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Original article

THE EFFECTS OF MEDIUM FREQUENCY CURRENT UPON LUMBAR PAIN

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Abstract

Aim: The study started of the idea of proving once more the effects of electrotherapy in general and of the medium frequncy currents in particular, upon low back pain amelioration.

Methods: The research was conducted at the Balneal and Recovery Sanatorium Techirghiol in 2019 and 14 subjects were included, diagnosed with low back pain of various causes: lumbar discopathy, lumbar spondylosis, myofascial syndrom, spondylitis ankylopoetica. All of them attended 10 sessions of electrotherapy, various procedures, for two weeks and were evaluated initially and finally with the Visual Analogue Scale (VAS).

Results: The distribution of the VAS score media values by pathology are as follows: the highest media is at the lumbar discopathy subgroup (7,86), the lowest at the lumbar spondylosis subgroup (6,5). The most favorable evolution had the spondylitis ankylopoetica subgroup, from value 7 to 0 (absence of pain), but it is not semnificative due to the small number of subjects (1). Per pathology groups and percentage, the pain intensity decrease was minus 80% for lumbar discopathy group, 69% for lumbar spondylosis and 93% for myofascial syndrom group.

The analyse of the pain intensity decrease by fixed frequency prescribed highlights the higher analgesic quality of the higher frequencies, as follows: for the 35 Hz frequency, the VAS score was minus 71,87%; for the 50 Hz frequency – minus 76,96%; for the 80 Hz frequency – minus 79,95%.

Conclusions: The tetra polar application decreased the VAS score with 80% and the bipolar application with 82%. As the study demonstrated, the differential action of the constant and variable frequencies has to have as curative objectives three main factors: the pain threshold increasing, the stimulating effect and the vegetative nervous system influence

Key-words: low back pain, electrotherapy, medium frequency current.

Introduction

The lumbo-sacrat spine pathology is characterized by multiple particularities, but pain is the most common symptom, with large variations of intensity, duration, pattern and causes (Arseni, 1967).

The lumbar conditions, so much spread among adult population, raise numerous issues regarding medical assistance, in many countries this kind of pathology receiving considerable attention because its social costs and public health matters (Webster B.S., Snook, 1990).

In the medical environment, there is not a consent regarding the optimum approach of the lumbar pain. Various methods and techniques are utilized, depending upon which type of specialist consults the pacient: rheumatologist, neurologists, orthopaedics, physical therapist etc (McKenzie, May,2004).

The low back pain might occur suddenly, after a specific physical effort, or in hours/days, insidiously. In an acute episode, the lombalgia has high intensity, it worsens at lumbar spine movements and in standing postures and decreases in supine, with a duration of days, even weeks (Lucescu, 2009).

The lumbar paravertebral reflex muscular contracture that accompanies the pain is present at the majority of the affected subjects. Most of the time it is unilateral.

Pain is a multifactorial phenomenon and practice proves that the different kinds of pain respond more or less at the various types of electrotherapy procedures (Ward, Lucas-Toumbourou, McCarthy, 2009). Also, the problem of physical exercise, with its many valences, are presently approached on a wide scale, due to the positive impact of physical activities upon the human biological side (Bota, Dragnea, 2010) in general and for the lumbar conditions in particular, so these two types of therapeutical means are most frequentely utilised in the rehabilitation process.

Few mechanisms exist that explain the analgesic effect of the electrotherapy. Along with the well known threshold of painful sensitivity theory, it has beeing demonstrated the increase of the endogenous opioids production through its synthesis by the human brain (Vedhara, Irwin, 2017). The analgesic effect is also

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sustained by the trofic effects of the current flux. The muscular relaxation gently removes the local hypertonicity and thus the pain of myofascial origin.

