

# Maitland Vs Kaltenborn Approach in Improving Pain and External Rotation in Adhesive Capsulitis

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**Abstract:**-Adhesive capsulitis is one of the most common shoulder pathology which is more prevalent among women compared to men. It can be seen among the age group of between 40 to 60 years old. It is characterized as a self-limiting condition which causes pain and restricts active and passive Glenohumeral range of motion more than 25% in at least two directions. The most commonly affected motion is external rotation followed by abduction. The objective of this study was to compare the effectiveness between anterior glide of Maitland and posterior glide of Kaltenborn joint mobilization techniques on external rotation range of motion and pain among patients with adhesive capsulitis. This quasi-experimental study was conducted at Hospital Seberang Jaya physiotherapy department. A total number of 34 subjects were randomly assigned and were divided into group A (n=17) and group B (n=17). Maitland mobilization was given to group A and Kaltenborn mobilization was given to group B respectively along with ultrasound therapy for one session per week for 6 weeks after obtaining informed consent. Outcome measures used were Shoulder Pain and Disability Index (SPADI) and range of motion of external rotation of shoulder. Paired 't'-tests was used to compare the pre- and post-intervention results in both groups and independent's-tests was used to compare groups. This study found that both Maitland and Kaltenborn approach group were effective in treatment for patients with adhesive capsulitis.

**Keywords** Shoulder Glide, External rotation, Adhesive Capsulitis, Ultrasound.

## I. INTRODUCTION

### I.1 Background of the study

Adhesive capsulitis (AC) is defined as a disorder characterized by progressive pain and loss of active and passive mobility of Glenohumeral joint (J.P. Tasto, et, al, 2007). It can be versed as frozen shoulder, periarthritits and pericapsulitis. This debilitating condition incites acute shoulder ache and deliberately augmenting stiffness and loss of function. Adhesive capsulitis is the commonest shoulder pathology which is more prevalent among women compared to men. Statistically, it shows 3 to 5% ubiquity in the accustomed population and approximately 40% in diabetics (Elias, et, al, 2007). People between 40 to 60 years are more

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prone to this condition, especially in women compared to men and in the diabetic population, with an occurrence rate of approximately 2-5% in the general population, and 10-20% of the diabetic population. (C.Hand, et, al 2008). The prevalence of adhesive capsulitis in the habitual population is slightly greater than 2%. Approximately 70% of patients with adhesive capsulitis are women, and 20% to 30% of those afflicted subsequently will have adhesive capsulitis develop in the opposite shoulder (BulgenDY, et al, 2012)<sup>[1,2,3,4]</sup>.

## II. SHOULDER GIRDLE

Shoulder girdle is a heterogeneous anatomical string which is subjected to connect axial to upper appendicular skeleton. Appendicular skeleton includes sternoclavicular, acromioclavicular, Glenohumeral, clavicle, scapula and proximal humerus (Groh GI, 2011)<sup>[5,6,7]</sup>.

According to Bureau of Labour Statistics of United States, the secondary common complaint after back pain is shoulder pain. It can be seen in workers as they tend to do ceaseless overhead uplifting and in some condition, static shoulder posture need to be maintained. Light industry, assembly line workstations and office environments are the most trivial work related disorders (J.A Porterfield, C.DeRosa, 2004). Shoulder pain can be due to bursitis, tendinitis, rotator cuff tear, adhesive capsulitis, impingement syndrome, avascular necrosis, Glenohumeral osteoarthritis and degenerative joint disease or from traumatic injury as well (K.L.Moore, A.F. Dalley, 2006). Among all these, rotator cuff disorders, adhesive capsulitis and Glenohumeral osteoarthritis ranks the top in shoulder pain. It accounts for about 10%, 6% and 2% respectively (Meislin RJ, 2005). These three main conditions have complicated etiologies. However, they can be diagnostic-ate under substructure of medical history, focused physical examination and plain film radiographs (SperlingJW, 2005)<sup>[8,9,10,11]</sup>.

