Imaging Findings of Permanent Impairment

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Image courtesy of Joe Katchka, KatchMoments Photography

OUTLINE

- Image acquisition
- CH 15: Spine
- CH 16: Wrist
- CH 17: Post-traumatic arthritis

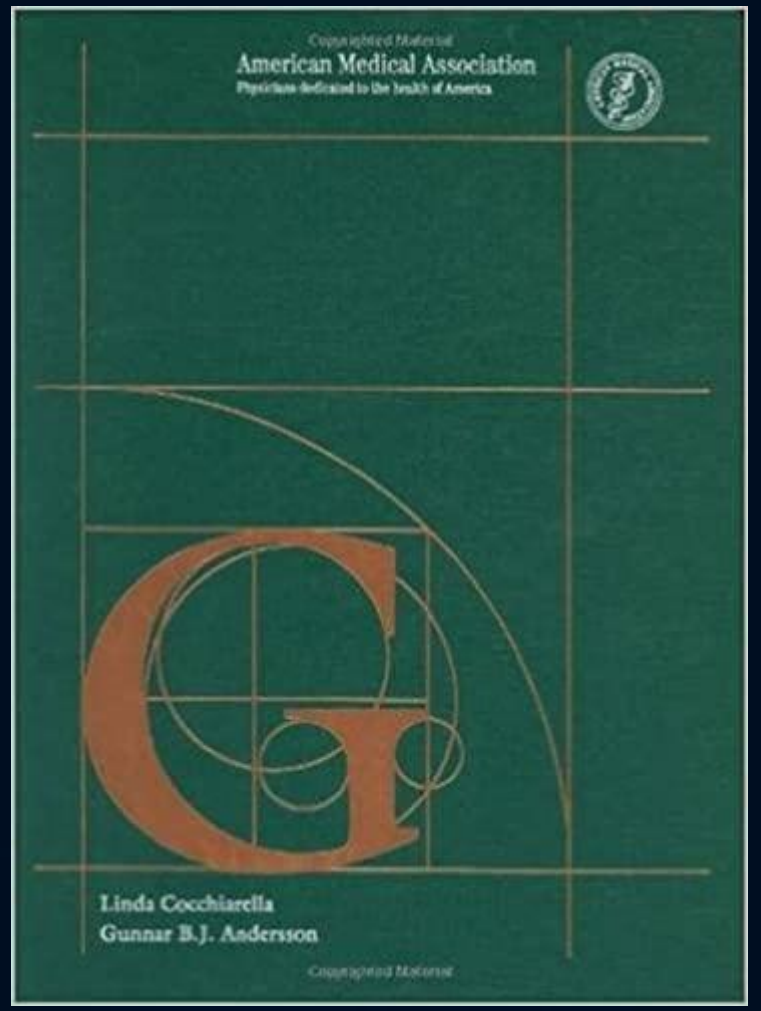


Image Acquisition

- DICOM
  - **D**igital **I**maging and **CO**mmunication in **M**edicine
  - International standard for medical images
    - Produce
    - Transmit/Retrieve
    - Display
    - Store
    - Print
    - Process

