

ORIGINAL ARTICLE

EFFECTIVENESS OF GRADE I, II KALTENBORN MOBILIZATION IN STAGE I ADHESIVE CAPSULITIS

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Abstract

Objectives: To determine the effectiveness of grade I and II Kaltenborn mobilization in treating stage I adhesive Capsulitis. **Material & Methods:** The study design was Randomized Controlled Trial. In which two groups were formed. One was Group A and second was Group B. In Group A for adhesive capsulitis stage I, Keltonborne mobilization Grade I&II was performed along with TENS, Hopsacks & Home Exercises Plan. In Group B TENS, Hot packs and Home Exercise Plan was introduced. The study was conducted in physiotherapy department BBH, Rawalpindi. The study was conducted for six months after the approval of topic by ASRC Isra University Islamabad. Sample size chosen was 60 patients and 30 patients were included in each group. Non probability Purposive Sampling technique was used collect the samples. The data was collected through the following questionnaires. The data collection also consisted of Quick DASH part-I with 11-items and Quick DASH work-module with 4 questions, which measured level of pain severity and level of difficulty. Data was analyzed through SPSS IBM 20. Baseline data was described in form of frequency table and bar charts, mean and standard deviation. **Results:** The result showed significant difference within and between the Group A and Group B after intervention. The result the p-value= ≤ 0.05 in quick DASH questionnaire. **Conclusion:** The results of the study concluded that Hot pack, TENS and home exercises with or with kaltonborne grade 1&2 are both effective for management of symptoms of stage 1 adhesive capsulitis. But Hotpack, TENS and home exercise plan with kaltonborne mobilization grade 1&2 significantly improve in term of treatment duration and symptoms reduction

Keywords: Adhesive capsulitis, Keltonborne manual mobilization, Quick DASH, TENS, Hot pack, Home exercise plan

INTRODUCTION

Adhesive capsulitis is characterized by a painful, gradual loss of both active and passive glenohumeral motion resulting from progressive fibrosis and ultimate contracture of the glenohumeral joint capsule.¹ The prevalence of the adhesive capsulitis in diabetics is 3-4% to 20%.² Some studies suggested that adhesive capsulitis is self limiting condition and resolve itself within 3 years but most of studies suggested that adhesive capsulitis affect ROM in 30-55% patient up to 5 years.³ Adhesive capsulitis is more prevalent in women than men after 50 years of age.⁴ But some studies suggested its occurrence bilaterally in 40-50% patients.⁵

The adhesive capsulitis on the basis of clinical presentation mainly have three stages. The first stages is freezing stage. it is also called painful stage.⁶ The painful stage (stage I) involves gradually increasing pain and stiffness and lasts between three and eight months also characterized by synovitis of shoulder joint.⁷ Most of the patients progress to the second stage, called the frozen or transitional stage.⁸ In the second stage ROM is limited marked but pain intensity do not increase. The duration of this stage is 4-12months.¹⁰ The third stage of adhesive capsulitis is thawing stage during this stage ROM of shoulder joint is

going to improve and this stage last from 12-42 months and characterized by returning of the shoulder joint movement.¹¹

As stage I progress the condition become worse with more pain and limitation in AROM & PROM of shoulder joint.¹² Stage 1 of adhesive capsulitis mimics the impingement syndrome of the shoulder.¹³ Muscle spasms in the trapezius also commonly occur during this phase.¹³ A history of a minor strain or injury before onset may be noted; however, it is unclear whether the initial strain is an independent phenomenon or an early awareness of the pain associated with the onset of adhesive capsulitis.^{14,22}

The OMT Kaltenborn-Evjenth Concept is the result of many years of collaboration between physical therapists and physicians, first in the Nordic countries from 1954 to 1970, and then worldwide.¹⁵ In kaltenborn classification system, a concept of management in which accessory and physiologic passive movements of the joints are applied at various grades of intensity depending on subject's pain and joint stiffness.¹⁶ A vital component of the kaltenborn approach is that the treatment is based on constant assessment and reassessment with subsequent individual modification of treatment techniques.¹⁷ KM involves the application of a passive sustained stretch technique to enhance joint mobility without articular surface suppression.¹⁸ The forces applied to increase joint mobility

are graded from I–III. Grade I applies a distraction of minor intensity that hardly causes stress within the joint capsule; it is often used to decrease pain.¹⁹ Grade II refers to a force that stretches the periarticular tissue; such stimulus is colloquially referred to as “taking up the slack.”²⁰ Finally, Grade III force causes enough distraction or gliding so that joint capsule can sufficiently stretch; it is often used for enhancing ROM.²¹

