



## Ophthalmic complications following a postero-superior alveolar nerve block: A case report and appraisal of mechanism of action

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### ABSTRACT

**Background:** Local anesthesia is an Integral part of armamentarium in dental practice for achieving pain control. Ophthalmic complications arising from posterior superior alveolar nerve block (PSA) administered for achieving regional anesthesia in maxillary molars are rare. The ophthalmic complications reported in the literature range from ophthalmoplegia to strabismus, ptosis, diplopia, and even loss of visual acuity. The case report highlights transient double vision (diplopia) and strabismus following administration of PSA nerve block with 2 percent lignocaine hydrochloride containing 1:80,000 adrenaline in a 27 year old female patient during root canal treatment procedure of maxillary right first molar. The patient was counselled, reassured and symptomatically managed. The report discusses about the etiology and mechanisms involved in occurrences of these ophthalmic complications, there by enabling the dental surgeon to diagnose, manage and avert these complications.

**Keywords:** Diplopia, ophthalmic complications, posterior superior alveolar nerve block, local anesthesia.

Local anesthesia (LA) is the routinely administered medicament used to achieve analgesia in various dental treatment procedures. The administration of local anesthesia is not devoid of complications, various local and systemic complications are documented following nerve blocks in the maxillofacial region. Posterior superior alveolar (PSA) nerve block is commonly administered to anaesthetize maxillary molars; the solution is deposited in the vicinity of PSA nerve branch of maxillary division of trigeminal nerve in the infratemporal fossa.

The commonly used technique for PSA nerve block technique advocated by Roberts and Sowray 1979 consists of using a 27-gauge long needle inserted into the mucogingival fold contiguous to the mesio-buccal root of the maxillary third permanent molar or the maxillary tuberosity in the absence of third molar and then passed inwards, upwards and backwards at an angle of approximately 45° for a distance of 20–25 mm<sup>1</sup>. The most frequent complication reported is the hematoma occurring from inadvertent injury to the pterygoid plexus of veins<sup>2</sup>. The ophthalmic complications like diplopia, strabismus, ptosis, amaurosis (monocular blindness) and ophthalmoplegia subsequent to PSA are occasionally accounted in the literature<sup>3-8</sup>.

### I. INTRODUCTION



Majority of these complications are transient and wear out with the absorption of LA into the circulation to undergo biotransformation. However there are few cases of permanent blindness reported, **Rishiraj et al**<sup>9</sup> documented permanent blindness subsequent to administration of plain prilocaine, amide local anesthetic agent. **Walsh**<sup>10</sup> reported a case of permanent loss of visual acuity following anesthesia of maxillary anterior teeth, attributing this to the oily nature of solution containing procaine hydrochloride which may have a resulted in the embolism of retinal artery. We present a rare and interesting case of diplopia and Strabismus following administration of PSA nerve block in a 27yrs female patient requiring root canal treatment (RCT) of maxillary right first molar. The paper also emphasizes on the diagnosis and management of these cases.

## II. CASE REPORT

A 27 year-old female patient reported to our centre with complaint of pain in the right upper back tooth past one week, which was not responding to over-the-counter medications taken by her. On clinical and radiological examination, it was diagnosed as a case of chronic pulpitis in relation to maxillary right first molar. The medical history revealed no known history of allergy to drugs and no history of systemic illness. RCT of the affected tooth was planned. Two percent lignocaine hydrochloride with 1:80,000 adrenaline was administered using a 26-gauge diameter and length of 1-1/2 inch needle, in a breach cartridge aspirating syringe. Approximately 1.5 ml was injected after negative aspiration. During the onset period of local anesthesia, patient complained of double vision. On examination, visual acuity was intact and the pupillary reflexes were maintained. The strabismus was evident on the affected side and incapability to abduct the right eyeball, resulting in diplopia on lateral gaze was observed (Fig. 1). The patient was counseled and reassured. The treatment was carried out and patient was detained in the recovery room for approximately two hrs and reassessed for recovery. On re-examination after two hrs, the movement of the eyeball was full and free in all gazes (Fig. 2, 3).

Patient was discharged with eye patch (Fig. 4) with instruction for review after 24hrs.

## III. DISCUSSION

The PSA nerve arises as a third branch of the maxillary nerve in the pterygopalatine fossa prior to its entry into the infraorbital canal. It gives out two branches, one providing sensory innervations to the mucous membrane of the maxillary sinus and the second to the alveoli, periodontal ligaments and pulpal tissues of maxillary molars<sup>11</sup>.

The PSA nerve block is primarily given to achieve anesthesia of maxillary molars (except mesiobuccal root of first molar) and surrounding soft tissues. The potential mechanisms involved in these ophthalmic complications are described in literature. The Diplopia secondary to strabismus is a result of ocular misalignment due to inadvertent intravascular injection of the local anesthetic into the venous system, which drains into the pterygoid plexus and later into the cavernous sinus. The anatomical proximity of abducent nerve as it exits through the cavernous sinus makes it vulnerable and result in paralysis of the lateral rectus muscle causing diplopia<sup>12</sup>.

Penarrocha-Diago and Sanchis-Bielsa reported a series of 14 cases of ophthalmologic complications following PSA nerve block. The most commonly encountered symptoms were diplopia, mydriasis, ptosis, and difficulty of abduction in the affected eye. The symptoms were transient in all these cases with absolute recovery. A possible diffusion of the anesthetic solution toward the orbital region<sup>13</sup> is attributed for such ophthalmologic complications.

Joseph Horowitz et al reports two cases of ipsilateral optic neuropathy and one patient had an ipsilateral abduction deficit along with a dilated, poorly reactive pupil instantly ensuing maxillary PSA nerve block. The discrepancies were explained, as a possibility of inadvertent intravascular injection into orbit or diffusion of anesthetic agent into cavernous sinus or orbit<sup>14</sup>.

In view of the fact that local anaesthetic needs to be deposited in proximity of neurovascular structures to achieve pain control, it becomes essential for the dental surgeon to be acquainted



with anatomical structures pertaining to that nerve block and exercise all possible precautions to prevent mishap. The safety measures include proper positioning of the patient, selecting the appropriate length of the needle and restraining to ideal depth of needle insertion, aspirate before injecting the solution and gradually administer the anesthetic agent. The patient reassurance is utmost priority following such an event. The cornea should be protected to prevent abrasions. An eye patch has to be placed and observe for resolution of signs and symptoms. Complications lasting beyond the duration of local anaesthesia requires intervention of ophthalmologist.

#### IV. CONCLUSION

The ophthalmic complications arising from PSA nerve block are transient and uncommon. But when such incidents are encountered, both the patient and the dental practitioner go through a dilemma. Hence a general awareness of such problems is essential for early diagnosis and prompt treatment. The dental surgeon should adhere to the tenets of local anaesthesia administration techniques and be equipped with first hand knowledge to handle such complications successfully.

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Fig. 1 Image revealing, strabismus due to right abducent nerve paralysis. Immediately after PSA nerve block administration.



Fig.2 Image revealing recovery after two hrs approx, post PSA nerve block administration.



Fig.3 Image revealing frontal gaze



Fig.4 Protective eye patch in situ