

Spine Metrics

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Analysis: Motion Lateral Cervical
Report: Impairment AMA Guides 5th Edition
Date: 05-03-15

Patient: [REDACTED], Eunjee
Position: Standing
X-Rayed: 04-07-15

SPINAL BIOMECHANICAL ENGINEERING STUDY X-Ray Study for Alteration of Motion Segment Integrity (AOMSI)

Utilizing evidenced-based objective findings that have been deemed as "Established" by the World Health Organization and can be found in the US National Guideline Clearinghouse, the patient's x-rays were analyzed for AOMSI based on abnormal angular segmental motion and abnormal translation. The method of analysis is Computerized Radiographic Mensuration Analysis (CRMA) and the report follows the standards of the AMA Guides to the evaluation of Permanent Impairment, 5th Edition (pages 381-388).

Angular Segmental Motion

The range of motion for each motion segment is calculated by taking the difference between the flexion and extension angles for each segmental level. The range of motion for each level is then compared to the range of motion of adjacent levels. The AMA Guides 5th edition identifies AOMSI when the difference of adjacent motion segment range of motion differs by greater than 11 degrees. The difference in adjacent level ranges of motion are illustrated with horizontal bar graphs (solid bars) and compared to the threshold value of 11 degrees for ligament instability. When the intersegmental range of motion is equal to or exceeds 11 degrees, it is identified with a double asterisk at the motion segment level in the data table.

Translation

Translation is measured by evaluating anterior / posterior movement of a superior vertebra on its neighboring inferior vertebra during the flexion to extension motion. Patient translation is illustrated with solid horizontal bar graphs. Normal ranges of translation are illustrated with hatched bar graphs. The AMA Guides 5th Edition identifies AOMSI when translation is equal to or exceeds 3.5 mm. When this threshold is reached, it is identified with a double asterisk at the motion segment level in the data table.

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REVIEW COMMENTS

Impressions

Angular Motion: Cervical motion study (C1-C7) indicates a loss of Angular Motion Segment Integrity at intersegment C6/C7. This was identified by an excess of 11 degrees difference in angular motion of adjacent motion segments. Loss of angular motion segment integrity is suggestive and consistent with ligament laxity and instability.

Translation Motion: Cervical motion study (C2-C7) indicates a loss of Translational Motion Segment Integrity at intersegment C4/C5. This was identified by an excess of 3.5 millimeters translation of one vertebra on another. Loss of translational motion segment integrity is suggestive and consistent with ligament laxity and instability.

Diagnosis

728.4 Laxity of ligament
847.0 Cervical strain sprain grade 2 / 3

Impairment Rating

Following the measurement protocols of the AMA Guides to the Evaluation of Permanent Impairment 5th Edition, the patient qualifies for a 25 per cent whole body impairment based on the DRE Category IV; Alteration of Motion Segment Integrity.

Alteration of Motion Segment Integrity is defined from flexion and extension radiographs as equal to or greater than 11 degrees difference in intersegmental angular motion of adjacent motion segments or equal to or greater than 3.5 millimeters translation of one vertebra on another.

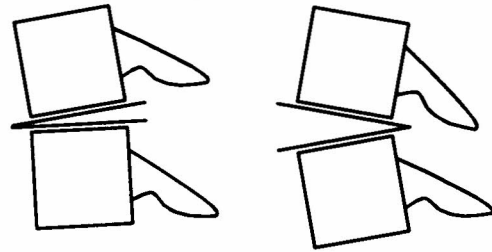
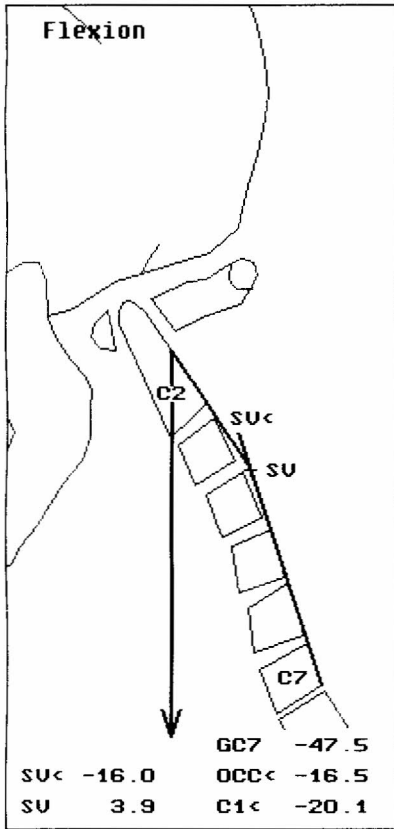
Records reviewed and report completed by _____

