Diagnosis and management of acute non-degenerative neck pain

Introduction

Neck pain affects 60% of the population at some point in their lives (Binder, 2006). Prevalence increases with age for both men and women, peaking in the 5th decade of life, with women affected twice as frequently as men (Picavet and Schouten, 2003; Binder, 2006). Approximately 10% of patients with acute neck pain develop chronic symptoms (Makela et al, 1991; Binder, 2006), with up to a third seeking medical attention (Andersson et al, 1999; Woolf et al, 2004). Thus, 1 in 5 people with pain actually seek help.

There is wide variation in management of acute neck pain (Vos et al, 2007) because of the lack of clear clinical guidelines and effective treatments. However, around 5–10% of cases of acute neck pain may be a result of serious underlying pathology requiring specialist investigation and intervention. Therefore while over 80% of cases do not have significant pathology and exhibit a benign and self-limiting prognosis, it is important to appreciate the differential diagnosis (*Table 1*) and to exclude more serious causes of acute neck pain.

Table 1. Differential diagnosis of acute non-degenerative neck pain

Benign (>85%)	
Traumatic (5–10%)	Fracture
	Subluxation
	Dislocation
	Acute disc prolapse
	Acute nerve entrapment
Non-traumatic (<5%)	Infection
	Neoplastic
	Vascular

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Traumatic neck pain

History

Demographics influence the condition of the bone and soft tissues, in particular the relative compliance of these tissues to withstand traumatic injury. It is important to establish the mechanism of injury, as this provides information regarding the degree and direction(s) of the energy dissipation and indicates locations of possible injuries. The presence of concurrent injuries, such as pelvic or long bone fractures, will also indicate a high-energy injury with the risk of cervical trauma. Post-injury neurological symptoms, including loss of consciousness, may be transient but are important to elicit for diagnostic information. A clear understanding of the events leading up to the injury is therefore vital from both a clinical and medicolegal perspective.

Initial management

The initial management of all suspected traumatic spinal injuries should follow Advanced Trauma Life Support (ATLS) guidelines (American College of Surgeons Committee on Trauma, 2008). Following a traumatic incident the cervical spine is assumed to be injured until proven otherwise. Initial management should follow the standard protocol of airway maintenance with cervical spine control, breathing, circulation and control of blood loss, disability and exposure (ABCDE).

With a suspected cervical spine injury maintenance of a patent airway remains the priority with the jaw thrust manoeuvre preferable to the head tilt to minimize movement of the cervical spine. The cervical spine should be triple immobilized with a semi-rigid collar, side blocks and tape to secure the head to the spinal board. Manual inline immobilization must be maintained if this equipment needs to be removed for any period of time before cervical injury is excluded.

The spine board should be used for patient extrication and the patient should be transferred to a firm mattress as soon as possible to prevent decubitus ulcers.

Approximately 10% of patients with a cervical spine fracture have a second, non-contiguous spinal fracture (American College of Surgeons Committee on Trauma, 2008). In addition, at least 5% of patients suffer deterioration in neurology after reaching hospital (American College of Surgeons Committee on Trauma, 2008), possibly the consequence of ischaemia, oedema or inadequate immobilization. However, an adequately immobilized cervical spine allows the clinician to examine and investigate any systemic cardiovascular or respiratory instability.

