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Case Report
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# Edema and hematoma after local anesthesia via posterior superior alveolar nerve block: a case report

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Although rare, complications can occur with anesthetic procedures. The posterior superior alveolar nerve (PSAN) block anesthetic technique has a high success rate, but positive aspiration can cause bruising, transient diplopia, blurred vision, and temporary blindness in approximately 3% cases. When edema occurs, it is occasionally massive, especially in the infratemporal fossa, and the resulting hematoma is usually unsightly. A 20-year-old woman presented with massive edema followed by hematoma in the upper right jaw immediately after PSAN block administration, which subsequently spread to the oral mucosa. The patient did not report any complications during the anesthetic procedure. However, after the injection was administered, the patient experienced anesthetic sensations, which rapidly evolved to facial edema. There was mild pain, but without intraoral or extraoral bleeding. The patient was prescribed medicines and instructed to perform contrast therapy. Although hematomas and edema are rare, they are difficult to prevent. The choice of local anesthetic and appropriate application of the anesthetic technique can minimize their occurrence.

**Keywords:** Anesthesia; Case Reports; Edema; Hematoma; Superior Alveolar Nerve.



## INTRODUCTION

Local anesthesia (LA) eliminates or drastically reduces nociceptive impulses, temporarily reducing the pain sensations during dental procedures [1]. LA injections are routinely administered in daily clinical practice; however, there are only few reports of serious complications, indicating the excellent clinical safety of these anesthetic agents [2].

Lack of knowledge of the local anesthetic techniques and anatomical structures increases the risk of adverse reactions and complications, leading to failure of anesthesia and damage to healthy tissues. The posterior superior alveolar nerve (PSAN) is an important sensory branch of the maxillary division of the trigeminal nerve. The PSAN block is performed to obtain pulpal and soft tissue anesthesia in the region between the maxillary first and third molars, excluding the mesiobuccal root of the first molar in approximately 25% cases [3], which requires supplementary anesthesia [2].

PSAN blocks have a high success rate in invasive dental procedures (85–100%) [4,5], despite the risk of complications [6]. Positive aspiration with PSAN block has been reported in approximately 3% cases, which is second to that of the inferior alveolar nerve block [2]. The possible complications associated with this technique include hematoma, transient diplopia, blurred vision, and

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temporary blindness [7]. The block needle can traumatize blood vessels, creating an intraneural hematoma [1]. Although uncommon, Bell's palsy can also result from incorrect insertion of the needle into the parotid fascia during the PSAN block [8]. If bleeding occurs in the infratemporal fossa, the hematoma and/or edema appear bulkier and esthetically unpleasant, as this site can accommodate a large volume of blood [2].

This study aimed to present a review of the literature on PSAN block and a report of a clinical case of edema following subcutaneous hematoma.

## CASE REPORT

This report was approved by the Research Ethics Committee of the School of Dentistry of Piracicaba, University of Campinas (protocol CAAE: #52141721.1.0000.5418).

A PSAN block was administered in a 20-year-old woman with 0.6 mL of 3% mepivacaine without vasoconstrictor. The patient had no remarkable medical, family, and psychosocial history or any relevant genetic information. A long needle (32 mm/27 G) was used according to the technique described by Malamed [2] after negative aspiration. Approximately 5 min after needle insertion,

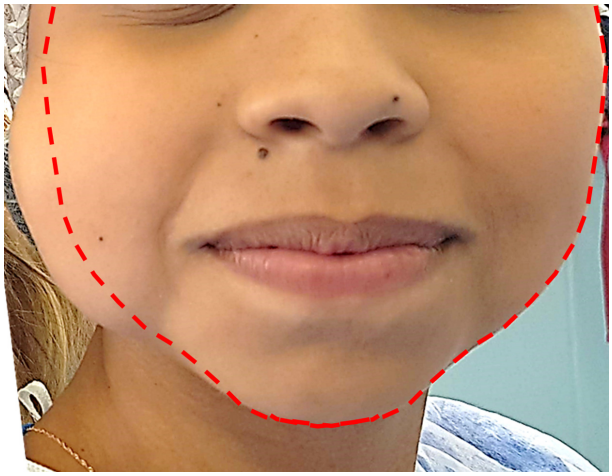

Fig. 1. Appearance of the face 5 min after posterior superior alveolar nerve block administration

