Sympathetic nervous system block to control phantom limb pain. Case report*

Bloqueio do sistema nervoso simpático para tratamento de dor do membro fantasma. Relato de caso

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ABSTRACT

BACKGROUND AND OBJECTIVES: Phantom limb sensation is a phenomenon affecting patients submitted to amputation of any limb and this sensation may or may not be followed by pain. This report aimed at presenting a case where sympathetic nervous system block was used as adjuvant to control phantom limb pain.

CASE REPORT: Patient with wrist epidermoid carcinoma, who evolved with phantom limb pain after left forearm amputation. Patient was submitted to conservative treatment and physical rehabilitation, however drug therapy analgesia was insufficient and patient evolved with pain in the amputation stump and sympathetic nervous system-mediated pain. Ultimately, patient was submitted to sympathetic venous block followed by diagnostic thoracic sympathetic chain block with significant pain decrease.

CONCLUSION: Sympathetic nervous system block in this case was induced with venous lidocaine infusion, followed by thoracic sympathetic chain block as therapeutic option for phantom limb pain. This sequence has provided pain relief without adverse effects.

Keywords: Neuropathic pain, Phantom pain, Sympathetic block, Sympathetic venous block.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A sensação do membro fantasma é um fenômeno que acomete pacientes submetidos à amputação de qualquer um dos membros, e essa sensação pode ser acompanhada ou não de dor. Este relato teve por objetivo apresentar um caso no qual o bloqueio do sistema nervoso simpático foi utilizado como adjuvante no tratamento da dor do membro fantasma.

RELATO DO CASO: Paciente portador de carcinoma epidermoide de punho que evoluiu com dor do membro fantasma após amputação do antebraço esquerdo. Foi submetido a tratamento conservador e de reabilitação física, porém a analgesia obtida com terapia farmacológica foi insuficiente e o paciente evoluiu com dor do coto de amputação e dor mediada pelo sistema nervoso simpático. Finalmente, o paciente foi submetido a bloqueio simpático venoso seguido de bloqueio diagnóstico da cadeia simpática torácica com redução significativa da dor.

CONCLUSÃO: Nesse caso foi utilizado o bloqueio do sistema nervoso simpático por meio de infusão venosa de lidocaína, seguido de bloqueio da cadeia simpática torácica como opção terapêutica para dor do membro fantasma. Nessa sequência, foi obtido alívio da dor, sem surgimento de efeitos adversos.

Descritores: Bloqueio simpático venoso, Bloqueio simpático, Dor fantasma, Dor neuropática.

INTRODUCTION

Phantom limb sensation is a phenomenon affecting patients submitted to amputation of any limb and this sensation may or may not be followed by pain. In most cases, the phantom limb has the same size, shape and posture presented by the amputated limb before surgery and may, in up to 20% of cases, evolve with progressive decrease of limb size. This phenomenon is called telescoping[1].

Regardless of the reason for the amputation, up to 80% of patients have phantom limb pain, which may generate an abnormal or anatomically impossible posture. The impact of phantom limb pain goes beyond the impact of the amputation itself or of the presence of phantom sensation. Pain is in general disabling and is usually associated to myofascial pain syndrome in muscles close to the amputated region[1].

The treatment of this painful syndrome is based on pharmaco-

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logical management and on the treatment of physical, psychological and behavioral aspects of patients. Surgery may be used, being in general directed to treating amputation stump neuroma. The pharmacological treatment is based on non-opioid analgesics, tricyclic antidepressants (or dual inhibitors), neuroleptics, anticonvulsants, opioids, neuromuscular blockers, ketamine and capsaicin[1].

This report aimed at describing a case where sympathetic nervous system block was used as adjuvant to treat phantom limb pain.

CASE REPORT

Male patient, 65 years old, widower, retired, who started follow up with the Pain Control Group in the postoperative period of left forearm amputation due to partial failure of chemotherapy (CT) + radiation therapy (RT) to treat left wrist and hand epidermoid carcinoma (EC).

In the immediate postoperative period, received patient-controlled analgesia (PCA) with morphine, ketoprofen, dipirone and gabapentin. At hospital discharge morphine was replaced by transdermal fentanyl (TDF) with good pain control, as observed during his subsequent return, although patient had decreased previously prescribed gabapentin dose.

For two months, patient started new RT in axillary region due to left node and had one unscheduled hospitalization due to pain. Differently from postoperative pain, he reported phantom limb pain with intensity 8/10, continuous, burning and in shock and with painful cold sensation. For this reason, gabapentin and RT doses were increased, amitriptyline was introduced and rescue morphine was maintained, obtaining pain relief. Patient also started a physical rehabilitation program oriented by the hospital's Physiatrics Service.

