

Potentiating the Effect of Treatment with Voltaren Gel Using Ultrasonic Frequencies of 1 MHz

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The effects of nonsteroidal anti-inflammatory drugs (NSAIDs) in abarticular conditions are well known. The aim was to compare the efficacy of NSAIDs, of Diclofenac drug class (Voltaren gel, in this case) applied topically, with and without ultrasound, for a period of 10 days in abarticular rheumatic diseases. The following parameters have been aimed at: pain, functional impotence and quality of life index. One gram of gel was applied daily for an area of 100 cm². The treatment was applied to patients in an outpatient regime. Therapeutic ultrasound frequencies were used. Among the effects of selective warming of the areas exposed to ultrasound, we mention: decreased joint stiffness, increased pain threshold of peripheral nerves and nerve endings, moderate increase of blood flow, increased joint mobility.

Keywords: pain, abarticular disorders, ultrasound conditions, NSAIDs

Abarticular rheumatic diseases - are conditions affecting the periarticular soft tissue (muscles, tendons, ligaments, bursae). The symptoms include pain and stiffness in the affected area [1]

For effective treatment, it is very important to practice evidence-based therapy. Practitioners should use interventions supported by scientific evidence [2, 3].

Despite a long-standing tradition of ultrasound physical therapy used in the treatment of musculoskeletal conditions, neither ultrasounds, nor specific aspects of NSAIDs have been tested for efficacy in the treatment of pain [4, 5].

The purpose of the study was to identify the effectiveness of two physiotherapy programmes of abarticular rheumatic diseases: Diclofenac applied topically, with and without ultrasound.

An abarticular rheumatic disease is a disease manifested by one or a combination of several symptoms such as pain, numbness in the extremities. Treatment consists of rest, topical administration of NSAIDs, muscle relaxants, local cortisone injection, physiotherapy, medical gymnastics [3].

Cold applications are useful (cold compresses or ice bags) resulting in relieving pain and reducing swelling.

Ultrasound physical therapy is a known method that has proven effective in joint and soft tissue pathology in acute, subacute and chronic stages [6, 7, 8]. Ultrasounds penetrate the tissues causing thermal and mechanical energy [9]. Locally, it proved to increase temperature of the tissue, thus favouring the blood flow.

The application of ultrasound can speed up biochemical reactions, alter diffusion and cellular metabolism, enhance oxidation-reduction reactions and can produce the thixotropic effect [10, 11].

Application of ultrasound treatment reduces the algic component, decreases articular stiffness and muscle contracture, and by increasing the local temperature, it allows an increase of blood flow. In ultrasound radiation exposed blood the following processes take place: reduced number of red blood cells, a slowdown in the clotting

process of the blood, a variation of the total seric calcium, etc [12, 13].

For a proper treatment, it is important to have the values of these blood elements correctly determined [14].

The physical parameters of importance for the recovery therapy are: vibration frequency (the best is 800 kHz), intensity (expressed in W/cm²), the working method of the transmitter (continuous or pulsed), contact environment, duration, the interval between sessions [15, 16].

Experimental part

The study was done in an outpatient setting, for a period of 10 months, in 2016.

The study included a total of 312 patients with abarticular rheumatic diseases (bursitis, tendonitis, tenosynovitis) divided into two groups: group G1 included a total of 126 patients receiving NSAID therapy - administered locally by gently massaging the painful region, and group G2 with 186 patients receiving NSAID therapy, administered locally, but by applying ultrasounds. We note that all patients have also followed physical therapy recovery programme.

Selection criteria of the patients in these groups were the following:

- patients who had painful and functional abarticular symptoms
- age 18-70 years
- clinical and laboratory diagnosis (radiography, musculoskeletal ultrasound, MRI)
- absence of skin lesions
- the absence of contraindications to NSAID treatment
- without neuropsychiatric disorders

Evaluation of patients was done on an outpatient basis at the beginning and at the end of the recovery treatment, which lasted 10 days.

Clinical and functional parameters followed in the two groups at the beginning and end of the recovery treatment were: pain, functional impotence, quality of life.

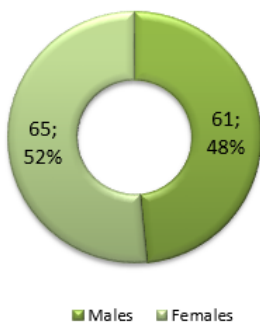
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All authors have equal contributions to the study and the publications.

Table 1
DISTRIBUTION OF GROUPS G1 AND G2 ACCORDING TO AGE GROUPS AND GENDER

Group/ Gender		No. of cases (%)	Age group				
			18-30 years old	31-40 years old	41-50 years old	51-60 years old	61-70 years old
G1	Total	126	38	24	24	18	23
	Males	61 (48.41%)	16	13	12	9	12
	Females	65 (51.59%)	12	11	12	9	11
G2	Total	186	6	22	63	77	18
	Males	88 (47.31%)	4	13	24	38	9
	Females	98 (42.69%)	2	9	39	39	9

Group without US



Group with US

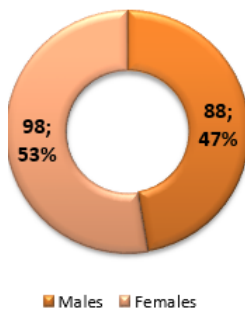


Fig. 1. Distribution of groups G1 and G2 according to gender

Evaluation tests used were: VAS pain scale, Quality of Life Scale- QOL

VAS scale - is a method of subjective self-assessment by the patient reporting the painful sensation. The level 10 indicates an unbearable pain and level 0 means absence of pain.