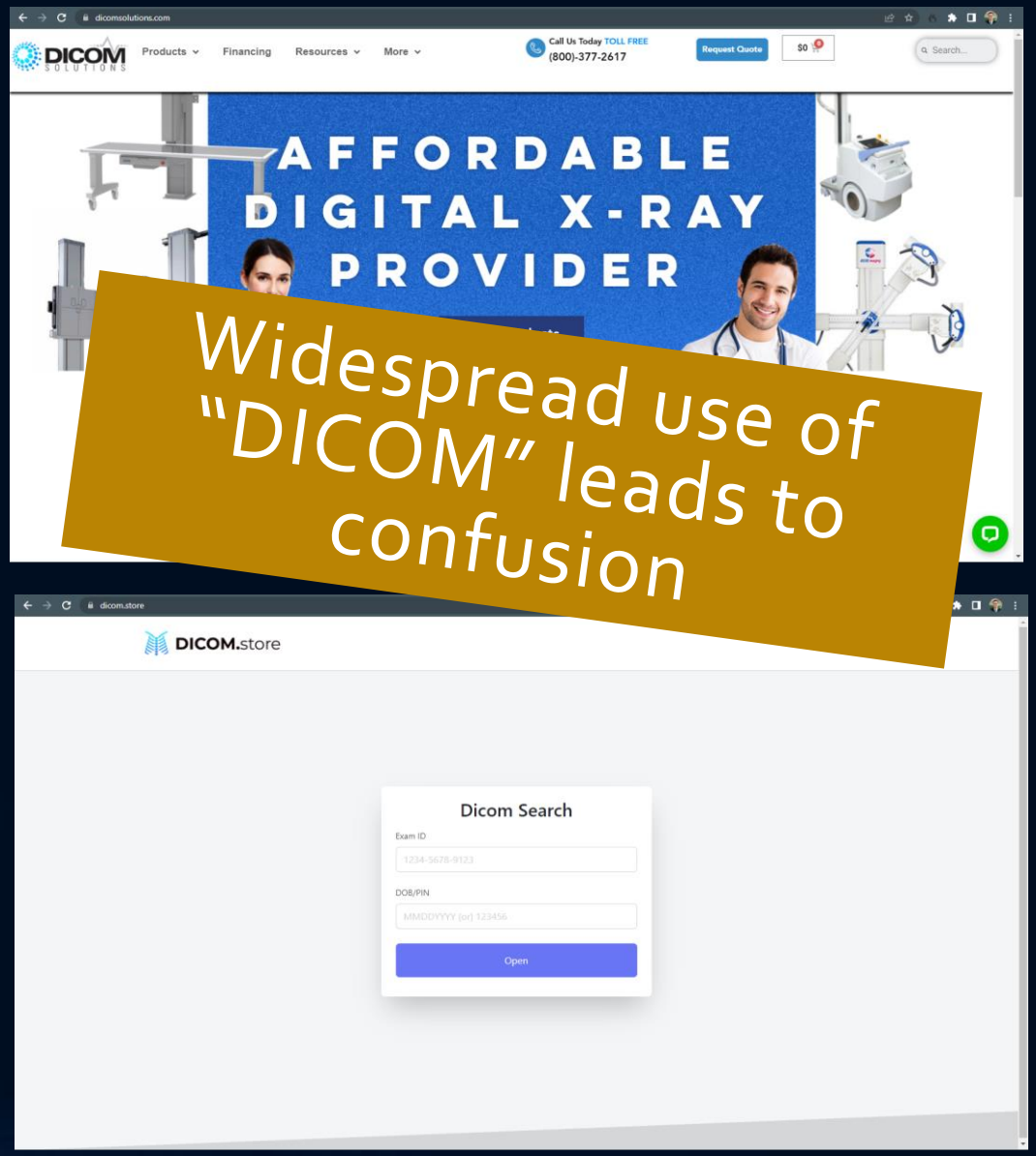


Image Acquisition

- ***ALL*** diagnostic images are in DICOM format
- You must have DICOM format image files to do impairment rating measurements
  - Easy if your own XR
  - Pretty easy from a CD
  - Pretty easy to impossible from online portal

