindicated, as it will increase inflammation response. Application of local steroid injection, capsular distension and manipulation under anesthesia are the other methods used. If a response is not obtained from the conservative treatment within a period of 12-16 weeks and if progression is detected, surgical treatment is preferred. Arthroscopic release is the most frequently applied methods in the recent years (http://www.turanuslu.net/adheziv-kapsulit-omuz-periartriti-donuk-omuz).

MATERIAL AND METHODS

Two hundred and four athletes treated by the researchers different dates due to different shoulder disorders are included in the study. Since all athletes wanted to be engaged in sports again within a short time, the researchers aimed to yield results as soon as possible. 86 out of 204 patients were patients with subacromial impingement syndrome, 25 were patients with partial rotator cuff injuries and 8 were patients with total rotator cuff injuries, 5 were patients with bicipital tendinitis, 3 were patients with calcified tendinitis, 18 out of them are patients with traumatic shoulder dislocation, 16 of them were patients with traumatic acromyoclavicular joint luxation, 4 were patients with four adhesive capsulitis, 12 were patients with proximal humeral head fractures, 2 were patients with glenoid fracture, and 16 were patients with various kinds of shoulder soft tissue injury and sprain problems.

Diagnoses of all athlete patients were made via detailed physical examination and radiological imaging methods (Fig. 5).

A recovery had been achieved within a short time with 2 weeks of physical therapy methods and with subacromial steroid injection in 64 patients out of 86 who had subacromial impingement syndrome. Recovery was achieved within 5 weeks on average, with the subacromail acromioplasty method and physical therapy methods applied later on 22 patients.

In 25 patients with supraspinatus tendon partial tear (average age is 49.8 years), recovery was achieved with local steroid injection and

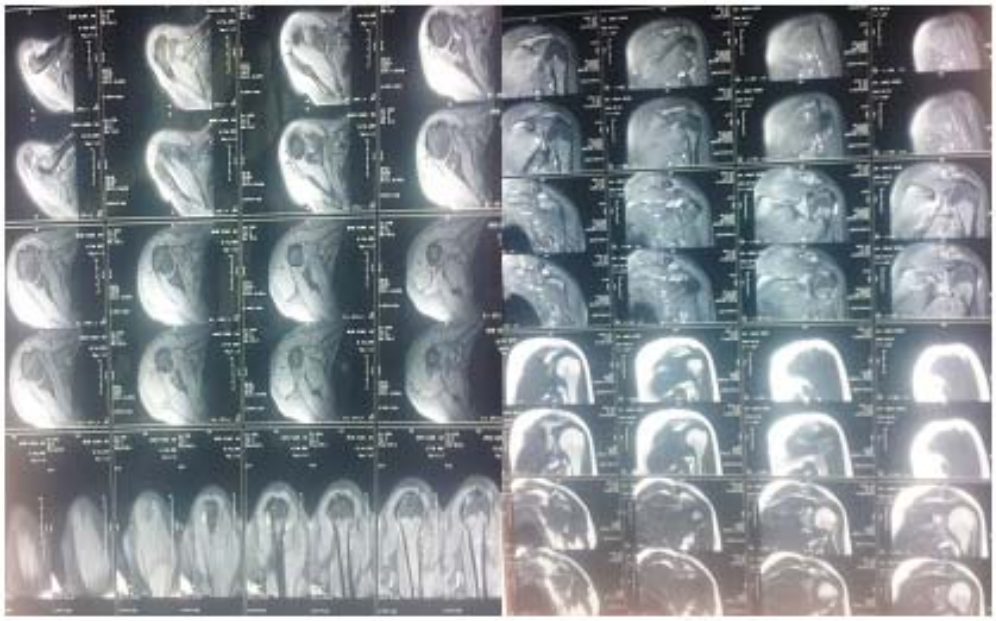

Fig. 5. MR imaging of the shoulder structures
Source: Author

physical therapy methods. An improvement was made with local steroid injection and physical therapy methods in 3 out of 8 patients with total supraspinatus tear. Surgical open supraspinatus tendon repair was performed on 5 patients. Five patients with bicipital tendinitis recovered with local steroid injection and physical therapy methods.

An improvement was observed in three patients with calcified tendinitis with local steroid injection, ESWT treatment and physical therapy methods applied.

On 18 patients with shoulder dislocation, closed reduction was applied on the glenohumeral joint following local xylocaine injection and hematoma aspiration and with the MR control performed after two weeks of evaluation, the patients were allowed to return sports actively upon confirming that they had no tissue damage.

On 16 patients with acromyoclavicular joint luxation, kirschner wire osteosynthesis was performed under percutaneous fluoroscopy and they were enabled to return sports within 2.3 months in average (Fig. 6).

Fig. 6. Direct radiographic appearance of the athlete patients on whom we applied surgical osteosynthesis due to traumatic acromyoclavicular joint luxation
Source: Author

Four patients with adhesive capsulitis were treated with local steroid injection, mobilization under anesthesia and physical therapy methods. Patients were enabled to return sports within 2.7 months in average.

