

## ORIGINAL ARTICLE

## IJPHY

## MULLIGAN VERSUS MAITLAND MOBILIZATION ON THORACIC KYPHOTIC ANGLE IN POSTURAL KYPHOSIS

<sup>\*1</sup>Mohamed Ibrahim Fathallah Abdelhay<sup>2</sup>Mohamed Hussein Elgendy<sup>3</sup>Yasser Ramzy Lasheen

## ABSTRACT

**Background:** Postural hypnosis can lead to cervical pain or bad cosmetic appearance. There is a lack in the literature supporting the efficacy of spinal mobilization techniques in restoring normal thoracic curvature. Mulligan and Maitland's mobilization were used to improve range of motion and referred pain not to restore normal kyphotic angle. The purpose: this study was conducted to compare the efficacy of Mulligan and Maitland spinal mobilization on a kyphotic angle in postural kyphosis. Subjects: seventy-five male subjects with postural kyphosis their age (17-21) years were included in the study by initial postural examination and were randomly assigned into three equal groups.

**Methods:** Group I each subject in this group received mulligan mobilization in addition to back exercises as conservative treatment, Group II each subject in this group received Maitland mobilization in addition to back exercises as conservative treatment, Group III this group was considered as a control group. Subjects within this group will perform exercises only as a conservative treatment. Kyphotic angle was measured by using formetric raster-stereography pre and post treatment.

**Result:** The result of the study showed a significant effect of Mulligan mobilization in reducing kyphotic angle in patients with postural kyphosis p-value was (0.001), and there was no significant effect on Maitland mobilization on a kyphotic angle, and the p-value was (0.256).

**Conclusion:** Mulligan mobilization is effective in restoring normal kyphotic angle in cases of postural kyphosis.

**Keywords:** Mulligan, Maitland, Mobilization, Kyphotic angle, Postural kyphosis.

Received 12<sup>th</sup> November 2017, revised 13<sup>th</sup> May 2017, accepted 31<sup>st</sup> May 2017



www.ijphy.org

10.15621/ijphy/2017/v4i3/149068

## CORRESPONDING AUTHOR

<sup>\*1</sup>Mohamed Ibrahim Fathallah Abdelhay

Assistant Lecturer,  
Basic Science Department,  
Faculty of Physicaltherapy,  
Cairo University.  
Email: prof\_dr\_pt@yahoo.com

<sup>2</sup>Professor, Basic Science Department,  
Faculty of Physicaltherapy, Cairo University.  
prof.mgendy@hotmail.com

<sup>3</sup>Lecturer, Basic Science Department,  
Faculty of Physicaltherapy, Cairo University.  
dr\_yasser\_1977@yahoo.com

## INTRODUCTION

Postural kyphosis is common in both the old and the young secondary to bad habits and prolonged sitting [1]. We can consider that subject has a postural kyphosis when kyphotic angle exceed 45 degrees[2]. Postural kyphosis is asymptomatic, and patients seek treatment only if exaggerated or become apparent.[3].

Strengthening back exercises and stretching exercised for the pectoral region were routinely used by therapists in subjects with hyperkyphosis. Exercise programs need a long time to have a significant effect and may need to be combined with postural back support [4]. Maitland spinal mobilization can improve pain and range of motion of thoracic spine[5]. Mulligan mobilization of thoracic spine can help in restoring normal alignment[6].

Maitland Rotarypostero-anterior mobilization can be used in improving range of extension in thoracic spine [7]. In adolescent conservative treatment with physical therapy and bracing is effective in limiting pain and fatigue until skeletal maturity is reached. But not sufficient for restoring normal curve. Combined treatment is recommended for functional and postural improvement[3]. There is a great need to identify the difference between Mulligan (active mobilization) and Maitland mobilization (passive mobilization) in effect on different body parts. This will help the therapist to choose the most effective mobilization technique according to diagnosis and aim of treatment[8].

Many studies compared the effect of thoracic mobilization one pain but not on restoring the normal kyphotic curve. Kauret et al. (2013), found that Maitland mobilization of the thoracic spine is more effective than Mulligan in improving nonspecific neck pain. Comparison between the two mobilization techniques was based on their effect on neck pain, not on thoracic curvature [9]. Other studies investigated on long-term exercise program last for six months. Back muscles strengthening exercises and proprioceptive training can reduce the extent of thoracic hyperkyphosis in senior women. These studies relate the exaggerated kyphosis to the weakness of back extensors secondary to aging [10].