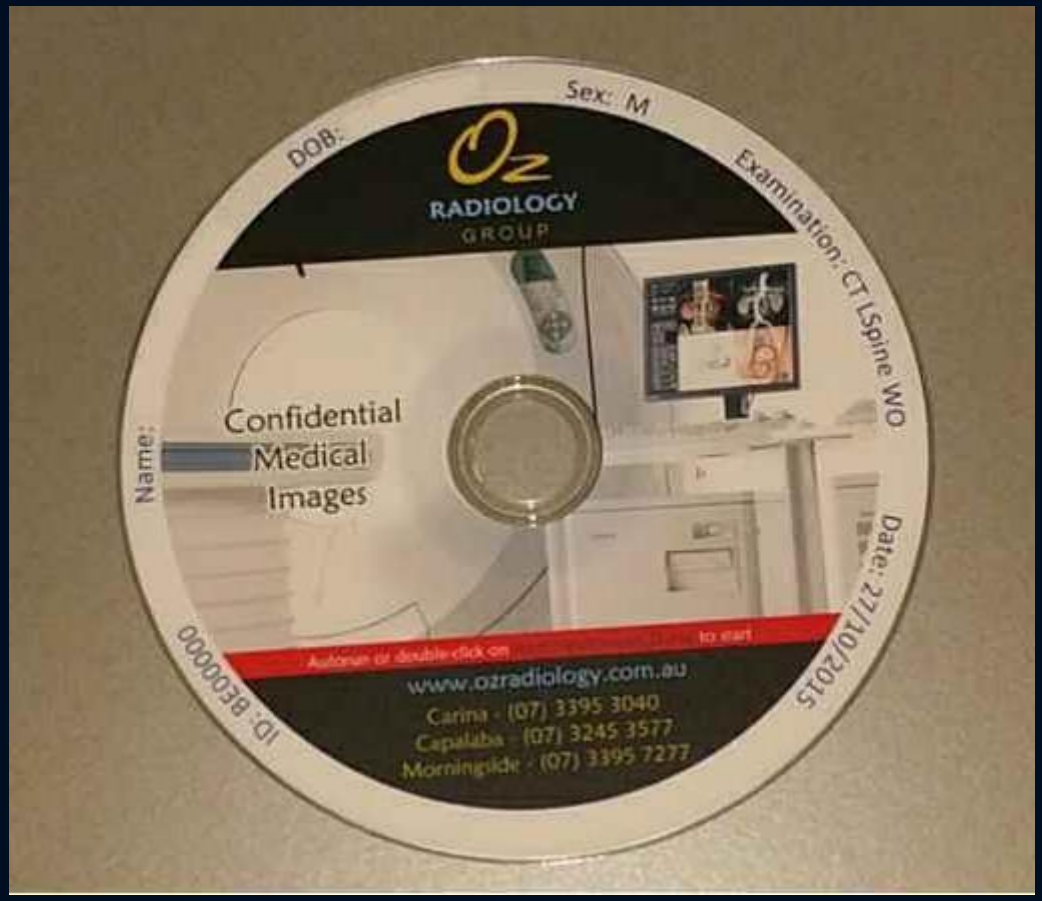
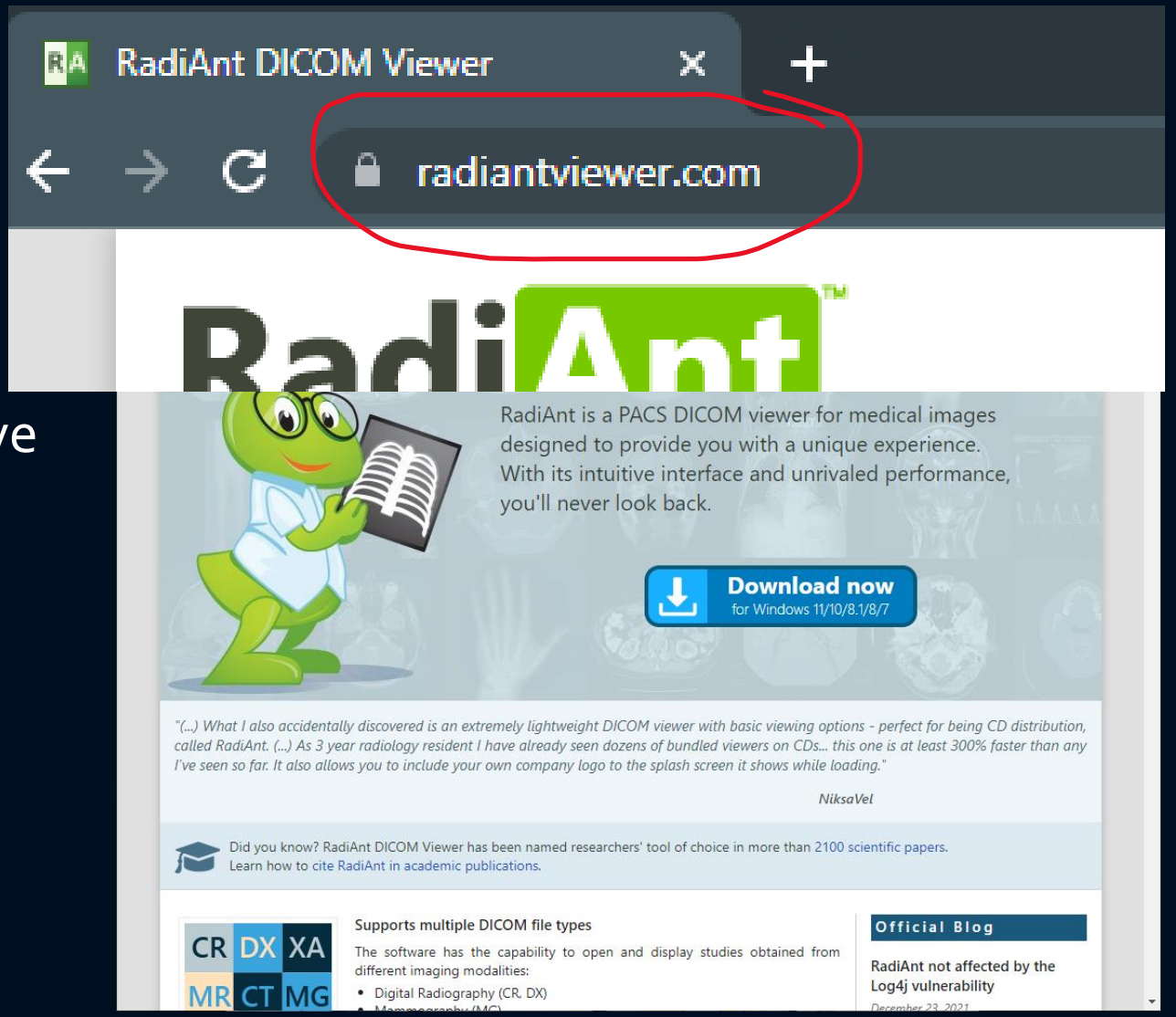


Image Acquisition

- How to view images
- Benefits of using an intuitive and consistent viewing program
  - Disadvantages?



CH 15: SPINE

- 15.1b Description of Clinical Studies
  - General
    - Review studies and report differences with primary report
  - Motion segment integrity
    - Must be done with flexion/extension XR

The physician should determine when, where, and by whom the studies were done, the findings, and who interpreted them. Whenever possible, the physician should personally review the studies and report agreement or disagreement with previous interpretations. A summary of the studies should be included as a separate paragraph or section.

Motion of the individual spine segments cannot be determined by a physical examination but is evaluated with flexion and extension roentgenograms (see Figures 15-3a through 15-3c).[13,14] Loss of motion segment integrity is defined as an anteroposterior

Motion Segment	Flexion Angular Measurement (°)	Extension Angular Measurement (°)	Total Angular Measurement [Flex – Ext] (°)	Normal Reference Range	Motion Segment Integrity	Between Motion Segments (°) normal <11°
C1/2				"little"		
C2/3				about 10°		
C3/4				11-15°		
C4/5				15-19°		
C5/6				about 20°		
C6/7				about 20°		

* positive (+) measurements with kyphosis, negative (-) with lordosis

Motion Segment	Flexion Translation Measurement (mm)	Extension Translation Measurement (mm)	Total Translation Measurement [Flex – Ext] (mm)	Normal Reference Range	Motion Segment Integrity
C2/3				<3.5mm	
C3/4				<3.5mm	
C4/5				<3.5mm	
C5/6				<3.5mm	
C6/7				<3.5mm	

* positive (+) measurements with anterolisthesis, negative (-) with retrolisthesis