The quantified assessment scale - QOL measures the personal satisfaction in 16 distinct areas of life, among which we mention: financial security, health, relationships with family and friends, learning, work, creativity, social life, reading and personal independence.

The equipment used was the Chattanooga combine. In our study, there were applied ultrasonic frequencies of 1MHz, continuous mode, with medium intensity 0.5-0.6W/cm² ensuring a penetration of 3-6 cm, daily application for 3 min. One gram of gel was applied daily for an area of 100 cm².

Demographic data of the study groups G1 and G2 are shown in the following tables and graphics.

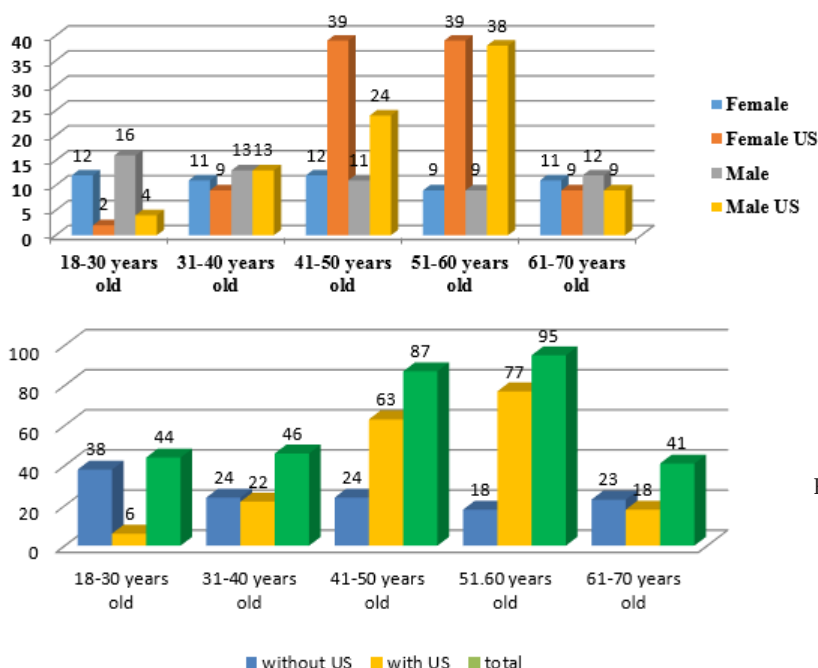


Fig. 2. Age group and gender distribution in groups G1 and G2

Fig. 3. Age group distribution of groups G1 and G2

The table shows that of the group G1 with 126 patients, 61 (48.41%) were males and 65 (51.59%) females. Age group distribution shows a greater number of patients (38) in the age group of 18-30 years old, 24 patients in the age groups of 31-40 years and 41-50 years, 23 patients in the age group of 61-70 years old and 18 patients in the age group of 51-60 years.

In group G2 with 186 patients, age group distributions shows a number of 77 patients in the age group of 51-60 years, 63 patients in the age group of 41-50 years, 22 patients in the age group of 31-40 years, 18 patients for the age group of 61-70 years and 6 patients in the age group of 18-30 years.

Results and discussions

Pain evaluation was performed by applying the VAS scale for both groups.

From the data obtained, it has been found that pain decreased in the patients treated with

Diclofenac gel (Voltaren) using ultrasound, having statistically significant values in group G2 in which ultrasound was applied ($p = 0.049904$) compared with G1 ($p = 0.061505$).

Improving patient quality of life is the goal of the recovery programme and it was evaluated by using the Quality of Life Scale-QOL.

The data show improved quality of life in patients receiving treatment with Voltaren gel using ultrasound, where p is statistically significant ($p = 0.45272$) versus group G1 without application of ultrasound, where p is not statistically significant ($p = 0.085921$).

There have been found highly significant differences between scores means, as well as between the values of standard deviation calculated for the 2 groups.

Groups	Standard deviation		T-student test	Statistical significance
	initial	final		
G1 without ultrasound	0.2822	0.2529	0.0615	p> 0.05 NS
G2 with ultrasound	0.1451	0.1617	0.0499	p< 0.05 S

Table 2
STATISTICAL RESULTS IN
GROUPS G1 AND G2 AFTER
APPLYING THE VAS SCALE

Groups	Standard deviation		T-student test	Statistical significance
	initial	Final		
G1 without ultrasound	13.3984	13.4968	0.0859	p> 0.05 NS
G2 with ultrasound	15.7895	10.9959	0.0453	p< 0.05 S

Table 3
STATISTICAL RESULTS IN THE
GROUPS G1 AND G2 AFTER APPLYING
THE QOL SCALE

There are no significant differences in scoring for female and male gender.

None of the patient reported on adverse events related to the application of therapeutic ultrasound [11].

Statistical results obtained meet the requirements of the study, namely, the application of ultrasound recovery programme and local NSAIDs allow a significant increase in the score during the recovery programme [17]. The biological effects of applying ultrasound are the outcome of ultrasound interaction with cellular structures, the resulting effects being dependent of wave characteristics (frequency, intensity) [18, 19].

Conclusions

The groups taken into discussion, namely the group treated with ultrasound and the control group were homogenous in terms of demographic factors (age, gender).

Applications of ultrasound (high frequency mechanical oscillations) bring about antalgic, anti-inflammatory, fibrolytic effects and, by the oscillating movement of tissue molecules, changes in cell membrane, fluid movements also occur. It has been also found a decrease in pain parameter and an increase in the quality of life index parameter.

Application of topical NSAIDs enhanced by ultrasound allows for better absorption of the active substance compared with topical application by massage.

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