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Dysphagia after anterior cervical spine surgery

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I. Introduction:

Cervical spondylosis is a chronic degenerative condition of the cervical spine that affects the vertebral bodies and intervertebral disks of the neck (in the form of, for example, disk herniation and spur formation), as well as the contents of the spinal canal (nerve roots and/or spinal cord). Some authors also include the degenerative changes in the facet joints, longitudinal ligaments, and ligamentum flavum.

Spondylosis progresses with age and often develops at multiple interspaces. Chronic cervical degeneration is the most common cause of progressive spinal cord and nerve root compression. Spondylotic changes can result in stenosis of the spinal canal, lateral recess, and foramina. Spinal canal stenosis can lead to myelopathy[1], whereas the latter 2 can cause radiculopathy.

A T2-weighted cervical magnetic resonance imaging scan shows obliteration of the subarachnoid space as a result of spondylotic changes.

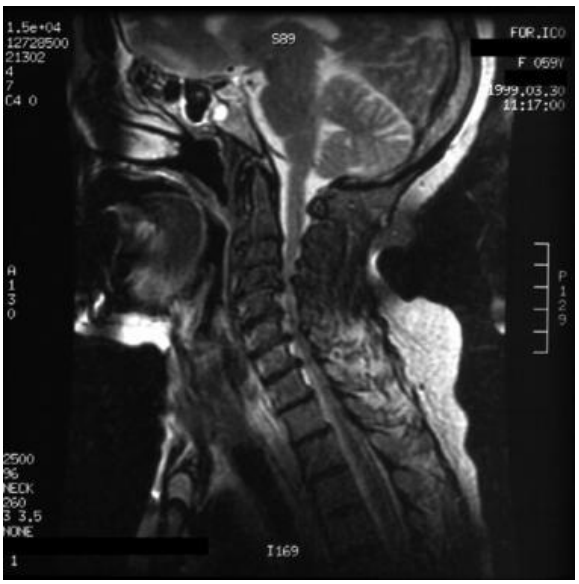
Pathophysiology

Intervertebral disks lose hydration and elasticity with age, and these losses lead to cracks and fissures. The surrounding ligaments also lose their elastic properties and develop traction spurs. The disk subsequently collapses as a result of biomechanical incompetence, causing the annulus to bulge outward. As the disk space narrows, the annulus bulges, and the facets override. This change, in turn, increases motion at that spinal segment and further hastens the damage to the disk. Annulus fissures and herniation may occur. Acute disk herniation may complicate chronic spondylotic changes.

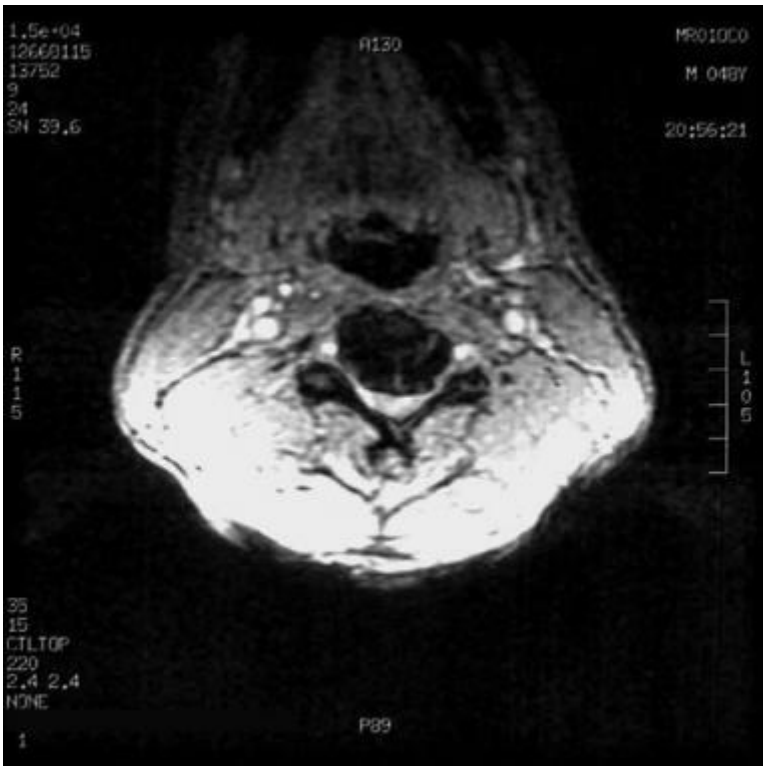
As the annulus bulges, the cross-sectional area of the canal is narrowed. This effect may be accentuated by hypertrophy of the facet joints (posteriorly) and of the ligamentum flavum, which becomes thick with age. Neck extension causes the ligaments to fold inward, reducing the anteroposterior (AP) diameter of the spinal canal.