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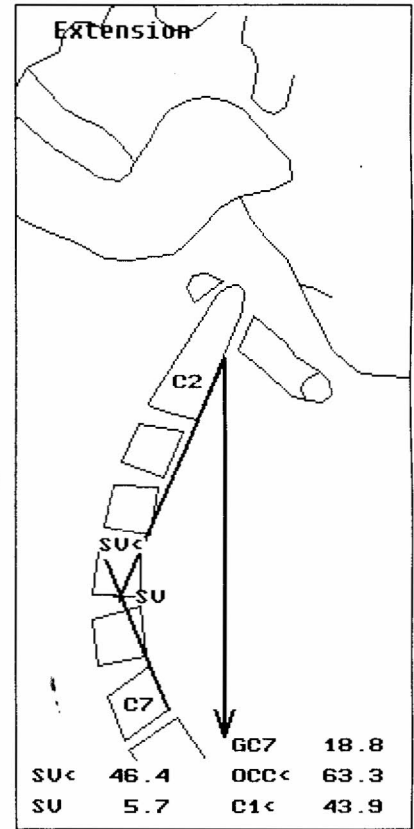
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ANGULAR ANALYSIS



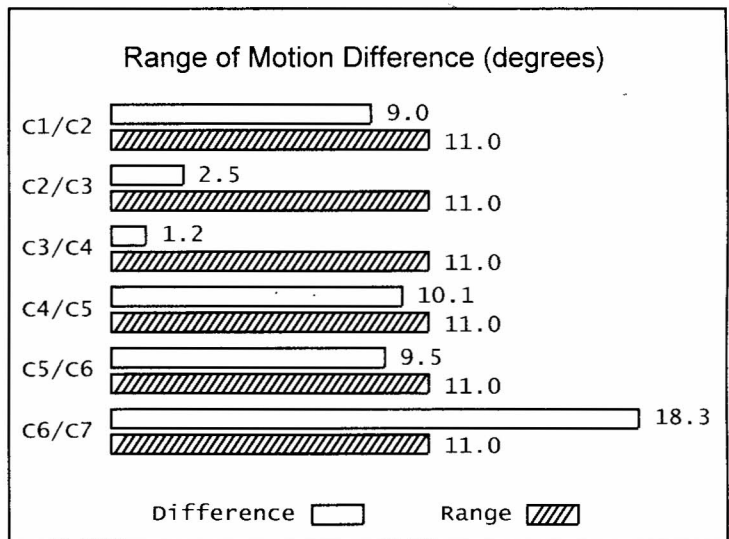
Flexion view is the referenced START position.

1. Flexion and extension angles are calculated for each motion segment level. (1)
2. The difference of flexion and extension angles is calculated to determine segmental range of motion.
3. The difference of range of motion between adjacent motion segment levels is calculated.
4. Paradoxical values (ROM <math>\ltlt;/math> 0) are identified with a single asterisk in the data table.
5. Intersegmental levels equal to or greater than 11 degrees are identified with a double asterisk.



	Flex Ang	Extn Ang	ROM	Inter Segm	ROM Diff	Max Range
C1	14.0	20.5	6.5			
C2	-7.6	7.9	15.5	C1/C2	9.0	11
C3	0.8	18.8	18.0	C2/C3	2.5	11
C4	0.4	17.2	16.8	C3/C4	1.2	11
C5	11.9	18.6	6.7	C4/C5	10.1	11
C6	8.0	24.2	16.2	C5/C6	9.5	11
C7	1.7	-0.4	-2.1 *	C6/C7	18.3 **	11

* Abnormal paradoxical motion
 ** Impairment threshold exceeded

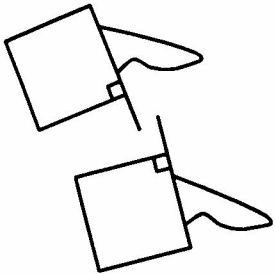


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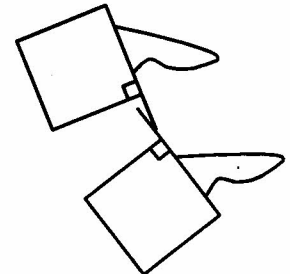
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TRANSLATION ANALYSIS



Flexion

1. Lower vertebra in extension is the referenced START position.
2. Positive number indicates anterior translation.
3. Negative numbers indicate posterior translation. (2)
4. Paradoxical values (posterior translation) are identified with a single asterisk in the data table.
5. Intersegmental levels with differences equal to or greater than 3.5 mm are identified with a double asterisk.

