9. Painful Shoulder Complaints

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Abstract: Painful shoulder complaints have a high incidence and prevalence. The etiology is not always clear. Clinical history and the active and passive motion examination of the shoulder are the cornerstones of the diagnostic process. Three shoulder tests are important for the examination of shoulder complaints: shoulder abduction, shoulder external rotation, and horizontal shoulder adduction. These tests can guide the examiner to the correct diagnosis. Based on this diagnosis, in most cases, primarily a conservative treatment with nonsteroidal anti-inflammatory drugs possibly in combination with manual and/or exercise therapy can be started. When conservative treatment fails, injection with local anesthetics and corticosteroids can be considered. In the case of frozen shoulder, a continuous cervical epidural infusion of local anesthetic and small doses of opioids or a pulsed radiofrequency treatment of the nervus suprascapularis can be considered.

Key Words: evidence-based medicine, shoulder pain, subacromial bursitis, acromioclavicular joint disorder, glenohumeral joint, nervus suprascapularis, corticosteroid injection, pulsed radiofrequency

INTRODUCTION

This article on shoulder complaints is part of the series “Interventional practice guidelines based on clinical diagnosis.” Recommendations formulated in this article are based on “Grading strength of recommendations and quality of evidence in clinical guidelines” described by Guyatt et al. and adapted by van Kleef et al. in the editorial accompanying the first article of this series (Table 1). The last literature update was performed in September 2009.

The incidence of shoulder complaints in daily general practice is high. An estimate of 24 episodes for every 1,000 patients in general practice has been calculated with a prevalence of 35 for every 1,000 patients per year, 60% of whom are women. Although 60% of the patients with shoulder complaints recover after one year, shoulder pain has a tendency to recur from time to time.
It is not always clear why a patient develops shoulder complaints except when it is due to trauma. Pathologies such as an aseptic inflammation of the synovial membranes of the glenohumeral joint, the acromioclavicular and sternoclavicular joints, and inflammation of the outer soft tissue surrounding these joints can cause shoulder complaints. A systematic review establishes that there is a relationship between artherosclerosis and shoulder pain. In addition, function disorders of the cervical spinal column and the cervicothoracic transition play a role in the etiology of shoulder complaints. It is therefore also of great importance to involve the cervical spinal column and cervicothoracic transition in the examination of the shoulder function. Shoulder complaints may be due to many causes and/or be part of an already existing ailment.

**I. DIAGNOSIS**

**I.A HISTORY**

In general, the symptom pattern is characterized by pain that prevents the patient from sleeping on the affected side. The localization and radiation pattern of the pain can provide an indication as to whether one is dealing with a primary disease of the shoulder joint or with a cause external to the shoulder joint. Other serious conditions such as pain in other joints, fever, malaise, weight loss, dyspnea, and angina pectoris should be ruled out: specifically for nontraumatic shoulder pain that has an abnormal natural course. Above all, a pancoast tumor must be ruled out. The findings from the shoulder examination are therefore of great importance.

**I.B PHYSICAL EXAMINATION AND CATEGORIZATION OF SHOULDER PAIN**

Three shoulder tests are important for the examination of shoulder complaints: shoulder abduction, shoulder external rotation, and horizontal shoulder adduction. With these three tests it is possible to establish the most important shoulder pathologies, which are usually expressed as a brachialgia.

**Normal Active and Passive Shoulder Abduction**

During the active and passive shoulder abduction, the examiner stands behind the patient, who is sitting. When the right shoulder is being examined, the examiner fixes the patient’s body by placing his left (fixating) hand on the patient’s left shoulder keeping his left thumb at the C7 level. This is to prevent the patient from lateral flexion toward the left during the abduction of the right shoulder. With the examining (open) right hand placed on the patient’s elbow, the active abduction of the arm is guided to the point where the patient stops because of pain, and if possible, passive shoulder abduction is further executed. The abduction is executed in the frontal plane as much as possible by keeping the examiner’s (open) right hand somewhat to the ventral side of the patient’s elbow (Figure 1) to prevent ventral translation of the arm during the abduction. Under

