The Role of Acupuncture in Integrative Pain Management

ORIGINS, MECHANISMS, AND EFFECTIVENESS

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NO FINANCIAL DISCLOSURES
ORIGIN & CODIFICATION

• **Origin**: Likely “multi-linear”
  • Bamboo and bone needles used in abscesses?
  • Tattoos on Stone-Age mummies?
  • Heat stimulation?

• **Codification**: Inner Classic of the Yellow Emperor - 1st century BC

Kaptchuk, 2002; Unschuld, 1985
HISTORICAL TRENDS IN MEDICINE

Super-natural
Rituals used to negotiate with spiritual world

Naturalistic
Sensory perceptions sufficient to understand health and illness

Biomedical
Scientific analysis reveals underlying pathophysiologic disruption, independent from human subjectivity

Modified from Kaptchuk, 2002
JAMES RESTON, 1971

Now, Let Me Tell You About My Appendectomy in Peking...

Continued From Page 1, Col. 8

ber thinking that it was rather a complicated way to get rid of gas on the stomach, but there was a noticeable relaxation of the pressure and distortion within an hour and no recurrence of the problem thereafter.

I will return to the theory and controversy over this needle and herbal medicine later. Meanwhile, a couple of disclaimers.

Judging from the cables reaching me here, recent reports and claims of remarkable cures of blindness, paralysis and mental disorders by acupuncture have apparently led to considerable specialization in America about great new medical breakthroughs in the field of traditional Chinese needle and herbal medicine. I do not know whether this speculation is justified, and am not qualified to judge.

Hardly a Journalistic Trick

On the other side, it has been suggested that maybe this whole accidental experience of mine, or at least the

puncture in overcoming post-operative constipation by putting barium in a patient's stomach and observing on a fluoroscope how needling manipulation in the limbs produced movement and relief in the intestines.

Even the advocates of Western medicine believe that necessity has forced innovation and effective development of traditional techniques.

Mr. Snow quotes Dr. Hua Hua-chen, a former deputy director of the hospital, as saying: "Diseases have inner and outer causes. The higher nervous system of the brain affects the general physiology."

Professor Li said that despite his reservations he had come to believe in the theory that the body is an organic unity, that illnesses can be caused by imbalances between organs and that stimulation from acupuncture can help restore balance by removing the cause of congestion or antagonism.

Dramatic Cures Reported
PROFESSIONAL HISTORY IN AMERICA

• The New England School of Acupuncture, 1976
• Today there are over 65 schools and colleges
• Oregon and Nevada were the first states to license the practice of acupuncture
• Currently regulated in 42 states and the District of Columbia
• 26,000 licensed acupuncture practitioners in the US today

Braveman, 2009
LICENSED ACUPUNCTURIST TRAINING

- Completion of a three or four year Masters degree (2625 hours of course and clinical work)
- 705 Hours in Asian Medicine Theory, Diagnosis, and Treatment Techniques in Acupuncture and Related Topics
- 450 Hours in Didactic Asian Herbal Studies
- 870 Hours in Integrated Acupuncture and Herbal Clinic Training
- 510 Hours in Biomedical Clinical Sciences
- 90 Hours in Counseling, Communication, Ethics, and Practice Management
ACUPUNCTURE AT A GLANCE: 2007

Adults visiting acupuncturists, increased 32% between 2002 and 2007.

3.1 million Americans used acupuncture within the previous 12 months.

> 80% of acupuncture was directed at pain conditions.

Most (82%) received from 1-10 treatments.

Most (72%) received “some” or “a great deal” of help for their first condition.

Most (60%) paid out of pocket.

Approximately $827,336,000 annual out of pocket.

Nahin, 2009; Barnes, 2007
From 1991 – 2009

- 3975 acupuncture research articles published
- 1647 (41%) focus on pain and analgesia
- United States published 1,097

Han & Jo, 2010
...HOW DOES IT WORK?
EXPLANATORY MODELS

Traditional
- Yin & Yang
- Qi
- Meridians

Scientific
- Developing theories
- Biomarker correlations
- Mechanisms of action

?
SUMMARY OF POSSIBLE TREATMENT RELEVANT MOA’S FOR ACUPUNCTURE ANALGESIA

Systemic mechanisms
Modulation of the endogenous opioid system – Neuropeptides & Receptors

Cerebral mechanisms
Changes in cerebral pain processing (limbic system)

Local mechanisms
Release of local tissue mediators: Improvement in local perfusion, anti-inflammatory effect

Modified from Backer, 2010
MODULATION OF THE ENDOGENOUS OPIOID SYSTEM: NEUROPEPTIDES

Frequency of EA

- 2hz
- 15hz
- 100hz

Neuropeptides released in CNS

- EM / ENK / βEP
- DYN

Opioid receptors

- μ
- δ
- κ

Physiological and therapeutic effects

Antinociception

Reproduced from Han, 2004
In vivo comparison of MOR binding availability between TA and SA in chronic pain patients diagnosed with fibromyalgia.

PET scan during first trx and at 1-month following 8\textsuperscript{th} trx.

TA $\uparrow$ MOR binding potential in multiple pain/sensory processing areas (Cingulate, Insula, Thalamus, Amygdala)

SA $\downarrow$ in MOR binding potential (consistent with other placebo PET Studies)

Findings suggest MOR processes may mediate clinically relevant analgesic effects for TA and SA

Harris, 2009
DEQI: THE SENSATION OF ACUPUNCTURE

Aching, pressure, soreness, fullness, distension, numbness, tingling, local warm or cool sensations, and the spreading of these sensations.

