



Interest of Transcutaneous Electrical Nerve Stimulation Versus Physiotherapy-Cyriax, in Lumbar Disc Repair. A Prospective and Randomized Study

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Abstract

Background and Aims: Radio-clinical study by functional MRI of the TENS effects, and their impact on the lumbar intervertebral disc in chronic low back pain.

Material and Method: Prospective randomized blinded study, running from September 2021 to August 2023, concerning two groups of chronic low back pain patients with disc herniations, hospitalized for five days. G1 (n = 74) underwent five very low frequency TENS sessions, G2 (n = 66) underwent five physiotherapy sessions combining: infrared, ultrasound and physiotherapy such as Cyriax (n = 66). All patients (n = 149) benefited from analgesic drug treatment and wearing of a lumbar support. Follow-up was done for six months by: age – VAS pain score – root irritation signs, body mass index, chronic smoking – level of disc herniation – VAS-100 satisfaction score – use of surgery - Oswestry Questioner - functional MRI including: CDA of Nucleus Pulposus (VP) and Annulus Fibrosis (AF). The exploration of the results is carried out by the SPSS-20 software.

Results: The two groups are homogeneous, there are no statistically significant differences between TENS and physiotherapy groups concerning age $p = 0,6$ (mean 34 years), BMI $p = 0,2$ (mean 24,9), protrusion stage $p = 0,55$ and concerning Oswestry score on Day-0; $p = 0,24$. The results are better in TENS group with significant and very significant differences in concerning; pain VAS score ($p = 0,004$ at 12 weeks and $p = 0,001$ at 24 weeks), NP CDA ($p = 0,01$ at 24 weeks), duration of associated medical treatments ($p = 0,001$), the Oswestry Questioner and EVA-100 satisfaction scores ($p = 0,001$ at 24 weeks), and concerning.

Discussion and Conclusion: This study shows a good clinical response of TENS treatment associated to lumbar disc diseases repair improving disc hydration state, in patients with chronic low-back pain. It could be an additional argument to increase the role of TENS in chronic low back pain treatment.

Keywords: Chronic Low Back Pain; TENS; Functional MRI; Disc CDA

Introduction

This study presents a final results of research project, in the field of chronic low back pain (CLBP), including lumbar disc hydration.

For more than thirty years, chronic low back pain has been ranked as the leading cause of disability across the world.

In the world, the highest and lowest incidence of low back pain (LBP) was reported in USA and the Netherlands, respectively [1]. In Africa, annual prevalence of LBP was considerably higher than or comparable to global LBP prevalence [2].

However, Due to the scarcity of quality study, in relation of chronic low back pain and lumbar disc repair, it's necessary to conduct works with high levels of proof.

The challenge is to keep lumbar discs in good state of hydration, to ovoid late-stage treatments.

Objectives

The objectives of our study were;

- Analyze the TENS effects, and their impact on the lumbar-intervertebral disc hydration, in chronic low back pain.
- Improve the symptomatology of CLBP.
- Delay the surgery or to ovoid it.
- Reduce number of sick-leave days.

Material and Method

This is a prospective and randomized blinded study, running from September 2021 to August 2023, concerning two groups of CLBP patients with disc herniations, hospitalized for five days. G1 (n = 74) underwent five very low frequency TENS sessions, G2 (n = 66) underwent five physiotherapy sessions combining: Infrared, Ultrasound and physiotherapy such as Cyriax (n = 66). All patients (n = 149) benefited from analgesic drug treatment and wearing of a lumbar support. Follow-up was done for six months by: age - VAS pain score - root irritation signs, body mass index, chronic smoking - level of disc herniation - VAS-100 satisfaction score - use of surgery - Oswestry Questioner - functional MRI including: CDA of Nucleus Pulposus (VP) and Annulus Fibrosis (AF). The exploration of the results is carried out by the SPSS-20 software.

Diffusion and disc CDA values were evaluated by functional MRI (3-TESLA).

Diffusion allows calculation of lumbar disc hydration levels, compared to conventional T2 weighting, diffusion quantifies more easily the disc hyper-signal degree, but still remains an operator dependent examination, and its precisely the study of CDA values of

AF and NP, that allows us to more significantly identify, the lumbar disc dehydration levels.

Results and Discussion

First results

Overall, the first results concerning 124 cases of patients, including the two groups shows that disc CDA values of NP and AF are proportional to those of diffusion, with better sensitivity and specificity of disc CDA values [3].

As such, we have noticed that the discs considered as asymptomatic are those witches present the highest CDA values. Therefore, this was verified for L3L4 in comparison with L4L5, and with L2L3 levels in comparison with L5S1. The results are valid for AF and NP.

However, for asymptomatic discs the average of AF CDA values is higher than of NP.

Concerning the VAS pain score, the first results show a very significant link of disc CDA values/VAS pain score ratio.

From a qualitative point of view, at day-0, we have noticed that the average of AF CDA values/VAS pain ratio is higher than of NP for moderate pain, this ratio is reversed with advantage of NP for very intense pain.