There was limited literature found on effectiveness of grade I&II mobilization in stage I adhesive capsulitis. The studies have also shown that electrotherapy is effective, but the studies have not compared the effectiveness of treatments together on rehabilitation outcomes in Pakistan. So the need arises to carry out the study with Kaltenborn mobilization and electrotherapy versus electrotherapy. The current study is designed to evaluate the effectiveness of Grade I and II Kaltenborn mobilizations of gleno-humeral joint in treating acute adhesive capsulitis of the GH joint in comparison to electrotherapy.

MATERIAL & METHODS

The study design was Randomized Controlled Trial. In which two groups were formed. One is Group A and second was Group B. In Group A for adhesive capsulitis stage I, Keltonborne mobilization Grade I&II was performed along with TENS, Hot packs & Home Exercises Plan. In Group B TENS, Hot packs and Home Exercise Plan was introduced. The study was conducted in physiotherapy department, BBH, Rawalpindi. Permission for study was also taken from ethical committee of BBH. Sample size chosen was 60 patients, 30 patients were randomly allocated in each group. Non probability Purposive Sampling technique were used collect the samples. Patients between the age 35-70 years, patients having purely stage I adhesive Capsulitis, both male and female genders were included in the study. Patients having diabetes, chronic osteoarthritis and with history of fracture & dislocation around shoulder joint were excluded.

The data was collected through General demographic questionnaire including age, gender, BMI, dominant arm and Occupation and also through Quick DASH part-I with 11-items and Quick DASH work-module with 4 questions, which measured level of pain severity and level of difficulty. Data was analyzed through SPSS IBM 20. Baseline data was described in form of frequency table and bar charts, mean and standard deviation. Group comparison was conducted by paired sample t-test. In which pre and post test comparison of both group was

conducted and describe by mean standard deviation and significant difference was calculated by p-value ≤ 0.05 .

The subjects received series of six consecutive physiotherapy sessions for two weeks of almost 45 minutes in duration. The sessions were administered by a physical therapist. The sessions were included TENS, which was applied for 10minutes over the shoulder; Hot pack for 10 minutes over the painful area of shoulder was applied. Home exercises plan included general range of motion exercises, pendular and wall walking exercises, 10 repetitions of each exercise 2 times per day was suggested.

Each session started by asking the patients about the symptoms and limitation under DASH Quick Questionnaire. After session last 15 minutes included a review of exercises and awareness of positional patterns and movements of the arm for at home and occupational settings. The last portion of session included a verbal and visual review of client’s status. In Group A, additionally Keltonborne Grade 1&2 mobilizations were used in patients with supine position, distraction gliding was performed in abduction, extension, internal rotation and flexion to improve symptoms of stage I adhesive capsulitis for about 10-15minutes

RESULTS

The patients in both groups were similar in terms of the age, gender, dominant arm and duration of the main complaints and outcome measure of base line value. (Table 1) The mean age in group A was 58.90 ± 6.03 and in group B was 56.50 ± 6.61 .

Table 1: General Demographic of Subjects

	Categories	Groups		n(%)
		A	B	
Age	41-50	1	5	6(10%)
	51-60	15	15	30(50%)
	Above 60	14	10	24(40%)
Gender	Male	14	13	27(45%)
	Female	16	17	33(55%)
	Right	26	27	53(88.3%)
Dominant Arm	Left	4	3	7(11.7%)

