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Understanding Chronic Post Surgical Pain: An International Perspective

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A review of chronic pain after surgery

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Session objective

“To examine methodological issues related to the definition and measurement of persistent chronic post-surgical pain”

- Epidemiology
 - Definitions & case-ascertainment
- Risk factors for CPSP
- Model for investigation

Definition

IASP – chronic pain

“Intermittent or continuous pain persisting beyond normal tissue healing time”

“**3** months most convenient division between acute & chronic but for research purposes, **6** months will often be preferred”

Criteria for CPSP (Macrae & Davies, 1999):

- i. Pain must develop after a surgical procedure;
- ii. Pain is of at least **2** months duration;
- iii. Other causes for the pain have been excluded;
- iv. The possibility that the pain is from a pre-existing problem should be explored and exclusion attempted.

Terminology

Chronic post-surgical pain

Post-surgical neuralgia

Post-operative traumatic nerve injury

Neuroma pain

Persistent scar pain

Procedure-specific pain syndromes

Post-mastectomy pain syndrome (PMPS)

Post-axillary dissection pain

Intercostobrachial nerve entrapment syndrome (INES)

Phantom pain

Stump pain

Post thoracotomy pain syndrome

Internal mammary artery syndrome (IMAS)*etc*

Mechanism

SURGERY

- **Nociceptive pain:** activation of peripheral sensory neurons by noxious stimuli
 - ~ local increase in sensitivity, fades on removal of peripheral stimuli
- **Inflammatory pain:** response to tissue injury & inflammation
 - ~ Drives acute postop pain until wound healed, usually reversible
- **Neuropathic pain:** arises after injury to nerves
 - ~ intraoperative nerve trauma from cautery, dissection etc.

Characteristics

Predominantly neuropathic (Kehlet 2006, Steegers 2008)

Sensation

- Loss of sensation of touch, temperature, pressure

Hypersensitivity

- Paresthesia by non-noxious stimuli, symptoms continuous or spasmodic
- Hypersensitivity can mask sensory loss

Descriptors

- Stabbing, shooting, burning, numbness, pins & needles, tingling.....

Measurement

Clinical vs epidemiological approach



Clinical

Individual

Detailed assessment

Targeted treatment

e.g. pain clinic

Epidemiological

Population level

Historical cohort

Cross sectional survey

Prospective cohort



Epidemiological studies

Case ascertainment



Defining 'chronic'

2, 3 or 6 months after surgery

Have you had pain in the last day?

Have you had this pain for more than 3 months?

Attributable to surgery?

Is this pain the same as the pain before surgery? [*recall bias*]

Is the pain due to surgery?

Surgical cohort studies

Model for investigation



Pain characteristics

Intensity

Character:

Impact on QoL:

Timeline:

VAS, VRS, BPI

MPQ, SF-MPQ, s-LANSS, DN4

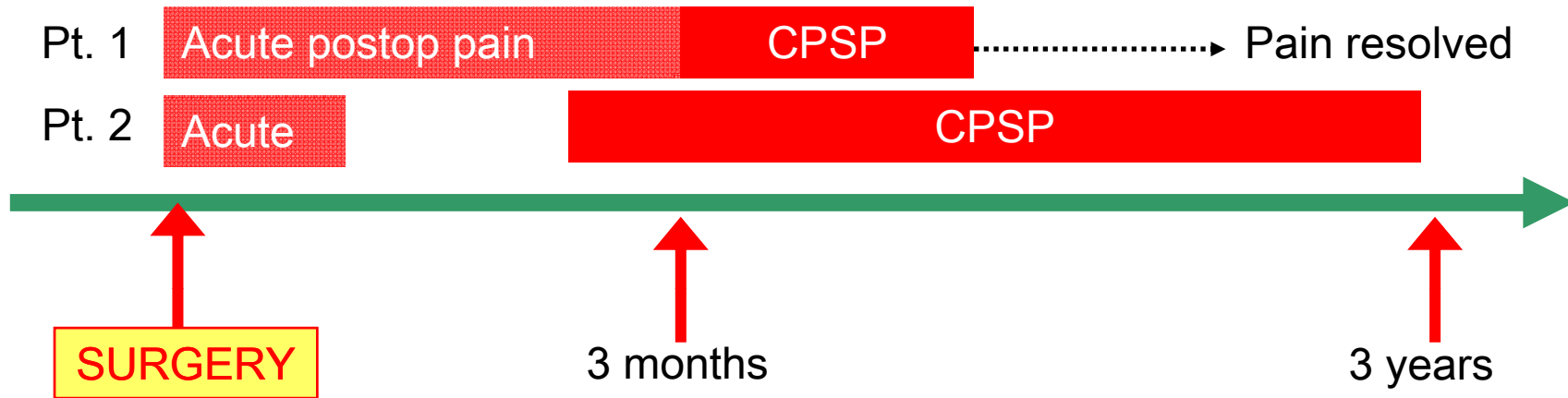
BPI, SF36 etc

onset & pattern



Case ascertainment

Methodological challenges



CPSP? 3 months	3 yrs
Pt 1. Yes	No
Pt 2. Yes??	Yes

BUT contributes to cumulative prevalence

Burden of disease

How common is CPSP?

