International Journal of Health Sciences and Research
Vol.13; Issue: 9; September 2023
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

Effectiveness of Ultrasound Versus Kaltenborn Mobilization in a Community-Dwelling Elderly Population with Knee Osteoarthritis - RCT Single Blind

Dr. Shrikant B. Darade[1], Dr. Vijay Bhartiya[2]

[1]Associate Professor, Motiwala College of Physiotherapy, Nashik
[2]Associate Professor, Nanded Physiotherapy College & Research Center, Nanded

Corresponding Author: Dr. Shrikant B. Darade

DOI: https://doi.org/10.52403/ijhsr.20230907

ABSTRACT

Introduction: osteoarthritis is the leading disorder which commonly found in older people but due to lifestyle it has early impact and its cause of musculoskeletal pain and disability and also it affects the quality of life of patients.
Methodology: 40 older individuals were selected from community and divided into two groups of Group A (US) and Group B (Kaltenborn), where the group A was blinded. They received an intervention for three times a week (Ultrasound and Kaltenborn mobilization) and evaluated on basis of VAS, QoL and WOMAC.
Result: Both groups shown a significant improvement but the group B (Kaltenborn) shown mark improvement in VAS, QoL and WOMAC, where p value was < 0.0001, which is statistically significant.
Conclusion: There were statistically significant differences and improvements in both groups, but the Kaltenborn mobilization group was more effective than the ultrasound group in community-dwelling elderly people with OA knee.

Keywords: Osteoarthritis, Ultrasound, Kaltenborn Mobilization, Physiotherapy

INTRODUCTION

Osteoarthritis (OA) is a multifactorial, chronic degenerative illness that causes loss of articular cartilage, enlargement of the bone around the joint, subchondral sclerosis, and a variety of biochemical and morphological changes to the synovial membrane and joint capsule.[1]

Articular cartilage weakening, ulceration, and localised disintegration are pathological alterations that occur in the late stages of OA. Inflammation of the synovium can also occur. Pain is a common clinical sign, especially after heavy lifting and prolonged exertion; stiffness is seen after inactivity. It most likely consists of a number of illnesses that together cause joint failure rather than being a single disease. Degenerative arthritis is another name for it, and it typically affects the hands, feet, spine, and large weight-bearing joints like the hips and knees.[2] The majority of OA cases known as primary OA, have no recognised cause. The main cause of primary osteoarthritis is ageing. It might manifest as erosive OA, widespread OA, or localised OA. Another illness or condition is the primary cause of secondary osteoarthritis.[3]

With a prevalence of 22% to 39% in India, osteoarthritis is the most prevalent joint disease and the second most prevalent rheumatologic condition. OA is more

prevalent in women than in males, but the prevalence rises sharply with ageing. Nearly 45% of women over the age of 65 have symptoms, while 70% of those over 65 have radiological evidence. OA of the knee, especially in women, is a significant factor in reduced mobility. According to estimates, OA is the tenth most common reason for nonfatal burden.[4,5]

Osteoarthritis is the leading cause of musculoskeletal pain and disability in older adults worldwide.[6] Osteoarthritis (OA) is a multifactorial disease caused by a failure of joint cartilage repair following an initial insult.[7] Although cartilage injury does not cause symptoms, Brandt et al 8 proposed that changes in cartilage cause a series of biologic and biomechanical changes in other joint tissues, resulting in pain, stiffness, and loss of function. As a result, cartilage integrity is critical for proper joint function.[8, 9]

Ultrasound therapy (US) is one of the most commonly used physical agents in physiotherapy.[10] This treatment modality is based on the application of mechanical energy to a tissue, which is produced by sound waves of varying frequencies, in order to elicit a biological response. [10, 11] In vitro and in vivo studies have revealed that the mechanical stimulus produced by low intensity ultrasonic energy (spatial and temporal average intensities ranging from 0.03 to 0.62W/cm2) promotes chondrogenesis in human cell cultures and animal models of cartilage injury. These findings suggest that low-intensity US may favour cartilage repair and, if used early on, may slow the progression of OA. Since 1981, the American College of Rheumatology (ACR) criteria have been used to make a clinical diagnosis of OA. Increased life expectancy and an increase in our geriatric population necessitate research into the prevalence and risk factors of OA.