The analgesic property of the electrotherapy is utilised on a large international scale. For its means to have a real benefit for the patients, it is necessary to be taken into consideration the next principles (Ward, Reed, Low, Robertson, 2002):

- The pain function of signalization and protection won't be suppressed (important especially in acute pain), meaning that first it will be taken into consideration the signal given by the pain, it will be determined a correspondent diagnosis or at least a preliminary hypothesis for it and after all this the intervention against pain will start. The pain which has been modified by the electrotherapy or analgesic medication could lose its specificity and thus cannot be described afterwards;
- Electrotherapy admistrated in analgesic purposes determines the considerable reduction of the analgesic medication quantity. This rule is important due to the posibility of obtaining the analgesic effect, which is the electrotherapy main target, in contrast with the difuse action of the medication and due to the possible un wished interactions between electrotherapy and medication;
- When the type of electrotherapy procedure will be chosen, it will be taken into consideration the probably effects, conform the threshold theory and the opioids theory;
- For the chronic or the recurrent diseases, before applying various types of currents, the locomotor body system will be examined, because very often the pain source of these diseases is located apart from the pain projection area.

The medium frequency currents utilised for medical purposes are alternative sinusoidal currents, having frequencies between 1000 Hz (1k Hz) and 100000 Hz (100k Hz), limits established by Gildemeister and Wyss (Daia, 2019).

In the therapeutical field generally there are used devices which provide currents with 3-10k Hz (3000-10000 Hz) frequency. The alternative currents from this domain have a series of properties which give them distinct particularities and effects, in comparison with the low fequency currents. Different from the last ones, at which at every impulses period is followed by an excitation (the principle of the syncrone excitations), at the medium frequncy current the nervous myelinic fibres excitation is possible only after a succesion of alternative currents periods, thus after a summed of medium frequncy oscilations (Rădulescu, 1991). This is „the temporary summed effect", descibed by Gildemeister.

In order to obtain the temporary summed effect, the medium frequency current must have over a specific intensity level and a specific due time. Thus it is necessary in this situation also, same as for the low frequncy excitation, a specific due time, depending on the excited tissue, for a stimulation to be triggered. The shorter is the due time, the higher is the excitation. Prelonging the time of the medium current passing over the due time has no importance for the excitation effect onset. The higher it grows the current frequency, the bigger is the number of the necessary periods for triggering a potential of action (Watson, 2000). This effect does not increase continuum, liniar, but knows two maximum points, described by Schwartz.

The main physiological effects of the medium frequncy currents can be formulated as follows (Rădulescu, 1991):

- Stimulation effect upon the skeleton muscles, producing powerful contractions, reversible and well tolarated;
- Stimulation effect upon the visceral muscles of some internal organs, possible to obtained through slowly increased modulations (in 3-5 seconds) and longer;
- Analgesic effect;
- Resorbable and hyperemiant effect;
- Derivative effects: de-contracturative, muscular relaxant, trofic, through vascular dilatation upon the vegetative structures (vague nerve stimulation - Mușat, Rizescu, Stroe, et all., 2020).

Electrotherapy cannot be applied without taken into consideration the objective situations which forbbid this type of procedure: active tuberculosis, neoplasm, infectious/contagious diseases, its application in the heart or eyes area, cochlear implant, metallic implants, pace-maker, cutaneous diseases which interfere with the electrodes dermal fixation, menstruation, pregnancy, psycho-pathological syndroms (Lucescu, 2009).

Method

The study had been placed at the Balneal and Recovery Sanatorium Techirghiol, in 2019 autumn and had included 14 subjects, who had attended 10 electrotherapy sessions (various procedures) for low back pain suffering, for two weeks, with a break on the weekend, during their sanatorium internment.

Including into the experiment criteria: low back pain, semnificative history of lumbar degenerative pain, discal type, the absence of anti-inflammatory and/or antialgic medication, no cutaneous issues in the lumbar area.

Excluding from the experiment criteria: referred pain on the lower limb, any contraindication signs for the electrotherapy.

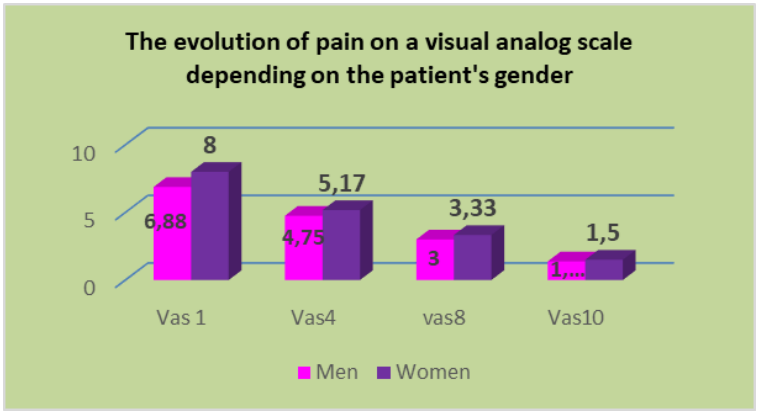
The patients had been clinical examined by the sanatorium rehabilitation specialists, for establishing the diagnosis and the physical treatment strategy. For the evaluation of the electrotherapeutic application efficacy it had been utilized the Visual Analogue Scale (VAS), with a 0-10 quotation, where 0 is pain absence and 10 is unbearable pain.

