ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research

International Journal of Recent Scientific Research
Vol. 7, Issue, 8, pp. 12847-12851, August, 2016

Research Article

ROLE OF SCAPULAR POSTURE ON CERVICAL ROTATION RANGE OF MOTION MEASUEMENT WITH SMARTPHONE IN HEALTHY YOUNG ADULTS

Abdur Raheem Khan[1]., Jasmine Anandabai[2]., Ashfaque Khan[3]., Kaushik S.C[4] and Singh A K[5]

[1]OPJS University Churu Rajasthan
[2]Churu Rajasthan
[3]Department of PMR and Physiotherapy Integral Institute of Medical Sciences and Research Kursi Road Lucknow India
[4,5]Orthopedic surgeon Buddha Hospital Gorakhpur

ARTICLE INFO

Article History:

Received 20th May, 2016
Received in revised form 29th June, 2016
Accepted 30th July, 2016
Published online 28th August, 2016

Key Words:

DS= Depressed shoulder, **NS**= Neutral Shoulder, **R CTRN**= Resting scapular position, cervical rotation ROM, **S CTRN**= Supported scapular position, cervical ROM, **ROM**= Range of motion

ABSTRACT

Background and Purpose: Changes of the alignment of either the scapulae or the cervical spine can potentially influence the biomechanics of the other by altering the tension at the cervico scapular muscles. This can lead to neck pain decrease cervical range of motion and difficulty in activity of daily living. The purpose of this study is to see the role of scapular posture on cervical rotation range of motion with Smartphone in healthy adult this will help in design appropriate assessment and management protocol for improvement of cervical rotation range of motion.
Methods: Total number of subject 80 was taken in this research, Group 1 (Group NS for the people with neutral scapular alignment) contains 40 subjects, and Group 2 (Group DS for people with depressed scapular alignment) contains 40 subjects.
Data Analysis: In this study SPSS 15 software was used to analyze the data. The independent variables was group (DS and NS) .A two way mixed model analysis of variance (ANOVA) was performed to test for the interaction of group and positions and to test for the main effects of group and position
Results: There is no significant difference in total cervical rotation (right + left) for subjects having neutral or depressed scapular alignment.

INTRODUCTION

Impairments in alignment of the cervical spine and scapulae are commonly cited as possible sources of pain dysfunction and range of motion limitation[1,2]. The scapulae and the cervical spine are anatomically linked through the cervicoscapular muscles: the upper trapezius and the levator scapulae. Changes of the alignment of either the scapulae or the cervical spine can potentially influence the biomechanics of the other by altering the tension at the cervicoscapular muscles [3]. It has been suggested that an ideal vertical scapular alignment is when the scapula is located between spinous process of the second and seventh thoracic vertebrae [4]. When the superior angle of the scapula is located below the spinous process of the second thoracic vertebra, the scapula is considered to be depressed [4,5]. It has been proposed that a depressed scapular alignment affects neck function potentially through increasing compressive loading in the neck region, through the transfer of weight from the upper extremities by way of the attachments of the cervicoscapular muscles [6].

A study has also shown that a decreased cervical ROM is associated with poor sitting postures, such as forward head posture. ROM losses can occur from inactivity and structural changes of the tissues in the cervical spine, and result in an increase in connective-tissue density, shortening of collagen tissue, and muscle fibrosis[7]. When a depressed scapular alignment is identified in individuals with cervical dysfunction, passively elevating the scapulae can decrease symptoms and improve ROM [8].

The association between altered scapular posture and neck pain has not been clearly defined, but a mechanism for the development of neck pain from habitual postures has been demonstrated [9].

Physical therapists have a variety of options to measure ROM and often times it is based on familiarity and convenience

Corresponding author:* ***Abdur Raheem Khan*
OPJS University Churu Rajasthan

Smartphone is one device that has good reliability and criterion validity; with increasing usage of smart phones by newer graduates and the accessibility of free measuring applications, these devices can potentially become a tool for measuring ROM in the clinic. Clinicians not opposed to using their personal phones for patient contact, as well as performing the calculations required for obtaining ROM measurements with the Smartphone may find it to be an efficient and accurate option to utilize during measurements of ROM.

The aim of this study is to see the role of scapular posture on cervical rotation range of motion with Smartphone in healthy adult this will help in design appropriate assessment and management protocol for improvement of cervical rotation range of motion.

METHODOLOGY

Sample Size

Samples of 80 subjects were taken in this study on the basis of inclusion and exclusion criteria. The subjects were assigned to two groups with 4o subjects in each group. Group 1 (Group NS for the people with neutral scapular alignment) contains 40 subjects, and Group 2 (Group DS for people with depressed scapular alignment) contains 40 subjects.

