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Sphenopalatine ganglion block with botulinum toxin type A using a three-dimensional injection guide for facial pain of cancerous origin: study of a clinical case.

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Abstract

Objective: Sphenopalatine ganglion block remains a noninvasive therapeutic option to treat diverse facial pain syndromes. The aim of this case report was to verify the effectiveness and safety of three-dimensional (3D) injection guide for sphenopalatine ganglion block in a tongue cancer patient.

Case report: A 53-year-old man presented with a large squamous cell carcinoma of the right base of the tongue, classified cT4N2M0 and exhibiting excruciating facial pain. A botulinum toxin injection was performed following Dr. Yoshida's method, using a 3D injection guide.

Conclusions: Sphenopalatine ganglion block with 3D injection guide can be an effective treatment against cancer pain. In this case report a complete withdrawal of painkillers was obtained less than 24 hours after botulinum toxin injection.

Keywords: Sphenopalatine ganglion block, tongue cancer, pain, botulinum toxin, 3D guide

Introduction

The sphenopalatine ganglion block is used in the management of cluster headache, trigeminal neuralgia, migraine, postoperative pain of head and face, postherpetic neuralgia, musculoskeletal pain, in other pain syndromes of head and face, and for head and neck cancer pain [1]. Prasanna et al., used sphenopalatine ganglion block for advanced cancer in tongue and floor of mouth with immediate pain relief for the patients [1, 2]. Prasanna et al., used local anesthetic with nasal sinuscope approach without any additional imaging to improve finding the area of sphenopalatine ganglion [2]. However, there is still controversy over both the ideal method and the pharmacological agent used [1].

The ideal technique should be efficient, minimally invasive, and likely to cause the fewest side effects. In addition, faced with a real demand from the population, it should be possible to perform it in private practice in order to unclog hospitals and in particular interventional radiology departments.

The sphenopalatine ganglion is a parasympathetic ganglion located in the sphenopalatine fossa, opposite the sphenopalatine foramen, posterior to the middle turbinate and maxillary sinus, anterior to the pterygoid canal and round foramen and inferior to the sphenoid sinus and to the maxillary branch of the trigeminal nerve (Figure 1).

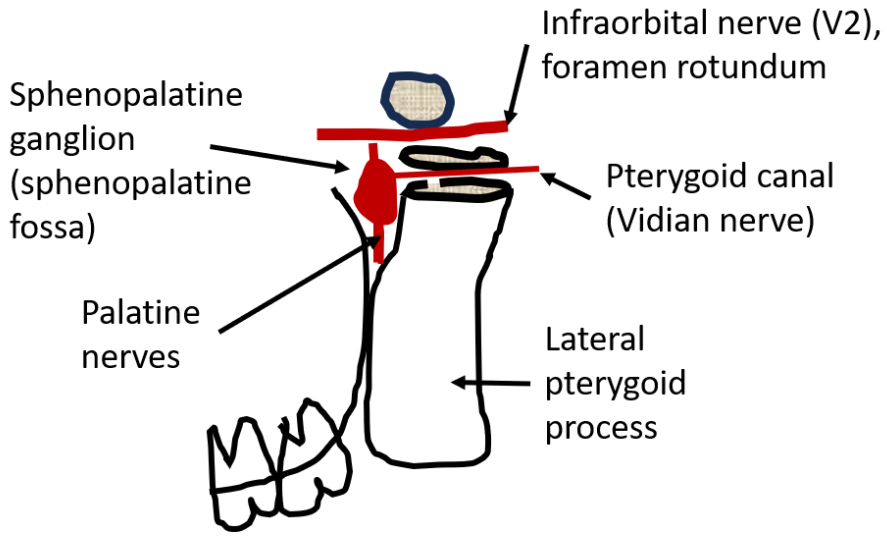

Fig. 1. Transverse section at the level of the sphenopalatine ganglion.

The nerve fibers then distribute to the nasal cavity, palate, upper pharynx, lacrimal gland and meningeal vessels. Although traversed by orthosympathetic and sensory fibers, its designation as a parasympathetic ganglion results from the fact that only this system establishes a synaptic connection within the ganglion (Figure 2).

