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A Review on Diagnosis and Management of Cervical Spondylosis

Ahmed Abdulaziz G. Ibrahim[1*], Ali Mohammed A. Alahmari[2], Abdullah Hassan F. Alsuayri[2], Abdullah Misfer M. Algomshah[2], Saeed Ghanem S. Almlfi[2], Ayman Dhaifallah A. Alamri[2], Sara Saeed Al-Akalbi[2], Kady Hassan Althunayan[2], Sarah Ibrahim Ali Alhammad[3], Wejdan Ibrahim Ali alhammad[3], Sadaf Esmail Buarish[3], Ahmad Abdullah A. Alsaleh[4], Noura Ali Abdullah Alnamazi[5] and Mariyah Ihab Alzayer[6]

[1]King Salman Military Hospital, Tabuk, Saudi Arabia.
[2]Bisha University, Saudi Arabia.
[3]Vision College of Riyadh, Saudi Arabia.
[4]Majmaah University, Saudi Arabia.
[5]Jazan University, Saudi Arabia.
[6]Royal College of Surgeons Ireland, Ireland.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Cervical spondylosis is a term that encompasses a wide range of progressive degenerative changes that affect all components of the cervical spine (i.e., intervertebral discs, facet joints, Luschka joints, flava ligaments, and laminae). It is a natural aging process and occurs in most people after the age of five. Most people with radiographic spondylotic changes in the cervical spine remain asymptomatic, and 25% of those under 40, 50% of those over 40, and 85% of those

[1]Consultant at King Salman Military Hospital, Tabuk, Saudi Arabia.
**Corresponding author: E-mail: aagie90@gmail.com;*

over 60 show some evidence of degenerative changes , including changes in the environment. Uncovertebral joints, facet joints, posterior longitudinal ligament (PLL) and yellow ligament lead to narrowing of the spinal canal and intervertebral foramina. As a result, the spinal cord, spinal vasculature, and nerve roots can become compressed, leading to the three clinical syndromes that occur with cervical spondylosis: axial neck pain, cervical myelopathy, and cervical radiculopathy. Cervical spondylosis is usually diagnosed for clinical reasons only, but imaging is also required. Treatment for cervical spondylosis can be medical or surgical, depending on whether the patient has symptoms of myelopathy, radicular pain, or neck pain.

Keywords: Diagnosis; management; cervical spondylosis; cervical spine.

1. INTRODUCTION

Cervical spondylosis is a term that encompasses a wide range of progressive degenerative changes that affect all components of the cervical spine (i.e., intervertebral discs, facet joints, Luschka joints, flava ligaments, and laminae). It is a natural aging process and occurs in most people after the age of five. The symptoms of cervical spondylosis manifest as neck pain and neck stiffness, these pains usually respond to modification of activity, immobilization of the neck, isometric exercise and medication, and can be accompanied by radical symptoms if there is compression of neural structures [1]. Neck pain is widespread and is the second most common complaint after low back pain. Given the significant burden of disease that carries significant disabilities and economic costs, healthcare providers must identify symptomatic cervical spondylosis and provide low-cost, evidence-based interventions.

Cervical spondylosis is caused by degenerative disc disease and usually produces intermittent neck pain in middleaged and elderly patients. For these patients, magnetic resonance imaging is the preferred initial diagnostic study [2]. Because involvement of neurologic structures on imaging studies may be asymptomatic, consultation with a neurologist is advised to rule out other neurologic diseases. In most cases of spondylotic radiculopathy, the results of conservative treatment are so favorable that surgical intervention is not considered unless pain persists or unless there is progressive neurologic deficit. If indicated, a surgical procedure may be done through the anterior or posterior cervical spine; results are gratifying, with longterm improvement in 70% to 80% of patients [3]. Cervical spondylotic myelopathy is the most serious and debilitating disease of this disease. Because many patients have minor non-progressive deterioration, neck immobilization is an appropriate treatment in patients with minor neurologic findings or for whom surgery is contraindicated. This simple remedy leads to improvement in 30% to 50% of patients. Surgical intervention is indicated in patients with severe or progressive neurological deficits. Anterior cervical approaches are generally preferred, although there are still indications for a laminectomy. Surgical results are modest, with good initial results expected in approximately 70% of patients. Functional outcome decreases markedly with longer follow-up, raising the question of whether and to what extent surgical treatment influences the natural course of the disease. Randomized prospective studies are required to answer these questions.

