Pearls for Phantom Limb Pain

Symposium I
24 April 2010

What is old
What is old (and still useful)
What is new
What is coming…
What is old

Phantom is very old, and still strong

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What is old

Sympathectomy

**Sympathectomy for neuropathic pain (Review)**

Last assessed as up-to-date 8 November 2001.

Mailis-Gagnon A, Furlan AD

THE COCHRANE COLLABORATION®
What is old

Sympathectomy

Sympathectomy for neuropathic pain (Review)

Last assessed as up-to-date: 8 November 2001.

Mailis-Gagnon A, Furlan AD

This systematic review found that the practice of sympathectomy for treating neuropathic pain is based on very weak evidence. Chronic pain due to damaged nerves is called neuropathic pain and is common. Some people speculate that neuropathic pain, particularly reflex sympathetic dystrophy and causalgia, is caused by the sympathetic nervous system. Sympathectomy is a procedure that interrupts (temporarily or permanently) the sympathetic nervous system. Chemical sympathectomy use alcohol or phenol injections to temporarily destroy the sympathetic chain. Surgical ablation can be performed by open removal or electrocautery of the sympathetic chain, or minimally invasive procedures using endoscopic thermal or laser interruption. Evidence for the effectiveness of sympathectomy for neuropathic pain is very weak. Furthermore, complications of the procedure may be significant.

No eligible studies on phantoms

What is old

Peripheral nerve blocks

Nerve Sheath Catheter Analgesia
After Amputation

Timothy E. Morey, MD 1; John Giannoni, MS 1; Eddy Duncan, MD 1; Mark T. Scarborough, MD 1; and F. Kuper Enneking, MD 1

Thirty-nine patients completed the study. The incidence of phantom limb pain (visual analog scale score ≥ 3) was 67% and was lower than the historic incidence (80%) before the use of this analgesia technique.

Retrospective, no VAS data
What is old

Pre-emptive analgesia

N = 24
Pre-operative VAS?
Only patients with “complete analgesia” were recruited
What is old

Pre-emptive analgesia

Randomised trial of epidural bupivacaine and morphine in prevention of stump and phantom pain in lower-limb amputation

Lancet 1997; 350: 1353–57

Lone Nikolefjen, Susanne Højber, Jorgen H Christensen, Karsten Jensen, Troels S Jensen

<table>
<thead>
<tr>
<th>Dose</th>
<th>Control</th>
<th>Median (range) Intensity of phantom pain (VAS, 0–100 mm)</th>
<th>Dose</th>
<th>Control</th>
<th>Median (range) Intensity of stump pain (VAS, 0–100 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>8 (–26–5)</td>
<td>15</td>
<td>15</td>
<td>–17 to 16 (–25–8)</td>
</tr>
<tr>
<td>1.2</td>
<td>6</td>
<td>12 (–25–3)</td>
<td>16</td>
<td>15</td>
<td>–17 to 16 (–25–8)</td>
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<tr>
<td>1.8</td>
<td>3</td>
<td>9 (–29–5)</td>
<td>19</td>
<td>6</td>
<td>17 to 1 C (–15–6)</td>
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<tr>
<td>2.5</td>
<td>5</td>
<td>14 (–43–5)</td>
<td>19</td>
<td>6</td>
<td>17 to 1 C (–15–6)</td>
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<tr>
<td>3</td>
<td>4</td>
<td>25 (–62–5)</td>
<td>20</td>
<td>6</td>
<td>17 to 1 C (–15–6)</td>
</tr>
</tbody>
</table>

What is old

Amitriptyline

Trial of Amitriptyline for Relief of Pain in Amputees: Results of a Randomized Controlled Study

Lawrence R. Robinson, MD, Joseph M. Czerniecki, MD, Dawn M. Ehde, PhD, W. Thomas Edwards, MD, PhD, David A. Judish, MD, Myron L. Goldberg, PhD, Kellye M. Campbell, RN, Douglas G. Smith, MD, Mark P. Jenson, PhD

