

Examination of Patients with Neck Pain

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DEFINITION

IASP has defined cervical spinal pain or neck pain as “pain perceived anywhere in posterior region of cervical spine from superior nuchal line to first thoracic spinous process”.

Chronic neck pain can be defined as widespread sensation and hyperalgesia in the skin, muscles, and ligaments on palpation in both active and passive movements in neck and shoulder region.

INTRODUCTION

Neck pain is one of the most common complaints and hence is a major health issue which can have a negative impact on economy. It is more common in adult population with an incidence of 15% in males and 25% in females in age group of 21 to 55 years. The initial evaluation should be comprehensive in order to ascertain not only the etiology of physical symptomatology, but also the impact the patient’s disability has on their psychosocial environment.¹

RED FLAGS

Though chronic neck pain is commonly due to myofascial pain syndrome or facet joint arthropathy, red flags must be rule out. As cervical canal is almost completely occupied by spinal cord, minor reduction in canal diameter will lead to cervical myelopathy, hence careful assessment is important to

identify early signs of myelopathy. Occasionally patients develop high spinal cord compression leading to quadriplegia, respiratory insufficiency, and death.² Table 11.1 enlists the red flags in neck pain.

In patients presenting with any of the above signs and symptoms, immediate radiologic assessment has to be done (MRI of the cervical spine) and they should be referred to the neurosurgeon for further management.

Table 11.1: Red flags in case of neck pain

1. History of trauma—fracture leading to unstable spine, cord compression, myelopathy, vertebral body fracture.
2. Fever, malaise, nuchal rigidity—meningitis, epidural abscess.
3. Sudden weight loss, anorexia, night pain—cervical tumors, metastatic lesions, SOL leading to cord compression, vertebral compression fractures.
4. Progressive disturbance of gait, progressive motor or sensory deficits, bladder bowel incontinence—cervical myelopathy.
5. Acute progressive neurologic and cognitive deficits accompanied by hemodynamic instability dissecting vertebral artery aneurysms and extracranial carotid artery aneurysms.
6. Associated chest pain, tachycardia, and breathlessness on exertion—ischemic heart disease, cervical angina syndrome.
7. Associated Horner’s syndrome—pancoast tumor of the lung.
8. History of rheumatoid arthritis, morning stiffness >30 min, peripheral joints swelling and arthritis—atlantoaxial dislocation, fibromyalgia.

DETAIL HISTORY OF THE PATIENT

The purpose of thorough history with determination of the location, pattern, and distribution of the patient's pain is to establish an initial differential diagnosis that can subsequently be confirmed or ruled out by physical examination, diagnostic laboratory, radiologic and electrophysiological testing.¹

Age of Onset

In pediatric and adolescent patients, trauma or sports injuries are common causes for neck pain. Congenital defects such as Chiari malformations type 1, short neck syndromes can also lead to neck pain in these age groups.¹ In middle aged adults inflammatory arthritis such as rheumatoid arthritis, seronegative spondyloarthropathies like ankylosing spondylitis, psoriatic arthritis, and reactive arthritis should be considered in differential diagnosis. Degenerative changes are common in elderly patients.

Location of Pain

It helps us to know the underlying pain generator. Pain generators in joints and muscles are usually localized. Nerve root compression pain is dermatomally distributed and pain along the peripheral dermatomal and/or myotomal distribution suggests lesions of the cervical or brachial plexus or their branches. Axial neck pain may be due to internal disc disruption or bilateral facet joint. Paramedial pain suggestive of U/L facet joint and its referred pain, myofascial pain or other neck pathologies. Widespread pain can be seen in fibromyalgia, osteoarthritis, rheumatoid arthritis, SLE, hypothyroidism or somatization in severe depression. Infections and neoplasms can cause axial neck pain through bone destruction with irritation of vertebral body, periosteal nerves and altered biomechanics of the facet joints and cervical discs.³

Spread of Pain

Cervical and brachial referral patterns may be secondary to myofascial trigger points or

referred pain from cervical facet joints.¹ Pain commonly is referred from the shoulder, heart, lungs, viscera, or temporomandibular joint to the neck region owing to overlapping nerve distribution. Referred pain to the occiput usually indicates pathologic changes in the upper cervical spine and may radiate down the neck and to the ear.³ If the face, head, or tongue is involved, the upper three nerve roots of the cervical plexus may be affected. Numbness of the neck, shoulder, arm, forearm, or fingers indicates involvement of C5–T1.³ The referral area in cervical region is listed in Table 11.2.