As disk degeneration occurs, the uncinate process overrides and hypertrophies, compromising the ventrolateral portion of the foramen. Likewise, facet hypertrophy decreases the dorsolateral aspect of the foramen. This change contributes to the radiculopathy that is associated with cervical spondylosis. Marginal osteophytes begin to develop. Additional stresses, such as trauma or long-term heavy use, may exacerbate this process. These osteophytes stabilize the vertebral bodies adjacent to the level of the degenerating disk and increase the weight-bearing surface of the vertebral endplates. The result is decreased effective force on each of these structures.

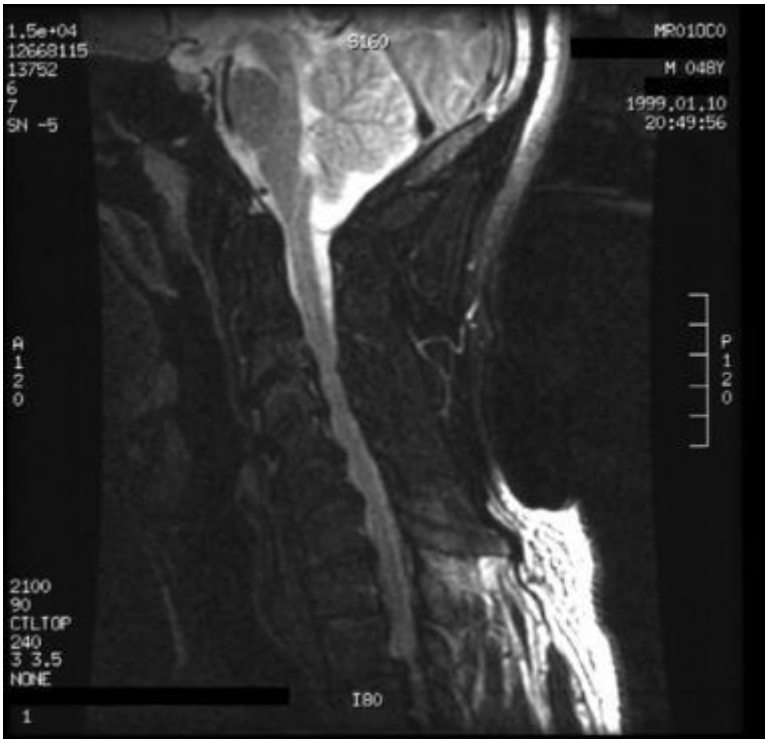
A cervical myelogram shows advanced spondylotic changes and multiple compression of the spinal cord by osteophytes.



A 59-year-old woman presented with a spastic gait and weakness in her upper extremities. A T2-weighted sagittal magnetic resonance imaging scan shows cord compression from cervical spondylosis, which caused central spondylotic myelopathy. Note the signal changes in the cord at C4-C5, the ventral osteophytosis, buckling of the ligamentum flavum at C3-C4, and the prominent loss of disk height between C2 and C5.



