

Pearls for Phantom Limb Pain

Symposium I

24 April 2010

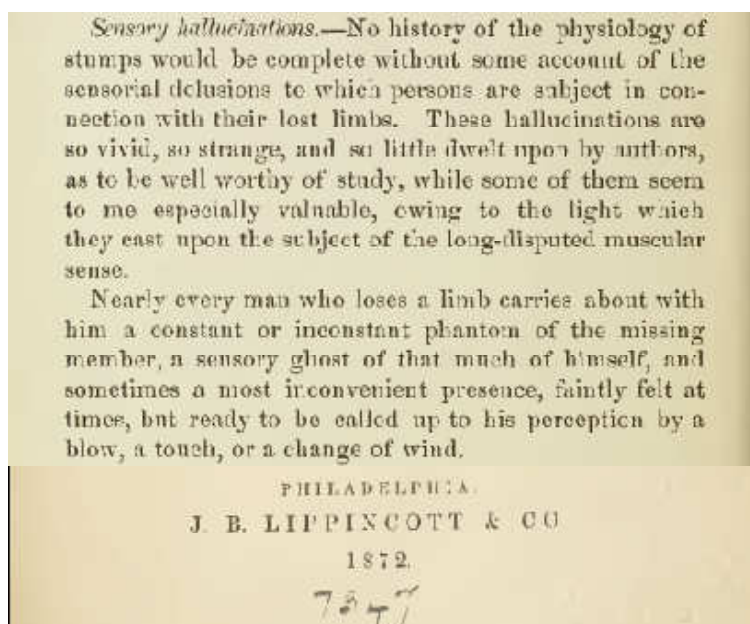
What is old

What is old (and still useful)

What is new

What is coming...

What is old



Phantom is very old, and still strong

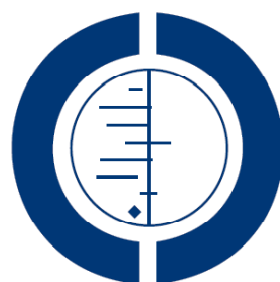
What is old

Sympathetomy

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

Sympathetomy

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 postulate 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 sympathectomies use alcohol or phenol injections to temporarily destroy the sympathetic chain. Surgical ablation can be performed by open removal or electrocoagulation of the sympathetic chain, or minimally invasive procedures using stereotactic 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**; *John Giannoni, MS†*; *Eddy Duncan, MD**;
Mark T. Scarborough, MD†; and *F. Kayser Enneking, MD*†*

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

Pain, 33 (1988) 297–301
Elsevier

Phantom limb pain in amputees during the first 12 months following limb amputation, after preoperative lumbar epidural blockade

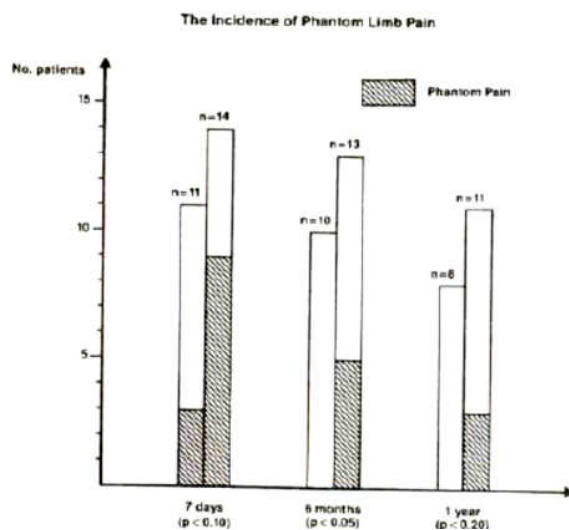
Søren Bach^a, Morten F. Noreng^b and Niels U. Tjølliden^b

^a Department of Orthopaedic Surgery and ^b Department of Anaesthesiology, Randers Central Hospital, DK-8900 Randers (Denmark)

(Received 4 September 1987, revision received 1 February 1988, accepted 11 February 1988)

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 Nikolajsen, Susanne Ilkjaer, Jørgen H Christensen, Karsten Krøner, Troels S Jensen