1.1 Objectives

The study aims to summarize the updated evidence regards, epidemiology, etiology, pathophysiology, diagnosis, and management.

2. EPIDEMIOLOGY

Most people with radiographic spondylotic changes in the cervical spine remain asymptomatic, and 25% of those under 40, 50% of those over 40, and 85% of those over 60 show some evidence of degenerative changes . The most commonly affected values are C6C7, followed by C5C6. Symptomatic cervical spondylosis most often manifests as neck pain. In the general population, the point prevalence of neck pain is between 0.4% and 41.5%, the 1-year incidence is between 4.8% and 79.5%, and the lifetime prevalence it can go up to 86.8%. According to Global Burden of Disease 2015, low back and neck pain remains the leading cause of disability years (YLD) and the fourth leading cause of disability-adjusted life years (DALYs) [4].

2.1 Etiology

The main risk factor and contributor to the incidence of cervical spondylosis is age-related

degeneration of the intervertebral disc and elements of the cervical spine. Degenerative changes in the surrounding structures, including the uncovertebral joints, the facet joints, the posterior longitudinal ligament (PLL), and the yellow ligament, lead to narrowing of the spinal canal and intervertebral foramina. As a result, the spinal cord, spinal vasculature, and nerve roots can become compressed, leading to the three clinical syndromes that occur with cervical spondylosis: axial neck pain, cervical myelopathy, and cervical radiculopathy [5].

Factors that can contribute to accelerated disease progression and early onset of cervical spondylosis include exposure to significant spinal trauma, a spinal canal that narrows from birth, dystonic cerebral palsy affecting the muscles neck and specific athletic activities such as rugby, football and horse riding [6].

2.2 Pathophysiology

As mentioned above, the main cause of cervical spondylosis is age-related degeneration. However, there are some exceptions where spinal intervertebral disc injuries can exacerbate the degenerative process in younger patients. A secondary manifestation of spondylosis is compression of the vascular and neural structures caused by loss of disc height and shocking osteophytes, which contribute to numbness, shock sensations, pain, and chronic motor and sensory deficits that, if not corrected, lead to permanent injury. Disabilities [7].

It is this physiological degenerative cascade that contributes to biomechanical changes that can cause neural and vascular compression, pain, and loss of function.

Early changes in the proteoglycan matrix lead to an increase in the ratio of keratin sulfate to chondroitin sulfate, leading to a loss of water in the intervertebral disc. This dehydration causes the nucleus pulposus to lose elasticity, shrink in size and lose the ability to support axial loads [8]. Since the dorsal fibers of the annulus are thinner than the ventral side, there is a path of least resistance through the annulus for nucleus pulposus herniation. As the disc continues to dry, the annular fibers become mechanically compromised and cannot effectively sustain axial loads, resulting in twisting of the spinal ligaments and annular fibers under compressive loads, which are aggravated by loads. eccentric (i.e. bending, twisting, and bending). The resulting loss of disc height causes the discs to bulge, the ligament tissue to sag and bend, and compress the ventral aspect of the cervical spine. At this point, there are significant changes in load distribution along the cervical spine with the end result of cervical spine kyphosis. If the kyphosis is not reversed, the kyphosis will continue to progress, the annular and Sharpey fibers will detach from the vertebral periphery and the bony end plates, resulting in reactive bone formation where the fibers have separated. These resulting bone spurs can form in response to altered biomechanical loads along the ventral or dorsal border of the cervical spine and within the canals, causing compression of the neural and vascular structures [9].

