Impingement shoulder syndrome: extraregional pain.

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Abstract

The study regards 300 consecutive cases of shoulder impingement in absence of cuff tear. Pain was clinically scored with VAS and an accurate anamnesis about the onset of the first symptoms was done. The aim of the study was detecting a painful syndrome, secondary to the shoulder pain, located in anatomical regions out of the shoulder complex. This syndrome was named by the Authors as "extraregional pain". The results showed a large percentage of patients affected from this syndrome, about a quarter of the total study population (25.3%).
Patients were also examined with a surface electromiography. The Authors believe that the high percentage of extraregional pain is due to the incorrect use of the affected shoulder, with overload of muscles that normally are not used for specific actions.

**Key Words:** Impingement; shoulder syndrome; Pain; Outcomes; uncommon pain.

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**Introduction**

The impingement syndrome of the shoulder is a very frequent affection characterized by shoulder pain, with a distal radiation to the arm, and active limitation of the range of motion. Pain usually increases at night.

The present paper regards a case record of patients affected from this syndrome. The presence of an extraregional pain, connected with the shoulder pain, was investigated.

**Material and methods**

Three hundred consecutive patients, affected from impingement syndrome of the shoulder, whose onset was minimum 30 days before, were clinically evaluated in order to identify possible pain syndromes in different anatomical regions appeared after the onset of the shoulder pain. There were 166 females and 134 males, mean age 53 years (min. 29, max 80). In 209 cases the affected limb was the dominant, in 91 the nondominant limb. All the patients were asked to rate pain on Visual Analogue Scale (VAS). Twenty patients were submitted to surface electromyography (EMG) for the evaluation of the possible overload of muscles not belonging to the rotator cuff. Exclusion criteria: rotator cuff tear, passive R.O.M. limitation, neurologic injuries, previous injuries of the shoulder or the arm, joint instability, SLAP lesions. The diagnosis of impingement syndrome was made on the basis of the anamnesis and the positivity of specific tests (Neer, Yocum, Hawkins). All the patients had a negative MR for cuff tear.

**Results**

Out of the 300 patients, 76 (25.3%) presented pain out of the shoulder complex, whose onset was posterior to the onset of the impingement syndrome, and exactly: 27 cases of cervicodorsal pain, 19 cases of cervical pain, 9 cases of dorsal pain, 13 cases of epicondylitis. In 8 patients an association was present: 6 epicondylites associated to cervicodorsal pain, 2 epicondylites associated to cervical pain (table I). No statistically significant differences were found with regard to sex, age and work activity, while the longer duration of symptoms (table II) and the dominant limb had a significant role in determining the extraregional pain syndrome.

In detail, the extraregional pain occurred in 62 out of 209 patients affected from dominant shoulder impingement (29.6%) and in 14 patients affected from nondominant shoulder impingement (15.3%).

EMG revealed fatigue of the deltoid, trapezius, epicondyle muscles in 50% of the patients. In the patients affected from cervical pain, the ipsilateral trapezius was always hyperfunctioning than the physiological. More variable was the overload of epicondyle muscles in patients with epicondilitis. Being a surface EMG, the deeper muscular fibers are not easily investigable. An unexpected finding was the superior activation, in comparison with a normal individual, of the contralateral trapezius (fig. 1).

**Discussion**

The present epidemiologic study shows that extraregional pain has a high prevalence in patients affected from an impingement syndrome of the shoulder, especially if the duration of symptoms is long. The fact that the 25.3% of the patients, a quarter of the total study population, declare that cervical or dorsal pain or
elbow pain has appeared some months after the onset of the shoulder pain, undoubtedly means that this “extraregional” pain is connected with the shoulder problem.

We speculate that the origin of this extraregional pain is that the patient tends to avoid the use of the painful shoulder, so that he/she uses his/her superior limb in an abnormal manner, creating an overload on muscles that physiologically possess a different function.

The trapezius muscle is a postural and active movement muscle, used to tilt and turn the head and neck, shrug, steady the shoulders, and twist the arms. The trapezius elevates, depresses, rotates, and retracts the scapula, or shoulder blade. The descending part of the trapezius muscle supports the arms. The transverse part retracts the scapulae, and the ascending part medially rotates or depresses the scapulae.

Contraction of the rhomboids causes a cranio medial movement of the scapula (adduction and elevation). At the same time, the inferior angle of the scapula is moved towards the vertebral column (rotation). That movement mainly supports lowering of the elevated arm. Another function of the rhomboid musculature is the stabilization of the scapula during both rest and arm movement.

The function of the serratus anterior muscle is to allow the forward rotation of the arm and to pull the scapula forward and around the rib cage. The scapula is able to move laterally due to the serratus anterior muscle, which is vital for the elevation of the arm. The serratus anterior muscle also allows the upward rotation of the arm, which allows a person to lift items over their head.