Duration of Pain

Acute pain due to trauma, infection, disc prolapse with neurodeficit, vascular dissection with hemodynamic instabilities must be aggressively investigated and treated to avoid major complications and death. More gradual or insidious onset is common in progressive degenerative, inflammatory or malignant process.

Character of Pain

Pain due to musculoskeletal origin are generally dull, aching, deep, throbbing in nature, whereas neuropathic pain are sharp, shooting, electric shock like with tingling and numbness. Nerve root involvement pain is dermatomally distributed and described along

Table 11.2: Cervical pain referral pathways^{3, 4}

Location of pain	Source
Upper posterolateral cervical region	C0–1, C1–2, C2–3
Occipital region	C2–3, C3
Upper posterior cervical region	C2–3, C3–4, C3
Middle posterior cervical region	C3–4, C4–5, C4
Lower posterior cervical region	C4–5, C5–6, C4, C5
Suprascapular region	C4–5, C5–6, C 4
Superior angle of scapula	C6–7, C6, C7
Midscapular region	C7–T1, C7

these areas. Dermatologically, C1 and C2 innervate the occiput region; C3 and C4 supply the nape of the neck; C5 supplies the deltoid region; C6 innervates the radial aspect of the forearm, thumb and lateral half of index finger; C7 supplies the medial half of index finger, middle finger and the lateral half of ring finger; C8 is for the ulnar side of the ring finger, little finger, ulnar border of the hand; and T1 supplies the medial border of the forearm. T2–T12 provide innervations to the chest and abdomen, with T4 being at the nipple line, T10 at the umbilicus, and T12 at the inguinal ligament.³ Articular symptoms arise from the facet and vertebral joints causing stiffness and localized pain.³ Poorly localized, burning pain characters are seen in sympathetically mediated pain. Hyperesthesia, allodynia and burning pain suggest complex regional pain syndrome (CRPS).

Progression of Neurodeficits

Any progression of sensory or motor dysfunctions due to nerve root or cord compression must be considered as red flag and treated accordingly. Myelopathy can be due to mass effect from a tumor or infection or instability owing to systemic arthritis or connective tissue disorders, but it is often a result of advanced degenerative changes within the cervical spine and large central PIVD.³ There can be bladder and bowel disturbances with loss of proprioception due to dorsal column compression leading to gait disturbances.³ Upper motor neuron type of lesion in lower limb, described as stiffness in lower limbs and lower motor neuron type of lesion in upper limb at the level of compression, described as weakness and looseness in upper limb.

Aggravating and Relieving Factors

Pain due to spine involvement will be aggravated during movements. Facet joint pain will be aggravated by neck extension, lateral flexion and lateral rotation. Atlanto-occipital

joints arthritis is worsened with provocative neck flexion and extension, whereas atlantoaxial arthritis is worsened with rotation.³ Discogenic pain will be more in forward flexion. Myofascial pain will be aggravated by muscle stretching and palpating over tender points. Radicular pain will be relieved with arm abducted and externally rotated over head. Chronic inflammatory pain is often worsened after a period of inactivity and improves with exercise. Degenerative arthritis is often exacerbated by exercise and improves with rest.¹

Associated Symptoms

Morning stiffness, polyarthritis, rigidity, skin manifestations are associated symptoms in inflammatory arthropathy. Rheumatoid arthritis often involves the cervical spine, initially causing stiffness and later causing pain.³ After the hands and feet, the cervical spine is the most common site of disease involvement in rheumatoid arthritis.⁵ Ankylosing spondylitis often affects the entire axial skeleton with early limitation of lumbar motion and chest expansion and later involvement of the cervical spine.³ Fever, night pain and weight loss are suggestive of infectious etiology.