*** (54y) - 3/8/2022 5:01:04 PM - C-Spine LAT - RadiAnt DICOM Viewer 2020.2 (64-bit)

***
8/7/1967
3/8/2022 4:33:40 PM
DX: 5 series
C-Spine LAT
C-Spine LAT
C-Spine LAT
C-Spine AP
C-Spine APOM

*** (54y) - 3/8/2022 5:00:43 PM - C-Spine LAT

Im: 1/1
Se: 2
***
***
8/7/1967 M
FlintridgeFamilyChiropratic-LaCanadaFlintridgeCA
C-Spine LAT
F: H

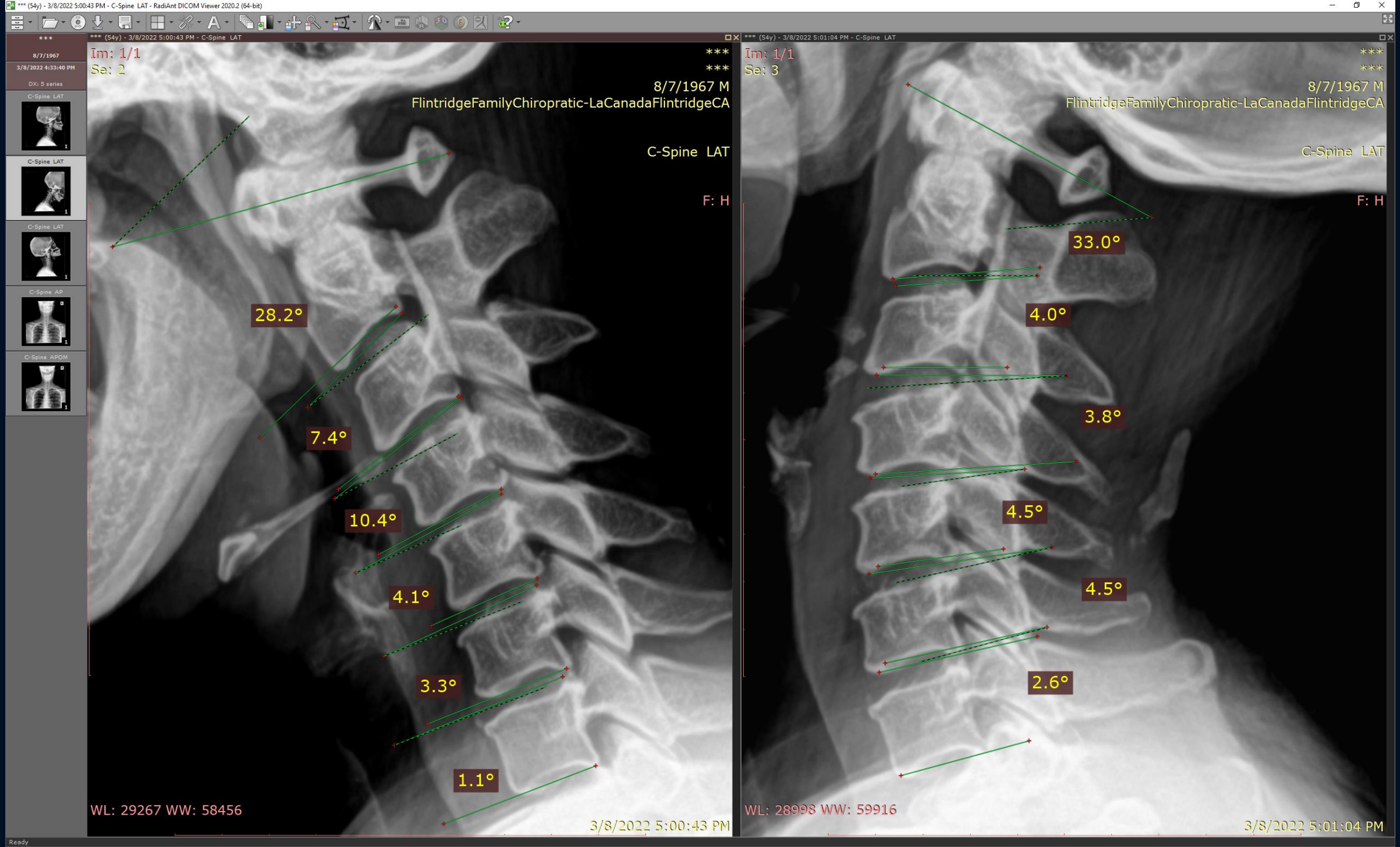
WL: 29149 WW: 58298 [D]
3/8/2022 5:00:43 PM

*** (54y) - 3/8/2022 5:01:04 PM - C-Spine LAT

Im: 1/1
Se: 3
***
***
8/7/1967 M
FlintridgeFamilyChiropratic-LaCanadaFlintridgeCA
C-Spine LAT
F: H

