A study of range of motion of neck in adult population of Western Rajasthan

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Abstract

Introduction: The amount of motion available at a joint is knowns range of motion.

Background: The purpose of the study was to predispose the effect of age and gender on movements of cervical spine in 100 normal subjects by the use of Goniometer.

Materials and Method: Study was carried out on 100 healthy subjects aged between 20-30 years. All the subjects having normal cervical spine were chosen and those who were not having any history of joint surgery, stress or any other type of abnormalities were included for determining the validity and reliability of the goniometric measurements.

Result: Females showed higher range of motion than male subjects except that of cervical flexion. Generally, females have a tendency to have larger range of motions, because of anatomical and physiological differences, like muscle mass size, geometry of joint and hormones.

Conclusion: A tendency existed for cervical ROM to decline with increasing age. The only exception is axial rotation which showed either same or it increases with age to compensate for an age related decrease in rotation in the lower cervical spine.

Keywords: Lateral flexion, Cervical spine, Flexion, Extension, Goniometer, Rotation.

Introduction

The term Goniometry is termed as measurement of angles created at human joints it is used to describe both a peculiar joint position and the total amount of motion present at a joint. It is also used to accurately describe abnormal fixed joint positions. Osteokinemetic mobility is described as taking place in one of three cardinal planes of body (sagittal, frontal and transverse) around three corresponding axes (medial-lateral, Ant-post and vertical). (1)

The cervical spine consists of certain joints. The Atlanto-occipital and Atlantoaxial joint are plane synovial joint. The motions allowed at the atlanto-occipital joint are flexion-extension in the sagittal plane around a medial-lateral axis and some rotation and lateral flexion. The median atlantovinual joint is a synovial trochoïd (pivot) joint, permitting rotation in the transverse plane around a vertical axis. The motions allowed at the three articulations are flexion-extension, lateral flexion and rotation.

There are total seven vertebrae in the cervical spine; the spinoous processes lies at the level of the facets joints of the same vertebra. Mostly, the spinoous process is absent or at least rudimentary on first cervical vertebra. This is why first palpable vertebra when we descend from the external occipit protuberance is the spinoous process of second cervical vertebra.

Range of motion is the amount of motion available at a joint. The starting position for calculating all range of motion (ROM), except rotations in transverse plane is the Anatomical position. Three documentation systems have been used for defining ROM the 0 - to 180 - degree system, the 180 - to 0° system and the 360 - degree system. Firstly told by Silver (2) in 1923, its use was supported by many authorities.

The ROM at Atlantoaxial joint is affected by osteoarthritis, lateral instability, subluxation, torticollis. The type of motion available at a joint varies according to the structure of joint, sex and age.

Thus the determinants of Range of Motion are:-

- Shape of the Bone & cartilage
- Strength and Muscle tone
- Ligaments & joint capsule laxness
- Muscle Mass
- Subcutaneous tissue and Skin Flexibleness
- Race (Indians are more mobile than Blacks, who are more mobile than Caucasians)
- Sex (women are mobile than men)
- Age (Range of Motion decreases with age)
- Genetic make up

Day to day stresses on joints.

Aim and Objectives

The objective of this study was to determine the effect of age and gender on movements of cervical spine in 100 normal subjects through the Universal Goniometer.

Materials and Method

The study was conducted out on 100 healthy subjects aged between 20-30 years. All the subjects having normal cervical spine and not having any history of joint surgery, trauma or any type of abnormalities formed inclusion criteria of this study. The subject's chosen for the study were checked out and validated for the following data- a. They are residents of Rajasthan. b. They have authentic documentation of their date of birth.

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Goniometry: The physical measurements of cervical spine for determination of range of motion were carried out on same individuals by use of Universal Goniometer by us.

Materials: Measurements were done by use of Universal Goniometer. The stationary arm is often adjusted parallel to the longitudinal axis of the proximal segment of the joint and the moving arm is adjusted parallel to the joint with distal segment.

Method
1. **Recommended testing motion**: It refers to body positioning which is recommend for obtaining Goniometric measurements.
2. **Stabilization required**: The recommended testing position which helps in stabilizing the subject's body and proximal joint being tested.
3. **Normal end feel**: Feeling, which is accomplished by an examiner as a blockade to extra motion at the end of a passive ROM is termed as end feel. It is normally three types soft, firm and hard.
4. **Anatomical bony landmarks** for Goniometric measurement:
   - **For Cervical Spine**:
     a. **Flexion**
        - External Acoustic Meatus
        - Base of nare
     b. **Extension**
        - External Acoustic Meatus
        - Base of nare
     c. **Lateral Flexion**
        - Spine of C7 vertebra
        - Occipital protuberance
        - Imaginary line between mastoid process and acromion process.
     d. **Rotation**
        - Imaginary line between two acromion process.
4. **Alignment of the Instrument**: Goniometer positioning implied to the positioning of the arms of the Goniometer with the proximal and distal segments of joint being assessed. Use of bony landmarks in conjunction with recommended testing positions should increase the accuracy and reliability of Goniometric measurement.

The following are the inclusion criteria:
1. Subject's name, age and gender.
2. Date of measurement
3. Type of Goniometer used
4. Body side, Motion & joint being assessed
5. Motion type being measured, may be active or passive
6. Any subjective knowledge, such as pain which is experienced by the subject during the testing procedure.

