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ORIGINAL ARTICLE

Effectiveness of Thoracic Spine Manipulation on Subjects with Subacromial Impingement Syndrome

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ABSTRACT

Background: Subacromial impingement syndrome is one of the most debilitating conditions affecting the shoulder joint and principal cause of shoulder pain. Though the role of manual physical therapy of thoracic spine along with the other treatment options at shoulder joint is well established, the specific effects of manual physical therapy techniques are not adequately reported.

Objective: This study was primarily designed to investigate the effectiveness of high velocity low amplitude thrust manipulation of thoracic spine on the subjects with the subacromial impingement syndrome.

Methodology: This study was quasi experimental trail in which 30 patients were recruited using a convenience sampling technique, for a single treatment session of high velocity low amplitude thrust manipulation at thoracic spine. Immediate effects of this intervention were recorded on 100mm Visual Analogue Scale and improvement in ROM at shoulder joint as primary outcome measure. A 14 points patient reported Global Rating of Change scale was also used as secondary outcome measure.

Results: There was mean reduction of pain by 27.03 ± 12.92 (p-value < 0.05) which was statistically and clinically significant. There was also improvement in shoulder range of motion by 25°- 35° and mean post treatment global rating of change score of 4.03 with median score of 5.

Conclusion: Thoracic spine manipulative technique is effective in terms of reducing subjective pain and improving range of motion at shoulder joint in subjects with subacromial impingement syndrome. This also signifies the potential interdependence between anatomical regions of thoracic spine and shoulder girdle.

Key Words: Shoulder Pain, Manipulation, Manual Therapy, Subacromial Impingement Syndrome.

INTRODUCTION

Shoulder pain is the 3rd most common diagnosis affecting the general population after low back pain & neck pain. One of the principal diagnosis of shoulder pain is subacromial impingement syndrome that is compression of subacromial structures between head of humerus and acromion [1], Subjects often report pain while performing any overhead activities[2,3]. Impingement syndrome is normally classified into 02 types; Primary & Secondary impingement sundrome process[4]. Primary impingement syndrome is further classified into 02 types based upon its etiological factors. It my intrinsic in nature due to surrounding muscle weakness or inflammation of the tendons of extrinsic due to abnormal anatomical features of the acromion [7,8]. Secondary impingement may be due to altered glenehumral or scapulothoracic biomechanics as result of shoulder instability [9].

In the past couple of decades, multiple researches were conducted to investigate the effectiveness of TSM using different techniques for the treatment of different MSK conditions affecting the upper quadrant [10-12]. Interestingly most of the recent researches evaluating the effects of TSM were not directed at thoracic spine itself, but towards the areas adjoining the thoracic spine like neck and shoulder. This has led to the development of a concept known as regional interdependence [13], which states that seemingly unrelated impairments in a remote anatomical region may contribute to, or be associated with, the patient's primary complaint.

Different studies worked on the concept of using multimodal techniques for treatment of different musculoskeletal disorders of the upper quadrant, and also incorporated cervico-thoracic spine manual therapy along with other conservative treatment approach in management of shoulder

pain. Improved outcomes were reported in the study, with reduced pain when SMT was assimilated to an overall treatment protocols for patients with shoulder impingement syndrome [14]. These results were further testified by in a clinical trial by Bergman et al[11] that assessed the added benefit of applying SMT and rib manipulations and mobilizations to a standardized treatment plan for the patients receiving medical management for their shoulder pain. The results favored the groups that received combination of both manipulative and medical treatment. In a recent research [15], patients diagnosed with bilateral impingement syndrome and rotator cuff disease reported improved outcome when they were managed with different manual therapy techniques including the SMT directed at cervical and thoracic spine and home based rehabilitation exercises. Athletes diagnosed with swimmer's shoulders also showed reduced crepitus, decreased in pain when measured on VAS before and after swimming when managed with SMT of ribs, cervicothoracic junction, and middle thoracic spine, and different physiotherapy techniques for myofascial adhesions and a rehabilitation program [16].

Though the effects of combining different manipulative techniques with conventional physical therapy have been adequately reported in the literature, relative effect of any specific manipulative technique applied at thoracic spine for their effects at shoulder joint is not reported yet. So this study was conducted to determine the effectiveness of thoracic spine manipulation in subjects with subacromial impingement syndrome.

METHODOLOGY

This study was conducted at Outpatient Department of Physical Therapy Jinnah Hospital & Akram Medical Complex Lahore. The study design used in this study was quasi experimental trial. Subjects with primary complaint of unilateral shoulder, age between 18 and 65 years, established diagnosis of sub acromial impingement syndrome, decreased ROM at the glenohumeral joint & pain reproduction with either Hawkins Kennedy or Neer's Impingement test were included in the study. Subjects with bilateral shoulder pain due any underlying systemic disease such as tumor, rheumatoid arthritis or fracture, physical findings consistent with adhesive capsulitis, ghlenohumeral osteoarthritis, cervical radiculopathy , any serious spinal pathology like infection, tumors, spinal fracture or osteoporosis or unwilling to undergo spinal manipulative therapy were excluded.

