Cervical intervertebral disc

- Crosstalk between osteoporosis and fat-infiltrated psoas at the upper lumbar levels
- Fast-field-echo resembling a CT using restricted echo-spacing (FRACTURE) can differentiate osteophytes from disc herniations in patients with cervical radiculopathy: a feasibility study
- A new slant on shear loading: Uncovering its effect on the intervertebral disc
- Increased cervical disc degeneration in ischemic stroke: a 10-year retrospective data review
- Evaluation and Comparison of Intervertebral Disc Degeneration Models Induced by Cervical Instability in Rats
- The CASINO trial: surgical versus conservative management in patients with cervical radiculopathy due to intervertebral disc herniation: a prospective cohort study
- Application value of Ultrasound-Guided cervical nerve root block test before percutaneous nucleoplasty in the treatment of patients with cervical chest pain: A retrospective study
- Prediction of heterotopic ossification on the cervical spine with offset of the artificial disc - A finite element study

The cervical intervertebral disc space is located close to the inferior portion of the pedicle (unlike the lumbar region).

There are six cervical discs and 23 total discs in the entire spinal column. Each cervical disc rests between the cervical vertebrae, acts as a shock absorber in the cervical spine and allows the neck to handle much stress.

Composed of collagen and ligaments, the cervical discs also hold the cervical vertebrae together and allow for flexibility and different movements of the neck.

Each cervical disc is made up of a tough exterior (annulus fibrosus) and a soft, jelly interior (nucleus pulposus), with the circular, outer core comprised of collagen fibers that surround the inner core and distribute pressure and force on the structure.

With age, the cervical discs lose water, stiffen and become less flexible in adjusting to compression. Such degenerative changes may result in the inner core of the cervical disc extruding through the outer core and coming in contact with the spinal nerve root (what is known as cervical disc herniation.

In other instances, the cervical disc may degenerate as a result of direct trauma or gradual changes. With no blood supply and very few nerve endings, the cervical discs cannot repair themselves.

In flexion, the disc functions as a fulcrum with the spinal cord draped over it. In patients with a congenitally narrow canal, extension creates dynamic stenosis as the body of the rostral vertebra translates posteriorly relative to the posterior elements of the caudal vertebra, thus compressing the cord between the rostral vertebral body and the caudal lamina.

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Being a visco-elastic structure, it is important to determine the stress-relaxation properties of the human cervical spine intervertebral discs to enable accurate simulations of these structures in stress-analysis models. While finite element models have the ability to incorporate viscoelastic material definitions, data specific to the cervical spine are limited.

A study was conducted to determine these properties and understand the responses of the human lower cervical spine discs under large number of cyclic loads in the axial compression mode. Eight disc segments consisting of the adjacent vertebral bodies along with the longitudinal ligaments were subjected to compression, followed by 10,000 cycles of loading at 2 or 4Hz frequency by limiting the axial load to approximately 150 N, and subsequent to resting period, subjected to compression to extract the stress-relaxation properties using the quasi-linear viscoelastic (QLV) material model. The coefficients of the model and disc displacements as a function of cycles and loading frequency are presented. The disc responses demonstrated a plateauing effect after the first 2000 to 4000 cycles, which were highly nonlinear. The paper compares these responses with the “work hardening” phenomenon proposed in clinical literature for the lumbar spine to explain the fatigue behavior of the discs. The quantitative results in terms of QLV coefficients can serve as inputs to complex finite element models of the cervical spine to delineate the local and internal load-sharing responses of the disc segment [1].

Of 265 patients (36 % male, mean age 30), 221 (83 %) patients had 1 to 6 discs (median 4) with decreased SI. Of 1,590 discs, 737 (46 %) were grade 1; 711 (45 %) grade 2; 133 (8 %) grade 3; 8 (1 %) grade 4 and 1 (0 %) grade 5. Secondary signs of degeneration were rare and seen predominantly in C5-C7 and appear to be related to signal loss grade 3 and 4.

Low signal intensity of intervertebral discs in absence of secondary degenerative signs in the cervical spine on fluid sensitive MR images might be pre-existing and part of the natural course [2].

Cervical disc herniation

see Cervical disc herniation.

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Yoganandan N, Umale S, Stemper B, Snyder B. Fatigue responses of the human cervical spine intervertebral discs. J Mech Behav Biomed Mater. 2016 Dec 15;69:30-38. doi: 10.1016/j.jmbbm.2016.11.026. [Epub ahead of print] PubMed PMID: 28033533.
[2]
de Bruin F, Ter Horst S, van den Berg R, de Hooge M, van Gaalen F, Fagerli KM, Landewé R, van Oosterhout M, Bloem JL, van der Heijde D, Reijnierse M. Signal intensity loss of the intervertebral discs in the cervical spine of young patients on fluid sensitive sequences. Skeletal Radiol. 2015 Dec 4. [Epub ahead of print] PubMed PMID: 26634254.