Results and Discussion
The prevalence of neck pain among the adult population may vary from 6 to 50%. Estimates have shown that 67% of individuals suffer from neck pain at some time during their lives. Among children the estimates of neck pain complaints may range from 19% to 43%. The present study was conducted on 100 participants (50 male and 50 females) volunteered for Goniometric study and their age group ranged between 20-30 years. The parameters observed were flexion, extension, right and left lateral flexion, left and right rotation regarded to cervical spine. Range, mean, standard deviation of all the parameters was calculated.

Cervical Flexion: In the present study the mean values of cervical flexion (Table 1) in age group (20 to 30 years) in males is 50.6° ± 8.44 and the range is from 19° to 63° in males. The mean values of cervical flexion in females are 45.82° ± 7.87 and the range is from 30°- 55° in females. American Medical Association (1988) observed the mean values of cervical flexion as 50°.

Cervical Extension: In the present study the mean values of cervical extension (Table 1) in age group (20 to 30 years) in males is 30.58° ± 9.82 and the range is from 15° to 45° in males. The mean values of cervical extension in females are 33.02° ± 8.60 and the range is from 20°-55° in females. American Medical Association (1988) observed the mean values of cervical extension as 60°.

Right Lateral Flexion: In the present study the mean values of cervical right lateral flexion (Table 2) in age group (20 to 30 years) in males is 34.92° ± 3.71 and the range is from 29° to 42° in males. The mean values of cervical right lateral flexion in females are 38.20° ± 3.59 and the range is from 32°- 45° in females. American Medical Association (1988) observed the mean values of cervical right lateral flexion as 45°.

Left Lateral Flexion: In the present study the mean values of cervical Left Lateral Flexion (Table 2) in age group (20 to 30 years) in males is 30.66° ± 4.27 and the range is from 24° to 38° in males. The mean values of cervical Left Lateral Flexion in females are 36.38° ± 3.48 and the range is from 27°- 41° in females. American Medical Association (1988) observed the mean values of cervical Left Lateral Flexion as 45°.

Left Rotation: In the present study the mean values of cervical left rotation (Table 3) in age group (20 to 30 years) in males is 70.96° ± 6.90 and the range is from 66° - 95° in males. The mean values of cervical left rotation in females are 75.3° ± 4.97 and the range is from 70°-85° in females. Youdas (1992) observed in age interval 20-29 years in 20 males and 20 females suggested the value of mean values for left rotation to be 69°± 7 in males and 72° ± 6 in females.

Right Rotation: In the present study the mean values of cervical right rotation (Table 3) in age group (20 to 30 years) in males is 69.9° ± 6.37 and the range is from 61° -87° in males. The mean values of cervical right rotation in females are 77.22° ± 5.85 and the range is...
from 70°-90° in females. American Medical Association (1988)(4) observed the mean values of right rotation to be 80°. Lantz et al.(6) in age group 20 to 39 years studied the right rotation and gave mean & SD values which were 72° ± 7.

**Table 1: Showing Cervical Flexion & Cervical Extension in age group 20-30 years**

<table>
<thead>
<tr>
<th>Motion</th>
<th>Measurements of Movement in Male (n= 50)</th>
<th>Measurements of Movement in Female (n= 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range (in degree)</td>
<td>Mean (in degree)</td>
</tr>
<tr>
<td>Cervical Flexion</td>
<td>19-63°</td>
<td>50.6 °</td>
</tr>
<tr>
<td>Cervical Extension</td>
<td>15-45°</td>
<td>30.58 °</td>
</tr>
</tbody>
</table>

**Table 2: Showing Cervical Lateral Flexion in age group 20-30 years**

<table>
<thead>
<tr>
<th>Motion</th>
<th>Measurements of Movement in Male (n= 50)</th>
<th>Measurements of Movement in Female (n= 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range (in degree)</td>
<td>Mean (in degree)</td>
</tr>
<tr>
<td>Cervical Lateral Flexion</td>
<td>Right 29-42°</td>
<td>34.92 °</td>
</tr>
<tr>
<td></td>
<td>Left 24-38°</td>
<td>30.66 °</td>
</tr>
</tbody>
</table>

**Table 3: Showing Cervical Rotation in age group 20-30 years**

<table>
<thead>
<tr>
<th>Motion</th>
<th>Measurements of Movement in Male (n= 50)</th>
<th>Measurements of Movement in Female (n= 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range (in degree)</td>
<td>Mean (in degree)</td>
</tr>
<tr>
<td>Cervical Rotation</td>
<td>Right 61-87°</td>
<td>69.9 °</td>
</tr>
<tr>
<td></td>
<td>Left 66-95°</td>
<td>70.96 °</td>
</tr>
</tbody>
</table>

**Diagram:**

- **Flexion:**
  - Vertical
  - External Auditory Meatus
  - Nostrils

- **Extension:**
  - Vertical
  - External Auditory Meatus
  - Nostrils
Conclusion

On the basis of present study we can say that the range of motion is affected by various factors like age, gender, measuring method (goniometry), type of motion whether (passive or active) and clinically problems. Generally a predisposition existed for cervical ROM to decrease with increasing age. The only exclusion is axial rotation (which occurs primarily at the atlantoaxial joint) which has been reported either to stay the same or it increases with age to recompense for age related decrease in rotation in the lower cervical spine. Age may not justify for a large amount of variation in ROM but age presents a sound effect than gender.

References