Adhesive capsulitis: How to treat your patient?

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Key words: bursitis; shoulder joint; diagnosis; drug therapy; physical therapy modalities; rehabilitation; treatment outcome.

Introduction

Adhesive capsulitis is a condition characterized by scapulohumeral pain and loss of shoulder mobility. The condition was first described by Dupley in 1896, who named it "peri-arthritis scapulohumerale" 1. Codmann 2 introduced the term "frozen shoulder" in 1934 to describe the condition characterized by pain and limitation of range of motion in the affected shoulder. Neviser 3 was the first to use the term "adhesive capsulitis" to describe the condition characterized by chronic shoulder inflammation. The present definition of the American Shoulder and Elbow Surgeons is "a condition of uncertain etiology characterized by significant restriction of both active and passive shoulder motion that occurs in the absence of a known intrinsic shoulder disorder" 4. The prevalence of shoulder pain is high, and ranges from 7% to 36% of the population 5. In order to provide adequate therapy accurate diagnosis of different conditions causing shoulder pain must be made. The aim of the study was to review the pathogenesis, diagnosis, and natural course of adhesive capsulitis, and provide evidence-based clinical practice guidelines on selected rehabilitation interventions.

Pathogenesis, diagnosis and course of the disease

Adhesive capsulitis is a condition that occurs in 2–5% of the general population. It most commonly occurs in women aged 40–60 years 6. Men rarely suffer from adhesive capsulitis, but are at greater risk for longer recovery and greater functional loss 7. The condition occurs often bilaterally, and the contralateral side is frequently affected 6 months to 7 years after onset of symptoms in the first shoulder 8. However, the same shoulder is never affected twice 8. The condition is also more common in people with sedentary vocations 9, with the non-dominant hand being more often affected 10. Adhesive capsulitis can often be seen in patients with diabetes mellitus. The incidence of adhesive capsulitis is also higher in patients with various cardiac, endocrine, and neurologic comorbid diseases 11–13.

Adhesive capsulitis can be classified as primary or secondary. The diagnosis of primary or idiopathic adhesive capsulitis is made when there are no data from adequate medical history or findings during the examination that account for the beginning of the disease. Abnormal response of the immune system may be the underlying cause of the idiopathic form of the disease. In recent years several studies showed an increase in the production of cytokines such as transforming growth factor β (TGF-β) and platelet-derived growth factor (PDGF) causing abnormal regulation of expression of collagen type I and type III and proliferation of fibroblasts, leading to adhesion formation in the joint 14–16.

Secondary adhesive capsulitis is a result of known causes of shoulder stiffness or immobilization, such as previous injuries, surgical interventions, etc 8. The etiology and pathophysiology of adhesive capsulitis are still poorly understood. The condition is considered to be basically a combination of synovial inflammation and capsular fibrosis 8. The natural course of adhesive capsulitis involves a continuum of three phases 9. The disease begins with the painful, or "freezing" phase. This phase is mostly characterized by the presence of pain usually without any known precipitating factors. Pain is first felt with activities, and is common at...
night. Patients often report that they cannot sleep on the affected shoulder. Typically, pain precedes the limitation of movement, but in some cases, loss of mobility can be the first symptom. Because of the non-specific symptoms patients rarely seek medical attention at this stage of the disease. In the early phase, arthroscopy shows a fibrous synovial inflammatory reaction without adhesions and capsular contracture, while later in the phase a thickened, hypervascular synovitis and normal capsular tissue, while later hypervascular synovitis with perivascular, and subsynovial scar formation can be seen. The "freezing" phase lasts between 10 and 36 weeks, and is followed by a "frozen" phase, in which pain gradually diminishes, but a progressive decrease in shoulder range of motion takes place. The "frozen" phase can last between 4 and 12 months. Arthroscopic examination shows loss of the axillary recess, while capsular biopsy reveals features characteristic for fibrosing conditions. Most patients visit doctor at this stage of disease. Finally, the recovery, or "thawing" phase shows a gradual spontaneous recovery of shoulder mobility and function over 5 to 26 months. Arthroscopic findings indicate mature adhesions. The average disease duration is 30 months (from 1 to 3.5 years.).