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**Table 1. Summary of Evidence Scores and Implications for Recommendation**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
<th>Implication</th>
</tr>
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<tbody>
<tr>
<td>1 A+</td>
<td>Effectiveness demonstrated in various RCTs of good quality. The benefits clearly outweigh risk and burdens</td>
<td>Positive recommendation</td>
</tr>
<tr>
<td>1 B+</td>
<td>One RCT or more RCTs with methodologic weaknesses, demonstrate effectiveness. The benefits clearly outweigh risk and burdens</td>
<td></td>
</tr>
<tr>
<td>2 B+</td>
<td>One or more RCTs with methodologic weaknesses, demonstrate effectiveness. Benefits closely balanced with risk and burdens</td>
<td></td>
</tr>
<tr>
<td>2 B±</td>
<td>Multiple RCTs, with methodologic weaknesses, yield contradictory results better or worse than the control treatment. Benefits closely balanced with risk and burdens, or uncertainty in the estimates of benefits, risk and burdens.</td>
<td>Considered, preferably study-related</td>
</tr>
<tr>
<td>2 C+</td>
<td>Effectiveness only demonstrated in observational studies. Given that there is no conclusive evidence of the effect, benefits closely balanced with risk and burdens</td>
<td></td>
</tr>
<tr>
<td>2 C−</td>
<td>Observational studies indicate no or too short-lived effectiveness. Given that there is no positive clinical effect, risk and burdens outweigh the benefit</td>
<td>Negative recommendation</td>
</tr>
<tr>
<td>2 B−</td>
<td>One or more RCTs with methodologic weaknesses, or large observational studies that do not indicate any superiority to the control treatment. Given that there is no positive clinical effect, risk and burdens outweigh the benefit</td>
<td></td>
</tr>
<tr>
<td>2 A−</td>
<td>RCT of a good quality which does not exhibit any clinical effect. Given that there is no positive clinical effect, risk and burdens outweigh the benefit</td>
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</table>

RCT, randomized controlled trial.
normal circumstances, a spontaneous external rotation of the humerus will occur between 145° and 180° abduction of the arm. This is due to the fact that, to perform this abduction trajectory, the tuberculum majus of the humerus must rotate posteriorly under the acromion. It is very important that the abduction is executed in the frontal plane as much as possible because a normal abduction can usually be executed in other movement planes independent from a disturbed shoulder function and potential shoulder pathology can subsequently be missed.

**Normal Active and Passive Shoulder External Rotation**

During active and passive shoulder external rotation, the examiner stands behind the patient, who is sitting. When the right shoulder is being examined, the examiner fixates the patient’s right elbow against the patient’s body with his left hand (Figure 2). This is to prevent the right shoulder from abduction during the external rotation. With the examining right hand placed on the wrist, active external rotation of the shoulder is guided to the point where the patient stops because of pain, and if possible, the passive shoulder external rotation is further executed.

**Normal Active and Passive Horizontal Shoulder Adduction**

The examiner stands on the patient’s side that is being examined during the active and passive horizontal shoulder adduction. When the right shoulder is being examined, the examiner places his left (fixating) hand on the patient’s left shoulder keeping his left thumb at the C7 level. This is to prevent the patient from lateral flexion to the left during the horizontal shoulder adduction of the
right shoulder (Figure 3). With the examining right hand placed on the patient’s right elbow, the active horizontal shoulder adduction is guided to the point where the patient stops because of pain and, if possible, the passive horizontal shoulder adduction is further executed.

Because the etiology of the shoulder complaints is usually unclear or even unknown, the findings from the active and passive range of motion examination are used to classify the shoulder complaints. On the basis of the active and passive abduction, external rotation and horizontal adduction of the shoulder, one can detect the underlying cause of the shoulder complaints and categorize it in the following three groups:

- Shoulder complaints with limited range of passive motion
- Shoulder complaints without limited range of passive motion but with pain on shoulder abduction or retro-abduction
- Shoulder complaints without limited range of passive motion and no painful abduction trajectory

Shoulder Complaints with a Limited Range of Passive Motion

Table 2 shows the shoulder complaints with a limited range of motion. It does not include shoulder affections that are considered to be the result of a systemic condition such as rheumatoid arthritis, for example.

Shoulder Complaints without Limited Range of Passive Motion but with a Painful Abduction Course

Table 3 represents the shoulder complaints without limited range of motion but with a painful arc in the active as well as the passive shoulder abduction. In addition, one or more structures in the subacromial space can be affected. This is also called the impingement syndrome in orthopedics. Subacromial bursitis is a common clinical affection.

Shoulder Complaints without Limited Range of Passive Motion and without a Painful Abduction Course

If the active and passive motion examination of the shoulder reveals no disorder, the pain is usually caused by structures external to the shoulder or the shoulder pain can be part of a radiating pattern such as brachialgia resulting from cervical radicular syndrome or a brachial plexus lesion. This also includes neurological conditions such as Parsonage–Turner syndrome (amyotrophic shoulder neuralgia) and the referred pain syndromes of the shoulder; the latter can have a visceral genesis. An exception is the unstable shoulder as in habitual shoulder dislocation. Table 4 provides an overview of the most common shoulder complaints without limited range of passive motion.
I.C ADDITIONAL TESTS

Diagnostics and laboratory tests are not indicated during the initial phase of uncomplicated shoulder complaints. Additional blood tests (C-reactive protein, hemoglobin, erythrocyte sedimentation rates, rheumatoid factor) must be carried out in case of persisting shoulder complaints if a systemic condition or other serious affection is suspected. Radiographs, ultrasound, and a magnetic resonance imaging examination are indicated with prolonged persistence of shoulder complaints. A bone scan is indicated when metastasis or primary tumor is suspected.