2.3 Clinical Manifestation

Cervical spondylosis presents in three symptomatic forms: neck pain, cervical radiculopathy, and cervical myelopathy. Neck pain and cervical radiculopathy (nerve root involvement) can be acute, subacute, or chronic conditions resulting from different stages along the degenerative cascade [10]. Cervical myelopathy is less common in the spondylotic patient and occurs in elderly patients with symptoms such as neck, subscapular or shoulder pain accompanied by a sensation of shock and numbness in the extremities. Cervical myelopathy includes motor and reflex changes indicative of more chronic disease and can eventually lead to spastic weakness and numbness in the extremities, loss of dexterity, spastic gait, loss of spinal function and painful paresthesias [11]. These chronic symptoms can eventually become permanent with a poor prognosis. Cervical radiculopathy is the most easily recognized syndrome and the clinical manifestations of neck pain with radiating pain in the upper extremities and/or weakness and/or numbness are known to any physician. Radiculopathy is caused by the combined compression and inflammation of a spinal nerve. Both factors are necessary. This can be caused by an acute "soft" disk, a chronic "hard" disk, or more rarely by posterior compression of an enlarged facet [12].

2.4 Diagnosis

Cervical spondylosis is usually diagnosed on clinical grounds alone. Although the pain is primarily in the cervical region, it can be referred to a large area and is usually aggravated by movement of the neck. Neurologic changes

should always be sought in the upper and lower extremities, but objective changes only occur when spondylosis is complicated by myelopathy or radiculopathy, or when unrelated causes such as disc prolapse, thoracic outlet obstruction, brachial plexus disease, malignancy, or primary neurologic disease is present [13].

3. IMAGING

3.1 X-ray

Standard radiographs are an appropriate initial imaging study for neck and upper limb pain in the absence of "red flag" symptoms. However, the degenerative changes seen on imaging are often poorly correlated with the presence of neck pain. Common radiographic findings include osteophyte formation, disc space narrowing, end site clerosis, degenerative changes in uncovertebral and facet joints, and calcified/ossified soft tissue. AP, lateral and oblique views of the spine are sufficient to assess foraminal stenosis, sagittal alignment, and size of the spinal canal [14] The TorgPavlov ratio can be obtained by comparing the sagittal diameter of the spinal canal with the sagittal diameter of the vertebral body. The normal value is 1.0, with a ratio < 0.8 indicating cervical stenosis. The flexion and extension views are also worth considering if there is a risk of ligament instability [15].

3.2 Magnetic Resonance Imaging (MRI)

MRI is the imaging modality of choice to assess neural structures and soft tissues. It allows correct visualization of the entire cervical spine without subjecting the patient to radiation. Sagittal and axial sections can help quantify the degree of compression of the nerves and medulla, as well as reveal involved pathological changes (e.g., hernia, bone spurs, enlarged flava ligaments, or facet arthropathy). A hyperintense bone marrow signal on T2-weighted images may be representative of edema, inflammation, ischemia, myelomalacia, or gliosis. [16]. Despite the high sensitivity of MRI studies to spondylotic changes, they should not be part of the routine diagnostic examination unless otherwise indicated, given the high prevalence of degenerative signs on MRI in asymptomatic individuals [17].

3.3 Computed Tomography (CT)

CT provides a good definition of bony structures and is more sensitive than plain radiographs in assessing intervertebral foraminal stenosis in the setting of uncovertebral or facet hypertrophy. However, it is less sensitive than MRI for the evaluation of soft tissues and nerve root compression. [18].

3.4 CT Myelogram

CT provides good definition of bone structures and is more sensitive than plain radiographs when evaluating intervertebral foraminal stenosis in the context of uncovertebral or facet hypertrophy. However, it is less sensitive than MRI for evaluating soft tissue compressions and nerve roots [19].

3.5 Discogram

Provocative discography is rarely required in cervical spondylosis. It is useful in evaluating patients who have cervical discogenic pain or who have multiple hernias in which surgery is very likely. However, the diagnostic procedure remains controversial, as it can accelerate the degeneration of normal intervertebral discs [20].