Median (range) intensity of phantom pain (VAS, 0-100 mm)				Median (range) intensity of stump pain (VAS, 0-100 mm)			
Blockade	Control	95% CI	p	Blockade	Control	95% CI	p
4	10	-8 to 7	1.0	16	15	-7 to 6	1.0
(0-26.5)	(0-26.3)			(8.3-24.8)	(10.3-22.8)		
12	6	11 to 7	0.7	13	6	17 to 1	0.6
(2-25)	(0-29)			(0-25)	(0-10.5)		
19	13	-20 to 5	0.2	3	6	-3 to 8	0.2
(4-37.5)	(0-25.5)			(0-8)	(0-15.5)		
20	9	-28 to 7	0.3	0	4	-2 to 7	0.6
(2.5-46.5)	(0-28.5)			(0-0.5)	(0-10.5)		

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. Judith, MD, Myron L. Goldberg, PhD, Kellye M. Campbell, RN, Douglas G. Smith, MD, Mark P. Jensen, PhD

Arch Phys Med Rehabil Vol 85, January 2004

Measure	Placebo Group (n=19)	
	Pre (mean ± SD)	Post (mean ± SD)
APLPI	3.1±2.0	3.1±2.9
ARLPI	3.0±2.5	2.3±2.0
SF-MPQ	12.0±11.1	12.6±8.6
CFS-D	16.4±12.4	16.1±13.1
SWLS	20.7±8.7	21.8±8.7
BFI	28.8±22.3	24.2±21.4
FIM	78.3±4.2	79.1±3.3
CHART	422±82	417±75

Abbreviations: APLPI, average PLF intensity; ARLPI, average RLP intensity.

What is old

Gabapentin

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

Margaret Bone, F.R.C.A., Peter Critchley, F.R.C.P., and
Donal J. Buggy, M.D., M.Sc., Dip.Med.Eld., F.R.C.P.I., F.C.A.R.C.S.I., F.R.C.A.

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

What is old

Gabapentin

Variable	Variable	Placebo Arm	Gabapentin Arm	P Value for Gabapentin v Placebo
Baseline before placebo	No. of tablets rescue medication	187 ± 80	177 ± 71	P = .19
Week 1	Sleep interference (baseline)	4 (2-5)	4 (2-5)	P = .30
Week 2	Sleep interference (end of			P = .80
Week 3	therapy)	4 (1-5)	3 (1-5)	P = .13
Week 4	HAD depression scale (baseline)	15 (5-25)	14 (5-25)	P = .24
Week 5	HAD depression scale (end of			P = .13
Week 6	therapy)	14 (5-25)	12 (4-22)	P = .025
Categorical pain baseline	Barthel index (baseline)	85 (65-100)	90 (70-105)	P = .49
Categorical pain end of therapy	Barthel index (end of therapy)	87 (65-105)	85 (70-105)	P = .80

Side effects	Gabapentin	Placebo
Somnolence	7	2
Dizziness	2	1
Headache	2	1
Nausea	1	1

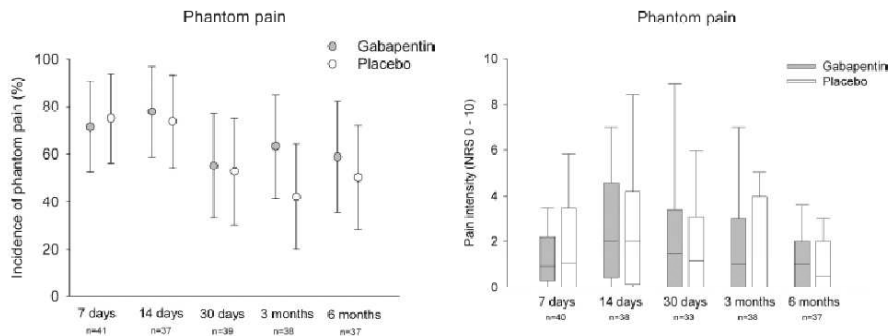
What is old

Gabapentin

Anesthesiology 2006; 105:1008-15

A Randomized Study of the Effects of Gabapentin on Postamputation Pain

Lone Nikolajsen, M.D., Ph.D.,* Nanna B. Finnerup, M.D., Ph.D.,† Steffen Kramp, M.D.,‡ Anna-Sofie Vmtrup,§ Johnny Keller, M.D., Ph.D.,‡ Troels S. Jensen, M.D., Ph.D.||