A 48-year-old man presented with neck pain and predominantly left-sided radicular symptoms in the arm. The patient's symptoms resolved with conservative therapy. An axial, gradient-echo magnetic resonance imaging scan shows moderate anteroposterior narrowing of the cord space due to a ventral osteophyte at the C4 level, with bilateral narrowing of the neural foramina (more prominently on the left side).

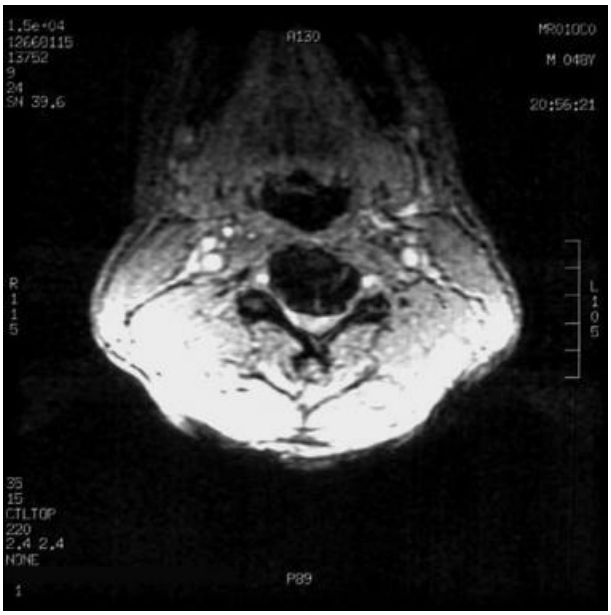


A 48-year-old man presented with neck pain and predominantly left-sided radicular symptoms in the arm. The patient's symptoms resolved with conservative therapy. A T2-weighted sagittal magnetic resonance imaging scan shows ventral osteophytosis, most prominent between C4 and C7, with reduction of the ventral cerebrospinal fluid sleeve.

History

Common clinical syndromes associated with cervical spondylosis include the following:

- Cervical pain
  - Chronic suboccipital headache may be present. Mechanisms include direct nerve compression; degenerative disk, joint, or ligamentous lesions; and segmental instability.
  - Pain can be perceived locally, or it may radiate to the occiput, shoulder, scapula, or arm.
  - The pain, which is worse when the patient is in certain positions, can interfere with sleep.
- Cervical radiculopathy
  - Compression of the cervical nerve roots leads to ischemic changes that cause sensory dysfunction (eg, radicular pain) and/or motor dysfunction (eg, weakness). Radiculopathy most commonly occurs in persons aged 40-50 years. Cervical myelopathy has an insidious onset, which typically becomes apparent in persons aged 50-60 years. Complete reversal is rare once myelopathy occurs.
  - Involvement of the sphincters is unusual at presentation, as based on the patient's perception of symptoms.
  - Five categories of cervical spondylotic myelopathy are described; these are based on the predominant neurologic findings, as follows:
    - Transverse lesion syndrome - Corticospinal and spinothalamic tracts, as well as the posterior columns, are involved.
    - Motor syndrome - This primarily involves the corticospinal or anterior horn cells.
    - Central cord syndrome - Motor and sensory involvement is greater in the upper extremities than the lower extremities.[2]
    - Brown-Séquard syndrome - Unilateral cord lesion with ipsilateral corticospinal tract involvement and contralateral analgesia are present below the level of the lesion.
    - Brachialgia and cord syndrome - Predominant upper limb pain is present, with some associated long-tract involvement.
- Less common manifestations
  - Primary sensory loss may be present in a glovelike distribution.
  - Tandem spinal stenosis is a simultaneous cervical and lumbar stenosis resulting from spondylosis. It is a triad of findings: neurogenic claudication, complex gait abnormality, and a mixed pattern of upper and lower motor neuron signs.
  - Dysphagia may be present if the spurs are large enough to compress the esophagus.
  - Vertebrobasilar insufficiency and vertigo may be observed.
  - Elevated hemidiaphragm, caused by spondylotic compression of C3-4 (as noted in a case report), may be another finding.



