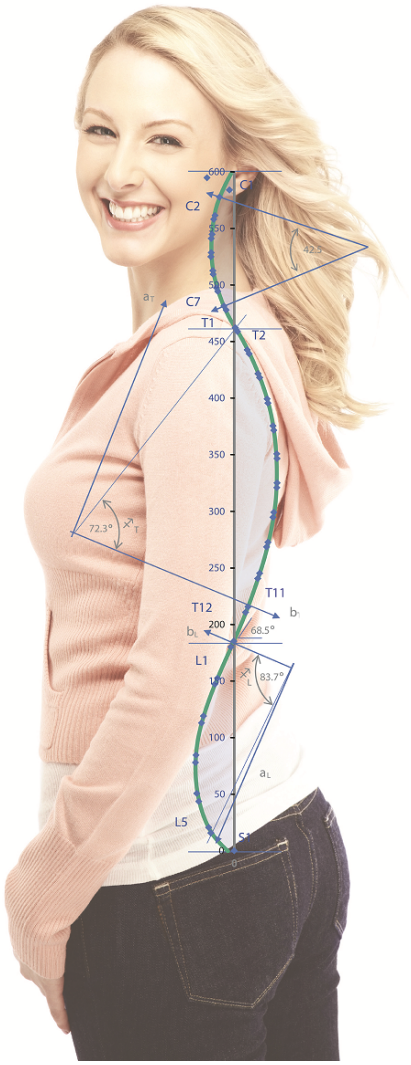
PostureRay®

Exacting X-Ray Analysis

Radiographic Impression Report



Prepared for:	KALIN JENKINS
Patient #:	JENKINSKALIN2025217000
Insurance #:	
Gender:	Female
Date of Birth:	6/26/1999
Address:	PLAINFIELD SPINE AND REHAB
Evaluation Date:	2/7/2025
Date X-Ray Taken:	12/14/2024

Prepared by:
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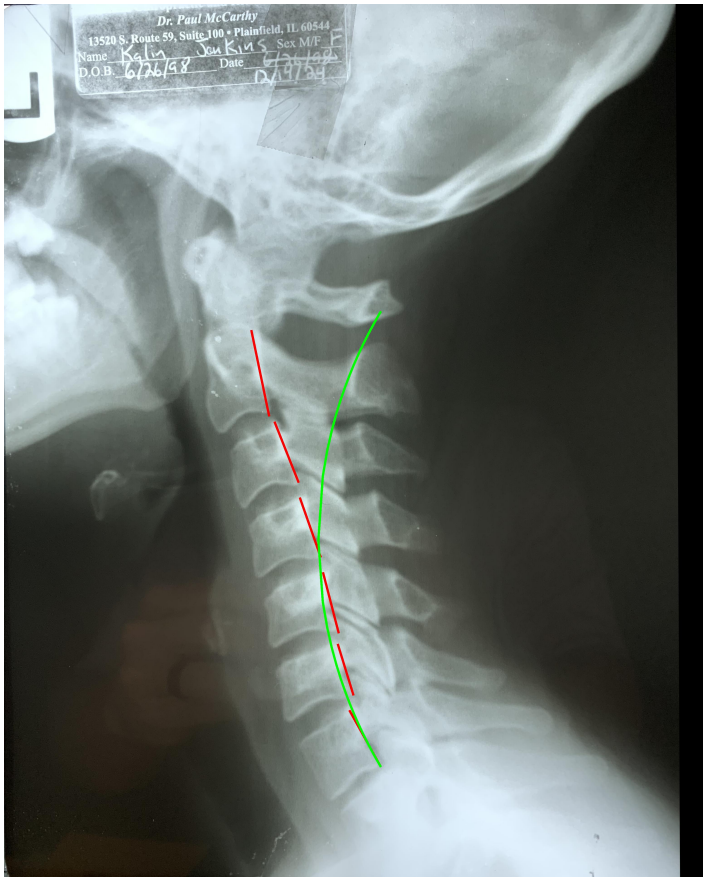
X-RAY Impressions and Biomechanics Report — Lateral Cervical Projection

Name: KALIN JENKINS **X-Ray was obtained: 12/14/2024** **Date of Digitization: 2/7/2025**
Date of Birth: 6/26/1999

Ms. KALIN JENKINS's x-rays were analyzed utilizing the PostureRay® computerized X-ray digitizing system with impressions interpreted by JOHN A. AIKENHEAD, DC,DACBR. X-Ray digitization for spinal biomechanics has been shown to be valid when compared to standard hand drawn methods. The patient's findings were then compared to established normals at each level and then globally. The X-Ray mensuration method used in analyzing this patient have been studied for reliability and validity and these results are as follows:



Anterior **Posterior**

This colored curved line represents the Normal Spinal Position and expected path of the posterior longitudinal ligament.