In our sample there were 14 male in group A and 13 males in group B and 10 females in group A and 13 females in group B. 10% of the sample lied in age category of 41-50, 50% of sample in 51-60 and 40% above 60 years of age. 53 patients had dominant right arm and only 7 patients had dominant left arm. The descriptive statistics regarding Quick DASH questionnaire for within the group Pre & Post comparison of group A & B has been given in Table 2 & 3 and results of between the groups A & B comparison has been given in Table 4. All the variables assessed to evaluate

the effectiveness of treatment methodology in group A showed significant difference as can be seen by the p-values except for a few variables like cutting food, social activities and tingling which had p-values 0.08, 0.08 and 0.16 respectively. (Table 2) In group B all the variables showed significant difference except for social activities and tingling with p-values 0.66 and 0.16 respectively. (Table 3)

Table 2: Comparison within the Group A (Pre & Post) , n=30

		Mean	SD	p-value
Carry a shopping bag or briefcase	Pre	2.60	0.49	0.00
	Post	2.26	0.73	
Cut food.	Pre	1.10	0.30	0.08
	Post	1.00	0.00	
Doing your usual work because of shoulder	Pre	2.16	0.37	0.00
	Post	1.23	0.50	
Doing your work as well as you would like?	Pre	2.16	0.37	0.00
	Post	1.23	0.50	
Heavy Household	Pre	1.26	0.44	0.00
	Post	1.83	0.69	
Open a jar	Pre	1.60	0.77	0.01
	Post	1.40	0.62	
Pain	Pre	1.66	0.75	0.00
	Post	1.23	0.50	
Recreational activities	Pre	1.83	0.69	0.00
	Post	1.30	0.53	
Sleeping	Pre	2.33	0.47	0.00
	Post	1.23	0.50	
Social activities	Pre	1.16	0.37	0.08
	Post	1.06	0.25	
Spending your usual amount of time doing your work	Pre	2.80	0.40	0.00
	Post	1.56	0.62	
Tingling	Pre	1.10	0.30	0.16
	Post	1.03	0.18	
Using your usual technique for your work?	Pre	2.33	0.47	0.00
	Post	1.56	0.62	
Wash your back	Pre	2.86	0.73	0.00
	Post	1.60	0.72	
Work or other regular activities	Pre	3.36	0.55	0.00
	Post	2.03	1.12	

When comparing the post values for both the groups A and B it can be clearly observed that the mean values for the group A are less as compared to group B which showed that Keltenborn mobilization along with electrotherapy is more effective than electrotherapy only for treatment of stage I adhesive capsulitis. A few of variables have non-significant p values such as cutting food with p-value not applicable and SD 0.00, opening jar with p-value 0.69 and SD 0.62 in group A and 0.68 in group B,

pain with p-value of 0.15 and SD 0.50 in group A and 0.56 in group B, social activities with p-value 0.39 and SD 0.25 in group A and 0.34 in group B and tingling with p-value not applicable and SD of 0.18 in group A and B. (Table 4)

Table 3: Comparison within the Group B (Pre & Post) , n=30

		Mean	SD	p-value
Carry a shopping bag or briefcase	Pre	1.60	0.77	0.05
	Post	1.43	0.67	
Cut food.	Pre	1.10	0.30	0.08
	Post	1.00	0.00	
Doing your usual work because of shoulder pain	Pre	2.17	0.37	0.02
	Post	2.00	0.52	
Doing your work as well as you would like?	Pre	2.16	0.37	0.04
	Post	2.03	0.49	
Heavy Household	Pre	1.633	0.55	0.03
	Post	1.83	0.69	
Open a jar	Pre	1.60	0.77	0.04
	Post	1.46	0.68	
Pain	Pre	1.66	0.75	0.03
	Post	1.43	0.56	
Recreational activities	Pre	1.83	0.69	0.01
	Post	1.53	0.57	
Sleeping	Pre	2.26	0.44	0.02
	Post	2.10	0.40	
Social activities	Pre	1.16	0.37	0.66
	Post	1.13	0.34	
Spending your usual amount of time doing your work	Pre	2.80	0.40	0.02
	Post	2.63	0.55	
Tingling	Pre	1.10	0.30	0.16
	Post	1.03	0.18	
Using your usual technique for your work?	Pre	2.33	0.47	0.00
	Post	2.033	0.66	
Wash your back	Pre	2.80	0.40	0.03
	Post	2.60	0.62	
Work or other regular activities	Pre	2.80	0.40	0.02
	Post	2.63	0.61	

DISCUSSION

There are several studies conducted which reported the effectiveness of joint mobilization in improving joint pain and ROM in subacute and chronic stages.^{23,24,25,26} But in this study keltonborne mobilization grade 1&2 were used to manage pain and discomfort in acute stage of adhesive capsulitis. The study showed improvement in the both groups but in post intervention group comparison significant difference in improvement of symptoms Group A (Keltonborn 1&2) as compared to Group B (without Keltonborn 1&2).

