Pre-emptive analgesia with thoracic paravertebral blockade?

The concept of pre-emptive analgesia is based on the intuitive idea that if pain is treated before the injury occurs, the nociceptive system will perceive less pain than if analgesia is given after the injury has already occurred. Pre-emptive analgesia would apply well to the situation of elective surgery, since in this situation it is possible to control the series of events and, thus, it is possible to deliver effective analgesia before the start of surgery.

Animal and human volunteer studies have verified the concept of pre-emptive analgesia. However, despite the use of various pharmacological and regional anaesthetic techniques, it has proven difficult, not to say impossible, to demonstrate a significant pre-emptive effect in regular clinical practice.1 In fact, the difficulty of showing pre-emptive effects in the clinical situation has lead to a current, widespread scepticism regarding the entire concept, in the context of elective surgery, and alluding to a potential pre-emptive analgesic effect in scientific manuscripts is often frowned upon by reviewers.

Nevertheless, there may be exceptions to every rule and, thus, Richardson and colleagues,2 in 1998, were able to demonstrate a pre-emptive effect of thoracic paravertebral blockade (PVB) in thoracotomy patients. Patients with a preoperative PVB had significantly lower postoperative pain scores. They also had better preserved postoperative lung function, as measured by forced vital capacity, compared with the other groups which showed the expected 30–40% decrease in measured pulmonary function. These results might explain the later finding of the same research group, showing thoracic PVB to be superior to thoracic epidural blocks for thoracotomy patients.3

Despite these thought-provoking results from this group no adequate follow-up studies have been published. However, a number of studies, mainly concerning breast surgery,4,5 have shown surprisingly long lasting analgesia after single injection PVB and have continued the speculation regarding the possible pre-emptive potential of this regional technique.

In the current issue of the British Journal of Anaesthesia, Vogt and colleagues6 provide further circumstantial evidence regarding this issue. In a prospective, randomized, blinded study in patients undergoing video-assisted thoracoscopic surgery (VATS) they observed improved pain relief, especially on coughing, up to 48 h postoperatively compared with the control group. This is slightly surprising since VATS is associated with less surgical trauma than traditional thoracotomy but, again, postoperative analgesia with PVB was found to substantially outlast the expected duration of action of the local anaesthetic solution used.

So in what theoretical mechanisms may PVB differ from, for example, epidural block? Despite providing clinically effective analgesia, it has, so far, not been possible to show a clear pre-emptive effect of epidural blockade.1

Three possible reasons could be proposed in this regard. First, in order to achieve a pre-emptive effect it is likely that the intervention must be effective not only during and immediately after the surgical procedure but also have a prolonged effect during the postoperative phase. The duration of the effect of single injection PVB has, in a number of studies, been shown to be >12 h, regardless if local anaesthetic were used alone or with adjunct drugs.4,5,7 Second, Richardson and co-workers have shown that PVB is capable of completely abolishing somato-sensory evoked potential (SSEP) in a number of adjacent dermatomal segments.8 Thus, PVB can produce a very dense afferent blockade of sensory information. This is in sharp contrast to epidural anesthesia. Despite using high concentrations of local anesthetics (bupivacaine 0.75%), epidural blockade is only capable of producing a slight modification of SSEPs, even in the dermatome level of the tip of the epidural catheter.9,10 Lastly, PVB does in one specific way differ from neuroaxial blocks. Although neuroaxial blocks cause almost complete blockade of the mainly efferent sympathetic transmission from the spinal cord, such blocks are not able to block transmission within the sympathetic chain. PVB, on the other hand, will cause not only dense somatic afferent blockade, but will also, due to the anatomy of the paravertebral space, completely block transmission within the

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sympathetic chain. The role of pain transmission within the sympathetic chain for pain perception and sensitization processes is still largely unknown but this unique quality of PVB may contribute to its efficacy.

Unfortunately, the current study, in common with previous ones, suffers from some minor design faults. In order to provide evidence based support for the earlier results, there is still the need for a large prospective randomized clinical trial with a primary hypothesis of the pre-emptive effect of PVB given before the start of surgery. Such a study should obviously be designed in a scientifically appropriate way, including placebo and post-surgical PVB groups.

Such studies may be underway, as an initial study provided further indirect evidence for a pre-emptive analgesic effect of bilateral T5-6 PVB for postoperative laparoscopic cholecystectomy pain and further studies are in progress. Until this evidence is available it is not possible to determine whether thoracic PVB does produce pre-emptive analgesia. Nonetheless, it is clear that PVB does, in many situations, provide excellent postoperative pain relief and does, whether pre-emptive or not, deserve a more widespread use.

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References