The prevalence of knee OA in the adult rural population in India is estimated to be 5.8%. Knee OA is more common in women.[8] It is also more common among men who work in agriculture, manual labour, and household work (women)[12, 13] using the ACR criteria, studies conducted in Jammu revealed a prevalence of 4.24% and the associated risk factors of knee OA to be age, female gender, and repeated bending of the knee. Due to a lack of imaging facilities and specialized orthopedic care in rural India, diagnosis and treatment are delayed until late stages of the disease process. In order to implement preventive and therapeutic measures, the disease burden must be estimated. We relied on previously validated clinical criteria for the diagnosis of knee OA due to a lack of radiographic facilities. Studies based on the ACR criteria have been published in both Western countries and India.[14, 15, 16, 17]

Knee pain associated with motion impairments is caused by a variety of factors, including joint immobilization following injury,[18] surgical interventions to repair or remove menisci,[19] and osteoarthritis.[20] Joint mobilization has been used by a variety of healthcare professionals in both the spine and peripheral joints to treat pain and motion impairment(s). However, the majority of these research studies used techniques for the spine and upper extremities, with less evidence for the efficacy of lower extremity mobilization.

While AP joint mobilizations were the primary intervention in the articles reviewed, Kaltenborn and Evjenth advocated traction mobilization as an intervention for extremity joints with painful movement impairment. Grade III traction is a linear motion that is applied with enough force to take up slack in the joint capsule and tighten the soft tissues surrounding the joint. Grade III traction mobilization's primary therapeutic goal is to stretch periarticular soft tissue and increase mobility in a hypomobile joint. The traction movement is applied at a right angle to the treatment plane, which is located in the concave proximal end of the tibia for the TF joint.[21, 22]

Studies on the knee joints have concentrated on the use of anterior/posterior (AP) joint mobilization and patellar glides to improve

outcomes in patients suffering from knee pain. Some studies, for example, found that AP mobilization of the knee joint reduced pain caused by chronic inflammation of the muscles and joints.[23]

As a result, the goal of our research is to compare the effectiveness of ultrasound versus Kaltenborn mobilization in an elderly population with knee osteoarthritis. Hence the aim of this study is to compare effectiveness of ultrasound and Kaltenborn mobilization in elderly population with osteoarthritis of knee.

METHODOLOGY

Design – This study was RCT with 40 subjects who aged from 60 to 75 years old allocated in two groups. The institutional ethical committee approval has been obtained.

Patient selection – Subject were recruited by using simple random sampling and divided into two groups of 20 each i.e., Group A (Ultrasound Group) and Group B (Kaltenborn), also followed by criteria in which the patients who meets the ACR criteria with both genders were included and the patients with recent trauma or surgery, peripheral vascular disease, deformity or neurological conditions were excluded.

The study conducted for 6 months form the date of ethical clearance from ethical committee of institution. The assessment was conducted at pre and post treatment. The assessment included VAS (visual analogue scale), ROM (range of motion), ACR criteria, and the WOMAC scale.

