The subacromial impingement syndrome (SIS) is a terminology that overshadows the real dysfunction and pain in the shoulder. The role of physiotherapist in the evaluation and treatment of subacromial impingement syndrome of the shoulder is critical. We searched the following electronic databases “PubMed, PEDro, Physical Therapy, MEDLINE and Science Direct”. The studies of the present review were examined regarding the way of evaluation conduction and treatment on patients

Key Words: Subacromial impingement syndrome, Shoulder pain, Clinical tests, Evaluation, Treatment
suffering from subacromial impingement of the shoulder. In this review, the role of physiotherapist was important both to the assessment and syndrome treatment. There was an improvement on patients with subacromial impingement of the shoulder through the proper assessment and treatment. The sufficient differential diagnosis through clinical evaluation signifies the most effective treatment on patients suffering from subacromial impingement syndrome.

INTRODUCTION

The subacromial impingement syndrome (SIS) of the shoulder or rotator cuff tear or swimmers’ shoulder is an “umbrella” term often used to describe pain and mobility problems in the shoulder area [32, 69]. It is the most common cause of pain on the shoulder and affects approximately 50% of all shoulder pain sufferers [56, 72]. The SIS is one of the most common disorders of the shoulder, which affects all age groups and various activity levels of patients [53]. It is more frequent in athletes doing sports such as hurling, racket sports, and swimming [10]. It is estimated that 7%-26% of the population in the UK will experience the syndrome [31].

A multivariate cause of the disease is due to modified and unmodified factors that appear individually or combined [22, 24, 32, 71]. An unmodified factor is the anatomy of acromioclavicular joint [62], the presence of osteophytes, stenosis of subacromial area [24, 32, 48, 62] and inadequate vascularization in the shoulder area [46]. Further, the modified factors include muscle imbalances [54], mechanical cuff compression of external structures, as the humerus head and repeated motions or overuse with repeated eccentric humerus loads with motions over the head [61]. Still, sports activities, such as volleyball, water polo and tennis [22], while the daily use of cigarettes is a predisposing tear cause of rotator cuff tendon and presence of impact [7].

The primate impingement is reported by Neer as a mechanical cause of subacromial impingement, whereas the secondary reported by Jobe and Kvnite as muscle imbalances and shoulder instability, where the humerus capita is moving excessively [58].

The main symptoms that can occur are the following: pain on the shoulder joint, dyskinesia and difficulty in the operating activities of upper limb [27]. Shoulder pain usually occurs gradually in a few weeks and is more intense at night [27, 48]. It also occurs during everyday activities, such as combing hair or trying to reach things up [71]. In addition, pain is often reflected in the middle of humerus, especially when impingement of supraspinatus tendon is caused [41, 66].

Differential assessment of the syndrome is conducted by the physiotherapist through subjective and objective evaluation [55]. Subjective evaluation should
include a detailed story, which will come from the patient himself [44]. Objective evaluation includes the study of diagnostic depictions and observation of static and dynamic motions of patient’s upper limb [10]. Moreover, special clinical tests are conducted by the physiotherapist, so as to assess the pathological structure [49].

The treatment includes conservative physiotherapy and surgery [9, 32]. The most common treatment is the strengthening exercises of shoulder muscles, i.e. strengthening and stabilization exercises of rotator cuff muscles of the shoulder, muscles of scapula and also, stretching exercises [43].

THE ROLE OF PHYSIOTHERAPIST IN THE EVALUATION AND TREATMENT OF SUBACROMIAL IMPINGEMENT OF THE SHOULDER

1. Evaluation

As long as a patient is assessed with subacromial impingement of the shoulder, the physiotherapy evaluation should make a differential assessment to the affected anatomic area. It is necessary to make a differential assessment between the internal and external impact of joint capsule, the integrity of rotator cuff muscles, integrity of subacromial bursa and integrity of biceps humerus tendon [55, 49]. Moreover, assessment of integrity circumferential fibro cartilage, acromioclavicular joint and sternoclavicular joint is conducted. Subjective evaluation includes personal details, the main problem, point and the behavior of the symptoms, frequency of symptoms, previous medical record of the patient, psychosocial record and medication [44]. Then, since the therapist has sufficiently recorded all subjective findings, ends up to the objective evaluation, on which he studies the x-rays, MRI scans or other diagnostic depictions, that the patient may bring [55].

