JACO
Journal of the Academy of Chiropractic Orthopedists

The Open Access, Peer-Reviewed and Indexed Publication of the Academy of Chiropractic Orthopedists

December 2012 – Volume 9, Issue 4

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Independent Research - Case Study


Abstracts and Literature Review – Low Back Pain / Radiculopathy


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Cervical Disc Disease with Radiculopathy Recommended Surgery, Responds to Conservative Measures.
By Bruce Gundersen, DC, FACO

Introduction

Cervical Disc Disease often presents with a variety of symptoms which may or may not be directly related to a specific disc level or adjacent discs. This disorder is differentiated from many similar syndromes and conditions including: thoracic outlet, brachial plexopathies, cervical spondylosis, fibromyalgia, Parsonage Turner's syndrome, osteoarthritis, osteoporosis, Paget’s Disease, multiple sclerosis, or psoriatic arthritis. Signs and symptoms may be blurred during the acute phase and advanced imaging may be the best diagnostic tool as the condition evolves. Prognosis and outcome expectations become difficult due to the poor predictive nature of the neurologic findings. Risk of treatment versus non-treatment must be considered against the acute status of the patient given the natural course of the disorder. It is clear that most studies find little etiology with neck pain and severity or advancement of neurologic signs, and do not necessarily correlate with worsened prognosis as do higher severity of pain and multiple episodic occurrences.

Case Report

This 54-year-old man presented with neck, arm, forearm, hand and upper back pain, numbness and tingling of the left arm, forearm and hand. Onset reported was "sleeping stupid the night before." The history of automobile trauma of 39 years previously was the solitary notable item discovered. No other physician had yet been consulted, and self-care had been implemented over the past 30 days consisting of: heat, contrived positional antalgia, over-the-counter medications and yoga/meditation. These had not produced any remission or abatement of the symptoms.

Physical examination revealed Bakody's sign present on observation, mensuration of the arm and forearm showed -1cm of the left arm, muscle testing showed grade 4 of the left shoulder elevators, and left internal/external rotators on the left. Grip strength was checked in one position using the hand dynamometer showing left strength reduced by 10% in this right hand dominate, well-strengthened male. Sensory testing was unremarkable using a pin and camel hair brush. Deep tendon reflexes of the upper extremity were 2+ bilaterally. No other tests were provocative. The Revised Neck Oswestry tool intake score was 54, subjectively placing him in the "severe disability" category. Cervical disc disease was the working diagnosis and advanced imaging was indicated and ordered as well as a neurosurgical consultation.

The consultation was performed several days later, resulting in a diagnosis of cervical disc disease with resultant left radiculopathy. At this time, the surgeon recommended surgery at once. The patient opted against that. The relevant images reviewed were in Figure 1 and Figure 2:
Figure 1 - T2 weighted image shows disc disease at C5-6.

Figure 2 - Confirmed in transverse image.

The patient was scheduled for computerized intermittent axial distraction for eight minutes at 25 lbs., followed by anti-gravity recumbent positioning, electrical stimulation (12 minutes) to patient tolerance. This protocol was performed three times per day for 6 days and then reduced in frequency and increased in dosage thereafter. After three weeks, the outcomes tool was repeated and scored at 34. Treatment sessions were reduced to three sessions per week, progressively decrease to two sessions and then one. After nine months, the patient had no subjective complaints. He rated his return of strength in the left arm at 50% and has had monthly treatment sessions, which he chose as a preventative and proactive measure.

Discussion

The physical examination findings were not consistent (i.e., muscle grading and grip strength) with the C5-6 level of lesion shown on the imaging. Some “pre-fixed and post-fixed” findings were noted, although they were also not entirely consistent with the final diagnosis.

What can be learned from this experience? One thing is that the clinical resolution of any symptom pattern may not be entirely congruent with the diagnosis. Also, imaging and even surgical consultation should be considered as tools or findings and not as a diagnosis. Additionally, patients may present in clinical practice with inconsistent findings or a presentation that may not precisely match the diagnostic criteria as expected. Additionally, axial distraction is not segmentally specific and might have actually relieved symptoms that were present but not necessarily related to the imaging findings. Finally, as discussed below, the natural course of disc disease might have mimicked this particular case following the acute phase, and the follow-up treatment may have been erroneous when viewed retrospectively.

