How to assess for pain sensitivity in the clinic: neck and arm pain focus

Prepared by Trudy Rebbeck, Niamh Moloney and Darren Beales.

ABSTRACT: How to assess for pain sensitisation in the clinic: neck and arm pain focus

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Background: Increased pain sensitisation assessed by quantitative sensory testing (QST), such as cold hyperalgesia, is associated with poor outcomes in cervical pain states. Thus, more detailed pain assessments of pain are warranted in clinical practice. Our work has demonstrated a relationship between clinical tests of ice pain sensitivity and QST. Other clinical tests used to assess for pain sensitisation include nerve trunk palpation and conditioned pain modulation. Identification of pain sensitisation in the clinic is important to not only sub-classify pain, but to inform appropriate management.

Aims / objectives: To improve participants' knowledge, skills and clinical reasoning in the clinical assessment of pain sensitisation. Participants will be competent in clinical application of the ice-pain test, pressure pain thresholds, 2-point discrimination, upper limb nerve trunk palpation and conditioned pain modulation. Participants will understand how to interpret these tests to sub-classify pain and direct treatment.

Approach: The presenters will provide a lecture style background introduction (10 mins) followed by a practical demonstration of the tests (10 mins). Participants will then have the opportunity to practise 1-2 of these tests (10 minutes). Learning materials provided include a manual on how to perform these tests.

Conclusion / Key Practice Points:

- Participants will be able to more accurately assess for pain sensitisation in their clinic.
- Participants will understand the added benefits and limitations of using these tests in clinical practice
- Participants will be able to use information gleaned from pain assessment to inform treatment

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*Notes adapted by Trudy Rebbeck from Professor Michele Sterling.

Screening Tools

Screening tools can be used to inform and supplement further clinical examination.

They should not be used solely for the purpose of diagnosis.

Easily accessible examples for screening for neuropathic pain and central sensitisation include:

- Pain Detect
- DN4 Neuropathic Pain Diagnostic Questionnaire
- The Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) Pain Scale
- Pain Sensitivity Questionnaire
- Central Sensitization Inventory

There are potential advantages and disadvantages of each questionnaire that it is beyond the scope of this paper to present. An example of one questionnaire will be presented.

Key Features in the Subjective Examination

Following are general considerations in the subjective examination that may alert to the relative dominance of pain sensitivity in a patients presentation.

Presenting symptoms complaints

- Constant, high level pain
- Neurological type symptoms (pins and needles/numbness/burning pain) that are frequently in a non-dermatomal distribution
- Spontaneous pain
- Sensitivity to hot or cold
- Subjective report hyperalgesia/allodynia eg pain with clothes on the shoulder, hypersensitive to light touch on the shoulder/hugs
- Sensitivity to sound, smell, hot or cold.
- Fatigue, concentration difficulties

Aggravating Activities/Positions

- Multiple factors-often non-specific
- Wind-up of symptoms disproportionately to the characteristics of the activity

Easing Activities/Positions

- Highly variable
- Usually very difficult to settle/ seems disproportionate to amount of aggravating stimulus
- Very limited relief medications.

Negative psychological factors with a clear link to pain experience

Sleep disturbances, non-refreshing sleep

Comorbidities

- Other disorders associated with pain sensitivity
- Migraine, IBS, Menstrual Pain, Fibromyalgia

ALLODYNIA (Tactile/Mechanical)	Provided by: Dr Darren Beales

Overview / general description

Allodynia is a painful response to what would generally be considered a non-painful stimulus.

How to do

Light touch stimulus is frequently used in neurological assessment for conduction disturbance, to assess for regions of reduced or absent sensation. In this case, the assessment is for a painful or exaggerated response to what should be a non-painful stimulus.

Light stimulation via various modalities is possible

- low size/force von Frey filament (2 to 4g)
- bush evoked
- very light blunt pressure

The stimulus should be first applied in areas remote to symptoms for a baseline indication of sensitivity, before moving to the painful areas.