Table 4: Comparison between the Group A & B (Post) , n=60

	Groups	Mean	SD	p-value
Carry a shopping bag or briefcase	A	2.26	0.73	0.00
	B	1.43	0.67	
Cut food.	A	1.00	0.00 ^a	N/A
	B	1.00	0.00 ^a	
Doing your usual work because of shoulder pain	A	1.23	0.50	0.00
	B	2.00	0.52	
Doing your work as well as you would like?	A	1.23	0.50	0.00
	B	2.03	0.49	
Heavy Household	A	1.26	0.44	0.00
	B	1.63	0.55	
Open a jar	A	1.40	0.62	0.69
	B	1.47	0.68	
Pain	A	1.23	0.50	0.15
	B	1.43	0.56	
Recreational activities	A	1.30	0.53	0.03
	B	1.60	0.56	
Sleeping	A	1.23	0.50	0.00
	B	2.10	0.40	
Social activities	A	1.07	0.25	0.39
	B	1.13	0.34	
Spending your usual amount of time doing your work	A	1.56	0.62	0.00
	B	2.63	0.55	
Tingling	A	1.03	0.18	N/A
	B	1.03	0.18	
Using your usual technique for your work?	A	1.57	0.62	0.00
	B	2.03	0.66	
Wash your back	A	1.60	0.72	0.00
	B	2.60	0.62	
Work or other regular activities	A	2.03	1.12	0.01
	B	2.63	0.61	

Yang JL, et al.²⁴ conducted a study in patients of adhesive capsulitis to study the effectiveness of end range mobilization/scapular mobilization treatment approach in adhesive capsulitis patients. But in this study grade 1&2 mobilization were along with distraction to improve pain and muscle grading in stage 1 adhesive capsulitis. The results of study claimed that the grade 1&2 Keltonborne mobilizations were more effective than a without Keltonborne grade 1&2 mobilization.

In this study all variable on Quick DASH questionnaire showed significant improvement in the study, but some variable of Quick DASH questionnaire were not significantly different, e.g. cutting food, social activities and tingling sensation in arm. This is because these

variables were not associated with stage 1 adhesive capsulitis in most of the patients. Cutting food mostly didn't had the role of shoulder included in performing the activity and might be only females are involved in cutting food that's why it wouldn't have shown the significant difference after treatment. Social activities showed a very minor change, which is not significant that might be because of female included in our sample aren't much social. Tingling sensations also didn't showed significant difference as the treatment strategy we used was for treating pain and range of motion and might be because very few samples had the complain of tingling.

When comparing the post values for both the groups A and B it can be clearly observed that the mean values for the group A are less as compared to group B which showed that Keltenborn mobilization along with electrotherapy is more effective than electrotherapy only for treatment of stage I adhesive capsulitis. A few of variables have non-significant p values such as cutting food, opening jar, pain, social activities and tingling. In cutting food as only females candidate are involved and in social activities mostly females have less contribution, that might be a possible reason for non-significant p-value but the mean value for both the variables are less in group A as compared to group B which still explains the effectiveness of Keltenborn mobilization. For tingling the mean values for both groups are same and the p-value is also non-significant as there were only few samples with the complaint of tingling and tingling is mostly associated with radiating pain and that should be excluded from sample to specify the effectiveness of treatment only for adhesive capsulitis.

The post group comparison showed mark improvement in group A in which grade 1& 2 mobilization was performed along with TENS, hot packs and home exercises plan.

The pain levels immediately after treatment were not assessed objectively in either group; however, nine of the group A patients and eight of the group B stated that their shoulder felt better after treatment.

