

## Therapeutic Aspects of Shoulder Joint Impingement Syndrome

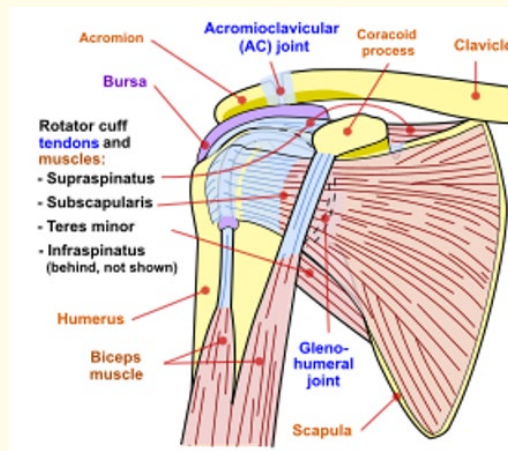
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Pain in the shoulder joint associated with damage to the periarticular tissues is one of the most common complaints among the adult population. The prevalence of this pathology is clearly related to age, from 3 - 4% in people aged 40 - 44 years to 15 - 20% in people 60 - 70 years old. Most cases of shoulder pain are associated with pathology of the periarticular rotator cuff, which was first described by Monroe in 1788. Impingement syndrome (hereinafter referred to as IS) of the shoulder joint or humeral head impingement syndrome is a disease that includes tendinitis of the rotator cuff muscles at the point where they pass through the subacromial space. Along with inflammation of the rotator cuff tendons, supraspinatus tendonitis occurs [1], which is often associated with IS. This can lead to pain, weakness, and loss of motion in the shoulder joint. The anatomy of the shoulder joint predisposes to the development of this potential pathology due to the low degree of congruence of the articular surfaces of the head and shoulder and the glenoid cavity of the scapula. There are no structural mechanisms that strengthen the joint; there is a high density of mutual topographic position of anatomical structures of different nature in the area close to the joint (lymph nodes, soft tissues, vessels and nerves). Often there is a combination of different variants of IS, which is also due to the high degree of instability of the periarticular tissues. The pathogenesis of the disease is explained by acute or chronic impingement (compression) of tissue between the rotator cuff and the coraco-acromial arch. With IS, damage simultaneously occurs to the subacromial bursa of the greater tubercle of the shoulder, sometimes to the biceps tendon, acromioclavicular joint, and surrounding vessels and nerves. The acromion process of the scapula should be considered one of the main anatomical structures that provoke the syndrome (Figure 1).



**Figure 1:** Compression of the rotator muscle between the acromion and the head of the humerus.

There are anatomical, regional and systemic predictors of this disease [2]. An anatomical predictor can often be the particular hook-shaped shape of the acromion process, which most contributes to injury to the rotator cuff tendons. Other possible predictors predisposing to the onset and manifestation of IS symptoms include endogenous (weakness of the muscles of the upper shoulder girdle, acute or chronic overload of the joint, degenerative changes in the rotator cuff) and exogenous (instability in the shoulder joint, osteoarthritis of the acromioclavicular joint, impingement coracoacromial ligament, impingement of the coracoid process of the scapula). The etiological role in the occurrence of pathology of the shoulder joint is played by regular unusual work and everyday postures, such as professional movements with a constant load on one arm, regular force load on one half of the body, sleep with the arm thrown back or fixed, household and sports injuries with a fall on a straight arm and other factors. Historically, inflammatory changes in soft tissues in the area of the shoulder joint were designated by the collective concept of “scapulohumeral periarteritis” [3]. This nosological form included pathology of the capsule of the shoulder joint (adhesive capsulitis or “frozen shoulder”), pathology of the tendons of the rotator cuff and long head of the biceps, as well as inflammation of the subacromial bursa. The introduction of the 10<sup>th</sup> revision of the International Classification of Diseases led to the need to change terminology. Therefore, several headings are currently used to designate disorders that were previously combined into a single undifferentiated concept of “humeral-scapular periarteritis”:

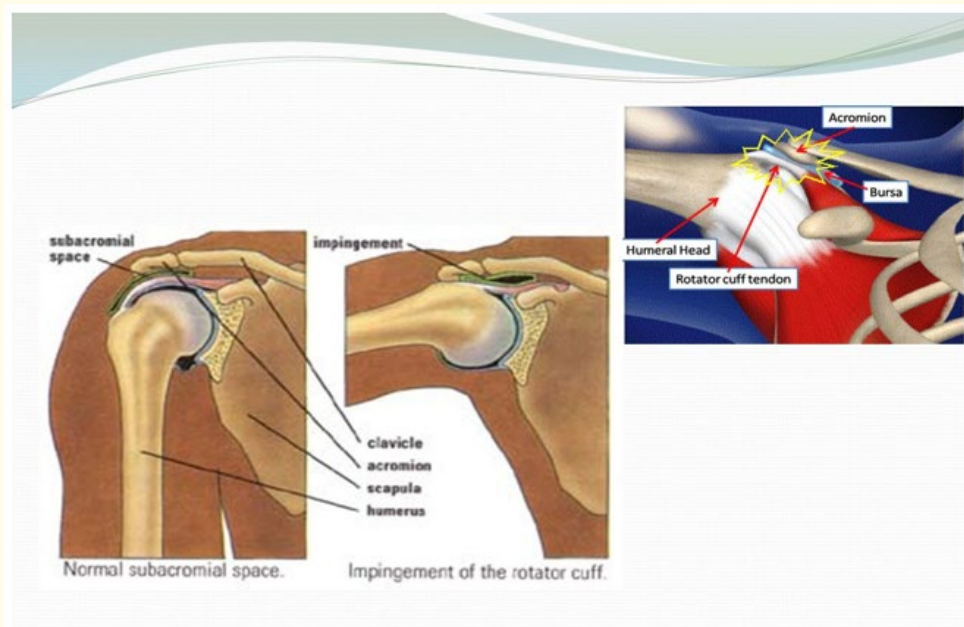
- M75 Shoulder lesions;
- M75.0 Adhesive capsulitis of the shoulder;
- M75.1 Rotator cuff syndrome;
- M75.2 Biceps tendinitis;
- M75.3 Calcific tendinitis of the shoulder;
- M75.4 Impingement syndrome of the shoulder;
- M75.5 Shoulder bursitis;
- M75.8 Other lesions of the shoulder;
- M75.9 Lesion of the shoulder, unspecified.

The clinical picture of the disease is determined by damage to the soft tissues of the joint due to pinching between bone structures for the following reasons:

- a) Narrowing of the interarticular space;
- b) An increase in the volume of the soft tissues themselves;
- c) Acute or chronic trauma to blood vessels and nerve trunks.

The disease develops acutely or unnoticed. IS is divided into three stages. The first (swelling and hemorrhage) is painful, when pain appears in the shoulder joint when the arm is abducted, radiating to the deltoid region or neck area. The doctor may notice tenderness to pressure on the humeral tubercle, painful resistive abduction, and external rotation of the arm (possibly weakened by large rotator cuff tears or pain). The second stage (fibrosis and tendinitis) is conventionally called “freezing”, when pain decreases against the background of increasing stiffness and limitation in the range of motion of the shoulder joint. And then a long (sometimes lifelong) third stage of “unfreezing” (bone spurs and cuff pathology) with a decrease in the range of motion in the joint, periodic occurrence of painful sensations against the background of “stretching” exercises. Extended complaints of patients are determined by the spread of the inflammatory process to the surrounding muscles and their tendons. The most common symptoms of impingement syndrome are pain, weakness, and loss of motion in the affected shoulder [4]. The pain is often worse when moving the arm overhead and may occur at night, especially when lying on the affected shoulder. The onset of pain may be acute due to injury or insidiously onset due to a gradual process such as