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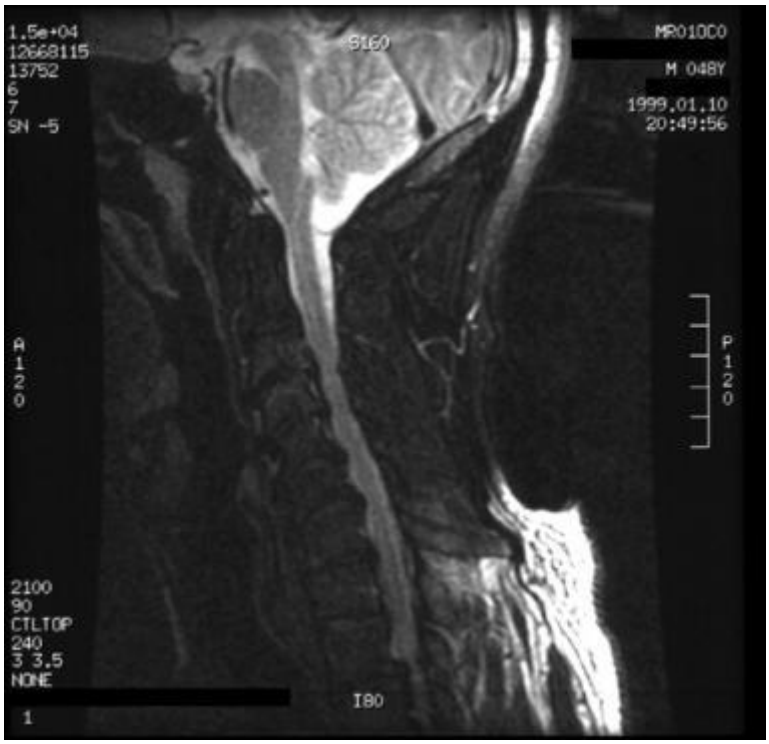

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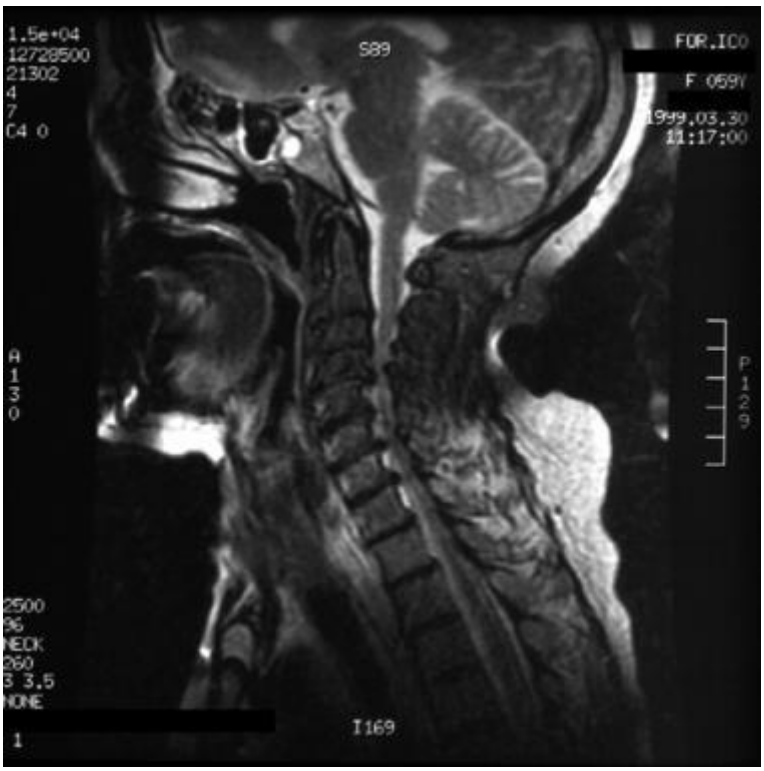