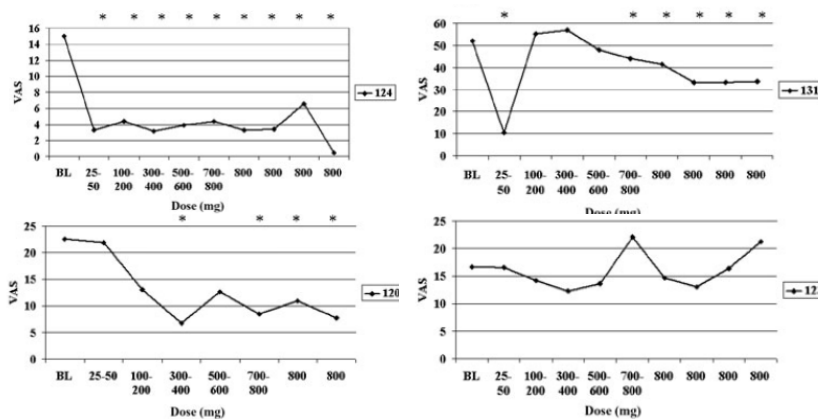
What is old

Topiramate

PAIN MEDICINE
Volume 6 • Number 5 • 2005

Topiramate for Phantom Limb Pain: A Time-Series Analysis

R. Norman Harden, MD, Tim T. Houle, PhD, Thomas A. Remble, MS, Wendy Lin, MD, Kenten Wang, DO, and Samuel Saltz, DO

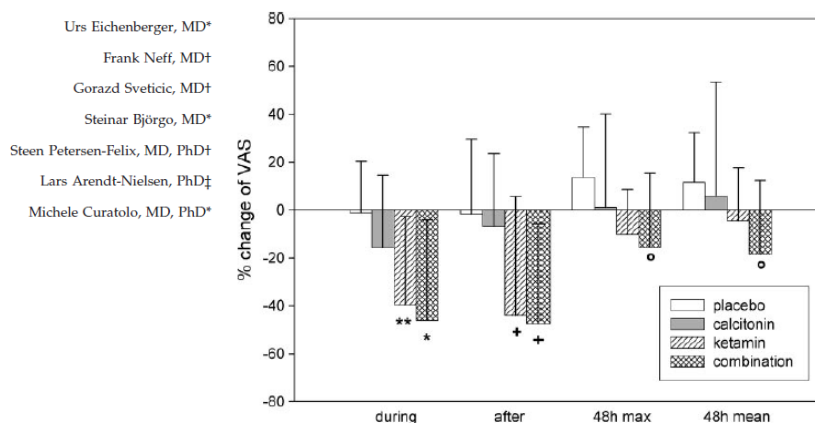


What is old (and still useful)

Ketamine

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

(Anesth Analg 2008;106:1265-73)



What is old (and still useful)

Opioids

The Clinical Journal of Pain, Vol. 18, No. 3, 2002

Case Report

Methadone for Phantom Limb Pain

*Lonneke Bergmans, M.D., *Dirk G. Snijdelaar, M.D., †Joel Katz, Ph.D., and
*Ben J. P. Crul, M.D., Ph.D.

*Pain Center, Department of Anesthesiology, University Medical Center, Nijmegen, The Netherlands; †Acute Pain Research Unit, Department of Anesthesia 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

Seema Mishra, MD, Sushma Bhatnagar, MD, and Amit Kumar Singhal, MD

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

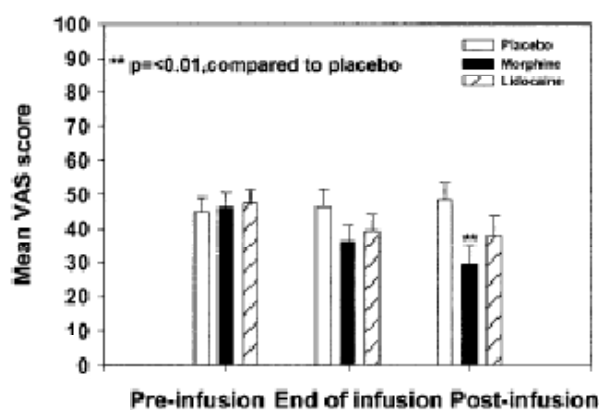
What is old (and still useful)