This colored line represents the patient's position and the path of the posterior longitudinal ligament.

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X-RAY Impressions and Biomechanics Report — Lateral Cervical Projection

Spinal Biomechanics Compared to Normal

Segments Analyzed	RRA Normal Values	RRA Patient Values	Difference From Normal	Segmental Translations
C1 to Horiz.	-29.0º	-21.1º	27.2%	
C2-C3	-10.0º	-9.9º	1.0%	0.6 mm
C3-C4	-8.0º	2.3º	128.8%	-1.7 mm
C4-C5	-8.0º	4.8º	160.0%	-1.0 mm
C5-C6	-8.0º	-2.5º	68.8%	-1.3 mm
C6-C7	-8.0º	-12.0º	50.0%	-3.5 mm

* Values in Red Exceed Established Normal

Global Analysis	Normal Values	Patient Values	Diff. From Normal
ARA C2-C7	-42º	-17.3º	58.8%
Translation C2-C7	0 mm	37.7 mm	37.7 mm
C7 Post. Tangent to Vert.	21.5º	29.1º	35.3%
T1 Post. Tangent to Vert.	26.5º	Not Digitized	Not Digitized
Sagital Balance C1-S1	0 mm	Not Digitized	Not Digitized

RRA = Relative Rotational Angle of Measurement
ARA = Absolute Rotational Angle of Measurement

Upper Cervical Measurements	Normal Values	Patient Values	Clinical Significance
Powers Ratio	0.9 to 1	Not Digitized	Not Digitized
Basilar Impression (McRae's method)	n/a	Not Digitized	Not Digitized
Atlanto-Dental Interspace	≤ 3 mm	2.2 mm	WNL
Spinal Canal Diameter	> 13 mm	25.5 mm	WNL

WNL = Within Normal Levels

Impressions and Assessment

The posterior tangent method of radiographic analysis has been studied extensively for both validity and reliability[1;2-5], and has been shown to be a superior method of analysis for biomechanical assessment over the Cobb method of x-ray analysis for sagittal cervical spine.[3] Using this radiographic analysis technique, the normal cervical lordosis measured from C2-C7 for a normal average population was found to measure -34º with ideal alignment measuring -42º.[1;2] (Note that the negative sign preceding the measurement of degree indicates direction, thus the normal Lordotic/extended position and an abnormal flexion angle/kyphosis is noted by a positive angle). There is a statistically significant association between cervical pain and lordosis < -20º and a "clinically normal" range for cervical lordosis of -31º to -40º.[6]
As noted in this computerized analysis, Ms. KALIN JENKINS's cervical spine measures -17.3º. According to recent research, Ms. KALIN JENKINS's cervical spine alignment is predictive of chronic neck pain.[1] This is a loss from the expected normal lordosis by 58.8%. Regarding anterior cervical translation (weight bearing) findings of less than 15mm has been established as a normal.[1;2] Ms. KALIN JENKINS has an abnormal anterior cervical translation from C2 relative to C7 of 37.7mm.

References

[1] Harrison DD, Harrison DE, Janik TJ et al. Modeling of the sagittal cervical spine as a method to discriminate hypolordosis: results of elliptical and circular modeling in 72 asymptomatic subjects, 52 acute neck pain subjects, and 70 chronic neck pain subjects. Spine (Phila Pa 1976.) 2004;29:2485-92.

[2] Harrison DD, Troyanovich SJ, Harrison DE et al. A normal sagittal spinal configuration: a desirable clinical outcome. J.Manipulative Physiol Ther. 1996;19:398-405.

[3] Harrison DE, Harrison DD, Cailliet R et al. Cobb method or Harrison posterior tangent method: which to choose for lateral cervical radiographic analysis. Spine (Phila Pa 1976.) 2000;25:2072-8.

[4] Harrison DE, Holland B, Harrison DD et al. Further reliability analysis of the Harrison radiographic line-drawing methods: crossed ICCs for lateral posterior tangents and modified Risser-Ferguson method on AP views. J.Manipulative Physiol Ther. 2002;25:93-8.

[5] Jackson BL, Harrison DD, Robertson GA et al. Chiropractic biophysics lateral cervical film analysis reliability. J.Manipulative.Physiol.Ther. 1993;16:384-91.