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Physical

Findings at physical examination may include the following:

- Spurling sign - Radicular pain is exacerbated by extension and lateral bending of the neck toward the side of the lesion, causing additional foraminal compromise.
- Lhermitte sign - This generalized electrical shock sensation is associated with neck flexion.
- Hoffman sign - Reflex contraction of the thumb and index finger occurs in response to nipping of the middle finger. This sign is evidence of an upper motor neuron lesion. A Hoffman sign may be insignificant if present bilaterally.
- Distal weakness
- Decreased ROM in the cervical spine, especially with neck extension
- Hand clumsiness
- Loss of sensation
- Increased reflexes in the lower extremities and in the upper extremities below the level of the lesion
- A characteristically broad-based, stooped, and spastic gait
- Extensor planter reflex in severe myelopathy

Causes

- Age
  - Cervical spondylosis is an accumulation of degenerative changes observed most commonly in elderly individuals.
  - Among persons younger than 40 years, 25% have degenerative disk disease (DDD), and 4% have foraminal stenosis, as confirmed with magnetic resonance imaging (MRI).
  - In persons older than 40 years, almost 60% have DDD, and 20% have foraminal stenosis, as confirmed with MRI.
- Trauma
  - The role of trauma in spondylosis is controversial.
  - Repetitive, subclinical trauma probably influences the onset and rate of progression of spondylosis.
- Work activity - Cervical spondylosis is significantly higher in patients who carry loads on their head than in those who do not (see Frequency).
- Genetics
  - The role of genetics is unclear. However, a retrospective, population-based study by Patel et al shows that genetics may play a role in the development of cervical spondylotic myelopathy (CSM). The study uses The Utah Population Database, which contains over 2 million residents' health and genealogical data, and cross-references it with 10 years of clinical diagnosis statistics from a large tertiary hospital. An abundance of cases showing relatedness, as well as a considerable amount of elevated relative risks to close and distant relatives, advances the idea of an inherited predisposition to CSM.[3]
  - Patients older than 50 years who have normal cervical spine radiographic findings are significantly more likely to have a sibling with normal or mildly abnormal radiographic results.

Imaging Studies

- Plain cervical radiography is routine in every patient with suspected cervical spondylosis.
  - This examination is valuable in evaluating the uncovertebral and facet joints, the foramen, intervertebral disk spaces, and osteophyte formation.
  - In select circumstances, flexion-extension views may be needed to detect instability.
- Myelography, with computed tomography (CT) scanning, was previously considered to be the imaging test of choice for assessing spinal and foraminal stenosis. However, with advances in MRI and CT scanning technology, myelography is now performed in selected patients. [4]
  - Because myelography method is invasive, most physicians depend on MRI in diagnosing cervical spondylosis.
  - Myelography adds anatomic information in evaluating spondylosis.
  - Myelography may be especially useful in visualizing the nerve root takeoff.
  - CT scanning, with or without intrathecal dye, can be used to estimate the diameter of the canal.
  - CT scans may demonstrate small, lateral osteophytes and calcific opacities in the middle of the vertebral body.
- MRI is a considerable advance in the use of imaging to diagnose cervical spondylosis. It offers the following advantages:
  - Direct imaging in multiple planes
  - Better definition of neural elements

- Increased accuracy in evaluating intrinsic spinal cord diseases
- Noninvasiveness
- Myelogramlike images

- High–signal-intensity lesions can be seen on magnetic resonance images of spinal cord compression; this finding indicates a poor prognosis.
- False-positive and false-negative MRI results occur frequently in patients with cervical radiculopathy; therefore, MRI results and clinical findings should be used when interpreting root compression. [5]