Dyspnea can be related to a deficit in the C3–C5 innervations of the diaphragm. Palpitations and tachycardia secondary to cervical spine pathology can be differentiated from other causes by the fact that these symptoms are associated with unusual positions or hyperextension of the neck. This hyperextension is caused by irritation of C4 innervation of the diaphragm and pericardium or by irritation of the cardiac sympathetic nerve supply. Drop attacks suggest posterior circulation insufficiency.³ Severe night pain, anorexia, progressive myelopathy is associated with malignancy.

Eye and ear symptoms may arise from irritation of the plexus surrounding the vertebral and internal carotid arteries. Eye symptoms can manifest with blurring of

vision relieved by changing neck position. Altered equilibrium with associated gait disturbances may result from irritation of the surrounding sympathetic plexus or from vertebral insufficiency.

OCCUPATIONAL HISTORY

Jobs requiring hyperextension of neck for overhead work are prone to occipital neuralgia and cervicogenic headache due to upper cervical spine involvement, whereas jobs requiring prolonged neck flexion such as computer work is prone to interspinous ligament sprain and lower cervical spine involvement.

FAMILY HISTORY

Various inflammatory and non-inflammatory arthritis such as rheumatoid arthritis, ankylosing spondylitis, Reiter's syndrome and psoriatic arthritis run in families and also tumors like schwannoma, neurofibromas, compressing cervical cord seen in familial neurofibromatosis type 1.¹ Family history of diabetes, hypothyroidism will help to identify diabetic neuropathy and widespread pain.

REVIEW OF OTHER SYSTEMS

For diagnosing referred pain from heart, lungs, abdomen, history regarding these systems involvement must be taken thoroughly. Angina can lead to referred neck pain with breathlessness on exertion, and dysrhythmias. In C6–C7 lesion, pain and tenderness may be present in the scapular region or over precordium known as pseudoangina³, and may be associated with torticollis or muscle spasm in the neck. Differentiation of heart disease from symptoms associated with C6–C7 dysfunction is made on the basis of muscle weakness, fasciculations and sensory or reflex changes.⁶ Respiratory infections can lead to cervical lymphadenopathy causing neck pain. Diaphragmatic irritation due to peritonitis due to infection or abdominal carcinoma will lead to referred pain to shoulder and neck.

PAST TRAUMA AND SURGICAL HISTORY

History of accident with whiplash injury due to hyperextension followed by hyperflexion is significant as these injuries in acute cases should be carefully evaluated for unstable fractures and cord compression. Mostly there is myofascial pain which will recover gradually. The prevalence of cervical facetogenic pain is high in the whiplash population.⁷ Past history of trauma or nerve injury with pain more than inciting injury along with sympathetic and autonomic changes, can be suggestive of CRPS. In case of past cervical spine surgery, facet joints and disc above and below fixation are more prone for arthropathy and degeneration due to shifting of load.

EXAMINATION

Clinical examination related to neck pain starts as soon as patient enters the room.

Gait: It is normal when neck pain is due to local pathology not involving cord. In cervical myelopathy, Trendelenburg gait, bilateral spastic, ataxic or spastic-ataxic gait can be present.

Body habits: Cancer patient will be cachexic. Patient with chronic infection will be thin built.

Higher functions: Mood and affect are altered due to chronic pain and help us to know impact of pain on daily routine quality of life. Cognition is impaired in cancer, vascular dissection and hemodynamically unstable patients.

INSPECTION

a. Skin: Skin over neck and upper limb is inspected for post-herpetic vesicular scarring which will be dermatomally distributed and do not cross midline in cases of post-herpetic neuralgia. Psoriatic skin eruptions can be seen in psoriatic arthropathy. Signs of inflammation like erythema, swelling, redness can be present in local pathologies of neck.