[6] McAviney J, Schulz D, Bock R et al. Determining the relationship between cervical lordosis and neck complaints. J.Manipulative Physiol Ther. 2005;28:187-93.

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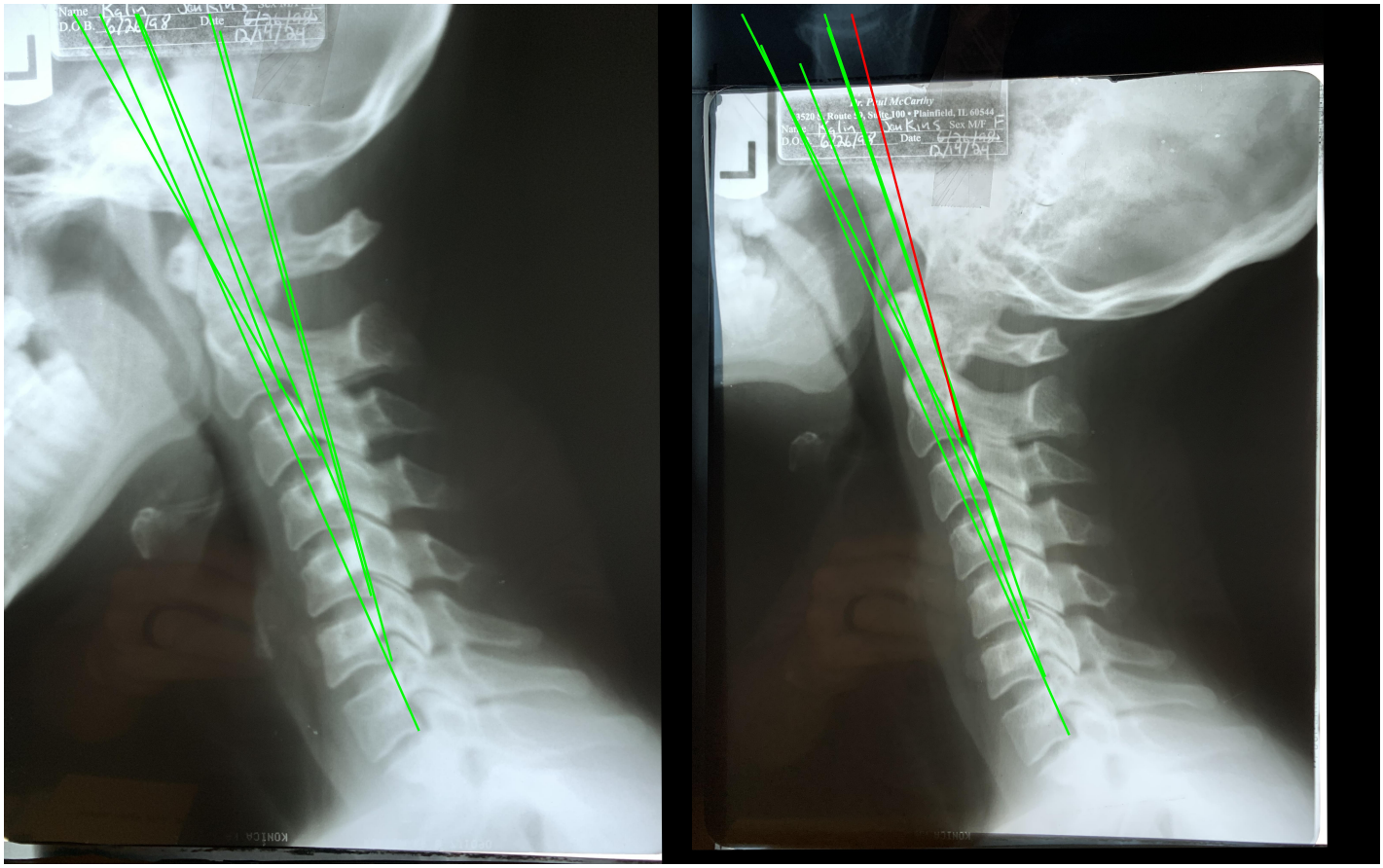
X-RAY Impressions and Biomechanics Report — Lateral Cervical Flexion/Extension

Name: KALIN JENKINS **X-Ray was obtained: 12/14/2024** **Date of Digitization: 2/7/2025**

Date of Birth: 6/26/1999

Ms. KALIN JENKINS's x-rays were analyzed utilizing the PostureRay® computerized X-ray digitizing system with impressions interpreted by JOHN A. AIKENHEAD, DC,DACBR. X-Ray digitization for spinal biomechanics has been shown to be valid when compared to standard hand drawn methods. The patient's findings were then compared to established normals at each level and then globally. The X-Ray mensuration method used in analyzing this patient have been studied for reliability and validity and these results are as follows:

Flexion **Extension**



Anterior **Posterior** **Anterior** **Posterior**

This colored line represents the posterior tangent lines of mensuration and exceeds normal allowable segmental motion indicating ligament laxity.