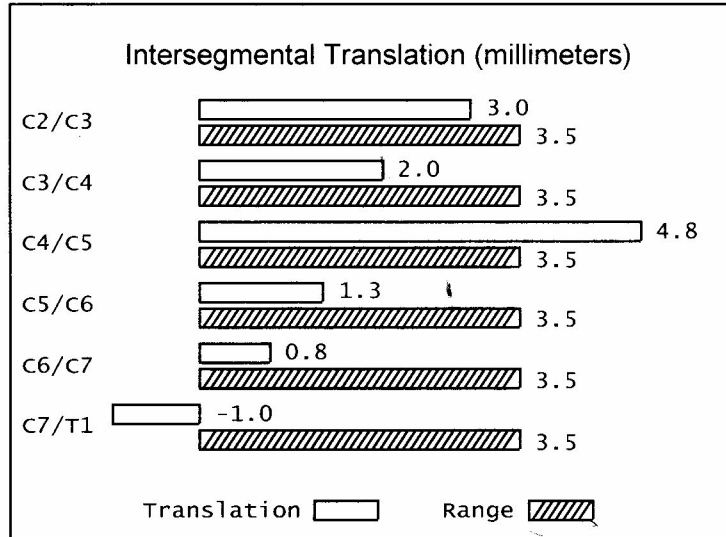


Extension

Inter Segment	Translation	Max Range
C2/C3	3.0	3.5
C3/C4	2.0	3.5
C4/C5	4.8	** 3.5
C5/C6	1.3	3.5
C6/C7	0.8	3.5
C7/T1	-1.0 *	3.5

* Abnormal paradoxical translation

** Impairment threshold exceeded



<< Negative = Posterior Positive = Anterior >>

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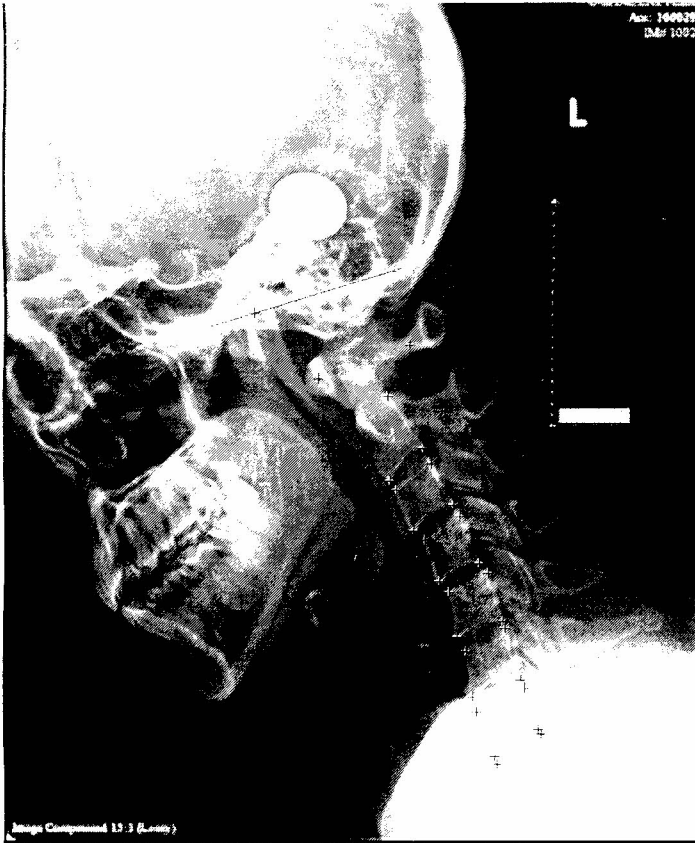
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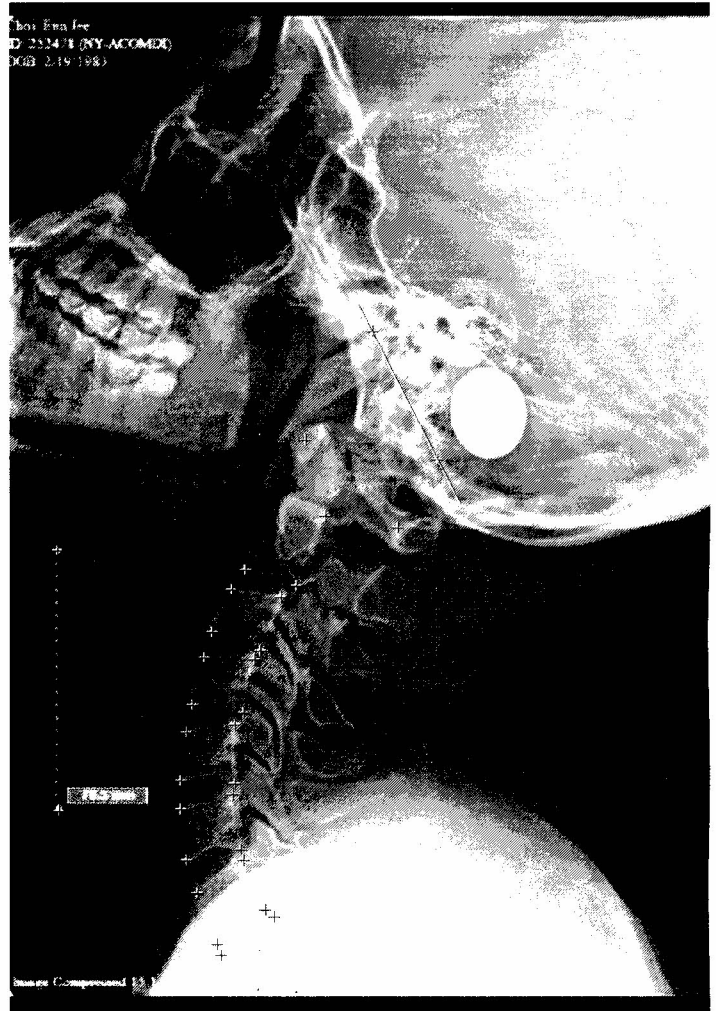
LATERAL RADIOGRAPH DIGITIZING POINTS