When to use and why

Used when there are subjective reports of allodynia. (Eg pain when clothes touch the skin) or other features of pain sensitization

Summary of background science

- Common occurrence in peripheral sensitisation to an acute traumatic injury, secondary to release of inflammatory mediators
- Also occurs with changes in the spinal cord (neuronal sprouting, expanded receptive fields), processes linked to central sensitisation.

Clinical Implications

Presence of allodynia can

- Be a potential contra-indication to the use of manual treatment techniques
- Indicate a potential need for centrally acting medications
- Be a very helpful educational experience for the effected person

Images	Other useful information
	- Withdrawal response to localised muscle spasm may be observed - Repeated stimulation, i.e. repeated tapping with a von Fry filament, can be used to assess for temporal summation. Temporal summation is another marker of increased pain sensitivity.

SHARP HYPERALGESIA	Provided by: Darren Beales
Overview / general description	
Hyperalgesia refers to an exaggerated pain response to a usually painful stimulus. In this case, the stimulus is sharp.	
How to do	
A sharp stimulus is frequently used in neurological assessment for conduction disturbance, to assess for regions of reduced or absent sensation. In this case, the assessment is for a painful or exaggerated response to what should be a non-painful stimulus. The stimulus (in this case, usually a toothpick) should be first applied in areas remote to symptoms for a baseline indication of sensitivity, before moving to the painful areas.	
When to use and why	
When there is subjective presentation consistent with exaggerated pain responses.	
Summary of background science	
- Common occurrence in peripheral sensitisation to an acute traumatic injury, secondary to release of inflammatory mediators - Also occurs in response to central sensitisation processes	
Clinical Implications/Recommendations	
Presence of sharp hyperalgesia, like allodynia can • be a potential contra-indication to the use of manual treatment techniques • Indicate a potential need for centrally acting medications • Be a very helpful educational experience for the effected person	
Images [if appropriate]	**Other useful information**
	- Withdrawal response to localised muscle spasm may be observed - Repeated stimulation, i.e. repeated tapping with a toothpick can be used to assess for temporal summation. Temporal summation is another marker of increased pain sensitivity.

PRESSURE HYPERALGESIA	**Provided by Professor Michele Sterling, adapted by Dr Trudy Rebbeck**
Overview / general description	
Pressure hyperalgesia can be determined via the measurement of pressure pain thresholds using an algometer.	
How to do/use	
Apply the force perpendicular to the body site being tested. Ask the patient to state when the stimulus stops being pressure and starts being pain. Repeat 3 times and take the average value. Measure in the cervical spine, upper trapezius and over the muscle belly of tibialis anterior as the remote site.	
When to use and why?	
When the presence of mechanical hyperalgesia is suspected after the subjective examination (eg patient reports being sensitive to pressure or touch) or after physical assessment (eg pain with manual examination or palpation of neck, upper and lower limbs). The test is an objective way to confirm the presence of pressure hyperalgesia.	
Summary of background science	
Some studies have shown that lowered pressure pain thresholds are predictive or poor outcome in neck pain conditions (eg WAD). [1,2]	
How it helps [what it adds to the clinical examination]	
Considered with the subjective examination, screening questionnaires and other physical examination tests, lowered pressure pain thresholds indicate the presence of pressure hyperalgesia. Clinicians could suspect abnormal pain processing being present as occurs in centrally sensitized states, particularly if pressure hyperalgesia is found at remote sites away from the neck.	
Clinical Implications/Recommendations	
Such patients may have a poorer prognosis, and may be less likely to respond to physical therapy interventions such as manual therapy and exercise. Managing pain with appropriate medications and /or referral to a pain specialist may be indicated. Care should also be taken with exercise interventions so as not to overly exacerbate the patient's pain in the acute stage	
Images [if appropriate]	**Other useful information**
	PPT (neck): Abnormal if < 185 kPa (females) < 210kPa (males) Units: 1 kg/cm2 (clinical device eg Wagner) = 98 kPa (lab algometer eg Somedic)

COLD HYPERALGESIA	Provided by Dr Trudy Rebbeck

Overview / general description

Cold hyperalgesia can be assessed quantitatively using quantitative sensory testing (QST) or clinically using the ice-pain test. The presence of cold hyperalgesia indicates abnormal sensory (thermal) pain processing.

