

# Successful Therapy Of Phantom Pain In The Upper Limb By Blocking The Brachial Plexus

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## Abstract

Early treatment of phantom limb pain in patients after amputation reduces the incidence of chronic pain sensations from 60 - 85 % to 10 - 20 % [1]. A 33 year old patient with osteosarcoma of proximal humerus developed a burning pain VAS 7-8 (Visual analog scale 0-10) of the left hand and fingers three days after amputation of the left arm in the shoulder joint. Treatment with calcitonin, amitriptyline, naproxen, piritramide and carbamazepine did not influence the pain. On the seventh day an interscalene block was done with the use of a nerve stimulator. After a bolus of 30 ml ropivacaine 0.2 % was infused with a rate of 6 ml/h for ten days. Within a time period of ten minutes the phantom limb pain was relieved (VAS 0). After four hours phantom limb sensations developed, but were not classified as pain by the patient. With the option of a patient controlled bolus of 5 ml (2x /h) it was possible to reduce the additional pain therapy to carbamazepine and amitriptyline. During the ropivacaine treatment no motor blockade or other side effects were observed.

After ten days the catheter site showed minor signs of inflammation and the catheter was removed. In an early follow-up (5 month) the patient reported mild phantom limb sensations and infrequent phantom pain (VAS 1-2), no analgesic medication was necessary.

Interscalene block provided comfortable and safe analgesia for this patient and helped to avoid development of chronic phantom limb pain. A comparable therapy using bupivacaine would have led to toxic plasma concentrations. Ropivacaine is not only less toxic (16), it also provides the advantage of a less intensive motor blockade (17), limiting the danger of phrenic nerve block.

## CASE REPORT

A 33 year old patient with osteosarcoma of proximal humerus developed a burning pain VAS 7-8 (Visual analog scale 0-10) of the left hand and fingers three days after amputation of the left arm in the shoulder joint. The patient received naproxen 550mg 2x / day, morphine 120 mg / day and amitriptyline 75mg for the night. He also received daily short infusions of calcitonin 100 IE for 3 days and a daily dose of 900 mg carbamazepine .

Treatment with calcitonin, amitriptyline, naproxen, morphine and carbamazepine did not influence the pain. There was no telescoping [7] then. At this time he was sent to our pain clinic. An additional use of a transcutaneous nerve electrical stimulation (TENS) device did not improve the patient's condition.

One week after the amputation it was therefore decided to

supply the patient with a continuous blockade of brachial plexus. On the seventh day an interscalene block was done with the use of a nerve stimulator and a catheter was inserted. After a bolus of 30 ml ropivacaine 0.2 % was infused with a rate of 6 ml/h for ten days. Within a time period of ten minutes the phantom limb pain was relieved (VAS 0). After four hours phantom limb sensations developed, but were not classified as pain by the patient. With the option of a patient controlled bolus of 5 ml (2x /h) it was possible to reduce the additional pain therapy to carbamazepine and amitriptyline. During the ropivacaine treatment no motor blockade or other side effects were observed. The carbamazepine therapy was continued. At no time no cardiac or central side effects were observed or detectable.

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follow-up (5 month) the patient reported mild phantom limb sensations and infrequent phantom pain (VAS 1-2), no analgesic medication was necessary.

### DISCUSSION

The prognosis mainly depends on the onset of therapy. If therapy is started in the first days or weeks after amputation, the success rate will be 80-90 %, if therapy is started later the success rate is expected to be only 30 % [1]. Thus, pain-relief should be initiated as early as possible, ideally prior to the operation.