## III. MAITLAND MOBILIZATION

Maitland mobilization can be expressed as a low-velocity and small or large amplitude movement applied anywhere within a joint range of motion to improve the corresponding extensibility of the shoulder capsule and stretch the specific tightened soft tissues to induce beneficial effects. Based on the classification system, which consists of 5 grades, the amplitude of the rhythmic oscillating mobilization in the specified range of movement is described. It is performed beyond the pain threshold. Maitland mobilization is used based on severity, irritability and nature of pain



(Maitland, 2013)<sup>[12,13,14]</sup>.

According to Kisner C, 2012, grade III anteroposterior oscillation helps in restoring both external rotation and internal rotation range of motion of shoulder in patients with adhesive capsule. It helps to stretch the anterior capsule of shoulder which has been tightened due to the scar tissue. Maitland mobilization helps in pain relief the most <sup>[15,16]</sup>.

**IV. KALTENBORN MOBILIZATION**

Kaltenborn mobilization evaluates the motions on the articular surface and applies them to treatment according to MacConaill’s classification, which posits most articular surfaces have convex interiors and concave exteriors. Kaltenborn mobilization involves the application of a passive sustained stretch technique to enhance joint mobility without articular surface suppression. The forces applied to increase joint mobility are graded from I–III. (Kaltenborn F, 2004).<sup>[17,18,19,20]</sup>.

According to Harry man, 2017, grade III posterior translation has a great impact in improving range of motion of external rotation of shoulder in patients with adhesive capsulitis. Applying distraction force on posterior capsule eases both the pain and increases range of motion of external rotation of shoulder. Kaltenborn mobilization has better evidence in increasing range of motion. It is done through stretching of fibrous tissue where tissue undergoes creep. It relates to the ability of tissue to change shape over time as a constant load is applied. Creep deformation is not permanent and once the load is removed, the tissue will slowly resume its original length <sup>[21,22,23]</sup>.

Variable	Mean	Std. Deviation	Std. Error Mean
Pre ROM	30.0	19.8	4.8
Post ROM	61.8	14.5	3.5
Pre SPADI	62.4	14.5	3.5
Post SPADI	52.5	15.0	3.6

**Table 1:** Demographic characteristic of the study

**V. ULTRASOUND THERAPY**

Therapeutic ultrasound is widely used in clinical practice since 1950’s and this intervention has great range of evidence in treating clinical problems (Shah and Farrow, 2012). This deep tissue heating modality has an effect in elevating the temperature of the tissue in contact (Robert A Donatelli, 2015). The ultrasound therapy causes physiologic response where it increases collagen tissue extensibility and pain threshold. Enzyme activity increases and it causes changes in nerve conduction velocity and contractile activity of skeletal muscle (Michael J, 2015)<sup>[24,25,26]</sup>.

**II. Methodology**

Data analysis was performed using descriptive statistic by calculating on frequencies and percentages in the form of tabulation and computation on selected variables. Paired sample ‘t’-test and independent sample ‘t’-test was used to evaluate SPADI and external rotation of range of motion. In this study, paired ‘t’-test was used to determine the mean difference of pre and post SPADI and external rotation of range of motion in each group. The independent samples ‘t’-test was used to compare the mean of two independent groups in order to determine whether there were statistical evidence

that the associated population means were significantly different. A quantitative research study was conducted in this study in the form of a quasi-experimental type design. Convenient sampling of 34 subjects within the age range of 40 to 60 years old of both genders among the patients with adhesive capsulitis was chosen from Hospital Seberang Jaya, Penang. Each patient was treated once a week for the duration of 6 weeks. Each treatment takes around 45 minutes with ultrasound therapy followed by joint mobilization techniques with subsequent rests given in between