30 subjects using convenient sampling technique, meeting the afore mentioned inclusion and exclusion criteria were recruited for this study by expecting a mean pain 31.9 ± 2.6 change using 95% power of study and 5% level of significance. Written consent of the subjects was recorded before participating in this study. Socio demographic data was also recorded at the start of the study.

General history taking and standardized physical therapy examination of the shoulder girdle was done to include the shoulder, cervical spine and thoracic spine. Shoulder abduction and flexion was measured with the subject in seated position while the total sum of internal and external rotation was recorded with the subject in spine lying with shoulder abducted to 90 and elbow flexed to 90. The Hawkins Kennedy [17] (Sensitivity 0.92 and specificity 1.00) and Neer's Impingement [17] (sensitivity 0.79 and specificity 0.53) test were performed on each subjects and immediately pain was recorded on 100 mm VAS. Lastly the physical examination of the thoracic spine was performed. This included the assessment of motion restriction, overpressure testing and symptom response for thoracic ROM (flexion, extension and bilateral rotation). Thoracic segmental mobility testing PAIVMs applied to the spinous and transverse processes. Following the physical examination all subjects were treated with high velocity, low amplitude thrust manipulation directed at the thoracic spine. The type of manipulative technique they received was based on the presence or absence of specific thoracic dysfunction.

Subjects with stiffness in the cervicothoracic junction were treated with a seated cervicothoracic junction distraction manipulation. Subjects with a thoracic flexion/opening restriction were treated with a supine technique that facilitated segmental thoracic flexion or rib mobility. Subjects with a thoracic extension/closing restriction were treated

with a prone technique to facilitate segmental thoracic extension. Subjects with no identifiable thoracic or rib restrictions were to receive a nonspecific general seated manipulation performed in a longitudinal direction to produce a distraction or unloading of the thoracic spine.

Usually the manipulative technique is followed by an audible pop from the segment at which it is applied. The treatment was discontinued if there was no popping sound after three attempts at specific vertebral segment at which the manipulative technique was applied. Post treatment pain was recorded immediately on the 100 mm VAS. Another self reported secondary outcome measure: Global rating of change was used. It's a 15 point scale with zero in the center showing no change, (+7) indicating a very great deal better and (-7) indicating a very great deal worst. This scale was used to assess the over change in the shoulder pain, motion and stiffness of the subjects after receiving manipulative treatment at thoracic spine. The pre and post treatment data was analyzed using SPSS 16. Statistical significance was set at *P* = 0.05. Paired sample *t*-test was performed to detect any differences between baseline and post-treatment shoulder ROM measurements and VAS pain scores.

RESULTS

A total of 30 patients participated in this study with 73.33 % (n=22) males and 26.67% (n=8) females. Mean age of the patients that participated in the study was $\chi = 38.33 \pm 10.06$. The age range of the patients was between 21 and 57 years. Most of the subjects i.e. 50% (n=15) that were included in the study had chronic presentation of the symptoms of the shoulder pain. 30% (n=9) presented with acute onset while only 20% (n=6) had sub acute presentation of the shoulder complaints. Results of this study demonstrated that there was mean reduction of pain by 27.03 ± 12.92 which was statistically and clinically significant ($p<0.05$) (Table 1). There was also improvement in shoulder range of motion by 25°- 35° (Figure 1) and mean post treatment global rating of change score of 4.03 with median score of 5.

Table I: Pre Treatment, Post Treatment and Mean change in VAS & Shoulder ROM With p value

	Pre-Treatment	Post- Treatment	Change Score	P-Value
Mean VAS Score (SD)	69.37 (10.11)	42.33 (16.21)	27.03 (12.92)	<0.05
Mean Shoulder Flexion ROM (SD)	106.03° (13.44)	133.93°(13.27)	27.90°(15.41)	<0.05
Mean Shoulder Adb ROM (SD)	94.83° (16.42)	127.13° (13.90)	32.30° (16.01)	<0.05
Mean Shoulder Rot ROM (SD)	127.53° (11.93)	152.03° (9.60)	24.50° (13.27)	<0.05

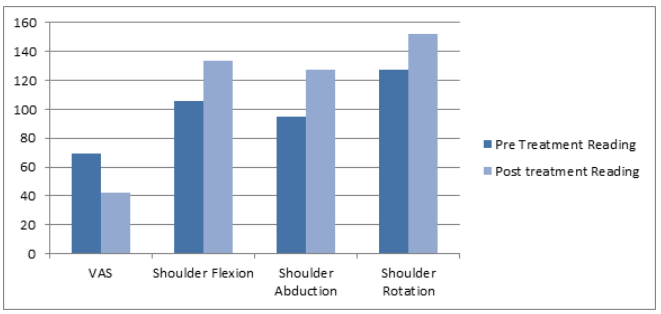

Figure I: Multiple Bar Chart showing comparison of Pre & Post treatment values for Changes in VAS score and Shoulder ROM.

