J Int Acad Phys Ther Res 2016; 7(2): 1041-1045
ISSN 2092-8475
www.iaptr.org
https://doi.org/10.20540/JIAPTR.2016.7.2.1041

Effect of Maitland Mobilization and Kaltenborn-Evjenth Mobilization on the SLR Angle

The aim of this study was to investigate the effect of Maitland mobilization and Kaltenborn-Evjenth mobilization on the SLR angle. Subjects randomly divided into Kaltenborn-Evjenth group(n=8) and Maitland group(n=7). The mean height, age, body weight was 176.00±5.10 cm, 22.75±1.83 years, 72.63±10.65 kg respectively in Kaltenborn-Evjenth group. The mean height, age, body weight was 175.00±5.60 cm, 22.29 ±3.68 years, 78.00±12.36 kg respectively in Maitland group. Hip joint accessary movements with Grade III or IV were applied depend on the patient's condition to the restricted direction for 1 minute each set, and performed 5 set in a Maitland group. Hip joint anteroposterior gliding with Grade III were applied 60 for 1 minutes each set, and performed 5 set in a Kaltenborn-Evjenth group. The angle of first pain was referred to as P1 and subjects were pointed out that they could not bend the knee anymore, then examiner measure SLR angle. The SLR was significantly increased in the Maitland group compared to the Kaltenborn-Evjenth group after intervention(p<.05). In a within group difference, SLR significantly increased in the both groups(p<.05). These results indicated that Maitland mobilization could be recommended the excellent technique to increase the hip flexion in patient with hip hypo-mobility.

Key words: *Maitland; Kaltenborn-Evjenth; Mobilization; Grade; Hip Flexion*

Ho Jung An[a], Hong Rae Kim[b], Bo Kyung Kim[c]

[a]Dongnam Health University, Suwon, Korea
[b]Kyungwoon University, Gumi, Korea,
[c]International University of Korea, Jinju, Korea

Received : 25 July 2016
Revised : 27 August 2016
Accepted : 20 September 2016

Address for correspondence
Bo Kyung Kim, PT, Ph.D
Department of Physical Therapy, International University of Korea, 965 International University of Korea, Dongbu-ro, Munsan-eup, Jinju-si, Gyeongsangnam-do, Korea
Tel: 82-55-751-8294
E-mail: 2000happyletter@hanmail.net

INTRODUCTION

Joint mobility is normally evaluated by the range of motion(ROM) of the joints, that is clinically defined as the ROM angle between maximal extension and flexion during bi-articular muscles are relaxed(1). The active ROM is smaller than passive ROM and is independent of a participant's effort, muscle strength and motivation(2). Hip is an important to maintain the center of gravity during both dynamic and static balance, and hip disorders could contribute to change body posture(3).

Recent researches suggested that abnormal hip joint morphology could limit the ROM without pathology(4, 5). However, the reduced ROM of lower extremity is often observed in patients with numerous hip joint pathologies. The patients with labral tear and femoro -acetabular impingement (FAI) is likely to exhibit decreased hip flexion ROM (6-8).

The limitations of hip mobility have been suggested to be present in distal lower extremity pathologies(9,10) and some lumbar spine disorders (11). These mobility limitations linked to the patients with FAI and/or hip labral tear(12, 13), osteoarthritis(4, 14) and sports related groin pain (13, 15). Especially, limitations in hip flexion ROM have been related to the hip pathology(7, 8).

The mobilization which is defined as passive movement could used to decrease the pain, maintain mobility, improve hypo-mobility and delay progressive stiffness(16). There is a report that manual therapy have no effect on joint function (17), however some evidence suggests that subjects with hip disorders could benefit on the hip joint mobilization by increasing ROM and reducing functional limitations(18, 19).

Self-mobilization or passive mobilization has been recommended as intermodal approach to the hip pathology(20-22). Especially, Posterior, lateral and inferior mobilization is the appropriate intervention to the restrictions of hip mobility which is related to the capsular disorders(23, 24). Mobilizations could increase hip flexion and Grade IV mobilizations were provided to repair hip mobility(25-27). Grade IV mobilization is a small-amplitude passive motion at the end of range against soft tissue resistance(28) among the 4 mobilization grade. Long axis distraction could increase the elasticity of the joint capsule and boost relaxation of the hip muscles(29, 30).