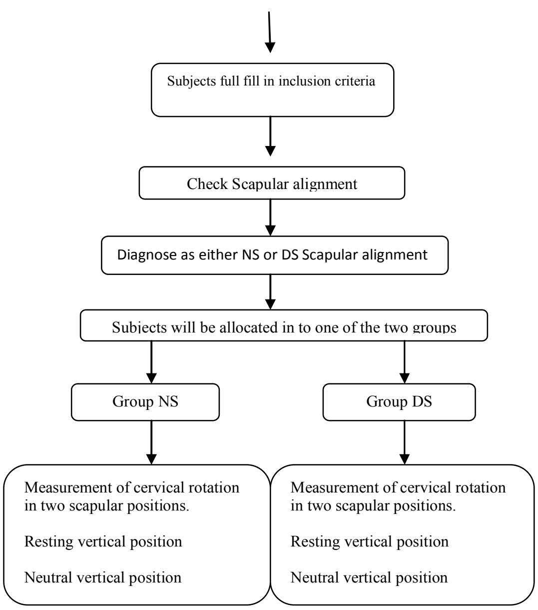
Source of the Subjects

Subjects were selected on the basis of inclusion and exclusion criteria and divided in to two groups on the basis of NS (Neutral scapular posture) and DS (Depress Scapular Posture) 40 subjects in each group in this study. The subjects were taken from Integral University and other place in Lucknow.

Methods of selection

The subjects were matched according to inclusion and exclusion criteria. Written informed consent was taken from the subjects and the procedure was explained to them in detail. The subjects for the study were assigned into Group 1 (NS) and Group 2 (DS).

Protocol



Inclusion Criteria

Age group: 25-30 years, Male, No history of the orthopedic or neurological conditions involving the cervical region and upper limbs for the last 12 months

Exclusion Criteria

History of the orthopedic or neurological conditions involving the cervical region and upper limbs for the last 12 months.

Instrumentation

I Phone 5, Chair with forearm rests, Markers

Procedures

Assessment: subjects were diagnosed by me into either having neutral scapular alignment or depressed scapular alignment. Subjects were made to stand with their arms hanging relaxed by their side. With a marker 3 anatomical landmarks were marked.

1. Superior angle of scapula (SAS),
2. Lateral border of acromian (A),
3. Spinousprocess of second thoracic vertebra (SP2).

Then subjects with scapular alignment were classified as depressed or neutral scapular posture. Subjects who display other combinations of the anatomical landmark positions were not included in the sample. Subjects also have both scapulae similarly classified as either a neutral vertical alignment or depressed alignment to be included in the study.

Subjects were made to sit on a chair. Chair had forearm rests. Subjects were instructed by me to sit on the chair. Seat height and back support was adjusted to allow the subject to be in a standard position (hips, knees, and ankles at 90°, feet flat on the floor, and lumbar and thoracic spine against the chair's back support). To adjust the height of forearm support, wood blocks will be used [10]. Depending upon the elevation of scapula needed, number of wood blocks was used. I Phone 5 was placed on patient's head [10].

Placement of I Phone 5 for rotation range of motion measurement

I phone 5 was placed at the vertex of cranial part of head. We choose the magnetic north to obtain our results. Rotation measures were taken with the I Phone 5 placed on participant's head with the arrow aligned with the nose. Head was placed in 0 degree of forward flexion, extension and lateral flexion. Thoracic and lumbar spine was stabilized. Initial neutral position of head was achieved by asking the subjects to stare at a fixed point positioned on the front wall at the level of the subjects' eyes. The subject performed each cervical rotation movement as far as possible without pain and without moving the trunk or shoulders.

During the movement, the subject visually followed a horizontal line that was drawn on the wall in front of the chair. The subject maintained the final head position for 10 seconds so that ROM value could be recorded. After returning to the neutral position, the subject head rotated in the opposite direction. One repetition was performed to each side.

Total rotation movement (right plus left rotation movement) was analyzed, because it is difficult to precisely determine the neutral position for cervical movements [11,12]. Both groups were performing cervical rotation movement in two positions:

1. Resting scapular position,
2. Neutral vertical scapular position,

The orders of testing of two positions were randomly assigned. For position (1), subjects were seated on chair with their arms hanging at their sides without support; subjects assuming their neutral scapular position. For position (2), subjects were seated in chair with the upper limbs supported by chair arm rests.