One month after hospital discharge, patient came to the outpatient setting again referring persistence of severe pain in the amputated limb, which has led him to ask for oral rescue morphine in high doses. Opioid rotation from fentanyl to methadone was instituted and rescue morphine dose was increased, being maintained remaining adjuvant drugs.

This change in opioid treatment schedule has provided phantom limb pain relief for approximately six months, when patient lost the pain group follow up, continuing only with radiation therapy in axillary lesion by metastasis of a previous EC.

Patient returned to Pain Control Team follow up due to arterial bleeding in axillary region associated to local infection, which has motivated left shoulder disarticulation and reconstruction with a flap. During this hospitalization period, we decided to change the opioid schedule to oxycodone, to increase gabapentin and amitriptyline doses and to maintain dipirone in usual doses, being this the hospital discharge prescription.

Despite shoulder disarticulation, when returning to the Pain Group outpatient setting, amputation stump remained with exuberant phlogistic signs and at clinical evaluation he presented trigger-points with phantom limb referred pain. Local hyperemia involved the whole axillary region and part of the ipsilateral dorsum.

This evaluation made clear the major participation of amputation stump pain and a possible participation of sympathetic nervous system in pain perpetuation. In addition to antibiotics, stomatotherapy, new RT sessions and new CT cycle with second line drugs, patient had opioid rotation to methadone – for having presented adequate pain control in previous phantom pain episode –, gabapentin dose was increased and amitriptyline was replaced by venlafaxine.

This therapeutic schedule provided poor pain relief, which made the team consider stellate ganglion block, procedure which was immediately discarded because patient had erythematous and infiltrative skin lesion which extended from the shoulder to the puncture site for this blockade.

A serial weekly schedule of sympathetic venous block (SVB) was indicated with 2 mg/kg lidocaine, which has relieved at least 50% of the pain lasting up to three consecutive days.

After three SVB sessions, patient was submitted to diagnostic left thoracic sympathetic block at T_4 with 10 mL of 1% lidocaine, with surprising results. Patient referred that the day of the diagnostic block he had the first night in months where he could sleep without pain and this result has lasted for two days after the procedure. After this period, pain has returned, however with lower intensity.

Thoracic sympathetic chain lesion by radiofrequency was scheduled to be performed three weeks after diagnostic block, however follow up exams have identified disease progression to mediastinum, which made the risk/benefit ratio unfavorable for the intervention.

We decided to maintain methadone (60 mg/day), gabapentin (3600 mg/day), venlafaxine (300 mg/day) and 1.5 g dipirone every 8h, 10 mg rescue morphine every 4h, and chlorpromazine (10 mg) at night, with partial relief. Patient is still being treated with stomatotherapy, CT, RT and psychology.

DISCUSSION

Phantom pain is difficult to treat and is typically triggered by traumatic or atraumatic limb amputation. Its incidence varies from 5% to 85%[2-4], depending on diagnostic criteria. Typically it is burning and shock pain in the amputated limb[4,5]. It should be differentiated from pain in the amputation stump triggered by surgical wound ischemia, local infection, neuroma formation or compression by adjacent structures.

In atraumatic amputations, the lack of adequate postoperative pain control and the presence of severe preoperative pain, a personality with catastrophizing trend[6,7] and postoperative neurotoxic chemotherapy[8,9] are risk factors for the development of phantom limb pain.

There are three primary mechanisms involved with phantom pain: peripheral, medullary and cerebral factors. These factors are responsible for the development of different triggers for this phenomenon, including physical (referred pain), psychological (mind focus on amputation and pain) and environmental (temperature or weather changes) factors[1].

Peripheral consequences of amputation are related to the development of the amputation neuroma. Changes in peripheral nerve induce, in general terms, an increase in ectoptic activities

in this nerve, combined with loss of inhibitory control in dorsal root horn[1].

In central nervous system, phantom pain corresponds to a poorly adapted reorganization of the thalamus and of the cortical representation of somatosensory and motor areas, in such a way that neighbor regions to the somatosensory homunculus end up overlapping the area representing the lost limb. These neuroplastic changes involve both an immediate loss of inhibition of stimuli sent from one area to the other, and the sprouting of new connections along time[1].

