The Link Between Acute and Chronic Pain

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Disclosure

• I receive no financial compensation from any commercial organizations.
Objectives

• Describe the problem of acute to chronic pain
• Identify common acute pain events leading to chronic pain and their incidence
• Review current theories regarding pathophysiology of acute to chronic pain transformation
• Understand potential approaches to reduce the transformation from acute to chronic pain

Acute to Chronic Pain
Chronic Pain After Surgery

Acute to Chronic Pain

• All chronic pain was once acute, but not all acute pain becomes chronic
• The transition is complex and involves preoperative, intraoperative, postoperative, psychosocial, socio-environmental and patient-related factors
• The focus on studying established chronic pain misses important cues that may help to predict who will develop chronic postsurgical pain and who will recover uneventfully
Epidemiology of Chronic Postsurgical Pain

- Hernia repair – 1 – 56.6%
- Thoracotomy – 52 – 61%
- Amputation – 59 – 78.8%
- Open cholecystectomy – 26%
- Sternotomy – 28%
- Hip replacement – 28.1%

Neuropathic Pain in the Acute Pain Service: A Prospective Study

Hayes C, Browne S, Lantry G, Burstal R.
Acute Pain 2002;4:45-8
Hayes C, et al

- Prospective study of almost 5000 patients
- Estimated the incidence of acute neuropathic pain to be 1 – 3%
- One-year follow-up showed that 56% of the patients with acute neuropathic pain continued to have pain
- Other published reports estimate the incidence of acute postsurgical pain to be much higher

Surgical Factors Associated with Chronic Postsurgical Pain

- Increased duration of surgery
- Low volume surgical unit
- Open surgical approaches
- Pericostal thoracotomy closure
- Conventional hernia repair
- Intraoperative nerve damage
**Surgical Factors**

- Avoid intraoperative nerve damage
- The practice of intentionally transecting nerves for surgical convenience should be avoided
- Unavoidable actions (?) – stretching and crushing during retraction, cutting tissues, cautery and suture or clip placement may all contribute to increased postsurgical pain and lead to pain chronicity

**Psychosocial Factors and Chronic Postsurgical Pain**

- Increased perioperative state anxiety
- Introverted personality
- Less catastrophizing, good social support and less solicitous responding in the week after amputation
- Higher concurrent emotional numbing (feeling detached from others) scores at 6 and 12 months
- Fear of surgery
- Psychic vulnerability
Catastrophizing

- Unrealistic beliefs that the current situation will lead to the worst possible pain outcome, negative thoughts about future and self, exaggerated negative “mental set” brought to bear during actual or anticipated pain experience
- Those who do not catastrophize fare better than patients that do
- Causal or associative relationship to chronic pain is still in question

Post-Traumatic Stress Disorder and Chronic Pain

- PTSD and chronic pain are highly comorbid
- Substantial symptom overlap common to both disorders
  - Anxiety and hyperarousal
  - Attentional biases
  - Avoidant behaviors
  - Emotional lability
  - Elevated somatic focus
Patient-Related Factors and Postsurgical Pain I

- Concurrent or past pain
- Preoperative pain is a risk factor for severe early acute postoperative pain, acute pain days and weeks after surgery and long-term postsurgical pain

Patient-Related Factors and Postsurgical Pain II

- Severity of pain in the days and weeks after surgery predicts pain after discharge and is a risk factor for the development of chronic postsurgical pain
- Female gender
- Younger age
Genetics of Chronic Postsurgical Pain

- No published reports of genes predisposing humans for the transition of acute to chronic postsurgical pain
- Some polymorphisms associated with chronic pain conditions
  - Migraine
  - Burning mouth syndrome
  - Irritable bowel syndrome
  - Fibromyalgia

Preventive Analgesia

- The belief that chronic pain is etched into the CNS has been the major driving factor behind attempts to halt the transition to chronic pain by blocking noxious impulses from reaching the CNS using a pre-emptive or preventive pharmacologic approach
Postoperative Analgesia

- Patients often arrive in the PACU in extreme pain and receive multiple doses of analgesics in a short time period to bring pain down to an acceptable level.
- Basic science and clinical data suggest that brief, noxious inputs or frank injury that activates A and C fibers induces long-lasting changes in CNS function that persist well after the stimulus has been removed or the injury has healed.
A method of preventing shock and exhaustion incident to surgical operations by preventing communication between the area of operation and the nervous system especially by means of a local anesthetic or sharp dissection.