To improve the body of knowledge in physical therapy, we need to use the objective method of assessment. So using formetric Raster Stereography which is valid and reliable in measuring spinal curvature increase reliability and validity of the study [11]. Although many studies investigated the causes and treatment of Scheuermann's Disease which is structural kyphosis, there is a lack of researchers in postural kyphosis [12]. Based on the current review of the literature, there is a need to expand mobilization techniques area of research to include the most effective mobilization technique which can help to restore normal kyphotic curve of the thoracic spine in cases of postural kyphosis[13]. So this study would be conducted to investigate the efficacy of Mulligan and Maitland mobilization techniques combined with back extension exercises on postural kyphosis.

## METHODOLOGY

### Subjects

The survey will be done to include all male students with postural kyphosis using general postural examination. Simple randomization will be used to include seventy-five volunteers taking in our consideration the inclusion criteria. Subjects will be randomly assigned into three equal groups. Each group will consist of 25 subjects. Randomization will be done as the following the name of each subject will be written on a paper folding it and putting it in a box. Finally, papers will be picked and assigned to three groups. Each subject had signed a consent form. The study was done in the faculty of physical therapy at Cairo University from may 2015 to may 2016.

### Group I:-

Each subject in this group received mulligan mobilization in addition to back exercises as conservative treatment. Mulligan mobilization will be given three sets with ten repetitions using sustained apophyseal joint glide technique (SNAG) to all thoracic spine[9].

### Group II:-

Each subject in this group received Maitland mobilization in addition to back exercises as conservative treatment. Subjects within this group will receive grade 3 Maitland-posteroanterior mobilization to all thoracic spines[9]. Exercises will be given as prescribed in group I.

### Group III:-

This group was considered as a control group. Subjects within this group will perform exercises only as a conservative treatment.

**Inclusion criteria:** 75 male subjects with age range from 17-21 years old[1]. Subjects included in this study have postural kyphosis noticed by observation in the initial postural examination with a kyphotic angle ( $>45^\circ$ ) as will be measured by formetric initial assessment. No history of pain at thoracic spine. **Exclusion criteria:** with structural kyphosis. With a history of spinal fracture or dislocation. With discogenic disorders especially with radiated pain. With kyphotic angle less than  $45^\circ$ . with scoliosis. Who miss more than two sessions.

## PROCEDURES

**General Procedures:** Subjects will be acquainted with the details of the procedures, which would be undertaken through demonstration sessions. Subjects will be recorded, and their height and weight will be measured

**Measurement procedures:** The Formetric 3D (DIERS, International GmbH, Germany) is a largely used raster stereographic system. Raster-stereography characterized by its high precision, validity, and reliability [11].

According to Drerup and Hierholze(1994), the formetric system contains the following major subassemblies: The scanning system: The scanning system (optical column with base plate) contains a raster projector, and a video camera mounted on profile tube. Projector and camera are

firmly aligned with each other. T telescope drive provides motorized vertical adjustment of the entire system. Computer: The computer consists of a standard PC for image processing, a printed circuit board for capturing images (frame grabber), a module for rotation of live images and image presentation of the monitor. Printer: The provided laser printer provides high-quality result presentation[14]. The operation of the instrument is in 10 steps. Start up of the computer (VRS program starts automatically). Patient data input (date of birth, name, first name, sex). Record data input (body height, body weight, radiograph, comments). Image acquisition (patient position, start exposure control, record image). Image clipping (remove distributing image structure {hair or hands}). Three-dimensional reconstruction (reconstruction of the back is displayed). Archiving (insert diskette/removable archive disk). Shape analysis (landmark correction, symmetry line, spine model). Graphical protocol (printout of back shape analysis (2 sheets)). Return to point two[15].

**Treatment Procedures:** Subjects within the three groups received exercises for postural correction. Three dynamic exercises the first exercise sitting, lifting hands together above the head and performing dorsal spine extension in sitting position. In the second exercise, the subjects sit on a chair with hands on the neck and instructed to lift his arms and extend upper back. The third exercise is to sit to stand while back against the wall. The previous exercises are performed three series; each is 10-15 repetitions. Also there are two positioning static exercises which are standing in front of wall, scroll with both hands as high as possible over the wall and maintain the upright position for 3-10 sec also performed three series, each is 10-15 repetitions, and the last one is lying on the back, knees, and hips flexed and feet resting on the ground and a small rolled-up towel under the 5th to 7th thoracic vertebrae (perpendicular to the spinal processes), stretching the thoracic spine for 30-180sec. The exercise program is under the supervision of the therapist or alone at home[16].