INTERVENTION

Group A - A frequency of 1 MHZ was used with a sound head area of 5 cm^2 and an intensity of 0.8 W/cm^2 (continuous mode) for 4 to 5 minutes three times per week for two weeks. The participants were positioned supine, with the affected knee flexed at 90° and the sound-head held stationary over the tibio-femoral joint, and an acoustic gel containing no pharmacologically active substance was applied. To ensure maximum energy absorption, ultrasound was applied to the medial and lateral parts of the knee in circular movements with the probe at right angles [10, 11]

Group B - Each participant was instructed to lie prone on a treatment table with the affected knee slightly flexed by placing a pillow under the lower leg. The participant's knee was then passively flexed to the first and final stops as defined by Kaltenborn.[17] Using a standard goniometer, the therapist collected the VAS and measured the passive knee flexion range of motion.[20, 21] The therapist used a stabilization belt to secure the distal portion of the participant's femur against the table. A stabilization belt placed above the TF joint line provides the most femoral stabilization during TF traction mobilization and does not interfere with joint motion. The hand was placed around the ankle of the lower extremity for joint distraction. The knee was fully flexed to the limit of its available range of motion, and the therapist straightened his or her own knees to achieve a Grade III traction mobilization[17] (tibia separation from femur). The intervention was performed continuously for 30 seconds, followed by a 10-second break. This sequence was repeated four times totaling two minutes of traction mobilization. The measurement therapist entered the booth after each 2-minute mobilization session and recorded the amount of available passive knee flexion. This process was repeated three times for a total of six minutes of joint traction mobilization on each participant's involved knee.

BLINDING -

The involved group A was blind about the intervention that was given to each subject.

RESULT

Table no. 1

Age Distribution		
Group	**US Group**	**Mobilization Group**
Mean ± SD	64.6 ± 3.2	65.28 ± 4.5

Table & Graph no. 1 shows that age distribution for both group which is almost same for the both groups.

Table no. 2

BMI		
Group	**US Group**	**Mobilization Group**
Mean ± SD	23.8 ± 2.3	25.65 ± 3.4
P value	0.024, S	0.012, S

Table & graph no. 2 show that the BMI for Group B (Kaltenborn) is more (overweight) as compared to Group A (US)

Table no. 3

Visual Analogue Scale				
Group	**US**		**Kaltenborn**	
component	**Pre**	**Post**	**Pre**	**Post**
Mean ± SD	6.12 ± 0.97	4.64 ± 0.76	6.36 ± 0.81	3.28 ± 0.84
SEM	19	15	16	17
t	7.687		12.264	
df	24		24	
P value	0.0001, S			

Table & graph no. 3 shows significant reduction of pain through VAS, but there was mark significant difference in Group Kaltenborn as compares to group US which is statically significant, P value < 0.0001.

Table no. 4

Quality of Life				
Group	**US**		**Kaltenborn**	
Component	**Pre**	**Post**	**Pre**	**Post**
Mean ± SD	3.5 ± 0.2	3.9 ± 0.3	3.2 ± 0.3	4.1 ± 0.4
SEM	0.06	0.07	0.06	0.08
t	6.11		7.072	
df	24		24	
P Value	0.0001, S			

Table & Graph no. 4 shows improvement of quality of life in both groups, but the group Kaltenborn shows significant improvement in quality of life as compared to group US.

Table no. 5

WOMAC												
Groups	**US group**						**Kaltenborn group**					
Component	**Pain**		**Stiffness**		**Physical function**		**Pain**		**Stiffness**		**Physical function**	
component	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Mean ± SD	13.08 ± 2.33	8.04 ± 1.77	5.6 ± 1.32	2.56 ± 0.96	46.28 ± 6.02	29.96 ± 7.81	14.48 ± 2.83	4.40 ± 1.26	5.44 ± 1.26	2.16 ± 1	50.58 ± 7.86	17.44 ± 3.33
SEM	0.47	0.35	0.26	0.19	1.2	1.56	0.57	0.25	0.25	0.2	1.57	0.67
t	9.387		13.837		8.817		15.747		19.639		19.513	
df	24		24		24		24		24		24	
P Value	0.0001, S											

Table & graph no. 5 shows significant improvement in all component of WOMAC in group Kaltenborn which is statistically significant, P value < 0.0001 as compared to group US.