The main function of the levator scapulae is the elevation of the scapula. Thereby it simultaneously pulls the entire scapula medially. This movement is helpful when bringing the elevated arm back to the neutral position. In addition, the muscle also moves the inferior angle away from the back causing a small upward tilt of the scapula. If the scapula is fixed, a contraction of the levator scapulae leads to the bending of the cervical vertebral column to the side (lateral flexion).

What happens in the patient affected from shoulder pain is that he/she tends to avoid the use of rotator cuff muscles, overloading the previously mentioned muscles and other spinal muscles, causing cervical and/or dorsal pain. As regards the frequent epicondylitis, the explanation is more logical: indeed, the patient affected from shoulder pain, tends to use the elbow in some activities rather than the shoulder (fig. 2), causing the inflammation of the epicondyle (or epitrochlear) muscles.

The percentage of patients affected from an associated pain increases as the time elapsed from the onset of shoulder pain increases. This can be explained with the fact that the longer is the duration of shoulder pain, the longer is the time in which the patient incorrectly uses the ipsilateral superior limb. Less explainable is the large gap between the seventh and the eighth month.

In the vast majority of the cases (85.5%), pain firstly appears between the third and the sixth month. The interpretation is the same as above: to develop a symptomatic, overload it is necessary a prolonged time of unbalanced muscle use. The onset of symptoms after the 7th month is likely connected with the resolution of the impingement syndrome in most patients.

The significant superior prevalence when the dominant limb is affected, is explainable, since the patient is induced to use the dominant limb even in presence of pain, while, when the affected limb is the nondominant, the patient tends to use the contralateral limb and reducing the use of the painful shoulder.

Literature about this specific problem is very poor. Only a few papers on cervical and shoulder caused by an erroneous posture have been published (1-3).

Regarding the results of EMG, these are less easily to interprete, even because there is the limit of assessing only the surface muscles. They seem to confirm that the patients incorrectly use the superior limb and compensate with abnormal movements. The overload of contralateral muscles can be interpreted as a condition of diffuse muscle contracture, connected to the hyperconcentration of the patients in making a difficult movement.

Conclusions

The present study shows that, in high percentage of cases, the shoulder impingement syndrome can cause pain in different anatomic regions, especially neck, dorsal spine and elbow. This can be a very important
finding, because it can be possible to exchange a shoulder disease with another pathology, while the painful symptomatology is closely related.

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**HUMAN AND ANIMAL RIGHTS:** For this type of study is not required any statement relating to studies on humans and animals. All patients gave the informed consent prior being included into the study. All procedures involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments.

**References**

Figures

**Fig. 1:** Right trapezium (a) and left trapezium (suffering limb) (b) during the gesture of combing three times. As you can see, the painful shoulder trapezoid works harder.
**Fig. 2:** In absence of pain (a), a chair is raised with the combined action of three joints: wrist, elbow and shoulder. In presence of shoulder pain (b), an individual tends to limit the contribution of the shoulder, increasing the commitment of the elbow and a possible development of an epicondylitis.
### Patients divided on the basis of the VAS (level of referred pain).

The second column shows the number of the cases (out of a total of 300), in the third column the number of patients in which there is an association of an extra-regional pain, in the fourth column the percentage. As we can observe, the percentage of patients affected from an associated pain increases as the time elapsed from the onset of shoulder pain increases. We believe that, the longer is the duration of shoulder pain, the longer is the time in which the patient incorrectly uses the ipsilateral superior limb. Less explainable is the large gap between the seventh and the eighth month.

<table>
<thead>
<tr>
<th>VAS</th>
<th>Cases (total 300)</th>
<th>Associations</th>
<th>Percentage</th>
</tr>
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<tr>
<td>3-4</td>
<td>101</td>
<td>23</td>
<td>22.7%</td>
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<tr>
<td>5-6</td>
<td>87</td>
<td>21</td>
<td>24.1%</td>
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<tr>
<td>7</td>
<td>62</td>
<td>15</td>
<td>24.1%</td>
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<td>30</td>
<td>10</td>
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<td>11</td>
<td>4</td>
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<tr>
<td>10</td>
<td>9</td>
<td>3</td>
<td>33.3%</td>
</tr>
</tbody>
</table>

Table I
Table II illustrates the onset of the extraregional pain. In the vast majority of the cases (85.5%), pain firstly appears between the third and the sixth month. This can be explained by the fact that this pain is caused by an overload of some muscles, consequent to the incorrect use of the shoulder. To develop a symptomatic overload it is necessary a prolonged time of unbalanced muscle use. The onset of symptoms after the 7th month is likely connected with the resolution of the impingement syndrome in most patients.