This colored line represents the posterior tangent lines of mensuration and appears to be stable with no significant ligamentous laxity.

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X-RAY Impressions and Biomechanics Report — **Lateral Cervical Flexion/Extension**

Flexion/Extension Values

Segment	Flexion RRA	Extension RRA	Angular Excursion	Flexion Transl.	Extension Transl.	Translational Excursion
C1 to Horiz.	3.1º	-22.9º	26.0º			
C2-C3	-8.0º	**-12.4º**	4.4º	0.0 mm	-1.7 mm	1.7 mm
C3-C4	6.5º	8.2º	-1.8º	0.2 mm	-0.5 mm	0.7 mm
C4-C5	7.2º	0.0º	7.2º	0.5 mm	-0.8 mm	1.3 mm
C5-C6	0.3º	-3.0º	3.3º	0.3 mm	-2.0 mm	2.3 mm
C6-C7	-8.7º	-2.3º	-6.4º	-1.6 mm	-1.0 mm	-0.6 mm

RRA = Relative Rotational Angle of Measurement
* Values in Red Exceed Established Normal

Global Analysis	Flexion	Extension	Global Excursion
ARA C2-C7	-2.8º	-9.4º	6.6º
Translation C2-C7	50.2 mm	36.8 mm	13.5 mm

ARA = Absolute Rotational Angle of Measurement

Upper Cervical Measurements - Flexion	Normal Values	Patient Values	Clinical Significance
Powers Ratio	0.9 to 1	Not Digitized	Not Digitized
Basilar Impression (McRae's method)	n/a	Not Digitized	Not Digitized
Atlanto-Dental Interspace	≤ 3 mm	3.0 mm	WNL
Spinal Canal Diameter	> 13 mm	23.4 mm	WNL

WNL = Within Normal Levels

Upper Cervical Measurements - Extension	Normal Values	Patient Values	Clinical Significance
Powers Ratio	0.9 to 1	Not Digitized	Not Digitized
Basilar Impression (McRae's method)	n/a	Not Digitized	Not Digitized
Atlanto-Dental Interspace	≤ 3 mm	2.2 mm	WNL
Spinal Canal Diameter	> 13 mm	21.8 mm	WNL

WNL = Within Normal Levels

Upper Cervical Measurements - Flexion + Extension	Normal Values	Patient Values	Clinical Significance
C0-C1 Instability	< 25º	Not Digitized	Not Digitized
C1-C2 Instability	< 20º	15.9º	WNL

WNL = Within Normal Levels

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X-RAY Impressions and Biomechanics Report — Lateral Cervical Flexion/Extension

Impressions and Assessment

The posterior tangent method of radiographic analysis has been studied extensively for both validity and reliability[4-8], and has been shown to be a superior method of analysis for biomechanical assessment over the Cobb method of x-ray analysis for sagittal cervical spine.[6] Normal values for intersegmental motion should not exceed more than 10-11º of angular motion.[9] Using the posterior tangent method of radiographic analysis, motion that exceeds 10º has been shown to predict and discriminate minor ligamentous injuries from those patients with true whiplash type ligamentous injuries.[3] Corroborating these findings using another method of analysis (inferior endplate assessment), an alteration of motion segment integrity (AOMSI) has been defined as motion at the level in question that is more than 11º greater than at either adjacent level.[1] Regarding segmental translational movements, authors have noted that subluxation should be noted with a range of 1.0-3.0mm[2] of intersegmental movement with absolute clinical cutoff threshold value of 3.5mm.[1;9]

There is anterior widening of the intervertebral disc space at C2-C3 levels evidenced by excessive segmental extension, which indicates possible damage to the anterior longitudinal ligament and/or intervertebral disc at said level.

- Segmental flexion instability is noted at the following segments: none
- Segmental extension instability is noted at the following segments: C2-C3 of -12.4º.
- Segmental subluxation for flexion is noted at the following segments: C6-C7 with -1.6 mm.
- Segmental subluxation for extension is noted at the following segments: C2-C3 with -1.7 mm, C5-C6 with -2.0 mm, C6-C7 with -1.0 mm.
- Segmental translational instability for flexion is noted at the following segments: none
- Segmental translational instability for extension is noted at the following segments: none

According to the above biomechanical assessment, there are findings of alteration of motion segment integrity (AOMSI) at the following levels: C2-C3. Consequently, this patient may be rateable for a permanent injury upon reaching maximal medical improvement.