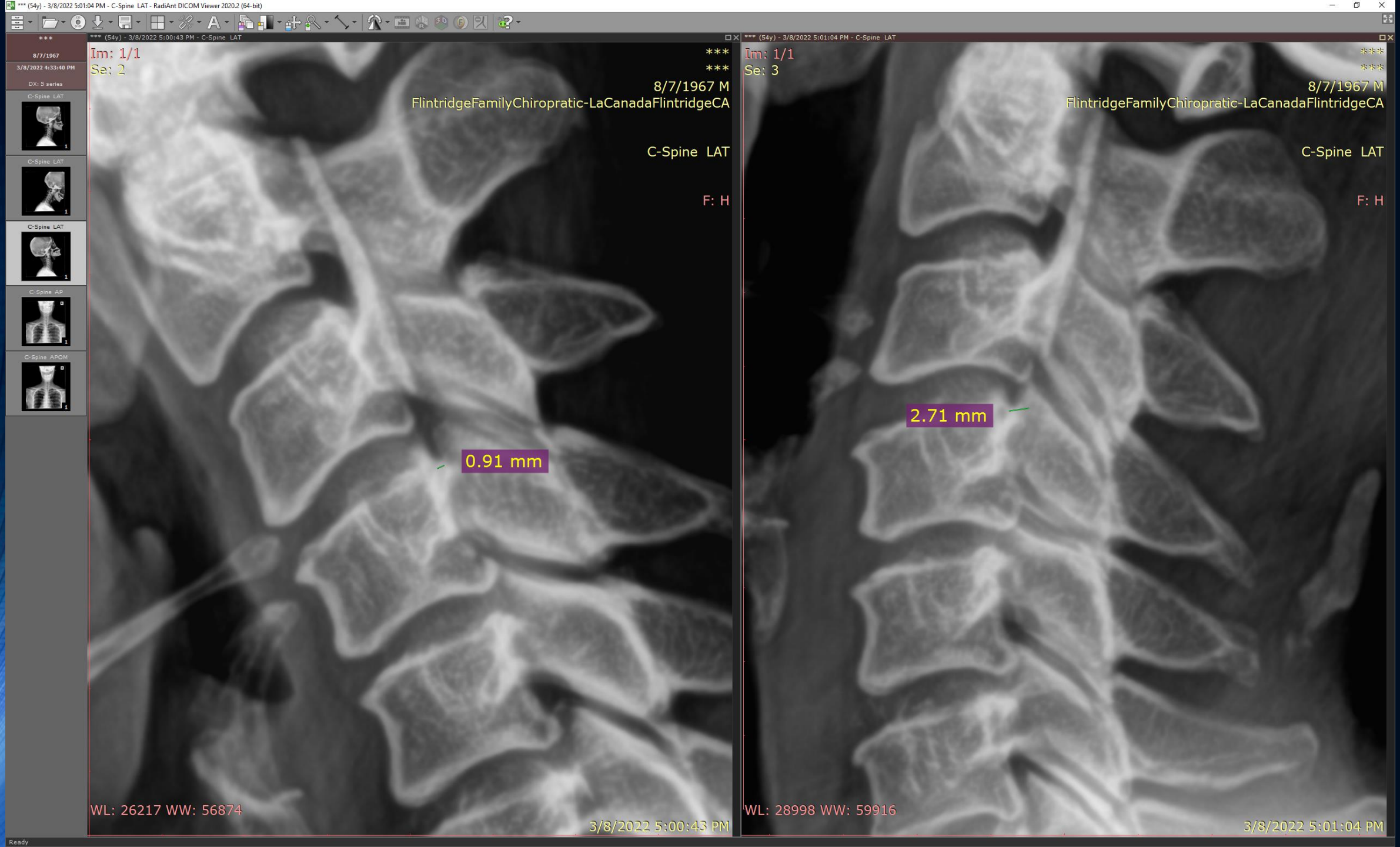
WL: 29148 WW: 58296 [D]
3/8/2022 5:01:04 PM

Ready


*** (54y) - 3/8/2022 5:00:43 PM - C-Spine LAT - RadiAnt DICOM Viewer 2020.2 (64-bit)
8/7/1967
3/8/2022 4:33:40 PM
DX: 5 series
C-Spine LAT
C-Spine LAT
C-Spine LAT
C-Spine AP
C-Spine APOM
Im: 1/1
Se: 2
8/7/1967 M
FlintridgeFamilyChiropratic-LaCanadaFlintridgeCA
C-Spine LAT
F: H
28.2°
7.4°
10.4°
4.1°
3.3°
1.1°
WL: 29267 WW: 58456
3/8/2022 5:00:43 PM
Im: 1/1
Se: 3
8/7/1967 M
FlintridgeFamilyChiropratic-LaCanadaFlintridgeCA
C-Spine LAT
F: H
33.0°
4.0°
3.8°
4.5°
4.5°
2.6°
WL: 28998 WW: 59916
3/8/2022 5:01:04 PM
Ready

Motion Segment	Flexion Angular Measurement (°)	Extension Angular Measurement (°)	Total Angular Measurement [Flex – Ext] (°)	Normal Reference Range	Motion Segment Integrity	Between Motion Segments (°) normal <11°
C1/2	-28.2	-33.0	4.8	"little"	normal	6.6
C2/3	7.4	-4.0	11.4	about 10°	normal	2.8
C3/4	10.4	-3.8	14.2	11-15°	normal	5.6
C4/5	4.1	-4.5	8.6	15-19°	decreased	0.8
C5/6	3.3	-4.5	7.8	about 20°	decreased	4.1
C6/7	1.1	-2.6	3.7	about 20°	decreased	

