

Effects of pulsed ultrasound on postural sway in women with knee osteoarthritis

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Background & Aim: Poor postural control in people with Knee Osteoarthritis (KOA) is evidenced by Center of Pressure (COP) abnormal excursions. The effect of PUS on improving the structure and function of the joint and muscle have been proven in previous studies. In this study, we tried to examine the effects of Pulsed Ultrasound (PUS) on the postural sway in patients with KOA.

Introduction- Osteoarthritis (OA) is a chronic and degenerative disorder, characterized by joint cartilage wear. Its main symptoms include pain and reduction of joint mobility and muscle strength. It is one of the conditions with the greatest impact on function and quality of life of the elderly in developed countries¹).

In the United States of America (USA), OA affects 12.1% of the adult population, particularly females (RR=1.79)²). In Colombia, the Ministry of Social Protection reported that healthy life-years (HLY, an epidemiological indicator) lost prematurely due to disability and death were similar to HLY lost due to prostate and cervix cancer and leukemia³). The support joint with the highest incidence of OA is the knee with an incidence of 240 new cases per 100,000 person-years compared to hip OA with an incidence of 88 new cases per 100,000 person-years⁴).

Pain, the main symptom, is present in 38–68% of people with OA and it is associated with insomnia, depression and impairment of participation in social activities³). Moreover, pain has a negative impact on muscle strength and joint Range of Motion (ROM), favoring the progressive decline of function and therefore of the quality of life of these people³).

Therapeutic ultrasound (TUS) is one of the most-used physical modalities of physiotherapy for treatment of knee and hip OA⁵); however, its application has not shown conclusive effects due to methodological limitations such as small sample size, confounding biases and the lack of clarity about the application parameters, the way ultrasound is generated and the recommended dose for this pathology⁶).

Few studies^{7, 8}) have been applied the TUS as the only modality of intervention and evaluated its short-term effects of TUS. These authors did not report significant differences in the variables evaluated possibly due to the application of continuous TUS and by methodological limitations such as selection bias, mainly. Regarding the use of pulsed TUS, only a controlled clinical trial included this form of generation in patients with knee OA. Huang et al.⁹) Reported a significant increase in the ROM of the knee, and decreased pain intensity, however, these authors did not evaluate the short-term effect of TUS.

Therefore, considering the high prevalence of OA in the elderly population and the daily use of TUS in clinical practice, the aim of the present study was to evaluate the effect of TUS applied

to the medial and lateral compartments of the knee on pain intensity, joint ROM, muscle strength, function and quality of life of the participants. This study was proposed with the hypothesis that relief of pain might increase knee ROM and the strength of the quadriceps and ischiotibial muscles, and hence give rise to a positive change in the function and quality of life of the participants.

Methods: 11 healthy elderly female and 27 age and weight matched subjects with bilateral KOA randomized into three sham with exercises, ultrasound, and ultrasound with exercise groups and were examined in Comfort Double Leg Standing (CDLS), Romberg Standing (RS) and Near Tandem Standing (NTS) on a force plate. PUS was set at a frequency of 1 MHz and power of 1 W/cm² for 10 sessions. In groups containing exercise therapy, prescribed lower limb strengthening exercises were also performed.

Findings: At baseline, Mediolateral (ML) was the most affected COP sway direction in KOA compared to healthy control. After treatment, in the US group, the ML range (P=0.006) and standard deviation of the ML range of the COP (P=0.009) in CDLS position significantly increased. In the US with exercise group, Anteroposterior (AP) range (P=0.013), standard deviation of ML velocity (P=0.010) and ML mean velocity (P=0.014) significantly decreased in RS position.

Conclusion: In female KOA patients, ML displacement of the COP is impaired more than other postural sway parameters. PUS also improved postural sway parameters in the ML direction and brought them closer to the healthy subjects group.

References-

- Zhang W, Moskowitz RW, Nuki G, et al. : OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage*, 2008, 16: 137–162
- Holt HL, Katz JN, Reichmann WM, et al. : Forecasting the burden of advanced knee osteoarthritis over a 10-year period in a cohort of 60–64 year-old US adults. *Osteoarthritis Cartilage*, 2011, 19: 44–50.
- Peñaloza RE, Salamanca N, Rodríguez JM, et al. : Estimación de la carga de enfermedad para Colombia, 2010, 1st ed. Bogotá: Editorial Pontificia Universidad Javeriana, 2014.
- Arden N, Nevitt MC: Osteoarthritis: epidemiology. *Best Pract Res Clin Rheumatol*, 2006, 20: 3–25.