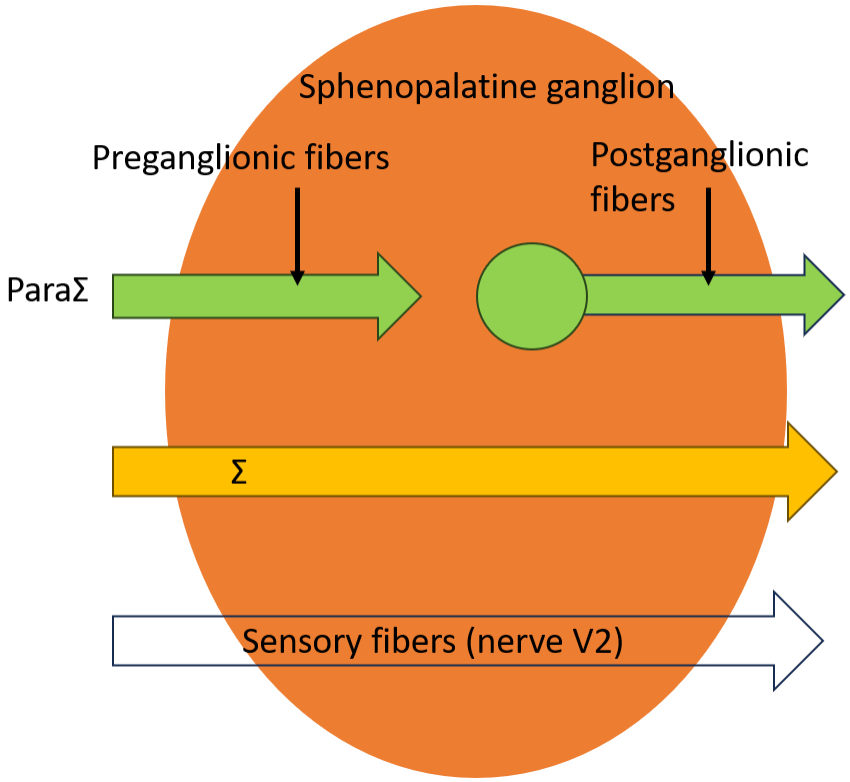

Fig. 2. Nerve afferents and outflows from the sphenopalatine ganglion. Para∑: parasympathetic nervous system; ∑: sympathetic nervous system.

This essential characteristic makes this ganglion a privileged target for the action of botulinum toxin type A (TBA), a protein complex produced by the anaerobic gram-positive bacterium Clostridium botulinum, by inhibiting the release of acetylcholine and therefore the neurotransmission between pre- and post-ganglionic parasympathetic fibers for up to a year [3].

The intraoral technique presented in this article has already been performed successfully on patients with trigeminal neuralgia by Yoshida, without any adverse effects described [4]. The idea here is to use the same methodology and operative technique but this time to evaluate its effectiveness on pain of oncological origin.

Case report

A 53-year-old patient presented to a maxillofacial surgery consultation because of very debilitating right hemifacial pain that had been present for 5 months. Several dentists and doctors were consulted without success and tooth 48 was extracted.
Palpation of the base of the tongue in consultation revealed the presence of a hardened mass, however without any surface mucosal lesion. The requested MRI detected the presence of a large mass of 42 mm long axis invading the extrinsic and intrinsic musculature of the posterior part of the free border and the base of the tongue on the right side, with suspicion of extension beyond from the midline.
During the assessment also including a PET-CT and a biopsy, the diagnosis of basic squamous cell carcinoma of the tongue classified cT4N2M0 was made (Figure 3).