As seen in the epidemiology studies to follow, this condition may occur often in middle-aged men. It may also respond without surgery or without any intervention:

Epidemiology of cervical radiculopathy from a study done at the Mayo Clinic, 1994 showed that ages ranged from 13 to 91 years. The mean age +/- SD was 47.6 +/- 13.1 years for males and 48.2 +/- 13.8 years for females. A history of physical exertion or trauma preceding the onset of symptoms occurred in only 14.8% of cases. A past history of lumbar radiculopathy was present in 41%. The median duration of symptoms prior to diagnosis was 15 days. A monoradiculopathy involving C7 nerve root was the most frequent, followed by C6. A confirmed disc protrusion was responsible for cervical radiculopathy in 21.9% of patients; 68.4% were related to spondylosis, disc or both. During the median duration of follow-up of 4.9 years,
recurrence of the condition occurred in 31.7%, and 26% underwent surgery for cervical radiculopathy. A combination of radicular pain and sensory deficit, and objective muscle weakness were predictors of a decision to operate. At last follow-up 90% of our population-based patients were asymptomatic or only mildly incapacitated due to cervical radiculopathy. The average annual age-adjusted incidence rates per 100,000 population for cervical radiculopathy in Rochester were 83.2 for the total, 107.3 for males and 63.5 for females. The age-specific annual incidence rate per 100,000 population reached a peak of 202.9 for the age group 50-54 years.¹

In another study, prevalence (cases per 1000 population) was 3.5 in the total population; it increased to a peak at age 50-59 years, and decreased thereafter. The age-specific prevalence was consistently higher in women.²

Signs and Symptoms of cervical radiculopathy may include any of these: loss of or reduction of deep tendon reflex, loss of strength, loss of muscle girth, sensory loss or change and pain that spreads into the arm, neck, chest and/or shoulders. Other symptoms may include lack of coordination, especially in the hands.

Conclusion

This patient was able to avoid surgery with conservative care. Compliance was rated by the patient at 100% and remission of symptoms was rated at 95% after 3 months. There were 3 days lost time from work and the cost of care was under $2500 of which $1400 was the MRI and the neurological consult.

References:

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Differential Diagnosis of Cervical Radiculopathy and Superior Pulmonary Sulcus Tumor

GU Rui, KANG Ming-yang, GAO Zhong-li, ZHAO Jian-wu, and WANG Jin-cheng

Chinese Medical Journal 2012; 125(15): 2755-2757

JACO Editorial Reviewer: Richard P. Corbett, DC, FCCR Canada (Inc), FCCO(C)

Authors’ Abstract

Study Design: Retrospective analysis of ten cases of superior pulmonary sulcus tumor (Pancoast tumor).

Objective: Investigate the differential diagnostic methods of cervical radiculopathy and superior pulmonary sulcus tumor among patients with complaints of neck pain and radiating shoulder and arm pain.

Summary of Background Data: The superior pulmonary sulcus tumor may cause symptoms of pain or radiating pain in the neck and upper extremities, motor weakness, atrophy of the intrinsic (hand) muscles, and sensory disturbance in certain cervical nerve root dermatomes which mimic the symptoms of cervical radiculopathy. The result would be tragic if the superior pulmonary sulcus tumor was misdiagnosed as degenerative cervical spine disease.

Methods: 7132 patients with main complaints of neck pain and radiating shoulder and arm pain visited the outpatient department of spinal disorders, in the China-Japan Union Hospital of Jilin University in Changchun, China. 10 cases (0.14%) were subsequently diagnosed with superior pulmonary sulcus tumor.

Results: Compared with patients with cervical radiculopathy, patients with superior pulmonary sulcus tumor had: History: a shorter mean history; Complaints: fewer complaints of neck pain or limited range of motion (ROM); Physical Findings: in all 10 cases: almost normal cervical spine ROM, and negative Spurling’s neck compression test; Imaging: AP cervical: lack of pulmonary air at the lung apex in all cases, and rib encroachment in 1 case.