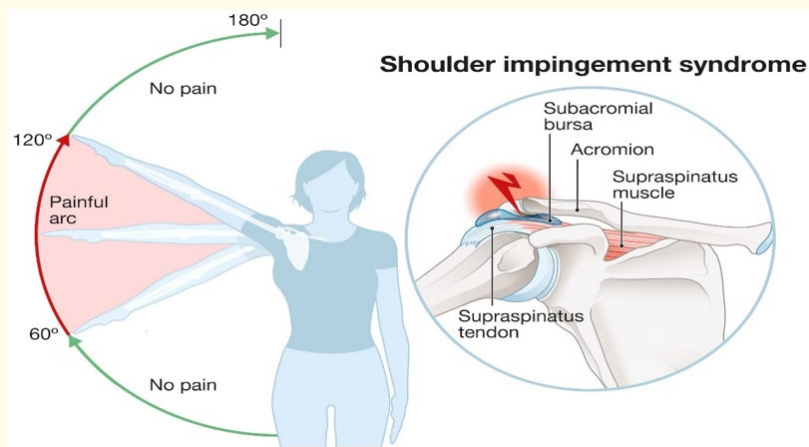
the development of osteoarthritis spurs. The pain is described as dull rather than sharp, lasting for a long time. Pain is especially common in the second half of the day, which makes it difficult to fall asleep. Other symptoms may include a grinding or clicking sensation when the shoulder moves. Diagnosis of IS is carried out on the basis of patient complaints, palpation of the joint, and the results of studying active and passive movements according to certain tests. Next, an X-ray or computed tomographic examination of the shoulder joint is performed with visualization of sclerosis of the tubercle, the lower surface of the acromion process or its curved shape, arthrosis of the acromioclavicular joint, and the formation of osteophytes. Sometimes it is advisable to inject anesthetics into the joint cavity, which makes it possible to differentiate contracture associated with pain. Research using ultrasound techniques and magnetic resonance imaging is also used. Using these techniques, it is possible to determine thickening of the joint capsule (walls of the axillary inversion) or tendinitis of the supraspinatus tendon (Figure 2).



**Figure 2:** Subacromial impingement and internal impingement syndrome of the shoulder joint with inflammation.

The main clinical symptoms of damage to the joint capsule (cuff) are determined by functional tests, when the limitation of movements in a certain range is caused by the occurrence of pain. The pain is localized, more pronounced along the posterior surface of the shoulder; limitation of both active and passive movements in the shoulder joint in a certain range of rotation can be identified (Figure 3).

A painful arc of motion may be present as the arm is raised forward from 60° to 120°. Passive movement of the shoulder will feel painful if a downward force is applied to the acromion, but the pain will decrease when the force is removed. Involvement of additional muscles in the process of inflammation leads to the appearance of pain in the neck and shoulder joint. To clarify the nature of the periarticular pathology of the shoulder, additional instrumental research methods are used: magnetic resonance imaging or ultrasound examination of the joint [5]. Inflammation of the subacromial and subdeltoid bursae of the shoulder joint is rarely isolated. As a rule, this is a complication



**Figure 3:** Limitation of movement within a certain range of pain.

of diseases of the rotator cuff. The cause of primary inflammation of the bags is most often hypothermia. The diagnosis is based on sharp palpation pain of the bursa. Clinically, there is a limitation of active movements in the shoulder joint in all planes. To clarify the diagnosis, ultrasound examination of the joint is used. The cause of periarticular pathology of tendinitis or tendovaginitis of the long head of the biceps brachii muscle is inflammatory and degenerative changes in the tendon of the long head of the biceps in the part that passes through the intertubercular groove. The anatomical proximity of the tendon of the long head of the biceps brachii to the tendons of the supraspinatus and subscapularis muscles contributes to its frequent involvement in the inflammatory process. Main clinical symptoms: pain along the anterior surface of the shoulder; increased pain when performing movements with resistance. Adhesive capsulitis of the shoulder joint can be primary or secondary. Primary capsulitis ("frozen shoulder") is characterized by a gradual increase in pain and a decrease in the range of motion in the shoulder joint, especially rotation and abduction. With primary capsulitis, it is possible to determine: diffuseness of damage to the capsule of the shoulder joint, manifested by fibrosis; involvement of bone structures in the form of regional osteoporosis; limitation of the range of passive movements in the shoulder joint in all planes.