- b. Head and neck posture:** Patient with neck pain tries to stabilize joint by surrounding muscle contraction to avoid movement aggravating pain.
- c. Shoulder symmetry:** In cases of shoulder pathologies or neck muscles contraction in myofascial pain, shoulder joints will be drooped or pulled upward.
- d. Muscle wasting:** Gross muscle wasting can be seen on inspection suggestive of motor nerve fiber involvement like brachial

plexopathy. It will be present in both upper and lower limbs in case on myelopathy.

PALPATION

It helps us to locate exact pain generators by eliciting local tenderness. Axial cervical spinous tenderness may be present in bilateral facet joint arthropathy, whereas interspinous tenderness in case of interspinous ligament sprain. Paramedial pain may be due to facet joint, myofascial or local infective sources like lymph node. Table 11.3 shows various structures to be palpated anteriorly and posteriorly.

Table 11.3: Palpation findings in a neck pain^{1,3}

Anteriorly or anterolaterally	
A. Bony structure	B. Soft tissue palpation
1. Between the angle of the jaw and the styloid process—transverse process of C1	1. Thyroid gland swelling or nodule.
2. At the level of the hyoid bone—C3–C4 facet joint.	2. Cervical lymph nodes enlargement due to infection or metastasis.
3. At the level of the thyroid cartilage—C4–C5 vertebral body and facet joint.	3. Sternocleidomastoid muscle for trigger and tender point.
4. At the level of the cricoid ring—C6 with carotid tubercle.	
5. Head of first rib with 1st costochondral joint should be palpated for pain generator.	
Posteriorly and posterolaterally	
A. Bony structures	B. Soft tissue palpation
1. Occiput,inion, superior nuchal line, mastoid processes. Tenderness or pain with examination 3 cm from the midline over superior nuchal line may be seen with occipital neuralgia where greater occipital nerve lies and lesser occipital nerve lies over medial two-thirds and lateral one-third of line joining occiput and mastoid process.	1. Suboccipital muscles and trapezius muscle for myofascial trigger and tender points.
2. Facet joints are located 2–3 cm from the midline. Palpation of the lateral atlantoaxial joint of C1–C2 is undertaken by rotating the patient's head to the ipsilateral side. ¹	2. Paraspinal muscles for stiffness.
3. C3–C5 are difficult to palpate due to cervical lordosis and identified by anterior structure.	3. Interspinous space for ligament sprain.
4. C7 has a largest spinous process and easily palpated.	4. Posterior group of lymph node for malignant metastasis or infection.

RANGE OF MOTION

It may reveal pain or limitations in flexion-extension, lateral bending, and rotation. Neck flexion occurs with 50% of the motion occurring at the occiput-C1 joint and the remaining 50% distributed over C2–C7. If the patient is unable to place the chin on the chest, the interval should be measured. One finger width shows a limitation of 10°; three finger indicates a 30° limitation in flexion. Backward neck extension, the distance between the base of the occiput and T1 spinous process should be measured. Lateral flexion should allow the ear to touch the shoulder with motion being shared across all cervical vertebrae. On rotation, the chin should touch the shoulder with 50% of rotation occurring at C1–C2 and the remaining 50% distributed in the sub-axial spine between C3 and C7.³ There is a natural decrease in range of motion with age, even in healthy individuals.⁸ Range of motion tests the ligaments, capsules, and fascia, and this range of motion is reduced in the presence of cervical spinal muscular spasm or pain. Patients with degenerative changes of the cervical spine have pain with decreased range of motion of the cervical spine. The most common findings secondary to changes in the cervical spine articulations are: Restriction of movement with or without pain, pain on movement, and local tenderness. Lateral flexion is the earliest and most impaired movement in degenerative diseases with rotation first impaired in rheumatoid arthritis owing to involvement of the odontoid peg. A uniformly stiff neck may be caused by diffuse idiopathic skeletal hyperostosis, which is present in a quarter of elderly patients, but also may be due to ankylosing spondylitis or recent trauma to the neck.⁹ If articular signs are found, the examiner must evaluate the entire vertebral column and peripheral joints for evidence of further arthritis and search for extra-articular manifestations. Causes of decreased range of motion of the cervical spine include joint locking and bony ankylosis from degenerative changes or

arthritis, fibrous contractures, muscle spasm, splinting over painful joints, and nerve root or spinal cord compression or irritation.³