Conclusion: Superior pulmonary sulcus tumor can be differentiated from cervical radiculopathy by normal range of motion in the cervical spine, negative Spurling's neck compression test and the radiographic finding of lack of air at the pulmonary apex of the affected lung.

Background

The superior pulmonary sulcus tumor is a malignant tumor of the superior pulmonary sulcus of the lung apex. It has a relatively low incidence (5% of all pulmonary tumors), but a much poorer prognosis. It
may mimic the symptoms of cervical radiculopathy caused by degenerative cervical spine disease, causing symptoms such as pain or radiating pain in the neck and upper extremities, muscle weakness, atrophy of the intrinsic muscles, and sensory changes in cervical nerve root dermatomes. This study investigates what features of the superior pulmonary sulcus tumor differentiate them from a cervical radiculopathy among patients with complaints of neck and radiating shoulder and arm pain, by reviewing 10 such cases.

Methods

Some 7132 patients visited the outpatient department of spinal disorders in the China-Japan Union Hospital of Jilin University in Changchun, China, from March 1998 through March 2005, with main complaints of neck pain and radiating shoulder and arm pain. Ten cases (0.14%) were subsequently diagnosed with superior pulmonary sulcus tumors that were later confirmed via needle biopsy. Findings of these 10 patients (clinical, physical, and imaging) were reviewed and compared with those patients with cervical radiculopathy.

Results

Four patients had plain film AP, lateral and oblique views performed in other hospitals before attending the authors’ facility, where they had been diagnosed as degenerative cervical disease or cervical radiculopathy. Two of these patients underwent conservative treatment (collar fixation, band traction, and NSAID’s), but they were refractory to treatment. Of note: The cervical spine range of motion was normal in 9 of the 10 patients. For all 10 patients:

- Pain was localized in the scapular or interscapular region
- There was no tenderness in the cervical spine region, and
- Spurling’s neck compression test was negative.

Other findings: Night pain in 6 out of 10 subjects, weight loss in 4 out of 10, with cough and fever in 2 out of 10. Male: Female ratio was 6:4. Average age 67.1 years. Pain and tenderness points were equivocal. Brachial plexus traction test was positive. Sensory disturbance was common in the posterior and medial arm and ulnar hand, with diminished strength on elbow extension and grip.

Plain film findings: There was cervical alordosis in four cases. Mild degenerative changes were found in seven cases. In all 10 cases, AP cervical radiographs showed absence of air at the pulmonary apex. In only one case was encroachment of the first rib found on the affected side. All patients went on to have chest radiography, and in all 10 cases the PA view showed unilateral apical opacity. One case showed wide spread tumorous shadows in the ipsilateral lung. MRI performed on two patients, clearly showed encroachment on vertebral bodies and brachial plexus, on the coronal images. Transthoracic aspiration needle biopsy confirmed epidermoid carcinoma in five cases, adenocarcinoma in four cases, and small-cell lung cancer in one case.

Conclusions

Cervical radiculopathy is one of the most common diseases seen in the cervical spine disorder clinic. The symptoms of cervical radiculopathy may be mimicked by the superior pulmonary sulcus tumor. A combination of medical history, physical examinations, and radiographic studies could improve the detection rate of superior pulmonary sulcus tumor in patients whose main complaints were radiating shoulder and arm pain. Clues that may lead to the diagnosis of superior pulmonary sulcus tumor in patients whose diagnosis would otherwise be cervical radiculopathy are: In contrast to typical cervical radiculopathy, superior pulmonary sulcus tumors have:

- A shorter mean history of the disease
- Almost normal cervical spine range of motion
- Pain localized in the scapular or interscapular region
- No tenderness in the cervical spine region, and
- Negative Spurling’s sign in all patients.
The current study confirmed Villas’ (et al) opinion in their retrospective study of 10 patients, that a lack of air at the lung apex on the affected side may indicate a superior pulmonary sulcus tumor.