Other Tests

- Electromyography is useful in evaluating radiculopathy caused by spondylosis when the diagnosis of radiculopathy is in question, but it may have only limited value in assessing myelopathy.
- In myelopathy, somatosensory evoked potential (SSEP) responses are delayed or have a low amplitude.[6]
- Cortical motor evoked potentials (MEP) may be more sensitive than SSEPs in evaluating spinal cord dysfunction. [7,8]
- As an invasive procedure, cervical diskography is not commonly used in the evaluation of cervical spondylosis.
- Urodynamic studies may be helpful in evaluating bladder incontinence

Treatment

Rehabilitation Program

Physical therapy

Immobilization of the cervical spine is the mainstay of conservative treatment for patients with severe cervical spondylosis with evidence of myelopathy. Immobilization limits the motion of the neck, thereby reducing nerve irritation. Soft cervical collars are recommended for daytime use only, but they are unable to appreciably limit the motion of the cervical spine. More rigid orthoses (eg, Philadelphia collar, Minerva body jacket) can significantly immobilize the cervical spine (see Special Concerns). The patient's tolerance and compliance are considerations when any of the braces are used. A program of isometric cervical exercises may help to limit the loss of muscle tone that results from the use of more restrictive orthoses. Molded cervical pillows can better align the spine during sleep and provide symptomatic relief for some patients.

Mechanical traction is a widely used technique. This form of treatment may be useful because it promotes immobilization of the cervical region and widens the foraminal openings. However, traction in the treatment of cervical pain was not better than placebo in 2 randomized groups.

The use of cervical exercises has been advocated in patients with cervical spondylosis. Isometric exercises are often beneficial to maintain the strength of the neck muscles. Neck and upper back stretching exercises, as well as light aerobic activities, also are recommended. The exercise programs are best initiated and monitored by a physical therapist.

Passive modalities generally involve the application of heat to the tissues in the cervical region, either by means of superficial devices (eg, moist-heat packs) or mechanisms for deep-heat transfer (eg, ultrasound, diathermy).

Manual therapy, such as massage, mobilization, and manipulation, may provide further relief for patients with cervical spondylosis. Mobilization is performed by a physical therapist and is characterized by the application of gentle pressure within or at the limits of normal motion, with the goal of increasing the ROM. Manual traction may be better tolerated than mechanical traction in some patients. Manipulation is characterized by a high-velocity thrust, which is often delivered at or near the limit of the ROM. The intention is to increase articular mobility or to realign the spine. Contraindications to manipulative therapy include myelopathy, severe degenerative changes, fracture or dislocation, infection, malignancy, ligamentous instability, and vertebrobasilar insufficiency.

Occupational therapy

Patients with upper extremity weakness often lose their ability to perform activities of daily living (ADL), vocational activities, or recreational activities. Lifestyle modifications may involve an evaluation of workplace ergonomics, postural training, neck-school therapy (supervised, small-group therapy), stress management, and vocational assistance. Disability can be improved with specific strengthening exercises of the upper extremities, special splinting to compensate for weakness, and the use of assistive devices that allow the patient to perform previously impossible activities.

Recreational therapy

The recreational therapist can use recreational and community activity to accomplish the following:

- Help the patient maintain his/her physical strength, social skills, and motivation
- Assist the patient and family in adjusting to the disability

- Decrease the patient's atypical behaviors
- Increase the patient's independence
- Reinforce other therapies
- Provide community integration
- Further evaluate the level of functioning in cases of severe disability caused by cervical spondylosis

Medical Issues/Complications

Cervical spondylosis may result in complications (see Mortality/Morbidity), including the following:

- Cervical myelopathy
- Paraplegia
- Tetraplegia
- Recurrent chest infection
- Pressure sores
- Recurrent urinary tract infection

Surgical Intervention

Indications for surgery include the following:

- Progressive neurologic deficits
- Documented compression of the cervical nerve root and/or spinal cord
- Intractable pain

The aims of surgery are to relieve pain and neuronal structure compression, as well as, in select cases, to achieve stabilization.