DISCUSSION

The study's goal was to compare the effectiveness of Kaltenborn joint mobilization alone versus ultrasound in osteoarthritis knee in a community-dwelling elderly population. Both treatment groups in this study achieved successful outcomes as measured by VAS, WOMAC, and quality of life. There were statistically significant differences between the two groups, but the mobilization group, Group B, outperformed Group A. According to the findings, Tables and graphs no. 4, 5, and 6 show a significant difference in pain, quality of life, and physical functioning in the community-dwelling elderly population, but Kaltenborn joint mobilization shows a significant improvement in pain, quality of life, and physical functioning.

The findings of this study were supported by Ahmad & Daud et al (2016), who discovered pain reduction and improvement

in physical functioning in elderly people with OA knee. They also reported that manual therapy improves the effectiveness of the exercise treatment program in treating symptoms of knee OA and improves function in elderly people with knee OA. [38]
While Mustafa et al. (2015) concluded that longer ultrasonic treatment duration may confer greater improvement in patient functionality and ability to perform daily activities, the US therapeutic acoustic radiation treatment has true potential in improving symptoms for patients with knee OA.
According to Heggannavar and Kandada (2015), the Kaltenborn mobilization group improved more in pain and function than the control group that received ultrasound treatment. Together with Silva et al (2011), they concluded that therapeutic ultrasound has analgesic and anti-inflammatory effects; pain reduction in subjects in both groups could be attributed to the use of therapeutic ultrasound. Kaltenborn mobilizations can also help with pain relief.
Narayana. C. Mascrain and Ibsen B Coimbra conducted a study to investigate the effects of electrotherapy on 40 women with bilateral knee OA who were randomly assigned to one of three groups: kinesiotherapy, transcutaneous electrical nerve stimulation (TENS), or ultrasound. All treatments were successful in reducing pain and improving the WOMAC index.

CONCLUSION

There were statistically significant differences and improvements in both groups, but the Kaltenborn mobilization group was more effective than the ultrasound group in community-dwelling elderly people with OA knee.

Declaration by Authors

Ethical Approval: Approved
Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Silman AJ, Hochberg MC. 2nd ed. Oxford: Oxford University Press; 2001. Epidemiology of the Rheumatic Diseases.
2. Akinpelu AO, Alonge TO, Adekanla BA, Odole AC. Prevalence and pattern of symptomatic knee osteoarthritis in Nigeria: A community-based study. Internet J Allied Health Sci Pract. 2009; 7:3.
3. Symmons D, Mathers C, Pfleger B. Global Burden of Osteoarthritis in year 2000: Global burden of disease 2000 study. World health report. 2002;5 Version 2.
4. Solomon L, Beighton P, Lawrence JS. Rheumatic disorders in the South African Negro. Patrt II. Osteo-arthrosis. S Afr Med J. 1975; 49:1737–40. [PubMed]
5. Davis MA, Ettinger WH, Neuhaus JM, Hauck WW. Sex differences in osteoarthritis of the knee. The role of obesity. Am J Epidemiol. 1988; 127:1019–30. [PubMed]
6. 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; 16:137-62.
7. Radin EL, Burr DB. Hypothesis: joints can heal. Semin Arthritis Rheum 1984; 13:293-302.
8. Brandt KD, Dieppe P, Radin EL. Etiopathogenesis of osteoarthritis. Rheum Dis Clin North Am 2008; 34:531-59.
9. Eckstein F, Glaser C. Measuring cartilage morphology with quantitative magnetic resonance imaging. Semin Musculoskelet Radiol 2004; 8:329-53.
10. Bélanger AY. Ultrasound. In: Evidence-based guide to therapeutic physical agents. Philadelphia: Lippincott Williams & Wilkins; 2003. p223-61.
11. Zhang W, Doherty M, Peat G, Bierma-Zeinstra MA, Arden NK, Bresnihan B, et al. EULAR evidence-based recommendations for the diagnosis of knee osteoarthritis. Ann Rheum Dis. 2010 Mar;69(3):483–9.
12. Symmons D, Mathers C, Pflegers B. Global burden of Osteoarthritis in the year 2000. Global burden of diseases. 1-26.
13. Salve H, Gupta V, Palanivel C, Yadav K, Singh B. Prevalence of knee Osteoarthritis amongst perimenopausal women in an urban resettlement colony in South Delhi. Indian J Public Health 2010; 54:155-7.

