International Journal of Medical and Health Research

Volume: 1, Issue: 2, 26-29
Sep 2015
www.medicalsjournals.com
ISSN: 2454-9142

Priya Singh Rangey
Post Graduate Student,
S.B.B. College of Physiotherapy

Megha S. Sheth
Lecturer, S.B.B. College of Physiotherapy

Neeta J. Vyas
Principal, S.B.B. College of Physiotherapy

Correspondence
Priya Singh Rangey
Post Graduate Student,
S.B.B. College of Physiotherapy

Comparison of Immediate Effect of Two Different Maitland Mobilization Protocols on Pain and Range Of Motion in Subjects with Osteoarthritis of Knee

Priya Singh Rangey, Megha S. Sheth, Neeta J. Vyas

Abstract
This experimental study was done to compare the immediate effectiveness of two different Maitland protocols on pain, pressure threshold (PPT) and range of motion (ROM) in 24 subjects with knee osteoarthritis selected according to the American College of Rheumatology criteria and randomly divided into two groups-group A and B receiving 3 repetitions of Maitland mobilization of the knee joint each of 1 minute duration and 1 repetition of 3 minutes duration respectively. Those who had recently undergone lower limb surgery, had co-existing inflammatory or neurological conditions, experienced altered sensation over the knee or exhibited cognitive difficulties were excluded. PPT and ROM were measured by pressure algometer and goniometer respectively. Level of significance was kept at 5%. Results showed statistically significant difference within both groups for both PPT (groupA p=0.002, groupB p=0.002) and ROM (groupA p=0.003, groupB p=0.003). Mann Whitney U test showed statistically significant difference between the groups for ROM (p=0.045) but no difference for PPT (p=0.356).

Keywords: Osteoarthritis; Maitland Mobilization; Pain; Range of motion

1. Introduction
The Subcommittee on Osteoarthritis of the American College of Rheumatology Diagnostic and Therapeutic Criteria Committee defined osteoarthritis (OA) as "A heterogeneous group of conditions that lead to joint symptoms and signs which are associated with defective integrity of articular cartilage, in addition to related changes in the underlying bone at the joint margins" [1]. Clinically, the condition is characterized by joint pain, tenderness, limitation of movement, crepitus, occasional effusion, and variable degrees of local inflammation.

Osteoarthritis is more common in women than men, but the prevalence increases dramatically with age. 45% of women over the age of 65 years have symptoms while radiological evidence is found in 70% of those over 65 years. Osteoarthritis of the knee is a major cause of mobility impairment, particularly among females. OA is the 4th leading cause of years lived with disability (YLDs) at the global level, accounting for 3.0% of total global YLDs [2].

OA is the second most common rheumatological problem and is the most common cause of locomotor disability in the elderly [3]. The knee is the joint most frequently affected by osteoarthritis. OA knee is two times more prevalent than OA hips in people aged over 60 years [4], and is a significant contributor of pain and mobility impairment in community-dwelling adults [2, 5]. The prevalence of OA knee in rural and urban India is 3.9% and 5.5%, respectively [6-8].

Pain is the most frequent reason for patients with OA knee to seek medical attention and rehabilitation [2]. If left untreated, pain and stiffness will result in a loss of physical function and self-independence. The presence of OA-related knee pain has also been associated with an increase in the risks of physical disability in the community [9].

Management of OA knee is a multidisciplinary approach. Physiotherapy is the mainstay of nonpharmacological treatment in osteoarthritis. It does not improve the patient's condition, but relieves the symptoms and maintains his/her independence to the maximum. Physiotherapy in OA knee involves use of thermal agents, transcutaneous electrical nerve stimulation, traditional Chinese acupuncture, tai chi programs, taping, manual therapy, aerobic land-based exercises, aquatic exercises, weight loss programs and orthoses in the form of medial or lateral insoles [10].

APTA's Guide to Physical Therapist Practice has defined mobilization/manipulation as "a manual therapy technique comprised of a continuum of skilled passive movements that are applied at varying speeds and amplitudes, including a small amplitude/ high velocity therapeutic movement" [11]. Manual therapy includes soft tissue manipulation, massage, manual traction, joint manipulation and joint mobilization [12]. The intensity of mobilization is commonly categorized based on a 5-grade classification system defined by Maitland [13, 14]. According to Maitland's classification, Grade I and Grade II joint mobilizations are performed primarily to decrease joint pain and Grade III and Grade IV joint mobilizations are performed to increase joint ROM [13].

