

## Effects of early diagnosis of the wrist over-use syndrome on the treatment

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### ABSTRACT

**Aim** To demonstrate the effects of early diagnosis of overuse syndrome in the wrist on healing, pain intensity and quick recovery to daily work and sport activities.

**Methods** This clinical retrospective study included 60 patients of both sexes aged from 22 to 44 years, with pain in the wrist and clinical signs of creeping tenosynovitis. Patients were divided into two groups: the first group - persons doing sports activity, and the second group - patients who did not deal with sports activities.

**Results** Females in 31 (51.7%) cases compared to males with 29 (48.3%) were slightly more represented in the total sample. Patients with injuries due to sports activities had previously reported to the physician and the diagnosis was set at an average of  $3.1 \pm 0.9$  days after the first symptoms (the range of 2-5 days), compared to the patients of the second group whose diagnosis was set at an average of  $4.7 \pm 1.1$  days after the first symptoms ( $p < 0.05$ ).

**Conclusion** Patients involved in sports activities were more motivated for faster recovery, they had earlier doctor's examination with rapid reduction of subjective symptoms during intensive physical therapy.

**Key words:** forearm tendinitis, overstretch, inflammation, conservative therapy over-use syndrome, early diagnosis, pain, wrist joint

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## INTRODUCTION

Over-use syndrome occurs as a consequence of repetition of similar movements over a long period of time, especially bending and protrusion movements in the wrist and hand. Performing repeated movements in the forearm and hand wrist, especially dorsiflexion, if performed under force-load may result in a collision syndrome on the dorsal side of the radiocarpal joint (1,2). Most commonly it is seen in people who over-use the wrist in every day work, as well as in sports activities (3,4). The pain that increases when the wrist is in the starting amplitude of the range of motion is the most pronounced symptom. The affected tendon is hard, the skin above the tendon is red and warm if the strain lasts longer. Responsive tendon inflammation occurs after repeating activity in flexion and extension. When patients fix the wrist, and then flex and extend the fingers, they can feel palpatory crepitations from the dorsal and proximal side of the wrist (5,6). De Quervain's disease is traumatic tenosynovitis of the extensor pollicis brevis and abductor pollicis longus muscle due to scraping between their tendons. Pain occurs when the thumbs are pushed away and aside resulting in tendon irritation. Incidence is higher in women probably due to the greater range of motions in the thumb especially further to the side when micro traumas are produced (7). The basic symptom of over-use syndrome is pain that can be of varying intensity, from mild, after activity, to permanent that prevents any activity (8,9). Pain is enhanced by flexing the hand to the thumb and can spread to the thumb or to the forearm side of the thumb. A characteristic symptom is also a reduction in the strength of the hand. Patients complain about the appearance of severe pain when lifting very light weight, such as raising cups of coffee or tea (10). Fluid or connective tissue in a tightly framed channel leads to higher pressure on other structures, from which the most sensitive is the central nerve (11,12). The most common pain occurs in the movement of the ulnar deviation (moving the fingers to the side to the small finger) with the over-use of the thumb (13). For diagnosis, a "Filkenstein test" is applied when the thumb is placed in the palm of a hand and closed with fingers, passive ulnar deviation is done with strong pain that shows above the radial styloid (3,14,15). The „rowing“ forearm is present at the point where the tendons of extensor pollicis brevis and abduc-