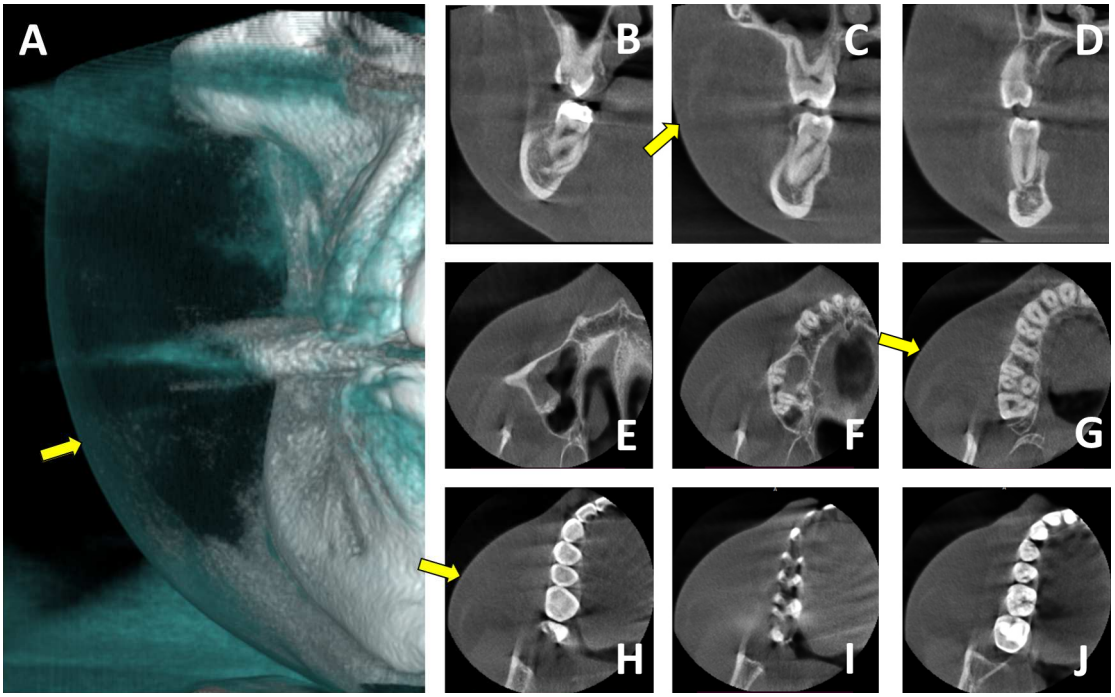


Fig. 2. Computed tomography images of hematoma 3 d after anesthesia. Images were obtained using RadiaAnt DICOM Viewer (version 2021.2.2). (A) Three-dimensional view using the filter "bones and skin 1"; (B–D): Coronal views of the second molar (B), first molar (C), and second pre-molar (D) regions; (E–J): Axial views of the maxillary sinus (E), apical third (F), middle third (G), coronal third (H), maxillary cuspid (I), and mandibular cuspid (J). Yellow arrows denote the soft tissue limits.

