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EFFECTS OF MUSCLE ENERGY TECHNIQUE ON PECTORALIS MINOR TIGHTNESS AMONG COMPETITTIVE SWIMMERS WITH SHOULDER DYSFUCTION- PILOT STUDY

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ABSTRACT

Background: Swimming is a professional sport in which the shoulder and upper extremity of the swimmers contributes up to 90% of the propulsive power. This activity requires different shoulder motions. The excessive shoulder rotational movements may result in hypertrophy of the anterior musculature. The tightness of these anterior musculature especially Pectoralis minor muscle leads to shoulder impingement and scapular dyskinesia. The Pectoralis minor muscle is a key component in the anterior musculature to address in the prevention and treatment of shoulder impingement and scapular dyskinesia which may be a predisposing factor for pain and functional disability among swimmers. **Aim:** The present aim of the study is to analyze the effectiveness of muscle energy technique on Pectoralis minor length changes among the competitive swimmers with shoulder dysfunction. **Method:** There were 07 swimmers who were selected for this study with reference to the Pectoralis minor index indicating tightness of the muscle and associated shoulder pain NPRS > 3. All the swimmers were given Muscle energy technique. The length of the muscle is measured in inch tape and Pectoralis minor index calculated before and after treatment. The outcome measures used were Pectoralis minor index, numerical pain scale, Glenohumeral range of motion and shoulder pain and disability index (SPADI). **Result:** In present study shows statistically significant ($p < 0.001$) difference after treatment with muscle energy technique application with reduction in tightness of the Pectoralis minor muscle. **Conclusion:** The present study concludes that Muscle energy technique helps in reducing the Pectoralis minor tightness and thereby improving shoulder range of motion and also improving shoulder dysfunction.

KEYWORDS: Pectoralis minor muscle; Swimmers; Shoulder dysfunction; MET.

INTRODUCTION

Swimming is a professional sport which can be practiced as recreational activity and competitive activity. Swimming requires high levels of training and performance in which they repetitively use their muscles thereby subjected to overuse injuries. There are four types of swimming strokes like freestyle, butterfly, backstroke and breaststroke. In all of these types freestyle is commonly practiced and even other strokes are involved in training activities in which the swimmers are subjected to constant stress and repetitive use of their musculoskeletal system.

Very commonly Glenohumeral joint is the most common joint involved and the shoulder girdle muscles are more subjected to stress and overuse. There were various research done on the alterations of posture in swimmers who are participating in competitions and there is reduced scapula posterior tilting, upward rotation and external rotation during shoulder elevation. This leads to imbalanced Scapulohumeral rhythm causing shoulder pain and dysfunction.

The most common cause for this imbalance and altered mechanics is due to repetitive micro trauma and overuse injuries when the swimmers does repetitive shoulder revolutions. This leads to diminished performance of the swimmers in their competition and also inability to participate in their sport.

The sole muscle that connects the scapula and thorax is Pectoralis minor which commonly goes for tightness among the swimmers. Thus, the shortening of the Pectoralis minor muscle leads to altered scapula motion which in turn causes shoulder dysfunction and affected performance.

Due to the potential development of this scapular dyskinesia and upper extremity injury due to tight Pectoralis minor muscle, stretching of the muscle is

believed to be critical in prevention and treatment of the shoulder dysfunction. The Pectoralis minor muscle is a key component to address in the prevention and treatment of shoulder impingement and scapular dyskinesia. Previous research articles have addressed the need for interventions that can increase the Pectoralis minor resting length in shoulder rehabilitation.

Dr. Fred Mitchell has been titled the father of muscle energy technique (MET). Muscle energy technique is a manual therapy intervention in which the patient actively contracts a targeted muscle against a precise, clinician counterforce, followed by relaxation and passive stretch. This technique is commonly used to strengthen and lengthen muscles, reduce edema, decrease pain stretch tight muscles and fascia. MET has been demonstrated to be more effective in improving the extensibility of shortened muscles than stretching. This method employs muscle contraction by the patient followed by relaxation and stretch of antagonist or agonist. It is essentially a mobilization technique using muscular facilitation and inhibition. MET works on two basic principles i.e. post isometric relaxation and reciprocal inhibition.