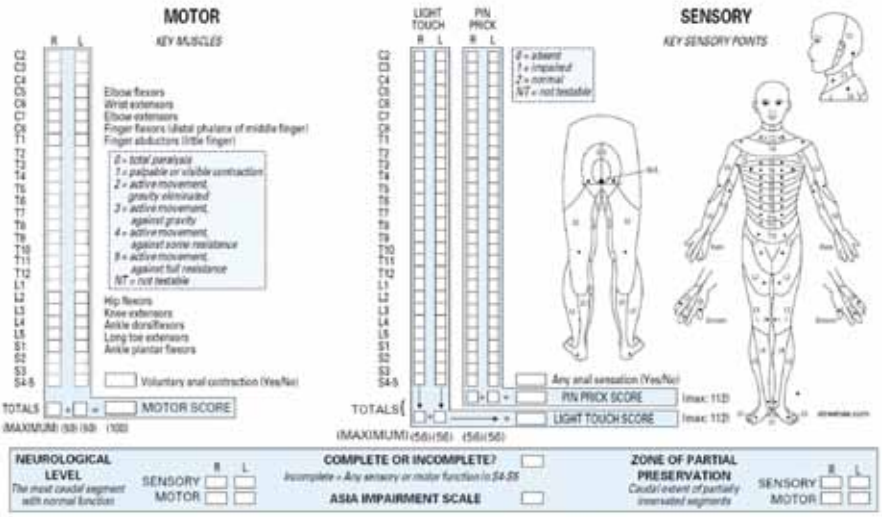
Examination

Following cardiovascular stabilization attention should focus on examining the spine. Initial assessment should incorporate a thorough neurological examination, including determination of a 'sensory level' – the lowest dermatome with normal sensory function. Subsequent motor examination should identify functioning myotomes – groups of muscles supplied by a single nerve root (spinal segment). *Figure 1* shows both the dermatomes and myotomes.

Spinal cord injury syndromes

Five specific spinal cord injuries pattern have been described:

1. Central cord syndrome – a disproportionate loss of motor power with the upper extremities affected more than the lower extremities. Sensory loss is variable and the prognosis is fair.
2. Anterior cord syndrome – paraplegia and a dissociated sensory loss with loss of pain and temperature sensation but preservation of proprioception, vibration and deep pressure (posterior columns). The prognosis is poor.
3. Brown–Séquard syndrome – usually from penetrating trauma, resulting in the hemi-section of the cord with ipsilateral motor and proprioception loss and contralateral loss of pain and temperature sensation. Prognosis is good.
4. Root compression – symptoms depend on level involved, although prognosis is good



ASIA impairment scale

A	Complete:	No motor or sensory function is preserved in the sacral segments S4–S5
B	Incomplete:	Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4–S5
C	Incomplete:	Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3
D	Incomplete:	Motor function is preserved below the neurological muscles below the neurological level have a muscle grade of 3 or more
E	Normal:	Motor and sensory function are normal

Figure 1. American Spinal Injury Association (ASIA) neurological assessment. From American Spinal Injury Association (2011).

5. Complete cord injury – secondary to burst fracture and canal compression, with no function below the injury level. The prognosis is poor.

Investigations

Guidelines were developed from the National Emergency X-Radiography Utilization Study Group study (Hoffman et al, 1998, 2000). Patients must meet the following criteria to be classified as having a low probability of injury:

1. No midline cervical tenderness
2. No focal neurological deficit
3. Normal alertness
4. No intoxication
5. No painful distracting injury.

Patients with any of the above features require further imaging of the cervical spine.

There is now good evidence that computed tomography is a better imaging modality in patients with traumatic mechanisms of injury who have a suspected cervical spine injury than plain radiographs (Griffen et al, 2003; Gale et al, 2005; Holmes and Akkinepalli, 2005; Bailitz et al, 2009).

Magnetic resonance imaging

This modality is most useful in detecting soft tissue injuries not visualized with computed tomography or plain radiographs, for example traumatic disc herniation, epidural haematoma, spinal cord oedema or compression, and posterior ligamentous disruption. It is also useful in children where the incidence of 'spinal cord injury without radiographic abnormality' is much higher.

Management

Initial treatment should include full spine immobilization and precautions including cervical orthosis (for stable fractures) or skull traction (for unstable injuries) as a general rule. The presence or absence of neurogenic shock should be looked for and treated with appropriate vasopressor support with expert guidance. One should be cautious about the use of intravenous steroids in the case of neurological injury, because of the significant associated side effect profile, and this should be discussed with the spinal surgeon or neurosurgeon who will be looking after the patient. Quite often there will be local guidelines to follow. It should be noted that there is no neurological benefit from using steroids if started after 8 hours.

Subsequent treatment will be determined by the type and location of injury. The majority of patients will be managed conservatively either with an orthosis (soft or rigid collar) or by skeletal traction using a halo device. If surgical stabilization is required then there is debate as to the appropriate timing of intervention. There is little human evidence to support early decompression in neurological injury. However, there is evidence that early surgery (within 8 hours) does not appear to increase the rate of complications or lead to neurological decline (McAfee et al, 1995).