It is different than sharp pain or noxious stimuli
DEQI: THE SENSATION OF ACUPUNCTURE

Biomechanical phenomenon - “needle grasp”

_Not_ muscle contraction

Collagen winds within connective tissue

Creates mechanical coupling between needle and tissue

Needle manipulation causes fibroblast cytoskeletal remodeling

Therapeutic benefit?

Langevin, 2010
NEEDLE GRASP

Reproduced from Langevin, 2010
# CHANGES IN CEREBRAL PAIN PROCESSING

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<thead>
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<th>Structures</th>
<th>fMRI Signal Changes</th>
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<td>Noxious Stimuli</td>
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<td>Somatosensory Cortex</td>
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<td>Limbic System</td>
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<td>Posterior Inferior Parietal Cortex</td>
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<tr>
<td>Brainstem</td>
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<td>Cerebellum</td>
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Modified from Rosen, 2006; Hui, 2010
RELEASE OF LOCAL TISSUE MEDIATORS: ANTI-INFLAMMATORY EFFECT

Needle insertion causes chemical cascade

1. Acupuncture’s effect on Cytokines → IL-6, NGF-b, and MMP1

2. Acupuncture → edema and suppressed inflammation via HPA.

Chae, 2007; Zhang, 2005
IS IT SAFE?
FIRST DO NO HARM: SAFETY & ADVERSE EFFECTS

- **UK**\(^1,2\)
  - 60,000 treatments
  - No serious adverse events provided by physicians (1) or by professional practitioners (2).

- **Germany**\(^3\)
  - 2.2 million treatments (229,230 patients, 10+/-3 treatments)
  - 8.6% at least one adverse effect
    - 6.1% bleeding/hematoma
    - 1.7% pain
  - 2.2% required treatment
  - 2 pneumothorax (1 in 1 million treatments)

White, 2001\(^1\); MacPherson, 2001\(^2\); Witt et al, 2009\(^3\)
...BUT DOES IT WORK?
EFFECTIVENESS VS EFFICACY

Effectiveness – overall impact of intervention

Efficacy – impact of intervention in ideal conditions

MacPherson, 2012
# COMPONENTS OF BENEFIT

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<td>Study setting and statistical artifacts (regression to the mean)</td>
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EFFECTIVENESS

Low back pain


Migraine/headache


Osteoarthritis of knee


Moderate clinically relevant effect size
EFFICACY

Osteoarthritis of the knee – short & long term


Headache – short & long term


Low back pain – short term+ / Long term equivocal


Small effect size
Acupuncture for Chronic Pain

Individual Patient Data Meta-analysis

Andrew J. Vickers, DPhil; Angel M. Cronin, MS; Alexandra C. Maschino, BS; George Lewith, MD; Hugh MacPherson, PhD; Nadine E. Foster, DPhil; Karen J. Sherman, PhD; Claudia M. Witt, MD; Klaus Linde, MD; for the Acupuncture Trialists’ Collaboration
ACUPUNCTURE FOR CHRONIC PAIN

Aim

• Determine effect size for back and neck pain, osteoarthritis, chronic headache, and shoulder pain

Methods

• Individual patient data meta-analyses were conducted using data from 29 of 31 eligible RCTs
• Total of 17,922 patients analyzed

Results

• Acupuncture superior to both sham and no-acupuncture control for each pain condition (p < .001 for all comparisons)
ELIGIBILITY

RCTs with at least 1 group receiving acupuncture needling and 1 group receiving either sham (placebo) acupuncture or no-acupuncture control

Primary endpoint had to be at least 1 month after initial acupuncture treatment

Allocation concealment unambiguously adequate

Studies with a high likelihood of unblinding (in the sham controlled studies) were excluded

81 RCTs identified
31 eligible studies
Raw data obtained for 29 of the 31 studies
RESULTS FROM SHAM CONTROLS

Back and Neck Pain
• 0.23 (95% CI, 0.13-0.33)

Osteoarthritis
• 0.16 (95% CI, 0.07-0.25)

Chronic headache
• 0.15 (95% CI, 0.07%-0.24%)
RESULTS FROM NO-ACUPUNCTURE CONTROLS

Back and Neck Pain
• 0.55 (95% CI, 0.51-0.58)

Osteoarthritis
• 0.57 (95% CI, 0.50-0.64)

Chronic headache
• 0.42 (95% CI, 0.37%-0.46%)
WHAT DO THOSE EFFECT SIZES MEAN IN REAL TERMS?

Assume a baseline score of 60 on a 0 to 100 pain NRS

Given a standard deviation of 25, follow up scores would be:

• 43 in a no-acupuncture group
• 35 in a sham acupuncture group
• 30 in patients receiving true acupuncture
WHAT DO THOSE EFFECT SIZES MEAN IN REAL TERMS?

If response were defined in terms of a pain reduction of 50% or more, response rates would be:

- 30% in a no-acupuncture group
- 42.5% in a sham acupuncture group
- 50% in patients receiving true acupuncture
CONCLUSION

“Acupuncture is effective for the treatment of chronic pain and is therefore a reasonable referral option. Significant differences between true and sham acupuncture indicate that acupuncture is more than a placebo. However, these differences are relatively modest, suggesting that factors in addition to the specific effects of needling are important contributors to the therapeutic effects of acupuncture.”
REFERENCES


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Questions?