

## CASE REPORT

# Posterior Superior Alveolar Nerve Block, a Dilemma for Dental Practitioners - A Case Report

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## Abstract

Posterior superior alveolar (PSA) injection technique delivers the local anesthetic agent on to the posterior surface of maxilla targeting posterior superior alveolar branch of maxillary nerve. This nerve block anaesthetizes maxillary molars of the respective side, bone and soft tissues covering these teeth. This technique when administered correctly will provides complete anaesthesia in the desired regions and also reduce the number of injections administered, but the presence of pterygoid venous plexus and posterior superior alveolar branch of maxillary artery in the area of administration poses the risk of complications during administration. This article describes case of an unusual hematoma that occurred following administration of posterior superior alveolar nerve. Also review about the existing literature about possible complications during PSA nerve block and techniques to avoid them have been discussed.

**Keywords:** PSA nerve, hematoma, Nerve Block, Complication

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## Introduction

Local anaesthetics have been used in dentistry for a century for avoiding pain during the surgical and non-surgical procedures. The first local anesthetic agent to be widely used in dentistry was cocaine by William Halsted.<sup>[1]</sup> In 1905 Alfred Einhorn and his associates discovered procaine, an ester-based synthetic, which can be used instead of cocaine and Nils Lofgren in 1943 reported the discovery of lignocaine which is commonly used local anaesthetic even today.<sup>[2]</sup> Several injections techniques have been devised for effective delivery of local anaesthesia into the desired sites in maxilla and mandible. In the maxillary injection techniques posterior superior alveolar nerve block has been used for anaesthetizing the maxillary molars. This technique when administered correctly will provide 100% anaesthesia in the desired regions, maxillary molars of the respective side, bone and soft tissues covering these teeth. This technique also

reduces the number of injections administered and hence preferred over infiltration technique. This injection technique delivers the local anesthetic agent on to the posterior surface of maxilla targeting posterior superior alveolar branch of maxillary nerve. Other important structures present in this space area include pterygoid venous plexus and posterior superior alveolar branch of maxillary artery.<sup>[3]</sup> Literatures insists that posterior superior alveolar nerve block should be administered with a short needle of 20mm in order to avoid injuring the blood vessels to prevent complications.<sup>[4]</sup> One of the most common complication encountered after posterior superior alveolar nerve block is hematoma arising from venous plexus or from the maxillary artery itself,<sup>3</sup> along with other neurological complications like peripheral nerve palsy, abducent nerve palsy resulting in diplopia and also temporary blindness due to involvement of optic nerve.<sup>[5]</sup> Malamed SF<sup>[4]</sup> had stated that even after following strict injection protocol, complications may arise. The

anatomic variations of patient's skull can also lead to complications even if local anaesthesia is administered correctly. The administration of posterior alveolar nerve block was always a matter of scepticism for dental professionals because same amount of anaesthesia can be achieved through maxillary infiltrations. This article presents a case of unusual hematoma that occurred following administration of posterior superior alveolar nerve block and reviews the existing literature for possible complications during PSA nerve block and how to avoid them.

### Case Report

A 45 year old female patient reported with grossly decayed upper left first and second molar teeth, and hence extractions were decided for the same. Local anaesthesia (LA) 2%

lidocaine with 1:100,000 adrenaline was administered using posterior superior alveolar nerve block. PSA nerve block was administered by using a 25mm needle and LA was administered distal to first molar with needle directed in upward, backward and inward 45 degree angulation. The depth of penetration was about half the needle, aspiration of needle was done which yielded negative aspiration and LA was injected. Immediately after injection of local anaesthesia patient developed swelling on the left side of face involving both buccal and temporal space, later the lower eyelid of the of patient also was involved which turned blue in colour showing involvement of infraorbital space [fig1&2].

Fig 1-Development of hematoma on left side of face with temporal and infra orbital space involvement. Fig 2 Subconjunctival Hemorrhage. Fig 3 complete resolution of hematoma after 10 days



On the sight of the facial swelling, pressure was applied on the left side of the face followed by intermittent application of ice pack. In the meantime the patient also developed subconjunctival hemorrhage. The swelling of the patient was subsiding gradually with pressure application and ice pack application for ten minutes. During this period patient was explained about the event and she was assured that swelling will resolve in a weeks' time. Patient was transferred to inpatient department and was kept under observation. Opinion from ophthalmologist was requested for any ocular complications. Patient didn't have any ophthalmologic complications and ophthalmologist opted for conservative treatment. Patient's vision was monitored at hourly intervals to rule out any visual

disturbances or progressive vision loss. Patient after being kept after observation for 1 day and was discharged. Patients facing swelling had resolved and patient was followed up after 10 days. After 10 days complete resolution of facial swelling and subconjunctival hemorrhage had occurred.