Historically,

- Rare syndrome, literature from 1970s: 0.1% to 4%
- 'mild side effect' of surgery (Brit J Cancer, 1992)

Crombie *et al.* (1998)

- Survey of UK chronic pain clinics

The contributors to the development of pain in 5130 patients

Putative cause	% of patients ^a
Degenerative	34.2
Surgery	22.5
No definite cause	20.2
Trauma	18.7
Infective	7.2
Inflammatory	6.7
Tumour	3.5
Others	6.2

Chronic pain after breast surgery

See reviews: Jung 2003; Macrae 2008; Macrae & Bruce 2008

Authors	Country	Year	S/Size	Pain (%)	Follow-up
Jamison	USA	1979	41	44	2 yr
Kroner	Denmark	1989	110	23	1 yr
Vecht	Netherlands	1990	38	18	6 months
Kroner	Denmark	1992	69	17-31	6 yr
Polinsky	USA	1994	223	22-32	8 yr
Stevens	USA	1995	95	20	NR
Tasmuth	Finland	1995	93	24	1 yr
Tasmuth	Finland	1995	469	49	2 yr
Wallace	USA	1996	282	31-49	1 yr
Smith	Scotland	1999	408	43	3 yr
Johansen	Denmark	2000	266	15	6 yr
Fassoulaki	Greece	2002	75	33	3 months
Fassoulaki	Greece	2005	55	57	6 months
Macdonald	Scotland	2005	175	50	9 yrs

A Review of Chronic Pain After Inguinal Herniorrhaphy

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W. Alastair Chambers, M.D., F.F.A.R.C.S.

Chronic postoperative pain: the case of inguinal herniorrhaphy

E. Aasvang and H. Kehlet*

Authors	Search	Included papers	S/Size	Definition of CPSP	% Pain
Poobalan <i>et al.</i>	1987-2000	N=40	Any	>3 months	10-30% (5% severe)
Aasvang & Kehlet	2000-2003	N=35	>100	> 6 months	CPSP 12% Testicular pain 6%

- 8/40 studies gave explicit definition for 'chronic pain'
- Pain primary outcome = higher prevalence (n=6; n=16)

Chronic pain after hernia surgery

Increasing recognition

Recent reviews:-

van Hanswick, Lloyd, Horstall, Tan, O'Dwyer. The measurement of chronic pain & HR-QoL following inguinal hernia repair: a review of the literature. *Hernia*; 2008; 561-9.

Nienhuijs, Rosman, Strobbe, Wolff, Bleichrodt. An overview of the features influencing pain after inguinal hernia repair. *Int J Surg*, 2008; 4: 351-6.

Nienhuijs, Staal, Strobbe, Rosman, Groenewoud. Chronic pain after mesh repair of inguinal hernia: a systematic review. *Am J Surg*. 2007; 3: 394-400.

Important surgical outcome – recurrence & chronic pain (UK NICE)

Public health burden

Population at risk?

Procedure	Number procedures per year		CPSP prevalence estimates	Estimated burden ~5% @1 yr [severe]
	Canada* 2000 Data	USA† 1994 Data		
Mastectomy	14,438	131,000	20-50%	7271
Thoracotomy	16,305	660,000	5-65%	33,815
Hysterectomy	55,404	-	16-50%	2770
Hip & knee	41,502	-	3-30%	2075
Limb amputation	-	132,000	50-80%	6600
Cardiac surgery	-	501,000	30-55%	25,050
Hernia	-	689,000	5-30%	34,450

> 100,000

*CIHI data - Goldstein 2004; †Rutgow 1997

Prognosis: long-term outcome?

