Central sensitization and musculoskeletal shoulder pain

Door Kevin Kuppens (MSc)
• 3rd most common cause of musculoskeletal consultation in primary care
• Lifetime prevalence up to 67% & Point prevalence 7 to 26%

40% still has shoulder complaints after 1 year

80% of the total economic cost for shoulder pain
(Shoulder) pain

Descartian ‘dualist’ philosophy
- Intensity of pain directly related to the amount of associated tissue damage
- One distinct pathway

Advances in knowledge on pain processing ...
Nociception

Rotator Cuff – Humeral Insertion
Glenohumeral Ligaments
Joint Capsule
Bursae
Coracoacromial Ligament
Long Head Biceps
Peripheral Sensitization

• Tissue injury (Nociception)

  ➢ Inflammatory mediators (histamine, bradykinin, ...), Cytokines (interleukins, TNF, ...), Glutamate, ...

  ➢ Increased responsiveness of nociceptive neurons to their normal input

  ➢ Protective and adaptive action

= Primary hyperalgesia & Allodynia

Unpredictable and disproportionate pattern of pain provocation in response to mechanical testing

Universiteit Antwerpen

Hegedus, 2012; Dean, 2013; Nijs, 2010
Central sensitization

• “An amplification of neural signalling within the CNS that elicits pain hypersensitivity” (Woolf, 2011)

• “Increased responsiveness of nociceptive neurons in the central nervous system to their normal or subthreshold afferent input” (Merskey and Bogduk 1994)
Secondary hyperalgesia

- Hyperalgesia outside the original zone of injury

- Sensitization of dorsal horn neurons
  ➢ explaining increased sensitivity to stimuli not only in the anatomical region of primary nociception, but also in segmentally related regions outside the primary zone of nociception.

These alterations in the central nervous system further contribute to the poor reliability and validity of shoulder testing in clinical practice.
If the nervous system **fails to reset**

- ongoing (secondary) hyperalgesia

- spreads to segmentally unrelated areas, resulting in widespread central sensitization

**Central sensitization is no longer restricted to the dorsal horn neurons, but also manifests itself in the brain and descending nociceptive system.**
• I’ve inherited weak shoulders so I’m limited in what I can do...
  - Wrong beliefs & attitudes

• The last time I cleaned the windows it resulted in a painful shoulder ...
  - Wrong beliefs ~ pain memory

• Pt: Same problem other side?
• T: Both sides grey
Widespread Hyperalgesia
Allodynia
Referred pain
Medical diagnoses associated with central sensitization

- Fibromyalgia
- Chronic fatigue syndrome
- Chronic whiplash associated disorders
- Irritable bowel syndrome
- Chronic low back pain
- Temporomandibular dysfunction
- Myofascial pain syndromes
- Osteoarthritis
- Rheumatoid arthritis
- Headache
- Tennis elbow

The CNS becomes **hypersensitive in a subgroup** of patients with unilateral shoulder pain

- **Central Sensitization may play a role** in the frequent pain complaints reported by these patients
- Some shoulder pain patients have altered central pain mechanisms **contributing (or even dominating)** to the patients clinical picture
• 8 / 10 included papers: key role for CS in unilateral shoulder pain

**Clinical Manifestations:**
- Referred pain
- Hyperalgesia
- More active and latent MTrPs
- Lower PPTs local and remote

**Quantitative Sensory Testing**
- 4 / 10 : Local AND Widespread hyperalgesia
- Suprathreshold Heat Pain Respons elevated (bilateral)

**Psychosocial Manifestations:**
- Pain related fear ~ Experimental Pain Sensitivity
- Pain catastrophizing (+ depression) ~ Clinical Pain Intensity
• Worse outcome after surgical decompression (chronic SIS)
  - Widespread hyperalgesia before surgery
  - Referred pain before surgery

(Gwilym et al, 2011)

• Pre VS Post-surgical assessments in SHPR = predictive of surgical outcome (SIS)

(Valencia et al, 2014)

• Widespread hyperalgesia (QST) ~ higher pain perception

Limited to those specific patient populations examined with unilateral shoulder pain

- Patients waiting for arthroscopic subacromial decompression (Glilmy et al.)
- Participants were considered eligible for this study if they were scheduled for arthroscopic surgery (Coronado et al.)