Objective evaluation begins with the observation of static and dynamic motions of the patient’s body in order to find deviations and pathological body postures [10, 44]. It is usually observed that during the evaluation shoulder pain occurs, on dermatome allocation A5-A6 and sensitivity to palpation of biceps or rotator cuff tendons. In addition, pain is caused by active motions of the patient [15, 6] using resistance [73] and passive motions by the physiotherapist. Resistance to shoulder abduction will be painful. Besides, resistance to internal or external rotation of the shoulder will be painful, too [49]. The above active and passive clinical motions are often used to record pain, strength and range motion track of the joint. Various clinical trials or tests are often used for the physical examination [49].
1.1 Questionnaires for the evaluation of subacromial impingement syndrome of the shoulder:

The questionnaires were always a valid and reliable solution on the evaluation of many musculoskeletal problems. The questionnaires used for evaluating the outcome measures of the patients are presented in table 1 [29].

<table>
<thead>
<tr>
<th>Questionnaires</th>
<th>Validity</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDQ</td>
<td>NE</td>
<td>Bot et al., (2004); Dogu et al., (2013)</td>
</tr>
<tr>
<td>WOSI</td>
<td>0.77</td>
<td>Bot et al., (2004)</td>
</tr>
<tr>
<td>SRQ</td>
<td>MRN</td>
<td>Angst et al., (2011)</td>
</tr>
<tr>
<td>OSS</td>
<td>0.79</td>
<td>Angst et al., (2011)</td>
</tr>
<tr>
<td>SST</td>
<td>0.72</td>
<td>Angst et al., (2011)</td>
</tr>
<tr>
<td>MCS</td>
<td>0.50-0.82</td>
<td>Angst et al., (2004; 2011)</td>
</tr>
<tr>
<td>ASES</td>
<td>0.79-0.92</td>
<td>Angst et al., (2004; 2011)</td>
</tr>
<tr>
<td>SPADI</td>
<td>0.55-0.93</td>
<td>Angst et al., (2004; 2011)</td>
</tr>
<tr>
<td>MCGRILL</td>
<td>NE</td>
<td>Dogu et al., (2013)</td>
</tr>
<tr>
<td>DASH</td>
<td>0.79</td>
<td>Angst et al., (2011)</td>
</tr>
<tr>
<td>QUICK-DASH</td>
<td>0.74</td>
<td>Angst et al., (2011)</td>
</tr>
</tbody>
</table>

NE: There was not evidence for the validity. MR: More Research needed

DASH & Quick DASH scale:

DASH scale: 30 questions (5 for each question, from «no difficulty» to «unable to perform activity», each question scored from 1 to 5) [29] and in Quick DASH scale: 11 questions. The reliability of two questionnaires were 0.91-0.96 (DASH) and 0.90-0.98 (Quick DASH) [42, 30].
McGrill scale:

Pain assessment, demonstrating pain, description of pain, sensitivity pain. Mc-Grill scale is a reliable pain assessment tool for patients with subacromial impingement syndrome [30]. Pain is mainly assessed on people with cancer [39] and quadriplegic persons [60]. The reliability was 0.84 while the sensitivity was 0.906, efficiency 0.712 and validity 0.912 [1].

Shoulder Pain and Disability Index (SPADI):

This questionnaire assesses the functionality of the shoulder. In 1991, including 13 questions, 5 related to pain and 8 to functionality. The reliability of the questionnaire is 0, 86-0, 96 [3].

American Shoulder and Elbow Surgeons (ASES):

It is easy to use and records the activities of the day, includes self-evaluation of the patient. The reliability is 0,61-0,96 [40].

Subjective Shoulder Rating Scale (SSRS):

Five questions on which pain and physical activities of the patient are assessed. The reliability of the questionnaire needs further research [11].

Murley Constant Score (MCS):

It consists of four sections, one of pain, 2 on day 3, activity level and 4 strength and power. The reliability of the questionnaire is 0,80-0,96 [59].

Simple shoulder test (SST):

Evaluates through 12 questions, two functional associated to pain, seven functional linked to power and 3 regarding the gauge [4]. The reliability SST found in 0,97-0, 99 [28].

Oxford Shoulder Score (OSS):

It assesses pain and function. First appeared in 1996 [18]. 12 questions, 4 regarding pain and 8 daily activities of the individual. The reliability of the questionnaire was 0,98 [33].

Shoulder Rating Questionnaire (SRQ):

5 questions to assess pain, functionality and social perception that evaluate the patient’s shoulder pain dysfunction. Nevertheless, the reliability needs further research [11].
Western Ontario Shoulder Instability (WOSI):

It evaluates shoulder instability. There are 21 questions on four categories. Pain (10 questions), sport / work (4 questions), Lifestyle (4 questions) and emotions (3 questions). The reliability of the questionnaire was 0.87-0.98 [21].

Shoulder Disability Questionnaire (SDQ):

There are 16 questions describing the symptoms, such as pain. The answers were yes or no, where yes is equivalent to a degree, while not to zero degree. The reliability of the questionnaire was 0.76-0.79 [75].