The study subjects were aged between 21 and 75, with a media of 46,57 years. There had been 8 men,

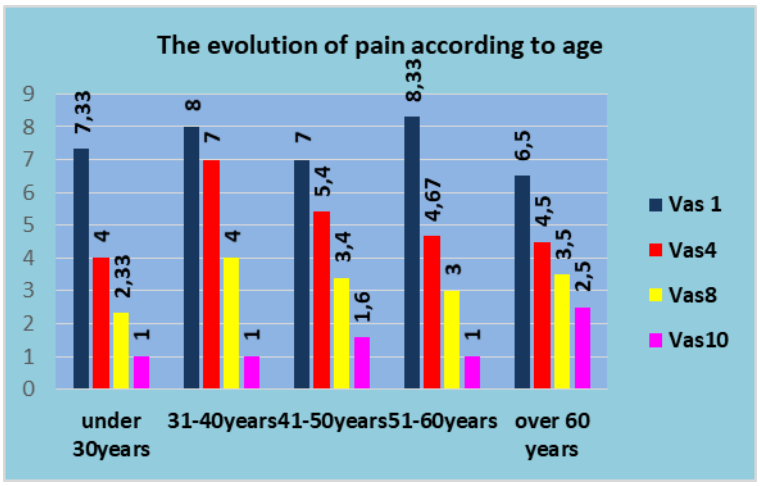
with and age media of 44,12 years and 6 women, with an age media of 49,83 years. 7 subjects were diagnosed with lumbar discopathy, 4 with lumbar spondilosis, 1 with spondilitis and 2 with myofascial syndrome.

Results and discussion

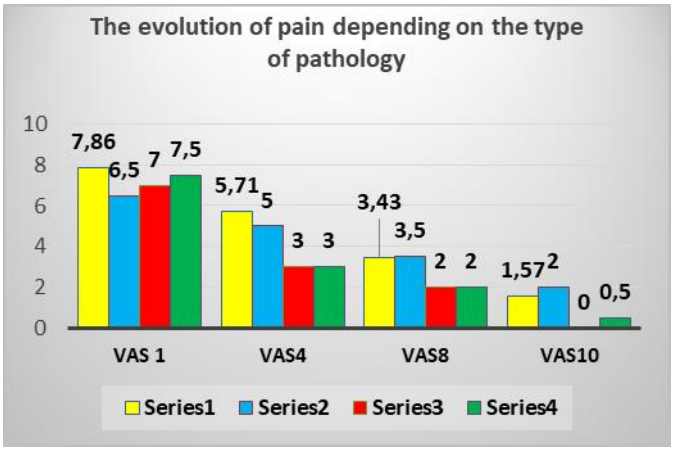
The utilised frequencies and the application type are presented in graphic number 4. The data analyse highlights that for low back pain (lumbar discopathy), spectrum mode is recommended with the highest frequncy: 80-100 Hz. For this type of patients the tetra polar application had been mainly utilised, along with the bipolar one. For spondilosis, the used fixed frequencies are those with vascular active effects and the indicated spectrum mode is the one with analgesic frequencies, exclusively in tetra polar application, same as for myofascial syndrome.