* positive (+) measurements with kyphosis, negative (-) with lordosis


*** (54y) - 3/8/2022 5:01:04 PM - C-Spine LAT - RadiAnt DICOM Viewer 2020.2 (64-bit)
***
8/7/1967
3/8/2022 4:33:40 PM
DX: 5 series
C-Spine LAT
C-Spine LAT
C-Spine LAT
C-Spine AP
C-Spine APOM
*** (54y) - 3/8/2022 5:00:43 PM - C-Spine LAT
Im: 1/1
Se: 2
***
***
8/7/1967 M
FlintridgeFamilyChiropratic-LaCanadaFlintridgeCA
C-Spine LAT
F: H
0.91 mm
WL: 26217 WW: 56874
3/8/2022 5:00:43 PM
*** (54y) - 3/8/2022 5:01:04 PM - C-Spine LAT
Im: 1/1
Se: 3
***
***
8/7/1967 M
FlintridgeFamilyChiropratic-LaCanadaFlintridgeCA
C-Spine LAT
F: H
2.71 mm
WL: 28998 WW: 59916
3/8/2022 5:01:04 PM
Ready

Motion Segment	Flexion Translation Measurement (mm)	Extension Translation Measurement (mm)	Total Translation Measurement [Flex – Ext] (mm)	Normal Reference Range	Motion Segment Integrity
C2/3				<3.5mm	
C3/4	0.9	-2.7	3.6	<3.5mm	increased
C4/5				<3.5mm	
C5/6				<3.5mm	
C6/7				<3.5mm	

* positive (+) measurements with anterolisthesis, negative (-) with retrolisthesis

*** (33y) - 3/12/2021 5:17:15 PM - C-SPINE LAT EXT - RadiAnt DICOM Viewer 2020.2 (64-bit)

***
1/19/1988
3/12/2021 5:05:47 PM
C-SPINE AP
CR: 8 series
C-SPINE AP
L-SPINE AP
L-SPINE LAT
L-SPINE LAT EXT
L-SPINE LAT FLEX
C-SPINE LAT
C-SPINE LAT EXT
C-SPINE LAT FLEX

*** (33y) - 3/12/2021 5:18:38 PM - C-SPINE LAT FLEX

Im: 1/1
Se: 1008
***
***
1/19/1988 M
Premier Chiropractic
C-SPINE AP
C-SPINE LAT FLEX
WL: 580 WW: 887 [D]
3/12/2021 5:18:38 PM

*** (33y) - 3/12/2021 5:17:15 PM - C-SPINE LAT EXT

Im: 1/1
Se: 1007
***
***
1/19/1988 M
Premier Chiropractic
C-SPINE AP
C-SPINE LAT EXT
WL: 579 WW: 891 [D]
3/12/2021 5:17:15 PM

Ready

CH 16: UPPER EXTREMITIES

- 16.7a Bone and Joint Deformities
  - Carpal Instability
    - Radiolunate angle
    - Scapholunate angle
    - Scapholunate gap
    - Triquetrolunate stepoff
    - Ulnar translation

Table 16-25 Upper Extremity Impairment Due to Carpal Instability Patterns

	% of Upper Extremity Impairment		
Roentgenographic Findings*	**Mild (8%)**	**Moderate (16%)**	**Severe (24%)**
Radiolunate angle†	11°-20°	21°-30°	>30°
Scapholunate angle	61°-70°	71°-80°	>80°
Scapholunate gap	>3 mm	>5 mm	>8 mm
Triquetrolunate stepoff	>1 mm	>2 mm	>3 mm
Ulnar translation‡	Mild	Moderate	Severe

* Clenched fist neutral PA views.

† A positive angle (lunate extension) represents a DISI deformity A negative angle (lunate flexion) represents a VISI deformity

‡ See text for description.

Adapted from Lichtman DM, Alexander AH, eds. *The Wrist and Its Disorders*. 2nd ed. Philadelphia, Pa: WB Saunders; 1997:chaps 7, 12, 35.

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Triquetrolunate stepoff	>1 mm	>2 mm	>3 mm
Ulnar translation‡	Mild	Moderate	Severe

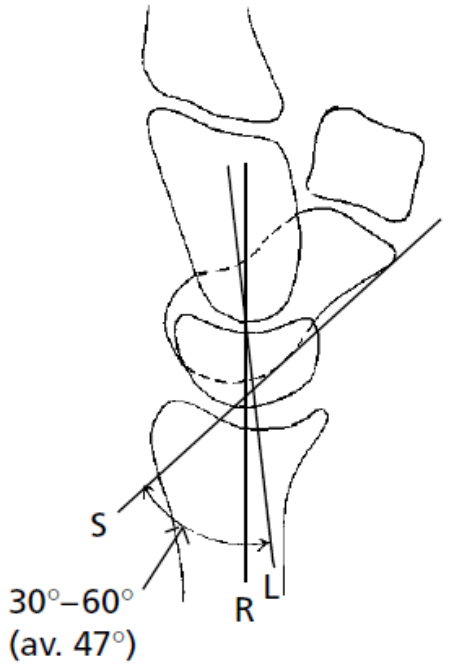
* Clenched fist neutral PA views.