The points and their relative (x,y) coordinates were identified on the radiographs shown below. From this data flexion, extension and translation values were calculated to determine Alteration of Motion Segment Integrity (AOMSI).

Flexion View



Extension View



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FOOTNOTES

1. In the angular analysis, the flexion view is the referenced position. The range of motion between the flexion view and the extension view must change in the correct relative position one to another. An increased angle from flexion to extension represents a normal finding. A positive angle is recorded when the extension angle changes correctly. If the extension angle decreases this is considered abnormal reciprocal / paradoxical motion and is recorded as a negative number.

2. In the translation analysis, the extension view is the referenced position. Translation should move in the anterior direction when comparing the flexion position to the referenced extension position. A positive translation is recorded when normal motion occurs. If translation moves in the opposite direction this is considered abnormal reciprocal / paradoxical motion and is recorded as a negative value.

NOMENCLATURE

SV< Stress Vertebra Angle

The stress vertebra angle is the intersection of two lines each of which is drawn parallel to the posterior bodies of C2 and C7. The C2 line is the superior stress line and the C7 line is the inferior stress line. This method is also referred to as the Jackson angle. A normal intersection measurement is in the range of 36 -42 degrees with the cervical curve facing anterior.

SV Stress Vertebra

The stress vertebra is the intersection location of the superior and inferior stress lines. The normal intersection location is the C4/C5 disc. The intersection location identifies the point of highest loading in a curved shaped object.

GC7 Gravitational Loading at C7

A gravity line is drawn originating at the pedicle/body junction of C2. When the cervical curve is balanced this gravity line will pass along a vertical axis intersecting the posterior superior end plate of C7. Anterior translation indicates movement toward abnormal disc loading.

OCC< Occiput Angle

The occiput angle is measured by locating two points on the occiput condyle. The first point is the intersection of the anterior portion of the condyle with the skull. The second point is the intersection of the posterior portion of the condyle with the skull. The points are connected and a line is drawn and intersected with a horizontal line. This angle identifies the position of the skull to the horizon.

C1< C1 Angle

The C1 angle identifies the position of C1 to a horizontal line. An atlas plane line is intersected with a horizontal line. The atlas plane line is drawn by connecting two points: the first point is located at the center of the anterior arch; the second point is located in the center of the posterior arch. The C1 angle is used to calculate the flexion/extension value of C1.

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1. Cocchiarella L., Anderson G., Et al. Guides to the Evaluation of Permanent Impairment, 5th Edition, Chicago IL, AMA Press 2001.
2. Kramer M., Patris A. Radio Functional Analysis of the Cervical Spine using the Arlen Method; A study of 699 subject. Part One: Methodology, Kramer, M, Journal of Neuroradiology,. 1989; 16(1), pgs. 48-64
3. Dvorak J, Panjabi MM, Novotny JE, Antinnes JA. In vivo flexion/extension of the normal cervical spine. J Orthop Res. 1991. 9:828-34
4. Lind B. Sihlbom H, Malchu H. Normal range of motion in the cervical spine. Arch Phys Med Rehab.; 1989;70:692-5
5. Wiegand R, Brahee D, Marquinna N, Kettner N. Cervical degenerative diseases: Identifying factors of pathomechanical stress, location, frequency, age and gender within a symptomatic group. J Chiro Edu. 2001;15:41-42
6. Owens EF, Hoiriis KT. (2001) Cervical curvature assessment using digitized radiographic analysis. Chiro Research J. 1990; 1:47-62
7. Raymond Wiegand, D.C. Graphical Analysis and Frequency Distribution of Dysfunctional Motion Segments of the Cervical Spine in the Sagittal Plane. 2003. ACC/RAC Conference.