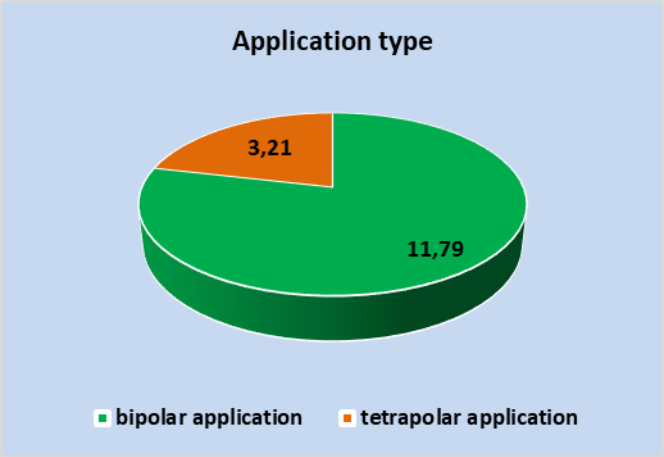
Graphic 1. Pain evolution by gender



Graphic 2. Pain evolution by age



Graphic 3. Pain evolution by pathology



Graphic 4. The application type

From data analyse it observes that the biggest value of the VAS media score before the experiment started is at the 51-60 age group, which had during therapy a score decreasing from 8,33 to 1, meaning a 7,33 variation or a pain intensity diminishing with 87,99%. This group had the best evolution.

The patients from the 31-40 age group had a similar VAS score evolution, from 8 before the experiment, to 1 at the end of it, meaning a 87,5% pain intensity decreasing.

The lowest pain intensity at the beginning of the study was noted at over 70 group age and it had a 6,50 score. This group had also the highest VAS score at the end of the study, of 2,50, with 69,23% pain intensity decreasing. Considering the polipathology involved in this group age, the modest score evolution is justified.

Per percentage, the decreasing of pain intensity at men subjects was minus 79,94% and 81,25 at women subjects, so the results were better at the last subgroup.

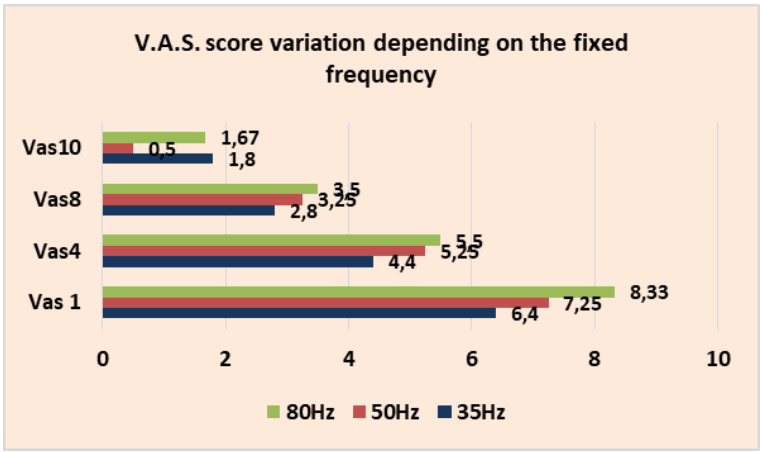
The distribution of the VAS score media values by pathology are as follows: the highest media is at the lumbar discopathy subgroup (7,86), the lowest at the lumbar spondilosis subgroup (6,5). The most favorable evolution had the spondilisis subgroup, from value 7 to 0 (absence of pain), but it is not semnificative due to the small number of subjects (1).

Per pathology groups and percentage, the pain intensity decrease was minus 80% for lumbar discopathy group, 69% for lumbar spondilosis and 93% for myofascial syndrom group.

The analyse of the pain intensity decrease by fixed frequency prescribed highlights the higher analgesic quality of the higher frequencies, as follows:

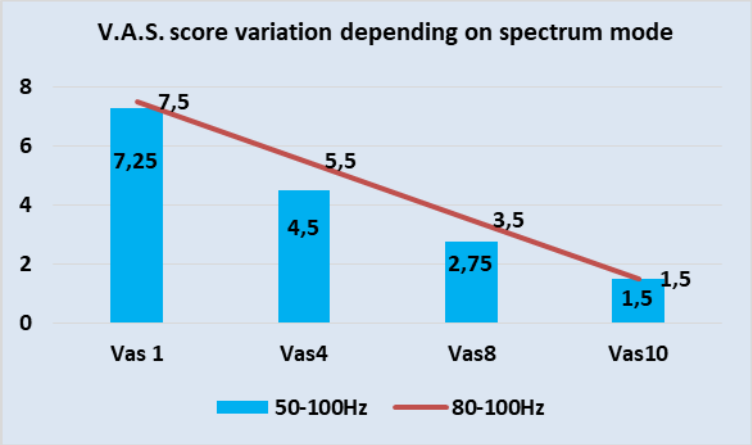
- For the 35 Hz frequency, the VAS score was minus 71,87%;
- For the 50 Hz frequency – minus 76,96%;
- For the 80 Hz frequency – minus 79,95%.