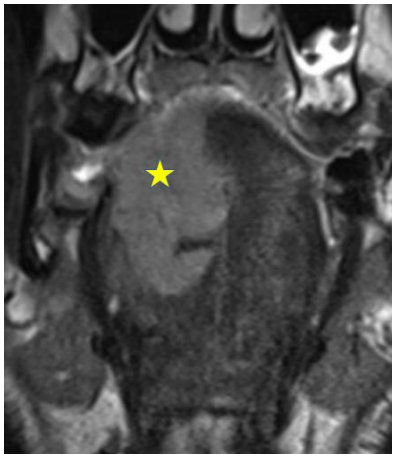

Fig. 3. MRI (T2) of tongue base squamous cell carcinoma (star) classified cT4N2M0.

The tumour, deemed unresectable, was treated with radiotherapy, chemotherapy and immunotherapy. On a numerical scale from 0 to 10, the patient judged his pain at 6/10 with analgesic treatment and at 9/10 in the event of therapeutic abstention. His analgesic treatment was: Lyrica 75mg 3x in the morning; Lyrica 150mg 3x in the evening, Dafalgan 1g 4 tablets/day; Oxyxontin 40mg 2x/day; Oxynorm 10mg 2x/day; Tegretol 200mg 2x/day; Dexamethasone 6mg 1x/day. After written consent from the patient, the intraoral injection guide was performed using the technique mentioned by Yoshida.
A cone beam computed tomography (CBCT) examination of the upper jaw including the ceiling of the sphenopalatine fossa was performed, and then merged with an intraoral scan recording the dentition of the upper jaw. After topographic validation of the sphenopalatine ganglion by a radiologist, the needle insertion path

was simulated using a 40mm zygomatic implant pointing towards the ganglion (CoDiagnostiX (Straumann)) (Figure 4).

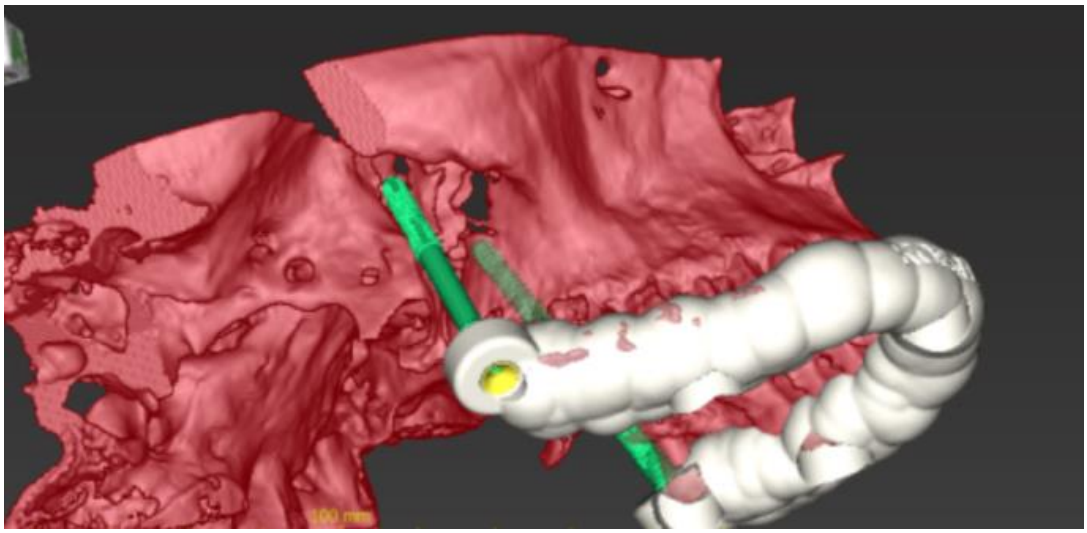

Fig. 4. 3D simulation of the needle insertion path, injection guide in place, within the sphenopalatine fossa. In this specific case, a 40 mm zygomatic implant makes it possible to point the ceiling of the pit with the surface of the guide as a reference. Simulation performed using the CoDiagnostiX software (Straumann).

A custom-made tray fitted with two metallic guides located posterior to the wisdom teeth was made and 50 units of botulinum toxin type A diluted in 1cm3 of physiological fluid was injected to the sphenopalatine fossa using a 50mm X 21G needle (Microlance) at a depth of 40mm after local anesthesia with 0.85 ml of mepivacaine hydrochloride (Scandonest) in the area of the injection site (Figures 5, 6).