Pain in the Perioperative Period

- **Preoperative**
  - Preoperative noxious inputs

- **Intraoperative**
  - A and C fiber injury barrage resulting from cutting or retraction

- **Postoperative**
  - Peripheral nociceptive input
  - Input from low-threshold afferents including that arising from inflammation and ectopic neural activity due to nerve injury
Current Belief…..

- Minimizing the negative impact of as many factors as possible across the 3 perioperative periods will increase the likelihood of preventing the induction and maintenance of peripheral and central sensitization and reduce pain and analgesic requirements.

Mastectomy

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Abstract

Chronic pain after breast cancer treatment is a major clinical problem, affecting 25 to 60% of patients. Development of chronic pain after breast cancer treatment, as well as other surgical procedures, involves a complex pathophysiology that involves pre-, intra- and post-operative factors. This review is a systematic analysis on methodology and evidence in research into persistent pain after breast cancer treatment during the period 1995 to 2010, in order to clarify the significance and relative role of potential risk factors. Literature was identified by a search in PubMed and OVID, as well as by obtaining relevant studies from a systematic review of reference lists. Sixty papers were identified, most of these being retrospective or questionnaires. Only 2 studies included quantitative sensory testing and only 26 studies were prospective. Furthermore, about a third of the studies did not apply modern principles of surgical and adjuvant therapy. In summary, the data show inconsistencies in definition of chronic pain and treatment groups, as well as in the collection of pre-intra- and post-operative data, precluding conclusions with regard to pathophysiologic mechanisms as well as rational strategies for prevention and treatment. However, nerve damage and radiotherapy appear to be significant risk factors for chronic pain. A proposal for the design of future prospective studies is presented. PERSPECTIVE: A comprehensive and systematic approach to research in chronic pain after breast cancer treatment is necessary in order to understand the pathophysiology and thus develop strategies for prevention and treatment.

Pre-incisional Paravertebral Block Reduces the Prevalence of Chronic Pain After Breast Surgery

Kairaluoma PM, Bachmann MS, Rosenberg PH, Pere PJ.
1 year follow-up of 60 patients to evaluate the prevalence of postoperative chronic pain

- 14 day symptom diary and telephone interviews at 1, 6 and 12 months
- 14 day analgesic consumption similar in the PVB and control groups

After 1 month, intensity of motion-related pain lower in the PVB group (P=0.005)

After 6 months, prevalence of any pain symptoms was lower in the PVB group (P=0.029)

After 12 months, prevalence of pain symptoms (P=0.003), intensity of motion-related pain (P=0.003) and intensity of pain at rest (P=0.011) was lower in the PVB group

Findings were independent of whether or not an axillary dissection had been performed
Herniorraphy

Persistent postsurgical pain:
risk factors and prevention

Kehlet H, Jensen TS, Woolf CJ.
Lancet 2006;367:1618-25

Chronic pain after hernia repair – 10%
Subset with chronic severe (disabling)
pain – 2 – 4%
The Incidence and Success of Treatment for Severe Chronic Groin Pain After Open, Transabdominal Preperitoneal, and Totally Extraperitoneal Hernia Repair

Bright E, Reddy VM, Wallace D, Garcea G, Dennison AR
World J Surg 2010;34:692-6

Bright et al

- 10 year retrospective review of inguinal hernia repairs
- 8513 patients with 9607 inguinal hernia repairs
  - 75.5% were open
  - 22.3% were transabdominal preperitoneal (TAPP)
  - 2.3% were totally extraperitoneal (TEP)
Bright et al

- 46/6497 (.71%) open hernia repairs were referred to a chronic pain clinic
- 28/2114 (1.33%) laparoscopic hernia repairs were referred to a chronic pain clinic
  - 22 TAPP repairs (1.15%)
  - 6 TEP repairs (3.03%)
- Majority discharged from chronic pain clinic symptom free after 1 year

Thoracotomy
Chronic Pain After Thoracic Surgery: A Follow-Up Study

Perttunen K, Tasmuth T, Kalso E.
Acta Anaesthesiologica Scandinavica 1999;43:563-7

- 110 pts interviewed before and 1 week after surgery to find out about preoperative pain and amount of postoperative pain
- The amount of postoperative analgesic used during the 1st 5 postoperative days
- Interviewed by letter 3, 6 and 12 months after surgery to determine extent of pain and effect on daily activities
Perttunen K, et al.