Although most patients with adhesive capsulitis have a complete recovery, some authors reported long-term pain and residual restrictions of motion. External rotation is the plane of motion that predominantly remains restricted, but this deficit may not interfere with activities of daily living. Incomplete resolution of symptoms in some cases is in contrast to Codman's statement that "recovery is always sure and may be confidently expected". Diagnosis of adhesive capsulitis is primarily made by history and physical examination. Criteria that must be taken into account when making the diagnosis include a gradual onset, night pain, pain provoking by isolated passive motion in the scapulohumeral joint, painful limitation of passive elevation (less than 100°) and external rotation (up to half of the full range of motion), and radiographs excluding other pathological processes in the shoulder. In the physical examination the most important part is the evaluation of passive range of motion in the shoulder joint. Real mechanical restriction that occurs in capsular contracture is characterized by a fixed ending point which must be distinguished from resistance arising due to pain. When making differential diagnosis of adhesive capsulitis the clinician should not forget that in addition to adhesive capsulitis, only osteoarthritis and neglected posterior shoulder luxation may present with passive restriction of scapulohumeral motion. Plain magnetic resonance imaging (MRI), MR arthrography, and ultrasound can be useful in diagnosing adhesive capsulitis.

**Pharmacological treatment and rehabilitation**

Conservative treatment of adhesive capsulitis includes pharmacological treatment (analgesics, corticosteroids) and physical therapy interventions (modalities, manual techniques, and therapeutic exercises). Although there is no scientific evidence that supports the use of non-steroidal anti-inflammatory medications, they are often prescribed in the early, inflammatory stage of the disease in order to attain adequate analgesia. Oral corticosteroids are, on the other hand, a well established therapy in the acute phase of adhesive capsulitis. A number of studies demonstrated their efficacy in pain reduction, especially night pain, and short-term improvement of scapulohumeral range of motion. It is important to critically select patients for this treatment option because of its known side-effects. Intraarticular, subacromial or glenohumeral administration of corticosteroids is often performed, and its efficacy in reducing pain for several weeks has been proven. It has been advised to perform this procedure under ultrasound or fluoroscopic guidance, because exclusive use of anatomical landmarks is imprecise.

Physical therapy interventions are widely recommended in the treatment of adhesive capsulitis, although evidence that clearly confirms their effectiveness is still deficient. According to the Cochrane database review of physiotherapy for painful shoulder conditions due to deficiencies in the literature, there is little evidence to guide treatment and no evidence that physiotherapy alone is of benefit in adhesive capsulitis. A recent study confirmed insufficient evidence regarding the most commonly applied therapies, such as physical therapy and analgesics. Regardless of this, physical therapy interventions remain the mainstay of adhesive capsulitis treatment. Different modalities should always be used in accordance with the underlying pathophysiological changes of the concurrent phase of the disease.

In the first phase of the disease, the goal of rehabilitation is primarily to reduce inflammation and eliminate pain. In addition to analgesics and corticosteroids, implementation of certain physical therapy procedures is indicated because of their known analgesic, anti-inflammatory and scar tissue modifying effects. There is strong evidence that low-power laser, transcutaneous electrical nerve stimulation (TENS), and acupuncture provide short-term pain relief. Efficacy of other modalities, such as ultrasound, massage, iontophoresis and sonophoresis has not been proven in the treatment of patients with adhesive capsulitis. At this stage of the disease, patient education and activity modification is necessary. In addition, light range of motion exercises are introduced. Patients are given a home exercise program consisting of self-assisted stretching, as well as pendulum exercises in the pain free range of motion, and advised to perform it daily. Since pain can change glenohumeral kinematics, performance of adequate exercises aimed at restoring the scapulohumeral rhythm is necessary. In the first place, hyperactivation of the upper trapezius, as a results of restricted capsular extensibility must be assessed. Static contractions and closed-chain exercises aimed at strengthening scapular stabilizing muscles are advocated in this phase of the disease.

