BRACHIALGIA: CERVICAL RADICULOPATHY AND DIFFERENTIAL DIAGNOSIS

Brachialgia had a wide differential diagnosis.

ROBERT DUNN, MB ChB, MMed (Orth), FCS (SA) Orth

Associate Professor, Division of Orthopaedic Surgery, University of Cape Town and Head, Spine Services, Groote Schuur Hospital, Cape Town
Robert Dunn is an orthopaedic surgeon with subspecialist training in spinal surgery. In addition to heading the Acute Spinal Cord Injury Unit, a
regional service based at Groote Schuur Hospital, he runs a comprehensive spine surgical service managing the full range of spine pathologies. He has
a particular interest in deformity, especially in the growing spine, where he manages congenital and acquired conditions causing kyphosis and scoliosis.

Correspondence to: R Dunn (info@spinesurgery.co.za)

Brachialgia or upper limb pain can be due to pathologies of the joints, soft tissue and to referred pain from nerve compression. Thus the primary care physician has to entertain a wide differential when a patient presents with such a complaint.

A careful history and examination is required to differentiate between the possible causes of the pain. Although appropriate special investigations may be required, they often cause confusion due to frequent co-existence of degenerative conditions, which may in fact be asymptomatic.

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The purpose of this article is to highlight the contribution of cervical pathology to upper limb pain and differentiate it from the other possible diagnoses. A frequent source of confusion arises in distinguishing between shoulder rotator cuff pathology and cervical radiculopathy, and there are of course peripheral nerve compression syndromes that also come in to play.

History

A clear understanding of the onset and nature of the pain is required. A cervical radiculopathy may be acute or insidious in onset. There may be associated axial neck pain and reduced cervical range of movement. Certain cervical movements may relieve or exacerbate the pain. Typically extension and lateral bending to the side of the pain causes or intensifies the pain. This is due to foraminal compression.

The higher cervical roots cause radiating pain into the occiput and posterior neck and shoulder. C2 (between C1 and C2) typically causes peri-auricular (ear) pain and is most frequently present in rheumatoid arthritis patients with atlanto-axial instability from inflammatory joint destruction.

The more distal roots cause radiation down the arm. C5 typically radiates into the shoulder, with C6 differentiating itself by radiating to the lateral elbow and into the thumb. C7 causes more posterior arm pain and into the middle finger when classic, with C8 involving the little finger. Scapula pain might be a feature that often confuses the situation, and is often due to C7 root irritation.

Shoulder pathology may be occupation or hobby related where the patient performs overhead work, or where the patient has recently performed unusual activity. There may be local muscle spasm with pain radiating down the proximal arm and into the base of the neck. There is usually a complaint of loss of range of motion and function. The patients may complain that they can no longer clip their bra or brush the hair on the back of their head.

Should the pain be relieved by arm elevation, cervical radiculopathy is more likely. In the severe case, the patient may hold the arm elevated with the unaffected arm in an effort to control the pain. This posture reduces the tension on the root and thus the pain.

Complaints of arm numbness or paraesthesia suggest neural involvement, and if a root dermatome, suggest cervical pathology.

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Should the complaints sound neural, i.e. dermatomal paraesthesia or pain, extraspinal causes of neural compression need to be considered. Brachial plexus pathology can also cause these symptoms. Nerve roots, trunks or actual nerves can be affected, depending which level of the brachial plexus is involved. This becomes very complex and requires a thorough knowledge of the brachial plexus anatomy, which few of us can remember unless frequently challenged. Generally, pathologies such as tumour (e.g. Pancoast's apical lung carcinoma) or trauma are likely to cause more than one root to be involved. Cervical pathology tends to involve only one root, although it can be difficult to always be sure which one if it is only proximal and there are no hand signs.

Constitutional symptoms, such as loss of weight, should be asked for and if present these should be investigated.

Examination

Examination involves an overview of general health status to exclude infection and malignancy.

Shoulder muscular wasting suggests local pathology, but a few weeks of disuse from cervical radiculopathy may well cause wasting. Local peri-scapular wasting, especially the supraspinatus muscle, viewed from above brings suprascapular nerve entrapment into the differential diagnosis.

Pain on palpation of the acromio-clavicular joint and the anterior rotator cuff may be useful in confirming rotator cuff problems.

All planes of cervical motion should be tested but in the older patient are often reduced. Likewise, reduced shoulder motion due to pain, especially abduction, confirms shoulder pathology. C5 root power loss will, of course, also limit shoulder abduction but is usually pure weakness and should not cause pain on movement of the shoulder.

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The Spurling test is useful to confirm cervical disc prolapse as the cause. This is performed with extension and lateral flexion to the side of pain with axial loading (downward pressure on the head by the examiner) (Fig. 1).