Joint mobilization which involves low-velocity passive movements within or at the limit of joint range of motion reduces pain by modulating the nervous tissues and increases joint motion [12, 13]. Restricted joint mobility, especially in terms of knee flexion, appears to be an important determinant of disability in patients with osteoarthritis p [15, 16].

Maitland mobilization has been found to be effective in reducing pain and improving ROM in knee osteoarthritis subjects. However, the studies regarding the frequency that needs to be applied are still inconclusive. In a study conducted by Moss *et al*, 9-minute mobilization of the tibio-femoral joint was compared with manual contact and non-contact interventions. They concluded that the technique significantly reduced pain and improved functional ability, measured with pressure pain threshold and 3-metre 'up and go' test than the other two techniques [17]. Whereas, Kisner C and Colby LA suggest smooth, regular oscillations at 2 or 3 per second for 1 to 2 minutes [18].

The immediate effects of Maitland mobilization on various joints have been studied [19-21]. However the protocols that have been used are different. Hence, this study was conducted to evaluate and compare the immediate effect of two different Maitland protocols in subjects with knee osteoarthritis.

2. Methods

A quasi experimental study was conducted with a convenience sample of 24 subjects at the Physiotherapy Out-patient department of a General Hospital during September and October 2013. The sample size was calculated by a pilot study conducted in the same population. Subjects having osteoarthritis of the knee, according to the American College of Rheumatology criteria and referred for physiotherapy by the Orthopedic Out-patient department were included. Subjects having mild to moderate pain and restriction of range of motion were selected for the study. Those who had recently undergone lower limb surgery, having co-existing neurological and inflammatory conditions, altered sensations over the knee and having cognitive difficulties were excluded. The study was explained to the subjects. Written informed consent was taken from the subjects. Level of significance was kept at 5 %.

Outcome measures included pain and knee range of motion. Pain was recorded through pain pressure threshold which was assessed using a pressure algometer. Whereas, knee range of motion was recorded using a Universal Goniometer. Pre-intervention data was collected.

The subjects were then randomly divided in two groups-Group A and B using the random number generator. For Group A, the protocol used was Maitland mobilization given thrice, each for a duration of 1 minute with a break of 30 seconds between each minute. For Group B, Maitland mobilization was given once for 3 minutes continuously without any breaks.

The most tender point on the medial aspect of the subject's affected knee was palpated and marked. With the subject in supine-lying, the pressure algometer was used to apply pressure at the tender point and the exact reading at which the subject reported conversion of pressure to pain was recorded. Knee ROM was measured with the patient in prone lying. Grade II-III AP glide of the tibia on the femur was applied with the knee in slight flexion and supported with the use of a pillow in the supine position [17].

Here, the immediate effect of the Maitland mobilization was to be studied. Hence, immediately after the mobilization the outcome measures were recorded.

3. Results

Statistical analysis was done using SPSS version 16. The data was found to be not normally distributed. Hence, non-parametric tests were applied.

Wilcoxon test was applied to determine whether there was a significant difference within the groups. There was statistically significant difference in both the groups for both PPT and ROM. Mann-Whitney test was applied to determine whether there was a significant difference between the two groups. It was found that both the protocols are equally effective in improving the PPT as there was no statistically significant difference between the 2 groups (p=0.356). But Group A was found to be more effective in improving the ROM than Group B (p=0.045). The results are as shown in Table 1 and Table 2.

4. Discussion

The study shows that both the Maitland protocols are effective in improving the PPT and ROM. They are equally effective in improving the PPT but 3 repetitions of 1 minute were more effective in improving the ROM than 1 repetition of 3 minutes. Mobilizations produce a multitude of beneficial effects through stimulation of peripheral mechanoreceptors, inhibition of nociceptors, and an increase in synovial nutrition, thus helping to reduce pain [22-24]. There was an increase in the PPT immediately after applying mobilization in both the groups similar to the findings of Moss P, Sluka K and Wright A. They provided experimental evidence that accessory mobilization of an osteoarthritic knee joint immediately produces both local and widespread hypoalgesic effects. And hence, it may be an effective means of reducing pain in the osteoarthritic population [17].