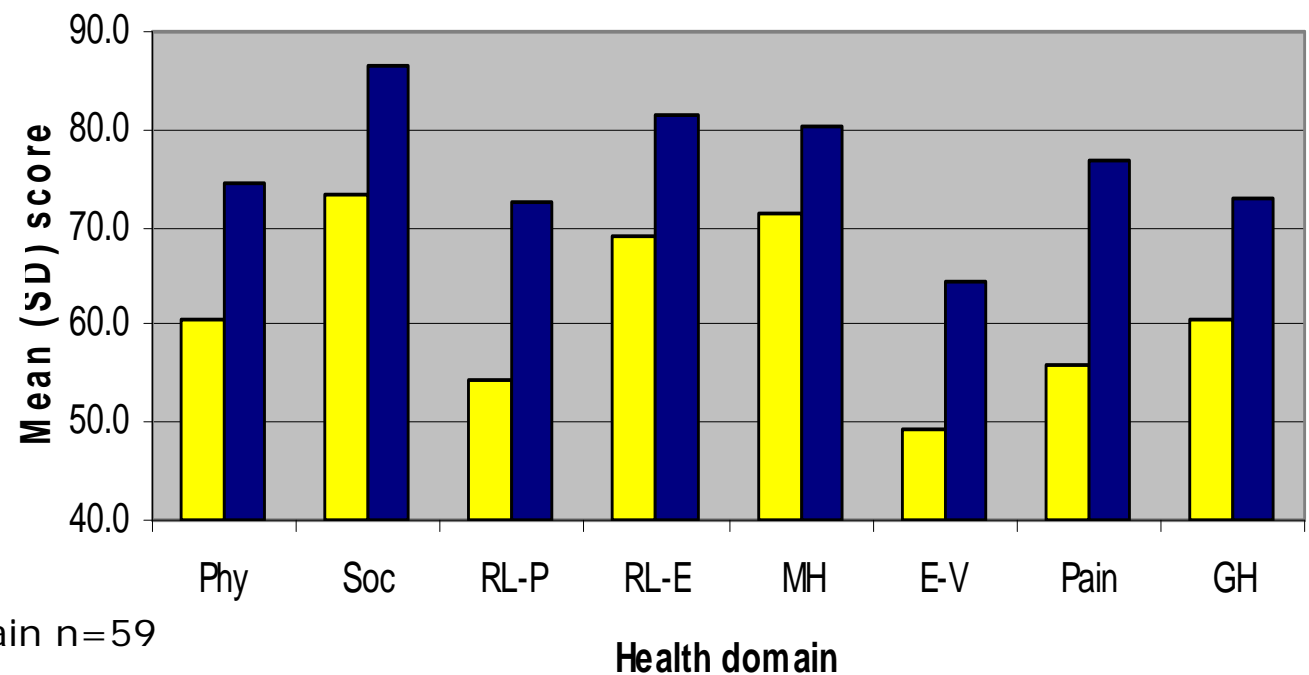
Smith et al. 1999; Macdonald et al. BJC 2005

- 175/ 408 (43%) with CPSP 3 years after breast ca surgery
- Re-assessed CPSP group at 9 years, 113/138 (82%)

SF-36 scores: 7-12 years postop

50% pain resolved
- QoL scores
improved

Lower QoL in
patients with CPSP
($P < 0.01$; all domains)



Yellow bar: Chronic pain n=59
Dark blue bar: Pain resolved n=54

Chronic post-surgical pain

Risk factors

Demographic factors

Younger age

- breast, hernia, cardiac, thoracic (e.g, Maguire, 2006)
- 2 studies with similar probabilities
- pain decreases 5% each 1yr increase in age (Poobalan 2001 & Poleshuck, 2006)
- severe pain common in younger patients (Aasvang & Kehlet, 2005)

Age	Aberdeen studies*		
	% CPSP		
	Breast N=408	Hernia N=351	Cardiac N=1080
<50	↓ 65%	↓ 58%	↓ 55%
50-70	40%	40%	38%
>70	↓ 26%	↓ 14%	↓ 34%

*Smith 1999; Poobalan 2001; Bruce 2003

Female sex

- evidence for & against

Genetic susceptibility

- pain perception & susceptibility variable (Diatchenko, 2005)
- % pain at 2 operative sites (Bruce 2003; Devor, 2004)

Surgical factors

Procedure-specific

e.g. implant, surgical approach, experience, volume & outcome
(Tasmuth 1995), duration of surgery (Peters 2007)

- Any relationship between extent of injury & severity of pain?
 - Higher rates after thoracotomy
 - BUT not consistent relationship (Kehlet 2006)
 - Minimally invasive surgery (lap hernia – testicular pain) / vasectomy (Manikandran 2004)
- Other techniques
 - Intercostal nerve/muscle sparing techniques
 - Video-assisted thoracoscopy – reduced acute pain but not difference in rates of CPSP (eg. Stammberger 2000)

Intraoperative nerve injury

- risk of stretching, contusion, entrapment, compression
- diathermy, sutures, staples, allergy to implants
- Recent studies:
 - No difference in CPSP or sensory deficit after ICBN dissection (Salmon 1998)
 - No difference in pain but more sensory deficit after sacrificing ICBN (Freeman, 2003)
 - N=973 hernia repairs, identification, dissection or preserved (Alfieri, 2006)
 - ~ *Identification of nerve structures associated with lower CPSP*
 - ~ *Risk of pain increased with number of nerves not detected.*

