Joint pain and its treatment with acupuncture

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Overview

• Physiological considerations of joint pain
• Applications of acupuncture
• Principles of acupuncture treatment in joint pain conditions

Some Facts...

Rheumatic Diseases:
• “...among the most frequently reported causes of impairment of adult population [ ...]major cause of work-related disabilities...”

• “…directly responsible main or secondary cause for over 2 million persons being unable to perform major activity at all and over 5 million having activity limitation...”

Some Figures...

• Second most common cause of consultation in general practice
• Its (combined) costs are only surpassed by cardiovascular disease
• Common cause of disability
• Most commonly treated by acupuncturists

Primary (Idiopathic) OA

• Aging
• Joint Laxity
• Other
  - Metabolic
  - Immune

Primary (Idiopathic) OA

• Mechanical Stress
  – Occupation
  – Obesity
  – Over-/mis-use
• Gender
### Secondary Aetiology

- Congenital
- Inflammatory
- Traumatic
- Obesity
- Hormonal
- Other

### Clinical Knee Osteoarthritis

- The majority of the management of patients with knee pain is undertaken in primary care
- OA is most likely underlying diagnosis
- Presents radiographically in 70% of community-dwelling adults with knee pain aged 50 and over (Duncan et al, 2006)

### Management approaches

- Pharmacological options
- Guidelines suggest non-pharmacological interventions should be first line of treatment
- Patient education, physical therapy, aerobic and strengthening exercise
  
  (ACR, EULAR, UK Primary Care)

### Integrated care

- Patients don’t like taking tablets
- People with knee OA want non-pharmacological options for pain relief
  
  (Arthritis Care Report 2004)
- Often choose CAM
- Concept of integrated healthcare

### Acupuncture

- Approx 40% of GP practices in England provide access to CAM
- More than 10% of GPs and Physiotherapists use acupuncture
- Systematic reviews
  - Ezzo et al 2001
  - White et al 2007

### Mechanisms of Pain in synovial joints

Overview of Physiology and clinical features
Structures able to produce Joint Pain

- Bone (Articular Surfaces)
- Cartilage
- Synovium?
- Capsule
- Synovial Fluid
- Ligaments
- Tendons, Muscles

Joint enervation

- A-beta fibres
  - Responsible for light pressure
  - Low threshold mechanoreceptors
- A-delta fibres
  - Responsible for high pressure
  - High threshold mechanoreceptors
- C-fibres
  - Pain fibres
  - Sympathetic enervation

Cascade of events: Peripheral Sensitisation

Effects of nociceptor activity

- Effects associated with inflammation:
  - Release of neuropeptides
  - Sensitisation
  - Autonomic reflexes

Effects of inflammation

- Tenderness
  - Lowering of excitation thresholds of Aδ and C fibres
  - Expression of activity by Silent Nociceptors
- Ongoing pain (at rest or with activity)
  - Ongoing discharge patterns
  - Enlargement of receptive fields
- Evidence of Central Sensitization

Clinical Picture

- Functional impairment
  - Joint ROM reduction
  - ADL compromise
- Pain
  - At rest, or with movement
  - Joint tenderness
  - Pain referral
Clinical Examples?

- Typical Pain drawing by an OA knee patient
- Spread of pain in tissues proximal and distal to the origin of pain

Key Points

- Initial events in inflammatory process guide progression of disease
- After a period of time, local changes are not as important as central processing of pain
- Early detection and intervention may hinder progress

Why Should Acupuncture Work???

Working hypothesis

- Stimulation of muscle afferents in somatic segments according to innervation modulates
  - motor,
  - autonomic,
  - endocrine and
  - nociceptive systems
- at both segmental and central level

Physiological basis of acupuncture

- Somatic stimulation results in:
  - CNS responses
  - Somatovisceral reflexes
- Peripheral and central therapeutic effects

Peripheral effects

Antidromic nerve impulses

↓

Release of neurotransmitters (CGRP, SP and VIP) → vasodilatation
and ↑ nutritional blood flow → Facilitation of healing processes

- Dawidsson et al. 1997 - salivary flow rates
- Lundeberg et al. 1993 and 1996 - inflammation and ischemia
- Sato et al. 2000 - muscle blood flow
Spinal Effects
Stimulation of Aβ-, Aδ-fibres and possibly C-fibres → modulation of spinal reflexes

- Stimulation with low intensity [manual or HF (80 - 100 Hz) EA] → ↓sympathetic tone and ↓pain ("gate control theory")
- Probably mediated by GABAergic mechanism
  - Sato et al. 1997 - "The impact of sensory stimulation"
  - Melzack and Wall 1965 - "Pain mechanisms"

Stimulation with high intensity (LF (1-4 Hz) EA) → long-term depression of synaptic transmission in the dorsal horn → long term effect of EA

- Probably mediated by activation of spinal receptors
- Stimulation with very high intensity → ↑sympathetic tone and ↑pain

Central Effects
Descending pain inhibitory systems

- Hypothalamic β-endorphin systems → project to PAG → NRM → 5-HT ergic neuron.
  From locus corruleus → NAergic neuron
- Project to the dorsal horn → activate enkephalinergetic interneuron

CENTRAL EFFECTS
Descending pain inhibitory systems

- Diffuse noxious inhibitory control (DNIC)
- Intense, painful stimulation results in the activation of supraspinal pathways → projects to the dorsal horn at every level
- Unspecific system, is not related to the site of stimulation

