

Anatomical Demonstration: Degenerative Changes of the Cervical Spine

20 Slides of anatomical specimens,
Xrays and MRIs



By: William J. Ruch, D.C.

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2 — Degenerative Changes of the Cervical Spine

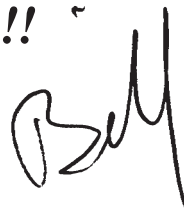
Congratulations on your purchase of this finely photographed and captioned CERVICAL SPINE slide presentation set.

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Please take a few minutes to review the slides and their captions. There are many ways this set may be used. Be creative on how you personalize it for its optimum usage.

Good Luck!!



About the Author:

William J. Ruch B.S., D.C., is a graduate of Life Chiropractic College West and was an educator in the college's anatomy department. He is the author of *Atlas of Common Subluxations of the Human Spine and Pelvis* (CRC Press, 1997) and numerous articles. Dr. Ruch currently practices in Oakland, California.

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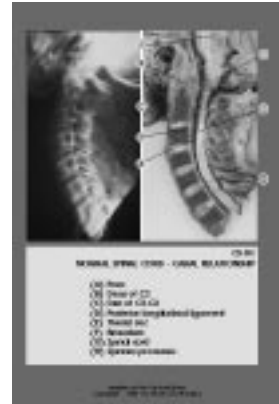
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CS-01

NORMAL SPINAL CORD - CANAL RELATIONSHIP

In this individual, the spinal cord does not completely fill the vertebral canal. Minor -posterior disc bulging (as at C5-C6 and C6-C7) has occurred without directly impinging on the cord, so this individual may have experienced only minor symptoms or none at all. Note the healthy cervical curve.

- (A) Pons
- (B) Dens of C2
- (C) Disc of C2-C3
- (D) Posterior longitudinal ligament
- (E) Thecal sac
- (F) Brainstem
- (G) Spinal cord
- (H) Spinous processes

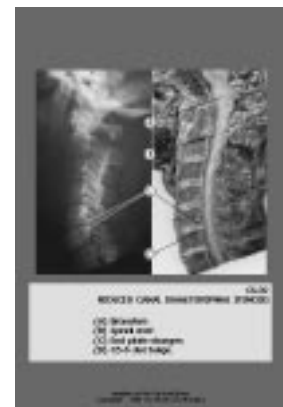


CS-02

REDUCED CANAL DIAMETER/SPINAL STENOSIS

This specimen has a reduced canal diameter and a large lower central nervous system. The combination has created a spinal canal stenosis. The brainstem is compressed and there is a hypolordotic or reduced cervical curve. The C5-6 disc bulge is a minor change in the anterior canal wall. C5 and C6 are subluxated and the disc and end plates have remolded and reduced the canal at that point. In this situation a small disc bulge can be clinically significant.

- (A) Brainstem
- (B) Spinal cord
- (C) End plate changes
- (D) C5-6 disc bulge.

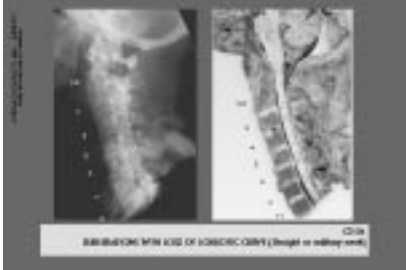


CS-03

**SUBLUXATIONS WITH LOSS OF LORDOTIC CURVE
(Straight or military neck)**



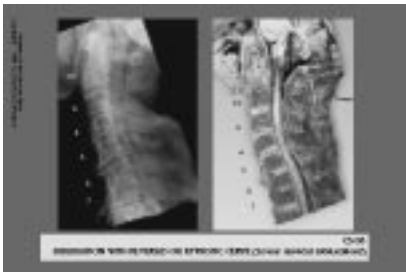
4 — Degenerative Changes of the Cervical Spine



CS-04
SUBLUXATIONS WITH LOSS OF LORDOTIC CURVE
(Straight or military neck)



CS-05
SUBLUXATIONS WITH REVERSED OR KYPHOTIC CURVE
(Mid-cervical subluxations)