Preoperative pain

- ❑ limb amputation, intensity but not duration (Nickolajsen 2007)
- ❑ spinal surgery (den Boer 2006; Thorvaldsen & Sorensen 1990)
- ❑ knee replacement (Brander 2003)
- ❑ inguinal hernia repair
 - CPSP at 3 months more likely in those with previous chronic pain conditions, e.g backache, headache, IBS (Wright 2002)
 - Dutch RCT >1000 patients, preop pain, independent of procedure & age
 - OR 1.7 (95% CI 1,1, 2.6), Liem et al, 2003

Acute postoperative pain

Pain intensity

Evidence:

- breast cancer surgery (Tasmuth 1995, Poleshuck 2005: 3 months)
- knee replacement/laparoscopy (e.g. Rosseland 2008)
- thoracotomy (Katz, 1996; Gottshalk 2008) VAS @ 6hrs predicted CPSP
- other surgeries (Peters 2007: 6 months)

Is it causal? (Katz, 2009)

Is it a linear pathway?

Table 2

Onset and frequency of post mastectomy pain syndrome

Time of onset of pain

	Number	Percentage
Immediate	52	30
Less than one month	44	25
1-3 Months	26	15
More than 3 months	42	24
Not reported	11	6

Psychological /social factors

- non-surgical populations

- surgical literature

- depression (Katz 2005, Poleshuck 2006)
- anxiety (Katz 2005, Poleshuck 2006)
- pain catastrophising (Granot 2005; Sullivan 2009)
- pain expectations (Iversen 1998)
- optimism (Peters 2007)
- fear of re-injury / kinesophobia (den Boer 2006; Powell in prep)

Reviews

Rosenberger et al. Psychosocial factors and surgical outcomes: an evidence-based literature review. J Am Acad Orthop Surg (2008)

Den Boer et al. A systematic review of bio-psychosocial risk factors for an unfavourable outcome after lumbar spine surgery. Eur J Spine (2006)

Psychosocial factors

Review

Psychosocial predictors and correlates for chronic post-surgical pain (CPSP) – A systematic review

Anke Hinrichs-Rocker^a, Kerstin Schulz^a, Imke Järvinen^a, Rolf Lefering^a,
Christian Simanski^b, Edmund A.M. Neugebauer^{a,*}

Eur J Pain 2008

50 studies included

- 18 prospective with sample size >100
- 13 (26%) considered 'good' quality
- mostly small studies, poor to moderate quality, lacking preoperative data

Model for investigation

Surgery provides ideal model

Preop

Intra-op

Acute postop

Chronic



Preoperative pain	Nerve handling	Acute pain (intensity) analgesia use
Other painful condition / comorbidity / previous surgery	Anaesthesia / perioperative management	Infection, wound healing, inflammatory processes
Genetic predisposition	Surgical approach	Concurrent treatment
Age / sex		Coping / self-efficacy
Psychological vulnerability & resilience		etc.

Summary

- common postoperative complication, increased awareness
- nerve injury contributes not sufficient in itself, transition from acute to chronic is complex
- persistent pain in susceptible subgroups
- detailed data collection on large patient samples
- require comprehensive monitoring systems to improve risk prediction

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Dr Liz van den Kerkoff



Thank you for listening!



Kings College, Aberdeen, UK

A United Kingdom survey of surgical technique and handling practice of inguinal canal structures during hernia surgery

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- Practice varied by volume procedures
- >50 repairs per year more likely to visualise & preserve iliohypogastric nerve (p<0.01)

Table. Routine practice of dealing with inguinal structures by 707 UK surgeons performing open mesh repair

	<i>Not routinely visualized</i> N (%)	<i>Divide</i> N (%)	<i>Preserve</i> N (%)	<i>Practice varies</i> N (%)	<i>No response</i> N (%)
Ilioinguinal nerve	51 (7)	54 (7)	572 (81)	23 (3)	7 (1)
Iliohypogastric nerve	299 (42)	36 (5)	347 (49)	14 (2)	11 (2)
Genital branch of the genitofemoral nerve	396 (56)	46 (6)	242 (34)	11 (2)	12 (2)
Cremasteric vessels	73 (10)	333 (47)	272 (39)	16 (2)	13 (2)

EU Hernia Trialists Collaboration Surgical technique	Outcome: Persistent groin pain	
	Analysis using published data N=3 studies	Re-analysis – IPD N=20 studies
Lap vs open surgery	OR: 2.03	OR 0.54

Type of pain - MPQ

Sensory-discriminative; motivational-affective; cognitive-evaluative; miscellaneous