Vermeulen H M²⁵ stated a multiple subject case report and warranted the effectiveness of end range mobilization techniques in treatment of adhesive capsulitis. Indexes of pain, joint ROM and function were measured, before treatment and after three weeks of treatment. Significant increase in active ROM and shoulder function was noted. 57% patients rated their improvement in shoulder function as excellent, 29% patients rated as good and 14% patients rated as moderate.^{26,27} In this it was also found that in both groups the patients who were not performing exercise at home suggested by therapist their symptom were not improved significantly.

A study was conducted to determine the effectiveness of passive exercises coupled with therapeutic activities to improve functional hand-to-back activity in adhesive capsulitis. This study supports passive exercise program along with therapeutic activities as a means for the improvement of functional hand-to-back activity in adhesive capsulitis.²⁸

Sean M Griggs²⁹ performed a prospective study on subjects having idiopathic adhesive capsulitis. This study provided detailed information about level of pain, Active-ROM and Passive-ROM and functional outcome. This study concluded that mobilization when applied on patients of adhesive capsulitis improves the patient's conditions. All the parameters were found to be significantly improved and 90% patients were satisfied.²⁹

CONCLUSION & RECOMMENDATION

The results of the study concluded that Hot pack, TENS and home exercises with or with keltonborne grade 1&2 are both effective for management of symptoms of stage 1 adhesive capsulitis. But Hotpack, TENS and home exercise plan with keltonborne mobilization grade 1&2 significantly improve in term of treatment duration and symptoms reduction. It was also noticed that home exercises plan was very crucial for reduction or maintenance of symptom at achieved level.

The sample size of study was very small so it is recommended that sample size should be large enough to generalizability of results. It is also recommended that further research should be done while considering the home exercises plane because these can affect the results of the study. Because in this study mostly did not follow the home exercises plan properly/regularly.

REFERENCES:

1. Neviaser TJ. Adhesive capsulitis. The Orthopedic clinics of North America. 1987 Jul;18(3):439. AS, Hannafin JA. Adhesive capsulitis: a review of current treatment. The American journal of sports medicine. 2010;38(11):2346-56.
2. Ramchurn N, Mashamba C, Leitch E, Arutchelvam V, Narayanan K, Weaver J, Hamilton J, Heycock C, Saravanan V, Kelly C. Upper limb musculoskeletal abnormalities and poor metabolic control in diabetes. European journal of internal medicine. 2009;20(7):718-21.
3. McNally EG, Rees JL. Imaging in shoulder disorders. Skeletal radiology. 2007;36(11):1013-6.
4. Hand C, Clipsham K, Rees JL, Carr AJ. Long-term outcome of frozen shoulder. Journal of Shoulder and Elbow Surgery. 2008;17(2):231-6.
5. Ahmad S, Rafi MS, Siddiqui IA, Hamidi K, Faruq NM. The frequency of adhesive capsulitis in diabetes mellitus patients. Pak J Rehabil. 2012;1(2):49-55.
6. Tukmachi ES. Frozen shoulder: a comparison of western and traditional Chinese approaches and a clinical study of its acupuncture treatment. Acupuncture in Medicine. 1999;17(1):9-21.
7. Manske RC, Prohaska D. Clinical commentary and literature review: diagnosis, conservative and surgical management of adhesive capsulitis. Shoulder & Elbow. 2010;2(4):238-54.
8. Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. Current reviews in musculoskeletal medicine. 2008;1(3-4):180-9.
9. Thelen MD, Dauber JA, Stoneman PD. The clinical efficacy of kinesio tape for shoulder pain: a randomized, double-blinded, clinical trial. Journal of orthopaedic & sports physical therapy. 2008;38(7):389-95.
10. Nath J. Different mobilization technique in management of frozen shoulder. International J of Science & Research. 2015;4(5):1285-90.