Central Effects
Modulation of higher control systems

- Descending pain inhibitory systems
- Central autonomic outflow
- HPA and HPO axes

Acupuncture- Opioids

Acupuncture modulates the release of β-endorphin

↑↓ depends on the intensity of stimulation and individual factors
**Tentative Clinical Suggestions**

- Evaluate irritability
  - Acute or chronic?
  - Differentiation of application according to state of disease
- Such an approach may guide:
  - Intensity of stimulation
  - Location of stimulation
  - Duration of needling
  - Frequencies (if TENS or EAP is used)

**Dose: Number of points**

General principles for nociceptive pain, depends on the state of the patient

- **ACUTE PAIN** → few local points, more distal points
- **SUBACUTE PAIN** → more local points
- **CHRONIC PAIN** → more local and distal points

**WHERE TO PUT THE NEEDLE?**

General principles in the selection of acupuncture points for the treatment of nociceptive pain

- **LOCAL POINTS (2 - 6)**
  - in the pain area
  - somatic segment
  - tender points (triggerpunkter)
  - ↑↑↑ pain threshold
  - direct, short term effect
- **DISTAL POINTS (2 - 4)**
  - in somatic segments according to the innervation (myotom) and / or extrasegmentally on the arms and / or the legs
  - ↑ pain threshold
  - prolonged effect

**Intensity**

- An important parameter in modulating the ANS and mediating pain relief
- High-intensity compared with low-intensity LF EA induced a more pronounced and longer lasting pain relief
  - Ronnita et al. 1997
  - Barlas et al. 2006
- Deep manual needling + needling sensation compared with superficial needling induce ↑ pain relief
  - Lundieberg et al. 1988

**Is acupuncture sensation important?**

A+B

- Deqi on AP point vs non-AP point activates different structures in the brain

C

- Minimal (non-deqi) stimulation does not elicit same response

D

- Minimal stimulation is not as effective as stimulation eliciting deqi

E

- no activation of areas related to analgesia in non-AP point stimulation
Conclusion:
• There is credible evidence that TENS reduces postoperative pain through less analgesic demand during the first 3 days after surgery.
• In addition, there is some evidence that suggests a reduction of side effects, like nausea and sedation, from opioid analgesia.
• The effect of TENS is dose-dependent and requires a strong sensation of currents. […] the assumed optimal frequency dose range, was 85 Hz for conventional TENS.

Duration of Stimulation:
• Optimal time of stimulation → 20 - 40 minutes
  • Andersson & Lundeberg 1995
  • Romita et al. 1997
  • Lundeberg et al. 1988
  • Uvnäs-Moberg et al. 1993

How long do we stimulate?

Repetition
• Repeated acupuncture treatments → gradually enhance the induced pain relief and circulatory effects
• Number of treatments?
  - 8 - 12 sometimes less, sometimes more
  - If no effect after 6 - 8 treatments → stop!
  • Bosut et al. 1991
  • Carlsson et al. 2000
  • Dyrehag et al. 1997
  • Han et al. 1997
  • List et al. 1992
  • Lundeberg et al. 1988 & 1993

Repetition
• Upregulation of mRNA
  - 1 treatment ?
  - 3 - 4 treatments → something happens
  - 6 - 8 → ↑ production of endogenous opioids

Hamza et al., 1999

Persevere!!
Tentative Clinical Suggestions

• Consider ANS symptoms
  - Redness, temperature changes, dysesthesia, sweating, subjective (non-explainable) symptoms
• Modification of such symptoms with acupuncture can happen
  - with superficial needling
  - with stimulation of the ear
  - by coordinating needle manipulation with breathing

Other effects of acupuncture

• ‘For a few minutes after the acupuncture and in the middle of it, my eyesight seems to be clearer’
• ‘There is no pain with the treatment but I get ice cold with it’
• ‘I feel a bit sick afterwards’
• ‘My legs feel heavy’
• ‘The treatment is very relaxing - I feel very tired’
• ‘I sleep well after each treatment’
• ‘The arthritis in my toe seems to have improved’
• ‘The treatment makes me feel good generally’

APEX Trial, Primary Care Sciences Research Centre, Keele University

Conclusions

• Joint pain is a major cause of disability
  - Think of your list!!
• Its processes are just being understood
  - Research in this area started 15 years ago!
• Early intervention in the inflammatory stage is indicated
  - Practice implications

Physical modalities may initiate processes of inhibition and reversal of central changes
- TENS, Electroacupuncture, Acupuncture

Clinical application should be guided by:
- knowledge of stimulation parameters
- disease state (acute vs chronic)

Remember...

• Acupuncture is supported by a larger body of evidence than most physiotherapy interventions
  - eg. IFT, US, PEME
  - Mobilisation,
  - Cyriax, MWM
  - Bobath
  - etc.

Ask yourself

• Is acupuncture a ‘last resort’ treatment?
• Is my practice of acupuncture in accordance to sound, evidence based principles?
  - Clinical vs research evidence
• Are my peers informed on these issues?
• If challenged, can I defend my choices?
Reality Check

‘Only the wildest who exhibited both charisma and the confidence of the charlatan claimed to effect permanent cure...The vast honest majority were proud of the ability to ameliorate the condition’

P.D. Wall, 2001
Pain: A textbook for Therapists

Any Questions?