Temporary pupillary dilatation and ptosis: complications of PSA nerve block: a case report and review of literature

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Abstract Lidocaine, an amide local anesthetic is administered regularly for the minor oral and dental surgical procedures. In this article, ophthalmic complications arising from Posterior superior nerve block are discussed and a case report which had dilatation of pupil and ptosis of eye lids is presented. A review of literature is done regarding the ophthalmic complications. The precautions one needs to take during the administration of Local Anesthesia (LA) especially Posterior Superior Alveolar nerve block and management guidelines are highlighted.

Keywords Temporary pupillary dilatation · Ptosis · PSA nerve block · Lignocaine

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Introduction

Local anesthetic agents are routinely administered for oral and maxillofacial surgical procedures. Preventing pain associated with dental care is the goal of all who practice in this profession as well as strong desire of all our patients. Occasionally problems do intrude in our practice which include the inability to anesthetize certain patients, patient's inherent fear of receiving 'shots' of local anesthetic drugs and those local and systemic complications that are associated with administration of those agents. Many reasons exist for these problems, including biological variations in response to drugs, anatomical differences among patients and significantly in relation to intra oral administration due to fear and anxiety.

Lignocaine was synthesized in 1943 and in 1948 it became first amide local anesthetic to be marketed [10]. Allergy to amide local anesthetics is rarely reported and its entry into clinical practice transformed dentistry. Lignocaine possesses more rapid onset of action (two minutes) produces more profound anesthesia and has a longer duration of action and greater potency. Lignocaine is today the 'gold standard' against which all

newer local anesthetics are compared [10]. However, there are reported cases of complications of Lignocaine in the literature. Ocular complications after the administration of Lignocaine are reported in the literature though they are rare. Nerve related ophthalmic complications other than the direct trauma can arise after anesthetic injection like paralysis of extra ocular muscles, diplopia, amaurosis (temporary blindness), Horner's syndrome, blurring of vision etc. These ocular complications would most likely to follow the posterior superior alveolar nerve block.

Case report

A 47-year-old female outpatient came to our Department of Oral and Maxillofacial Surgery, Modern Dental College and Research Centre, Indore with the chief complaint of pain in the left upper back teeth region since a week. The pain was continuous and relieved after taking analgesics. On examination, it was found that she had deep proximal caries in the upper left second molar tooth. She was not ready for endodontic treatment due to some personal reasons. She opted for the extraction of the particular tooth. 1.5ml of

Lignox 2% A (Lignocaine (2%) with adrenaline 1:80,000, Indoco Remedies Ltd Goa) was administered for the posterior superior alveolar nerve block. Greater palatine nerve block was completed. After a few minutes, the anesthetic effect was reviewed and reflection of the flap was done. The patient complained of irritation in the left eye. She also complained of pain and blurring of vision in the eye. Visual acuity was also reduced. She was not able to close the eye due to the ptosis of the eye lids. The general physician was consulted and it was found that there was dilatation of the pupil in the left eye. All the vital signs were normal. The diagnosis was based on clinical picture. The patient was assured of the temporary nature of the event. The patient was kept under observation in the hospital till recovery (5 hours), and the patient was discharged.

Discussion

Visual disturbances are uncommon following the administration of Local anesthesia and have been reported in a few publications. There is little doubt that LAs used in dentistry are safe agents. This is confirmed by hundreds of thousands of

such anesthetics injected each day without serious complications. Complications associated with LA can be divided into systemic and regional and also those determined by local anesthetic agents used and the technique of administration. Some of the systemic reactions include vasovagal syncope, anaphylactic shock, toxicity, hyperventilation etc and regional complications include hematoma, muscle trismus, tissue necrosis, facial paralysis and ophthalmic complications include temporary blindness, diplopia, temporary paralysis of cranial nerves III, IV and VI, Oculomotor muscle paralysis, mydriasis, palpebral ptosis and even permanent blindness.