Opioids

Analgesic Effects of Intravenous Lidocaine and Morphine on Postamputation Pain

A Randomized Double-blind, Active placebo-controlled, Crossover Trial

Phantom Pain



What is old (and still useful)

Opioids

The effect of opioids on phantom limb pain and cortical reorganization

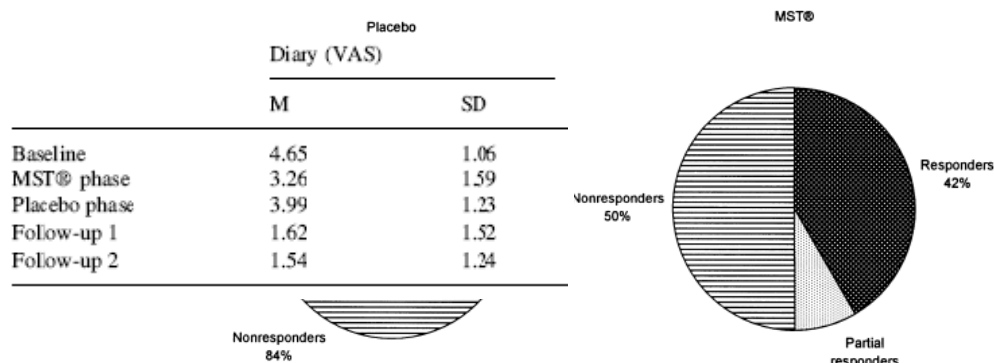
Ellena Huse^{a,*}, Wolfgang Larbig^a, Herta Flor^b, Niels Birbaumer^{a,c}

^aInstitute of Medical Psychology and Behavioral Neurobiology, Eberhard-Karls-University of Tübingen, Gartenstrasse 29, 72074 Tübingen, Germany

^bDepartment of Clinical and Cognitive Neuroscience, Central Institute of Mental Health, Mannheim, Germany

^cDepartment of Psychology, University of Padua, Padua, Italy

Pain 90 (2001) 47–55



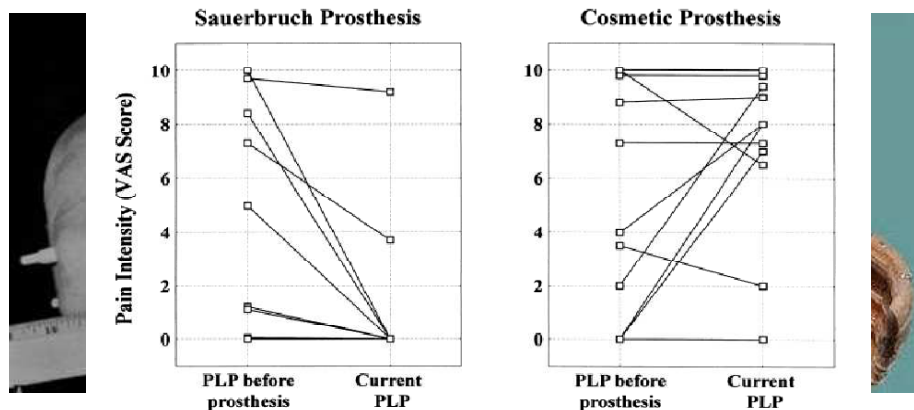
What is old (and still useful)

Prosthesis

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

Thomas Weiss^a, Wolfgang H.R. Miltner^{a,*}, Torsten Adler^b,
Lutz Brückner^b, Edward Taub^{c,d}

Neuroscience Letters 272 (1999) 131–134



What is old (and still useful)

Prosthesis

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

M. Lotze^{1,2}, W. Grodd¹, N. Birbaumer^{2,3}, M. Erb¹,
E. Huse² and H. Flor⁴

nature *neuroscience* • volume 2 no 6 • june 1999



What is old (and still useful)