The authors of the current study recommend chest radiography should be performed if asymmetries of the superior margins of the pulmonary opacity are observed on a cervical spine AP radiograph. Following confirmation of diagnosis of superior pulmonary sulcus tumor on chest x-ray, CT and MRI would be appropriate, with needle biopsy for confirmation.

**Clinical Relevance**

Cervical radiculopathy is seen frequently in chiropractic clinics. Chiropractors should have a high index of suspicion when faced with a patient whose diagnosis would otherwise be cervical radiculopathy when the patient has the following: a shorter mean history of the disease, almost normal cervical spine range of motion and a negative Spurling’s sign.

**JACO Editorial Summary:**

- The article was written by authors from the Department of Orthopedics, China-Japan Union Hospital of Jilin University, Changchun, Jilin 130033, China.
- The purpose of the study was to investigate the differential diagnostic methods of cervical radiculopathy and superior pulmonary sulcus tumor among patients with complaints of neck pain and radiating shoulder and arm pain.
- The main differentials are as follows. In contrast to typical cervical radiculopathy, superior pulmonary sulcus tumors have:
  - A shorter mean history of the disease
  - Almost normal cervical spine range of motion
  - Pain localized in the scapular or interscapular region
  - No tenderness in the cervical spine region, and
  - Negative Spurling’s sign in all patients.

**Summary**

The results of this investigation should assist clinicians in making the diagnosis of superior pulmonary sulcus tumor(s) in patients whose diagnosis would otherwise be cervical radiculopathy.

**References and Additional Readings**

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Author's Abstract

The specialized ligaments of the craniocervical junction must allow for stability yet functional movement. Because injury to these important structures usually results in death or morbidity, the neurosurgeon should possess a thorough understanding of the anatomy and function of these ligaments. To the authors’ knowledge, a comprehensive review of these structures is not available in the medical literature. The aim of the current study was to distill the available literature on each of these structures into one offering. (DOI: 10.3171/2011.1.SPINE10612)

Background

The craniocervical junction is an anatomically complex and important area of the human structure. The close proximity of vital neurovascular pathways makes this region clinically relevant. Injury to the craniocervical junction can produce a wide range of symptoms including localized pain, headaches, and proprioceptive disorders. Many of the ligamentous structures in this region are the key to understanding appropriate diagnosis and treatment. However, a comprehensive review of these structures was not available prior to this review of existing research.

Methods

The study included a comprehensive review of the literature of the anatomy and biomechanics of the craniocervical junction. The authors included adult and pediatric observations utilizing cadaveric dissection, surgical reports, and radiographic imaging. The craniocervical ligaments were described in terms of their location, course, size, elasticity, and biomechanical significance.

Results

The craniocervical junction consists of two major joints: the atlantooccipital joint and the atlantoaxial joint. The majority of cervical mobility occurs at this region. The atlantooccipital joint is primarily responsible for flexion and extension while the atlantoaxial joint is primarily responsible for...
cervical rotation. It is essential that these joints move in a specifically coordinated manner for proper biomechanics to occur. Rotation of the axis beyond 30-35 degrees can occlude the vertebral artery. The most important ligaments of the craniovertebral junction are the transverse and alar ligaments. The transverse ligament is one of the most important ligaments in the body and is the largest, thickest, and strongest craniovertebral ligament. The transverse ligament is the main stabilizing ligament of the atlantoaxial joint where about 47 degrees of rotation occur in the neck. This ligament is relatively inelastic and prone to rupture with greater than 3-5 mm of displacement.

The alar ligament, in addition to the transverse ligament, is the only ligament that is strong enough to oppose anterior displacement of the atlas on the axis. Its primary function is to limit axial rotation and lateral flexion on the contralateral side. Damage to the alar ligament increases axial rotation which can damage or occlude the vertebral artery. The alar ligament is frequently injured in a motor vehicle collision. The transverse occipital ligament is a small ligament located posterior and superior to the alar ligaments and odontoid process. The presence of this ligament varies from 8.3-77.8% of specimens. It has similar functions to the alar ligament when present. The accessory atlantoaxial ligament inserts medially into the dorsal aspect of the axis and travels superolaterally to the transverse ligament on the lateral mass of the atlas. This ligament may supply blood flow to the odontoid process.