II. TREATMENT OPTIONS

In general, shoulder complaints are initially treated conservatively. When indicated, interventional treatments usually involve local injections with corticosteroids and a local anesthetic. Interventional treatments are usually limited to shoulder complaints based on capsulitis of the shoulder joint, either arising spontaneously or in the context of a postoperative capsulitis. In addition, interventional treatments can be considered for impingement syndrome or a subacromial bursitis, diseases of the acromioclavicular joint, and diseases of the glenohumeral joint such as frozen shoulder.

II.A CONSERVATIVE MANAGEMENT

The initial conservative treatment consists of nonsteroidal anti-inflammatory drugs, possibly in combination with manual medicine and/or exercise therapy, particularly when there is a functional disorder of the cervical spinal column and cervicothoracic passage. The local application of heat and cold has been insufficiently studied.

II.B INTERVENTIONAL MANAGEMENT

Depending on the conditions, a local injection with an anesthetic and corticosteroid is given to treat subacromial bursitis, diseases of the acromioclavicular joint, adhesive capsulitis (frozen shoulder) and a rotator cuff disease. On the basis of a Cochrane review, there is little evidence to either support or reject the efficacy of corticosteroid injections.

- With impingement syndrome or subacromial bursitis, usually 40 mg of depot corticosteroids with a local anesthetic are administered. Active abduction should be pain free immediately after the injection when carried out properly. There is limited evidence for its efficacy in the short term.
- In case of acromioclavicular joint diseases, an intra-articular injection is indicated for persistent pain. Passive abduction should be pain-free and normalized in terms of limited range of motion immediately after the injection if it is carried out properly.
- In case of glenohumeral joint diseases, such as frozen shoulder, an intra-articular injection with an anesthetic and corticosteroids can be considered when there is severe pain. There is limited evidence for this treatment, but after 3 to 6 months the injections are no longer more beneficial than other conservative treatments.

Table 4. Shoulder Complaints without Limited Range of Passive Motion

<table>
<thead>
<tr>
<th>Affections</th>
<th>Passive External Rotation</th>
<th>Active Abduction in Neutral Pos. Arm</th>
<th>Passive Abduction in External Rotation Arm</th>
<th>Passive Horizontal Abduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder instability (habitual dislocation)</td>
<td>-</td>
<td>+++</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Amyotrophic shoulder neuralgia (Parsonage–Turner syndrome)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cervical radicular syndrome</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Brachial plexus lesion</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cervical spondylarthrosis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Referred pain syndromes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gallbladder conditions</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cardiovascular conditions</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Subdiaphragm pathology</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Intrathoracic tumors</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Metastases</td>
<td>-</td>
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</table>

++, degree limited; -, normal; Pos., position.
The natural course of an uncomplicated frozen shoulder is that of a self-limiting disease from which most of the patients completely recover. In the first phase (2 to 9 months) the pain is prominent, in the second phase (4 to 12 months) the limited range of motion is more prominent than the pain, and in the last phase (5 to 24 months) recovery gradually occurs.

A continuous cervical epidural infusion of local anesthetic and small doses of opioids has been used to provide continuous analgesia in patients with adhesive capsulitis of the shoulder (frozen shoulder). The tunneled epidural catheter was maintained for an average of 6 weeks to facilitate rehabilitation. As yet, only this observational retrospective study is available.

A pulsed radiofrequency (PRF) treatment of the nervus suprascapularis can be considered for a frozen shoulder or a capsulitis of the shoulder joint. As yet, only retrospective studies are available that investigated the effect of PRF treatment of the nervus suprascapularis for shoulder pain.

### II.C EVIDENCE FOR INTERVENTIONAL MANAGEMENT

A summary of the available evidence is given in Table 5.

### III. RECOMMENDATIONS

Primarily, shoulder complaints should be treated conservatively with pharmaceuticals and manual and/or exercise therapy. Interventions with a local injection of anesthetics and corticosteroids can only be considered for specific affections that are therapy resistant. PRF treatment of the nervus suprascapularis and a continuous cervical epidural infusion of local anesthetic and a small dose of opioids can be considered for frozen shoulder and capsulitis, preferably as part of a study.

