

AOMSI Radiology Report Layout

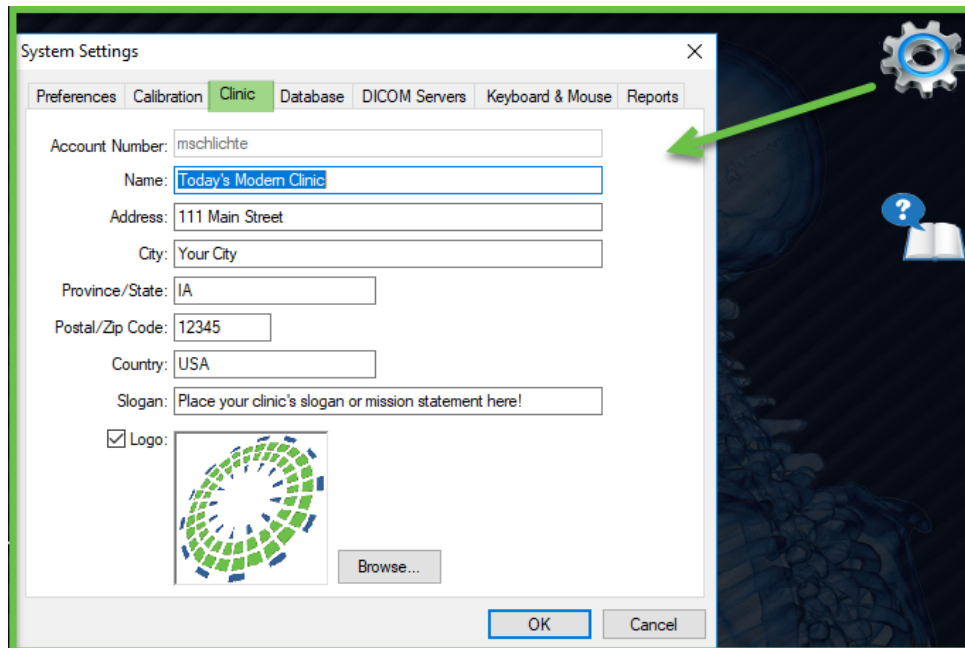
The AOMSI (Alteration of Motion Segment Integrity) report layout contains detailed information to explain how the images were evaluated and with what criteria.

The report fully supports the exact same impairment evaluation using the vertebrae angulations for both the 5th and 6th edition on Flexion view only. The AOMSI standards (5th and 6th edition) do not endorse the use of angulation measurements on the Extension views.

1. Clinic Information

This information comes from the **Clinic Tab** under **System Settings**.

It is local to the install.





2. Abstract

This tells how the x-rays have been evaluated, using which standards and criteria, what the practitioner was looking for and trying to determine.

It is necessary for this report and **cannot** be removed.

AOMSI Report Cervical Flexion Extension 2020-03-05

Today's Modern Clinic
111 Main Street
Your City, IA
12345
USA

Abstract →

The patient's radiographs of the cervical spine were evaluated utilizing spinal biomechanical engineering with the established standards from the AMA Guides To The Evaluation of Permanent Impairment (5th and 6th editions) using the Alteration of Motion Segment Integrity (AOMSI) criteria. Both the angular segmental motion and the translational measurements were utilized in this evaluation. The purpose of the biomechanical evaluation study was to determine ligament laxity or connective tissue injury. By quantifying the overall cervical spine AOMSI, the confirmation of anterior longitudinal ligament and posterior longitudinal ligament instability via the translational and angular motion as demonstrated on the flexion/extension cervical spine study views is documented in this report.

Prepared for CERVICAL FLEXION EXTENSION
on March 05, 2020

Place your clinic's slogan or mission statement
here!



The correct and valid method for determining AOMSI is utilization of lateral cervical spine radiography with flexion/extension views per the AMA Guides. The nature of diagnosing ligamentous injuries include the use of George's Line in the establishment of the involvement of posterior longitudinal ligament injury (Croft/Foreman pp. 287-290). Clinical instability may be demonstrated by standard x-rays (flexion/extension) and is often associated with chronic or intractable pain syndromes and neurological symptoms (Croft/Foreman p. 51).

3. Introduction

You have two options for your introduction on the radiology reports.