† A positive angle (lunate extension) represents a DISI deformity A negative angle (lunate flexion) represents a VISI deformity

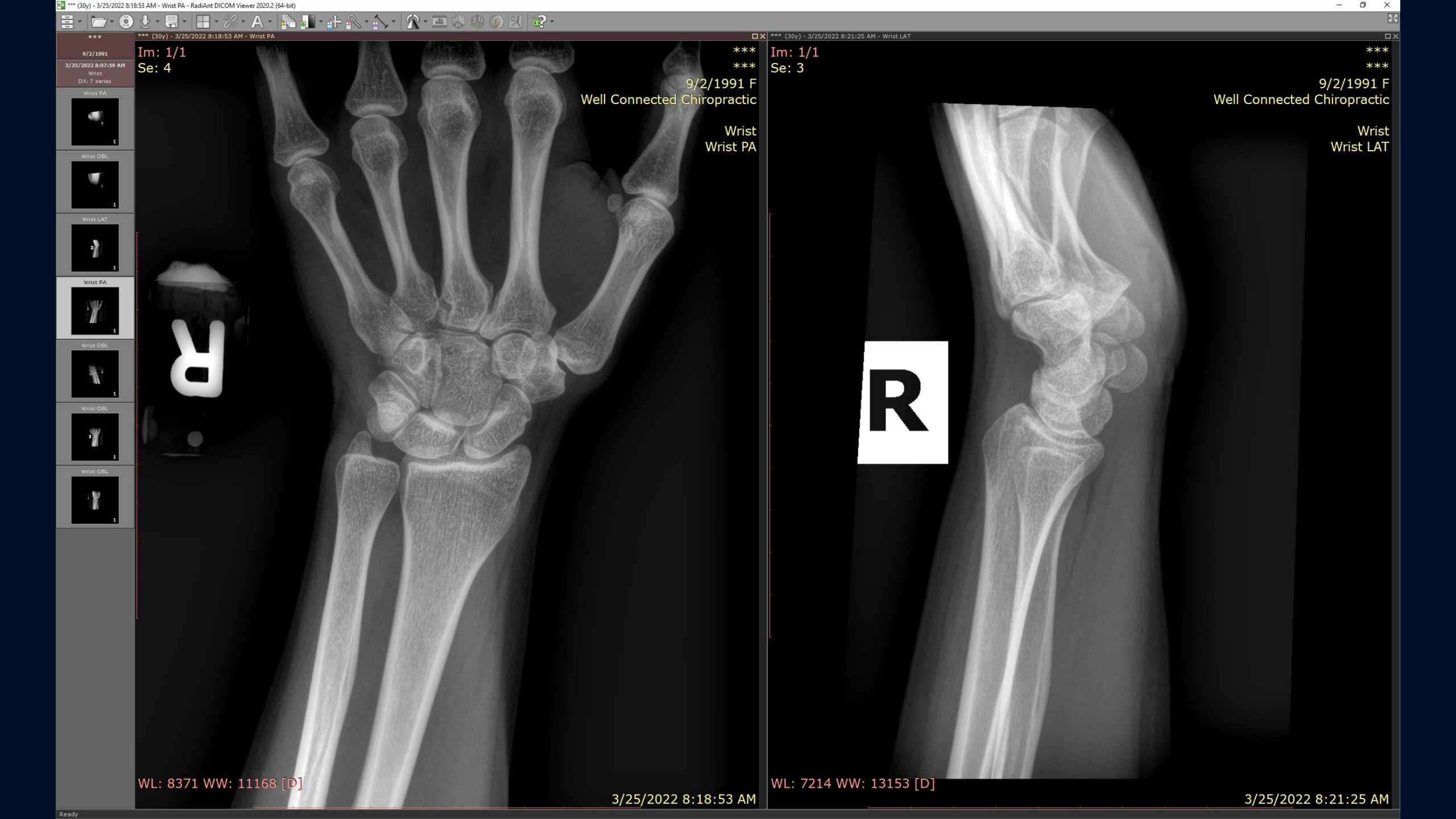
‡ See text for description.

Adapted from Lichtman DM, Alexander AH, eds. *The Wrist and Its Disorders*. 2nd ed. Philadelphia, Pa: WB Saunders; 1997:chaps 7, 12, 35.

Figure 16-51 Techniques for Measuring the Scaphoid (S), Lunate Axis (L), and Long Axis of the Radius (R) and Corresponding Angles



Source: David M. Lichtman, Fort Worth, Texas.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***
9/2/1991
3/25/2022 8:07:59 AM
Wrist
DX: 7 series
Wrist PA
Wrist OBL
Wrist LAT
Wrist PA
Wrist OBL
Wrist OBL
Wrist OBL
*** (30y) - 3/25/2022 8:18:53 AM - Wrist PA
Im: 1/1
Se: 4
***
***
9/2/1991 F
Well Connected Chiropractic
Wrist
Wrist PA
R
WL: 8371 WW: 11168 [D]
3/25/2022 8:18:53 AM
*** (30y) - 3/25/2022 8:21:25 AM - Wrist LAT
Im: 1/1
Se: 3
***
***
9/2/1991 F
Well Connected Chiropractic
Wrist
Wrist LAT
R
WL: 7214 WW: 13153 [D]
3/25/2022 8:21:25 AM
Ready

Triquetrolunate Stepoff

Ulnar Translation

Kani KK, Mulcahy H, Chew FS. Understanding carpal instability: a radiographic perspective. *Skel Radiol.* Apr 2016.

CH 17: LOWER EXTREMITIES

- 17.2h Arthritis

Certain roentgenographic findings that are of diagnostic importance, such as osteophytes and reactive sclerosis, have no direct bearing on impairment. The best roentgenographic indicator of disease stage and impairment for a person with arthritis is the cartilage interval or joint space. The hallmark of all types of arthritis is thinning of the articular cartilage; this correlates well with disease progression.