Arch Phys Med Rehabil Vol 85, January 2004

<table>
<thead>
<tr>
<th>VAS</th>
<th>Pre (mean ± SD)</th>
<th>Post (mean ± SD)</th>
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<tbody>
<tr>
<td>APPI</td>
<td>3.1±2.0</td>
<td>3.1±2.0</td>
</tr>
<tr>
<td>ARPLI</td>
<td>3.0±2.5</td>
<td>3.2±2.0</td>
</tr>
<tr>
<td>SF-AMQ</td>
<td>12.0±7.1</td>
<td>12.8±8.0</td>
</tr>
<tr>
<td>CES-D</td>
<td>16.4±12.4</td>
<td>15.3±12.3</td>
</tr>
<tr>
<td>NWW-N</td>
<td>20.7±8.7</td>
<td>19.8±8.7</td>
</tr>
<tr>
<td>RPI</td>
<td>28.9±22.3</td>
<td>24.2±21.4</td>
</tr>
<tr>
<td>HMI</td>
<td>78.3±4.2</td>
<td>76.1±3.3</td>
</tr>
<tr>
<td>CHART</td>
<td>422±92</td>
<td>417±75</td>
</tr>
</tbody>
</table>

Abbreviations: APPI, average PLF intensity; ARPLI, average RLP intensity.
What is old

Gabapentin

Gabapentin in Postamputation Phantom Limb Pain: A Randomized, Double-Blind, Placebo-Controlled, Cross-Over Study


Regional Anesthesia and Pain Medicine, Vol 27, No 5 (September–October), 2002: pp 481–486

<table>
<thead>
<tr>
<th>Variable</th>
<th>Placebo Arm</th>
<th>Gabapentin Arm</th>
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</thead>
<tbody>
<tr>
<td>No. of tablets rescue medication</td>
<td>187 ± 80</td>
<td>177 ± 71</td>
</tr>
<tr>
<td>Sleep interference (baseline)</td>
<td>4 (2-5)</td>
<td>4 (2-5)</td>
</tr>
<tr>
<td>Sleep interference (end of therapy)</td>
<td>4 (1-5)</td>
<td>3 (1-5)</td>
</tr>
<tr>
<td>HAD depression scale (baseline)</td>
<td>15 (5-25)</td>
<td>14 (5-25)</td>
</tr>
<tr>
<td>HAD depression scale (end of therapy)</td>
<td>14 (5-25)</td>
<td>12 (4-22)</td>
</tr>
<tr>
<td>Barthel index (baseline)</td>
<td>85 (65-100)</td>
<td>90 (70-105)</td>
</tr>
<tr>
<td>Barthel index (end of therapy)</td>
<td>87 (65-105)</td>
<td>85 (70-105)</td>
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<table>
<thead>
<tr>
<th>Side effects</th>
<th>Gabapentin</th>
<th>Placebo</th>
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<tbody>
<tr>
<td>Somnolence</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Dizziness</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Headache</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Nausea</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

P Value for Gabapentin v Placebo

- P = .19
- P = .30
- P = .80
- P = .13
- P = .24
- P = .13
- P = .005
- P = .49
- P = .80
What is old

Gabapentin

A Randomized Study of the Effects of Gabapentin on Postamputation Pain

What is old

Topiramate

Topiramate for Phantom Limb Pain: A Time-Series Analysis
What is old (and still useful)

Ketamine

Chronic Phantom Limb Pain: The Effects of Calcitonin, Ketamine, and Their Combination on Pain and Sensory Thresholds

(Aeodih Analg 2008;108:1265-73)

% change of VAS

during after 48h max 48h mean

placebo calcitonin ketamine combination

What is old (and still useful)

Opioids

The Clinical Journal of Pain, Vol. 18, No. 5, 2002

Case Report

Methadone for Phantom Limb Pain

*Ionneke Bergmans, M.D., *Dirk G. Snijdehaar, M.D., *Joel Katz, Ph.D., and *Ben J. P. Curn, M.D., Ph.D.