According to the classification of GRC proposed by Juniper at el 3 subjects reported no change in the symptoms (GRC= 0 or 1), 10 had minimal improvement (GRC = 2 or 3), 10 had moderate improvement (GRC= 4 or 5) and 7 had a large improvement in their general condition (GRC= 6 or 7).

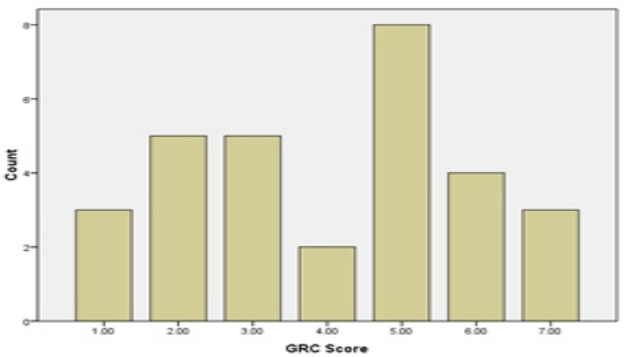

Figure II. Global Rating of Change Score

No subject reported adverse effects of the manipulative treatment directed at the thoracic spine i.e. negative value of the GRC (Figure II).

DISCUSSION

This study was principally designed to determine the effectiveness of 04 different high velocity low amplitude thrust manipulation on patients with sub acromial impingement syndrome. Results showed statistically significant reduction in shoulder pain and improvement in shoulder range of motion. Overall improvement was also evident from the post treatment GRC score, which did not recorded any adverse affect of manipulative technique on the patients.

Different studies have been conducted on the based on the concept of regional examination treatment approach, using different manipulative techniques of spine for management of shoulder pain. A recent study investigated the effect of HVLA thrust manipulation on the subjects diagnosed with shoulder impingement syndrome. Results showed statistically significant reduction in pain recorded on NPRS and SPADI after 48 hours of follow up consistent with the results of this study[12]. A similar study measured pre and post treatment difference in the strength of bicep muscle in 16 subjects with established diagnosis of chronic neck pain. These subjects were treated with thrust joint manipulation at cervico-thoracic junction. There was significant improvement in strength of bicep muscle [19]. Another study was conducted on asymptomatic subjects investigating the strength of lower trapezius muscle. Subjects were divided into 02 groups. The group that received grade IV mobilization of thoracic spine recorded significantly improved muscle strength compared with other group that was treated with grade I mobilization [20]. A similar study also documented the similar results of improved lower trapezius strength immediately after thoracic spine manipulation [21].

A second proposed theory is analgesic effect of joint manipulation leading to reduction in pain and improvement in shoulder mobility. This effect is due to increased level of the plasma levels of endogenous opiates like beta endorphins that binds to receptors in the nervous system and reduces pain. A study conducted recorded increase in the plasma levels of beta endorphins after 5 minutes interval in subjects that received high velocity manipulation at cervical spine. No significant increase in the levels of this endogenous opiate was recorded in the control group that was managed with only less aggressive mobilization technique [22]. This mechanism was further investigated by several other authors. A study investigating the effects of spinal manual therapy on VAS pain score used an opioid antagonist,Naloxone in experimental group[23]. Naloxone usually reverses the effects of endogenous opiates produced in the body. The control group was given only a normal saline solution. Improvement in pain was recorded in both groups contradicting the previous findings of the study and falsifying endogenous opioids mechanism of post manipulation analgesia.

CONCLUSION

It can be concluded that thoracic spine manipulation is effective in reducing self reported pain and improving ROM in subjects with SIS.

LIMITATIONS

There are some very apparent limitations of this study conducted. Effects recorded in this study are the very immediate one. No long term effects were documented and patients were not followed to record any adverse affects later on. There was only a single treatment group and no randomization was done to allocate the patients in different groups, to compare its effects with any other technique. No control group was used in this study and neither was the researcher blinded to remove any biasness. No cause and effect relationship was therefore can be concluded from the findings of this study.

RECOMMENDATIONS

Future researchers are recommended to perform a randomized clinical trial to prove the efficacy of this technique alone and over other manipulative techniques also.

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