Treatment of patients in the acute stage of the disease involves regular use of non-steroidal anti-inflammatory drugs topically in the form of ointments (Voltaren) and patches (Nanoplast) and orally, especially at night. It is widely recommended to use ketorol (ketorolac) in tablets of 0.01, 2% gel or solution (1 ml contains 30 mg of the drug). Intramuscular administration of the drug is comparable to the effect of 10 mg of morphine solution or 50 mg of meperidine. Strictly in accordance with the individual approach, daily (no more than five days) medicinal electrophoresis with 1% hydrocortisone ointment or gel, or a blockade by administering a hydrocortisone solution once every three days, no more than three times in a row, should be prescribed. Standard traditional glucocorticoids have now been replaced by a 2% highly purified OST-TENDON solution obtained by bacterial fermentation [6]. It basically contains mannitol, which allows the drug to be administered into the peritendinous area. Such paraarticular injections help avoid unwanted reactions. Active movements in the shoulder joint should be limited by wearing a headscarf, and then skin taping should be used. In case of severe pain syndrome, which limits both active and passive movements in the shoulder joint, patients are recommended to wear a scarf or use a fixing orthosis, which provides rest and relaxation of the periarticular muscles. Active movements in the shoulder joint are performed in the pain-free range. Before the physical therapy procedure, it is advisable to perform a light massage of the collar area, the area of the shoulder joint and shoulder, which can be combined with reflexology or hardware physiotherapy (amplipulse therapy, transcutaneous electrical neurostimulation, magnetic therapy). Thermal effects at the initial stage can provoke an increase or relapse of pain. After the pain has subsided, great attention should

be paid to the use of Longidaza cutaneously or through physiotherapy (therapeutic ultrasound). It ensures the simultaneous local presence of the hyaluronidase enzyme and a carrier capable of binding enzyme inhibitors and stimulators of collagen synthesis (iron, copper ions, heparin and others) released during hydrolysis of matrix components. Thanks to these properties, Longidaza not only has the ability to depolymerize the connective tissue matrix in fibrogranulomatous formations, but also suppress the reverse regulatory reaction aimed at the synthesis of connective tissue components. In recent years, orthobiology methods have been actively recommended. When plasma enriched with platelets, stem cells or growth factor and hyaluronic acid solution is injected into the joint cavity, damaged anatomical structures are quickly restored [7]. Unique formulas of polypeptides and chondroprotectors with the patented name "Hyalripayer" have also been developed. It is administered by intra-articular (using a syringe) and extra-articular 2.0 ml (in a bottle with 5.0 ml at a concentration of 1.5%) infusions. Next, you should apply a variety of rehabilitation and physical therapy procedures. Massage sessions on the posterior edge of the deltoid muscle using subcutaneous or fascial techniques are especially effective. The doctor places the fingers of the opposite hand near the shoulder joint at the dorsal edge of the muscle. Soft tissue displacement and therapeutic tension are applied to the edge of the deltoid muscle. Short massage movements should be performed using subcutaneous or fascial techniques. The tension ends at the muscle attachment. In addition to medical procedures, it is necessary to orient the patient to constant physical exercise to train the strength of the muscles of the upper shoulder girdle. It is advisable to prescribe exercises with a stick to practice movements of external, internal rotation, abduction and adduction of the shoulder. Exercises with a towel to stretch the shoulder muscles are also useful. On weekdays, it is advisable to limit active movements in the joint by constantly wearing an elastic bandage on the shoulder joint. In the process of rehabilitation of this category of patients, the passive range of motion should be restored as early as possible with complete or maximum possible relaxation of the periarticular muscles. For this purpose, passive movements are used (which are reproduced by a physical therapy instructor), mechanotherapeutic devices (block and driven), as well as exercises to relax the periarticular muscles. Voluntary relaxation, relaxation during extended exhalation and post-isometric muscle relaxation are used).

The therapeutic effectiveness of treatment and rehabilitation can be considered exhausted when arthrosis of the acromioclavicular joint or shoulder joint occurs, rotator cuff compression syndrome appears, damage or rupture of the rotator cuff, tendonitis and damage to the biceps tendon, chronic instability of the shoulder joint. It is also obligatory to consult a surgeon with subsequent arthroscopy if patients complain of clicking sounds during movements in the joint (evidence of the formation of free chondromic bodies) and severe restrictions on its mobility (formation of adhesive capsulitis). In the presence of long-term IS, insufficient analgesic effect from intra-articular anesthetic, magnetic resonance imaging signs of subacromial stenosis, thinning and degeneration of the rotator cuff, surgical treatment in the form of subacromial decompression and redressation is recommended.

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