Prosthesis

Subject	No extensive myoelectric prosthesis use									Extensive myoelectric prosthesis use						
	7	9	8	14	5	1	3	10	4	Mean ± s.d.	2	6	11	13	12	Mean ± s.d.
Amputated hand ¹	nd	nd	nd	nd	d	d	nd	d	d	—	d	d	d	d	d	—
Age	28	56	31	62	78	35	31	63	58	49.11 ± 18.10	26	32	60	35	66	43.8 ± 17.94
Years since amputation	3	30	7	48	53	19	11	3	27	22.33 ± 18.71	9	7	7	3	15	5.4 ± 3.29
Prosthetic type ²	2	2	1	1	1	0	0	0	0	—	2	2	2	2	2	—
Time wearing prosthetic ³	8	4	16	16	3	0	0	0	0	5.22 ± 6.86	16	16	12	16	16	15.2 ± 1.79
Prosthetic usage ⁴	42	9	61	38	25	0	0	0	0	19.44 ± 23.00	100	100	100	71	58	85.8 ± 19.98
Phantom limb pain ⁵	3	4	4	0	2	0	2	3	4	2.33 ± 1.53	0	0	0	0	0	0 ± 0
Stump pain ⁶	0	0	4	0	1	0	0	1	0	0.57 ± 1.21	0	0	0	0	0.7	0.13 ± 0.3
Initial phantom pain ⁵	5	6	5	0	2	4	2	3	4	3.33 ± 1.79	6	3.5	0	4.8	4.8	3.82 ± 2.31
M1 displacement-AM ⁷	0	7	7	0	10	1	2	7	9	4.64 ± 3.91	0.2	0.4	0	0	1	0.32 ± 0.41
S1 displacement-AM ⁷	0	9	24	0	13	1	13	7	9	8.39 ± 7.81	0	0	0	0	0	0 ± 0

¹d, dominant; nd, nondominant hand. ²no prosthesis, 0, cosmetic prosthesis, 1, myoelectric prosthesis. ³not at all, 0; all the time, 16. ⁴usage of prosthesis in VAS (usage 0–100% in daily living, homemaking and work outside home). ⁵phantom limb pain intensity based on the MPI Pain Intensity Scale (range, 0–6). ⁶stump pain intensity based on the MPI Pain Intensity Scale (range, 0–6). ⁷Displacement of activation maxima (AM) of the contralateral lip representation in M1 and S1.

What is old (and still useful)

Prosthesis

	Mean ± s.d.	Mean ± s.d.
Amputated hand ¹	—	—
Age	49.11 ± 18.10	43.8 ± 17.94
Years since amputation	22.33 ± 18.71	5.4 ± 3.29
Prosthetic type ²	—	—
Time wearing prosthetic ³	5.22 ± 6.66	15.2 ± 1.79
Prosthetic usage ⁴	19.44 ± 23.00	85.8 ± 19.98
Phantom limb pain ⁵	2.33 ± 1.53	0 ± 0
Stump pain ⁶	0.57 ± 1.21	0.13 ± 0.3
Initial phantom pain ⁵	3.33 ± 1.79	3.82 ± 2.31
M1 displacement-AM ⁷	4.64 ± 3.91	0.32 ± 0.41
S1 displacement-AM ⁷	8.39 ± 7.81	0 ± 0

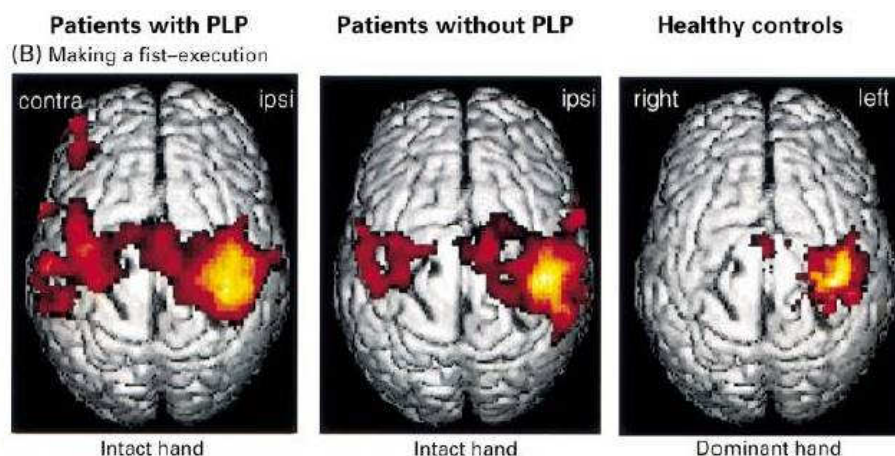
What is new

CNS changes

Brain (2001), 124, 2268–2277

Phantom movements and pain An fMRI study in upper limb amputees

Martin Lotze,¹ Herta Flor,³ Wolfgang Grodd,² Wolfgang Larbig¹ and Niels Birbaumer^{1,4}