There is little evidences which supporting the effects of hip manual mobilizations on improving hypo-mobility(31, 32), even hip mobilization with Maitland and Kaltenborn-Evjenth technique. The purpose of present study is to investigate the effect of applied hip mobilization with Maitland and Kaltenborn -Evjenth technique on the SLR angle.

METHODS

Subjects

Fifteen male with hip joint hypo-mobility were analyzed among participants who has the hip flexion degree less than 90. Subjects who had surgery on the hip joint in the last 6 months or had rheumatoid arthritis were excluded. Subjects randomly divided into two group, Kaltenborn-Evjenth (n=8) and Maitland(n=7) group. The mean height of the subjects was 176.00±5.10 cm, mean age was 22.75±1.83 years and mean body weight was 72.63±10.65 kg in Kaltenborn-Evjenth group, and the mean height of the subjects was 175.00±5.60 cm, mean age was 22.29±3.68 years and mean body weight was 78.00±12.36 kg in Maitland group. All subjects provided written informed consent to participate in the study. This study was approved by the IRB of the Namseoul University of Korea.

Intervention

One physical therapist completed interventions for this report. The physical therapist has 7 years clinical experience and complete Maitland 2a Course. In a Maitland group, hip joint accessary movements (among the postero-anterior, anterio-posterior, rotation, transverse mvts and distraction) with Grade Ⅲ or IV were applied depend on the patient's condition to the restricted direction for 1 minute each set, and performed 5 set. Therapist treated one area if subject have a hypo-mobility to the one direction, and treated all disordered area if have a hypo-mobility in various directions. In a Kaltenborn-Evjenth group, hip joint anteroposterior gliding with Grade Ⅲ were applied 60 for 1 minutes each set, and performed 5 set. Treatment was applied to the hypo-mobility dominant leg.

Measurement SLR

Straight leg raise angle was measured by standard dual-arm goniometer with the subject in a supine position. One physical therapist measured the SLR angle and was blind to each subject. The standard dual-arm goniometer was placed parallel to the femur with the subject in the position of lying on the back. The knee and ankle were hold in the extension position. Holding the talus bone without hip rotation, increased the hip flexion and lifting the lower limbs until subjects first noticed of pain in the area of the hamstrings. End range of ankle dorsi-flexion was avoided to prevent stiffness or pain of the calf muscle from confusing the sense of hamstring stiffness and pain, which are indicator the limitation of SLR. The angle of first beginning of pain was referred to as P1(33). Subjects were pointed out that they could not bend the knee anymore, then examiner measure SLR angle. The SLR angle was recorded three times for each subject, and used average data. All subjects began with a single measurement of the passive SLR on their dominant leg.

Statistical Analysis

The independent two-sample t-test were used to test whether SLR means are significantly different from each group after intervention, and Paired sample t-test were used in 'before-after' intervention in each group. The significance level was set at $\rho < .05$.

RESULTS

The demographic variables of the subjects, including height, age and weight were recorded. These variables revealed no significant difference among the two groups. The baseline measurement of the SLR was not statistically significantly different among the two groups(Table 1). The Maitland group showed statistically significant improvement in the SLR compared with the Kaltenborn –Evjenth group after intervention(ρ <.05). On comparing the SLR before and after mobilization, significant improvement was noted in the both Kaltenborn–Evjenth and Maitland group(ρ <.05).