**Procedures**

Pre- assessment was taken prior to the commencement of treatment with self-report outcome measures of Shoulder Pain and Disability Index (SPADI) and range of motion with goniometry. The SPADI form contains 13 items describing common situation that may induce symptoms in patients with shoulder disorder. All items are related to the preceding 24 hours. Response options are either ‘YES’, ‘NO’ or ‘NOT APPLICABLE’. The not applicable category can be used when the situation at issue has not occurred during the preceding 24 hours; a final score is calculated by dividing the number of positively scored items, by the total number of applicable items, and lastly by multiplying the score by 100. Patient was positioned in supine lying. Shoulder was abducted to 90 degrees. Elbow was flexed with forearm in neutral and perpendicular to table top such that the palm was facing the feet. Elbow was not supported. Humerus was fully supported on the table. The distal humerus, thorax and scapula were stabilized. A goniometer was placed at the axis of olecranon process of ulna. Stationary arm was placed in parallel to the

table top or perpendicular to the floor. The arm was moved along the ulnar shaft aligned with the styloid process of the ulna <sup>[28,29,30]</sup>.

**Table 2:** Demographic characteristic comparison between Group A and Group B

Variable	Frequency	Percentages (%)
<b>RACE</b>		
Malay	10	29.4
Chinese	8	23.5
Indian	16	47.1
<b>AGE</b>		
50-55	5	14.7
56-60	4	11.8
61-65	10	29.4
66-70	15	44.1
<b>GENDER</b>		
Male	14	41.2
Female	20	58.8



**Table 3:** Mean, Standard Deviation, and Standard Error Mean of ROM and SPADI pre and post intervention in Group A

Variable	Group A Frequency (%)	Group B Frequency (%)
<b>RACE</b>		
Malay	6 (35.3)	4(23.5)
Chinese	2 (11,8)	6(35.3)
Indian	9 (52.9)	7(41.2)
<b>AGE</b>		
50-55	4(23.5)	1(5.9)
56-60	2(11.8)	2(11.8)
61-65	6(35.3)	4(23.5)
66-70	5(29.4)	10(58.8)
<b>GENDER</b>		
Male	6(35.3)	8(47.1)
Female	11(64.7)	9(52.9)

**Table 4:** Comparison between pre and post intervention of ROM and SPADI in Group A

Variable	Paired Differences				t	p-value
	Mean diff	SEM	95% CI of the Differences			
			Lower	Upper		
Pre & post ROM	31.8	3.0	38.2	25.3	10.5	.00
Pre & post SPADI	9.9	1.6	6.6	13.2	6.4	.00

**Table 5:** Mean, Standard Deviation, and Standard Error Mean of ROM and SPADI pre and post intervention in Group B

Variable	Mean	Std. Deviation	Std. Error Mean
Pre ROM	19.1	12.1	2.9
Post ROM	75.3	11.2	2.7
Pre SPADI	59.7	17.8	4.3
Post SPADI	43.4	15.8	3.8

**Table 6:** Comparison between pre and post intervention of ROM and SPADI in Group B

Variable	Paired Differences				t	p-value
	Mean diff	SEM	95% CI of the Differences			
			Lower	Upper		
Pre & post ROM	56.2	3.1	62.8	49.6	18.1	.00

Pre & post SPADI	16.4	2.1	12.0	20.7	7.9	.00
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**Table 7:** Comparison between Group A and Group B of ROM and SPADI

Variable	Group	Mean	SD	SEM	Mean Difference	95% CI of the Difference		t	p-value
						Lower	Upper		
ROM	A	31.8	12.5	3.0	24.4	33.3	15.6	5.6	0.00
	B	56.2	12.8	3.1		33.3	15.6		
SPADI	A	9.9	6.4	1.6	6.5	1.2	11.7	2.5	0.02
	B	16.4	8.5	2.1		1.2	11.8		