Approaches for surgery are anterior or posterior.

Anterior approaches include the following:[9,10,11]

- Diskectomy without bone graft
- Diskectomy with bone graft
- Cervical instrumentation

Posterior approaches include the following:[12]

- Decompressive laminectomy and foraminotomy
- Hemilaminectomy
- Laminoplasty[13,14]

II. Methods:

This is a prospective study of 25 patient over a period of 2 years. All presented with dysphagia secondary to cervical vertebrae spondylosis and osteophytes (after exclusion of other causes). The age range was (25 year-70year), with a mean age of 51 year.

They had variable duration of dysphagia: 68% (17 patients had one month duration, 24% (6 patients) had two month duration of dysphagia and 8% (2 patients) had 3 months duration of dysphagia.

The past medical and surgical history were reviewed for all patients with exclusion of other possible causes of dysphagia. All patients had (in addition to dysphagia) radiating pain to the neck and shoulder with features of cervical root nerve compression.

Evaluation of cervical spine using CT-scan and/or MRI of all patients for detecting levels and severity of compression for both the esophagus, spinal cord and nerve roots. The medical records of all patients were reviewed and collected for data analysis,

III. Results:

During the period of 2 years, 25 patients were followed up after cervical spine surgery to relieve symptoms of dysphagia caused by hyperostosis or osteophytes causing compression on the esophagus.

All surgeries done under general anesthesia in supine position with availability of C-arm screen and microscope.

Nasogastric tube inserted for all patients for support of the esophagus in order to easily retract the esophagus during manipulation.

Anterior cervical incision (parallel to anterior border of sternocleidomastoid muscle) used with variable levels according to the levels of cervical spine need exposure.

Special retractors were used for exposure of prevertebral fascia between the esophagus medially and carotid sheath laterally.

Once properly visualized, the offending disc can be removed with a rongeur or drill set. As the posterior aspect of the vertebral body is reached, upward-curette tools can be used to maximize removal of osteophytes. The posterior longitudinal ligament should be visualized

15 patients (60%) had multi level disease (more than one disc involved), 10 patients (40%) had single level disc disease.

Fixation plate used in 40 % of patients (10 patients) regardless the number of disc involved!?

Closure of the wound with no need for drain after good hemostasis.

Table 1
Complications

Complications	Number of patients	Management
Dysphagia -without plate -with plate	_____	
Neurological deterioration	_____	
RLN[+] injury	**4**	**steroid**
Dural tear	_____	
Esophageal perforation	_____	
Wound infection	**2**	**Conservative with antibiotic coverage**

[+]RLN: recurrent laryngeal nerve

Table (1) shows the complications accounted during the study

Table (2)

Cases number	Age/year	Surgical resection
10	35 y, 30 y 33y, 51 y 25 y, 40 y 52 y, 38 y 56 y, 54 y **(mean age: 55 years)**	**one disc resection**
10	40 y, 68 y 45 y, 48 y 60 y, 62 y 46 y, 61 y 61 y, 58 y **(mean age: 55 years)**	**Two disc resection**
5	52 y, 63 y 70 y, 66 y 70 y **(mean age: 64)**	**Three disc resection**

Table (2) shows the number of patients according to the number of disc resected
Number of levels required resection is increasing with increasing of age.

IV. Discussion:

Symptomatic degenerative changes of the cervical spine affect a large percent of population above 60 years of age. Dysphagia caused by degenerative change of cervical spine (hyperostosis and osteophytes) is an important but uncommon cause.

All the patients included in the study were followed up of a period range from 6-24 months.

20 patients (80%) had relief of symptoms of dysphagia and pain, while the remaining (20%) had no relief of dysphagia and this maybe multifactorial.

V. Conclusion:

The surgical removal of cervical osteophytes can be highly successful in treating dysphagia if refractory to prolonged conservative treatment,

Keywords: Cervical degenerative disease, osteophytes, dysphagia, surgical management.

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