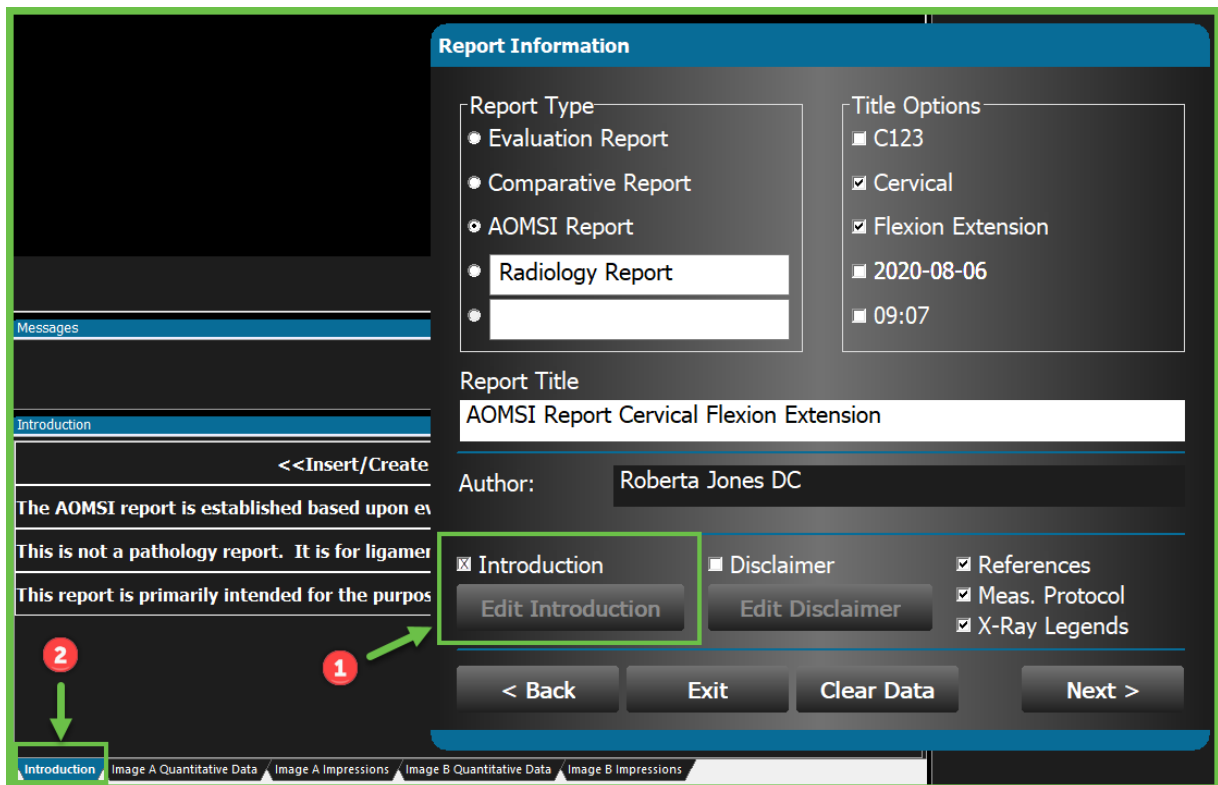
You have the Introduction option on the Report Information screen and you will have access to the Introduction tab prior to creating a section on your radiology report.

Once the **Create Section** button is selected, the Introduction tab is deactivated.


As you are creating the report, the Introduction tab will be accessible when the x-ray section is marked **Done** and prior to a **New Section** being added.

You can use the Introduction on the Report Information screen for all your reports, or use that for your basic reports and use the Introduction Tab for your AOMSI reports.

If both introductions are selected, both will appear on your report. The one from the Report Information screen will be on the report first, and the one(s) from the Introduction tab will be listed below it, in the order they were selected.



REMINDER: Any change made on the Report Information screen will be the default setting for the next report created on that computer.



Abstract →

The correct and valid method for determining AOMSI is utilization of lateral cervical spine radiography with flexion/extension views per the AMA Guides. The nature of diagnosing ligamentous injuries include the use of George's Line in the establishment of the involvement of posterior longitudinal ligament injury (Croft/Foreman pp. 287-290). Clinical instability may be demonstrated by standard x-rays (flexion/extension) and is often associated with chronic or intractable pain syndromes and neurological symptoms (Croft/Foreman p. 51).

