

Effectiveness of Kaltenborn Joint Mobilization Technique Versus Muscle Energy Technique on Pain and Disability in Patients with Shoulder Adhesive Capsulitis

Farjad Afzal*

Department of Allied Health Sciences, University of Sargodha, Sargodha 40100, Punjab, Pakistan

*Corresponding author: Farjad Afzal, farjad.afzal@uos.edu.pk

Copyright: © 2022 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: The objective of this study was to compare the effectiveness of Kaltenborn joint mobilization techniques with muscle energy techniques in adhesive capsulitis. Study was conducted in population of Sargodha who is seeking physiotherapy treatment for adhesive capsulitis in physiotherapy rehabilitation departments and centers. The study design was randomized, controlled, and multicenter. Around 75 patients were selected by inclusion and exclusion criteria, and were divided into three groups by lottery method of randomization. Group 1 obtained Kaltenborn method of treatment, Group 2 obtained muscle energy technique, and Group 3 is control group that obtained conventional treatment in the form of heat and range of motion exercises. Duration of study was 6 months, and the interventions were performed for two weeks, with a total of 10 sessions. A baseline measurement was taken on shoulder pain and disability index (SPADI). A post intervention measurement was taken on same outcome measurement tools and was compared using ANOVA statistical analysis. The pre-intervention measurements on SPADI were 61.11±8.79, 60.91±9.90, and 61.18±9.00 in control, Kaltenborn, and METs groups, respectively. The post intervention measurements were 49.33±9.95, 39.09±9.45, and 27.69±11.97 in control, Kaltenborn, and METs groups, respectively. This study concluded that both techniques are effective in the treatment of adhesive capsulitis to decrease the pain and disability in experimental groups in comparison to control groups. METs is superior to Kaltenborn in pain and disability management when compared to each other.

Keywords: Frozen shoulder; Adhesive capsulitis; METs; Kaltenborn; SPADI

Online publication: September 29, 2022

1. Introduction

Duplay was the first who identified frozen shoulder as a “periartthritis” in 1872 [1]. After that Codman recognized this condition as “frozen shoulder” in 1935 [2]. In 1945, the termed “adhesive capsulitis” was originated by Neviasser. He identified the pathology in capsule of the joints. There is formation of adhesions in the capsule of the joints and synovial fluid became thick [3]. Exact cause of frozen shoulder is still unknown; however, it is associated with diabetes mellitus, hyperthyroidism, post operative surgeries (mastectomy, coronary artery bypass grafting CABG), post stroke, immobilization of upper limbs after fracture, and sometimes without any medical reason (idiopathic frozen shoulder) [4]. This disease is very common among diabetes patients in Pakistan as compare to foreigner diabetes patients [5]. Incidence and prevalence of frozen shoulder are increasing, compared to the past. The incidence rate is 2% to 3% in the general population with more common in elderly after 40s. Female is more affected as compare to male.

About 70% are women presenting with frozen shoulder. 20 to 30% patients will develop frozen shoulder in the opposite shoulder. The overall mean prevalence rate is 13.4 % in patients with diabetes mellitus. There is 30% prevalence of diabetes mellitus among frozen shoulder patients. It affects 2 to 5% in general population [6]. It commonly affects the women between age 40 and 60 [6]. Adhesive capsulitis is successfully managed by physiotherapy treatments, but NSAIDs (non-steroidal anti-inflammatory drugs), oral glucocorticoids, corticosteroid injection, and investigational therapy are used in acute stage of the disease to manage pain and inflammation. Most popular surgical techniques are performed under anesthesia and arthroscopic release and repair [7]. Joint mobilization techniques like Keltanborn, Maitland, Mulligan, and muscle energy techniques are used to mobilize the joints and control the pain [8]. There are different concepts of joint mobilization techniques, for example Kaltenborn, Maitland, Mulligan, McKenzie, and Butler. Kaltenborn gave the concept of biomechanical approach for treatment and diagnosis with combination techniques along with concept of trial treatment along with ergonomics principle [9]. Muscle energy techniques are used by the active participation of the patients, in which patients is command to perform an isometric or isotonic muscle movement whose line of pull can produce the desire glide, while therapist provide distal stabilization [10]. Adhesive capsulitis is very common condition in Pakistan [11], and the incidence is increasing with time [12]. Patients have to bear a big cost for the disease treatment. Previously, there is a large controversy in literature and many techniques had been used for this condition. Therefore, the objective of this study was to compare the effect, in term of pain, mobility, and disability of muscle energy techniques and Kaltenborn's joint mobilization in patients with shoulder adhesive capsulitis.