Non-traumatic neck pain

History

Acute neck pain in the absence of trauma can reflect numerous underlying pathologies. While an exacerbation of a chronic degenerative progress is commonly found (Rogers et al, 2010) a thorough history should be taken to identify 'red flag' symptoms that suggest serious underlying conditions, in particular infection or malignancy (*Table 2*). A complete past medical and surgical history should also inform the clinician as to possible pathology.

Examination

As with any musculoskeletal examination, a 'look', 'feel', 'move' and 'special tests' sequence should be adopted and a complete neurological examination, as described above and previously (Rogers et al, 2010).

Treatment

The management of non-traumatic acute cervical pain depends on the underlying diagnosis. If the initial clinician or hospital does not have the necessary experience or expertise then transfer of the patient to an appropriate unit should be expedited. A full description of all such pathology is beyond the scope of this review.

Full serological screening should be performed, including full blood count, a blood film and blood cultures, and inflammatory markers (erythrocyte sedimentation rate and C-reactive protein). This will enable more chronic conditions, such as infection or malignancy, to be

screened for, although normal results do not fully exclude such diagnoses.

Cervical spine stability at presentation should not be assumed, especially in the presence of new or evolving neurological signs and full cervical spine immobilization, as described above, should be maintained until appropriate imaging, including computed tomography and/or magnetic resonance imaging, has been obtained.

Further initial treatment depends on the presence of new or evolving neurological signs that suggest ongoing spinal cord or nerve root compression. The use of high-dose steroids for patients presenting within 8 hours of spinal cord injury is controversial.

Primary tumours

The density of blood vessels makes the spine a frequent site of metastasis and specific primary tumours, several of which are associated with either the vertebral body (anterior) or the posterior levels of any particular vertebra (*Table 3*). The underlying tissue involved with the malignancy may be bone, spinal cord or meninges.

Radiographic features can include absent pedicle, cortical erosion or expansion and possible vertebral collapse. Primary malignant spine tumours are more frequently located in the thoracic and lumbar spine. Surgical management requires specialist neurosurgery or orthopaedic involvement, using the principles of tumour de-bulking and stabilization of the spine. Complete surgical excision is difficult.

Metastatic tumours

Metastatic bone tumours commonly involve the spine and the presence of 'red flag' symptoms (*Table 2*) should alert the clinician. The presence of associated neurological dysfunction, long symptom duration, rapid growth of metastasis and cervical spine involvement are all poor prognostic features. Owing to the osteolytic nature of most metastatic lesions, over 30% of the vertebral body has been destroyed if the lesion is visible on plain radiographs. Breast, lung, thyroid, renal and prostatic (osteoblastic lesions) are the common primary tumours, and computed tomography-guided biopsy often avoids the need for surgery to make the diagnosis.

Non-operative management, including radiotherapy and chemotherapy, are the principal treatments unless the cervical spine is unstable and causing progressive spinal cord compression. The risks of operative management need to be balanced against the overall prognosis for any individual patient, and thus close liaison between the oncology and surgical teams is essential. In general, progressive neurological dysfunction that is unresponsive to radiotherapy, pathological instability and persistent pain despite radiotherapy are all relative indications for surgical stabilization.

Infection

Infection of the disc space, meninges, epidural space or vertebra (pyogenic vertebral osteomyelitis) is associated with specific patient risk factors (*Table 4*) and 'red flag' symptoms (*Table 2*). The most common cause is blood-borne *Staphylococcus aureus* although older immunocompromised patient may be affected by Gram-negative organisms.

Management

Pyogenic vertebral osteomyelitis

The non-surgical work up includes blood cultures and a tissue diagnosis, possibly using a computed tomography-guided biopsy. The tissue diagnosis allows the use of sensitive high-dose antibiotics given over an appropriate period of time (often 6 or more weeks) via a central venous catheter. Serological inflammatory markers, such as erythrocyte sedimentation rate and C-reactive protein, can be used to monitor the response to treatment. Bed rest and immobilization will provide some symptomatic relief. Neurological deterioration may indicate the development of an epidural abscess, meningitis or worsening kyphosis and dictate further management.