What is new

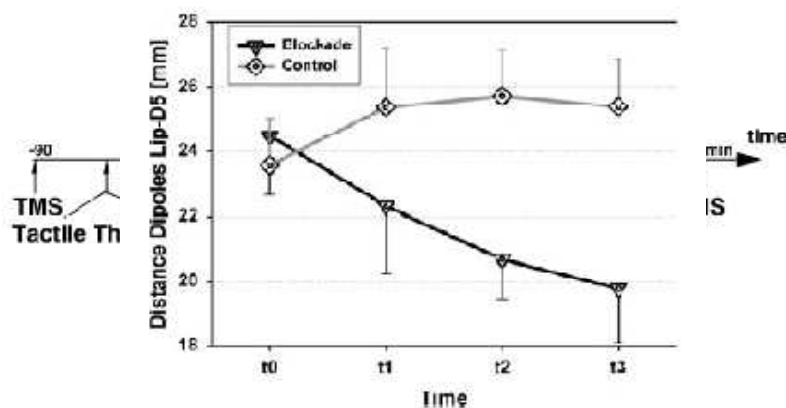
CNS changes ... within minutes

European Journal of Neuroscience, Vol. 20, pp. 3413-3423, 2004

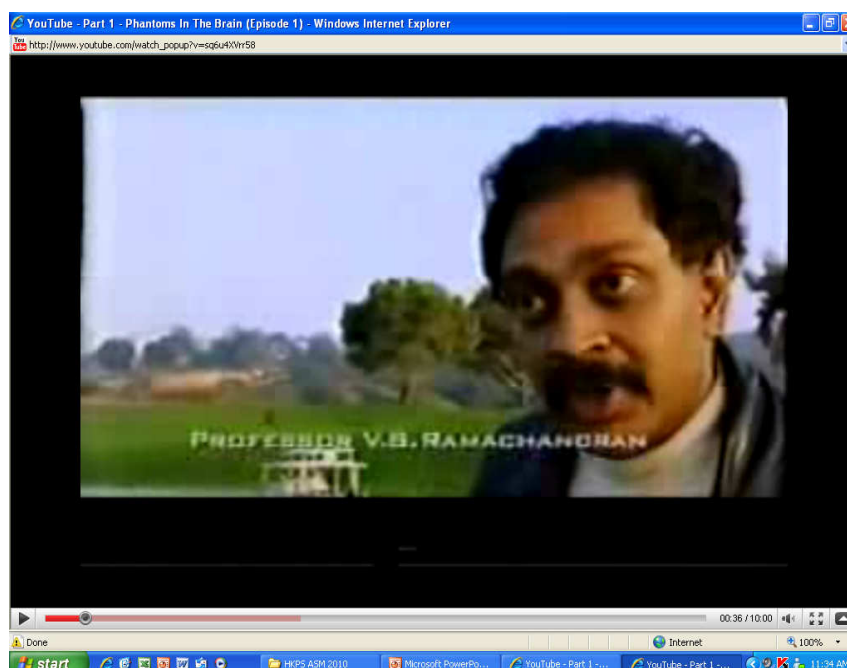
© Federation of European Neuroscience Societies

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

Thomas Weiss,¹ Wolfgang H. R. Miltner,¹ Joachim Liepert,^{2*} Winfried Meissner³ and Edward Taub^{4,5}



What is new



What is new

Mirror



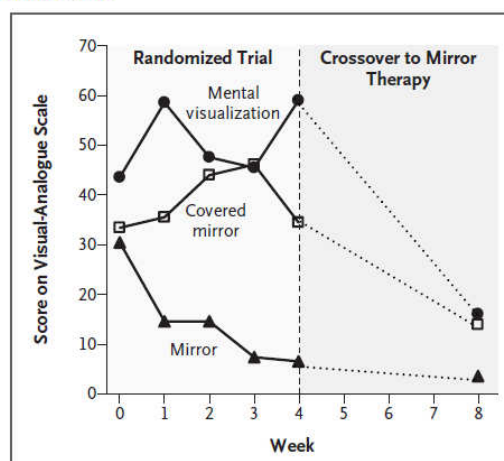
What is new

Mirror

Mirror Therapy for Phantom Limb Pain

N ENGL J MED 357:21 WWW.NEJM.ORG NOVEMBER 22, 2007

Brenda L. Chan, B.A.
Richard Witt, P.A.-C.
Alexandra P. Charrow, B.A.
Amanda Magee, P.A.-C.
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What is new