INTRODUCTION ←

The AOMSI report is established based upon evidence-based practice involving biomechanical analysis and protocols that have been established for radiology studies of the spine. This report may not include a pathological component. The radiology images used were of acceptable quality and in compliance with normal protocols for X-ray analysis following AOMSI criteria as described in the AMA Guides to The Evaluation of Permanent Impairment, 5th Edition and 6th Edition where indicated.

Utilizing evidenced-based objective findings as established by the World Health Organization and the US National Guideline Clearinghouse, the patient's cervical spine radiographs were analyzed for AOMSI based on angular segmental motion and translation segmental motion parameters. The method of AOMSI analysis follows the standards of the AMA Guides to the Evaluation of Permanent Impairment, 5th Edition (pages 378-79) and 6th Edition (pages 563-566).

4. Radiology Exam

All images added to the report will appear in this section. The title of the x-ray section includes the body area and the view position (flexion, extension, or neutral).

When the section includes two images of different view positions, both view positions are included in the title. i.e. If both Flexion and Extension views were selected in the section, one as a comparison, it will be labeled Radiology Exam – Cervical Spine Flexion/Extension Study.

Images will be numbered. i.e. Image 1A 2019-02-07 (date captured or inserted into software), 1B (comparative image, listed **below** image A); 2A, 2B...

Radiology Exam - Cervical Spine Flexion/Extension Study

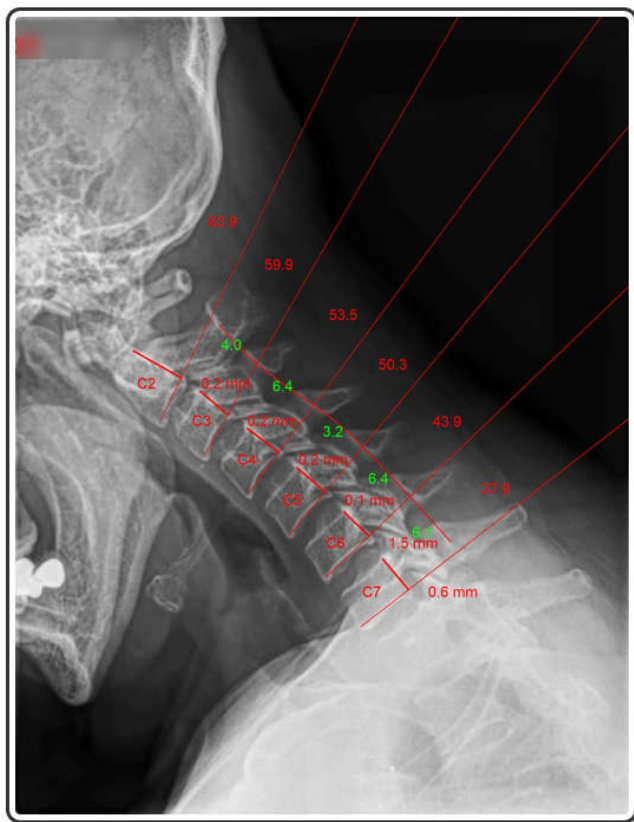


Image 2A: 2019-02-07

The quantitative data that contains tables will appear in this section, below the Legend (see below) for the last image in the section.

4a. Legend

On the Report Information screen, the option for X-ray Legends will be checked by default. Uncheck to remove from the report.

Report Information

Report Type

- Evaluation Report
- Comparative Report
- AOMSI Report
- Radiology Report
-

Title Options

- C123
- Cervical
- Flexion Extension
- 2020-08-06
- 09:07

Report Title

Author:

Introduction

Disclaimer

References
 Meas. Protocol
 X-Ray Legends

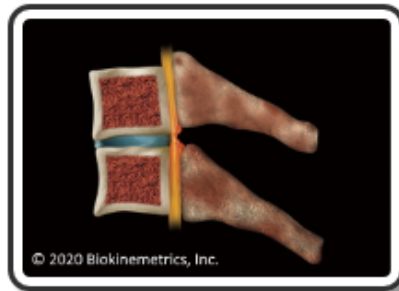
The Legend will appear below each image in the Radiology Exam as well as below the Measurement Tables when added to the report.

The legends below the flexion and extension images explain what the practitioner is looking for within these views: damages to the two longitudinal ligaments – shown in yellow.