Table 1. Changes in the Straight Leg Raising Angle

Group	Before treatment (m±SD)	After treatment (m±SD)
Kaltenborn –Evjenth mobilization	68.00±6.44°	77.38±3.20° *
Maitland mobilization	75.14±9.87°	83.86±2.79° *
ρ	0.19	0.00

* Significantly different before and after treatment
P Significantly different between the two groups

DISCUSSION

The purpose of present study was to the report the effect of hip joint mobilization which is Maitland and Kaltenborn–Evjenth techniques on the change of SLR angle. The SLR of Maitland group was significantly increased compared with the Kaltenbron –Evjenth group after intervention. On comparing the SLR angle between before and after mobilization, significant increasing was noted in the both Kaltenborn –Evjenth and Maitland group(ρ <.05). Present study suggested that the Maitland hip mobilization has a greater benefit of SLR than the Kaltenborn –Evjenth hip mobilization. One potential description is the combination of accessory movement which occurs in Maitland mobilization but not in Kaltenborn–Evjenth posterior mobilization. Comparing of Kaltenborn–Evjenth group with Maitland group was difficult due to lack of evidence to support Kaltenborn –Evjenth hip mobilization.

Mobilization could change positional fault of the joint, provide a stretching effect on the muscles and joint capsules(34) and has been recommended to increase accessory movements in hypo–mobile structures(35). The capsule –ligamentous tissues of a joint are mechanically stretched(27) and articular mechanoreceptor is activated during mobilization. Thus, may bring pain inhibition and enhanced motor control or repairing normal arthrokinematics(27, 36, 37). Joint mobilization could effect on the motor unit activity over the joint and on those in more remote area, even on those opposite side of the body(36).

Neurophysiological mechanisms related with mobilization contain alterations of potentially central pain proccessing mechanisms(38) as well as the descending pain modulatory system(39). It is possible that mobilization decreases pain by stimulating joint mechano –receptors, which consequently inhibits nociceptive stimuli(27, 40). In addition to these biomechanical and neuro –physiological effects, the repetitive motion of mobilization might change the attentions of anti–inflammatory mediators in the joint, which might subsequently inhibit nociceptors(41). Lastly, other probable mechanisms contain psychological effects such as a decrease in fear avoidance related with movement(42).

Whatever the results, the immediate effect of Maitland indicates opportunity for future researches to discover the long–term effects of joint mobilization. Additionally, it's difficult to compare our date directly with other studies due to osteoarthritis subjects participated in the most other studies and subjects were young men in this study. Researches are needed to compare effects of Maitland mobilization(43) and Mulligan mobilization(37) or Kaltenborn–Evjenth mobilization and Mulligan mobilization on SLR in the future.

CONCLUSIONS

Present study suggested that SLR angle was significantly improved before and after the treatment in both Kaltenborn–Evjenth and Maitland group. However, SLR angle was significantly increased in Maitland group compared with the Kaltenborn–Evjenth group after intervention. Consequently, these results indicated that Mailtland mobilization could be recommended the excellent technique to increase the hip flexion in patient with hip hypo–mobility.

ACKNOWLEDGEMENTS

This study was financially supported by the research fund of Dongnam Health University in 2016.