Available from: http://www.ijph.in/text.asp?2010/54/3/155/75739 accessed on Nov 18, 2011.
14. Chopra A, Patil J, Billempelly V, Relwani J, Tandle HS. Prevalence of rheumatic diseases in a rural population in western India: a WHO-ILAR COPCORD Study. J Assoc Physicians India. 2001 Feb; 49:240-6.
15. Al-Arfaj AS, Alballa SR, Al-Saleh SS, Al-Dalaan AM, Bahabry SA, Mousa MA, Al-Sekeit MA. Knee Osteoarthritis in Al-Qaseem, Saudi Arabia. Saudi Med J 2003;24(3):291-93.
16. Altman R, Asch E, Bloch D, Bole G, Borenstein D, Brandt K, et al. Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Diagnostic and Therapeutic Criteria Committee of the American Rheumatism Association. Arthritis Rheum. 1986 Aug;29(8):1039–49.
17. Mahajan A, Jasrotia DS, Manhas AS, Jamwal SS. Prevalence of Major Rheumatic Disorders in Jammu. J K Science, April-Jun 2003; 5(2): 63-8. Available from: http://www.japi.org/july2005/U-634 pdf.
18. Noyes FR, Mangine RE, Barber SD. Early knee motion after open and arthroscopic anterior cruciate ligament reconstruction. Am J Sport Med 1987;15: 149–60.
19. Fairbanks TJ. Knee joint changes after meniscectomy. J Bone Joint Surg Am 1948;30: 664–70.
20. Rangger C, Katherin A, Klestil T, Gltozer W. Partial meniscectomy and osteoarthritis: implications for treatment of athletes. Sports Med 1997;23: 61–8.
21. Goldlblatt JP, Smith S. Managing meniscal injuries: the treatment. More aggressive procedures are being attempted for repair and replacement. J Musculoskelet Med 2005;22: 183–7.
22. Kaltenborn FM. Manual mobilization of the joints. 6th ed. Oslo: Olaf Norlis Bokhandel; 2002.
23. Szebenyi B, Hollander AP, Dieppe P, Quilty B, Duddy J, Clarke S, etal. Associations between pain, function, and radiographic features in osteoarthritis of the knee. Arthritis Rheum 2006;54: 230–5.
24. Zhang C, Shi J, Xiang T, Kong Y; effect of uultrasound therapy for knee osteoarthritis: a meta-analysis of randomized, double blinded, placebo-controlled clinical trials; Int J Clin Exp Med 2016;9(11):30552-20561
25. Anand Heggannavar, Ankita Kale. IMMEDIATE EFFECT OFMODIFIED LUMBAR SNAGS IN NON-SPECIFIC CHRONIC LOW BACK PATIENTS: A PILOT STUDY. Int J Physiother Res 2015;3(3):1018-1023. DOI: 10.16965/ijpr.2015.126
26. Kwon CS, Lee NY, the effect of manual joint mobilization on pain, ROM, body function and balance in patient with knee osteoarthritis, J Korean Soc. Phys Med., 2015; 10(4: 91-99).
27. Sahiba Yadav, Megha Arora Nijhawan, Paresh Panda. EFFECTIVENESS OF SPINAL MOBILIZATION WITH LEG MOVEMENT (SMWLM) IN PATIENTS WITH LUMBAR RADICULOPATHY (L5 / S1 NERVE ROOT) IN LUMBAR DISC HERNIATION. Int J Physiother Res 2014; 2(5): 712-718.
28. Ajit NE, B Nandish, Fernandes RJ, Roga G, Kasthuri A, ShanbhagDN, Goud R. Prevalence of knee osteoarthritis in rural areas of Bangalore urban district. IJRCI. 2014;1(S1):SO3.
29. Falconer J, Hayes KW. Chang RW, effect of the Ultrasound on mobility in osteoarthritis of the knee; Jou Arthritis care and Research;1992:29-35.
30. Luís E. S. Aguiar, Mafra R. T. Oliveira, Rafael R. Caldas, Mariana C. Correia, Sérgio Rocha, Maíra I. S. Carneiro, et al. effect of mobilization time by maitland method in nonspecific low back ppain and neck pain; MTP & Rehabilitation, 2014, 12;334-339.
31. Sanchez AL, Richardson J, Beattie KA, Fuentes CO, Adachi JD, Macintyre NJ; effect of low intensity pulsed ultrasound on the cartilage repair in people with mild to modereate OA knee: a double blinded randomized, placebo-controlled pilot; Arch Phys Med Rehabil, 2012; 93, 35-42.
32. Maher SM, Creigton D, Kondratek M, krauss J, the effect of tibio-femoral traction mobilization on passive knee flexion motion impairment and pain: a case series; Journal of Manual and Manupulative atherapy:2010, 18(1); 29-36.
33. Srbely JZ, ultrasound in the management of osteoarthritis: part I: a review of the current literature, J Can Chiropr Assoc 2008; 52 (1), 30-37.