*Pain Unit, Department of Anaesthesiology, University Medical Center, Nijmegen, the Netherlands; Victorian Pain Research Unit, Department of Anesthesiology and Pain Management, Toronto General Hospital and Mount Sinai Hospital, Toronto, Ontario, Canada
What is old (and still useful)

Opioids

CASE REPORT

High-dose Morphine for Intractable Phantom Limb Pain
Soema Mishra, MD, Sushma Bhazanvar, MD, and Amit Kumar Singhal, MD

Clin J Pain • Volume 23, Number 1, January 2007

What is old (and still useful)

Opioids

Analgesic Effects of Intravenous Lidocaine and Morphine on Postamputation Pain
A Randomized Double-blind, Active Placebo-controlled, Crossover Trial

Phantom Pain

![Graph showing analgesic effects of lidocaine and morphine](image)
What is old (and still useful)

Opioids

The effect of opioids on phantom limb pain and cortical reorganization

Ellena Huseb, Wolfgang Larbigc, Herta Florb, Niels Birbaumerd

Institute of Medical Psychology and Behavioral Neurobiology, Heidelberg University, Heidelberg, Germany

Institute of Clinical and Cognitive Neurosciences, Centre for the Study of Pain and Painful Conditions, University of Heidelberg, Heidelberg, Germany

Department of Psychology, University of Padua, Padua, Italy


<table>
<thead>
<tr>
<th>Placebo</th>
<th>Diary (VAS)</th>
<th>M</th>
<th>SD</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>4.65</td>
<td>1.66</td>
<td></td>
</tr>
<tr>
<td>MSTb phase</td>
<td>3.26</td>
<td>1.59</td>
<td></td>
</tr>
<tr>
<td>Placebo phase</td>
<td>3.99</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td>Follow-up 1</td>
<td>1.62</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>Follow-up 2</td>
<td>1.54</td>
<td>1.34</td>
<td></td>
</tr>
</tbody>
</table>

What is old (and still useful)

Prosthesis

Decrease in phantom limb pain associated with prosthesis-induced increased use of an amputation stump in humans

Thomas Weissa, Wolfgang H.R. Miltnerb,*, Torsten Adlerb,
Lutz Brücknerb, Edward Taubc, d

What is old (and still useful)

Prosthesis

Does use of a myoelectric prosthesis prevent cortical reorganization and phantom limb pain?

M. Lotz1,2, W. Codd1, N. Birbaumer2,3, M. Erb1, E. Huse1 and H. Flor4

nature neuroscience • volume 2 no 5 • june 1999

<table>
<thead>
<tr>
<th></th>
<th>No extensive myoelectric prosthesis use</th>
<th>Extensive myoelectric prosthesis use</th>
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<tbody>
<tr>
<td>Subject</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Amputated hand1</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>20 20 25 21 60 70 30 31 03 20 45.11 ± 10.19</td>
<td>20 22 00 50 65 45.0 ± 17.94</td>
</tr>
<tr>
<td>Years since amputation</td>
<td>3 30 7 48 63 16 13 3 27 22.33 ± 16.71</td>
<td>9 7 7 2 15 5.4 ± 3.29</td>
</tr>
<tr>
<td>Prosthetic type2</td>
<td>2 2 1 1 1 0 0 0 0 2 2 2 2 2</td>
<td>2 2 2 2 2</td>
</tr>
<tr>
<td>Time wearing prosthesis2</td>
<td>18 4 16 16 16 3 0 0 0 5.22 ± 8.58</td>
<td>16 16 12 16 16 16 155 ± 15.79</td>
</tr>
<tr>
<td>Prosthetic usage2</td>
<td>45 0 01 09 29 25 0 0 0 15.44 ± 22.09</td>
<td>100 100 100 71 30 70.0 ± 15.90</td>
</tr>
<tr>
<td>Phantom limb pain3</td>
<td>3 4 0 2 0 2 0 2 3 4 2.33 ± 1.53</td>
<td>0 0 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Stump pain4</td>
<td>0 0 4 0 1 0 0 1 0 0.57 ± 1.21</td>
<td>0 0 0 0 0 0 0 0 0 0.63 ± 0.01</td>
</tr>
<tr>
<td>Initial phantom pain5</td>
<td>3 6 5 0 2 4 2 4 3 4 3.33 ± 3.70</td>
<td>0 3.5 0 4.8 4.8 3.32 ± 2.31</td>
</tr>
<tr>
<td>VM deprojection-A5</td>
<td>0 7 7 0 9 10 1 2 7 9 6.84 ± 1.94</td>
<td>0 0 0 0 0 0 0.32 ± 0.41</td>
</tr>
</tbody>
</table>

