

## **LOW LEVEL LASER THERAPY (LLLT) FOR CHRONIC TINNITUS**

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**Keywords:** Tinnitus, Low Level Laser Therapy, LLLT

### **ABSTRACT**

#### **Background**

The aim of this study was to assess the efficacy of chronic subjective tinnitus treatment with Low Level Laser.

#### **Materials and methods**

42 patients with chronic subjective tinnitus were included in the study. The study included patients suffering from monolateral or bilateral tinnitus more than 3 months prior to Low Level Laser treatment with no concomitant treatments for tinnitus. The subjects were treated with Low Level Laser (wave-length 650 nm, output 50 mW) for 10 sessions, 2-3 sessions per week, twenty minutes per session. The tinnitus was measured before and after the treatment with Tinnitus Handicap Inventory (THI) and Visual Analog Scale (VAS) and the results were statistically analysed by Wilcoxon signed-rank test.

#### **Results**

All 42 patients completed Low Level Laser Therapy which was well tolerated. The adverse or side effect were not observed. Twenty-five (59.5%) patients were men and seventeen (40.5%) were women. Visual Analog Scale (VAS) score improvement of tinnitus intensity was: 1 degree (14.3%), 2 degrees (19%), 3 degrees (14.3%), 4 degrees (4.8%), 5 degrees (9.6%). No improvement showed 38.1% of treated patients. Visual Analog Scale (VAS) score mean before the treatment was 6.9 ( $\pm$  1.8) and after the treatment was 5.4 ( $\pm$  2.4). The VAS score difference before and after the treatment was statistically significant ( $p < 0.001$ ). No statistical difference was found before and after the treatment in the Tinnitus Handicap Inventory (THI) score ( $p = 0.752$ ).

## **BACKGROUND AND OBJECTIVES**

Tinnitus is perception of sound within the human ear or head in the absence of external sound. Approximately 15% of the adult population persistently suffers from tinnitus. Tinnitus is an obscure symptom because of lack of knowledge of its pathophysiology. Pharmacological treatment of tinnitus show limited succes and commonly prescribed drugs for tinnitus include sedatives, anticonvulsants, antidepressants. Non-pharmacologic and surgical procedures can be used in specified indications, with limited results. Other tratment modalities can be used for treatment of chronic tinnitus: Tinnitus Retraining Therapy (TRT), transcutaneous electrical stimulation, transcranial magnetic stimulation (rTMS), tinnitus masking therapy, etc. Low Level Laser Therapy (LLLT) is a therapeutic modality for cochlear dysfunction. Low Level Laser Therapy is an alternative tratment modality for chronic subjective tinnitus. The therapeutic mechanism of Low Level Laser Therapy is not completely understood; some theories are: increasing cell proliferation, ATP and collagen production, secretion of growth factors, improving the inner ear blood flow and activating the haircell mitochondria. Different studies, with different treatment protocols, have been performed to assess the Low Lewel Laser efficacy and these studies showed diverse results.

The aim of this study was to assess the efficacy of chronic subjectictive tinnitus treatment with Low Level Laser.

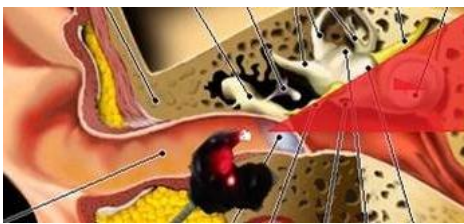
## **MATERIALS AND METHODS**

42 patients with chronic subjective tinnitus were included in the study; patients suffering from monolateral or bilateral tinnitus more than 3 months prior to LLL treatment with no concomitant treatments for tinnitus. The audiological assessment and ENT examinations were performed to rule out treatable causes of tinnitus. The written informed consent was provided to all patient. The Ethics Committee of University hospital „Sestre milosrdnice“ approved the study protocol. Inclusion criteria were the age of 18 years or more, normal hearing threshold or sensorineural hearing loss and diagnosis of chronic subjective tinnitus (monolateral or bilateral). Exclusion criteria were conductive hearing loss, tympanic membrane perforation, ear discharge and a history of ear surgery. The subjects were treated with Low Lewel Laser (wave-lenght 650 nm, output 50 mW) for 10 sessions, 2-3 sessions per week, twenty minutes per session. The individual ear plugs with embedded optical cable were used [Fig 1] and the laser beam was directed through the tympanic

membrane into the cochlea [Fig 2]. The individual silicone ear plugs reduce the possibility of influencing the external ear canal anatomy on the results of laser treatment. The tinnitus was measured before and after the treatment with Tinnitus Handicap Inventory (THI) and Visual Analog Scale (VAS) and the results were statistically analysed by Wilcoxon signed-rank test.



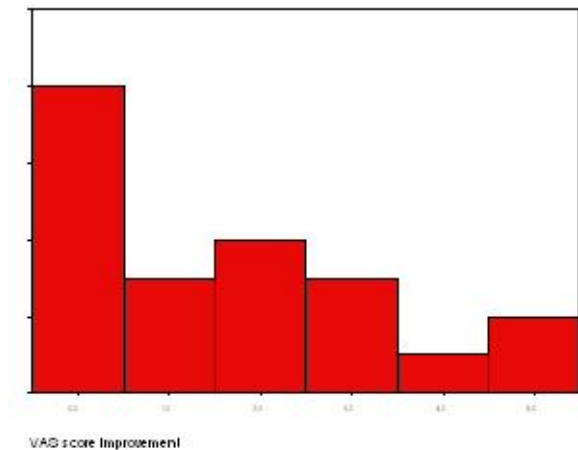
**Fig 1:** Individual ear plugs with embedded optical cable



**Fig 2:** Laser beam directed through the tympanic membrane into the cochlea

## **RESULTS**

All 42 patients completed Low Level Laser Therapy which was well tolerated. The adverse or side effect were not registered. Twenty-five (59.5%) patients were men and seventeen (40.5%) were women. Visual Analog Scale (VAS) scores were calculated before and after the treatment. Visual Analog Scale (VAS) score improvement of tinnitus intensity was: 1 degree (14.3%), 2 degrees (19%), 3 degrees (14.3%), 4 degrees (4.8%), 5 degrees (9.6%). No improvement showed 38.1% of treated patients [Fig 3]. None of the patients reported tinnitus severity increase. Visual Analog Scale (VAS) score mean before the treatment was 6.9 ( $\pm 1.8$ ) and after the treatment was 5.4 ( $\pm 2.4$ ). VAS distribution was not normal so we used non-parametric Wilcoxon signed-rank test. VAS score difference before and after the treatment was statistically significant ( $p < 0.001$ ). No statistical difference was found before and after the treatment in the Tinnitus Handicap Inventory (THI) score ( $p = 0.752$ ).



**Fig 3:** Visual Analog Scale (VAS) score improvement of tinnitus intensity

## CONCLUSION

Low Level Laser Therapy (LLLT) is effective for the treatment of chronic subjective tinnitus. A further randomized placebo-controlled trials are mandatory for clinical evaluation of therapeutic effectiveness of LLLT and to assess the placebo effect on the treatment efficacy.

## Acknowledgments

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