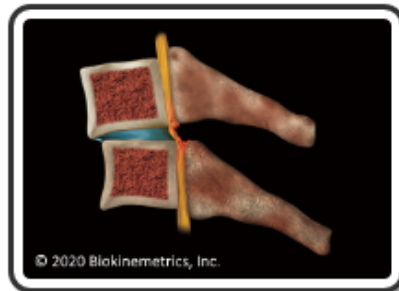
Flexion:

Posterior Longitudinal Ligament

The compromised integrity of the posterior longitudinal ligament (PLL) is demonstrated on the images below by an anterior shift (forward translational motion) of one vertebra over the vertebra below. Translational deviation can also occur by the posterior widening of the intervertebral disc space resulting in an increased disc angle or angular motion. By measuring these deviations of George's Line (as defined in Yochum & Rowe, p. 149), Alteration of Motion Segment Integrity (AOMSI) can be quantified and identified with the AMA Guides To The Evaluation of Permanent Impairment. (5th edition, p. 378-379; and 6th edition, p. 563-566).



Widening of the Posterior Disc

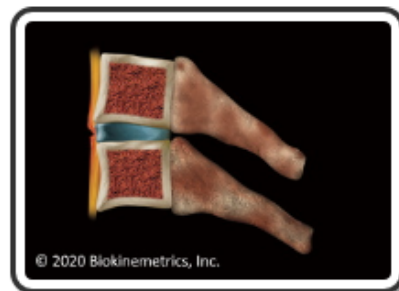


Anterolisthesis

Extension:

Anterior Longitudinal Ligament

The compromised integrity of the anterior longitudinal ligament (ALL) is demonstrated on the images below by a posterior shift (backwards translational motion) of one vertebra over the vertebra below. Translational deviation can also occur by the anterior widening of the intervertebral disc space resulting in an increased disc angle or angular motion. By measuring these deviations of George's Line (as defined in Yochum & Rowe, p. 149), Alteration of Motion Segment Integrity (AOMSI) can be quantified and identified with the AMA Guides To The Evaluation of Permanent Impairment. (5th edition, p. 378-379; and 6th edition, p. 563-566).



Widening of the Anterior Disc



Retrolisthesis

The neutral view will not have a legend.

The legends under the measurement tables present the criteria that are used to determine if a mobile segment is impaired.

Image 2A - Vertebral Angulations (Cervical Flexion)

Vertebra	Angle (°)	Angulation (°)	Result
C2-3	63.9	4.0	Normal
C3-4	59.9	6.4	Normal
C4-5	53.5	3.2	Normal
C5-6	50.3	6.4	Normal
C6-7	43.9	6.1	Normal
C7-T1	37.8	N/A	N/A

Angular motion is measured by determining the anterior angular motion of one vertebra over another. A diagnosis of AOMSI in the cervical spine by angular loss of motion segment integrity measurements requires angular motion of more than 11 degrees greater than each adjacent level on the flexion radiograph. Angular motions between 7 and 11 degrees are abnormal but not ratable. (AMA Guides)

Image 2A - Vertebral Translations (Cervical Flexion)

Vertebra	A - Translation (mm)	B - Diameter (mm)	A/B Ratio (%)	Result
C3	0.2 posterior	18.1	1.1	Normal
C4	0.2 posterior	18.7	1.1	Normal
C5	0.1 posterior	19.1	0.5	Normal
C6	1.5 posterior	21.1	7.1	Normal
C7	0.6 posterior	21.1	2.8	Normal

Translational motion is measured by determining the anteroposterior motion of one vertebra over another. A diagnosis of AOMSI in the cervical spine by translational loss of motion segment integrity measurements requires greater than 20% anterior OR greater than 20% posterior relative translation of one vertebra on another, on flexion OR extension radiographs, respectively. (AMA Guides 6th Ed.)

Combined Vertebral Translations

Vertebra	Flexion (mm)	Extension (mm)	Total (mm)	Result
C3	-0.2	4.1	3.9	Ratable
C4	-0.2	4.1	3.9	Ratable
C5	-0.1	3.6	3.5	Abnormal
C6	-1.5	2.8	1.3	Abnormal
C7	-0.6	1.0	0.4	Normal

Translational motion is measured by determining the anteroposterior motion of one vertebra over another. A diagnosis of AOMSI in the cervical spine by translational loss of motion segment integrity measurements requires greater than 3.5 mm cumulative translation of one vertebra on another, when combining the results from one flexion radiograph and one extension radiograph. Cumulative translations between 1.0 and 3.5 mm are abnormal but not ratable, as well as negative translations greater in magnitude than -1.0 mm. (AMA Guides 5th Ed.)