Anwar and colleagues conducted a study on Kaltenborn grade three mobilization and muscle energy techniques on mechanical neck pain and they concluded that both techniques have effectiveness in reduction of pain and disability, but their combination technique is more effective compared to a single technique. This study focuses only short-term effectiveness with 7 days of session [13]. This study was conducted on neck pain and in the present study the effects were compared on adhesive capsulitis.

In addition, Suri and colleagues conducted a study on frozen shoulder in which they compared the muscle energy technique with Maitland techniques, and they concluded that muscle energy technique is more effective for control the pain, whereas Maitland's technique has more effectiveness in increasing the range of motion and mobility of the joints [14]. In the study, they compared the Maitland method of mobilization with muscle energy techniques, but in the present study Kaltenborn technique is used.

Moore and colleagues conducted a randomized control study on posterior shoulder tightness to find the immediate effects of muscle energy techniques in baseball players by treating them in a single session. They concluded that a single MET (muscle energy technique) session can improve the GHJ (gleno humeral joint) horizontal abductors in overhead athletes [15]. This study was conducted on healthy population, while the present study is conducted on patients with adhesive capsulitis.

2. Materials and methods

The study design is randomized control trial. The study was conducted at rehabilitations centers in Sargodha city i.e. DHQ teaching hospital, University medical diagnosis, and Research Centre Mubarak Medical Complex. The duration of study is 6 months, from March 1, 2017 to September 31, 2017, and the study population is patients that visited the rehabilitation clinics for treatments for adhesive capsulitis. A sample of 75 patients who fulfilling inclusion and exclusion criteria were selected and divided into three groups by random table method. The study populations were selected by convenient sampling techniques by following inclusion and exclusion criteria as described below:

- (1) Inclusion criteria:
 Idiopathic frozen shoulder
 Sub-acute and chronic stage of adhesive capsulitis
 Age between 25-55
 Both male and female gender
- (2) Exclusion criteria:
 Arthritic shoulder
 Rotator cuff disease
 Post traumatic stiff shoulder
 Post CABG shoulder hand syndrome
 Post stroke frozen shoulder
 Bilateral frozen shoulder

Data was collected with the help of outcome measurement tool, shoulder pain and disability index (SPADI). This is an outcome measurement tool, that have two dimensions; (1) For pain and (2) For functional activities. For the assessment of pain, there are five questions, while for the assessment of functional activities there are eight questions^[16]. Demographic data like age, gender, and side of adhesive capsulitis are also collected. The selected 75 patients were divided into three groups by the method of randomization: (1) Group I received Kaltenborn method of treatment; (2) Group II received muscle energy technique; and (3) Group III is a control group that obtained conventional treatment in the form of heat and range of motion exercises. The study groups with their treatment methods are described in **Table 1**.

Table 1. Study groups and their treatment description

Groups	Treatment methods
T1 (treatment 1)	Muscle Energy Techniques + Moist Hot Pack + ROM (range of motion) Exercises for 15 minutes
T2 (treatment 2)	Kaltenbarn's joint mobilization + Moist Hot Pack + ROM Exercises for 15 minutes
T3 (treatment 3)	Moist Hot Pack + ROM Exercises for 15 minutes

Duration of study was 6 months. Interventions measurement was carried out for two weeks (total 10 sessions), and a baseline measurement was taken using measurement tool, SPADI. A post intervention measurement was taken by using the same measurement tool, and the results between the groups was compared by ANOVA.

3. Results

Mean age of participants was 48.06 ± 9.72 years. The range of age of participants was from 31.0 to 69.0 years. 30 (40%) males and 45 (60%) females were included in this study. 43 patients with right adhesive capsulitis and 32 with left adhesive capsulitis.

The pre intervention measurements were 59.36 ± 16.15 , 58.52 ± 14.03 and 65.00 ± 15.84 in control, Kaltenborn, and METs groups, respectively (**Table 2**). Meanwhile, the post intervention measurements were 50.58 ± 15.98 , 39.44 ± 12.23 and 28.80 ± 7.94 in control, Kaltenborn and METs groups respectively (**Table 2**).

The pre intervention measurements were 51.08 ± 10.16 , 51.48 ± 7.55 , and 46.60 ± 8.76 in control, Kaltenborn and METs groups, respectively (**Table 2**). The post intervention measurements were 39.08 ± 13.35 , 31.48 ± 20.56 , and 21.60 ± 11.12 in control, Kaltenborn and METs groups, respectively (**Table**

2).

Table 2 is also showing SPADI score measurements. The pre intervention measurements were 61.11±8.79, 60.91±9.90, and 61.18±9.00 in control, Kaltenborn, and METs groups respectively. The post intervention measurements were 49.33±9.95, 39.09±9.45, and 27.69±11.97 in control, Kaltenborn and METs groups, respectively.