In our case, patient had most risk factors for the development of phantom pain. After being submitted to anesthesia with brachial plexus block – possible protective factor[10] -, having had the opportunity to adequately control postoperative pain and having been submitted to pre and post procedure CT, patient evolved with phantom limb pain, which was adequately controlled with gabapentinoids, methadone[11] and amitriptyline.

However, baseline disease recurrence in the amputation stump, as well as its infection, have provided a substract for the worsening of phantom pain associated to stump pain and to sympathetic nervous system-mediated pain, making pain control a challenge.

Notwithstanding maximum dual antidepressant doses, gabapentinoids and opioids rotation, and baseline disease treatment (antibiotics, CT and RT), patient persisted with refractory pain with major worsening of quality of life.

Several studies have suggested that the sympathetic nervous system may play an important role in pain persistence in patients with phantom pain[12-14]. This has led the team to perform a therapeutic test with sympathetic venous block with better results as compared to previous therapy.

The role of sympathetic venous block to treat phantom pain is controversial. A study[15] has compared venous therapy with morphine versus lidocaine for post-amputation pain in 31 patients. Among these patients, some had phantom pain associated to stump pain, others only phantom pain or only stump pain. It was observed that amputation stump pain had satisfactory response with both drugs, while phantom pain has only responded to morphine.

In a Cochrane Library review from 2012, investigating the use of sympathectomy for neuropathic pain management (where phantom pain studies were included), the author has concluded that the evidence of the effectiveness of this technique is weak and that it should only be used in selected patients in whom drug therapy has been ineffective[16].

In our case, the decision for sympathetic nervous block was based on the following criteria: failure of drug therapy, presence of amputation stump pain (with trigger-point) and clinical signs of participation of the sympathetic nervous system in pain mechanism.

However, notwithstanding the good pain relief, this effect was fleeting. We then considered the possibility of thoracic chain sympathectomy by pulse radiofrequency after diagnostic thoracic chain block, intervention which has shown promising results in recent studies[12,13,17].

Sympathetic ganglia feeding upper limbs are located in the intermediate-lateral spinal cord horn between T_2-T_8 and preganglionic fibers travel to the sympathetic chain via white communicating branches. This pathway ascends and communicates with post-ganglionic fibers in T_2, T_3 and the stellate ganglion[18,19]. Usually, thoracic sympathetic block target are T_2 and T_3 ganglia, however due to the presence of skin hyperemia in blockade area, we decided for diagnostic block at T_4.

Thoracic chain sympathectomy with pulse radiofrequency was not performed due to disease progression, because it would increase surgical risk. Currently, patient is being treated with pharmacological and non pharmacological (acupuncture) measures, second line CT and RT for the baseline disease.

CONCLUSION

In this case where patient with phantom limb pain associated to amputation stump pain and sympathetic nervous system pain maintenance, without improvement with conventional drug therapy, sympathetic nervous system block was used with venous lidocaine, followed by thoracic sympathetic chain block (Figure 1). The conclusion was that, in this scenario, this technique has provided pain relief without adverse effects.