A thorough neurological examination is important to assess the nerve function in terms of power, sensation and reflexes. Typically there is sensory alteration in the areas of pain when the cause is nerve

Brachialgia



Fig.1. Spurling test to confirm cervical disc pathology as the cause of radicular pain.

compression, with a normal examination in shoulder pathology. Weakness needs to be assessed carefully as it is likely to be caused by neural pathology, pain inhibition or even anatomical disruption of structures such as the rotator cuff or biceps tendon.

Likewise, reduced shoulder motion due to pain, especially abduction, confirms shoulder pathology.

C5 pathology causes abductor and biceps weakness with an absent/diminished biceps jerk. This needs to be differentiated from a rotator cuff tear. Passive movement needs to be checked, and if passive shoulder abduction or elevation at 45° to the sagittal plane causes shoulder pain, then rotator cuff pathology is more likely.

When sensory disturbance is more in a nerve dermatome, such as the lateral three-and-a-half fingers on the palmar aspect, then a single root cannot be responsible. This is more likely to be a median nerve compression syndrome, the most likely being the carpal tunnel syndrome.

At this point, the examining physician is usually in a position to make a diagnosis based on the clinical findings.

Special examinations

Often there is no need for special investigations as cervical radiculopathy is self-limiting and a 'wait and see' stance may be adopted. The same is true for local causes where a trial of symptomatic care may be instituted.

The mainstay however is X-rays (Figs 2 and 3). Cervical X-rays are not particularly useful as degenerative changes (spondylosis) are common in the asymptomatic patient. C5/6 is commonly degenerate in the people over the age of 40, with reduced disc height and anterior osteophytes. Foraminal osteophytes may be visible on the oblique views, but



Fig. 2. Lateral cervical X-ray demonstrating early C5/6 disc degeneration with loss of disc height, loss of segmental lordosis and anterior osteophytes.



Fig. 3. Lateral cervical X-ray demonstrating advanced C5/6 degeneration with obliteration of disc space and marked osteophytosis.

again most are not pathological. X-rays may demonstrate instability if forward shift (anterolisthesis) is evident, or evidence of soft-tissue change or bony erosion from infection or tumour. The addition of flexion/extension views is useful to unmask this instability, often present in rheumatoid patients.

Shoulder X-rays may confirm gleno-humeral arthritis or reduced sub-acromial space suggesting rotator cuff pathology.

Should cervical radiculopathy be highest on the list, an MRI is indicated once intervention

is planned. MRI is excellent for soft-tissue visualisation and thus the discs and nerve tissue can be assessed. The root compression in the foramina can thus be confirmed (Figs 4 and 5).



Fig. 4. Sagittal MRI of the cervical spine confirming C6/7 disc extrusion.

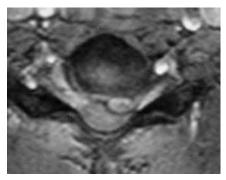


Fig. 5. Axial MRI of the cervical spine confirming the C6/7 disc extrusion.

EMGs are usually unhelpful. They require specialist interpretation and most of the time are unable to differentiate between the various sites of compression, such as cervical versus carpal tunnel.

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Shoulder ultrasound can be useful in confirming the presence of a rotator cuff tear but is operator dependent. Shoulder MRI can assess the muscular condition and adds value.

Cervical radiculopathy

The C6 and C7 nerve roots are typically involved, due to C5/6 and C6/7 disc pathology respectively. There is seldom an urgency to proceed surgically unless profound motor weakness or myelopathy (upper motor signs) is present.

Many of these patients will improve spontaneously while symptoms are managed with conservative means such as analysesics and physiotherapy.

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Should pain persist beyond 6 weeks or be debilitating despite analgesics, surgery is indicated subject to MRI confirmation. An anterior discectomy and fusion is the gold-standard procedure with high rates of pain resolution. The downside is the fusion and the increased risk of supra-jacent disc level degeneration. Motion preservation technologies, such as disc replacement, are a consideration to avoid this but are for a well-selected patient only. Those with associated facet joint degeneration may in fact experience increased axial pain with replacement surgery due to the new motion and forces they are exposed to.^{1,2}

Thoracic outlet syndrome (TOS)

TOS refers to compression of the brachial plexus and vascular structures at the base of the neck as they exit over the first rib and between the scalenus muscles. It is a rare cause of arm pain. Although TOS can present with symptoms and signs of vascular claudication, the vast majority of patients complain of neurological symptoms, i.e. pain, paraesthesia, or arm and hand weakness. Typically it is the lower brachial plexus trunk that is involved and thus the C8 and T1 areas. There are a number of provocative tests designed to elicit the symptoms but they are seldom useful.