REFERENCES

1. American Academy of Orthopedic Surgeons, Committee for the Joint Motion. Method of Measuring and Recording Joint Motion. Chicago: American Academy of Orthopedic Surgeons, 1965, 5 – 85.
2. James B, Parker AW. Active and passive mobility of lower limb joints in elderly men and women. Am J Phys Med Rehabil 1989; 68: 162 – 7.
3. Suzuki Y, Nomura T, Casadio M, Morasso P. Intermittent control with ankle, hip, and mixed strategies during quiet standing: a theoretical proposal based on a double inverted pendulum model. J Theor Biol 2012; 310: 55–79.
4. Agricola R, Heijboer MP, Bierma–Zeinstra SM, Verhaar JA, Weinans H, Waarsing JH. Cam impingement causes osteoarthritis of the hip: a nationwide prospective cohort study (CHECK). Ann zRheum Dis. 2012.
5. Yuan BJ, Bartelt RB, Levy BA, Bond JR, Trousdale RT, Sierra RJ. Decreased range of motion is associated with structural hip deformity in asymptomatic adolescent athletes. Am J Sports Med. 2013; 41(7): 1519–1525.
6. Clohisy JC, Knaus ER, Hunt DM, Lesher JM, Harris–Hayes M, Prather H. Clinical presentation of patients with symptomatic anterior hipimpingement. Clin Orthop. 2009; 67(3): 638–644.
7. Prather H, Hunt D, Fournie A, Clohisy JC. Early intra–articular hip disease presenting with posterior pelvic and groin pain. Pm R. 2009; 1(9): 809–815.
8. Song Y, Ito H, Kourtis L, Safran MR, Carter DR, Giori NJ. Articular cartilage friction increases in hip joints after the removal of acetabular labrum. J Biomech. 2012; 45(3): 524–530.
9. Reiman MP, Bolgla LA, Lorenz D. Hip functions infl uence on knee dysfunction: a proximal link to a distal problem. J Sport Rehabil. 2009; 18(1): 33–46.
10. Currier LL, Froehlich PJ, Carow SD, et al. Development of a clinical prediction rule to identify patients with knee pain and clinical evidence of knee osteoarthritis who demonstrate a favorable short–term response to hip mobilization. Phys Ther. 2007; 87(9): 1106–1119.
11. Burns SA, Mintken PE, Austin GP, Cleland J. Shortterm response of hip mobilizations and exercise in individuals with chronic low back pain: a case series. J Man Manip Ther. 2011; 19(2): 100–107.
12. Agricola R, Bessems JH, Ginai AZ, et al. The development of Cam–type deformity in adolescent and young male soccer players. Am J Sports Med. 2012; 40(5): 1099–1106.
13. Nevin F, Delahunt E. Adductor squeeze test values and hip joint range of motion in Gaelic football athletes with longstanding groin pain. J Sci Med Sport. 2013.
14. Birrell F, Croft P, Cooper C, et al. Predicting radiographic hip osteoarthritis from range of movement. Rheumatology (Oxford). 2001; 40(5): 506–512.
15. Taylor CJ, Pizzari T, Ames N, Orchard JW, Gabbe BJ, Cook JL. Groin pain and hip range of motion is different in Indigenous compared to non–indigenous young Australian football players. J Sci Med Sport. 2011; 14(4): 283–286.
16. Kaltenborn, F. Manual mobilization of the joints: the Kaltenborn method of joint examination and treatment; volume I The extremities. Oslo: Olaf Norlis Bokhandel; 2002.
17. Bennell KL, Egerton T, Martin J, Abbott JH, Metcalf B, McManus F, Sims K, Pua YH, Wrigley TV, Forbes A, Smith C. Effect of physical therapy on pain and function in patients with hip osteoarthritis: a randomized clinical trial. Jama. 2014; 311(19): 1987–97.
18. Wright AA, Cook CE, Flynn TW, Baxter GD, Abbott JH. Predictors of response to physical therapy intervention in patients with primary hip osteoarthritis. Phys Ther 2011; 91(4): 510–24.
19. Hando BR, Gill NW, Walker MJ, Garber M. Short– and long–term clinical outcomes following a standardized protocol of orthopedic manual physical therapy and exercise in individuals with osteoarthritis of the hip: a case series. J Man Manip Ther 2012; 20: 192–200.
20. Cook KM, Heiderscheit B. Conservative management of a young adult with hip arthrosis. J Orthop Sports Phys Ther. 2009; 39(12): 858–866.
21. Wright AA, Hegedus EJ. Augmented home exercise program for a 37–year–old female with a clinical presentation of femoroacetabular impingement. Man Ther. 2012; 17(4): 358–363.
22. Abbott JH, Robertson MC, Chapple C, Pinto D, Wright AA, de la Barra SL, Baxter GD, Theis JC, Campbell AJ, MOA Trial team. Manual therapy, exercise therapy, or both, in addition