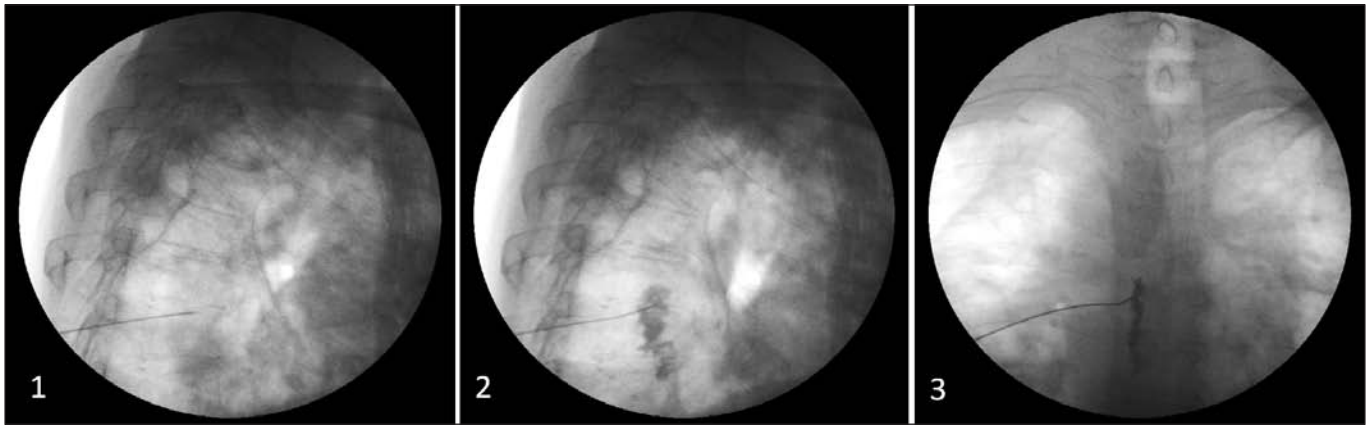

Figure 1 – Thoracic sympathetic chain block.
1 – Radioscopy with lateral view showing needle positioning at T_5 vertebral body level. 2 – Radioscopy with lateral view showing contrast medium spread in thoracic sympathetic chain topography. 3 – Radioscopy with anteroposterior view showing contrast medium distribution in thoracic sympathetic chain topography.

REFERENCES

1. Giummarra MJ, Moseley GL. Phantom limb pain and bodily awareness: current concepts and future directions. Curr Opin Anaesthesiol. 2011;24(5):524-31
2. Jensen TS, Krebs B, Nielsen J, et al. Immediate and long-term phantom limb pain in amputees: incidence, clinical characteristics and relationship to pre-amputation limb pain. Pain, 1985;21(3):267-78.
3. Perkins FM, Kehlet H. Chronic pain as an outcome of surgery. A review of predictive factors. Anesthesiology. 2000;93(4):1123-33.
4. Nikolajsen L, Jensen TS. Phantom limb pain. Br J Anaesth. 2001;87(1):107-16.
5. Ephraim PL, Wegener ST, MacKenzie EJ, et al. Phantom pain, residual limb pain, and back pain in amputees: results of a national survey. Arch Phys Med Rehabil. 2005;86(10):1910-9.
6. Hanley MA, Jensen MP, Smith DG, et al. Preamputation pain and acute pain predict chronic pain after lower extremity amputation. J Pain. 2007;8(2):102-9.
7. Richardson C, Glenn S, Horgan M, et al. A prospective study of factors associated with the presence of phantom limb pain six months after major lower limb amputation in patients with peripheral vascular disease. J Pain. 2007;8(10):793-801.
8. Macrae WA. Chronic post-surgical pain: 10 years on. Br J Anaesth. 2008;101(1): 77-86.
9. Kehlet H, Jensen TS, Woolf CJ. Persistent postsurgical pain: risk factors and prevention. Lancet. 2006;367(9522):1618-25.
10. Gehling M, Tryba M. Prophylaxis of phantom pain: is regional analgesia ineffective? Schmerz. 2003;17(1):11-9.
11. Bergmans L, Snijdelaar DG, Katz J, et al. Methadone for phantom limb pain. Clin J Pain. 2002;18(3):203-5.
12. Cohen SP, Gambel JM, Raja SN et al. The contribution of sympathetic mechanisms to postamputation phantom and residual limb pain: a pilot study. J Pain. 2011;12(8):859-67.
13. West M, Wu H. Pulsed radiofrequency ablation for residual and phantom limb pain: a case series. Pain Pract. 2010;10(5):485-91.
14. Halbert J, Crotty M, Cameron ID. Evidence for the optimal management of acute and chronic phantom pain: a systematic review. Clin J Pain. 2002;18(2):84-92.
15. Wu CL, Tella P, Staats PS, et al. Analgesic effects of intravenous lidocaine and morphine on postamputation pain: a randomized double-blind, active placebo-controlled, crossover trial. Anesthesiology. 2002;96(4):841-8.
16. Straube S, Derry S, Moore RA, et al. Cervico-thoracic or lumbar sympathectomy for neuropathic pain and complex regional pain syndrome. Cochrane Database Syst Rev. 2010;7;(7):CD002918.
17. Agarwal-Kozlowski K, Lorke DE, Habermann CR, et al. Interventional management of intractable sympathetically mediated pain by computed tomography-guided catheter implantation for block and neuroablation of the thoracic sympathetic chain: technical approach and review of 322 procedures. Anaesthesia. 2011;66(8):699-708.
18. Raj PP, Lou L, Erdine S, Staats PS, et al. T2 and T3 sympathetic nerve block and neurolysis. In: Raj PP, Lou L, Erdine S, et al. (editors). Radiographic imaging for regional anesthesia and pain management. 1st ed. Texas, Philadelphia: Churchill Livingstone; 2003. p. 132-7.
19. Yoo HS, Nahm FS, Lee PB, et al. Early thoracic sympathetic block improves the treatment effect for upper extremity neuropathic pain. Anesth Analg. 2011;113(3):605-9.