SPECIAL TESTS AND SIGNS

These tests change the diameter of the neural foramen, thereby increasing or decreasing the symptoms.

a. Spurling maneuver (Fig. 11.1): Passive lateral flexion and compression of head. Positive test is reproduction of radicular symptoms distant from neck.¹⁰ It also increases pressure on the cervical facet joints and may intensify facet mediated pain.¹

b. Shoulder abduction (relief) sign (Fig. 11.2): Active abduction of symptomatic arm, by placing the patient's hand on head. Positive



Fig. 11.1: Spurling's test



Fig. 11.2: Shoulder abduction (relief) sign

test is relief or reduction of ipsilateral cervical radicular symptoms.¹

c. Neck distraction test (Fig 11.3): Examiner grasps patient's head under occiput and chin and applies axial traction force for 30 to 60 seconds. Positive test is relief or reduction of cervical radicular symptoms.⁵ Increased pain with this maneuver may be due to inflammatory or degenerative disease, or muscle or ligamentous pathology.¹

d. Valsalva test (Fig. 11.4): This test is performed by having the patients place their thumb in their mouth and blow, as if to push the thumb out of their mouth. This maneuver increases the intraspinal pressure and may reveal the presence of space-occupying lesions of the cervical spine such as large

intervertebral disk herniations, tumors, and stenosis due to spondylosis or osteophytes. If the mass involves the area of the spine adjacent to nerve roots, radicular pain may be reproduced.¹

e. Jackson's compression test (Figs 11.5 and 11.6): The patient is instructed to rotate his or her head first to the right and then to the left. The examiner exerts gentle pressure to the top of the patient's head after each movement. This test places increased pressure on the cervical facet joints and causes narrowing of the neural foramen and reproduce neck pain due to facet arthropathy and/or upper extremity radicular pain due to nerve root compression.¹



Fig. 11.3: Neck distraction test



Fig. 11.5: Jackson's compression test



Fig. 11.4: Valsalva test



Fig. 11.6: Jackson's compression test

f. Lhermitte's sign: Production of paresthesias or dysesthesias in the arms or legs upon flexion of the cervical spine. It may be caused by a large disc herniation or bony compression of the anterior cord in patients with a narrowed central canal. It may also occur in patients with rheumatoid arthritis with associated instability or in patients with multiple sclerosis affecting the cervical spinal cord, tumors, and syringomyelia.¹ This indicates changes in the white matter of the spinal cord and may be secondary to cervical myelopathy or multiple sclerosis.³

g. Adson's maneuver (Fig. 11.7): This test is used to rule out compression of the subclavian artery by an extra cervical rib or scalene muscle bands, which may result in thoracic outlet syndrome. The patient's arm hangs at their side and the head is extended and rotated toward the affected side. The patient is then instructed to breathe deeply and hold their breath while the radial pulse is monitored. The test is considered positive, if the radial pulse disappears.¹

h. Grip-release test: It is an inability to open and close a fist rapidly because of weakness and spasticity of the hand.

Sensory Examination

Light touch, pressure sense, pinprick along with temperature and proprioception should



Fig. 11.7: Adson's maneuver

be done in both upper limbs for comparisons in cases of radiculopathy, CRPS, peripheral neuropathy and in all four limbs in case of myelopathy. Progressive sensory loss is considered as red flag.