**Image 2B - Vertebral Angulations
(Cervical Extension)**

Vertebra	Angle (°)	Angulation (°)
C2-3	19.5	-7.7
C3-4	11.8	-9.2
C4-5	2.6	-9.5
C5-6	-6.9	-6.4
C6-7	-13.3	-15.0
C7-T1	-28.3	N/A

Angular motion segment integrity on the cervical extension view is not considered as part of the cervical spine AOMSI determination although it can have relevant clinical considerations and is measured here for clinical observation. (AMA Guides)

Image 2B - Vertebral Translations (Cervical Extension)

Vertebra	A - Translation (mm)	B - Diameter (mm)	A/B Ratio (%)	Result
C3	4.1 posterior	18.1	22.7	Ratable
C4	4.1 posterior	18.7	21.9	Ratable
C5	3.6 posterior	19.1	18.8	Normal
C6	2.8 posterior	21.1	13.3	Normal
C7	1.0 posterior	21.1	4.7	Normal

Translational motion is measured by determining the anteroposterior motion of one vertebra over another. A diagnosis of AOMSI in the cervical spine by translational loss of motion segment integrity measurements requires greater than 20% anterior OR greater than 20% posterior relative translation of one vertebra on another, on flexion OR extension radiographs, respectively. (AMA Guides 6th Ed.)

5. Findings & Impressions

The findings (text quantitative data), evidences and impression macros for all images on the report will be stored in the dedicated section of Findings & Impressions on the AOMSI report instead of within the individual x-ray sections.

They will be in the order of: Findings, Evidences, and then Impressions.

The Findings (text quantitative data) are divided based on the area and view position of their related x-ray image. Each paragraph includes the area and view position in its title (see below screen shot), without any image number.

FINDINGS AND IMPRESSIONS

Cervical Spine Lateral:

- The Atlas vertebra is positioned at 19.6 degrees with the horizontal.
- The angle between the Atlas and Axis vertebrae is 31.1 degrees.
- The second vertebra is positioned 25.8 millimeters anterior relative to normal.
- The angle of curvature between the C2 and C7 vertebrae is -13.8 degrees.

Cervical Spine Lateral Flexion:

- The angle of curvature between the C2 and C7 vertebrae is 20.4 degrees.

Cervical Spine Lateral Extension:

- The angle of curvature between the C2 and C7 vertebrae is -44.8 degrees.

If the quantitative data contains tables, the tables will appear in the **Radiology Exam** section below the **Legend** (if included) of the image. If a comparison is done on the report, Image B will be below Image A, then the tables for Image A and B.

The Evidences and Impressions will be in separate paragraphs, but not split out by the view it pertains to. When you create the Evidence or Impression, reference the view position (extension, flexion or neutral) in the content.

FINDINGS AND IMPRESSIONS

Cervical Spine Lateral:

- The Atlas vertebra is positioned at 19.6 degrees with the horizontal.
- The angle between the Atlas and Axis vertebrae is 31.1 degrees.
- The second vertebra is positioned 25.8 millimeters anterior relative to normal.
- The angle of curvature between the C2 and C7 vertebrae is -13.8 degrees.

Cervical Spine Lateral Flexion:

- The angle of curvature between the C2 and C7 vertebrae is 20.4 degrees.

Cervical Spine Lateral Extension:

- The angle of curvature between the C2 and C7 vertebrae is -44.8 degrees.

Impressions

Cervical Disc heights appear normal.

Abnormal loss of the cervical lordosis is evident with mild reversal on the upper cervical spine.

There are no abnormalities on the lateral cervical flexion view for translation or angulations.

The patient has clinically documented radiculopathy radiating from the cervical spine to the right shoulder.

