

10 Nicklin JL, Wright RG, Bell JR, et al. A clinicopathological study of adenocarcinoma in situ of the cervix. The influence of cervical HPV infection and other factors and the role of conservative surgery. *Aust NZ J Obstet Gynecol* 1991; 31: 179-82.

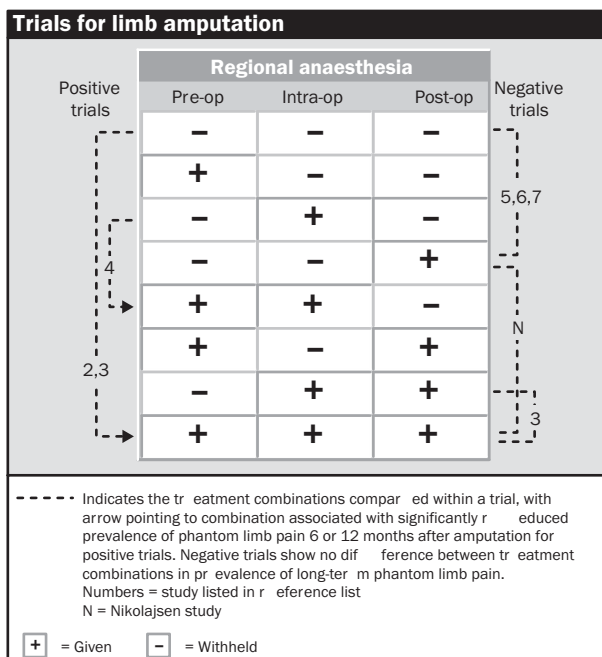
Phantom limb pain

Traditional methods of postoperative analgesia do not provide adequate control of pain, in part because they focus on treating the patient only after the pain is well entrenched. Despite recent advances in the management of postoperative pain, up to 60% of patients continue to report moderate to severe pain shortly after surgery.¹ Patients are ordinarily transported to the recovery room, in considerable pain, where they receive high doses of morphine in an attempt to bring the pain under control.

The idea behind pre-emptive analgesia is to administer analgesics or local anaesthetics before the start of surgery with the aim of reducing postoperative pain intensity and postoperative analgesic requirements. The concept is not simply that pre-emptive analgesia reduces pain during the procedure, although that in itself is a worthwhile goal. The hypothesis is that the transmission of noxious afferent input from the periphery (brought about by, for example, pre-amputation pain, incision and subsequent noxious intraoperative events, and postoperative noxious inputs from the amputation stump) to the spinal cord induces a prolonged state of central neural sensitisation or hyperexcitability that amplifies subsequent input from the wound and leads to increased postoperative pain. By interrupting the transmission of noxious peri-operative inputs to the spinal cord, a pre-emptive approach is thought to prevent the establishment of central sensitisation and to result in reduced pain and analgesic requirements after the analgesic effects of the (pre-emptive) agents have worn off.

The need for well-controlled trials to find out whether regional anaesthesia given before, during, or after surgery prevents long-term phantom-limb pain was discussed in these columns only earlier this year.² We know that more than 70% of amputees report phantom-limb pain years after amputation,² but we do not know the factors responsible for the transition of acute postoperative pain to long-term pain. In today's *Lancet* Lone Nikolajsen and colleagues report the results of a randomised trial evaluating the long-term effects on phantom limb and stump pain of continuous epidural morphine and bupivacaine administered 18 hours before, during, and for about a week after lower-limb amputation. The control group received epidural saline before and throughout the surgical procedure, followed by epidural morphine and bupivacaine postoperatively. There were no significant differences between the groups in pain incidence, pain intensity, or opioid consumption at any time up to 12 months after surgery. This work is by far the most carefully controlled study done to date. What is the future for preventive or pre-emptive epidural anaesthesia for amputation? What further studies should be done?

The accompanying figure shows the eight possible treatment combinations for timing of regional anaesthesia for amputations. Also depicted are the positive and negative trials conducted so far, along with their treatment comparisons. On the basis of existing data, the study design with the most potential for reducing long-



term phantom limb pain would be a well-controlled replication of the studies by Jahangiri et al³ and Schug et al⁴ comparing pre-operative, intra-operative, and post-operative epidural treatment with a placebo or sham epidural control. Logistical and ethical considerations, however, may make such a study difficult to implement in a double-blind, placebo-controlled fashion.

The ability to demonstrate a pre-emptive analgesic effect depends on the interaction of multiple factors, including the extent and nature of damaged tissue, duration of surgery, agents used pre-emptively, their route and timing of administration and their duration of action, extent of afferent blockade, ability of other agents given during surgery to pre-empt postoperative pain, and the time course of central sensitisation. Further research of the calibre of the study by Nikolajsen and colleagues is called for to take into account these factors before an informed conclusion can be reached on the basis of empirical evidence.

Joel Katz

Departments of Psychology and Anaesthesia, Toronto Hospital, Department of Anaesthesia, Mount Sinai Hospital, and Departments of Public Health Sciences and Anaesthesia, University of Toronto, Toronto M5S 2C4, Canada

- Warfield CA, Kahn CH. Acute pain management. Programs in US hospitals and experiences and attitudes among US adults. *Anesthesiology* 1995; 83: 1090-94.
- Katz J. Prevention of phantom-limb pain by regional anaesthesia. *Lancet* 1997; 349: 519-20.
- Jahangiri M, Bradley JWP, Jayatunga AP, Dark CH. Prevention of phantom limb pain after major lower limb amputation by epidural infusion of diamorphine, clonidine and bupivacaine. *Ann R Coll Surg Engl* 1994; 76: 324-26.
- Schug SA, Burrell R, Payne J, Tester P. Pre-emptive epidural analgesia may prevent phantom limb pain. *Regional Anesth* 1995; 20: 256.
- Bach S, Noreng MF, Tjelliden NU. Phantom limb pain in amputees during the first 12 months following limb amputation, after preoperative lumbar epidural blockade. *Pain* 1988; 33: 297-301.
- Fisher A, Meller Y. Continuous postoperative regional analgesia by nerve sheath block for amputation surgery—a pilot study. *Anesth Analg* 1991; 72: 300-03.
- Elizaga AM, Smith DG, Sharar SR, Edwards T, Hansen ST. Continuous regional analgesia by intraneural block: Effect on

postoperative opioid requirements and phantom limb pain following amputation. *J Rehab Res Dev* 1994; **31**: 179-87.

- 8 Pinzur MS, Garla PGN, Pluth T, Vrbos L. Continuous postoperative infusion of a regional anesthetic after an amputation of the lower extremity: A randomized clinical trial. *J Bone Jt Surg* 1996; **78-A**: 1501-05.