A number of mechanisms have been proposed to explain how the hypoalgesic effects of passive joint mobilization may be mediated. Sambajon *et al* in 2003 [25] stated that local mechanical disturbance may modify the chemical environment and thereby alter concentrations of inflammatory mediators which may lead to a reduction in the pain experienced [25]. Melzack and Wall in 1999 [26] gave the theory that movement may trigger segmental inhibitory mechanisms relieving pain [26]. In addition, Wright in 2002 [27] and Souvlis *et al* in 2004 [28] hypothesized that mobilization may activate descending pain inhibitory systems, mediated supraspinally [27, 28].

The oscillatory movements performed during mobilization are believed to produce mechanical effects, such as the realignment of collagen, increase in fiber glide, and the break-up of adhesions, which help to restore normal mobility [29]. There was an increase in the ROM in both the groups which was in accordance to various previous studies. Sambandam *et al* in 2011 [30] concluded that Maitland mobilization is effective in improving ROM in Subjects with Unilateral Tibiofemoral Osteoarthritis (30). Landrum E *et al* in 2008 [21] studied the immediate effects of AP talocrural joint mobilization and found that after a single application of grade

III anterior-to-posterior talocrural joint mobilization, dorsiflexion ROM and posterior ankle joint stiffness were significantly increased. They applied a 30-second mobilization once [21]. No studies were found that mentioned about immediate effect of Maitland mobilization at knee joint. However, this study concludes that Maitland mobilization does have an immediate effect on PPT and ROM at the knee joint.

5. Conclusion

It may be concluded from this study that both the protocols may be used for pain relief and improvement in ROM for subjects with osteoarthritis. For a greater improvement in the ROM, Maitland mobilization may be given for three repetitions of 1 minute each with a 30 second break between each repetition.

Tables 1: Comparison of means for PPT and ROM for group A and B

Parameter	Group	Pre	Post	Z value	p value	Significance
PPT	A	3.52±1.75	5.28±2.28	-3.059	0.002	YES
	B	4.87±2.57	5.73±2.8	-3.061	0.002	YES
ROM	A	112.92±17.6	118.67±16.57	-2.941	0.003	YES
	B	121±6.54	124.33±7.1	-2.944	0.003	YES

Table 2: Comparison of means for PPT and ROM for group A and B

Parameter	Group A	Group B	U value	pvalue	Significance
PPT	1.76±1.18	1.36±1.06	56	0.356	NO
ROM	5.75±3.41	3.33±2.67	37.5	0.045	YES

5.1 Clinical Application

Maitland mobilization can be used to immediately relieve pain and improve ROM in subjects with osteoarthritis of knee.

5.2 Future Research

Further studies can be conducted to see the effect of 3 sets of same protocols compared to 1 set. Also, long term effect of Maitland Mobilization can be seen in subjects with OA of the knee.

5.3 Limitations

Limitations of this study were that long term follow-up was not taken to evaluate the duration of the pain relief and ROM improvement. Also, blinding of the subjects and assessors was not done.

5.4 Contribution of Authors

All the authors together conceptualized the study and designed it. They collected the data and analyzed it and drafted the manuscript together. The manuscript was submitted only after the approval of all the three authors. There was no dispute or conflict regarding any of the aspects of study designing between the authors.

6. Acknowledgements

The authors thank the subjects who participated in this study. We would also like to thank our colleagues and staff members and all those who supported this study.

6.1 Conflict Of Interest

None.