For the DS group, the chair arms were vertically positioned so that the subjects' scapulae are elevated until a neutral vertical scapular position is set (SAS at the same level as SP2). For the NS group, the chair arms were also is vertically positioned so that the subject had a neutral vertical scapular position. Because these subjects already were in the neutral vertical scapular position, minimum elevations of the subjects' scapulae were performed simply to support the weight of the subjects' upper limbs.

Data Analysis In this study SPSS 15 software was used to analyze the data. The independent variables was group (DS and NS). A two way mixed model analysis of variance (ANOVA) was performed to test for the interaction of group and positions and to test for the main effects of group and position. Results was considered significant at an alpha level of less than or equal to 0.05 for all tests.

RESULTS

There were 40 subjects in each group. The descriptive analysis of cervical rotation ROM for NS and DS group in both conditions are provided in table below.

Cervical Neck Rotation Range of Motion

The cervical neck rotation range of motion measure for both groups in rested scapular posture and supported scapular posture

Within group effect in group one

There is no significant difference for subjects having neutral scapular alignment on total cervical rotation (right + left) either in resting vertical position or when forearms was supported in chair arm rest.

There is no significant difference for subjects having depressed scapular alignment on total cervical rotation (right + left) either in resting vertical position or when forearms was supported in chair arm rest the descriptive value are given in Table 1 below.

Table 1 Within Group effect in Group one

	Mean ± SD	p- value (2 tailed)
R CTRN	153.375 ± 2.74	0.4982
S CTRN	152.925 ± 3.16	

Within group effect in group two

There is no significant difference for subjects having neutral scapular alignment on total cervical rotation (right + left) either in resting vertical position or when forearms are supported in chair arm rest. The descriptive values are given in Table 2.

Table 2 Within Group effect in Group two

	Mean ± SD	p- value (2 tailed)
R CTRN	153.25 ± 3.13	0.9432
S CTRN	153.2 ± 3.13	

Between Group effects in resting vertical position. There is no significant difference in total cervical rotation (right + left) in resting vertical position for subjects having neutral or depressed scapular alignment. The descriptive value are given table 3 below.

Table 3 Between Group Effects in resting vertical position

	Mean ± SD	t- value	p- value (2 tailed)
Group 1	153.375 ± 2.74	0.1900	0.84977
Group 2	153.25 ± 3.13		

Between Group effects in neutral vertical position. There is no significant difference in total cervical rotation (right + left) in neutral vertical position (forearms supported on chair arm rests) for subjects having neutral or depressed scapular alignment. The descriptive values are given table 4 below.

Table 4 Between Group effects in neutral vertical position

	Mean ± SD	t- value	p- value (2 tailed)
Group 1	152.925 ± 3.16	0.3910	0.69677
Group 2	153.2 ± 3.13		

DISCUSSION

This study was conducted in an attempt to identify the role of scapular posture on cervical rotation range of motion in young adult. The findings of this study suggest that equal amount active cervical range of motion in both scapular position (resting scapular and neutral scapular position) in both groups (neutral scapular and depressed scapular posture). The result indicates there is no significant difference of cervical rotation in both groups and both scapular position.

Our hypotheses were based on previous research and descriptions that suggested that a position of scapular depression is related to neck and shoulder dysfunction [13]. Swift and Nichols described 10 individuals with thoracic outlet syndrome proposed to have been related to a depressed scapular alignment. In all 10 patients, the T2 vertebra was visible above the shoulders on lateral cervical spine radiographs. The authors proposed that excessive stretch to the brachial plexus was a symptom-provoking factor because the symptoms were relieved when the scapulae were elevated [14].

Sahrmann also has proposed that a depressed scapular alignment leads to a chronic state of increased tension of the cervicoscapular muscles and passive loading of supportive tissues [15]. Azevedo *et al*1 reported that healthy people with a depressed scapular alignment had decreased PPT in the upper trapezius muscle region when compared to people with a neutral vertical scapular alignment. Finally, because the upper trapezius and levator scapulae can limit neck rotation, It was considered possible that increased tension on these muscles could contribute to a limitation in cervical rotation ROM [16].

Azevedoet, *et al*[12] examined the effects of scapular position on PPT in the upper trapezius region of healthy subjects.