Rotator Cuff Quality of Life (RC-QOL):

This questionnaire evaluates the muscles of the rotator cuff in the shoulder, includes 34 questions and evaluates the pain, physical, emotional and social perception of symptoms. However, reliability was not rated [11].

1.2 Special clinical evaluation trials

Many clinical tests were carried out by the physiotherapists to evaluate SIS (Table 2a-2b). The painful arc of abduction or flexion arm to 60-120 degrees, or to restore the arm can mark the existence of subacromial impingement [49, 38, 50]. The Painful arc can be used to assess the supraspinatus tendon and Painful arc II to examine the acromioclavicular joint (AC) [51].
Table 2a

<table>
<thead>
<tr>
<th>Special tests</th>
<th>Pathology</th>
<th>Article</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hawkin's-Kennedy Test</strong></td>
<td>Integrity of supraspinatus</td>
<td>Park, et al., (2005)</td>
</tr>
<tr>
<td><strong>Jobe Test</strong></td>
<td>Checking supraspinatus</td>
<td>Michener, Walsworth and Burnet, (2004)</td>
</tr>
<tr>
<td>Empty can or to Full cantest</td>
<td>Checking supraspinatus</td>
<td>Michener, Walsworth and Burnet, (2004)</td>
</tr>
<tr>
<td></td>
<td>Checking internal impingement</td>
<td></td>
</tr>
<tr>
<td>Ludington's test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed's test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-over test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 2b

**Summary of published values for sensitivity and specificity of special clinical tests for SIS**

<table>
<thead>
<tr>
<th>Articles</th>
<th>Clinical Tests</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micheroli et al., (2014)</td>
<td>Hawkins-Kennedy</td>
<td>86</td>
<td>45</td>
</tr>
<tr>
<td>Michener et al., (2009)</td>
<td>Neer</td>
<td>81</td>
<td>54</td>
</tr>
<tr>
<td>Micheroli et al., (2014)</td>
<td>*Painful arc I</td>
<td>83</td>
<td>35</td>
</tr>
<tr>
<td>Micheroli et al., (2014)</td>
<td>**Painful arc II</td>
<td>25</td>
<td>96</td>
</tr>
<tr>
<td>Michener et al., (2009)</td>
<td>Painful arc</td>
<td>75</td>
<td>67</td>
</tr>
<tr>
<td>Kelly &amp; Brittle, (2010)</td>
<td>Painful arc</td>
<td>29.6</td>
<td>50</td>
</tr>
<tr>
<td>Silva et al., (2008)</td>
<td>Empty Can (pain &amp; weak)</td>
<td>74</td>
<td>30</td>
</tr>
<tr>
<td>Michener et al., (2009)</td>
<td>Empty Can (weak)</td>
<td>50</td>
<td>87</td>
</tr>
<tr>
<td>Kelly &amp; Brittle, 2010</td>
<td>Empty Can (pain)</td>
<td>52</td>
<td>33</td>
</tr>
</tbody>
</table>

*Painful arc I- The arm is passively and actively abducted from the rest position alongside the trunk. Pain occurring in abduction between 70° and 120° is a sign of a lesion of the supraspinatus tendon, which becomes impinged between the greater tubercle of the humerus and the acromion in this phase of the motion. Patients are usually free of pain above 120°.

**Painful arc II- The patient’s arm is passively and actively abducted from the rest position alongside the trunk. Pain in the acromioclavicular joint occurs between 140° and 180° of abduction.**

The Hawkins-Kennedy Test evaluates not only the integrity of supraspinatus, but also the presence of impingement (Figure 1.2) [55, 38, 50, 51, 64]. The subacromial impingement is evaluated by Neer test (Figure 1.3), as passive flexion motions of
glenohumeral cause further impingement on the anatomic points below acromion [55, 38, 50, 64].

The Empty can test (weakness, pain, pain & weakness) can be used for examining the subacromial impingement, considering the weakness [38, 50], pain [50] or the inability pain [64].

Figure 1.1 **Hawkins-Kennedy test**

Figure 1.2 **Neer test**
1.3 Treatment

The subacromial impingement of the shoulder is treated by surgery and also conservatively. When conservative treatment is not effective, then the patient will need surgical treatment [32]. Arthroscopic decompression of subacromial area has presented 70-80% successful results in reducing pain and improving shoulder function [32, 34]. When the patient often feels much pain after the conservative treatment and rotator cuff tendon is ruptured, then the patient should follow surgical repair with open or half-open complete arthroscopic technique, stitching the tendon at the point where it is ripped [5].

During surgery of subacromial impingement, the pathological structure is usually removed for decompressing the subacromial area [9]. Thus, the symptoms are decreased and shoulder mobility is improved [32, 9]. Typically, after the surgical treatment, physiotherapy is conducted with exercises to improve shoulder mobility, such as assisted exercises with pulley (humerus lifting) and other exercises [32, 9]. In I and II grade SIS usually occurs conservative treatment as it showed the same results with the conservative exercise [23].