Ligamentous laxity is evident on the lateral extension view at the C3 and C4 vertebral motor unit with C3 sliding posteriorly 4.1mm on C4 having posterior translation of 22.7% giving it a ratable WPI. In addition, C4 also has a ratable WPI with posterior translation of 21.9% by translating 4.1 mm on C5. The laxity and retrolisthesis abnormalities are ratable in accordance with the AOMSI methodologies described in the 6th Edition of the AMA Guides to the Evaluation of Permanent Impairment. The patient has a 19% Whole Person Impairment. (Chapter 17 page 564).

The combined vertebral translations methodology also demonstrates abnormal, but not ratable, translation at the C5 and C6 vertebral levels when combining flexion and extension translations in accordance with the 5th edition of the AMA guides to the evaluation of Permanent Impairment. While the abnormalities are present on mensuration they are not severe enough to apply a WPI rating to the C5 and C6 levels.

The comparison option on the AOMSI report is designed to compare the flexion/extension images. If you are wanting to compare the same view over time on a report, it is suggested you use the basic report feature and not the AOMSI report due to the Findings (text quantitative data) are not split out when the comparison image is the same view.

6. Disclaimer

This is an option on the Report Information screen.

The screenshot shows a software interface titled "Report Information". It features two columns of radio button options: "Report Type" (with "Radiology Report" selected) and "Title Options" (with "Cervical" and "Flexion Extension" checked). Below these is a "Report Title" field containing "AOMSI Report Cervical Flexion Extension" and an "Author:" field with "Roberta Jones DC". A row of checkboxes includes "Introduction", "Disclaimer" (highlighted with a green box), "References", "Meas. Protocol", and "X-Ray Legends". Each checkbox has a corresponding "Edit" button. At the bottom are navigation buttons: "< Back", "Exit", "Clear Data", and "Next >".

The header or text 'Disclaimer' will not appear on the report. You have the ability to create your own disclaimer.

The screenshot shows a text input area with a green border. The text inside reads: "See clinic disclaimer policy." followed by a horizontal line and the address: "Jon Doe DC", "Today's Modern Clinic", "111 Main Street", "Your City, IA", "12345", "USA".

7. Signature

The user that is signed into the software when the Control Center option **Create a Radiology Report/RoF** is selected, will be listed as the author of the report. Their name will be in the signature line which is located below the disclaimer. (See above screen shot.)



8. References

This is a list of supporting AOMSI references that covers each element of the AOMSI report.

On the Report Information screen, the option for References will be checked by default. Uncheck to remove from the report.