tor pollicis longus muscle cross over the extensor carpi radialis longus and extensor carpi radialis brevis muscle (16). The name of the syndrome most often occurs in rowing boats sportsmen and kayakers, and sometimes even in tennis players, weight lifters and athletes who deal with throwing disciplines (17,18). Strong crepitations from the radial side of the forearm with reduced strength of the hand are the most characteristic symptoms of this syndrome (19). Both syndromes include the inflammatory condition of the tendon in the forearm and wrists (20). Based on a detailed anamnesis and clinical examination with specific clinical tests, the early diagnosis is possible (21,22). In clinical presentation oedema, palpatory pain on the radial side of the forearm at about 4 cm above the wrist, and in the case of advanced stage, redness and crepitations from the radial side of the forearm with reduced force of the hand are present (5,6). Clinical examination can show functional changes in active and passive mobility of the wrist, sometimes even the presence of effusion in the joint, local signs of inflammation, or haemathoma (23). Standard X-ray of the wrist is in most cases normal. It is designed to detect some damage or deformation of the wrist, and in a small number of cases, it can show calcifications or degeneration changes (24). The ultrasound examination may identify focal hypoechoic areas within the tendons that are thickened and around which traces of effusion as well as calcification in musculoskeletal structures can be found (1,18) Ultrasonic diagnostics today is an unavoidable diagnostic method for the diagnosis of tendinitis and similar conditions (25). The significance of ultrasonic diagnostics increases during a dynamic examination like muscle inspection during contraction and relaxation or tendon inspection during passive or active stretching. For the proper treatment, it is most important to modify or stop activities that cause the symptoms. It is necessary to avoid repeated movements in the wrist (7,8). The orthoses that are used in the treatment immobilize the thumb and the wrist (26). In the first phase of the rehabilitation program, cryotherapy and non-steroidal antireumatics are used. In the second stage, kinesiotherapy exercises help eliminate the symptoms (15,16). Early diagnosis of the syndrom is important for the treatment that should be started as early as possible. With conservative treatment, healing is achieved in about

85-90%. Surgical treatment is rarely applied and is reserved for resistant painful overcapacity and recurrences most commonly in specific sports (19).

## PATIENTS AND METHODS

### Patients and study design

This clinical, retrospective study included 60 patients (aged 22 to 44) who had clinical signs of tendon inflammation in the wrist, who were admitted and treated at the Orthopaedics and Traumatology Clinic of the University Clinical Centre of Sarajevo during 2016.

The analysed parameters included age, gender, pain perception (visual-analogue scale), duration of the immobilization, and physical therapy. Visual-analogue (VAS) scale is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot be easily measured directly. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective this spectrum appears continuous ± their pain does not take discrete jumps, as a categorization of none, mild, moderate and severe would suggest. It was to capture this idea of an underlying continuum that the VAS was devised. VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score was determined by measuring in millimetres from the left hand end of the line to the point that the patient marks (27,28). For pain intensity, the scale is most commonly anchored by "no pain" (score of 0) and "pain as bad as it could be" or "worst imaginable pain" (score of 100; 100-mm scale). A higher score indicates greater pain intensity. Based on the distribution of pain VAS scores in postsurgical patients (knee replacement, hysterectomy, or laparoscopic myomectomy) who described their postoperative pain intensity as none, mild, moderate, or severe, the following cut points on the pain VAS have been recommended: no pain (0–4 mm), mild pain (5–44 mm), moderate pain (45–74 mm), and severe pain (75–100 mm) (11). Normative values are not available.

Patients were classified into two groups: group I - 30 patients who had sustained sports-related

symptoms, and group II - 30 patients who had sustained non-sport related symptoms. A side of the upper extremity without symptoms was in both groups of patients used to take control parameters, and thus, an exact functional result could be obtained without the possibility of any positive or negative variation.

### Methods

All data for this research were gathered through patient protocols of the Outpatient Clinic of the Clinic for Orthopaedics and Traumatology. After the first examination by the orthopaedic surgeon, all patients included in this research had ultrasound examination of the forearm and wrist that confirmed diagnosis of the over-use syndrome. After the initial conservative treatment with immobilization by orthopaedic surgeon that showed regression of the subjective symptoms, all patients underwent physical therapy at the Clinic for Physical Medicine and Rehabilitation.

### Statistical analysis

The results are presented in tables and graphs through the number (percentages) of patients, arithmetic mean with standard deviation and range of values. The comparison between the two groups of patients was performed using the  $\chi^2$  test, Student-t test, Pearson correlation coefficient and analysis of variance results of all tests. Tests were considered significant with reliability of 95% ( $p < 0.05$ ).

## RESULTS

Females were slightly more represented in the total sample comparing to males, 31 (51.7%) and 29 (48.3%), respectively. An analysis by the groups showed that although males were slightly more represented in the group of injuries due to sports activities, females in the group with injuries resulting from professional activities did not show significant difference between the groups ( $p=0.303$ ). The sample was homogenous by gender (Table 1).