**Group I:** Subjects within this group received mulligan mobilization in addition to back exercises. Mulligan mobilization will be given three sets with ten repetitions using sustained apophyseal joint glide technique (SNAG) to all thoracic spine[9].

The patient sits astride the end of the plinth with his hands behind his neck. By placing his hand behind the neck, the scapulae move away from the thoracic vertebra, and it will make the latter more accessible. The therapist stands on his side with one arm wraps around the patient and guides the movement. The other hand is placed on the suspected level of the lesion and applies gliding force along the facet plane while the patient extends his thoracic spine. Some strength is required to support the patient's extension as well as providing facet glide[6].

**Group II:** Each subject in this group will receive Maitland mobilization in addition to back exercises as conservative treatment. Subjects within this group will receive grade 3 Maitland posteroanterior mobilization to all thoracic

spines. Mobilization will be given three sets with ten repetitions [9]. In a prone lying position with a pillow under the patient's chest Rotary P-A, intervertebral mobilization clockwise and anti-clockwise three times 30 seconds grade III was performed[7].

**Group III:** Subjects within this group received back exercises only, and this group will be considered as a control group.

**Data collection:** Kyphotic angle will be measured and collected pre and post treatment for subjects within each group.

**Data analysis:** Descriptive analysis (mean and standard deviation). Paired T-test for comparing pre and post treatment. ANOVA to compare the three groups.

## RESULTS

One way ANOVA proved homogeneity between the three groups and as there was no statistical significant differences between groups as regarding age, body weight, height.

**Table 1:** General characteristics of the subjects

	Group (A)		Group (B)		Group (c)		Comparison		
	Mean	±SD	Mean	±SD	Mean	±SD	F-Value	P-Value	S
Age (yrs)	18.12	1.24	18.44	1.42	18.28	1.49	.334	.717	NS
Weight (Kg)	67.68	3.57	67.52	3.92	67.92	4.09	.068	.934	NS
Height (cm)	167.76	3.23	168.24	3.23	168.24	3.23	.218	.805	NS

**Group I:** Table 2 demonstrate the kyphotic angle pre and post treatment for the group I which received Mulligan mobilization in addition to back exercises as conservative treatment. There was a significant difference in the paired t-test between pre and post treatment kyphotic angle values as the mean value of pre-treatment kyphotic angle (54.88±5.26) and for post-treatment kyphotic angle was (45.37±4.77) where the t-value was (7.422), and the p-value was (0.001).

**Table 2:** Influence of Mulligan mobilization in addition to back exercises as conservative treatment kyphotic angle group I

Group A (mulligan)	Kyphotic angle	
	Pretreatment	Post-treatment
Mean	54.88	45.37
±SD	±5.26	±4.77
Mean difference	9.52	
Percentage of improvement	17.35%	
DF	24	
t-value	7.422	
p-value	0.001	
S	S	

**Group II:** Table 3 demonstrate the kyphotic angle pre and post treatment for group II. There was no significant difference in the paired t-test between pre and post training ky-

photic angle values as the mean value of pretraining peak torque was (54.22±4.51) and for post training, peak torque was (54.06±4.41) where the t-value was (7.422) p-value was (0.256)

**Table 3:** Influence of Maitland mobilization in addition to back exercises as conservative treatment kyphotic angle group II

Group II	Kyphotic angle	
	Pre- treatment	Post-treatment
Mean	54.22	54.06
±SD	±4.51	±4.41
Mean difference	0.16	
Percentage of improvement	0.29%	
DF	24	
t-value	1.163	
p-value	0.256	
S	NS	

**Group III:** Table 4 demonstrate the kyphotic angle pre and post treatment for group III which received just back exercises as a conservative treatment. There was no significant difference in the paired t-test between pre and post training peak torque values as the mean value of pre-treatment kyphotic angle (54.1±4.36) and for post-treatment kyphotic angle was (54.04±4.19) where the t-value was (0.531) p-value was (0.6).