How to do/use

QST: Apply a descending temperature (usually 30^0 C to 5^0C) using QST equipment (eg MSA Thermal Stimulator, Somedic, Sweden) via a thermode at local sites of pain (neck and upper trapezius) and sites neuroanatomically remote from pain (eg tibialis anterior for neck pain). Record the temperature at which the stimulus stops feeling cold and starts feeling painful.

Clinical ice-pain test: Apply an ice cube to the patient's skin at the sites above. Hold for 5 seconds Ask the patient to rate pain on an NRS scale ranging from 0/10 (no pain) →10/10 (maximum possible pain).

When to use and why?

When the presence of abnormal sensory (thermal) processing is suspected after the subjective examination (eg factors as indicated in the presentation or patient reports being sensitive to cold or pain worsening in the cold). The test is an objective way to confirm the presence of cold hyperalgesia.

Summary of background science

Cold hyperalgesia is associated with poor outcome in neck pain states such as whiplash[2,3]. The ice- pain test has moderate to good correlations with cold pain threshold assessed using QST [4]. A cold-pain rating of >5/10 indicates a 90% likelihood of cold hyperalgesia assessed by CPT, being present.[5]

How it helps [what it adds to the clinical examination]

Considered with the subjective examination, screening questionnaires and other physical examination tests, high levels of pain with the ice-pain test indicates the presence of cold hyperalgesia. Clinicians could suspect abnormal sensory (thermal) processing being present as occurs in centrally sensitized states.

Clinical Implications/Recommendations

Such patents have a poorer prognosis, and are less likely to respond to physical therapy interventions such as manual therapy and exercise. Managing pain with appropriate medications and /or referral to a pain specialist may be indicated.

Images

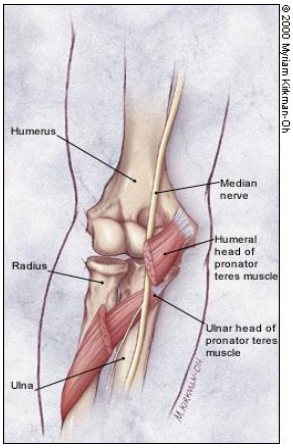
Other useful information

Example of data from Rebbeck et al (2015)

	Neck pain Median (IQR)	Controls Median (IQR)
CPT °C	22.31 (18.58)	5.0 (0.74)
Ice pain test NRS 0-10	2.0 (5.0)	0.0 (1.0)