#### III.A TECHNIQUE(S)

**Subacromial Bursitis**

The patient should be in a supine position. After sterile preparation of the area, 4 mL bupivacaine 0.25% with 40 mg depot corticosteroid is injected. The lateral corner of the acromion is identified. The bursa subacromialis is injected exactly in the center. In case of serious calcification in the bursa subacromialis, calcification should be surgically removed. The most important complication of injection is an infection. Small subcutaneous bleedings may result in a temporary increase in pain after the injection.

**Acromioclavicular Joint Disorders**

Intra-articular injection of the acromioclavicular joint is applied with the patient in a supine position. After sterile prep, 1 mL bupivacaine 0.25% with 40 mg depot corticosteroid is injected. The top (most cephalad portion) of the acromion is identified. The intra-articular space is identified 2.5 cm medial from this point. There should be some resistance when injecting because it involves a relatively small intra-articular space. The tip of the needle is probably situated inside the connective tissue layers of the joint capsule if there is substantial resistance. With too little resistance, the intra-articular space is possibly no longer intact and an MRI should be made. The most important complication is infection.

**Glenohumeral Joint**

Intra-articular injection of the shoulder is performed with the patient in a supine position. After sterile covering, 2 mL bupivacaine 0.25% with 40 mg depot corticosteroid is injected. The midpoint of the acromion is identified. The intra-articular space is identified 2.5 cm underneath this point. There should be little resistance during injection. If the resistance is high, the tip of the needle is probably situated inside the connective tissue layers of the capsule. The most important complication is infection. Twenty-five per cent of the patients complain of temporary worsening of the pain after the injection.

**Nervus Suprascapularis**

A PRF treatment of the nervus suprascapularis is carried out as described below. The patient is sitting on the edge of the bed with the neck in slight lateral flexion. It is not necessary to use imaging techniques for this procedure. The localization and treatment using anatomical landmarks is more efficient, less expensive, with less radiation hazard and better results.

The anatomy and innervation of the shoulder, with particular attention given to the nervus suprascapularis and the landmarks for the PRF treatment are represented in Figure 4.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Evaluation</th>
<th>Table 5. Evidence for Interventional Management of Painful Shoulder Complaints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corticosteroid injections</td>
<td>2 B ±</td>
<td></td>
</tr>
<tr>
<td>Continuous cervical epidural infusion</td>
<td>2 C +</td>
<td></td>
</tr>
<tr>
<td>PRF nervus suprascapularis</td>
<td>2 C +</td>
<td></td>
</tr>
</tbody>
</table>

PRF, pulsed radiofrequency.
Figure 4. Anatomy of the shoulder joint, landmarks for the pulsed radiofrequency treatment of the nervus suprascapularis.

Figure 5. Injection site for the treatment of the nervus suprascapularis.
The spina scapulae is palpated and demarcated from the cranial side. Across the middle of a line running from the acromion to the margo medialis scapulae (medial scapular border), a line is drawn parallel to the cervical spinal column; the lateral angle is then divided into two equal parts with a line and an X (the injection site) is drawn on this line 2.5 cm from the angular point. An SMK 10/5 needle is inserted perpendicular to the skin in all directions until bone contact is made with the scapula in the fossa supraspinata; this usually occurs at a depth of 5 to 6.5 cm. At the cranial border of the fossa supraspinata, called the margo superior scapulae (superior scapular border), the incisura scapulae is located (Figure 5). This is the injection site for the nervus suprascapularis. One should be careful not to insert the electrode too far ventrally; there is a small chance of rib contact or pneumothorax. The electrode is connected to the generator and with a motor stimulation (2 Hz) of < 0.3 V twitches should be visible in the shoulder girdle. Subsequently, PRF treatment is executed with a frequency of 2 Hz, 20 ms and 45 V lasting 4 minutes. There is usually immediate improvement with regard to movement and pain in most patients. In some cases, the treatment must be repeated after a few weeks. With injection techniques, one must be aware of potential intravascular injection in the arteria or vena suprascapularis. Pneumothorax is also a described complication.

IV. SUMMARY
Clinical history and the active and passive motion examination of the shoulder are the cornerstone of the diagnostic process.

When conservative treatment fails, injection with local anesthetics and corticosteroids can be considered. In case of a frozen shoulder or capsulitis, a continuous cervical epidural infusion of local anesthetic and small doses of opioids or a PRF treatment of the nervus suprascapularis can be considered, preferably as part of a study.

ACKNOWLEDGEMENTS
This review was initially based on practice guidelines written by Dutch and Flemish (Belgian) experts that are assembled in a handbook for the Dutch-speaking pain physicians. After translation, the article was updated and edited in cooperation with U.S./International pain specialists. The authors thank José Geurts and Nicole Van den Hecke for coordination and suggestions regarding the article.

REFERENCES