**Table 4:** Kyphotic angle pre and post treatment in control group:

Group III (control group)	Kyphotic angle	
	Pre-training	Post training
Mean	54.1	54.04
±SD	±4.36	±4.19
Mean difference	0.06	
Percentage of improvement	0.11%	
DF	24	
t-value	0.531	
p-value	0.6	
S	NS	

**Between Group:** ANOVA To determines the difference in the mean value of kyphotic angle analysis of variance was performed. It revealed that there was a nonsignificant difference among the three groups for the pre-treatment value as F value was (0.2) and P value was (0.819). While there was a significant difference in the post treatment value as F value was (44.602) and P value was (0.001) as shown in table (6)

**Table 5:** Results of ANOVA among the four groups for peak torque

Kyphotic angle		SS	MS	F	P value	S
Pre	Between Groups	8.916		0.2	.819	NS
	Within Groups	1606.954	4.458			
	Total	1615.870	22.319			
Post	Between Groups	1614.421		44.602	0.001	S
	Within Groups	1303.058	807.211			
	Total	2917.479	18.098			

## DISCUSSION

Within the limitations of this study, the application of Mulligan mobilization technique had a significant effect in decreasing kyphotic angle in subjects with postural kyphosis and the p-value was (0.001), but the application of Maitland mobilization technique had no significant effect on kyphotic angle-values (0.256).

Our finding of improving thoracic kyphosis and decreasing kyphotic angle in postural kyphosis using Mulligan mobilizations agreed with Mulligan concept of manual therapy which aiming to restore normal alignment and joint congruence not only relieving pain[17]. This finding is also agreed with A single case report describes the favorable response of a 20-year-old male university student. The first session was completed after some tape was applied to maintain the improvement in spinal posture. Though this constitutes level 4 evidence, it does provide a description of an actual case that will assist practitioners in the application of the MWM concept. There is no other higher-level evidence on MWM at the thoracic spine[18].

Back exercises should be combined with back support orthoses to have a permanent corrective effect on spine curvature, and not sufficient alone. This agreed with our results that back exercises alone in control group had no significant effect on kyphosis[19]. Carriere(1996), found that important goal of therapeutic exercise for the thoracic spine is to improve mobility and dynamic stability only but can not correct faulty curvature [20].

Our finding of an insignificant effect of Maitland mobilization on postural kyphosis is agreed with Banks et al. who investigated the effect of Maitland mobilization on pain and range of motion and found that Maitland had improved pain and range of motion with no effect on spine curvature of the thoracic spine[21].

Most of all of the previous studies investigated the effect of mobilization techniques on the spine in decreasing pain and improving range of motion, and there is a lack of literature that supports using of a Mulligan or Maitland mobilization on the spine to correct curvature or deformity of thoracic spine[22].Cross et al.(2011), found that thoracic spine thrust manipulation improves pain, range of motion, and self-reported function in patients with mechanical neck pain, but they did not measure the effect of manipulation on thoracic curvature[23].Cleland and McRae (2002), found that Maitland mobilization is effective in improving Complex regional pain syndrome[24].Jowsey and Perry (2009)in a randomized,placebo-controlled trial found that grade III poster-anterior rotator mobilization technique

applied to T4 had an effect on the Sympathetic nervous system in hand[25].

Our finding of the efficacy of Mulligan mobilization on decreasing kyphotic angle in postural kyphosis may be different from previous studies, as measured kyphotic angle objectively using formetric Raster-stereography. Also, our study was conducted on 75 subjects which are considered larger sample size than any previous studies.

## CONCLUSION

Mulligan mobilization on thoracic spine is an effective technique in restoring normal thoracic curvature in cases of postural kyphosis.