Mirror



Available online at www.sciencedirect.com



European Journal of Pain 11 (2007) 428–436



www.EuropeanJournalPain.com

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

Variable	Pre-intervention		Post-intervention		
	Mirror (<i>n</i> = 7)	Control (<i>n</i> = 8)	Mirror (<i>n</i> = 7)	Control (<i>n</i> = 8)	
MPQ	NWC	9.57 (\pm 4.43)	7.38 (\pm 3.78)	5.43 (\pm 6.83)	3.38 (\pm 3.42)
	Total PRI	19.14 (\pm 11.5)	20.13 (\pm 13.3)	12.86 (\pm 18.0)	6.00 (\pm 7.2)
	Sensory PRI	14.57 (\pm 8.9)	11.38 (\pm 7.5)	9.29 (\pm 12.6)	3.88 (\pm 4.7)
	Other PRI	4.57 (\pm 3.2)	7.62 (\pm 9.1)	4.86 (\pm 9.1)	2.13 (\pm 2.9)
Visual analogue scale	Intensity score	57 (\pm 24.2)	33 (\pm 21.0)	40 (\pm 41.0)	29 (\pm 31.9)

Mean (\pm SD) phantom limb sensation (PLS) measures pre- and post-intervention

Variable	Pre-intervention		Post-intervention		
	Mirror (<i>n</i> = 21)	Control (<i>n</i> = 22)	Mirror (<i>n</i> = 21)	Control (<i>n</i> = 22)	
Verbal descriptors	NWC	5.33 (\pm 5.05)	6.91 (\pm 4.84)	4.05 (\pm 4.41)	5.32 (\pm 4.57)
	Total	9.71 (\pm 10.5)	11.59 (\pm 8.8)	7.76 (\pm 9.3)	8.82 (\pm 7.2)
	Sensory	6.81 (\pm 7.1)	7.50 (\pm 6.1)	5.38 (\pm 6.1)	5.77 (\pm 4.9)
	Other	2.91 (\pm 3.9)	4.09 (\pm 3.2)	2.38 (\pm 3.5)	3.05 (\pm 2.98)
Visual analogue scale	Intensity score	48.85 (\pm 30.18)	49.22 (\pm 27.74)	37.60 (\pm 36.05)	44.08 (\pm 31.81)

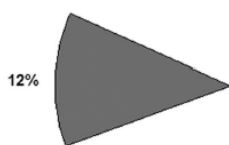
What is new

Mirror

ORIGINAL RESEARCH ARTICLE

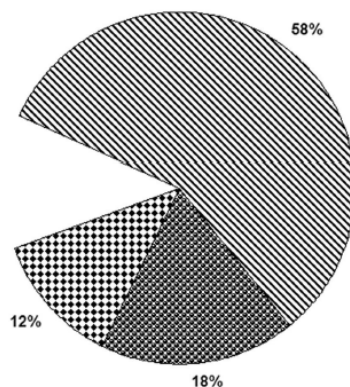
Roberto Casale, MD
Carlo Damiani, MD
Venessa Rosati, MD

treatment completed (12%)



■ no side effect

treatment withdrawal (88%)



▨ dizziness

▩ irritation

▧ uneasiness

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

Disability and Rehabilitation, 2009; 31(10): 845-854

RESEARCH PAPER

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

JONATHAN COLE^{1,2} SIMON CROWLE², GREG AUSTWICK² &
DAVID HENDERSON SLATER³

¹Department of Clinical Neurophysiology, Poole Hospital, Longfleet Road, Poole, BH15 2JB, UK, ²DEC, Bournemouth University, Poole, Dorset, BH12 5BB, UK, and ³Oxford Centre for Enablement, Nuffield Orthopaedic Centre, Windmill Road, Headington, Oxford, OX3 7HE, UK