Kevin G. et al. (2015) states that MET may assist in preventing and treating various shoulder injuries associated with forward shoulder posture and Pectoralis minor tightness among swimmers. There were less studies uses MET protocol for the treatment of shoulder problems in swimmers and there were no studies using MET for Pectoralis minor tightness among the Indian swimmers. Thus the purpose of the present study uses Muscle energy technique in treating the altered length of the Pectoralis minor muscle among the competitive swimmers who have shoulder dysfunction.

METHODS

The study was a pilot study with 7 samples conducted at Anna swimming pool, Chennai. The samples were selected based on the inclusion criteria with age group 18-25 years and male swimmers were taken through random sampling. The swimmers who's Pectoralis minor index less than 7.44 and NPRS value more than 3 were taken for the study. Informed consent obtained from the swimmers and the procedure explained to the swimmers. The study was conducted for around 6 week's duration. The swimmers who were subjected to recent fractures, injuries around shoulder and any other pain related issues were excluded.

The swimmers who met the inclusion criteria were positioned in standing position and the resting length of the Pectoralis minor muscle is measured to confirm the Pectoralis minor index. The measurement were taken with the help of inch tape placing the point one on the coracoid process of the scapula and the other end to the inferior aspect of the 4th rib. The three measurements will be taken in centimeters and the average values will be calculated.

The Pectoralis minor index with previous studies as reported can be calculated by dividing the resting length of the muscle in centimeters by subject height in centimeters and multiplying by hundred. Patients with a PMI 7.44 could be considered to have a relatively short Pectoralis minor tightness.

Muscle energy technique is a manual therapy technique which is applied to lengthen or to stretch the tight muscle which lacks flexibility. The swimmers were asked lie supine lying and the treatment side passively moved into horizontal abduction in line with Pectoralis minor and major muscles until the end range of motion. The arm held in this barrier for 3 seconds and this was maintained in stretch position for 3 seconds. The swimmers were asked to pull against resistance towards the opposite hip. The contraction was performed isometrically with 25% of the swimmer's effort for 5 seconds. The swimmer were asked to take a breath in between and relax. Immediately after this contraction, the entire sequence was repeated with arm again being passively horizontally abducted to new range of motion barrier before another contraction. The entire session took 45-60 seconds. 3 repetitions can be done for 1 session and 2 sessions per week this was done for 6 weeks duration.

The same procedure followed for shoulder internal rotators, external rotators and abductors. The patient positioned in supine lying. Swimmer's shoulder and elbow flexed to 90^0. The therapist passively moved the shoulder into internal rotation until the end range barrier reached. The swimmers was instructed to perform 5-second isometric contraction of approximately 25% of the maximal effort in the direction of external rotation against an opposing force provided by the therapist. The participant was instructed to internally rotate the arm towards down surface and a 30second stretch applied. Now the swimmers was asked to relax and a new movement barrier was then initiated by the therapist. The same procedure repeated for other groups. The protocol was done with 3 repetitions and 2 sessions per week for 6 weeks duration.

As the anterior muscle groups were given muscle energy techniques, to counteract the opposing muscles the scapula retractors were given strengthening with theraband. These Theraband exercises were chosen with various colours based on the resistance. The exercises can be given to scapular retractors with 3 sets of 10 repetitions in the 1st week, 3 sets of 15 repetitions in the 2nd week, 3 sets of 20 repetitions in the 3rd week, shifting to next higher level of resistance 4th week with 3 sets of 10 repetitions, 5th week 3 sets of 15 repetitions, 6th week 3 sets of 20 repetitions.

Post isometric relaxation applied for the anterior muscle groups followed by reciprocal inhibition for the antagonist. The strengthening exercises applied for posterior muscle groups. The treatment were given for 2 sessions per week for 6 weeks duration.

The outcome measures used for this study will Numerical pain rating scale, Pectoralis minor index, Range of motion and Shoulder pain and disability index. Both pretreatment and post treatment values have been taken and it has been analyzed.