The diagnosis is often that of exclusion, with a raised index of suspicion if cervical ribs are present. EMGs are generally not helpful. MRI can delineate the anatomy of the plexus and is the imaging of choice. With the introduction of open scanners, imaging with the arm in abduction can be done to confirm neural and/or vascular compression. A few patients may benefit from surgical decompression.³

Median nerve compression

The median nerve is often referred to as the 'eye' of the hand due to its large sensory contribution to the working surface of the hand. It provides sensation to the lateral three and a half digits. Thus compression of the median nerve causes pain and numbness in this area.

The commonest site of compression is in the carpal tunnel at the wrist. Symptoms don't always involve the whole median distribution and isolated thumb involvement can be confused with proximal C6 radicular pathology. Typically carpal tunnel syndrome (CTS) causes nocturnal symptoms, with patients complaining of waking with a numb painful hand. They are often not able to confirm sparing of the little finger, although it is not involved. They often relieve the pain by 'shaking it out'.

Diagnosis can be confirmed clinically by the Phalen test (Fig. 6) where the wrist is flexed 90° and kept in this position for 30 - 60 seconds. Should the thumb and other median nerve-innervated fingers develop the numbness and replicate the patient's symptoms, the test is considered positive. Additional tests are the 'tap' and compression tests (Fig. 7). The examiner taps over the volar aspect of the wrist just proximal to the wrist crease. Should there be paraesthesia in the median area of the palm, it confirms CTS. Likewise compression over this area with the examiner's thumb causes palmar symptoms in the CTS patient.



Fig. 6. Phalen test where the wrist if flexed to elicit median nerve distribution paraesthesia/numbness and confirm carpal tunnel syndrome.



Fig. 7. Compression test to confirm carpal tunnel syndrome.

CTS may be transient, such as in pregnant women, and a night splint to prevent wrist flexion is all that is required. More persistent symptoms may require a surgical release where the flexor retinaculum is divided to decompress the median nerve.

The median nerve is less commonly compressed more proximally as it courses

down the arm. Compression can occur between the two heads of the pronator teres muscle, between pronator teres and the flexor digitorum sublimus muscles and from an aponeurotic band of fibrous tissue extending from the biceps tendon to the forearm fascia.⁴

Anterior interosseus nerve

The anterior interosseus nerve is the largest branch of the median nerve, exiting 5 - 8 cm distal to the lateral epicondyle just distal to the heads of the pronator teres and then runs on the interosseus membrane to the wrist. It supplies the flexor digitorum profundus muscles of the thumb and index finger and occasionally the middle finger.

Patients may experience pain in the elbow area followed by weakness of the aforementioned muscles and inability to form an 'O' with the index finger and thumb (Fig. 8). As there is no easy differentiation between neuritis and compression as regards this nerve, there is no clarity on ideal management.⁵



Fig. 8. Inability to flex the distal interphalangeal joint and form the 'O' with a left-sided anterior interosseus nerve deficit.

Posterior interosseus nerve (PIN)

The posterior interosseus nerve is a branch of the radial nerve just distal to the elbow

Brachialgia

joint and supplies the supinator muscle and extensors of the wrist and fingers. Compression of the PIN may be painless or painful. It is often misdiagnosed as a recurrent tennis elbow, but is differentiated by careful palpation. Tennis elbow tends to cause pain over the extensor muscle origin whereas the PIN is tender about 3 cm distal to this. Management is initially symptomatic with behaviour modification but may require surgical decompression in the end.

Ulnar nerve

The ulnar nerve can be entrapped at the wrist in Guyon's canal. It is more medial and superficial than the median nerve carpal tunnel. The dorsal sensory branch leaves the nerve before the canal, and is thus not affected when there is canal compression. Diagnosis can be late due to slow intrinsic

muscle wasting, less obvious that median nerve sensory symptoms.

Froment's sign is positive with ulnar nerve pathology. Ask the patient to clasp a piece of paper between the thumb and index finger while both digits are maintained in a straight position. An attempt to pull the paper out will result in flexion of the interphalangeal joint if the ulnar nerve is not functioning.

More proximal entrapment will involve both the motor and the sensory component. The ulna nerve is vulnerable at the elbow where it lies medially. Joint instability as in rheumatoid disease can cause ulnar compression and traction in this area.

Thus upper limb pain has a wide differential. The physician needs to exclude shoulder

pathology and peripheral nerve compression before diagnosing cervical radiculopathy.⁶

References available at www.cmej.org.za

IN A NUTSHELL

- Upper limb pain can be caused by joints, soft-tissue and referred pain from neurological pathology.
- Cervical spine and shoulder pathology are often confused.
- Neurological radiating pain can be due to cervical radiculopathy or peripheral nerve compression syndromes.
- A careful history, examination and, when appropriate, special investigations, are required to differentiate between the causes of brachialgia.