In addition to reducing pain, and inflammation, the goal of treatment in the second phase of the disease is to decrease capsular adhesions. Thus, the focus of therapy is treatment of
loss of motion and abnormal scapulo-humeral rhythm. Regarding the optional range of motion exercise program, Diercks and Stevens 36 found that physical therapy consisting of pain-free active exercises leads to better functional outcome in a shorter time when compared to physical therapy based on strenuous active and passive exercises, and stretching beyond what was painful. Similarly, Griggs et al. 7 showed good results in patients in the second phase of adhesive capsulitis treated with a specific exercise program where motion was limited to the range of tolerable discomfort. There is also evidence that that prolonged, low-load stretching is more effective than brief, high-load stretching 30. At this stage, different joint mobilization techniques are advocated in order to improve range of motion 17. Systematic literature reviews demonstrated moderately strong evidence for short- and long-term positive effects of this kind of therapy approach 25. In addition, there is evidence that high-grade mobilization techniques are more effective than low-grade mobilization techniques 35, and that posterior glide mobilization is more efficient than anterior glide, especially for the improvement of external rotation range of motion 37. Continuous passive motion is also used in the treatment of these patients, but there are still no recommendations for the duration and intensity of this kind of therapy 38. Exercise intensity must be such that the patient does not have significant pain. Strengthening of scapular stabilizers continues in this phase in accordance with the functional status. Rotator cuff muscles strengthening should also be introduced as soon as adequate range of motion is obtained 17.

At the end of the second and the beginning of third phase of the disease, the mainstay of therapy is stretching of contracted structures that can be done more vigorously once the pain has subsided. Heat therapy is suggested before stretching, as well as active warm-up that promotes soft tissue circulation, relaxation of surrounding structures, and facilitates easier stretching.

A conservative rehabilitation approach will lead to a positive outcome in the majority of patients with adhesive capsulitis. Most studies documented that only 10% of patients do not achieve satisfactory therapy results 6. Generally, it is advised to treat patients with adhesive capsulitis for 6 months conservatively, before taking into a consideration any other, more invasive treatment procedures. Indications for more invasive procedures are not clearly defined, and have to be set out individually for every patient. Manipulation under anesthesia, hydrodilatation, suprascapular nerve block, arthroscopic or open capsular release are treatment options in the case of failed conservative treatment.

Conclusion

Although adhesive capsulitis is commonly seen in everyday clinical practice, lack of strong scientific evidence enables setting of clear guidelines for its treatment. Knowing the natural history of disease, the key point of treatment is the patience of both the doctor and his patient.

Treatment must be tailored according to the phase of the disease. Recommendations based on current literature suggest the use of nonsteroidal anti-inflammatory drugs and corticosteroids in the first phase of the disease for the reduction of inflammation and pain. The use of physical therapy modalities, especially low-power laser and TENS is also recommended. In addition, a low intensity exercise program within the pain-free range of motion should be introduced along with modification of daily activities. In the second phase, as pain diminishes, the exercise program should specifically target shoulder contracture and the distorted scapulo-humeral rhythm. The keystone of the third phase of the disease is stretching the shortened shoulder structures, and strengthening the rotator cuff muscles. Bearing in mind the long-lasting nature of the disease, and the fact that patients can easily become unmotivated a continuous follow-up is mandatory.

The results of our paper highlight the necessity of updating conventional rehabilitation approaches for the treatment of adhesive capsulitis in our hospitals in order to promote optimal painless functional recovery. Future prospective studies are expected to identify the causes of adhesive capsulitis, define specific causal treatment, determine the influence of different treatment modalities on the natural history of the disease, and precisely distinguish therapeutic options that provide the best treatment outcome.

REFERENCES

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