There are no existing studies of the accessory atlantoaxial ligament, but it is thought to function similarly to the alar ligament. The lateral atlantooccipital ligament courses lateral to the anterior atlantooccipital membrane, attaching to the anterolateral aspect of the transverse process of the atlas and onto the jugular process of the occipital bone. No studies have been conducted on the lateral atlantooccipital ligament, but it may play a role in limiting lateral flexion of the neck. The barkow ligament is a horizontal band attaching into the anteromedial portion of the occipital condyles. This ligament has been poorly studied, but it appears to restrict extension of the atlantooccipital joint. The apical ligament courses from the tip of the odontoid process to the basion. Present in only 80% of cadavers, some authors suggest that the apical ligament is rudimentary notochord tissue.

The tectorial membrane forms the posterior border of the supraodontoid space and consists of 2-3 distinct layers of tissue. Nerves and vessels travel between these layers as well as a bursa being present over the odontoid process. No clear agreement exists as to the function of the tectorial membrane. The posterior atlantooccipital membrane attaches the posterior arch of the atlas to the posterior rim of the foramen magnum. Little study has been devoted to the atlantooccipital membrane, but the vertebral arteries pierce this membrane and dura to enter the posterior fossa suggesting some clinical significance. The anterior atlantooccipital membrane attaches the anterior aspect of the atlas to the anterior rim of the foramen magnum. This soft tissue structure, along with the posterior atlantooccipital membrane, helps to maintain stability of the craniovertebral joint.

The nuchal ligament is an extension of the supraspinous ligament and runs from the C7 spinous process to the inion of the occiput. This ligament restricts hyperflexion and appears to have a high concentration of proprioceptive fibers that “may play a role in maintaining proper alignment of the cervical spine.” The majority of the craniovertebral ligaments are thought to be modified intervertebral discs.

The amount of elastic tissue varies from ligament to ligament. The transverse and alar ligaments contain very little elastic fibers. Ligaments that are under
Chiropractors frequently see patients with motor vehicle or other injuries to the craniocervical junction. Neck pain, headaches, and proprioceptive symptoms are common for patients presenting for chiropractic treatment. It is important for chiropractors to understand the craniocervical anatomy and biomechanics to effectively diagnose and treat these conditions. Knowing when and, perhaps more importantly, when not to apply manual adjusting techniques to an injured craniocervical region is essential.

**JACO Editorial Summary**

- This article was written by authors from Children’s Hospital – Birmingham, AL, the University of Tennessee, College of Medicine – Memphis, TN, Clarian Neuroscience, Campbell Brain and Spine Department of Neurological Surgery, Indiana University, Indianapolis, IN, and the Department of Anatomical Sciences, St. George’s University, Grenada.
- The purpose of this study is to conduct a comprehensive review of the literature of the anatomy and biomechanics of the craniocervical junction.
- Rotation of the axis beyond 30-35 degrees can occlude the vertebral artery.
- The nuchal ligament restricts hyperflexion and appears to have a high concentration of proprioceptive fibers that “may play a role in maintaining proper alignment of the cervical spine.”
- The transverse and alar ligaments contain very little elastic fibers.
- Ligaments that are under constant pressure contain large amounts of fibrocartilage such as glycosaminoglycans which can trap water to act as a cushion.
- Fibrocartilage tends to act as a target for autoimmune disorders such as rheumatoid arthritis.
- Approximately 9-30% of Down’s Syndrome children have atlantoaxial instability.

Conclusions

The ligaments of the craniocervical junction provide essential structural stability for this region.

Clinical Relevance

constant pressure contain large amounts of fibrocartilage such as glycosaminoglycans which can trap water to act as a cushion. Fibrocartilage tends to act as a target for autoimmune disorders such as rheumatoid arthritis. Disorders such as RA, Down’s Syndrome, calcium pyrophosphate dehydrate crystal deposition and “whiplash” commonly affect the ligaments of the craniocervical junction. RA tends to affect primarily the transverse ligament creating instability in the atlantoaxial joint. Approximately 9-30% of Down’s syndrome children have atlantoaxial instability.