3.6 Electromyogram (EMG)

EMG can be useful in supplementing neuroimaging findings in the diagnosis of cervical radiculopathy. It is especially valuable in differentiating nerve root compression from other possible concomitant neurologic conditions, including peripheral neuropathies, entrapment neuropathies, brachial plexopathies, myopathies, and motor neuron diseases [21].

4. TREATMENT / MANAGEMENT

The treatment strategy for cervical spondylosis depends on the severity of the patient's signs and symptoms. In the absence of alert symptoms or significant myelopathy, the goal of treatment is to relieve pain, improve functionality in daily activities, and prevent permanent damage to neural structures. Symptomatic cervical spondylosis should be addressed gradually, beginning with nonsurgical treatment [22].

4.1 Non Surgical

The basis of nonsurgical treatment is physical therapy for four to six weeks with isometric and resistance exercises to strengthen the muscles of the neck and upper back.

Pharmacological agents, including non-steroidal anti-inflammatory drugs (NSAIDs), oral steroids,

muscle relaxants, anticonvulsants, and antidepressants may be prescribed for pain relief. Therapy can be extended to opioid analgesics for refractory axial neck pain, but is not recommended for first-line or long-term use due to the potential for side effects [23].

Long-lasting medical devices can be considered to relieve symptoms. Short-term use of a soft neck brace can sometimes relieve acute neck pain and cramps. Using a cervical pillow at night can alleviate neck pain by helping to maintain normal cervical lordosis, which would improve the distribution of biomechanical loads between the intervertebral discs, promoting better quality sleep. [24].

Trigger point injections can be used to treat myofascial trigger points, which can manifest clinically as neck, shoulder, and upper arm pain. The most invasive interventional treatment options include epidural steroid injections (ESI), zygapophyseal (facet) joint injections, medial branch blocks, and radiofrequency injury (RFL). Long-term success reports are available in 40-70% of patients who have undergone interlaminar or transforaminal ESI for the treatment of cervical radiculopathy [25].

4.2 Surgical

Surgical intervention should be considered in patients with severe or progressive cervical myelopathy and in patients with persistent axial neck pain or cervical radiculopathy after failure of nonsurgical measures 26]. These affected individuals must also have a pathological condition demonstrated in neuroimaging studies consistent with their clinical characteristics. The surgical approach depends on the clinical syndrome and the pathological locations [27].

The anterior approach involves a cervical discectomy or corpectomy followed by fusion with an autograft, allograft, or artificial disc. Anterior plates, metal cages, and synthetic spacers can be used in conjunction with bone grafts and have resulted in comparable fusion rates, but long-term results are still unclear. In patients with radicular pain due to a central or bilateral disc herniation, an anterior approach is preferred [28]. whereas for a lateral disc injury, an anterior or posterior approach is possible. Anterior cervical discectomy and fusion (ACDF) is used to treat patients with myelopathy and pathological compression of up to three levels or with loss of cervical lordosis.

The posterior approach consists of partial discectomy, laminotomy foraminotomy, laminoplasty, and laminectomy. Foraminotomy alone is sufficient in patients with foraminal stenosis due to bone spur formation and / or a herniated disc. Laminectomy or laminoplasty is a clinical option for patients who require decompression to four or more levels or who have an anterior column that is already fused [29]. A preserved cervical lordosis is crucial for a posterior approach, as it allows the spinal cord to move dorsally after decompression. Patients with flexible cervical kyphosis require additional posterior cervical instruments to restore normal lordosis and maximize posterior spinal cord displacement [30].

5. CONCLUSION

Cervical spondylosis is a natural aging process and occurs in most people after the age of five. Most people with spondylotic changes in the cervical spine on radiographs remain asymptomatic. Cervical spondylosis is usually diagnosed for clinical reasons only, but imaging is also required. Treatment for cervical spondylosis can be medical or surgical, depending on whether the patient has symptoms of myelopathy, radicular pain, or neck pain.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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