Motor Examination

Motor functions are tested as per standard grading 0 to 5, with grade 0 having no power, grade 1 having trace flickering movements, grade 2 having motion with gravity eliminated, grade 3 having antigravity function, grade 4 having function against slight resistance, and grade 5 having normal strength against resistance. Progressive decreasing motor grading or grade 3 or less is considered as red flag. Lower motor neuron disease is indicated by weakness, hypotonia, and fasciculations. Upper motor neuron disease is indicated by spasticity.³

Reflexes

Deep tendon stretch reflexes should be performed and graded on a scale of 0 to 3 with 0 being no response, 1 being hyporeflexive, 2 being normal, and 3 being hyperreflexive. To facilitate reflex testing, it may be helpful to use muscle loading or Jendrassik maneuver (performed by having the patient flex both sets of fingers into a hook-like form, interlocking the hands, and pulling apart). This maneuver creates a diversion to help relax the patient and assess lower extremity reflexes. If difficulty with reflex testing persists, the clinician should ensure that no peripheral neuropathy is present.³

a. Biceps reflex (Fig. 11.8): C5 is tested by striking the biceps tendon with elbow flexed.

b. Supinator reflex (Fig. 11.9): C6 mediated and tested with elbow semi-flexed with forearm midpronated by striking over brachioradialis tendon over radial tubercle.

c. Triceps reflex (Fig. 11.10): C7 mediated and tested with elbow flexed and triceps tendon is struck above olecranon process.



Fig. 11.8: Biceps reflex



Fig. 11.9: Supinator reflex



Fig. 11.10: Triceps reflex

d. Babinski test: It is performed by stroking the lateral plantar aspect of the foot with a pathologic response indicated by an up-going great toe indicating an upper motor neuron lesion.¹⁰

Lower limb reflexes, knee and ankle reflex should be checked in case of myelopathy in which they will be exaggerated due to upper

motor neuron lesion, whereas upper limb reflexes will be diminished due to lower motor neuron lesion.

OTHER SYSTEMIC EXAMINATION

a. Cardiovascular: To rule out referred pain of angina in neck, cardiovascular examination must be carried out thoroughly.

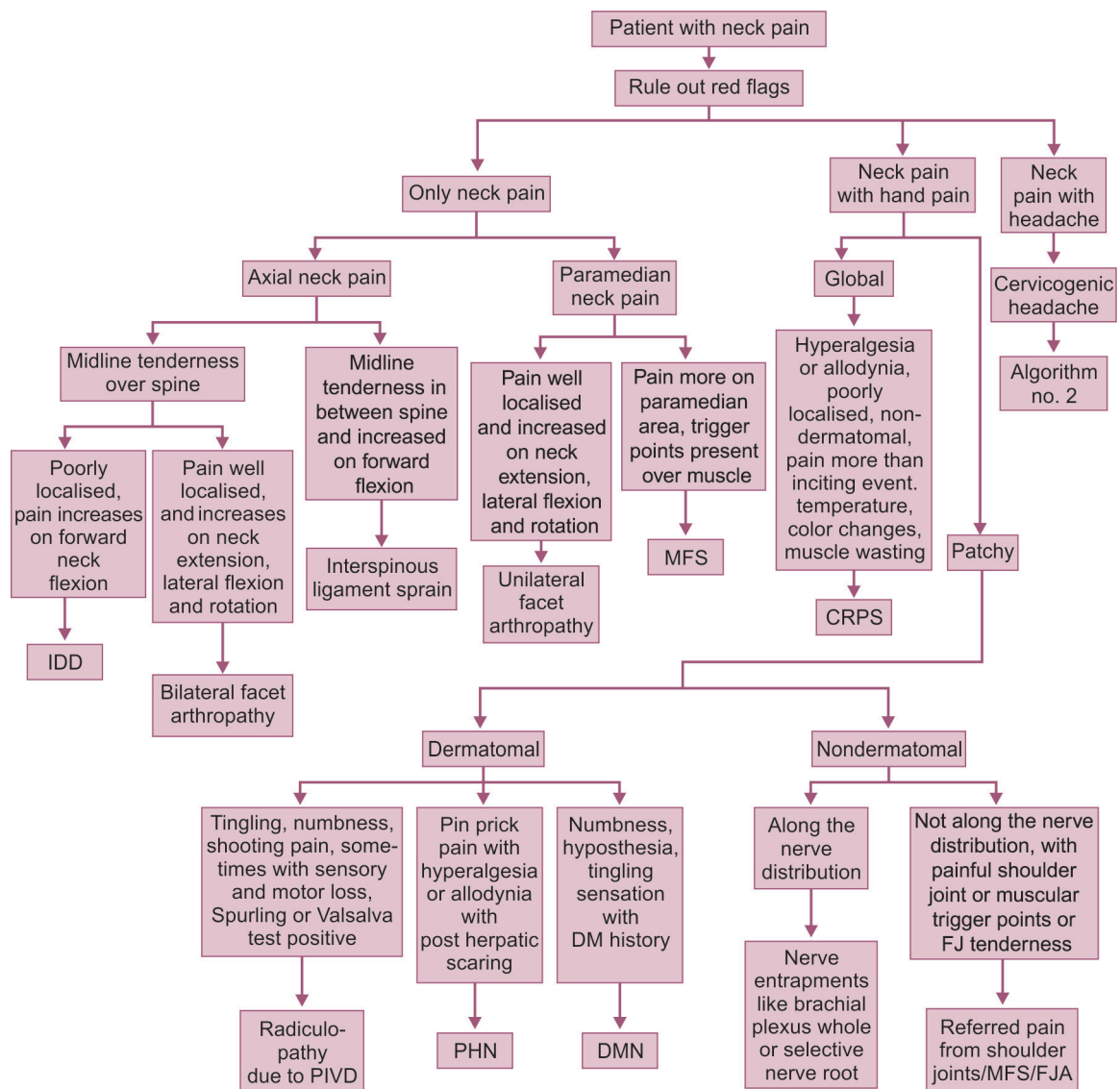
b. Respiratory: Pancoast tumor of lung apex causes lower brachial plexus invasion and plexopathy, diaphragmatic involvement can cause referred neck pain. Respiratory