What is coming

Virtual reality



What is coming

Virtual reality

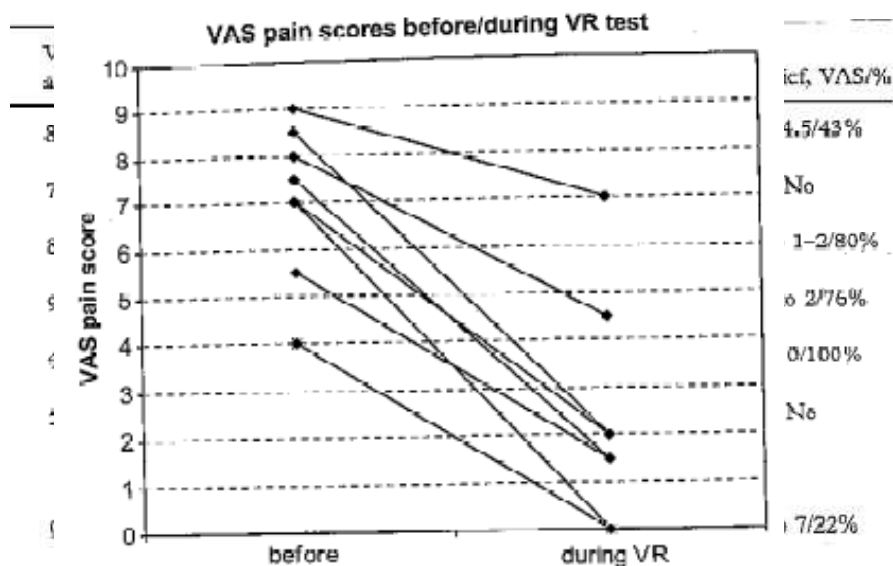


Figure 3. VAS pain scores before/during VR test.

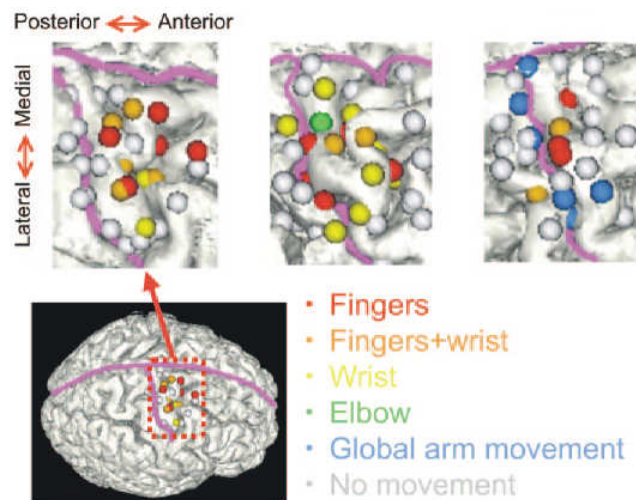
What is coming

Motor Cortex Stimulation

doi:10.1093/brain/awl180

Brain (2006), 129, 2202–2210

Mapping phantom movement representations in the motor cortex of amputees



What is coming

Motor Cortex Stimulation

Chronic
Phantom
Magnetic
Technica

Franck-Emma
Yves Lazorth
Departments of Neu
Toulouse, France



for

:

o.,

il,

Neurosurgery, Vol. 48, No. 3, March 2001

What is coming

Motor Cortex Stimulation

13th Meet World Soc Stereotact Funct Neurosurg, Adelaide 2001
Stereotact Funct Neurosurg 2001;77:159-162
DOI: 10.1159/000064593

*Stereotactic
Functional
Neurosurgery*

Motor Cortex Stimulation for Phantom Limb Pain: Comprehensive Therapy with Spinal Cord and Thalamic Stimulation

Yoichi Katayama Takamitsu Yamamoto Kazutaka Kobayashi
Masahiko Kasai Hideki Oshima Chikashi Fukaya

Serial implants for 19 patients

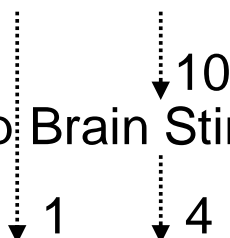
What is coming

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

J Neurosurg 91:121-123, 1999

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.