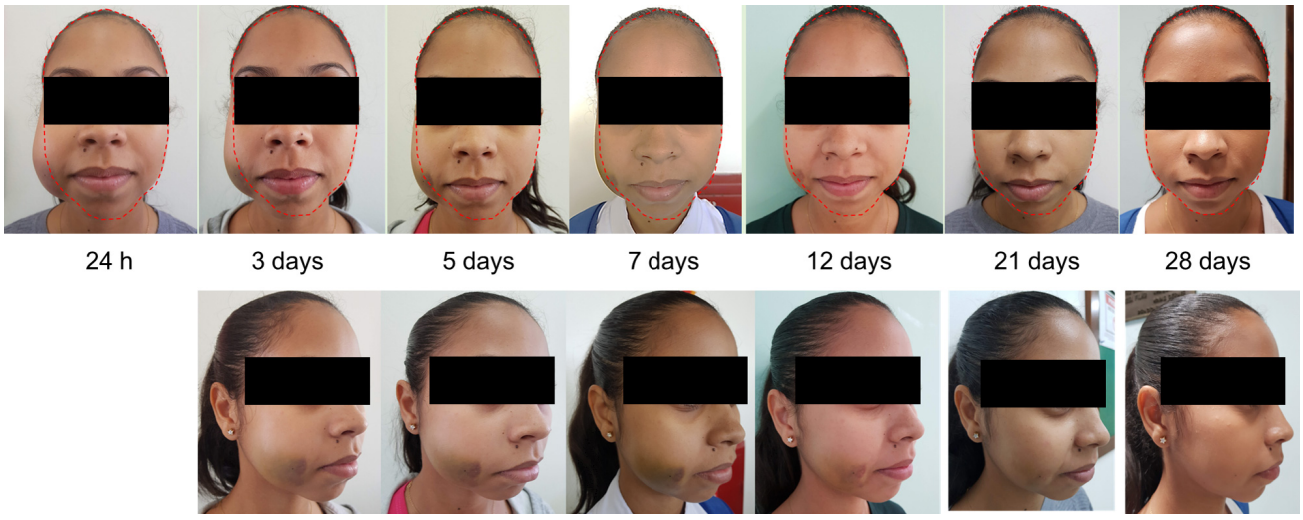


Fig. 3. Evolution of the hematoma from 24 h to 28 d after anesthesia. The dashed red line indicates the original contour of the face.

a large swelling developed in the right cheek. Anesthesia sensation and mild pain were reported, but without intraoral or extraoral bleeding (Fig. 1). The purpose of this anesthesia technique exercise was to train the pupils on this subject without clinical and physical examination.

Cone-beam computed tomography images are shown in Fig. 2. Apart from an increased isodense area in the right cheek region (Fig. 2A), no abnormalities were observed in the surrounding structures. There were no lesions in the maxillary bone near the second molar (Fig. 2B), first molar (Fig. 2C), or second pre-molar (Fig. 2D). The swelling was most notable in the cheek around the upper molars (Fig. 2F and 2G).

Sodium dipyrone (1 g every 6 h for 24 h) and contrast therapy (cold/heat) were immediately administered. Nimesulide (100 mg) was prescribed every 12 h for 3 d.

Fig. 3 shows the evolution of the edema and appearance of the hematoma. At 24 h after anesthesia, the hemiface swelling worsened and showed signs of hematoma. In the first 3 d, the edema caused slight restriction of mouth opening due to pain, but eating was not restricted. After 5 d, the swelling was predominantly located on the cheek on the right side, with a more pronounced purple hematoma. After 1 week, the edema reduced; there was no pain, but the hematoma was more evident and greenish in color and covered a larger area. After 12 d, the edema reduced significantly; there was no pain or discomfort, and the hematoma was lighter in color and covered a smaller area.

After 3 weeks, the edema resolved completely, and the hematoma color faded to the extent that it was almost imperceptible. After 28 d, there was no swelling or bruising. This was the first accident reported by the patient. Moreover, this episode could not be attributed to any physiological or pathological conditions. Blood tests performed a few months before and after the incident revealed no abnormalities in the red and white blood cell or platelet counts. Complementary examinations were not required to confirm the final diagnosis.

## DISCUSSION

Although LA is considered quite safe, there is a risk of accidental complications [2]. This case report shows that complications can occur in healthy patients with no history of previous such incidents, reflecting the unpredictability of the event. The various techniques proposed for PSAN block present minimal differences [5]. The use of long needles dates back to the 1960s, with the aim of positioning the needle tip approximately 8–10 mm above the PSAN foramina [9]. Later studies showed that the use of a short needle did not significantly change the success rate of the technique, particularly with

average facial sizes, but it was associated with fewer complications [2,6]. In this case, a long needle was used, but its penetration depth was as per the usual recommendation for this technique.