References

[1] Guides to the Evaluation of Permanent Impairment, Fifth Edition.American Medical Association, 2000.
[2] Green JD, Harle TS, Harris JH, Jr. Anterior subluxation of the cervical spine: hyperflexion sprain. AJNR Am.J.Neuroradiol. 1981;2:243-50.
[3] Griffiths HJ, Olson PN, Everson LI et al. Hyperextension strain or "whiplash" injuries to the cervical spine. Skeletal Radiol. 1995;24:263-6.
[4] Harrison DD, Harrison DE, Janik TJ et al. Modeling of the sagittal cervical spine as a method to discriminate hypolordosis: results of elliptical and circular modeling in 72 asymptomatic subjects, 52 acute neck pain subjects, and 70 chronic neck pain subjects. Spine (Phila Pa 1976.) 2004;29:2485-92.
[5] Harrison DD, Troyanovich SJ, Harrison DE et al. A normal sagittal spinal configuration: a desirable clinical outcome. J.Manipulative Physiol Ther. 1996;19:398-405.

[6] Harrison DE, Harrison DD, Cailliet R et al. Cobb method or Harrison posterior tangent method: which to choose for lateral cervical radiographic analysis. Spine (Phila Pa 1976.) 2000;25:2072-8.
[7] Harrison DE, Holland B, Harrison DD et al. Further reliability analysis of the Harrison radiographic line-drawing methods: crossed ICCs for lateral posterior tangents and modified Risser-Ferguson method on AP views. J.Manipulative Physiol Ther. 2002;25:93-8.
[8] Jackson BL, Harrison DD, Robertson GA et al. Chiropractic biophysics lateral cervical film analysis reliability. J.Manipulative.Physiol.Ther. 1993;16:384-91.

[9] White AA, III, Johnson RM, Panjabi MM et al. Biomechanical analysis of clinical stability in the cervical spine. Clin.Orthop. 1975;85-96.

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X-RAY Impressions and Biomechanics Report

AP Cervical Projection

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Date of Birth: 6/26/1999

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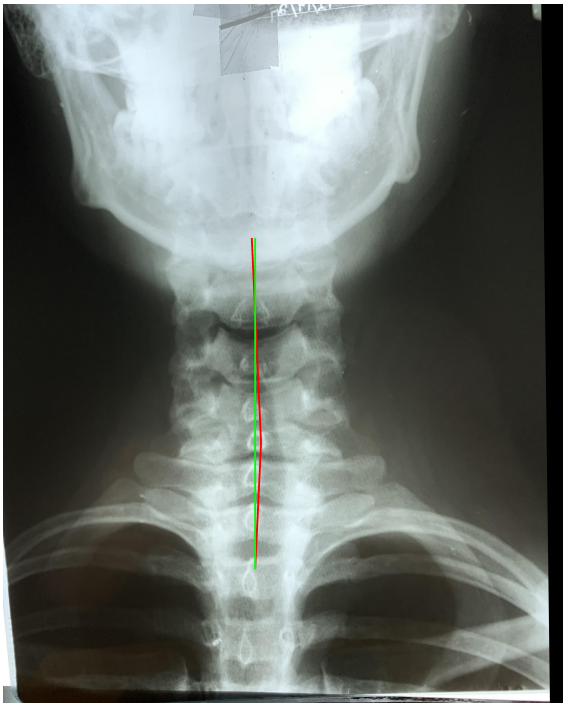
Spinal Biomechanics Compared to Normal

Global Analysis	Normal Values	Patient Values	Difference From Normal
RZA T3	0º	-2.9º	2.9º
CDA C3-T3	0º	5.1º	5.1º
Translation C3-T3	0 mm	-0.5 mm	0.5 mm

CDA = Cervico-dorsal Angle and is a measure of the mid cervical angle
RZA = Rotation Angle relative to true vertical of the lower cervical and upper thoracic spine



Right **Left**

This colored line represents normal spinal position.

This colored line represents the patient's alignment and the projected centers of mass of the spine.

Impressions and Assessment

As noted above in the table, Ms. KALIN JENKINS's cervical spine is translated (listed) from plumb by 0.5 mm to the right. Of importance is that the patient has a mid neck abnormal angle of 5.1 degrees to the right. The patient has an angular displacement from normal (plumb) of the lower cervical and upper thoracic spine of 2.9 degrees to the left.