Table 17-31. Arthritis Impairments Based on

	Whole Person (Lower Extremity) [Foot] Impairment (%)			
	Cartilage Interval			
Joint	**3 mm**	**2 mm**	**1 mm**	**0 mm**
Sacroiliac (3 mm)*	—	1 (2)	3 (7)	3 (7)
Hip (4 mm)	3 (7)	8 (20)	10 (25)	20 (50)
Knee (4 mm)	3 (7)	8 (20)	10 (25)	20 (50)
Patellofemoral†	—	4 (10)	6 (15)	8 (20)
First metatarsophalangeal	—	—	2 (5) [7]	5 (12) [17]
Other metatarsophalangeal	—	—	1 (2) [3]	3 (7) [10]

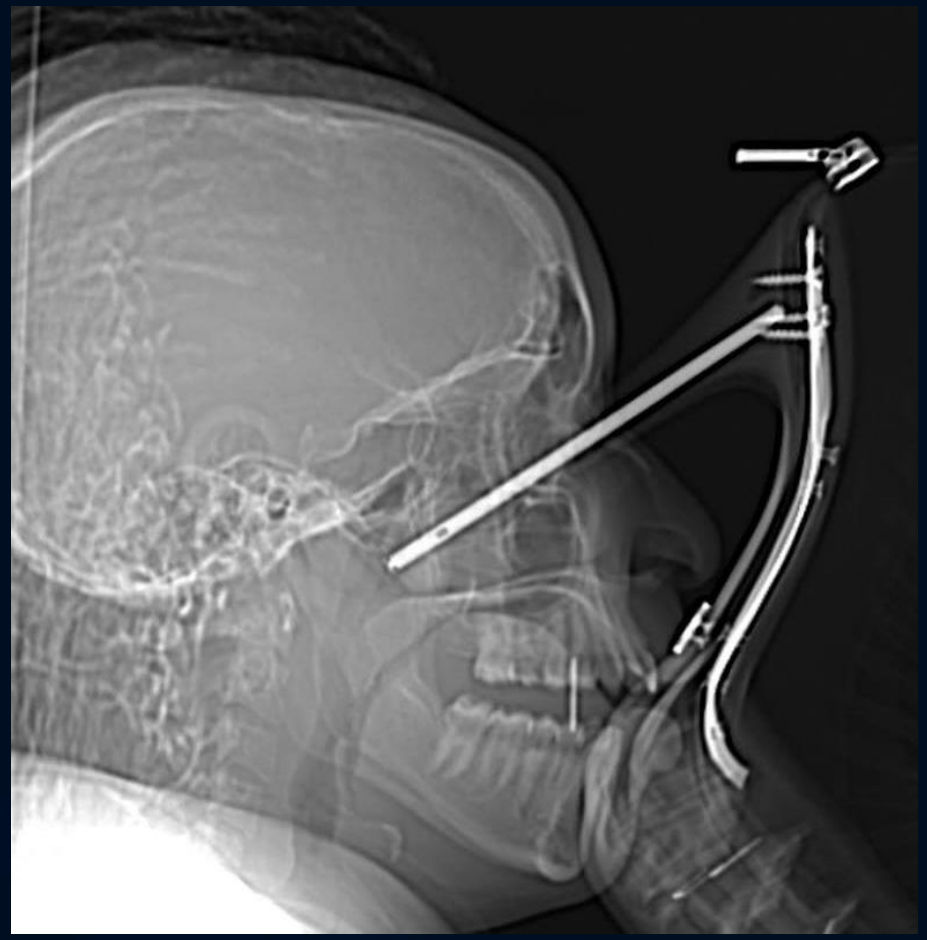
* Normal cartilage intervals are given in parentheses.

† In an individual with a history of direct trauma, a complaint of patellofemoral pain, and crepitation on physical examination. but without joint space narrowing on x-rays, a 2% whole person or 5% lower extremity impairment is given.

*** (72y) - 3/25/2022 11:40:13 AM - KNEE AP - RadiAnt DICOM Viewer 2020.2 (64-bit)
***
10/12/1949
3/25/2022 11:38:00 AM
KNEE AP
DX: 4 series
KNEE AP
KNEE LAT
KNEE LAT
KNEE AP
*** (72y) - 3/25/2022 11:40:13 AM - KNEE AP
Im: 1/1
Se: 1
R
WL: 6826 WW: 7153 [D]
***
***
10/12/1949 M
Spectrum Medical Group
4966
KNEE AP
KNEE AP
3/25/2022 11:40:13 AM
*** (72y) - 3/25/2022 11:43:19 AM - KNEE AP
Im: 1/1
Se: 4
R
WL: 8190 WW: 5453 [D]
***
***
10/12/1949 M
Spectrum Medical Group
4966
KNEE AP
KNEE AP
3/25/2022 11:43:19 AM
Ready

SUMMARY

- Look at images, not just at the report
- View imaging in a consistent, user-friendly software
- Familiarize with XR measurements for:
  - Spinal motion segment integrity
  - Carpal instability
  - Post-traumatic lower extremity arthritis
- XR findings are just one part of your impairment rating and may or may not contribute



Dalela S *et al. Can J Anesth/J Can Anesth* **62,** 92–93 (2015).

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