Case Report

Repetitive paravertebral nerve block using a catheter technique for pain relief in post-herpetic neuralgia

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We described in this report a case of post-herpetic neuralgia refractory to medical therapy that was successfully treated with repetitive injections of local aesthetic mixture (bupivacaine 0.5% 19 ml and clonidine 150 μg ml⁻¹ 1 ml) every 48 h for 3 weeks using a paravertebral catheter inserted at T2–T3 level.

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Post-herpetic neuralgia (PHN), an extreme form of neuropathic pain characterized by a sharp, burning, aching, mechanical or thermal allodynia, continues to be a challenge in clinical pain management. Left untreated, it may persist for many years affecting all aspects of a patient’s life. Several pharmacological and interventional approaches have been used to treat this pain, which is often refractory to medications, regardless the mode of delivery. The effectiveness of epidural, intrathecal and sympathetic nerve blocks in the management of PHN is still controversial. We present the first case of PHN treated successfully with repetitive paravertebral block (PVB) with bupivacaine and clonidine using a paravertebral catheter.

Case report

A 69-yr-old male patient, ASA II, height 173 cm, weight 75 kg, previously healthy was referred with 20 month right sided parietal chest pain diagnosed as PHN. This pain was continuous at a level of 7–8/10 on the visual analogue scale (VAS) (with 0 = no pain and 10 the worst pain imagined). Previous pain treatment included acetaminophene, non-steroidal anti-inflammatory drugs and tramadol, combined with oral carbamazepine 1200 mg per day and amitryptyline 10 mg three times per day with no improvement. A few months later, gabapentin was added at a dose of 300 mg three times per day that was increased gradually to 3600 mg per day for a 6 month period. Transtcutaneous electrical nerve stimulator was used many times with no pain relief. No topical therapy was reported. Upon presentation, the patient was still complaining of persistent pain with a VAS=7/10 in the right thoracic region mainly at T1 extending to T4 associated with mood changes and sleep disturbance. Physical examination revealed an allodynia and hypeaesthesia of the corresponding dermatomes. No skin changes, that is, skin hypopigmentation, residual scaring, oedema and inflammations were noted. Chest X-ray, computed tomography scan of the thorax, and a magnetic resonance imaging of the cervico-thoracic region were unremarkable.

A unilateral PVB at T1–T2 levels guided by a nerve stimulator (Stimuplex, B.Braun, Melsungen, Germany) was performed as described previously. The injectate solution contained bupivacaine 0.5% 19 ml and clonidine 150 μg ml⁻¹ 1 ml. After this procedure, the pain disappeared for 2 days and then gradually reappeared. Based on this positive clinical response, we inserted a paravertebral catheter at the level of T3 to allow a repeated access to the paravertebral space (PVS). Sedation was achieved with fentanyl 50 μg and midazolam 3 mg per i.v. route while the patient was in the lateral left decubitus position. Blood pressure, ECG, and S<sub>O₂</sub> were continuously monitored. The injection site was marked 2.5 cm laterally to the midline of the intervertebral line, defined as the line drawn between
two spinous processes determined by manual palpation (T2–T3 space). After aseptic preparation of the skin, the injection site was infiltrated with lidocaine 1% 0.1 ml using a 29 G needle. A 10 cm 21 G insulated needle (Stimuplex, B. Braun, Melsungen, Germany), attached to a nerve stimulator (initial stimulating current: 5 mA, 1 Hz, 9 V; Stimuplex, B. Braun) was introduced perpendicularly to the skin. After piercing the costo-transverse ligament, a proper muscular response of the intercostal muscles of the corresponding level was obtained and the needle’s tip was manipulated into a position allowing a muscular response while reducing the stimulating current to 0.4–0.6 mA. The depth between the skin and the PVS was then measured (58 mm). At this point, the insulated needle was removed and an 18 G Tuohy needle (Perifix, B. Braun Melsungen AG) was introduced at the same depth previously measured. The catheter (Perifix 401 filter fet 451 4017, B. Braun Melsungen AG) was introduced cephalad into the PVS and the tip was left 4 cm inside the PVS in order to facilitate its placement. We had used two separate needles when inserting the catheter because we did not have systems that offer both stimulation and catheter insertion through a single needle.