- Twelve patients with strictly unilateral shoulder impingement (Hidalgo-Lozano et al.)
- No current complaints of neck, elbow, hand, low back, hip, knee, or ankle pain for more than the previous 3 months (Valencia et al.)
Description of patients with painful shoulder syndrome

- Imaging
  - 66,2 % Tendinosis
  - 26,9 % Arthropathy
  - 18,5 % Bursitis
  - 22,3 % Normal

- Reference diagnosis
  - 75,4 % Rotator cuff syndrome
  - 8,7 % Unspecified Lesion
  - 6,3 % Frozen Shoulder
  - 6,3 % Cervicalgia
  - 2,4 % Instability
  - 0,8 % Arthrosis

Dias et al (2008)
Decreased mechanical pain thresholds were reported in all studies

Greater mechanical hyperalgesia at sites distal to the participants’ reported site of tendon pain
- Lateral epicondylitis
- Shoulder impingement syndrome.
ASSESSMENT:
How To Recognise Central Sensitization Pain

Applying Modern Pain Neuroscience in Clinical Practice: Criteria for the Classification of Central Sensitization Pain

Jo Nijs, PhD1,2, Rafael Torres-Cueco, MSc2, C. Paul van Wilgen, PhD4, Enrique Lluch Girbés, MSc3, Filip Struyf, PhD1,5, Nathalie Roussel, PhD1,5, Jessica Van Oosterwijck, PhD1,6, Liesbeth Daenen, PhD1,7, Kevin Kuppens, MSc1,5,7, Luc Vanderweeën, MSc1,8, Linda Hermans, MSc6, David Beckwée, MSc1, Lennard Voogt, PhD1,9, Jacqui Clark, MSc10, Niamh Moloney, PhD1,11, and Mira Meeus, PhD5,7
Musculoskeletal pain

Disproportionate pain experience?

YES

Central Sensitization

NO

Diffuse pain distribution?

YES

Central Sensitization

NO

Central Sensitization Inventory \( \geq 40 \) ?

YES

Central Sensitization

NO

no Central Sensitization
Criterion 1: Disproportionate pain?

- **Severity of pain and related disability**
  disproportionate to the nature and extent of injury or pathology
Musculoskeletal pain

Disproportionate pain experience?

YES

Diffuse pain distribution?

YES

Central Sensitization

NO

Central Sensitization Inventory ≥ 40?

YES

Central Sensitization

NO

no Central Sensitization

NO

Central Sensitization Inventory ≥ 40?

YES

Central Sensitization

NO

no Central Sensitization
Criterion 2: Diffuse pain distribution?

One of the following options:

- Large pain area with a non-segmental distribution
- Pain varying in (anatomical) location
- Widespread pain
- Bilateral pain / mirror pain (i.e. symmetrical pain pattern)
- Hemilateral pain
Musculoskeletal pain

Disproportionate pain experience?

YES

Diffuse pain distribution?

YES

Central Sensitization

NO

Central Sensitization Inventory \( \geq 40 \) ?

YES

Central Sensitization

NO

no Central Sensitization

NO

Central Sensitization

www.paininmotion.be
Criterion 3: Hypersensitivity of non-musculoskeletal senses?

- Smell
- Light
- Sound
- Touch
- Drugs
- Cold / heat
Additional signs and symptoms

- Abnormal therapeutic response
- Abnormal pain timeline
- Sleeping difficulties
- Memory- and concentration difficulties
- Fatigue
- Muscle weakness
- Phantom swelling
- Impaired tactile localization
- Dyskinaesthesia
TREATMENT OPTIONS

- TOP – DOWN APPROACH
- BOTTOM - UP APPROACH