Our case presented above had the temporary dilatation of pupil and ptosis of the eye lid after administration of LA for the Posterior Superior Nerve block. M Penanocha Biago et al presented 14 cases with ophthalmic complications after intra oral anesthesia with articaine namely PSA nerve block. The complications include mydriasis as well as palpebral ptosis which we also came across in our case. Rishiraj et al has reported a case of permanent vision loss in one eye following administration of LA for a dental extraction. The author has proposed mechanism that intra arterial injection of certain quality and pressure allows for retrograde flow with arteries and may lead to the occlusion of retinal and choroidal vasculature [3]. Panarrocha et al. proposed another mechanism that ophthalmic disorders are caused by the direct diffusion of the anesthetic solution from pterygo-maxillary fossa through the sphenomaxillary cavity to the orbit. It would affect the ciliary ganglion located between optic nerve and the external rectus muscle of the eye. This ganglion receives parasympathetic fibers originating in the accessory nucleus that accompany the common oculomotor nerve. The fibers form synapses in the ganglion and thus produce 8 or 9 short ciliary nerves that end in the eye. Sympathetic fibers from the carotid plexus also traverse the ciliary ganglion and are incorporated to the short ciliary nerves before reaching the eye. In this way, the different manifestations observed can be explained through either sympathetic or parasympathetic involvement [4].

Chun-Kei Lee has reported ocular complications which include strabismus, ptosis, diplopia, ophthalmoplagia and amaurosis. After administering inferior alveolar nerve block, blurring of vision and dilatation of pupil were observed in two patients. The following hypotheses are

given by the author for the ocular complications. The Local anesthetic solution reaches the orbit through vascular, neurological and lymphatic network [1]. The intra-arterial injection of the LA can reach the cavernous sinus through the arteries and cause paralysis of cranial nerves III, IV and VI. The author states that although initial aspiration may show negative finding, minor movement of the patient or needle may cause penetration of arterial wall and subsequent injection of LA in the arterial system [1].

The case that we had encountered in the department had the complications of dilatation of pupil as well as ptosis of eye lids for almost 5 hrs after the injection of PSA nerve block. As Rishiraj et al suggested a variety of anatomic variation can also cause this rare complication. It is also possible that anesthetic solution entered the inferior alveolar artery passed through middle meningeal artery and anastomised in the face to occlude the ophthalmic artery [3]. In 4% of patients, the ophthalmic artery arises not from internal carotid but from middle meningeal artery. Any occlusion of ophthalmic artery may obstruct the circulation to the choroid and retina. St. John Cren and Alison Paris have reported following complications from PSA nerve block. They are peripheral facial nerve palsy and Abducent nerve palsy where the patient complained of double vision. LA solution reaches the inferior ophthalmic vein via the pterygoid plexus or its communicating branches. The vein contains no valves and connects directly with the extrinsic muscles of the eye via inferior orbital foramen. The deposition of anesthetic solution with in the PSA artery which causes a back flow into the connecting maxillary artery and subsequently in to middle meningeal artery. There exists constant anastomosis between orbital branch of middle meningeal artery and recurrent meningeal division of lacrimal artery. This lacrimal artery supplies the lateral rectus muscle, lacrimal gland and outer half of the eye lids, which, due to these anatomical considerations, may explain all the above symptoms [8]. Temporary blindness has been reported following PSA nerve block due to a large quantity of LA under great pressure diffusing through the inferior orbital fissure and coming into contact with optic nerve. Coming to our case, dilatation of pupil and ptosis of the eyelids may be due to the diffusion of Local anesthetic solution in to the orbital cavity through pterygo-maxillary fossa. It could also due to direct deposition

of LA in the PSA artery which reaches the lacrimal artery through above routes and cause the particular symptoms.

Considering above mechanisms, the steps one needs to follow when administering LA are as follows:

1. Take an accurate medical history
2. Use a small gauge needle (27 gauge)
3. Carefully aspirate before injection
4. Provide appropriate concentration and volume of anesthetic solution
5. Inject slowly with the least possible pressure
6. Look for swelling and blanching of the site indicating extravascular injection.

Conclusion

Everyday in dentistry, thousands of LA injections are administered to patients but ophthalmic complications are very rare but one needs to be aware of the above complications. Any practitioner can encounter these complications. It calls for an awareness and knowledge to manage them. The following management guidelines can be helpful to avoid further complications:

1. The patients have to be reassured as to the transient nature of these complications.
2. The affected eye has to be covered with gauze dressing to protect the cornea for the duration of anesthesia.
3. Functional monocular vision will be restored by covering the affected eye. The patient should be escorted by a responsible adult, since monocular vision is devoid of distance-judging capability.
4. If the ocular complications last longer than 6 hrs, refer patients to an ophthalmologist for evaluation.

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