Table 2. Pre and post measurement on pain, disability, and SPADI scale

	Pain scale		Disability scale		SPADI scale	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Control	59.36±16.15	50.58±15.98	51.08±10.16	39.08±13.35	61.11±8.79	49.33±9.95
Kaltenborn	58.52±14.03	39.44±12.23	51.48±7.55	31.48±20.56	60.91±9.90	39.09±9.45
Mets	65.00±15.84	28.80±7.94	46.60±8.76	21.60±11.12	61.18±9.00	27.69±11.97

Table 3 showed that at the baseline results there a no significant ($P>0.05$) different between all the groups are greater than 0.05. In post intervention comparisons, P value is less than 0.05, which showed that there is difference in post intervention measurements between the groups. When control group is compared with Kaltenborn and METs the p values were 0.008 and 0.000, respectively, showing that METs is superior to Kaltenborn techniques. When Kaltenborn techniques are compared with control group and METs the p values were 0.008 and 0.000, respectively, showing that METs is superior to Kaltenborn techniques. When MET techniques are compared with control group and Kaltenborn techniques the p values were 0.000 and 0.008, respectively, showing that METs is superior to altenborn techniques.

Table 3. ANOVA test (disability score)

	Disability scale			P-value		Multiple comparison	
	MET	Kaltenborn	Control	Within	Between	between groups	
Pre	46.60±7.84	51.40±7.55	51.00±10.16		.091; $P>0.05$	P-value	
Post	21.60±7.00	31.40±7.06	39.00±10.05		.000; $P<0.05$		
Multiple comparison between groups						Pre	Post
MET				Kaltenborn		.146	.000
				Control		.209	.000
Kaltenborn				MET		.146	.000
				Control		1.00	.008
Control				MET		.209	.000
				Kaltenborn		1.00	.008

Following ANOVA statistical test for pain scale (**Table 4**), the statistical analysis showed that at the baseline results, there is no significant ($P > 0.05$) difference between all the groups. In post intervention comparisons P value is less than 0.05, indicating that there is a significant difference in post intervention measurements between the groups. When control group is compared with Kaltenborn and METs the P values were 0.007 and 0.000, respectively, indicating that METs is superior to Kaltenborn techniques. When Kaltenborn techniques are compared with control group and METs, the p values were 0.007 and 0.000, respectively, indicating that METs is superior to Kaltenborn techniques. When MET techniques are

compared with control group and Kaltenborn techniques, the p values were 0.000 and 0.007, respectively, indicating that METs is superior to Kaltenborn techniques.

Table 4. ANOVA test (pain scale)

	Pain Scale			P Value		Multiple Comparison Between Groups	
	MET	Kaltenborn	Control	Within	Between		
Pre	65.00	58.12	59.36		.275; P>0.05	P value	
Post	28.80	39.44	50.58		.000; P<0.05		
Multiple Comparison Between Groups						Pre	Post
MET				Kaltenborn		.422	0.011
				Control		.596	0.000
Kaltenborn				MET		.422	0.011
				Control		1.00	0.007
Control				MET		.596	0.000
				Kaltenborn		1.00	0.007

4. Discussion

In this study METs was compared with Kaltenborn's techniques for frozen shoulder. Both treatments can produce significant change between pre and post treatments, if we compare the effectiveness between these two groups then METs show more effectiveness. The results of this study can be compared to a local study conducted by Naveed and colleagues in 2016, in which they compare the effectiveness of muscle energy technique, Kaltenborn G III mobilization with a combination of Kaltenborn and METs [13]. They selected 72 patients with neck pain and divided into three groups, and Goniometry and Oswestry disability neck index were used as the outcome measurement tools. They concluded that there was significant improvement in the combination group (METs and Kaltenborn G III Mobilization techniques) as compared to a single treatment. They measured short term and midterm effectiveness, and duration of treatment was 7 days. Another difference in this study was duration of treatment. In current study, 2 weeks treatment was used, while in the published study they used 7 days of treatments only. Results of previous study support the results of current study. The difference between these two studies are it was conducted on patient with neck pain, while current study was conducted on patients with frozen shoulder. In the study they compare the individual techniques with the combination techniques and found that the combination techniques group is more effectiveness, compared with the single technique group.