Percutaneous osteosynthesis was performed on 12 patients with proximal humeral fracture under general anesthesia and they were enabled to return to sports within 3.4 months (Fig.7).

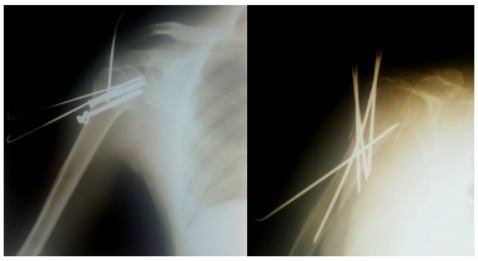

Fig. 7. Direct radiographic images of athlete patients on whom we applied proximal humeral fracture surgical osteosynthesis
Source: Author

Two athlete patients with glenoid fractures are followed and treated with conservative dressing determination (Fig. 8). These patients were enabled to return sports within 2.5 months in average.

Fig. 8. Radiographic appurtenance of athlete patients whom we treated conservatively due to glenoid fracture
Source: Author

In 16 patients, various traumatic shoulder soft tissue injuries were identified and they were treated with conservative methods and were enabled to return sports within a short time.

DISCUSSION

Lately the subject of epidemiology study has extended with the following branches. One of them is the traumaticness. The occurrence of traumata became so massive that it had become classified as one of non-infectious illnesses. It is doubtless one of most sizable problems of present sport—both in the professional version as well as unprofessional life (Yamaner et al. 2011). Due to the increase in the interest in sports, injuries and disorders associated with sports activities have increased too. In general, sports injury's name is a collective name given to the damage that occurs during sports activities (Hasçelik 2007). According to Grah, it is reported that the probability of injury among those who do sports is one in 4,000, the mortality rate is one in 40,000 and the probability of facing an accident is one in 40 people. It is reported that due to upper extremity injury, almost 1.9 to 2.5 million athletes get admitted to emergency service annually in USA (Durmaz 2006: 18). The results of Randelli study's showed autologous PRP reduced pain in the first postoperative months. The long-term results of subgroups of grade 1 and 2 tears suggest that PRP positively affected cuff rotator healing (Randelli et al. 2011).

In this study, out of 204 patients, 86 were patients suffer the subacromial impingement syndrome, 25 were patients with partial rotator cuff injury, 8 were patients with total cuff injury, 5 were patients with bicipital tendinitis, 3 were patients with calcified tendinitis, 18 were patients with traumatic shoulder dislocations, 16 werewith traumatic acromyoclavicular joint luxation, 4 were patients with adhesive capsulitis, 12 were patients with proximal humeral fracture, 2 were glenoid fracture, and 16 were patients with various soft tissue injury and sprain disorders.

A recovery had been achieved within a short time with 2 weeks of physical therapy and with subacromial steroid injection in 64 patients out of 86 who had subacromial impingement syndrome. According to 5-week healing process in patients to whom surgical method was applied, the conservative method was highly advantageous. The researchers' conservative application had yielded coherent results with literature (Roddy 2014; Khan 2013)

In 25 patients with supraspinatus tendon partial tear, recovery was achieved with local steroid injection and physical therapy methods. The researchers recommend this healing practice, which is in parallel to literature (Tilley 2014).

A one hundred percent success rate is obtained in patients with bicipital tendinitis with local steroid injection and physical therapy methods is significant, it must be preferred as the primary treatment (Churgay 2009).

An improvement was made in three patients with calcified tendinitis with local steroid injection, ESWT treatment and physical therapy methods applied, the results obtained and those in literature are very meaningful (Suzuki 2014).

On 18 patients with shoulder dislocation, closed reduction was easily applied without causing trauma on the glenohumeral joint following local xylocaine injection and hematoma aspiration, the researchers recommend it as in literature studies (Aronson 2014).

On 16 patients with acromyoclavicular joint luxation, kirschner wire osteosynthesis was performed under percutaneous fluoroscopy and they were enabled to return sports within 2.3 months in average. Its advantage is that it does not have serious complications in comparison to many other practices in literature (Chen 2014; Cook 2014).

Four patients with adhesive capsulitis were treated with local steroid injection, mobilization under anesthesia and physical therapy methods. Patients were enabled to return sports within 2.7 months on average. The result process of the application shows parallelism with literature (Chen 2014; Guyver 2014).

For athletes, returning to sports within a short time is of significance. In the clinical applications, the researchers applied important conservative methods for helping the athlete patients return to sports in a short time, but they obtained good results with the percutaneous methods they applied without performing surgery in chronicle cases and in traumas with certain indications in which they could not yield results.

The low number of cases for some specific diseases in the study is a disadvantage. Conducting studies with higher number of cases and comparing the studies for various age groups with different treatment modalities would be beneficial.

CONCLUSION

Today, the number of the sports activities has increased and resultantly, the injuries associated with sports also have increases. As return-

ing to sports within a short time is of importance, the methods offering treatments for these disorders in a short time are significant.

In this study, when 204 athletes became sick, conservative methods were combined with physical therapy applications in cases with no certain surgical indications, and in fracture cases for which surgery is required, good results were obtained with percutaneous osteosynthesis.

NOTE

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