Table 2. 'Red flag' symptoms

Possible cervical fracture, facet joint subluxation or dislocation	History of trauma
	Elderly with minor trauma (beware the forehead bruise)
	Known ankylosing spondylosis
Possible malignancy	Constant pain
	Pain worse at night
	Weight loss
	Young (<20 years) or elderly (>50 years)
Possible infection	Systemic symptoms: fever, rigours, night sweats
	Intravenous drug user
	Recent cervical spine surgery
Possible acute neurological compression	Progressive neurology
	Sphincter disturbance, urinary or faecal incontinence
	Unable to walk or 'weak legs'
	Rapidly progressing upper and lower limb symptoms

Table 3. Common locations of spine tumours

Anterior elements	Giant cell tumour
	Langerhans cell histiocytosis
	Leukaemia
	Lymphoma
	Osteoid osteoma
Posterior elements	Aneurysmal bone cyst (may extend anterior)
	Osteochondroma
	Osteoblastoma

Table 4. Risk factors for spinal infection

Diabetes
Malignancy
Intravenous drug abuse
Human immunodeficiency virus
Urinary tract manipulation
Previous spinal surgery
Sickle cell disease
Pre-existing paraplegia
Pre-existing infection elsewhere
Gunshot wound

Surgical management of cervical spine infection depends on appropriate patient selection, affected by numerous factors including:

1. Age
2. Medical condition of the patient
3. Neurological status
4. Site of infection
5. Destruction of disc
6. Destruction of bone
7. Deformity of bone
8. Types of bacteria (if known).

Disc space infection

Disc space infection with an abscess but no bone destruction may be managed with simple drainage, undertaken either via a computed tomography-guided or an open procedure. Cartilage end-plate and vertebral body destruction are indications for debridement, excision and surgical stabilization of the anterior cervical vertebra.

Epidural abscess

These can occur de novo or more commonly with concurrent disc space infection. De novo abscesses, with minimal end-plate or bone destruction, may be drained via a posterior approach with wide laminectomy as the spine remains stable.

Tuberculosis of the spine

The spine is the commonest extra-pulmonary location for tuberculosis and is commonly seen in the human immunodeficiency virus-positive population with a CD4+ count of less than 200 cells/mm^3. The destructive chronic inflammatory process spreads under the anterior longitudinal ligament of the spine, frequently presenting with 'skip' lesions. Two thirds of patients with spine tuberculosis have abnormal chest X-rays.

Chemotherapy is the principal treatment modality. Various combinations of antibiotics can be used, depending on local protocols, and the commonest used antituberculous drugs are:

1. Rifampicin 10–600 mg/kg/day
2. Isoniazid 5–300 mg/day
3. Ethambutol 25 mg/day
4. Pyrazinamide 25 mg/kg/day (max 2.5 g/day)
5. Streptomycin 0.75–1.0 g/day for 60–90 days.

Failed chemotherapy with the presence of a spinal abscess, progressive deformity and cord compression are indications for surgery. Surgical treatment is based on drainage of abscesses, decompression of the spinal cord and possible fusion of the affected segment. The aims of surgical treatment are to:

1. Achieve stability of the spine
2. Decompress the cord and nerve roots
3. Restore spinal growth in a child
4. Maintain adequate lung function.

Conclusions

Acute neck pain is a common complaint following trauma and may pose difficult diagnostic and management problems. Clinicians should ensure the stability of the neck is maintained at all times, and investigate all possible causes as summarized in this article. Appropriate care of such injuries may require input from several medical specialties. BJHM

KEY POINTS

- A full history and clinical examination is essential for traumatic or non-traumatic neck pain.
- Immediate management involves complete cervical spine immobilization until stability of the cervical vertebral column is determined.
- Presence of 'red flag' symptoms signify the potential for serious underlying pathology, including infection and malignancy conditions.
- Plain radiography, computed tomography and magnetic resonance imaging are all usually required to fully delineate pathology.
- Referral to appropriate clinicians is essential whether non-operative or operative intervention is required.

Conflict of interest: none.

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