to usual care, for osteoarthritis of the hip or knee: a randomized controlled trial. 1: clinical effectiveness. Osteoarthritis and Cartilage. 2013; 21(4): 525-34.
23. Loudon JK, Manske RC, Reiman MP. Clinical mechanics and kinesiology. Champaign, IL: Human Kinetics; 2013.
24. Cook CE. Orthopedic Manual Therapy: An Evidence Based Approach. 2nd ed. Upper Saddle River, New Jersey: Pearson Education, Inc; 2012.
25. Powers CM. The influence of altered lower-extremity kinematics on patellofemoral joint dysfunction: A theoretical perspective. J Orthop Sports Phys Ther 2003; 33: 639-46. (a)
26. Powers CM, Ward SR, Fredericson M, Guillet M, Shellock FG. Patellar kinematics during weight-bearing and non-weight-bearing movements in persons with lateral patellar subluxation of the patella: A preliminary study. J Orthop Sports Phys Ther 2003; 33: 677-685 (b)
27. Warmerdam A. Arthrokinematic Therapy: Improving Muscle Performance through Joint Manipulation. Wantagh, NY: Pine Publications, 1999: 32-44.
28. Donatelli R, Wooden MJ, eds. Orthopaedic Physical Therapy. 2nd ed. New York, NY: Churchill Livingstone, Inc., 1994: 242.
29. Gross J, Fetto J, Rosen E. Musculoskeletal Examination. 2nd ed. Cambridge, MA: Blackwell Science, 2002.
30. Friel K, McLean N, Myers C, Caceres M. Ipsilateral hip abductor weakness after inversion ankle sprain. J Athletic Training 2006; 41: 74-78.
31. Marques B, Toldbod M, Ostrup EL, Bentzen L, Gjorup T, Gylding-Sabroe JP, Leopold M, Riis P. [The effect of naproxen compared with that of traction in patients with osteoarthrosis of the hip. A single-blind controlled study]. Ugeskr Laeger 1983; 145: 2840-4.
32. Nyfos L. [Traction therapy of osteoarthrosis of the hip. A controlled study]. Ugeskr Laeger 1983; 145: 2837-40.
33. Maitland GD, Hengeveld E, Banks K, English K . Maitland's vertebral manipulation, 7thed., PA: Elsevier Butterworth -Heinemann, Philadelphia, USA; 2005
34. Vicenzino B, Paungmali A, Teys P. Mulligan's mobilization-with-movement, positional faults and pain relief: current concepts from a critical review of literature. Man Ther 2007; 12: 98-108.
35. Herzog W, Scheele D, Conway PJ. Electromyography responses of back and limb muscles associated with spinal manipulative therapy. Spine 1999; 24: 146-152.
36. Wyke BD. Articular neurology. In: Glasgow EF, Twoney LT, Scull ER, Kleynhams AM, eds. Aspects of Manipulative Therapy. New York, NY: Churchill Livingstone, 1985: 72-77.
37. Hing W, Hall T, Rivett D, Vicenzino B, Mulligan B. The mulligan concept of manual therapy e textbook of techniques. Sydney: Elsevier; 2015.
38. Sterling M, Vicenzino B. Pain and sensory system impairments that may be amenable to mobilisation with movement. In: Vicenzino B, Hing W, Rivett D, Hall T, editors. Mobilisation with movement: the art and the science. Chatswood: Elsevier; 2011: 86-92.
39. Paungmali A, O'Leary S, Souvlis T, Vicenzino B. Naloxone fails to antagonize initial hypoalgesic effect of a manual therapy treatment for lateral epicondylalgia. J Manip Physiol Ther 2004; 27: 180-5.
40. Paungmali A, O'Leary S, Souvlis T, Vicenzino B. Hypoalgesic and sympathoexcitatory effects of mobilization with movement for lateral epicondylalgia. Phys Ther 2003; 83: 374-83.
41. Sambajon VV, Cillo JEJ, Gassner RJ, Buckley MJ. The effects of mechanical strain on synovial fibroblasts. J Oral Maxillofac Surg 2003; 61: 707-12.
42. Vicenzino B, Hall T, Hing W, Rivett D. A new proposed model of the mechanisms of action of mobilisation with movement. In: Vicenzino B, Hall T, Hing W, Rivett D, editors. Mobilisation with movement: the art and the science. London: Churchill Livingstone; 2011: 75-85.
43. Beselga C, Neto F, Alburquerque-Sendín F, Hall T, Oliveira-Campelo N. Immediate effects of hip mobilization with movement in patients with hip osteoarthritis: A randomised controlled trial. Man Ther 2016; 22: 80-5.