The pain was rated 1/10 with the visual analogue scale 24 hours after the injection. A month later, the pain remained perfectly controlled and unchanged. Our patient relapsed in pain 2 months later and died soon after without having received a second injection.

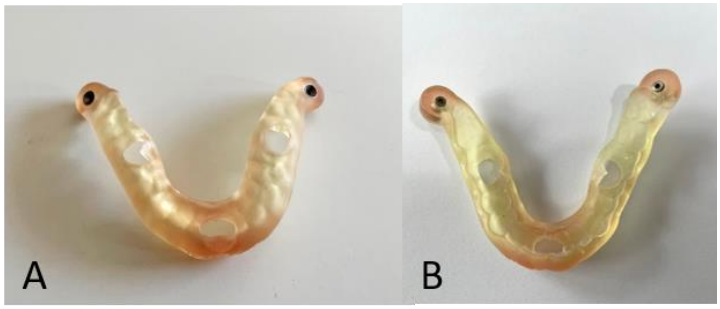

Fig. 5. A. Extrados of the tooth-supported injection 3D guide. B. Intrados of the tooth-supported injection 3D guide.

Fig. 6. The injection time.

Discussion

Botulinum toxin type A has been shown to be effective in the treatment of chronic migraines as well as cluster headaches [5, 6]. However, the transnasal and percutaneous routes seem to cause more undesirable effects such as epistaxis, pain, swelling at the injection site, diplopia, dysphagia, asymmetry of the nasolabial groove, dry eye. The transnasal approach can be made difficult in case of nasal obstruction [7, 8].

Approaching the sphenopalatine ganglion intraorally via the greater palatine foramen is generally considered painful and technically difficult [9].
On the other hand, access to the sphenopalatine fossa by an approach lateral rather than medial to the wisdom tooth seems to be a more promising technique [4]. The needle is oriented by the custom-made intraoral guide and the vestibular approach seems easier than an approach via the greater palatine canal. Local anesthesia before injection thus seems optional [4].

However, the depth of the insertion of the needle was not controlled by the 3D guide. Yoshida used a needle of 60mm (Yoshida). We used a needle of 50mm but inserted 40mm for more safety. Yoshida measured the target point on CT scan of pterygopalatine fossa, however, not explained in this article princeps how the depth was controlled to arrive to the selected depth [4]. We may use in the future endodontic stops inserted on the needle to control the depth of insertion more accurately and closely to the 3D simulation. Also, we did not control the time of injection.

The 3D guide is reusable, which represents a clear advantage in terms of cost. The action is fast, from the first injection and the injection can be repeated if necessary. Yoshida recommends in case of recurrence, a reinjection at least 3 months after [4]. For our patient, the effectiveness of botulinum toxin decreased 2 months after the injection.

The analgesic mechanism of botulinum toxin does not seem to be fully elucidated. The inhibition of the parasympathetic system by inhibition of the exocytosis of acetylcholine is the most widespread theory but the action on the peripheral sensory fibers and on the central nervous system is under study [6].

Finally, it is surprising to note that the infiltration of the sphenopalatine ganglion, in close connection with the maxillary nerve, relieves pain originating from a territory innervated by the third trigeminal branch. The presence of dendrites coming from the ganglion of Gasser within the sphenopalatine ganglion could explain this phenomenon [10].

The intra-oral method of injection of botulinum toxin using a 3D guide seems to be particularly safe and likely to provide a real analgesic effect in patients for whom conventional treatments have proven to be ineffective. The treatment proposed in this clinical case allowed a total withdrawal of painkillers for a period of 2 months in an oncological patient.

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- **Informed consent**: there was no need for the informed consent for this ca se report as all the images were anonymized and no private data were provided allowing the patient's identification.

Authors contribution:

Author	Contributor role
Bourgeois Thomas	Conceptualization, Investigation,Methodology, Data curation, Resources, Validation, Writing original draft preparation, Writing review and editing
Gilon Yves	Writing original draft preparation, Writing review and editing

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