Ten millilitres of the radio-opaque dye (Omnipaque 300 mg ml⁻¹, Nycomed Ireland Ltd, Cork, Ireland) were injected using the paravertebral catheter to determine radiologically the catheter position and to predict the level of spread of the local anaesthetic to be injected. The Tuohy needle was then removed (Fig. 1), and the catheter was tunneled to the right upper quadrant of the abdomen.

Additional injections provided pain relief lasting ~48 h. We decided on repetitive block therapy with injection of the described solution every 48 h for 3 weeks. The catheter remained in place for an additional week after the final injection in case the pain recurred. There were no complications, and the patient remained pain free over an 8 month follow-up period.

**Discussion**

Repetitive PVB using a catheter with bupivacaine and clonidine provided effective pain relief for PHN.

Despite advances in antiviral therapy during acute herpes zoster, PHN continues to be a significant clinical problem with up to 25% of patients developing persistent neuropathic pain after acute herpes zoster reactivation.⁶⁻⁹ Although PHN is a common chronic pain syndrome, the pathophysiology of this pain is poorly understood, many studies proposed three main mechanisms.⁹⁻¹² Irritable nociceptors may induce and maintain sensitization in the spinal dorsal horn. On the other hand, loss of nociceptive primary afferents induces a synaptic reorganization in the dorsal horn. Finally, pain could be because of a massive degeneration of both myelinated and unmyelinated primary afferents. While these three mechanisms presumably coexist in many patients, one often predominates.⁹⁻¹² In addition, the mediators released as a result of tissue injury and inflammation profoundly altered the activity and sensitivity of sensory neurons in neuropathic pain. These complex changes in peripheral signal processing may lead to altered central pain processing and develop central sensitization.¹³

In the current report, we elected to perform repeated blockades allowing for a prolonged prevention of peripheral and central sensitization. It is possible that using a ‘pain free period’ of 3 weeks had interrupted the established reverberatory neural circuit between the nociceptors, the central nervous system and the motor unit resulting in pain alleviation. This suggests that blocking the trigger signal of reaching the central nervous system may attenuate the increased sensitivity to painful stimuli and subsequent central sensitization, hyperalgesia and production of pain by non-painful stimuli (i.e. allodynia), which accompany tissue injury. As there are no studies assessing the optimal duration of this technique, we chose performing the ‘free pain’ period for 3 weeks. It is possible that a shorter duration could have been sufficient to attenuate PHN.

Several studies evaluated the effect of nerve blocks on PHN using local anaesthesia with steroids administrated by epidural, intrathecal or sympathetic block.¹⁴ ¹⁵ Kikuchi and colleagues¹⁴ found that administration of local anaesthetics with steroids was more effective intrathecally than epidurally, resulting in pain reduction by more than 50%. Another study showed that intrathecal addition of steroids to local anaesthetic was more effective than local anaesthetic alone.¹⁵ However, the risk of arachnoditis after intrathecal steroids continues to be a controversial issue.¹⁶ Our technique achieved a complete pain relief without the use of steroids.

The use of a nerve stimulator-guided technique could have enhanced the chance of an adequate nerve block. The administration of clonidine with bupivacaine has been found capable of prolonging the duration of peripheral nerve blocks. Clonidine provides an interaction with the immune system resulting in reduced recruitment of
macrophages and lymphocytes at the nerve injury site and shift of the proportion of macrophages from the pro- to the anti-inflammatory phenotype.\textsuperscript{17} This nerve blockade was used, in most studies, for the treatment of acute postoperative pain\textsuperscript{18–22} using continuous or single injection technique. Single injection techniques are limited by the duration of the local anaesthetic; the use of paravertebral catheter to provide unilateral or bilateral analgesics has been described in adults and children.\textsuperscript{23 24} The risk for inadvertent pleural puncture and pneumothorax is, probably, the most serious complication of this technique. We have previously found that the incidence of complication is low because of the use of a nerve stimulator-guided technique.\textsuperscript{18 25} We do not consider that 20 ml was a large volume for an upper thoracic paravertebral single-shot injection because there is no association between the anaesthetic injectate volume and the risk of epidural spread of the injectate. Previous studies conducted on 60 and 30 patients, respectively, used up to 30 ml of anaesthetics per single-shot injection did not find clinical evidence of the epidural spread risk.\textsuperscript{26 27} Radiological verification of the catheter positioning should prevent this possible complication.

In summary, our report showed that repetitive intermittent PVB using a catheter technique for 3 weeks, resulted successfully in sustained pain relief for PHN. Further studies are needed to determine the optimal duration of repetitive PVB.

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References
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