11. Laubscher PH, Rösch TG. Frozen shoulder: A review. SA Orthopaedic Journal. 2009;8(3):24-9.
12. Johnson AJ, Godges JJ, Zimmerman GJ, Ounanian LL. The effect of anterior versus posterior glide joint mobilization on external rotation range of motion in patients with shoulder adhesive capsulitis. Journal of orthopaedic & sports physical therapy. 2007;37(3):88-99.
13. Pappas AM, Zawacki RM, McCarthy CF. Rehabilitation of the pitching shoulder. The American journal of sports medicine. 1985;13(4):223-35.
14. Siegel LB, Cohen NJ, Gall EP. Adhesive capsulitis: a sticky issue. Am Fam Physician. 1999;59(7):1843-52.
15. Koo JP, An HJ, Koo HS, Park JH, Kim SY, Kim YK, Choi JH, Kim SH, Min KO. The effects of interferential current and Kaltenborn-Evjenth orthopedic manual therapy on functional constipation. Journal of International Academy of Physical Therapy Research. 2010;1(1):45-51.
16. Vermeulen HM, Rozing PM, Obermann WR, Le Cessie S, Vlieland TP. Comparison of high-grade and low-grade mobilization techniques in the management of adhesive capsulitis of the shoulder: randomized controlled trial. Physical Therapy. 2006;86(3):355.
17. Shrivastava A, Shyam AK, Sabnis S, Sancheti P. Randomised controlled study of Mulligan's vs. Maitland's mobilization technique in adhesive capsulitis of shoulder joint. Indian journal of physiotherapy and occupational therapy-An international journal. 2011;5(4):12-5.
18. Do Moon G, Lim JY, Kim TH. Comparison of Maitland and Kaltenborn mobilization techniques for improving shoulder pain and range of motion in frozen shoulders. Journal of physical therapy science. 2015;27(5):1391-5.
19. Choi SJ, Choi WS, Moon OK. A Study on the Load Analysis of Gliding Grade under the Kaltenborn-Evjenth Concept®. Journal of the Korean Society of Radiology. 2012;6(5):383-8.
20. Weaver AD. Lameness above the foot. Bovine Medicine: Diseases and Husbandry of Cattle. 1992:364-95.
21. Kachingwe AF, Phillips B, Sletten E, Plunkett SW. Comparison of manual therapy techniques with therapeutic exercise in the treatment of shoulder impingement: a randomized controlled pilot clinical trial. Journal of manual & manipulative therapy. 2008;16(4):238-47.
22. Rodgers S, Brealey S, Jefferson L, McDaid C, Maund E, Hanchard N, Goodchild L, Spencer S. Exploring the outcomes in studies of primary frozen shoulder: is there a need for a core outcome set?. Quality of Life Research. 2014;23(9):2495-504.
23. Turner PA, Whitfield TW. A multidimensional scaling analysis of the techniques that physiotherapists use. Physiotherapy Research International. 1997;2(4):237-54.
24. Yang JL, Jan MH, Chang CW, Lin JJ. Effectiveness of the end-range mobilization and scapular mobilization approach in a subgroup of subjects with frozen shoulder syndrome: a randomized control trial. Manual therapy. 2012 Feb 29;17(1):47-52.
25. Vermeulen HM, Obermann WR, Burger BJ, Kok GJ, Rozing PM, van Den Ende CH. End-range mobilization techniques in adhesive capsulitis of the shoulder joint: a multiple-subject case report. Physical Therapy. 2000;80(12):1204-13.
26. Guler-Uysal F, Kozanoglu E. Comparison of the early response to two methods of rehabilitation in adhesive capsulitis. Swiss medical weekly. 2004;134(23-24):353-8.
27. Levine WN, Kashyap CP, Bak SF, Ahmad CS, Blaine TA, Bigliani LU. Nonoperative management of idiopathic adhesive capsulitis. Journal of shoulder and elbow surgery. 2007;16(5):569-73.
28. Johnson AJ, Godges JJ, Zimmerman GJ, Ounanian LL. The effect of anterior versus posterior glide joint mobilization on external rotation range of motion in patients with shoulder adhesive capsulitis. Journal of orthopaedic & sports physical therapy. 2007;37(3):88-99.
29. Griggs SM, Ahn A, Green A. Idiopathic adhesive capsulitis. J Bone Joint Surg Am. 2000 Oct 1;82(10):1398

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