Conservative intervention consists of the conservative pharmaceutical medicine and conservative physiotherapy treatment. In conservative medicine, corticosteroid injections (combined with exercises) [16], non-steroid anti-inflammatories and other medication are recommended [52].

Conservative physiotherapy treatment comprises electrotherapeutic methods, like laser [76,13], ultrasound [76,13,25], microwave diathermy [2]. However, it also comprises the non electrotherapeutic physiotherapy, where other physiotherapy methods are subjected, such as manual mobilization techniques [6, 36, 19], taping [65,63], acupuncture [65] and kinesiotherapy [23, 25, 37]. In conclusion, taking into account the above studies’ reports, it is clear that there is a significant improvement of patients’ symptoms from physiotherapy treatments using ultrasound and laser, ultrasound hammer, acupuncture along with exercises at home, kinesiology band and intra-articular mobilization with kinesiotherapy [25,37].

A basic physiotherapy intervention is kinesiotherapy (exercises) [58, 77]. The patient usually begins kinesiotherapy within a more sub acute to chronic stage of the syndrome, since the subacromial impingement is often developed “insidiously”. During kinesiotherapy, stretching exercises [23], assisted active exercises using pulley for the improvement of range gauge, exercises with rod and bending on the wall and also, strengthening exercises, such as the isometric exercise are conducted [43].

In addition, in Polimeni (2003) article [57], passive exercises are recommended, which are conducted either by the therapist or the patient himself passively. There are also closed kinetic chain exercises and exercises in isokinetic dynamometer. Other exercises include plyometric exercises stabilizing the scapulae, using
stabilizer and peripheral upper limb exercises [14]. Strengthening techniques are also mentioned with PNF exercises and exercises for regaining neuromuscular control and mobilization of soft tissues [17].

This way, strengthening, stabilization, stretching, and neuromuscular control exercises contribute to effective rehabilitation, strength, endurance, stabilization and elasticity of rotator cuff and scapula muscles [8, 23, 26, 45, 67]. Exercises are likely to reverse the pathology of tendons and improve pulling coordination of shoulder muscles, so that the impingement syndrome rehabilitates [43].

**DISCUSSION**

The aim of the present review was to highlight the role of physiotherapeutic evaluation and treatment in patients suffering from subacromial impingement of the shoulder. The role of evaluation in physiotherapy practice is very important, as the “main intervention” in the clinical site in order to differentially evaluate the anatomic structure, which has been damaged. Since subjective and objective evaluation have successfully carried out, the structure will be clear, which is damaged, so as to provide an appropriate and effective treatment for the syndrome.

Several shoulder questionnaires are used for the evaluation of the shoulder and subacromial impingement syndrome. When the questionnaires were compared, the best questionnaire was not found on the various outcome measuring the shoulder region [3,4].

In the evaluation of the syndrome clinical trials are significant, which are conducted for evaluating the SIS. Great validity is marked for the impingement: the abduction arch pain or flexion of humerus, by 81.1% on Neer test, 68.7%, Hawkin's-Kennedy test, 66.3% [55].

Combination of 4 physical tests reported in Table 2 (Hawkins- Kennedy test, Neer sign, Painful arc and Empty can test) with ≥ 3 positive tests with sensitivity 75 and specificity 74 to indicate that there was subacromial impingement [50].

Significant improvement on patients was marked by physiotherapy treatments using ultrasound along with laser, ultrasound hammer, and acupuncture with exercises at home, kinesiological band, mobilization and kinesiotherapy (exercises). Further, the most important tools of conservative rehabilitation are therapeutic exercises in contrast to other physiotherapy techniques, according to systematic review of Hanratty, et al., (2012) [31]. Recent studies showed effectiveness in combination stretching exercises, isometric and eccentric exercises for patients with SIS [23, 68].

More research is needed though, which will show the most effective conservative treatment of the syndrome, as single techniques and combined, too.
CONCLUSION

The present reference review highlights the role of physiotherapist in both effective evaluation and effective treatment of subacromial impingement syndrome of the shoulder. This way, the therapist will follow the proper treatment, which will be marked by a good differential assessment.

REFERENCES


47. Lo I, Nonweiler B, Woolfrey M, Litchfield R and Kirkley A. An evaluation of the


59. Roy J, Macdermid J and Woodhouse L. A systematic review of the psychometric
72. Van Der Windt D, Koes B, De Jong B and Bouter L. Shoulder disorders in


Address for correspondence:

Anastasios Efstathiadis
MSc student Sports Rehabilitation
in European University of Cyprus, Nicosia
Email: tasose@hotmail.com,
Phone: 00306950257665