Table 1. Distribution of the patients by gender

Gender	No (%) of patients		Total
	Group I sport activities	Group II professional activities	
Males	16 (53.3)	13 (43.3)	29 (48.3)
Females	14 (46.7)	17 (56.7)	31 (51.7)
Total	30 (100)	30 (100)	60 (100)

$p=0.303$

The average age in the total sample was  $31.8 \pm 5.9$  years and ranged from 22 to 44 years. Patients in group I were slightly younger than the average age, of  $30.7 \pm 5.9$  years (range 22-44 years), and in group II they were slightly older with an average age of  $32.8 \pm 5.8$  years (range 25-44) ( $p > 0.171$ ).

Patients with injuries due to sports activities (group I), that reported to the Clinic immediately after the injury and the diagnosis was established (on average)  $3.1 \pm 0.9$  days after the injury (range 2-5 days), were compared to patients with injuries due to professional activities (group II) with diagnosis established (on average)  $4, 7 \pm 1.1$  days after the injury. Statistical analysis suggests a marked difference in the injury-diagnosis period between the groups ( $p < 0.05$ ).

Most of the injuries in both groups were on the right side of the body, in 22 (73.3%) and 20 (66.7%) patients, respectively ( $p > 0.05$ ).

The duration of immobilization in total sample averaged  $13.8 \pm 1.5$  days (range 10-20 days), and it was slightly longer in group II with an average of  $14 \pm 2.5$  days (range 10-20 days) in relation to group I, with an average of  $13.5 \pm 1.5$  days (range 10-15 days) ( $p > 0.05$ ). The duration of physical therapy in the total sample was  $14.2 \pm 3.04$  (range 5-20) and was statistically significantly shorter in group II with an average of  $13 \pm 3.6$  days (range of 5-20 days) in relation to the group I with an average duration of  $15.4 \pm 1.6$  days (range 14-20 days) ( $p < 0.05$ ).

Analysis of pain perception through VAS scale showed that the score of the pain was almost the same in both groups at the beginning,  $7.4 \pm 0.5$  in

group I and  $7.3 \pm 0.8$  in group II. After 4 weeks a significant difference ( $p < 0.05$ ) was observed in terms of significantly less pain score in the group I,  $3.9 \pm 0.5$  comparing to group II,  $4.4 \pm 0.6$ . Similarly, the analysis of the reduction in the grade of pain (initial 4 weeks) showed a greater decrease ( $p < 0.05$ ) in the group I,  $3.5 \pm 0.7$  compared to the group II,  $2.9 \pm 0.9$  (Table 2).

**Table 2. Analysis of pain perception/reduction score using the Visual-analogue scale (VAS)**

Pain perception/ reduction	Group of patients*	VAS score				
		N	X	SD	SEM	Min Max
At the beginning of the treatment ( $p=0.427$ )	I	30	7.433	.5371	.0981	6.0 8.0
	II	30	7.290	.8214	.1500	4.5 8.5
	Total	60	7.362	.6919	.0893	4.5 8.5
After 4 weeks ( $p=0.003$ )	I	30	3.967	.5074	.0926	3.0 4.5
	II	30	4.417	.6029	.1101	3.5 5.5
	Total	60	4.192	.5973	.0771	3.0 5.5
VAS pain reduction ( $p=0.007$ )	I	30	3.4667	.68145	.12441	2.00 4.50
	II	30	2.8733	.94793	.17307	.00 4.00
	Total	60	3.1700	.87145	.11250	.00 4.50

\*group I, patients who had sustained sports-related symptoms; group II, patients who had sustained non-sport related symptoms; N, number of patients; X, variable; SD, standard deviation; SEM, standard error of the mean; Min., minimal value; Max., maximal value;

The statistically significant correlation according to the time period from the injury to diagnosis was recorded according to the VAS pain score after 4 weeks ( $r=0.395$ ;  $p=0.003$ ) in the sense that the respondents who were later evaluated had a higher grade of pain after 4 weeks. Significant negative correlation was also noted for VAS pain reduction ( $r = -0.294$ ;  $p=0.028$ ), suggesting that the grade of pain decreased less after 4 weeks in subjects who had a longer period of time from injury to diagnosis establishment (Table 3).

