

# Compassionate use of ultrasound-guided bilateral infraclavicular brachial plexus block with phenol in a case of obliterative thromboangitis

## Introduction

Obliterative thromboangitis is a non-atherosclerotic, segmental, recurrent arterial occlusion of unknown cause in predominantly male, young, smoker patients that affects peripheral small and medium-caliber veins and arteries and less frequent cerebral and visceral vessels.<sup>1</sup>

The neurolytic blockade with phenol is an analgesic tool used in advanced selective and palliative cases. Perineural injection in experimental animals produces denaturation of membrane proteins, denervation, loss of cellular fat content, separation of the myelin sheath, axonal edema and consequently neurolysis, a combination of neurotoxicity and ischemia.<sup>2</sup> Histological specimens also show, non-selective nerve destruction, muscle atrophy and necrosis. Phenol is a compound of carboic acid, carbolic acid, phenyl acid, phenyl hydroxide, hydroxybenzene, and oxybenzone.<sup>3,4</sup>

A recent meta-analysis demonstrated the efficacy and lower risk of complications of infraclavicular versus supraclavicular brachial plexus block through a selective injection guided by ultrasound and also reported for pain relief in cancer refractory to treatment.<sup>5,6</sup>

## Case

59-year-old male with a diagnosis of diabetes mellitus 2 with a 20-year evolution managed with insulin NPH 36, hypertension of 20 years of evolution under treatment with telmisartan/hydrochlorothiazide 80mg/12.5mg every 12 hours, nifedipine 30mg, peripheral arterial disease treated with cilostazol 50mg every 12 hours, clopidogrel 300mg every 24 hours. It began 6 months ago with a sensation of "cooling" of the fingers of the thoracic limbs bilaterally with the consequent distal necrosis of the second finger of the right hand (Figure 1) evaluated by the thoracic surgery department to schedule amputation. Smoking of 3 cigarettes a day for 5 years, suspended 6 months ago, active alcoholism with 12 liters of beer a week, also suspended 6 months ago, denies allergies. Surgical history of appendectomy 32 years ago, right infracondylar pelvic limb amputation 4 years ago. He came to the emergency room for pain reported with a 10/10 ENVA (Analogue Verbal Numerical Scale) secondary to ischemia of the distal phalanges of both extremities that began suddenly.

## Pain management

Management was started with methadone 90 mg per day, achieving adequate analgesic control (ENVA 3/4), but unfortunately due to lack of financial resources, it was suspended and rotated to transdermal buprenorphine of 840mcg with pain relief, achieving ENVA of 5/10, and infusion of ketamine at a dose of 0.2mg/kg/hr, Mg sulfate 1g/day, lidocaine. 5mg/kg/h with poor pain management, with little tolerance to moderate sedation and constipation as undesirable effects.

During his stay, he suffered amputation of the second, third and fourth fingers of the left hand as well as the third, fourth and fifth of

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the right hand due to ischemia and consequent necrosis of the same and continuing with ischemic pain in both hands.



**Figure 1** Necrosis of the ring finger and cyanosis of the middle finger of the right hand before the neurolytic procedure.

It was decided to initiate interventional pain management by means of sympathetic stellate ganglion block by ultrasound, in addition to T1-T2 block by fluoroscopy to promote vasodilation and improve distal irrigation without poor response. A USG-guided suprascapular

block was then performed with 15ml of 2% Ropivacaine and 8mcg dexmedetomidine with a good analgesic response, decreasing to ENVA 1/10 with improvement in 48 hours. When noticing the response to the brachial plexus blocks, a bilateral axillary approach was attempted with 10ml of 2% ropivacaine, however analgesia was also achieved (ENVA 2/10) for 12 hours.

The patient in a general poor septic condition, thoughts of death, a feeling of hopelessness, requesting a medicine that ends this suffering. SF-36 quality of life survey is carried out. Given the conditions and the advanced state of the deteriorated physical and psycho-emotional state due to severe pain and suffering, it was decided to perform compassionate-palliative phenolization of the brachial plexus through an ultrasound-guided infraclavicular approach.