## REFERENCES

- [1] Kado DM, Prenovost K, Crandall C. Narrative review: hyperkyphosis in older persons. *Ann. Intern. Med.* 2007;147 (5): 330–8.
- [2] Bergman. J, Gert J.D., Winters J.C., Groenier, Klass H., van der Heijden. Manipulative therapy in addition to usual medical care for patients with shoulder dysfunction and pain a randomized, controlled trial, *Ann Intern Med.* 2004;141(6), 432–439.
- [3] Trevor Axelrod, MSIV; Fang Zhu, MD; Laurie Lomasney, MD; Bartosz Wojewnik, MD. Scheuermann's Disease (Dysostosis) of the Spine. *Orthopedics.* 2015; 38 (4), 66-71.
- [4] Morris and Q.M. Bui, The effects of mode of exercise instruction on compliance with a home exercise program in older adults with osteoarthritis, *Physiotherapy.* 2005;91(2), 79–86.
- [5] Kessler TJ, Brunner F, Künzer S, Crippa M, Kissling R. Effects of Maitland's manual mobilization on the thoracic spine. *Rehabilitation (Stuttg).* 2005;44(6):361-6.
- [6] Mulligan BR. *Manual Therapy: "NAGS", "SNAGS", "MWMS", etc.* 6th ed; 2010:35-37.
- [7] Maitland GD *Vertebral manipulation.* Butterworth Heinemann, Oxford. 6th ed ;2001: 309-310.
- [8] Hing W, Bigelow R, Bremner T. Mulligan's mobilization with movement: A systematic review. *The Journal of Manual & Manipulative Therapy.* 2009;17(2): 39-66.
- [9] Kauret Inderpreet, Arunmozhi R, Arfath Umer and Sardar Bhagwan. Effect of maitland vs mulligan mobilization techniques on upper thoracic spine in patients with non specific neck pain. *International Journal of Physiotherapy and Research.* 2013;1(5), 214- 219.
- [10] Katzman WB, Sellmeyer DE, Stewart AL, Wanek L, Hamel KA. Changes in flexed posture, musculoskeletal impairments, and physical performance after group exercise in community-dwelling older women. *Arch Phys Med Rehabil.* 2007; 88: 192–199.
- [11] Guidetti L. Intra- and Interday Reliability of Spine Rasterstereography. *BioMed Research International.* 2013, Article ID 745480, 5 pages.
- [12] Fotiadis E, Kenanidis E, Samoladas E, et al. Scheuermann's disease: focus on weight and height role. *Eur Spine J.* 2008; 17(5):673–678.
- [13] DeMauroy J, Weiss H, Aulisa A. 7th SOSORT consensus paper: conservative treatment of idiopathic & Scheuermann's kyphosis. *Scoliosis.* 2010; 5(9). 5-9 .
- [14] Jason M. Frerich, Kristen Hertzler, et al "Comparison of Radiographic and Surface Topography Measurements in Adolescents with Idiopathic Scoliosis" *The Open Orthopaedics Journal.* 2012, 6, 261-265 .
- [15] Neveen A. Abdel Raouf. Reliability and Validity of Video Raster stereography in Measuring Pelvic Parameters. *Bull. Fac. Ph. Th. Cairo Univ.,* 2014.;19, (1): 8-11.
- [16] Bautmans I, Arken J, Mackelenberg M and Mets T. Rehabilitation using manual mobilization for thoracic kyphosis in elderly postmenopausal patients with osteoporosis. *J Rehabil Med* 2010; 42: 129–135.
- [17] McDowell, J.M., Johnson, G.M., Hetherington, B. Mulligan Concept manual therapy: standardising annotation. *Man Ther.* 2014 Oct;19(5):499-503.
- [18] Horton, S.J. Acute locked thoracic spine: treatment with a modified SNAG. *Man. Ther.* 2002 ;17 (2), 103–107.
- [19] Moore DP, Tilley E, et al. Spinal orthoses in rehabilitation. In: Braddom RL, Ed. *Physical Medicine and Rehabilitation.* Philadelphia, PA: Saunders/Elsevier. 2007:369–380.
- [20] Carriere B. Therapeutic exercises and self-correction programs. In: Flynn TW. *Thoracic Spine and Rib Cage: Musculoskeletal Evaluation and Treatment,* Boston, MA: Butterworth-Heinemann. 1996:287–310.\
- [21] Banks K, Hengeveld E: *Maitland's Clinical companion: an essential guide or students,* Edinburgh, Churchill Livingstone. 2010.
- [22] Jones, M.A., Rivett, D.A. *Clinical Reasoning for Manual Therapists.* 2004. 3–24.
- [23] Cross, K.M., Kuenze, C., Grindstaff, T.L., Hertel, J., Thoracic spine thrust manipulation improves pain, range of motion, and self-reported function in patients with mechanical neck pain: a systematic review. *J. Orthop. Sports Phys.* 2011; 41, 633–642.
- [24] Cleland J, McRae M: Complex regional pain syndrome 1: management through the use of vertebral and sympathetic trunk mobilization. *J Man Manip Ther.* 2002; 10(4):188–199.
- [25] Jowsey P, Perry J: Sympathetic nervous system effects in the hand following a grade III posteroanterior rotator mobilisation technique applied to T4: a randomised, placebo-controlled trial. *Man Ther.* 2009;15: 248–253.

### Citation

Abdelhay, M. F., Elgendy, M. H., & Lasheen, Y. R. (2017). MULLIGAN VERSUS MAITLAND MOBILIZATION ON THORACIC KYPHOTIC ANGLE IN POSTURAL KYPHOSIS. *International Journal of Physiotherapy*, 4(3), 168-172.