The results of this study can be compared with study conducted by Suri and colleges. Suri and colleagues conducted study on frozen shoulder in which they compared the muscle energy technique with Maitland techniques, and they concluded that muscle energy technique is more effective for control of pain, whereas Maitland's technique has more effectiveness in increasing the range of motion and mobility of joint [14]. In this study, they compared the Maitland method of mobilization with muscle energy techniques, but in the current study Kaltenborn technique was used. Study support that METs is more effective when compared. The results of this study were in line with the study conducted by Shakil and colleagues. Shakil and colleagues conducted a study on adhesive capsulitis to compare the effects of Kaltenborn techniques and general scapular mobilization, and they concluded that Kaltenborn mobilization is more effective when compared with general scapular mobilization [17].

5. Conclusion

This study concluded that both techniques are effective in the treatment of adhesive capsulitis to decrease the pain and disability in experimental groups in comparison to control groups. METs is superior to Kaltenborn in pain and disability management when compared to each other.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Lippmann RK, 1943, Frozen Shoulder: Periarthritis and Bicipital Tenosynovitis. *Archives of Surgery*, 47(3): 283–296.
- [2] Luime J, Koes B, Hendriksen I, et al., 2004, Prevalence and Incidence of Shoulder Pain in the General Population: A Systematic Review. *Scandinavian Journal of Rheumatology*, 33(2): 73–81.
- [3] Sheridan MA, Hannafin JA, 2006, Upper Extremity: Emphasis on Frozen Shoulder. *Orthopedic Clinics*, 37(4): 531–539.
- [4] Brue S, Valentin A, Forssblad M, et al., 2007, Idiopathic Adhesive Capsulitis of the Shoulder: A Review. *Knee Surgery, Sports Traumatology, Arthroscopy*, 15(8): 1048–1054.
- [5] Inayat F, Ali NS, Shahid H, et al., 2017, Prevalence and Determinants of Frozen Shoulder in Patients with Diabetes: A Single Center Experience from Pakistan. *Cereus*, 9(8):e1544.
- [6] Hsu JE, Anakwenze OA, Warrender WJ, 2011, Current Review of Adhesive Capsulitis. *Journal of Shoulder and Elbow Surgery*, 20(3): 502–514.
- [7] Stupay KL, Neviasser AS, 2015, Management of Adhesive Capsulitis. *Orthopedic Research and Reviews*, 7: 83–94.
- [8] Hesbach AL, 2014, Manual Therapy in Veterinary Rehabilitation. *Topics in Companion Animal Medicine*, 29(1): 20–23.
- [9] Kaltenborn FM, 1993, Orthopedic Manual Therapy for Physical Therapists Nordic System: OMT Kaltenborn-Evjenth Concept. *Journal of Manual & Manipulative Therapy*, 1(2): 47–51.
- [10] Kisner C, Colby LA, Borstad J, 2017, *Therapeutic Exercise: Foundations and Techniques*, Fa Davis, Pennsylvania.
- [11] Kidwai SS, Wahid L, Siddiqi SA, et al., 2013, Upper Limb Musculoskeletal Abnormalities in Type 2 Diabetic Patients in Low Socioeconomic Strata in Pakistan. *BMC Research Notes*, 6: 16.
- [12] Karoli Y, Karoli R, Fatima J, et al., 2016, Musculoskeletal Disorders in Patients with Type 2 Diabetes Mellitus. *International Journal of Health Sciences and Research (IJHSR)*, 2016(6): 99–104.
- [13] Anwar N, Khalid K, Rana AA, et al., 2016, Efficacy of Kaltenborn Grade III Mobilizations, Muscle Energy Techniques, and their Combination to Improve Range and Functional Ability in Adults with Mechanical Neck Pain. *International Journal of Physiotherapy*, 3(4): 482–486.
- [14] Suri SA, Anand M, 2013, Comparative Study on the Effectiveness of Maitland Mobilization Technique Versus Muscle Energy Technique in Treatment of Shoulder Adhesive Capsulitis. *Indian Journal of Physiotherapy and Occupational Therapy*, 7(4): 1.
- [15] Moore SD, Laudner KG, Mcloda TA, et al., 2011, The Immediate Effects of Muscle Energy Technique on Posterior Shoulder Tightness: A Randomized Controlled Trial. *Journal of Orthopaedic & Sports Physical Therapy*, 41(6): 400–407.
- [16] Roach KE, Budiman-Mak E, Songsiridej N, et al., 1991, Development of a Shoulder Pain and Disability Index. *Arthritis & Rheumatology*, 4(4): 143–149.

[17] Shakil-ur-Rehman S, Danish KF, Khan A, et al., 2012, Comparison between Kaltenborn and General Scapular Mobilization in Adhesive Capsulitis Patients. *Journal of Rawalpindi Medical College (JRMC)*, 16(2): 121–122.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.