7. References

1. 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 & Rheumatism 1986; 29(8):1039-1049.
2. Symmons D, Mathers C, Pfleger B. Global burden of osteoarthritis in the year Global Burden of Disease 2000. Geneva: WHO, 2000.
3. Mahajan A, Verma S, Tandon V. Osteoarthritis. Journal of the Association of Physicians of India. 2005; 53:634-641.
4. Nor Azlin MN, Su Lyn K. Effects of Passive Joint Mobilization on Patients with Knee Osteoarthritis. Sains Malaysiana 2011; 40(12):1461-1465.
5. Corti MC, Rigon C. Epidemiology of osteoarthritis: Prevalence, risk factors and functional impact. Aging Clinical and Experimental Research. 2003; 15(5):359-363.
6. 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; 49:240-246.
7. Chopra A, Saluja M, Patil J, Tandale HS. Pain and disability, perceptions and beliefs of a rural Indian population: A WHO-ILAR COPCORD study. WHO-International League of Associations for Rheumatology. Community Oriented Program for Control of Rheumatic Diseases. J Rheumatol. 2002; 29:614-621.
8. Joshi VL, Chopra A. is there an urban-rural divide? Population surveys of rheumatic musculoskeletal disorders in the Pune region of India using the COPCORD Bhigwan model. J Rheumatol. 2009; 36:614-622.
9. Van Baar ME, Dekker J, Lemmens JA, Oostendorp RA, Bijlsma JW. Pain and disability in patients with osteoarthritis of hip or knee: the relationship with articular, kinesiological, and psychological characteristics, J Rheumatol. 1998; 25:125-33.
10. Hochberg MC, Altman R, April KT. Recommendations for the use of No pharmacologic and Pharmacologic therapies in Osteoarthritis of Hand, Hip, and Knee. Arthritis Care & Research. American College of Rheumatology. 2012; 64(4):465-474.
11. Guide to Physical Therapist Practice. Revised 2nd ed. Alexandria, VA: American Physical Therapy Association, 2003.
12. Vicenzino B, Paungmali A, Buratowski S, Wright A. Specific manipulative therapy treatment for chronic lateral epicondylalgia produces uniquely characteristic hypoalgesia, Manual Therapy, 2001, 205-212.
13. Maitland GD. Peripheral Manipulation. 4th ed. London, UK, Butterworth-Heinemann, 2005.
14. Mangus B, Hoffman L, Hoffman M. Basic principles of extremity joint mobilization using a Kaltenborn approach. J Sport Rehabil. 2002; 11:235-250.
15. Steultjens MP, Dekker J, van Baar ME, Oostendorp RA, Bijlsma JW. Range of joint motion and disability in patients with osteoarthritis of the knee or hip.

Rheumatology (Oxford) 2000; 39:955-961.
16. Odding E, Valkenburg HA, Algra D, Vandenouweland FA, Grobbee DE, Hofman A. The association of abnormalities on physical examination of the hip and knee with locomotor disability in the Rotterdam Study. British Journal of Rheumatology. 1996; 35:884-890.
17. Moss P, Sluka K. Wright the initial effects of knee joint mobilization on osteoarthritic hyperalgesia. Manual Therapy 2007; 12:109-118.
18. Kisner C, Colby LA. Peripheral Joint Mobilization. Therapeutic Exercise: Foundations and Techniques. 5th Edition. Philadelphia: FA Davis Company, 2007, 119.
19. Shum GL, Tsung BY, Lee RY. The Immediate Effect of Posteroanterior Mobilization on Reducing Back Pain and the Stiffness of the Lumbar Spine. Archives of Physical Medicine and Rehabilitation, 2013, 94(4).
20. Willett E, Hebron C, Krouwel O. The initial effects of different rates of lumbar mobilisations on pressure pain thresholds in asymptomatic subjects. Manual Therapy 2010; 15(2):173-178.
21. Landrum E. Immediate Effects of Anterior-to-Posterior Talocrural Joint Mobilization after Prolonged Ankle Immobilization: A Preliminary Study. The Journal of Manual and Manipulative Therapy. 2008; 16(2)100-105.
22. Melzack R, Wall PD. Pain mechanisms: a new theory Science 1965; 150:971-979.
23. Wall PD. the gate control theory of pain mechanisms. A re-examination and re-statement. Brain 1978; 101:1-18.
24. Threlkeld AJ. The effects of manual therapy on connective tissue. Phys Ther 1992; 72:893-902.
25. Sambajon VV, Cillo JE, Gassner RJ, Buckley MJ. The effects of mechanical strain on synovial fibroblasts. Journal of Oral and Maxillofacial Surgery. 2003; 61:707-12.
26. Melzack R, Wall J. Textbook of pain. 4th ed. Edinburgh, Churchill Livingstone, 1999.
27. Wright A. Pain-relieving effects of cervical manual therapy. In: Grant R, editor. Physical therapy of the cervical and thoracic spine. New York: Churchill-Livingstone. 2002, 217-38.
28. Souvlis T, Vicenzino B, Wright A. Neurophysiological effects of spinal manual therapy. In Boyling JD, *et al.*, editors. Grieve's modern manual therapy. Edinburgh: Churchill-Livingstone. 2004, 367-79.
29. Frank C, Akeson WH, Woo SL, Amiel D, Coutts RD. Physiology and therapeutic value of passive joint motion. Clin Orthop Relat Res, 1984, 13-125.
30. Sambandam CE, Sailor SN, Alagesan J. Effect of Mulligan Mobilization and Maitland Mobilization in Subjects with Unilateral Tibiofemoral Osteoarthritis - Randomized Controlled Trial. Journal of Pharmaceutical and Biomedical Sciences. 2011, 11(17).