- Incidence of chronic post-thoracotomy pain
  - 80% at 3 months
  - 75% at 6 months
  - 61% at 12 months
  - 3-5% had severe pain
- Chronic pain interfered with daily life in more than 50%
- High analgesic consumption during the 1st week was associated with a higher risk of chronic pain

Chronic Post-Thoracotomy Pain: A Retrospective Study

Pluijms WA, Steegers MAH, Verhagen AFTM, Scheffer GJ, Wilder-Smith OHG.
Pluijms WA, et al.

- 255 patients that had postero-lateral thoracotomy
- Overall incidence of chronic pain was 52% (32% mild, 16% moderate and 3% severe chronic postoperative pain)
- Patients with chronic post-operative pain reported acute post-operative pain more frequently than those without 85% vs. 62%, had more severe acute post-operative pain, underwent more extensive surgical procedures, had more constant acute pain and reported less absence of pain during the first post-operative week.
- There was no significant decrease in chronic pain with time after the thoracotomy

Total Knee Replacement
Perioperative Oral Pregabalin Reduces Chronic Pain After Total Knee Arthroplasty: A Prospective, Randomized, Controlled Trial

Buvanendran A, Kroin JS, Della Valle CJ, Kari M, Moric M, Tuman KJ.

Buvanendran et al

- Chronic neuropathic pain after surgery in 12.7% at 6 months
- Pregabalin 300 mg before surgery, 150 mg BID for 10 days, 75 mg BID 2 days and 50 mg BID 2 days
- Sedation and confusion were more common on the day of surgery and postoperative day 1 in patients receiving pregabalin
- Less opioid consumption and improved ROM during first 30 days of rehabilitation
- Less neuropathic pain at 3 and 6 months in pregabalin group
Nephrectomy

Optimizing Open Live-Donor Nephrectomy – Long-Term Donor Outcome

Schostak M, Wloch H, Müller M, Schrader M, Offerman G, Miller K.
Laparoscopic or retroperitoneoscopic donor nephrectomy is supposed to reduce perioperative discomfort.

- 102 living related donors
- 41.5% had lasting impairment
- 20.7% had persistent pain

Amputation
Preamputation Pain and Acute Pain Predict Chronic Pain After Lower Extremity Amputation

Hanley MA, Jensen MP, Smith DG, Ehde DM, Edwards WT, Robinson LR.

The Journal of Pain 2007;8:102-9

Hanley MA, et al.

- Evaluated the relationship between acute postsurgical pain and chronic amputation-related pain
- Acute phantom limb pain intensity was the only significant independent predictor of chronic phantom limb pain intensity at 6 and 12 months.
- Preamputation pain intensity was the only significant predictor of chronic phantom limb pain intensity at 24 months
- Higher levels of pain before or soon after amputation might identify individuals at greatest risk for chronic pain problems and those in need of early, intensive pain interventions
Transition from Acute to Chronic Postsurgical Pain: Risk Factors and Protective Factors

Katz J, Seltzer Z.
Long-Term Pain and Activity During Recovery from Major Thoracotomy Using Thoracic Epidural Analgesia

Anesthesiology 2002;97:1234-44

- Thoracic epidural analgesia either prior to incision or at the time of rib approximation
- Incidence of persistent pain at 1 year was 21.2% (compared to average incidence of ~50%)
Epidural Analgesia

- Should be used for patients undergoing thoracotomy
- Catheter tip should be at the level of the incision
- Evidence to support its use to prevent long-term pain is not too strong

Treating Chronic Pain After Surgery

- Completion surgery
- Revision
- Neurectomy
- Medical management
- Neuromodulation
- Physical Therapy
- Psychological therapy
Conclusions

- The transition from acute to chronic pain is significant and often underappreciated.
- Risk factors for chronic pain may be identified in some patients.
- Good perioperative pain control may play a role in reducing long-term chronic pain, but the evidence is limited at present.
- Additional prospective research needs to be performed.

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