1 all dominant, all nonamputated hand. 2 prosthesis, 3 amputees, 4 use of myoelectric prosthesis. 2. "Total out of all the times 100% range of movements in VAS range 0-100% or daily limp, amputee will work outside frame." Phantoms based on intensity of the NIN Pain VAS (range 0-100). 4-5 "Phantom pain assessed based on the T11 Pain VAS (range 0-10)." 5 "Phantom pain assessed based on the NIN Pain VAS (range 0-10)."
## What is old (and still useful)

### Prosthesis

<table>
<thead>
<tr>
<th></th>
<th>Mean ± s.d.</th>
<th>Mean ± s.d.</th>
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</thead>
<tbody>
<tr>
<td>Amputated hand(^1)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Age</td>
<td>49.11 ± 18.10</td>
<td>43.8 ± 17.94</td>
</tr>
<tr>
<td>Years since amputation</td>
<td>22.33 ± 18.71</td>
<td>5.4 ± 3.29</td>
</tr>
<tr>
<td>Prosthetic type(^2)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Time wearing prosthesis(^3)</td>
<td>5.22 ± 6.66</td>
<td>15.2 ± 1.79</td>
</tr>
<tr>
<td>Prosthetic usage(^4)</td>
<td>19.44 ± 23.00</td>
<td>85.8 ± 19.96</td>
</tr>
<tr>
<td>Phantom limb pain(^5)</td>
<td>2.33 ± 1.53</td>
<td>0 ± 0</td>
</tr>
<tr>
<td>Stump pain(^6)</td>
<td>0.57 ± 1.21</td>
<td>0.13 ± 0.3</td>
</tr>
<tr>
<td>Initial phantom pain(^5)</td>
<td>3.33 ± 1.79</td>
<td>3.82 ± 2.31</td>
</tr>
<tr>
<td>M1 displacement-AM(^7)</td>
<td>4.64 ± 3.91</td>
<td>0.32 ± 0.41</td>
</tr>
<tr>
<td>S1 displacement-AM(^7)</td>
<td>8.39 ± 7.81</td>
<td>0 ± 0</td>
</tr>
</tbody>
</table>

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## What is new

### CNS changes

**Phantom movements and pain**

An fMRI study in upper limb amputees

Martin Lotze,\(^1\) Herta Flor,\(^2\) Wolfgang Grodd,\(^3\) Wolfgang Larbig\(^1\) and Niels Birbaumer\(^1,4\)

**Brain** (2001), **124**, 2268–2277
What is new

CNS changes … within minutes

Rapid functional plasticity in the primary somatmotor cortex and perceptual changes after nerve block

Thomas Weiss,1 Wolfgang H. R. Mittner,1 Joachim Liepert,1,2 Winfried Meissner3 and Edward Taub4,5

[Graph showing changes over time]
What is new

Mirror

Mirror Therapy for Phantom Limb Pain

Brenda L. Chan, B.A.
Richard Witt, P.A.-C.
Alexandra P. Charrow, B.A.
Amanda Magee, P.A.-C.
Robin Howard, M.A.
Paul F. Pasquina, M.D.
Walter Reed Army Medical Center
Washington, MD 20018

Kenneth M. Heilman, M.D.
Malcolm Randall Veterans Affairs Medical Center
Gainesville, FL 32608

Jack W. Tsao, M.D., D.Phil.
Uniformed Services University of the Health Sciences
Bethesda, MD 20814
jour@usuhs.mil

Randomized Trial
Crossover to Mirror Therapy

Mental visualization

Score on Visual Analog Scale

Week

Covered mirror

Mirror

What is new
What is new

Mirror

Available online at www.sciencedirect.com


Mean (±SD) phantom limb pain (PLP) measures pre- and post-intervention

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
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<tbody>
<tr>
<td></td>
<td>Mirror (n = 7)</td>
<td>Control (n = 8)</td>
</tr>
<tr>
<td>MPQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NWC</td>
<td>9.57 (±4.43)</td>
<td>7.38 (±3.78)</td>
</tr>
<tr>
<td>Total PRI</td>
<td>19.13 (±11.5)</td>
<td>20.13 (±13.3)</td>
</tr>
<tr>
<td>Sensory PRI</td>
<td>14.57 (±8.9)</td>
<td>11.38 (±7.5)</td>
</tr>
<tr>
<td>Other PRI</td>
<td>4.37 (±3.2)</td>
<td>7.62 (±5.1)</td>
</tr>
<tr>
<td>Visual analogue scale</td>
<td>Intensity score</td>
<td>31 (±24.2)</td>
</tr>
</tbody>
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Mean (±SD) phantom limb sensation (PLS) measures pre- and post-intervention