## VI. RESULTS

In Group A, the mean difference of pre-post ROM was 31.8 while the mean difference of pre-post SPADI was 9.9. As p-value of ROM and SPADI were  $0.00 < 0.05$  respectively, so the mean score of pre-ROM and pre-SPADI was significant difference from the mean score of post-ROM and post-SPADI which indicates that there was improvement in decreasing pain and restoring external rotation in Group A. While in Group B, the mean difference of pre-post ROM was 56.2 while the mean difference of pre-post SPADI was 16.4. As p-value of ROM and SPADI were  $0.00 < 0.05$  respectively, so the mean score of pre-ROM and pre-SPADI was significant difference from the mean score of post-ROM and post-SPADI which indicates that there was improvement in reducing pain and improving external rotation in Group B. For inter-group comparison, the mean difference of ROM for both groups was 24.4 while p-value of ROM is  $0.00 < 0.05$ , thus Group A was significant different from Group B in mean of ROM which indicates both groups are equally effective in pain reduction. Meanwhile, the mean difference of SPADI for both groups was 6.5 while p-value of SPADI was  $0.018 > 0.05$ , thus Group A was significant different from Group B in mean of SPADI which indicates both groups were equally effective in pain reduction. Thus, null hypothesis is rejected and alternative hypothesis is accepted. This is because both Group 1 and Group 2 were equally effective in reducing pain and improving external rotation in patient with adhesive capsulitis.

## VII. CONCLUSION

Following the comparative study, to evaluate the effectiveness of Maitland approach with ultrasound versus Kaltenborn approach with ultrasound on patients with adhesive capsulitis, it is concluded that both joint mobilization



approach are effective as treatment.