Figure: 01

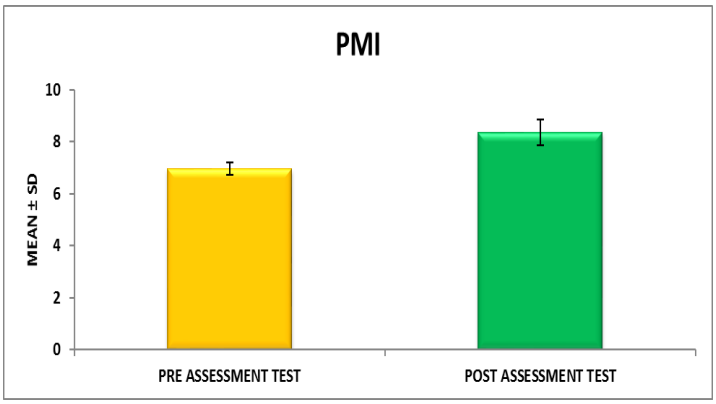
Figure: 02

Figure: 03

Figure: 04

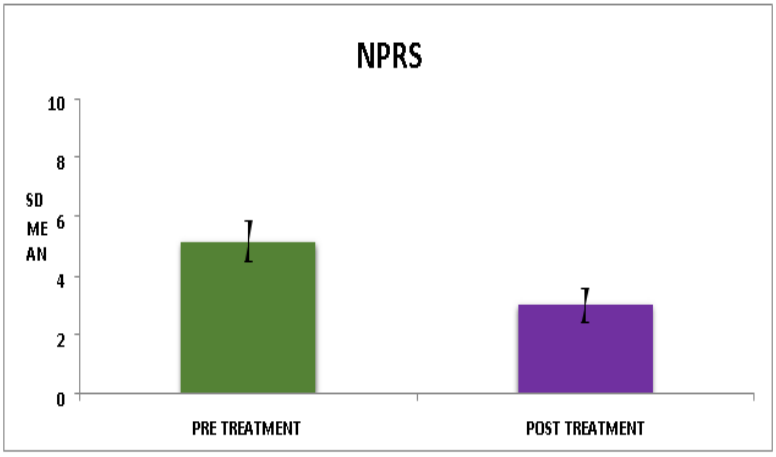
Data analysis

The collected data were analyzed with the Statistics Package for Social Sciences (SPSS) software and the ordinal data collected were analyzed using Non – Parametric tests. In this study the data were analyzed by Wilcoxon Signed Ranks Test. The nominal data used in this study were Pectoralis minor index (PMI) Numerical pain rating scale, Shoulder pain and disability index (SPADI). The ordinal data used in this study will be range of motion of the Glenohumeral joint. The data analyzed were described.



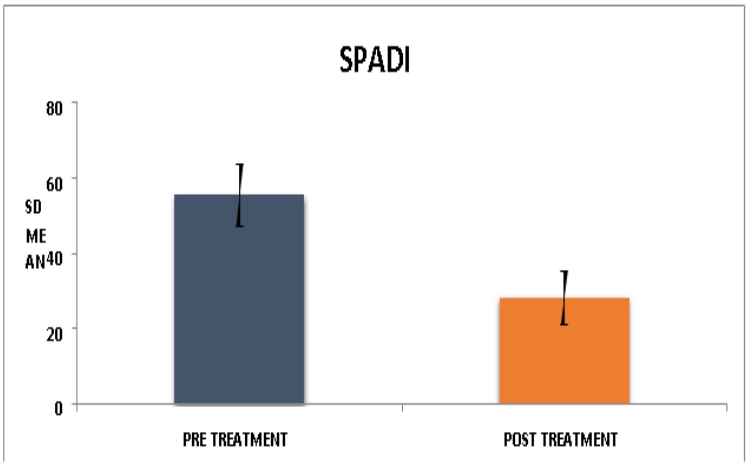
Graph 1: Pectoralis minor index.

Pre assessment test 6.95 0.239
Post assessment test 8.36 0.488



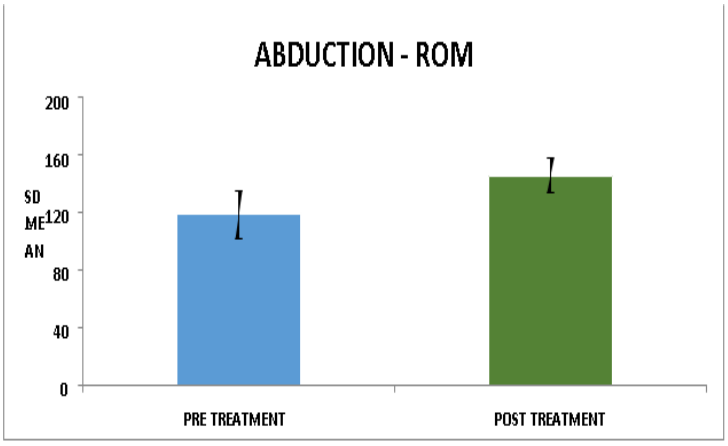
Graph 2: Numerical pain rating scale.