<table>
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<tr>
<th>Variable</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
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<tr>
<td></td>
<td>Mirror (n = 21)</td>
<td>Control (n = 22)</td>
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<tr>
<td>Verbal descriptors</td>
<td>NWC</td>
<td>5.53 (±5.05)</td>
</tr>
<tr>
<td>Total</td>
<td>9.01 (±10.9)</td>
<td>11.39 (±8.8)</td>
</tr>
<tr>
<td>Sensory</td>
<td>6.81 (±7.1)</td>
<td>7.39 (±6.1)</td>
</tr>
<tr>
<td>Other</td>
<td>2.91 (±3.9)</td>
<td>4.09 (±3.2)</td>
</tr>
<tr>
<td>Visual analogue scale</td>
<td>Intensity score</td>
<td>48.85 (±30.18)</td>
</tr>
</tbody>
</table>

What is new

Original Research Article

Roberto Casale, MD
Carlo Damiani, MD
Venessa Rosati, MD

Treatment completed (12%)

No side effect 12%
Dizziness 12%
Irritation 18%
Uneasiness 58%

Treatment withdrawal (88%)

No side effect 12%
Dizziness 12%
Irritation 18%
Uneasiness 58%
What is new

Mirror

Problems (esp. with lower limbs)
- Mirror size and weight
- Asymmetrical movements
- Bilateral amputations
- Contradicts the use of prosthesis

What is coming

Virtual reality

RESEARCH PAPER

Exploratory findings with virtual reality for phantom limb pain from stump motion to agency and analgesia

JONATHAN COLE¹, SIMON CROWLE³, GREG AUSTWICK² & DAVID HENDERSON SLATER²

¹Department of Clinical Neurophysiology, Southend Hospital, Longfellow Road, Southend-On-Sea, SS2 5EP, UK; ²DRC, Department of Medicine, University of Oxford, Oxford, OX2 6HE, UK; and ³Vynwy Centre for Pain Research, Spinal Orthopaedic Centre, Whitchurch Road, Headington, Oxford, OX3 7HD, UK
What is coming

Virtual reality

More "real", less emotional than mirror
Less "unreal" than the prosthesis

Allow single limb movement

Is "agency" the answer?

Figure 3. VAS pain scores before/during VR test.
What is coming

Motor Cortex Stimulation

Mapping phantom movement representations in the motor cortex of amputees

- Fingers
- Fingers+wrist
- Wrist
- Elbow
- Global arm movement
- No movement

What is coming

Motor Cortex Stimulation

Chronic Phantom Magnetic Technical

Franck-Emmanuel Yves Lazorthes
Department of Neurosurgery, Toulouse, France

What is coming

Motor Cortex Stimulation

19 Spinal Cord Stimulations → 6 good
10 Deep Brain Stimulation → 6 good
5 Motor Cortex Stimulation → 1 good
What is coming

Motor Cortex Stimulation … oops

Painful supernumerary phantom arm following motor cortex stimulation for central poststroke pain

Case report

SERGIO CANAVERO, M.D., VINCENZO BONICALZI, M.D., GIANCARLO CASTELLANO, M.D., PAOLA PEROZZO, PSYCHOL.D., AND BARBARA MASSA-MICON, M.D.

Pain Relief Unit, Department of Neurosciences, Service of Nuclear Medicine, and Neuropsychology Unit, University of Turin, Ospedale Molinette, Turin, Italy

Summary

Atypical among neuropathic pains
Shifting research and treatment paradigm
Courtesy to Mr. B Stott *Therapy Times*, photo by Sgt. RJ Mommaerts Jr.