### VIII. REFERENCES

- Abbott, J., (2001), "Mobilization with movement applied to the elbow affects shoulder range of movement in subjects with lateral epicondylalgia," *Man.Ther.*, 6, pp. 170–177.
- Ansari SH, L.I., Shah, S.H., Patel, N. (2012), Effect of ultrasound therapy with end range mobilization over Cryotherapy with capsular stretching on pain in frozen shoulder- a comparative study. *Int. J. Curr. Res. Rev.* 04:6
- Anthony Ewald, M.D., (2015), Grant Medical Centre, Columbus, Ohio, *Am Fam Physician.* ; 83 (4), pp. 417-420.
- Bal A., Eskioglu E., Gulec B., Aydog E., Gurcay E., Cakci A., (2008), Effectiveness of corticosteroid injection in adhesive capsulitis. *Clinical Rehabilitation.* 22, pp.503-512.
- Breckenridge J.D., McAuley J.H., (2011), Shoulder pain and disability index (SPADI). *Journal of Physiotherapy.* 57(3), pp: 197. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21843839> (1) (assessed on 5 July 2018)
- Buchbinder R., Hoving J.L., Green S., Hall S., Forbes A., Nash P., (2007), "Short course prednisolone for adhesive capsulitis (frozen shoulder or stiff painful shoulder): a randomised, double blind, placebo controlled trial". *Ann Rheum Dis.* 63(11), pp.1460–1469
- Bulgen D.Y., Binder A.I., Hazelman B.L., et al, (2012), "Frozen Shoulder: Prospective Clinical Study with an Evaluation of Three Treatment Regimens" in *Ann Rheum*, 43, pp. 353-360.
- Chen J.F., Ginn K.A., Herbert R.D., (2009), Passive mobilisation of shoulder region joints plus advice and exercise does not reduce pain and disability more than advice and exercise alone: a randomised trial. *Aust J Physiother.* 55, pp. 17
- Clipsham K., (2008), "Adhesive capsulitis. A treatment approach". *Clin Orthop.* 372, pp. 95–109.
- Cole P.A., Freeman G., Dubin J.R., (2013), Scapula fractures *Curr Rev Musculoskeletal Med.*, 6(1), pp. 79-87. Drake, R.L., Vogl, W., Mitchell, A.W.M., (2005), *Gray's Anatomy for Students*, Elsevier Inc, 1.
- Diercks R.L., Stevens M., (2004), Gentle thawing of the frozen shoulder: a prospective study of supervised neglect versus intensive physical therapy in seventy-seven patients with frozen shoulder syndrome followed up for two years. *J Shoulder Surg.*, 13 pp. 499-502.
- Elias, D.W., (2007), "The Effect of Continuous Glucose Monitoring in Well-Controlled type 1 Diabetes" in *Diabetes Care.*, 32, pp. 1378-1383.
- Gaspar, P., Willis B., (2009), Adhesive capsulitis and dynamic splinting: a controlled, cohort study. *BMC Musculoskeletal Disorders*, 10 pp. 111
- Gorthi, V., Moon Y.L., Kang J.H., (2010), Department of Orthopaedics, Chosun University Hospital, Dong-ku, Gwangju, South Korea, 33(4)
- Groh, G.I., Wirth, M.A., (2011), Management of traumatic sternoclavicular joint injuries, *J Am Acad Orthop Surg.*, 19(1), pp. 1-7.
- Hacer Dogru, Sibel Basaran, Tunag Sarpel, (2008), "Effectiveness of Therapeutic Ultrasound in Adhesive Capsulitis; Joint Bone Spine" (75), pp. 445-450.
- Hammer, W.I., (2007), Functional Soft Tissue Examination and Treatment by *Manual Methods in Adhesive Capsulitis*.
- Hand, C., Beck, R.W., Bode, B.W., (2008), "Continuous Glucose Monitoring and intensive Treatment of type 1 Diabetes" in *N England Journal Medicine.* 359, pp. 1464-1476.
- Harryman, D.T., Sidles, J.A., Harris, S.L., et al. (2017), the role of the rotator interval capsule in passive motion and stabilizing of the shoulder. *J Bone Joint Surg Am.* pp.66
- Jan, M.H., Yang, J.L., Chang, C.W., Lin, J.J., (2012), "Effectiveness of the end-range mobilization and scapular mobilization approach in a subgroup of subjects with frozen shoulder syndrome: a randomized control trial," *Man Ther.* 17(1), pp. 47.
- Jayanta Nath (2013), "Types of Mobilization in Adhesive Capsulitis" in *International Journal of Scientific and Research Publication.* 5:3
- Kaltenborn, F. (2004), *Fisioterapia Manual Columna 2<sup>nd</sup> Edition in Interamericana,* pp.27-28.
- Kim, S.B., (2012), Effect of manual adjustment and gym ball exercise on EMG, Cobb's angle, VAS, Flexibility, and strength in elderly women with low back pain symptom, *Kyung-hee University, Dissertation of Master's Degree*.
- Kline C.M., (2009), "Adhesive capsulitis: clues and complexities". *JAMA Online.* Pp.2-9
- Kumar, A.S., Kumar, A., Aggarwal, R., Kumar. Das P.G., (2012), "Effectiveness of Maitland Techniques in Idiopathic Shoulder Adhesive Capsulitis," *ISRN Rehabilitation.* 2, pp. 1–8.
- Loew, M., Heichel, T.O., Lehner, B., (2005), Intraarticular lesions in primary frozen shoulder after manipulation under general anaesthesia. *J Shoulder Elbow Surg.* 14, pp. 16
- Lubiecki, M., Carr, A. (2007), "Frozen Shoulder: past, present, and future." in *Journal Orthopaedic Surgery.* 15(1), pp. 1-3.
- Maitland, G., Hengeveld, E., (2005), "Maitland's vertebral manipulation," *Elsevier ButterworthHeinemann,* 7.
- Mangus, (2002), "Frozen shoulder in hyperthyroidism". *Arthritis Rheum.* 30(8), pp.936–939.
- Maricar, N., Shacklady, C., McLoughlin, L., (2009), "Effect of Maitland mobilization and exercises for the treatment of shoulder adhesive capsulitis: a single-case design," *Physiotherapy Theory and Practice.* 25(3), pp. 203–217.