CONDITIONED PAIN MODULATION Provided by Dr Niamh Moloney	
Overview/general description	
Assessment of conditioned pain modulation is an assessment of individuals' endogenous analgesic responses to noxious stimuli. The premise is that a normal physiological response to nociception is activation of descending pain inhibitory pathways in order to modulate nociception. This is considered an important aspect of people's pain responses and it may be important to understand pain modulation efficiency in patients with painful musculoskeletal disorders.	
How to do	
There are a number of methods available for assessment but all involve a 'test' stimulus and a 'conditioning' stimulus. The conditioning stimulus should be sufficiently noxious to stimulate an endogenous analgesic response. The test stimulus is used to assess pain sensitivity pre- and post the noxious conditioning stimulus and the difference is calculated between pre- and post-measures. For cervical pain states, we recommend use of the lower limb for components of the testing protocol. Step 1: Assess baseline pressure pain sensitivity (eg using PPT) over tibialis anterior. Step 2: Cold pressor test: Place the contra-lateral foot in an ice-bath usually kept at 4-5°C (use a thermometer to record) for at least 60 seconds. Record a pain rating at 30s and 60s, ensure that 4/10 pain has been achieved. Step 3: Immediately on removing the foot from the ice bath, repeat PPT. over the original Tibialis anterior site. Compare the PPT measures from before and after the conditioning stimulus.	
When to use and why	
This assessment is indicated if sensitization of the nervous system is suspected to be a key part of the patient's presentation. It may be useful to assess in people with acute WAD. The measure is thought to reflect descending pain modulation and its efficiency.	
Summary of background science	
Conditioned pain modulation is purported to assess descending pain modulation and may reflect individuals' ability to modulate nociception i.e. endogenous analgesia eg [6.] This may be related to individuals' pain experience. There is emerging evidence that CPM is less efficient in people with whiplash[7,8] but the role of CPM in people with idiopathic neck and/or chronic neck pain is less clear.[9,10] As an emerging area of research, further data is required before drawing definite conclusions from this method of testing.	
Clinical Implications	
Findings from CPM testing may help to identify those at risk of poor pain outcomes e.g. post-operative pain[11] ; this is less clear in neck pain[12]. CPM assessment *may* contribute to assessments of overall pain sensitization and pain modulation in people with neck pain. If using this assessment, it should be done within a multi-dimensional assessment.	
Images [if appropriate]	**Other useful information**
	Functional CPM response: Second PPT score is higher than the first. **Dysfunctional CPM response: Second PPT score is lower than the first.**

UPPER LIMB NERVE TRUNK PALPATION Provided by Dr Niamh Moloney
Overview / general description
Assessment of neural mechanosensitivity can involve assessment of responses to movement (i.e. neurodynamic tests) and assessment of sensitivity to light touch. Ideally, both should be combined for a more comprehensive assessment.
How to do
Using index and/or middle fingers, locate location of the selected nerve and gently palpate to assess for sensitivity. Commonly used sites for palpation in the neck and upper limb include: 1. Branches of the brachial plexus 2. Median nerve lateral to the brachial artery pulse in the upper arm 3. Ulnar nerve medial to the brachial artery pulse in the upper arm 4. Radial nerve in the radial groove, posterior aspect of the upper arm 5. Median nerve in the cubital fossa medial to biceps tendon 6. Ulnar nerve at the elbow between olecranon and medial epicondyle 7. Radial nerve approx. 7cm distal to the lateral epicondyle 8. Median nerve in the carpal tunnel 9. Ulnar nerve between pisiform and hook of hamate 10. Radial nerve in anatomical snuffbox and approx.. 3cm proximal to radial styloid
When to use and why
Palpation of one or more nerve trunks is indicated if: a. The patient presents with radiating symptoms/referred pain b. Pain/symptoms are distributed within the neuroanatomical distribution of that nerve c. Aggravating/easing factors appear to be provoked by compression or lengthening of neural tissue d. A history of a nerve lesion is present e. Pain presentation indicates that generalized pain hypersensitivity might be present
Summary of background science
Neural tissue sensitivity has been identified in a number of neck and upper limb conditions [13,1,14]. This has mostly been assessed using neural tissue responses to movement but can also be assessed using nerve trunk palpation. Nerve trunk palpation has been found to have moderate reliability[15].
Clinical Implications
Results from nerve trunk palpation may be combined with other findings to inform clinical decision-making. When nerve trunk palpation reveals sensitivity of a discrete nerve and is consistent with neuro-dynamic tests as well as the clinical history, it can be concluded that neural tissue sensitivity is a key component of the patient's presentation. Patients with neural tissue sensitivity have been found to respond to treatments targeting neural tissue e.g. cervical lateral glides[16] and /or combined with neural mobilization exercises (Nee et al. 2012).

Images [if appropriate]	Other useful information
	Sensitivity over a single nerve may more likely indicate discrete neural tissue sensitivity (eg median nerve neuropathy). However if multiple nerves are sensitive, this may more likely indicate central sensitization.

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