rate, pattern and lung field auscultation help to rule out lung pathologies.

c. Abdominal: Palpation of abdominal organs for enlargement and infection.

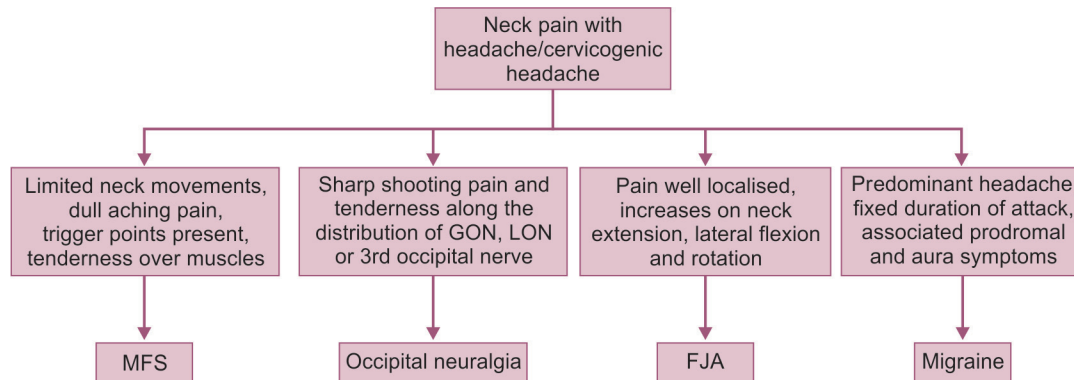
DIAGNOSTIC ALGORITHMS OF NECK PAIN

Algorithm 1



MFS—Myofascial pain syndrome, FJA—facet joint arthropathy, IDD—internal disc disruption, PIVD—prolapse intervertebral disc, PHN—postherpetic neuralgia, DMN—diabetic mononeuropathy, CRPS—complex regional pain syndrome.

Algorithm 2



MFS—myofascial pain syndrome, FJA—facet joint arthropathy, GON—greater occipital nerve, LON—lesser occipital nerve.

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