Pre assessment test 5.14, 0.69
Post assessment test 3, 0.577



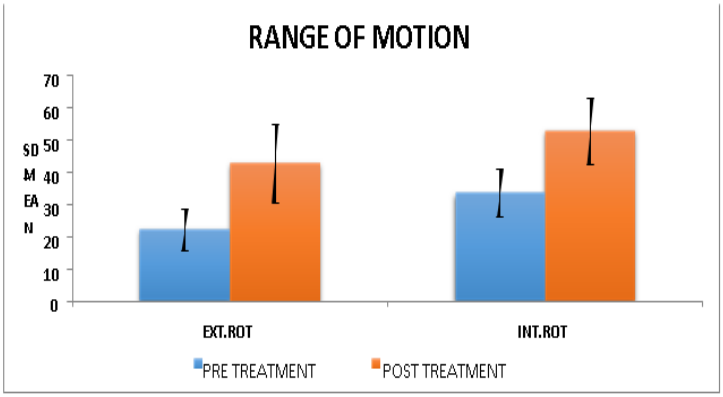
Graph 3: Shoulder pain and disability index.

Pre assessment test 55.47 8.311
Post assessment test 28.14 7.205



Graph 4: Shoulder abduction rom.

Pre assessment test 118.57, 16.762
Post assessment test 145.71, 11.701



Graph -5 Shoulder Internal and External ROM

Pre assessment test post assessment test
EXT. ROT 22.14 42.86, 6.362 12.199
INT. ROT 33.57 52.86 7.48 10.351

RESULTS

The results of the present study shows the test statistics highly significant improvement of Muscle energy technique application among the swimmers with Pectoralis minor tightness with shoulder dysfunction. The mean and standard deviation for Pectoralis minor index will be -1.41 and 0.290 with 'p' value 0.000 which is highly significant ($p < 0.001$). The mean and standard deviation for Numerical pain rating scale will be 2.14 and 0.378 with 'p' value 0.000 which is highly significant ($p < 0.001$).

The mean and standard deviation for SPADI will be 27.32 and 2.003 with 'p' value 0.000 which is highly significant ($p < 0.001$). The mean and standard deviation for external rotation is -20.71 and 7.31 with 'p' value 0.000 which is highly significant ($p < 0.001$). The mean and standard deviation for internal rotation will be -19.286 and 3.45 with 'p' value 0.000 which is highly significant ($p < 0.001$). The mean and standard deviation for abduction range of motion will be -27.14 and 8.09 with 'p' value 0.000 which is highly significant ($p < 0.001$).

DISCUSSION

Swimming sport has become a common professional as well as a recreational sport. Due to repetitive nature of competitive swimming the swimmers can get postural adaptations which is due to tightness of the anterior musculature giving way to shoulder injuries.

In previous study done by Kevin G. et al., (2015) explained that tightness of the anterior musculature, Such as the Pectoralis minor, has been associated with the development of shoulder pain among competitive female swimmers and can lead to forward shoulder posture, which has been described as forward head and rounded shoulders.

Borstad JD, Ludewig PM et al, Phadke V et al, Camargo P, Ludewig P et al in their previous studies reported that the common muscle which goes for tightness and structural adaptations is Pectoralis minor as that is the only muscle connects the scapula and thorax. This tightness in the muscle causes scapular tilting anteriorly, internal rotation as well as downward rotation. The previous research have reported regarding dry land strengthening and warm ups for the swimmers in which swimmers are again susceptible to injuries on repetitive use. There were less studies that addressed the anterior musculature tightness and related shoulder dysfunction.