## Process

The patient is placed in a supine position, non-invasive monitoring is performed, a nasal cannula is placed to administer oxygen 2 liters/m, asepsis and antisepsis of the bilateral infraclavicular region are performed with iodine and alcohol. Sonosite M4 equipment with linear probe and Pajunj stimulator is used. With a linear probe in a transverse position to the subclavian artery, the brachial plexus is observed adjacent to it, later simple lidocaine is infiltrated into the skin and subcutaneous tissue, then a neurostimulation needle is inserted and ultrasound is directed around the brachial plexus, obtaining a motor response to .5mA, then it is aspirated to confirm that the tip is not inside a vessel and 1 cc of 6% phenol is infiltrated, repositioning the needle bordering the plexus, repeating the same operation on both sides of the plexus in total volume per plexus of 10 ml. Finish procedure without complications. Final evaluation, ENVA 4/10 in the right arm and 3/10 in the left arm, in addition to a feeling of heaviness and numbness. Decreased strength in left brachial biceps 1/5 Daniels.

After the interventional phenol treatment, the patient presented significant clinical improvement. She is discharged and communication is maintained for 10 months and a quality of life test is performed which shows an improvement in the perception of her quality of life by reducing the pain that was previously unbearable and the perfusion of both upper extremities regressing the sense of living and suspending all analgesic drugs and continues with poor glycemic control (Figure 2).



**Figure 2** Patient with phalangeal amputation, with good palmar coloration without pain 10 months after phenolization of the brachial plexus by the infraclavicular route.

## Discussion

Like standard local anesthetics, phenol blocks C fibers first, followed by faster conducting A fibers.<sup>4</sup> The drug immediately acts as a local anesthetic in gamma fibers and second, a chemical axonotmesis occurs with destruction of the axons, while the endoneurial tubules remain. Nerve conduction is impaired, and the reflex arc is disrupted, decreasing muscle tone, resulting in a degree of muscle relaxation or sometimes paresis. Some EMG studies suggest that alpha nerve fibers are the most affected. Over a period of weeks to months, axonal regeneration eventually reaches the motor endplates with clinical reversal of the block. However, muscle weakness sometimes persists after phenol injection. The pathophysiology of this clinical finding is unclear. Perhaps it reflects the original damage to the central nervous system, the development of muscle atrophy, or permanent axonal damage and scarring.<sup>4-6</sup>

The nerve blocking effect of phenol can be assessed by adjusting the concentration or volume of phenol injected. Its effect also depends on how and where it is injected, and the application technique. Both the concentration and the volume alter the effects of phenol on driving for up to 8 weeks; 5% phenol has a longer effect than 3% and 0.3 ml has more effect than 0.1 ml. A large volume of phenol solution can spread more extensively in the perineural sheath than a small volume.<sup>7</sup>

Phenol is a drug used since the 1950s, it was demonstrated thanks to the reports of Nathan et al. its safety in administration for pain management with minimal adverse effects, these being dose dependent as previously mentioned. Currently, technology increases security in its administration, being ultrasound and nerve locator, the most used and effective. More studies are needed with a greater number of selected patients, especially resource conditions, experience, type of pain that can benefit, as in this case, as well as palliative patients, taking into account the bioethical aspects of their use and their compassionate use. Finally, it was very surprising for us the peripheral vasodilator effect that extends over the long term for more than 10 months, which did not occur with the central sympathetic lytic blockade techniques, which would suggest a vasodilator effect similar to some local anesthetics of the Currently, a peripheral depletion of aminoamines and other mechanisms are unknown to us today and in contrast to the ischemic effect described by Liu et al.<sup>2,8</sup>

The SF-36 Health questionnaire improved the perception of the individual when evaluating their quality of life, allowed to obtain a profile of the clinical evaluation on the concept of disease, but also on physical, mental and social well-being, and as in this case of a rating of zero after the procedure, currently 5 to 10 months later.<sup>9</sup> The importance of this case lies in the benefits that can be obtained from a technique that had been abandoned for a long time, with the use of phenol being a valuable tool within the arsenal of techniques for the management of chronic pain that is intractable by other measures.

## Conclusion

This case shows the safety and efficacy of phenol in patients with uncontrollable pain by other means, opening the door to new studies that support the use of this drug in the arsenal of drugs that can be used in interventional techniques for patients with advanced states and with a terrible burden of suffering for pain, with the desire that they benefit and be released from it, and this action is a worthy definition of compassion according to the Dalai Lama, love and compassion are necessities not luxuries. Without them, societies cannot survive.<sup>10,11</sup>

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