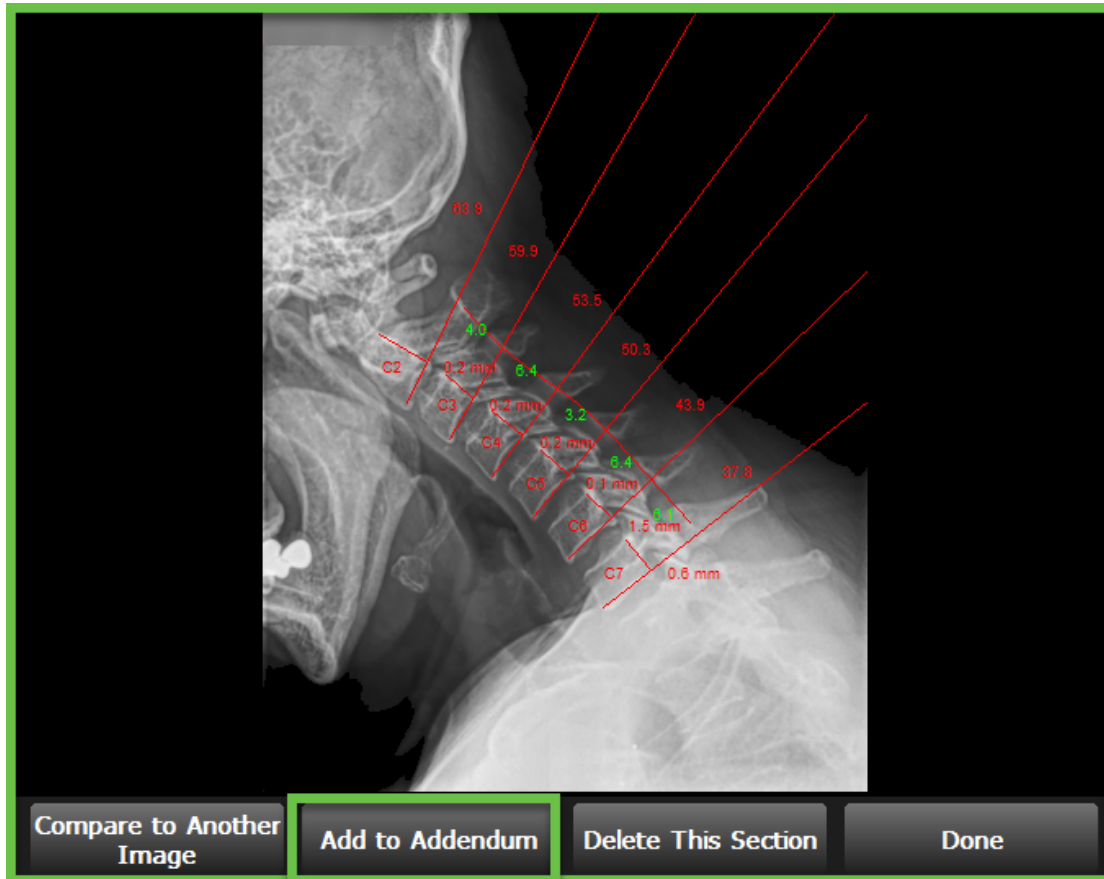
The image shows the "Report Information" screen of the application. The screen is divided into several sections. At the top, there is a "Report Information" header. Below it, there are two columns of options. The left column is labeled "Report Type" and contains radio buttons for "Evaluation Report", "Comparative Report", "AOMSI Report", "Radiology Report", and an empty option. The right column is labeled "Title Options" and contains checkboxes for "C123", "Cervical", "Flexion Extension", "2020-08-06", and "09:07". Below these columns is a "Report Title" field containing the text "AOMSI Report Cervical Flexion Extension". Underneath the title field is the "Author:" field with the name "Roberta Jones DC". At the bottom, there are five checkboxes: "Introduction", "Disclaimer", "References", "Meas. Protocol", and "X-Ray Legends". The "References" checkbox is checked and highlighted with a green box. Below the checkboxes are four buttons: "< Back", "Exit", "Clear Data", and "Next >".

REFERENCES

1. Guides to the Evaluation of Permanent Impairment, 4th Edition; American Medical Association, 1993.
2. Guides to the Evaluation of Permanent Impairment, 5th Edition; American Medical Association, 2000.
3. Guides to the Evaluation of Permanent Impairment, 6th Edition; American Medical Association, 2008.
4. Yochum T, Rowe L: Essentials of Skeletal Radiology, 2nd Edition; 1996 (pp. 149-151, 162, and 867-868).
5. Foreman SM CAC: Whiplash Injuries - The Cervical Acceleration/Deceleration Syndrome, 3rd Edition; Lippincott Williams and Wilkins, 2002:52-53.
6. Pintar F: Anterior Longitudinal Ligament Injuries in Whiplash; Medical Engineering 2006, 28:515-524.
7. Dvorak J, Froehlich D, Penning L et al.: Functional radiographic diagnosis of the cervical spine: flexion/extension; Spine 1988, 13:748-55.
8. Penning L: Normal Movements of the Cervical Spine; Am J Roentgenol 1978, 317-26.
9. Wu SK, Kuo LC, Lan HC et al.: The quantitative measurements of the intervertebral angulation and translation during cervical flexion and extension; Eur. Spine J 2007, 16:1435-44.
10. Panjabi MM: Injury of the Anterior Longitudinal Ligament; European Spine Journal 2004, 13:61-68.
11. Dvorak J, Panjabi MM: Clinical Validation of Functional Flexion/Extension Radiographs of Cervical Spine; Spine 1993, 18(1).
12. Panjabi MM, Ivancic P: Whiplash Causes Increased Laxity of Cervical Capsular Ligament; Clinical Biomechanics 2008, February:23(2):159-165.
13. Harrison D: Comparison of Axial and Flexural Stresses in Lordosis and Three Buckled Configurations of the Cervical Spine; Clinical Biomechanics 2001.
14. Frobin F, Leivseth G, Biggemann M: Sagittal Plane Segmental Motion of the Cervical Spine. New Precision Measurement Protocol and Normal Motion Data of Healthy Adults; Clinical Biomechanics 2002, 17:21-31.
15. Nelson D, Peterson E: Reliability of Digitizing Techniques; Journal of Bone and Mineral Research, 5(7), 1990.
16. White AA, Panjabi MM, Johnson RM, Southwick WO: Biomechanical analysis of clinical instability in the cervical spine; Clinical Orthopedics Rel. Res. 1975, (109):85-96.
17. White AA, Panjabi MM: Clinical Biomechanics of the Spine, 2nd edition; pp. 285-316.
18. White AA, Panjabi MM: Clinical Biomechanics of the Spine, 1st edition; pp. 223-228.
19. Dvorak J, Panjabi MM, Novotny JE, Antinnes JA: In vivo flexion/extension of the normal cervical spine; J Orthop Res. 1991, 9:828-34.
20. Owens EF, Hoiriis KT (2001): Cervical curvature assessment using digitized radiographic analysis; Chiro Research J. 1990, 1:47-62.
21. 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.