34. White D, Evans JA, Truscott JG, Chivers RA. Can ultrasound propagate in the joint space of a human knee? Ultrasound Med Biol 2007; 33:1104-11.
35. Deyle GD, Allison SC, Matekel RL, Ryder MG, Stang JM, Gohdes DD, et al. Physical therapy treatment effectiveness for osteoarthrisis of the knee: a randomized comparison of supervised clinical exercise and manual therapy procedures versus a home exercise program. Phys Ther 2005;85: 1301–17.
36. Bellamy N, Buchanan W, Goldsmith C, Campbel J, Stitt L. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. J Rheumatol 1988; 15:1833-40.
37. Bellamy N, Campbell J, Stevens J, Pilch L, Stewart C, Mahmood Z. Validation study of a computerized version of the Western Ontario and McMaster Universities VA3.0 osteoarthritis index. J Rheumatol 1997; 24:2413-5.
38. Aftab Ahmad, & Muhammad Daud. (2016). A COMPARATIVE STUDY BETWEEN JOINT MOBILIZATION AND CONVENTIONAL PHYSIOTHERAPY IN KNEE OSTEOARTHRITIS. *International Journal of Physiotherapy*, 3(2), 159-162.
39. Mustafa AY, Demet U (2015) Comparison of therapeutic duration of therapeutic ultrasound in patients with knee osteoarthritis. J. Phys. Ther. Sci. 27: 3667–3670, 2015
40. Anand B Heggannavar, Swathi Kandada. EFFECT OF IMPAIREMENT-BASED KALTENBORN TECHNIQUE FOR PLANTAR FASCIITIS: A RANDOMIZED CONTROL TRIAL. Int J Physiother Res 2015;3(4):1117-1121. DOI: 10.16965/ijpr.2015.154
41. Naryana C et.al. Effects of kinesiotherapy, ultrasound and electrotherapy in management of bilateral knee osteoarthritis: prospective clinical trial. BMC Muscu-loskeletal Disorders. 2012; 13:182.

How to cite this article: Shrikant B. Darade, Vijay Bhartiya. Effectiveness of ultrasound versus Kaltenborn mobilization in a community-dwelling elderly population with knee osteoarthritis – RCT single blind. *Int J Health Sci Res.* 2023; 13(9):34-40.
DOI: *https://doi.org/10.52403/ijhsr.20230907*

******