### Discussion

Hematoma is one of the most common complications following posterior superior alveolar nerve block, which is due to inadvertent injury of blood vessels during injection. Hematomas can occur even if correct injection techniques are followed. Anatomical considerations of the patient are also important while administering PSA nerve block because for example, for a patient with small skull if normal injection technique and depth are

followed it may injure blood vessels and form hematoma. So it is prudent to modify the injection technique based on patient considerations<sup>[3]</sup> In previously described case of hematoma, before injecting aspiration of the syringe was done and it yielded negative aspiration. This is because for a positive aspiration the tip of the needle should be within the blood vessel, if the tip is outside the blood vessel it is not necessary that a positive aspiration should be obtained. The length of the needle used was 25mm needle and the depth of penetration was half of the needle, it is advised in literature<sup>[6]</sup> that short needles should be used for administration of PSA nerve block, so in this case the injection was administered more posteriorly than recommended and the needle might have pierced the blood vessels in pterygopalatine fossa. The appearance of swelling immediately suggests that maxillary artery might have been penetrated. In case of hematomas with penetration of pterygoid plexus of veins the appearance of swelling is not immediate, it will take hours to develop and most of the cases will not form noticeable extra oral swellings. The swelling developed in this case was immediate and it formed an oblong shaped swelling which is characteristic of involvement of temporal space. The lower eyelid of the patient was also involved and subconjunctival hemorrhage also occurred, this can be explained by tracking the interconnection of facial spaces. Injury to posterior superior artery might have caused bleeding to pterygopaiatine fossa ,through the pterygomaxillary fissure the blood entered to infratemporal space from to which communicate with orbit through inferior orbital fissure resulting in subconjunctival hemorrhage. Infraorbital space is reached through buccal space which in turn is connected from infratemporal space.

Several authors have reported neurologic complications following superior alveolar nerve block like diplopia, peripheral facial palsies and peripheral nerve palsies resulting in transient blindness.<sup>[5]</sup>Possible means of transport of local anaesthesia to orbit are through blood vessels, ie by intra-arterial injections or intravenous absorption and the inadvertent deposition of local anaesthetic solution which passes through the inferior orbital fissure to cause direct anaesthesia of the nerves in the orbit.<sup>[5,7,8]</sup>

Bernsen BLJA explained peripheral facial nerve on this basis of retrograde injection of local anaesthetic into the posterior superior alveolar artery is transported via the middle meningeal artery and subsequent petrosal artery branches to the facial nerve palsy.<sup>[8]</sup>

Nicholas D Freuen et al. in a study on cadavers to determine the clinical anatomy of complications observed in posterior superior alveolar nerve block stated that improper placement of the needle could lead to damage of the pterygoid plexus, local anaesthetic will reach the inferior portion of the parotid gland anaesthetizing the cervicofacial division of the facial nerve, or medial pterygoid muscles which would result in trismus.<sup>[6]</sup> Mukul Padhye et al had stated PSA nerve block as an obsolete technique. On comparison of PSA nerve block with buccal infiltration for removal of maxillary first molar it was observed that buccal infiltrations are equally effective as PSA nerve block.<sup>[9]</sup> In a recent study it was postulated that PSA nerve block using curved needle would avoid all complications reported in the literature.<sup>[10]</sup>

#### ***Management of Posterior Superior Alveolar Hematoma***

- Pressure Application- The bleeding occurs in to infratemporal fossa which can accommodate large volume of blood. It is difficult to apply pressure to the site of bleeding because of location of primary source of bleeding. Digital pressure can be applied in the mucobuccal fold far distally immediately after appearance of hematoma
- Explain the situation to patient and record it in patients case sheet and assure the condition is self –limiting a would be resolved in 7 to 10 days
- Immediate application of ice is recommended as it acts as vasoconstrictor and also as an analgesic
- Heat application is contraindicated in first day or at least for 4 to 6 hours, heat can be applied from next day for 20 minutes every hour as it helps in vasodilation and faster reabsorption of blood.
- It is prudent to prescribe antibiotics as hematoma can act as nidus of infection along with this serratiopeptidase or trypsin

medications can be advised for faster resolution

- Time is most important factor in management of hematoma. With or without treatment hematoma will be present for 7 to 14 days, always explain this to patients.

### Conclusion

A case of unusual hematoma following posterior superior alveolar nerve block is presented here. Various complications can result from an improperly placed PSA nerve block. The most common complication is a hematoma due to injury to blood vessels in infratemporal fossa. Other complications, although uncommon, are temporary Bell's palsy, transient diplopia, temporary blindness due to involvement of nerves. To prevent the complications strict protocol for Posterior superior alveolar nerve block administration should be followed.

- The needle must be advanced approximately 15mm in the following x-y-z plane at the same time to reach the PSA nerve along the posterior surface of the maxilla: medially, superiorly, and posteriorly at a 45 degree angle to the maxillary occlusal plane. Short or curved needles are recommended for a PSA injection.
- Injection technique should be modified based on anatomic considerations of the patient
- Considering the possibility of complications associated with it PSA nerve buccal infiltrations can be used as an effective substitute

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