9. Addendum – Other Images

Once you create an x-ray section you can insert one copy of the main image into the addendum section.



This copy does not include any accompanying title, legend or text. It will include a caption with the Radiology Exam section number where the original image is located, and the date when the image has been taken.

While a Radiology Exam section is being created or modified, you can remove the image from the addendum.

If the Radiology Exam section is deleted from the report, the addendum pertaining to that section will be removed as well.

The addendum allows you to display different annotation lines than the ones in the Radiology Exam section, or to display the annotation point placements.

ADDENDUM - OTHER IMAGES



Image 1A: 2019-02-07

10. Addendum – AOMSI Measurement Protocol

This explains in detail what calculations are done to determine if there are mobile segment impairments. Two separate calculations are done, based on the vertebrae translations, and on the vertebrae angulations.

On the Report Information screen, the option for Measurement Protocol will be checked by default. Uncheck to remove from the report.

Report Information

Report Type

- Evaluation Report
- Comparative Report
- AOMSI Report
- Radiology Report
-

Title Options

- C123
- Cervical
- Flexion Extension
- 2020-08-06
- 09:07

Report Title

AOMSI Report Cervical Flexion Extension

Author: Roberta Jones DC

Introduction Disclaimer References

 Meas. Protocol

X-Ray Legends

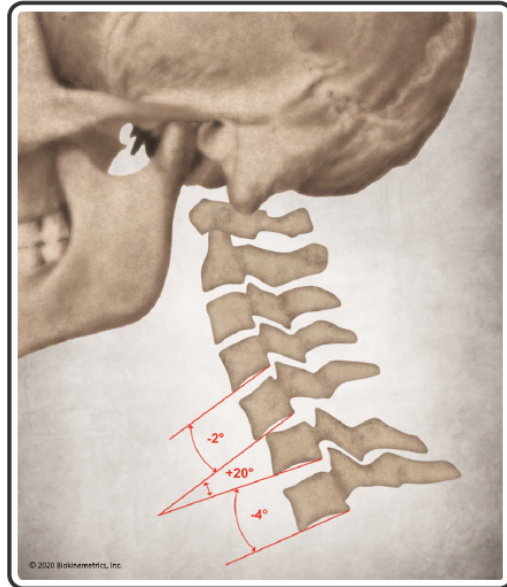
ADDENDUM - AOMSI MEASUREMENT PROTOCOL

Translation loss of motion segment integrity is determined as shown in the diagram below.



Measurements are obtained in flexion and extension. A dot is placed at the posterior superior corner of the lower vertebrae, and a separate dot is placed at the posterior-inferior corner of the upper vertebrae. The translation (A) is measured as illustrated above, using two parallel lines. Measurement of the A-P sagittal plane diameter at the mid-level of the superior vertebrae (B) is obtained, and the A/B ratio is computed. The resulting translation (in millimeters) or ratio (in %) is used as criterion for determination of AOMSI translational loss of motion as described above in this report. In the cervical spine these parameters apply to the motion segments from C3 to C7.

Angular loss of motion segment integrity is determined as shown in the diagram below.



Measurements are obtained in flexion only. Two dots are placed at the inferior endplate of the lower vertebrae, and two separate dots are placed at the inferior endplate of the upper vertebrae. The angle is measured as illustrated above. The resulting angle (in degrees) is used as criterion for determination of AOMSI angular loss of motion as described above in this report. In the cervical spine these parameters apply to the motion segments from C3 to C7.