The predental space on radiograph was 8mm for a Down’s Syndrome patient compared to 3mm for normal. A predental space greater than 3 mm for adult and 5 mm for children suggest transverse ligament pathology. Overhang of C1 on C2 lateral mass greater than 6.9 mm indicates a probable tear of the transverse ligament. CPPD may affect the transverse ligament and produce symptoms of myelopathy. Because the posterior atlantooccipital membrane interdigitates with the dura mater, mechanical forces may be transferred to the dura causing cervicogenic headaches. The transverse and alar ligaments are most likely to be injured in a whiplash-type injury, mainly due to their lack of elastic tissue. Plain film radiographs can provide useful information in evaluating the craniocervical ligaments, but the authors recommend MR as the imaging technique of choice. Alar ligaments can contain high amounts of epidural fat that may result in a high signal intensity on MR with no lesion present.
• The predental space on radiograph was 8mm for a Down’s Syndrome patient compared to 3mm for normal.
• A predental space greater than 3 mm for adult and 5 mm for children suggest transverse ligament pathology.
• Overhang of C1 on C2 lateral mass greater than 6.9 mm indicates a probable tear of the transverse ligament.
• CPPD may affect the transverse ligament and produce symptoms of myelopathy.
• Because the posterior atlanto-occipital membrane interdigitates with the dura mater, mechanical forces may be transferred to the dura causing cervicogenic headaches.
• The transverse and alar ligaments are most likely to be injured in a whiplash-type injury, mainly due to their lack of elastic tissue.
• Plain film radiographs can provide useful information in evaluating the craniocervical ligaments, but the authors recommend MR as the imaging technique of choice for most ligaments.
• Alar ligaments can contain high amounts of epidural fat that may result in a high signal intensity on MR with no lesion present.

Summary

The results of this review should renew an interest and concern for chiropractors, especially those employing dynamic cervical techniques, for the importance of the craniocervical anatomy, neurology, and biomechanics.

References and Additional Readings

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Abstracts & Literature Review

Morphological Features and Clinical Significance of Epidural Membrane in the Cervical Spine

Akira Miyauchi, MD, Tadayoshi Sumida, MD, Hideki Manabe, MD, Yukio Mikami, MD, PhD, Mayumi Kaneko, MD, PhD, Yoshio Sumen, MD, PhD, and Mitsuo Ochi, MD, PhD

SPINE Volume 37, Number 19, pp E1182–E1188
2012, Lippincott Williams & Wilkins

JACO Editorial Reviewer: Jeffrey R. Cates, DC, MS, FACO, DABCC

Published:
Journal of the Academy of Chiropractic Orthopedists
December 2012, Volume 9, Issue 4

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Authors’ Abstract:

Study Design: A prospective clinical study.

Objective: To elucidate the histomorphological features and clinical significance of the epidural membrane (EM) in the cervical spine based on operative and histological findings.

Summary of Background Data: The anatomical features of the EM have been mostly discussed on the basis of cadaver studies in the whole spine. However, the histomorphological features and clinical significance of the EM in the cervical spine based on operative findings have never been reported.

Methods: Eighty-seven patients with cervical spondylotic myelopathy who had undergone an expansive open-door laminoplasty under microscopy were evaluated with a more than 2-year follow-up period. The most damaged spinal segment was determined in each patient from the preoperative neurological and image findings along with the remaining symptoms at follow-up. The morphological features of the EM were observed and recorded in each patient during decompression. For histology, specimens of common and remarkable types of the EM obtained from 16 patients were examined.