The Mean±SD age of the subjects was 22±1 years. Interestingly, subjects who displayed a depressed scapular alignment had lower PPT values when compared to subjects with a neutral scapular alignment. The lower PPT values were considered an index of tissue sensitivity. The researchers proposed that the increase in sensitivity was a reaction to the constant strain on the upper trapezius muscle from the depressed scapular alignment. Thus, the Azevedoet, *et al*[12] findings suggest that prolonged scapular depression may, over time, be a contributor to cervical region dysfunction. This study was not designed to determine if a depressed scapular position was a cause of neck pain because only healthy subjects were enrolled. Our second hypothesis was also not supported by the current findings. The neutral vertical scapular position (condition 2) resulted in an increase in cervical rotation motion in both the DS and NS groups.

Van Dillenet, *et al*[17] reported increases in cervical rotation when the scapulae were passively elevated in patients with a neck pain-related diagnosis. The increase was obtained in both patients with and patients without pain with cervical rotation. Even though the exact mechanism for the increase in rotation ROM is not known at this time, the ROM increase with support of the upper limbs or passive elevation of the scapulae demonstrates that the (1) scapulae affect the cervical region, and (2) effect is present in healthy individuals and individuals with cervical dysfunction.

The increase in cervical rotation ROM obtained in our study with the upper limbs supported (mean total ROM very little) was smaller than that reported by Van Dillen *et al*[17] in patients with cervical pain (mean total ROM gain, 15.0°). There are some differences between the 2 studies, however, in procedures and sample. Van Dillen *et al*[17] used a maximally elevated scapular position, while we brought the scapulae to the ideal vertical position (SAS at the same level as SP2). We also supported the upper limbs with chair arms. The differences in the ROM gain between the 2 studies, however, may not be entirely due to the difference in the amount of scapular elevation. In our study, the NS group had the same increase in cervical ROM compared to the DS group, only by supporting the forearms.

Moreover, the total cervical rotation ROM values found in the Van Dillen *et al*[17] study for resting scapular position (100.8°) and for elevated scapular position (115.8°) were lower than our values of 152.9° (NS group) and 152.3° (DS group), and 153.3° (NS group) and 153.3° (DS group), for the unsupported and supported upper limb conditioned, respectively In healthy subjects, it appears that the weight transferred from the upper limbs to the cervical region could potentially limit cervical rotation ROM by about 10°, and supporting the upper limbs appears to be an effective way to facilitate rotation of the cervical spine.

When assessing cervical rotation ROM, therefore, examination of cervical motion with and without upper limb support would provide information about the contribution of the upper limbs to the patient's clinical presentation. If the upper limbs are related to the patient's restriction or symptoms, it may be useful to have the patient perform cervical rotation exercises with the arms supported. Additionally, these findings suggest that patients may benefit from forearm support during functional activities to facilitate cervical rotation. Because only healthy subjects were assessed in the current study, however, the suggested clinical benefits are as yet unknown.

More studies investigating the effects of different amounts of scapular elevation or upper limb support on cervical ROM and symptoms in patients with cervical pain are necessary. The current study did not control other cervical movements that may have occurred during cervical rotation. Several studies have documented varying degrees of concomitant flexion, extension, and lateral bending during axial rotation in healthy subjects. The purpose of our study was to assess the effect of scapular position on rotation ROM when subjects used their preferred method of performing cervical rotation. This would not have occurred if we controlled other cervical movements during neck rotation. We did not assess other possible scapular alignments (ie, scapular abduction, scapular downward rotation, scapular tilting) during the study procedures.

It is reasonable that in some subjects other scapular alignments were present in addition to the depressed scapular alignment of interest. It is also reasonable that some other scapular movement, such as scapular rotation or tilt, occurred when we positioned the subjects with depressed scapulae in the neutral vertical alignment The purpose of this study, however, was limited to the investigation of the neutral vertical alignment on cervical rotation ROM. To ensure that we were modifying the vertical alignment and not just scapular rotation, we used both the acromion and the superior angle of the scapula to classify the subjects' scapular alignment.

The scapular alignment classification procedures used could be considered a limitation of the current study. For ethical reasons, we could not use radiological assessment to assess scapular position. The use of skin surface palpation, however, has been shown to be a valid tool to determine the location of the scapulae and thoracic spine. Other studies have also used skin surface palpation to describe scapular position.

Limitation of the study

In this study the sample size was small consisting of only 80 subjects, with 40 subjects in each group. Therefore the result is restricted to limited population. In this study only normal subjects were taken and the research was limited in a particular age group. In this study only we are using neck rotation ROM.

Future Research

This study was done only on male subject from the population in a normal subject. This study can also be done including female subjects in whom the incidence of limitation of the neck rotation is common in compare to the male. The future research is needed for multiple observations. In addition further study can be done using other more neck ROM like flexion, extension, lateral flexion. Further study can be done with the help of other variables like NDI and other neck functional scale with the help of large no. of subjects. In addition further study can be done with diseased condition.