**Table 3. Correlation according to the time period from the injury to diagnosis**

Variable		Time from injury to diagnosis	Duration of immobilization	Duration of physical therapy	VAS pain score at the beginning	VAS pain score after 4 weeks
Duration of immobilization (days)	$r^*$	0.233				
	$p^\dagger$	0.089				
	N	54				
Duration of physical therapy (days)	$r^*$	-0.236	0.168			
	$p^\dagger$	0.089	0.221			
	N	53	55			
VAS pain scale at the beginning	$r^*$	-0.040	-0.215	-0.142		
	$p^\dagger$	0.770	0.105	0.291		
	N	56	58	57		
VAS pain scale after 4 weeks	$r^*$	0.395‡	0.049	-0.053	0.092	
	$p^\dagger$	0.003	0.715	0.696	0.485	
	N	56	58	57	60	
VAS pain reduction	$r^*$	-0.294¶	-0.220	-0.067	0.731‡	-0.612‡
	$p^\dagger$	0.028	0.098	0.619	0.000	0.000
	N	56	58	57	60	60

\* $r$ , Pearson Correlation coefficient;  $^\dagger$ Two-tailed significance test;  $^\ddagger$ Correlation is significant at the 0.01 level (2-tailed);  $^\S$ Correlation is significant at the 0.05 level (2-tailed);

N, total number of patients;

## DISCUSSION

Results of this study have shown that males were slightly more represented in the group of injuries due to sports activities; females mostly were in the group of injuries resulting from professional activities probably due to the greater scope of the movements of a thumb farther to the side (11,17). Physician's help is always sought late, usually when pain is a major disruption to sports or professional activity. However, when a clinical picture is developing, the treatment is difficult and is primarily based on a shorter or longer break or a significant reduction in the intensity of sports or professional activity, which is difficult for a patient to accept (17,18).

The patients in this study with injuries due to sports activities had earlier reported for an examination. The local tissue injury is reduced by rest, the cooling and compression effects are improved, so the healing process is better (9).

A quality orthosis can be adjusted, it has low weight and appropriate strength, easy to apply and aesthetically acceptable (3,7,9).

The application of various physical therapy procedures after acute healing has the purpose of alleviating pain and enhancing the healing of the affected area of tendons supplied with sensory nerve endings (19). The pain is caused by excessive load (compression, stretching) as the synthesis of algogenic bioactive substances (lactate, catecholamine, acetylcholine, glutamate, substance P, prostaglandins, cytokines) is then increased (10,11). Pain is restricted due to the pain in the manual joints and forearms. Mechanical load results in minor or major damage to the tendons of affected muscles, their bone marrow, and untreated and chronic patients and damage to the surrounding area (18). The most common symptoms include reduced hand function, sensitivity, and pain beyond the bone muscle baseline, and pain is enhanced by the use of a hand. Symptoms develop gradually and worsen over time if the disease is not treated (7,19). One of the theories is that pain is caused by unsatisfactory tissue reactions to produce collagen, due to poor regeneration of the tissue. Another theory points

out that the appearance of pain is due to newly created blood vessels that arise in response to the burden (24). Transient ischemia is a stimulus for nerve endings to register pain (25).

The statistically significant correlation for the time period from injury to diagnosis was recorded according to the VAS pain scale after 4 weeks in the sense that the respondents were later evaluated with a higher grade of pain after 4 weeks (13,19). The results of the presented study have shown that the patients in the I group dealing with sports activities were more motivated for their earlier appointment to the physician, as well as setting up early diagnosis and adequate treatment. It is primarily about painful syndromes that cause the patient to go to the doctor. Medical help is required almost always late, when pain is a major disruption to sports or professional activity (26). However, when a clinical image of over-use syndrome develops, treatment is difficult and is primarily based on shorter or longer interruption or a significant reduction in the intensity of sports or professional activity, which is difficult to accept in patients (9,19). None of the nonoperative or surgical methods for over-use syndrome has yielded one hundred percent successful results, and therefore, the importance of the prevention and early diagnosis, which has been given more attention with the individual approach lately (3,9,19).

A limitation in our research was the VAS pain scale use since it is a subjective scale, but generally recognized pain scale.

In conclusion, over-use syndrome represents important condition that can disable a person in everyday activities and it demands multidisciplinary approach in the treatment. Results of our research are consistent with other similar researches showing that more active patients rehabilitate better than the less active patients.

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## TRANSPARENCY DECLARATION

Competing interests: none to declare

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