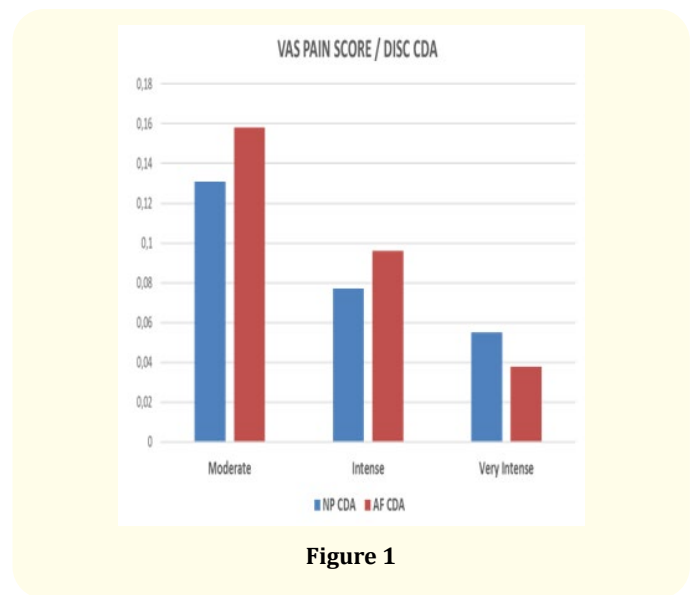


Figure 1

Final results

The final results show that the two groups are homogeneous, regarding age (p:0.6), Body Mass Index (p:0.2), protrusion stage (p:0.55), Nucleus Pulposus CDA (p:0.39), Annulus Fibrosis CDA (p:0.9) and regarding Oswestry score (p:0.23).

The main protrusion stage concerned L4-L5 and L5-S1 levels.

Concerning the VAS-pain score, the results were better for TENS group in comparison with Physiotherapy-Cyriax group, with a very significant differences at the 12th and 24th weeks (p:0.001). The average of sick leave days is very significantly lower in TENS group; 10,68 days, in comparison with Physiotherapy-Cyriax group;17.54 days (p:0.001).

Overall, the duration of associated analgesic treatment was very significantly higher in Physiotherapy-Cyriax group, and the proportion of patients treated by corticosteroids was very significantly higher in Physiotherapy-Cyriax group (p:0.001), however the proportion of patients treated by paracetamol was very significantly higher in TENS group (p:0.001).

Also, with 10,6 days; the average-duration of sick leave days was very significantly lower in TENS group, against 17,5 days in Physiotherapy-Cyriax group (p:0,001).

Concerning the recourse to surgery, only 8,2% of patients were operated in TENS-Group, against 35,5% cases in Physiotherapy-Cyriax Group (p: 0,001).

The results were significantly better for TENS group, in Oswestry and VAS-100 satisfaction.

The radiologic results, including the functional MRI, shows an increase of NP CDA values in TENS-Group, and at the same times we have a decrease of NP CDA values in Physiotherapy-Cyriax Group, with a very significant differences at the 12th and 24th weeks (p:0,001).

However, we don't have a significant difference between the two groups concerning AF CDA Values.

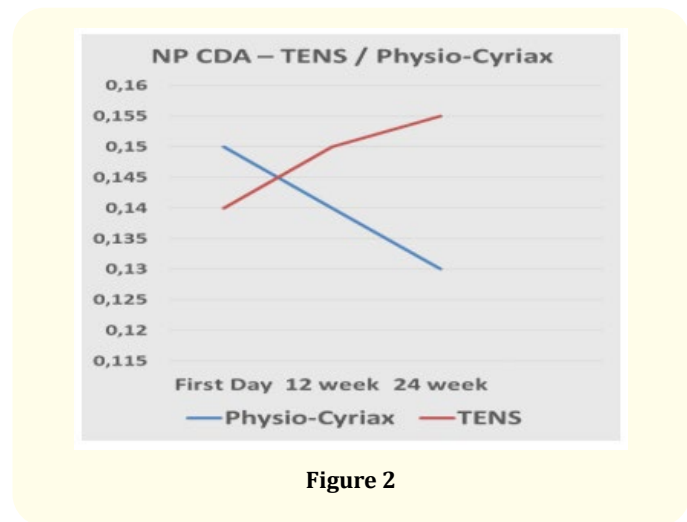


Figure 2

In the nineteenth, the evidence-based literature offers a little support for TENS in chronic low-back pain [4-8], and now we have more and more studies with high level of proof in this area [9-11].

In this field, we published some works including TENS in chronic-low-back pain treatment [12].

Until now, TENS at very low frequency is the only medical alternative which implicated in substance P inhibition [13].

In this approach, we have an American work, which obtained ISSLS prize paper in the SPINWEEK of Amsterdam, in 2012.

In this study, the authors where be able to delate disc degeneration diseases in a mouse stream, by inhibiting of NFKB pro-factor [14].

So, when the speaker described his inflammatory cascade, we saw Substance P and its role in NFKB-action.

From that moment, the idea was born to conduct this research project, to study the TENS role, and their impact in lumbar disc repair, in patients with chronic low back pain.



Figure 3: NP CDA: 0.129 (L4-L5) Day-0.

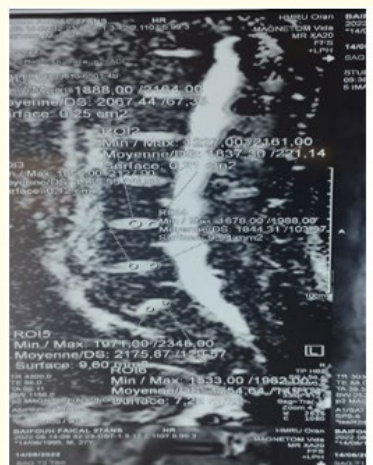


Figure 4: NP CDA: 0.129 (L4-L5) 24th week.

Conclusion

The study shows that PN dehydration has a significant link with chronic low back pain and disability. There is no correlation between the signs of root irritation and the proportion of water in the lumbar intervertebral disc. Similarly, the role of the tobacco is not established, other factors would come into play.

Also, this study shows a good clinical response of TENS treatment associated to lumbar disc diseases repair, improving disc hydration state, in patients with chronic low-back pain [15].

It could be an additional argument to increase the role of TENS in chronic low back pain treatment.

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