Results: The age at surgery averaged 64.5 years; there were 58 men and 29 women. With regard to the most damaged spinal segment, there were 14 cases at the C3–C4 level, 37 at the C4–C5 level, 32 at the C5–C6 level, and 4 at the C6–C7 level. The EM was an adipo-fibro-vascular tissue with various histomorphologies, blending with the periradicular sheath. Some EMs showed notable findings: obstructing dural tube expansion (13 cases, 14.9%), compressing a nerve root or disturbing its mobility (4 cases, 4.6%), and the combined type (1 case, 1.1%). All of them were located at approximately the most damaged spinal segment. In addition, some EMs had interesting histological features, such as harboring many small arteries, calcified debris, and metaplastic bone fragments.

Conclusion: The EM can develop into remarkable structures with spondylosis and aging in patients with cervical spondylotic myelopathy, affecting surgical outcomes as...
well as successful decompression procedures. A sound understanding of the histomorphological features of the EM is required to obtain satisfactory surgical outcomes in the limited field afforded by minimally invasive surgery.

**Key words:** Cervical spine, epidural membrane, histology, myelopathy, minimally invasive surgery.

**Background**

This prospective study reviews the histology, morphology, and gross anatomical changes seen in patient with cervical spondylotic myelopathy in an operative setting. The purpose of this study was to further the understanding of the features and role of the epidural membrane in cervical spondylotic myelopathy.

**Methods**

Eighty-seven patients were included in this study. Observation and documentation of the subjects pre-surgical condition was accomplished with CT, MRI, and the Japanese Orthopedic Association (JAO) scoring system. In vivo evaluation of the epidural membrane was performed during surgery and pathological epidural membranes (p-EM) were assessed as type 1 or type 2; Type 1 p-EM being a band like or membranous constriction adhering to the dura, whereas the type 2 compressed the nerve root and/or restricted its mobility. Post surgical histological evaluation of removed tissues was also performed.

**Results**

Post surgical JOA scores improved with the mean recovery rate being 47.4 +/- 25.9%. Morphological features noted in the study included fibrous tissue on the central portion of the dura with increased vascularization in the lateral portion. Additionally, there were adhesions to the ligamentum flavum and dura. There was also a fibrous root pouch noted. Type 1 p-EM were found in 14.9% of cases and type 2 p-EM in 4.6% combined types were seen in 1.1%. Histological evaluation of tissues recovered during surgery show loose fibrous tissue with scattered calcified debris, vascular anomalies including pseudoangioma-like changes and immature stromal cells.

**Conclusions**

The complexity and diversity of symptoms and findings seen with cervical spondylotic myelopathy make it difficult to diagnoses and treat. This study shows that the EM attaches to both the ligamentum flavum and dura, and, is highly vascularized laterally. These data are of particular interest to those performing surgical procedures.

**Clinical Relevance**

Cervical spondylotic myelopathy can be difficult to diagnosis. It can be painless, progressive and debilitating. While CSM is not an absolute contraindication to chiropractic management or care, the practitioner that chooses to do so should have a firm grasp of the diagnostic and management challenges these case can present. This paper provides the reader with advance insight and understanding of the role of the epidural membrane in these cases.

**JACO Editorial Summary:**

- The article was written by authors from the departments of orthopedic surgery and pathology, Hiroshima City, Asa Hospital, Hiroshima, Japan; the department of orthopedic surgery, Onomichi General Hospital, Onomichi, Japan; and the department of orthopedic surgery, Graduate School of Biomedical Sciences, Hiroshima University, Hiroshima, Japan.
- The purpose of this study was to further the understanding of the features and role of the epidural membrane in cervical spondylotic myelopathy.
- This study reviews the histology, morphology, and gross anatomical changes seen in patient with cervical spondylotic myelopathy in an operative setting.
- Surgical intervention improved patients with CSM mean recovery rate 47% (JOA score).
- Morphological features noted in the study included fibrous tissue on the central portion.
of the dura with increased vascularization in the lateral portion. Additionally, there were adhesions to the ligamentum flavum and dura. 

- Histological evaluation of tissues recovered during surgery show loose fibrous tissue with scattered calcified debris, vascular anomalies including pseudoangioma-like changes and immature stromal cells.

Summary

This study adds to the basic understanding of the cervical spondylotic myelopathy and the role that the epidural membrane can play in its development.

References


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