For the lower extremities spinal or epidural anaesthesia is a good option, whereas for the upper limbs regional nerve blocks can be applied. The advantage is not only the prophylactic treatment of the phantom pain, it is also a comfortable postoperative analgesia. If phantom pain already appeared, treatment with intravenous calcitonin can be started. 100 to 200 IU calcitonin can be administered as a short-term infusion up to 5 times every single to every third day [8]. Side effects are nausea and vomiting, flush, short-term hypotension and increase of pain. If the phantom-pain is presenting as a sharp pain, anticonvulsive therapy can be added. Another option is the use of TENS. However, a study of Gnezdilov [6] on 24 patients with phantom pain showed that only 25 % of the patients had some relief of their pain by using a TENS.

In this case, phantom pain had already developed and has been resistant to treatment with analgesics and adjuvant drugs. An interscalene brachial plexus catheter was inserted on the left side. The catheter was inserted using a nerve stimulator to place it as precisely as possible and therefore minimise the required doses of local anaesthetics [12]. Another treatment option could be a cervical epidural catheter which would also prevent high doses of local anaesthetics. Beside the risk of diaphragmatic paralysis there is also a higher risk of a spinal cord injury than at the lumbar site. This was the reason for an interscalene catheter.

With the continuous application of local anaesthetics the risk of cardiovascular or neurotoxic side effects increases. Bupivacaine 0.25 %, as a long acting local anaesthetic, had to be considered for continuous application. At this concentration it has sympatholytic and anaesthetic activity without causing a motor block in most cases.

In the case described here, the patient described much pain and it was not known how much local anaesthetics he would need. With a continuous rate of 6 ml/h and a patient

controlled bolus option of 5 ml 2x/h a maximum of 32 mg/h bupivacaine 0.25 % would have been possible. The recommended maximal single dose of bupivacaine (150 mg) would have been reached after 5 to 6 hours [14].

An alternative local anaesthetic is ropivacaine, which shows a similar duration of action as bupivacaine, but is considered less toxic. Higher doses are therefore applicable without the appearance of cardiac or central nervous complications [13, 16]. In addition, the motor block is less pronounced with ropivacaine [17].

Therefore a higher degree of safety is expected for ropivacaine in high doses or continuous infusion with a lower risk of central side effects. A maximum single dose of ropivacaine is not defined. The maximum daily dose recommended by the producer is 600 mg, up to 800 mg were given in a few cases without complications [1]. With the application of ropivacaine 0.2 % via motor pump and patient controlled analgesia with a rate up to 16 ml/h a maximum daily dose of 768 mg could be reached. Cardiac or central side-effects with this dose are not expected in patients with normal body weight.

A review of the current literature shows differing results in the therapy of phantom pain. Studies by Bach [2] and Katsuly-Liapis [10] found a significantly lower incidence of phantom pain, if epidural anesthesia was started before surgical procedures. In both essays a continuous regional anesthesia was started 72 hours before surgery. If epidural anesthesia was started after the surgical procedure, there was no influence on the incidence of phantom pain [10]. In a study by Fisher [3] 10 ml of bupivacaine 0.25 % were infused per hour through a catheter placed in the nerve sheath of tibial and ischiadic nerve during amputation of the lower limb. Within an observation interval of one year there were no cases of phantom limb pain, if the continuous nerve block was started immediately after the surgical procedure. Pinzur [15] reported contrary results for patients receiving 1 ml bupivacaine 0.5 % per hour through a catheter placed in the nerve sheath above the region of amputation. Sufficient analgesia was provided, but the incidence of phantom pain was not influenced within the first postoperative year. The much lower dosage of bupivacaine in this study could give a possible explanation for the contradictory results. It might be possible, that the low volume of the local anesthetic used by Pinzur was sufficient for postoperative analgesia, but not for the prevention of phantom limb pain.

Although some of the methods described showed promising

results, there is no standard therapy established yet. Further investigations in this special field are certainly necessary.

It is generally accepted that early commencement of regional anaesthesia is very important for the avoidance of phantom pain. In the early stage after surgery or intensive care treatment cardiovascular or central nervous problems might be important factors limiting the use of local anaesthetics. In the described case, the local anaesthetic ropivacaine was applied in high doses over a longer period of time without toxic side effects.

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