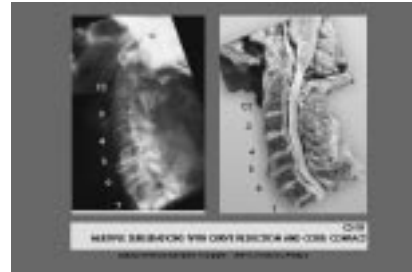


CS-06
SUBLUXATION WITH REVERSED OR KYPHOTIC CURVE
(Lower cervical subluxations)

CS-07

MULTIPLE SUBLUXATIONS WITH CURVE REDUCTION AND CORD CONTACT

The lower cervical spine has by far the most injuries and degenerative changes of any section of the spine. In both cadavers and in our patients in clinical practice, the C4-C5 and C5-C6 segments show the greatest relative anteroposterior displacement in the entire cervical spine (Hadley, 1964). They are also remote from the head, and therefore are more vulnerable to whiplash than the upper segments.



CS-08

MULTIPLE SUBLUXATIONS WITH A REVERSAL OF THE CERVICAL CURVE

Loss of curve starts with C2-3 and a complete retrolisthesis of C5 to C4 and C6 with cord compromise C4-C7. Vertebral body enlargement forms stenosis of the canal and significant anterior spurring of C4-7. C6 retro to C7 with cavitation and near fusion of disc.



CS-09

CERVICAL X-RAY AND MRI STUDY WITH LOSS OF LORDOSIS

The lateral x-ray of this patient clearly shows the loss of curvature, multiple subluxations, loss of disc height, and posterior osteophytes. This MRI shows loss of curvature ("military neck") resulting from posterior subluxations at C3 retro to C2; C4 retro to C3 and C5 retro to C6.

Note the loss of disc height and posterior spurring. The spinal cord is much smaller in diameter than the vertebral canal, but it is the tethering or stretching of the cord against C3-5 that makes these significant problems. The posterior disc bulging and osteophytes of C3-5 are actually in contact with the spinal cord in the neutral supine position, a position of relief for this patient of bilateral paresthesia in the upper extremities. His symptoms were brought on by sitting at his desk doing paper work.

We have to extrapolate his changing positions to the changing length of the vertebral canal.



6 — Degenerative Changes of the Cervical Spine



CS-10

CERVICAL MRI AND X-RAY STUDY SHOWING REVERSAL OF CURVE

Cervical MRI and x-ray of same individual showing reversal of lordotic curve or a cervical kyphosis.

Note the straightening of the brainstem to thoracic cord, a complete retrolisthesis of C5, large interspinous distance from C3-7, enlargement of C5 body due to hyper loading and bulging discs. Consider the anatomic and physiologic changes with active, persistent cervical flexion as required by many jobs.



CS-11a

EPIDURAL ADHESIONS (ANTERIOR WALL)

Epidural adhesions between the anterior vertebral canal wall and the thecal sac (Dura Mater). These tissues are supposed to be freely moveable relative to each other. The adhesions are the result of chronic inflammation due the subluxations of the vertebra and end stage DJD.

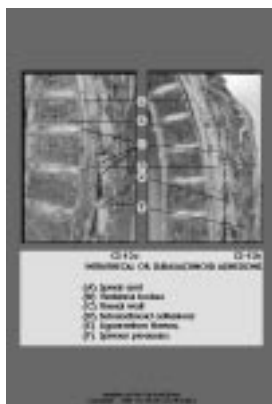
- (A) Body of vertebra
- (B) Epidural adhesions
- (C) Thecal wall
- (D) Spinal cord

CS-11b

EPIDURAL ADHESIONS (POSTERIOR WALL)

Epidural adhesions in the posterior portion of the vertebral canal. These adhesions are the result of chronic inflammatory states in the posterior joints and soft tissues of the vertebral column in the thoracic region and even the thecal sac, pia mater, nerve rootlets and arteries.