CONCLUSION

Our results indicate that the depressed scapular position, as defined in this study, does not have a direct effect on cervical rotation ROM in a young healthy population, however with the supporting the upper limbs, also does not result in a significant increase in cervical rotation ROM. The data from the current study suggests that in healthy subjects (1) the presence of a depressed scapulae position should not be considered responsible for a finding of reduced cervical rotation ROM and (2) reduced cervical rotation ROM in patients with cervical pain and depressed scapulae should not be automatically attributed to the depressed scapulae position. More studies are necessary to understand the contribution of scapular alignment on cervical spine biomechanics and dysfunction.

References

1. Jan Lucas Hoving, Jan JM Pool, Henk van Mameren, Walter JLM Devillé, Willem JJ Assendelft, Henrica CW de Vet, Andrea F de Winter, Bart W Koes, and Lex M Bouter. Reproducibility of cervical range of motion in patients with neck pain. BMC Musculoskeletal Disord, 2005; 6:59.
2. M. tousignant, N. Boucher, J. Bour0bonnais, Gravelle, M. Que and L. Brosseausnel. Intratester and intertesterreliabilty of the Cybex electronic digital inclinometer (EDI-320) for measurement of active neck flexion and extension in healthy subjects. Manual therapy. volume 6, issue 40, Nov. 2001 pages 235-241.
3. Braun BL. Postural differences between asymptomatic men and women and craniofacial pain patients. Arch Phys Med Rehabil. 1991; 72:653-656.
4. Capuano-Pucci D, Rheault W, Aukai J, BrackeM, Day R, Pastrick M. Intratester and intertesterreliability of the cervical range of motion device. Arch Phys Med Rehabil. 1991; 72:338-340.
5. Castro WH, Sautmann A, Schilgen M, SautmannM. Noninvasive three-dimensional analysis of cervical spine motion in normal subjects in relation to age and sex. An experimental examination. Spine. 2000; 25:443-449.
6. DiVeta J, Walker ML, Skibinski B, Relationship between performance of selected scapular muscles and scapular abduction in standing subjects. PhysTher. 1990; 70:470-476; discussion 476-479.
7. Youdas JW, Garrett TR, Suman VJ, Bogard CL, Hallman HO, Carey JR (1992) Normal range of motionof the cervical spine: an initial goniometric study. PhysTher 72, 770–80.
8. Dvorak J, Antinnes JA, Panjabi M, Loustalot D, Bonomo M. Age and gender related normal motion of the cervical spine. Spine. 1992; 17:S393-398.
9. Szeto GP, Straker L, Raine S (2002) a field comparison of neck and shoulder postures in symptomatic andasymptomatic office workers. ApplErgon 33, 75–84.
10. Edmondston SJ, Henne SE, Loh W, Ostvold E (2005) Influence of cranio-cervical posture on three-dimensional motion of the cervical spine. Man Ther 10, 44–51.
11. Ferrario V F, Sforza C, Serrao G, GrassiG, Mossi E. Active range of motion of the head and cervical spine: a three-dimensional investigation in healthy young adults. *J Orthop Res*. 2002; 20:122-129.
12. Azevedo DC, de Lima Pires T, de Souza Andrade F, McDonnell MK. Influence of scapular position on the pressure pain threshold of the upper trapezius muscle region. *Eur J Pain*. 2008; 12:226-232.
13. Swift TR, Nichols FT. The droopy shoulder syndrome. Neurology. 1984; 34:212-215.
14. Sahrmann SA. Diagnosis and Treatment of Movement Impairment Syndromes. St Louis, MO: Mosby; 2001
15. Sahrmann SA. Diagnosis and Treatment of Movement Impairment Syndromes. St Louis, MO: Mosby; 2001.
16. Azevedo DC, de Lima Pires T, de Souza Andrade F, McDonnell MK. Influence of scapular position on the pressure pain threshold of the upper trapezius muscle region. Eur J Pain. 2008; 12:226-232.
17. Van Dillen LR, McDonnell MK, Susco TM, Sahrmann SA. The immediate effect of passive scapular elevation on symptoms with active neck rotation in patients with neck pain. Clin J Pain. 2007; 23:641647. http://dx.doi.org/10.1097/AJP.0b013e318125c5b6

****

How to cite this article:

Abdur Raheem Khan *et al.*2016, Role of Scapular Posture on Cervical Rotation Range of Motion Measuement with Smartphone in Healthy Young Adults. *Int J Recent Sci Res.* 7(8), pp. 12847-12851.