The average penetration depth in the PSAN block is approximately 16 mm from the fornix of the second molar towards the tuber, and bruising is more common when the needle advances beyond 15 mm [5]. However, Pfeil et al. [10] penetrated the needle up to 18 mm, and similar to the report by Singla and Alexander [5], who used long needles (38 mm) and penetrated up to 23 mm, there was no edema or hematoma development. The risk of hematoma increases with deeper needle penetration, which should be limited to 25 mm [11]. Other studies reported neither positive aspiration nor hematoma formation when the needle reached 18–25 mm in depth [3,10]. Needle placement has been suggested as a possible cause of swelling, particularly when the needle is positioned more posteriorly and reaches the pterygoid plexus [4,12].

Regardless of the penetration depth and needle position, it is clear that arterial injury is the primary cause of edema and subsequent hematoma [13]. Additionally, hemorrhages concentrated in the infratemporal fossa can diffuse to other adjacent tissues [14]. Negative aspiration during PSAN does not ensure absolute safety against this complication. The incidence of this complication is rare because infiltration is easier and safer in maxillary anesthesia [5]. PSAN may be appropriate when more than one maxillary molar needs to be anesthetized. This technique has varying success rates depending on the molar in consideration. Malamed [2] reported an efficacy of 95%, whereas Pfeil et al. [10] reported success rates of 97% and 77% for the second and first molars, respectively. Singla and Alexander [5] observed only 9% effectiveness for the first molar using the needle-bending method, which is not recommended for this technique. Esthetic and psychological complications are usually the main concerns of doctors and patients, as the clinical consequences are reversible in almost all cases. A similar case with similar resolution has been presented previously [14] that recommended manual pressure on the affected area for 2 min; however, this was not possible in our case because of pain.

Analgesics and local application of ice for a short period without antibiotics, if there are no signs of infection, have been recommended previously [12]. Although analgesics alone were used in these cases, non-steroidal anti-inflammatory drugs can also be used to control edema. Singh et al. [14] reported the use of analgesics and antibiotics together with heparin cream application on the affected area. Biočić et al. [15] reported the development of an acute bacterial infection in a child with voluminous edema, which was managed by drainage and antibiotic therapy. Despite the additional complications, complete resolution of the condition occurred 2 weeks after the initial anesthesia. This was similar to our case, wherein there was no edema evident after 12 d, and only slight hematoma remained. Gupta et al. [12] also observed an uneventful regression after 15 d of an initially alarming condition, which was resolved by adopting similar measures. Gupta et al. [12] and Singh et al. [14] reported complete resolution only 3 weeks after the complication. It is likely that the affected region, volume of edema, and other factors influence the resolution. For example, Singh et al. [14] observed complete remission of a small swelling in the temporal region and cheek 7 d after the incident. Hrishi and Gupta [16] described a case of severe bulky edema reaching the infraorbital region, which resolved completely after 10 d. Hence, resolution usually occurs gradually, with discoloration of the hematoma and involution of the edema occurring after 10–15 d [12], although it is possible for the condition to last longer.

It is impossible to predict the occurrence of these complications, and there are no factors to identify the most susceptible patients. Therefore, healthcare professionals must observe maximum care when using anesthetic block techniques and be prepared to take the appropriate actions when such complications occur. The patient must always be informed about the risks associated with all dental procedures and provided with

guidance concerning pre- and postoperative care.


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**Aline Louise Nascimento Marques:** Conceptualization, Data curation, Writing - review & editing
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**Marco Antonio Tridapalli Mafra:** Writing - original draft, Writing - review & editing
**Francisco Carlos Groppo:** Conceptualization, Data curation, Visualization, Writing - review & editing

**DECLARATION OF INTERESTS:** The authors declare no conflicts of interest.

**CONSENT:** Informed consent was obtained from the patient in this case report. This report was approved by the Research Ethics Committee of the School of Dentistry of Piracicaba, University of Campinas (protocol CAAE: #52141721.1.0000.5418).

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