- (A) Thecal wall
- (B) Epidural adhesions
- (C) Spinous process
- (D) Ligamentum flavum



CS-12a

CS-12b

INTRATHECAL OR SUBARACHNOID ADHESIONS

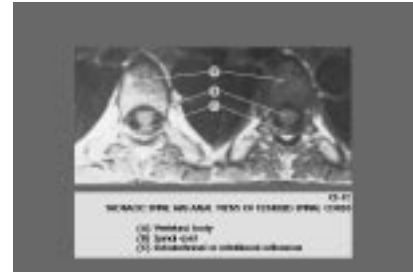
Both of these specimens show posterior subarachnoid adhesions in the thoracic region of the vertebral column. They each have tethered the spinal cord with large contact areas against the canal wall. Since the posterior canal wall lengthens more, the stretch or irritation is greater in the posterior hemisphere of the thecal sac.

- (A) Spinal cord
- (B) Vertebral bodies
- (C) Thecal wall
- (D) Subarachnoid adhesions
- (E) Ligamentum flavum,
- (F) Spinous processes.

CS-13

Thoracic Spine: MRI Axial Views of Tethered Spinal Cords
 Note subarachnoid adhesions and cord-canal contact in the recumbent position, the spinal cord is in the wrong part of the canal for this position.

- (A) Vertebral body
- (B) Spinal cord
- (C) Subarachnoid or intrathecal adhesions

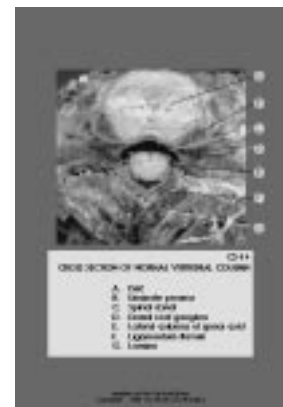


CS-14

CROSS SECTION OF NORMAL VERTEBRAL COLUMN

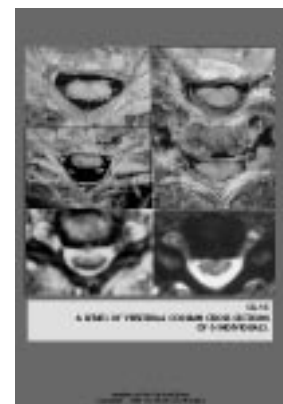
Note the spinal cord has a nearly round appearance or 1:1 ratio between the sagittal and coronal diameters. Also it is in the posterior aspect of the spinal canal indicating a relaxed lower central nervous system in the supine position, which is normal.

- A. Disc
- B. Uncinate process
- C. Spinal canal
- D. Dorsal root ganglion
- E. Lateral columns of spinal cord
- F. Ligamentum flavum
- G. Lamina

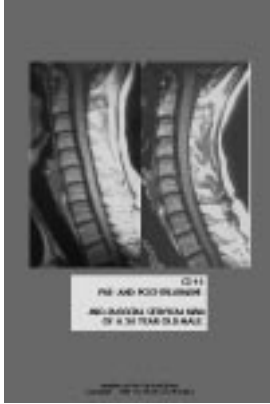


CS-15

A SERIES OF VERTEBRAL COLUMN CROSS SECTIONS OF 6 INDIVIDUALS.
 The top 4 are cadavers and the bottom 2 are patients' MRIs. All are in the supine position. Note the lack of 1:1 ratio of the sagittal and coronal diameters; the oval appearance is due to an increase in length of the spinal canal and therefore the spinal cord. Both of the patients would lie down to get relief, which is the position the MRI was taken.



8 — Degenerative Changes of the Cervical Spine



CS-16
PRE- AND POST-TREATMENT MID-SAGITTAL CERVICAL MRIs
OF A 36 YEAR OLD MALE.



CS-17
PRE- AND POST-TREATMENT AXIAL UPPER THORACIC MRIs
OF A 36 YEAR OLD MALE.



CS-18
PRE- AND POST-TREATMENT LATERAL CERVICAL X-RAYS
OF A THREE YEAR OLD GIRL.

CS-19
PRE- AND POST-TREATMENT LATERAL CERVICAL X-RAYS
OF A 28 YEAR OLD MALE.



CS-20
PRE- AND POST-TREATMENT LATERAL CERVICAL X-RAYS
OF A 69 YEAR OLD WOMAN.



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Photographs and text by
William J. Ruch, D.C.

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