Commentary

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Journal of Biology and Medical Research

2018
Vol.2 No.1:5

Faster Recuperation of Pain and Musculoskeletal System through Vibroacoustic Sound Therapy

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Citation: Kang DH, Lim HW, Lee WY, Jee YS (2018) Faster Recuperation of Pain and Musculoskeletal System through Vibroacoustic Sound Therapy. J Biol Med Res. Vol.2 No.1:5

Abstract

Recently, medical doctors and biotechnology researchers from various countries have developed new therapeutic methods and techniques called vibroacoustic sound therapy (VAT) for a wide range of patients. However, most of the patients from previous studies had chronic diseases or were at the latter phases of therapy. Although the effectiveness of VAT has been examined in a few studies, no research has yet been conducted regarding the application of VAT on patients shortly after undergoing an operation on a joint. The aim of this study was to determine the therapeutic effect of applying VAT on pain, range of motion (ROM), and isometric strength in patients who have recently had a knee joint operation. A total of 22 patients who underwent knee joint surgery within the past 7 days were selected for this study and were randomly divided in the control group and the experimental group, which received VAT for 30 min * 5 days/week for 4 weeks. The intensity of VAT was set from minimum to maximum with a wide range of sound waves and patterns of vibration. After 4 weeks of VAT intervention, the hamstrings were shown to have improved more than the quadriceps. Thus, this study confirmed that the recuperation of hamstrings in patients who recently received a knee joint operation may result in reduced pain and increased ROM through VAT intervention.

Keywords: Vibroacoustic sound therapy; Hamstrings; Pain; Range of motion; Knee joint

Received: February 20, 2018; **Accepted:** February 27, 2018; **Published:** March 01, 2018

Introduction

The purpose of vibroacoustic sound therapy (VAT) is to recuperate lost cellular energy over time and improve the patient's overall health. In theory, micro vibrations not only heal damaged cells, but also express energy at the cell level. These biological phenomena cause sudden vibrations in the body, which can reduce the recovery time from intense physical stress or long-term fatigue after injury [1,2]. As a recreational therapist, Patrick observed the effects of bioacoustics therapy on patients with various medical conditions by performing a test program for pain and symptom relief. He concluded that the 22-minute VAT sessions lead to a 53% cumulative reduction in pain and symptoms [3]. Kike et al. also demonstrated the efficacy of vibration-absorbing therapy as a monotherapy applied to patients with arthritis. In their study, a 15-minute bioacoustics therapy session was performed by directly attaching vibration-absorbing material to the skin surrounding the knee joint. The results showed that 91% of the patients improved from knee pain [4]. Although previous studies have shown that VAT can be effective, most of the subjects that were treated had chronic diseases or were at the end of their therapy period, which indicated the need for a more aggressive experimental approach.

Discussion

Procedures for finding evidence to support the effectiveness of VAT

The subjects were recruited in Seoul, South Korea, through the recommendation of surgeons who were familiar with VAT. Prior to the study, the participants received detailed explanations regarding all the study procedures and signed a written informed

consent form. Twenty-two subjects (mean age 71.95 ± 5.66 years) were randomly classified into control group (non-VAT group; n=10; female=6 Vs male=4) and VAT group (experimental group; n=12; female=6 Vs male=6) after a 4-week baseline period. Out of the 12 patients in VAT group, eight underwent ACL reconstruction, two underwent arthroscopic surgery with ACL and PCL complex injuries, and two underwent ACL arthroplasty. Out of the 10 patients in control group, seven underwent ACL reconstruction, and three underwent arthroscopic surgery with simple ACL rupture. The control group did not receive the VAT intervention except for general rehabilitation, whereas the VAT group received the VAT intervention in addition to the same program. The experimental variables were pain, ROM, and isometric strength of the operated knee joint. These were assessed at Weeks 0, 2 and 4. A visual analogue scale was used to measure pain using a scale ranging from no pain (close to "0") to severe pain (close to "10") and Cronbach's α was 0.78 [5,6]. The ROM of the knee joint was measured using a goniometer when the leg was actively extended or flexed [7]. The isometric strengths of the quadriceps and hamstrings in the operated joint were assessed at 60º knee flexion in the sitting position using an isokinetic dynamometer (HUMAC /NORMTM Testing and Rehabilitation System, CSMI, MA, US). To examine inter-group or within-time variations along the intervention differences, non-parametric Mann-Whitney U Test and Wilcoxon Signed Ranks Test were performed. The significance level for all analyses was set a priori at $P < 0.05$.

Intervention methods of VAT

To accomplish the aim of this study, a VAT device called Evo cell (Shinoo Medison, Gangwon-do, Korea) was used. The electrical output of Evo cell is equivalent to that of a mobile phone speaker. The intensity of Evocell is divided into ten steps between a minimum of 1 watt and a maximum of 12 watts with varying frequencies from 129 to 1,658 Hz. Patients who underwent knee joint surgery within the past 7 days were selected for this study. The experimental group was given VAT for 30 minutes * 5 days/ week during 4 weeks with varying patterns of vibration and a wide range of sound wave while the control group only received general rehabilitation without VAT. An exogenous pharmaceutical gel (menthol-based material) was applied on the anterior and posterior operated knee during VAT treatment. During the first and last 5 minutes of VAT treatment, the front and back of the knee were massaged with low intensity and then massaged with high intensity for 20 minutes by a technical expert.

Therapeutic evidence and effect of VAT

The pain levels in VAT group and control group were 7.59 ± 1.86 and 3.61 ± 1.01 (Z=-3.828; P=0.001) at Week 0, 3.93 ± 0.95 and 2.72 ± 0.93 (Z=-2.644; P=0.007) at Week 2, and 2.55 ± 0.58 and 3.12 ± 0.61 (Z=-2.129; P=0.036) at Week 4, respectively. As indicated by these results, pain tended to decrease in both groups over time, however, the VAT group showed a significant decrease (X2=24.000; P=0.001) compared to control group (X2=5.243; P=0.073). The strength of the quadriceps significantly increased in both groups and there were no differences between groups in each week. At Week 4, the strength of the hamstrings did not significantly change in control group, whereas the strength in VAT group significantly increased from 21.50 ± 9.81 N to 41.58 ± 4.32 N (X2=15.500; P=0.001). From these results, the strength of hamstrings was significantly different between groups (Z=-2.153; P=0.030). The ROM levels in VAT group and control group were 90.08 ± 20.00º and 94.80 ± 18.09º (Z=-0.495; P=0.628) at Week 0, 101.67 ± 16.32º and 111.20 ± 12.09º (Z=-1.254; P=0.228) at Week 2, and 128.08 ± 7.51º and 120.40 ± 8.30º (Z=-2.185; P=0.030) at Week 4, respectively. In other words, ROM significantly increased in both groups, but at Week 4, the ROM of VAT group was significantly higher than that of control group.

Conclusion

It is not an exaggeration to say that treatment techniques in recent clinical interventions are characterized by quick rehabilitation and shorter treatment times [8]. In keeping with this trend, the results of this study confirmed that VAT intervention was effective for patients shortly after undergoing knee joint operation. In other words, these results showed that vibroacoustic intervention increases the strength of hamstrings, which can lead to reduced pain and improved ROM in patients after knee joint surgery.

Funding

This research was supported by the 2017 AMS Global Research Grant.

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