Muscle energy technique is one of the common manual therapy technique which lengthens the tight structures. Kluemper et al in his previous studies reported the effects of stretching for 6 weeks duration showed improvements on anterior shoulder muscles tightness and strengthening of posterior musculature. Post-Isometric Relaxation (PIR) refers to the subsequent reduction in tone of the agonist muscle after isometric contraction. This occurs due to stretch receptors called Golgi tendon organs that are located in the tendon of the agonist muscle. Thus, applying muscle energy technique using autogenic inhibition helps reducing tightness of small muscle like Pectoralis minor following post isometric relaxation for Pectoralis minor muscle and reciprocal inhibition applied for the antagonist that is scapular retractors and Glenohumeral adductors. Then the posterior scapular muscles are strengthened to maintain the force couple during Glenohumeral joint motions.

This tightness of the Pectoralis minor muscle is addressed as because this may lead to forward scapula position and may cause impingement of the Glenohumeral structures due to repetitive use in the later stages. This directly causes shoulder dysfunction and there by affecting the performance of the swimmers during competition. Thus the present study focused on shortness of the Pectoralis minor by applying Muscle energy technique which shows clinically and statistically significant improvement in reduction of pain, improving the Glenohumeral joint range and also the functional

ability of the swimmers. The main limitation of this study was very less sample chosen as it is a pilot study. Only male swimmers were taken. Further study can aim at comparing the other manual therapy techniques on field with respect to the feasibility on application and also with larger sample size.

CONCLUSION

The present study concludes that Muscle energy technique as an on field manual therapy technique shows clinically and statistically significant improvement on shoulder dysfunction with respect to pain, range of motion and functional disability among the competitive swimmers.

REFERENCES

1. Amit Sharma, Ankur sharma Abishek Mishra et al "Pectoralis Minor Index: Does Ethnicity Hold Relevance? Estimation of Pectoralis Minor Length in the Indian Population and Its Correlation with Hand Length. Indian Journal of Orthopaedics, 2020; 54: 374-380.
2. Kevin Laudner, Kyle Thorson et al "Acute Effects of Pectoralis Minor Self-Mobilization on Shoulder Motion and Posture: A Blinded and Randomized Placebo-Controlled Study in Asymptomatic Individuals. Journal of Sports rehabilitation, 2019; 29(4): 420-424.
3. Maddox L. Reed, Rebecca L. Begalle, Kevin G. Laudner et al "Acute effects of muscle energy technique and joint mobilization on shoulder tightness in youth throwing athletes: a randomized controlled trial" The international Journal of sports physical therapy, 2018; 13: 1024-1031.
4. Jonathan roman, Noelle Selkow et al "Short term effects of Pectoralis minor positional release in collegiate swimmers – a case series" Journal of clinical practice in athletic training, 2018; 1(2): 42-48.
5. Dayana P Rosa, John D Borstad et al "Reliability of measuring Pectoralis minor muscle resting length in subjects with and without signs of shoulder impingement" Brazilian journal of physical therapy, 2016; 20(2): 176-183.
6. Jeffrey G Williams, Kevin G Laudner et al "The acute effects of two passive stretch maneuvers on Pectoralis minor length and scapular kinematics among collegiate swimmers" International journal of sports physical therapy, 2013; 8(1): 25-33.
7. Artaban Johnson Jeldi, Antony leo aseer et al "Cross – cultural adaptations, reliability and validity of an Indian (Tamil) version for the shoulder pain and disability index", 2012; 30(2): 99-104.
8. Angela tate, Gregory N Turner et al "Risk factors associated with shoulder pain and disability across the lifespan of competitive swimmers" Journal of athletic training, 2012; 47(2): 149-158.
9. Stephanie D Moore, Kevin G Laudner et al "The immediate effects of muscle energy technique on posterior shoulder tightness: a randomized controlled trial, 2011; 41(6): 400-407.
10. Scott A. Heinlein, Andrew J. Cosgarea et al "Biomechanical considerations in the competitive swimmer's shoulder" Journal of sports health, 2010; 2(6): 519-525.
11. John D Borstad et al "Measurement of Pectoralis minor muscle length: Validation and clinical application, 2008; 38(4): 169-174.
12. Muscle energy techniques Leon Chaitow, 3.
13. John D Borstad, Paula M. Ludewig et al "The effect of long versus short Pectoralis minor resting length on scapular kinematics in healthy individuals" Journal of orthopaedic sports physical therapy, 2005; 35(4): 227-238.