Regarding the VAS score distribution by the fixed frequency, it ascertain that the frequncy chosing is corelated with VAS score at the beginning of the therapy, respectively the highest VAS score media value (8,33) is asociated with the most analgesic frequncy (80 Hz); the 35 Hz frequncy, which has mainly vascular activation effects and only secondary analgesic effects is asociated with a VAS score media of 6,4.



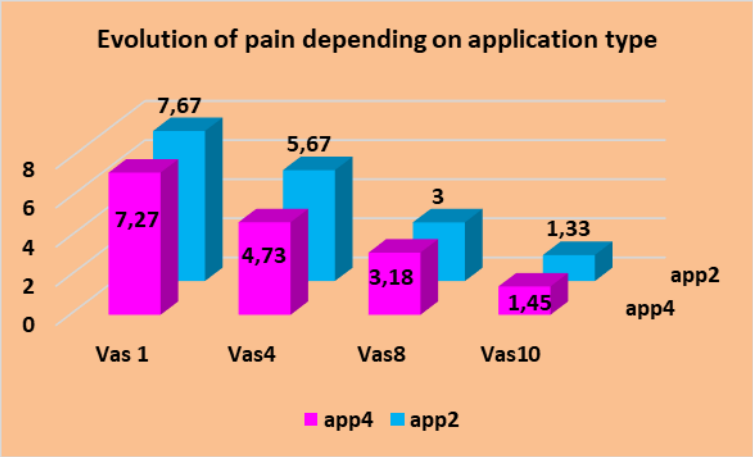
Graphic 5. VAS score by the fixed frequency

For the spectrum mode, the VAS score has a similar distribution with the fixed frequncy mode: at higher values of the frequncy the analgesic effect is more obvious.



Graphic 6. VAS score by the spectrum mode

The VAS score distribution by the interference mode, bi or tetra polar is synthesised in graphic number 7.



Graphic 7. VAS score by the interference mode

It can be observed the association of a higher VAS score before experiment at the subjects which had received a bipolar application prescription. The pain intensity decrease for the bipolar application is of 82% and of 80% for the tetra polar application.

It can be observed the association of a higher VAS score before experiment at the subjects which had synthesised by age, gender, pathology, the interference type and mode and thus the next conclusions outline:

The 51-60 age group had the best evolution, with a pain intensity decrease of minus 87,99% after the therapy sessions. The 31-40 age group subjects evolution was close to that, with 87,5% pain intensity decrease and for the over 70 age group the VAS score decreased with 69,23%.

The women subgroup had better results than the men subgroup, with minus 81,25% pain intensity, versus 79,94% for men.

For the subjects diagnosed with lumbar discopathy the VAS scos was minus 80%, for those with lumbar spondilosis minus 69% and for the subjects having

Conclusions

During the study, there had been no case of symptoms aggravation or adverse reactions due to therapeutic application, there were no subjects exclusion cases. The data were analysed and

myofascial syndrom was 93%, so the electrotherapy antiinflammatory effects are notable in this case.

The analysis of the pain intensity decrease by fixed prescribed frequency is in accordance with the speacialty literature data: the 80 Hz frequncies, respectively 80-100 Hz spectrum have the most analgesic effects. By using fixed frequncy of 80 Hz in this study we obtained a 79,95% pain intensity decrease, for the 50 Hz frequency 76,96% and for 35 Hz frequency the result was a minus 71,87% VAS score. Similar results were obtained utilising the spectrum mode – the higher frequencies have higher analgesic effects.

The tetra polar application decreased the VAS score with 80% and the bipolar application with 82%.

No matter the cause, the low back pain treatment is first hygienic (Creți, 1996) – bed rest for 2-3 days, in order to annihilate the mechanical factors. Afterwards the electrotherapy and others therapeutical means are applied.

As the study demonstrated, the differential action of the constant and variable frequencies has to have as curative objectives three main factors: the pain threshold increasing, the stimulating effect and the vegetative nervous system influence (Rădulescu, A., 1991).

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