Rare Ocular Complication Following Posterior Superior Alveolar Nerve Block: A Case Report

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ABSTRACT
Complications in dentistry are not always preventable, and their occurrence does not essentially entail poor technique by the dental surgeon. However, it is vital that the dentist develop extended knowledge regarding the prevalence and significance of these complications and their proper management. This report documents a case of a complication involving the patient’s power of accommodation following the conventional posterior superior alveolar nerve block technique. The enigmatic aspect of this report is the delayed onset and extended duration of the complication, however, the deficit resolved completely. A sincere attempt is made to summarize the precautionary steps to be followed in order to avoid such complications and should such complications occur, a management guideline is recapitulated.

Key Words: Dental anesthasia, Posterior superior alveolar nerve block, Power of accomodation, Ocular complications

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INTRODUCTION
Local anesthetic administration has become an integral part of dental practice.1 There exists little doubt that local anesthetics used in dentistry are safe agents. This statement is confirmed by many millions of local anesthetic cartridges administrated safely in dentistry each year.2 Conversely, this augmented use as well resulted in describing few unusual and less frequent complications including ocular and auricular complications. Ocular complications of dental anesthesia are rare and almost always transient.3 Symptoms following these complications generally develop immediately after administration of the anesthetic solution and persists no more than several hours.4 There are, however, few reports of these complications that cannot be related only to the anesthetic effect, either due to delayed onset or prolonged duration of the deficits. The aim of this work is to document a case report of a complication involving only the patient’s power of accommodation following the conventional posterior superior alveolar (PSA) nerve block technique. The enigmatic aspect of this report is the delayed onset and extended duration of the complication, however, the deficit resolved completely.

CASE REPORT
A 27-year-old healthy female outpatient attended the Oral and Maxillofacial Surgery Unit, with a chief complaint of pain in the left upper back teeth region. On examination, a buccally tilted maxillary left third molar leading to traumatic keratosis of adjacent buccal mucosa was evident. Following radiographic examination, an intra-alveolar extraction of the tooth under local anesthesia was planned.

Following an informed consent, the patient was placed in a semi-reclined position and a traditional PSA nerve block was administered on her left side with one cartridge (1.8 ml) of lignocaine (Lidocaine 2% E-80 with epinephrine 1:80,000, New stetic, Colombia) using a short needle (27 G 0.40 x 22mm Terumo Dental Needle). The injection was given slowly over a period of 60 seconds after confirming a negative aspiration. Greater palatine nerve block was also completed. After few minutes, the anesthetic effect was
reviewed and the tooth extracted atraumatically with minimal gingival reflection. The procedure was completed uneventfully and the patient drove herself back to home with her friend. Just about 3 hours after the procedure, the patient felt a sensation of blurred foggy vision in her left eye. The patient considered this disability as a transient reaction following the tooth extraction and waited for improvement.

Subsequent to an uneventful and restful night, the following morning, the patient’s vision remained blurred without any improvement. With no further delay, she returned to our department. Clinical examination revealed that, both her pupils were circular in shape and equal in size, and a full range of eye motions in all direction were possible. Though she was able to distinguish gross items with her left eye, she felt difficult to focus on small prints. The patient was otherwise fine with no accompanying signs and symptoms, such as paresthesia of the lateral orbital region, or any blanching around the same region. The above findings revealed that she was not experiencing diplopia but the power of accommodation was lost in the left eye.

In view of the foregoing, the patient was referred to an ophthalmologist. But she did not visit the Ophthalmologist as her vision gradually started to improve and it returned to normal within few hours after she left the dental hospital (approximately 16 hours after the procedure).

DISCUSSION

Probably the one single practice that accompanies almost all dental procedures is the administration of local anesthetic, which is considered very safe and the incidence of complications related with its administration is low. Most of these complications occur locally and are temporary, although, a few systemic complications were documented. Rarely, intraoral local anesthetic administration can also affect the structures further from the oral cavity which includes the eye and the middle ear.

Ocular complications following intra-oral local anesthetic administration though uncommon have been reported in a few publications. A review of literature in 2010 revealed a total of 48 cases involving ocular complications. Twenty-seven reports occurred following maxillary injections and twenty-one reports were related to mandibular injections. The most commonly identified symptom in ocular complication was diplopia, followed by muscle paralysis and ptosis. Fortunately, most of the ocular complications have been transient; however, cases of permanent complications do occur. Reports suggests that amid intra-oral injections, ocular complications after middle or posterior alveolar nerve block were twice more frequent than inferior alveolar nerve block. The onset time of most symptoms following an ocular complication is within the first 5 minutes following the injection and the symptoms usually resolved without any sequelae within 6 hours, though three cases have been reported in which damage was permanent.

In our case, the patient experienced just a blurred foggy vision without any significant diplopia and hence we diagnosed it to be a loss of power of accommodation in the left eye. Similar condition has been reported by Ngeow et al., in two of their cases. However, complications in those cases occurred after inferior alveolar nerve block but in our case it occurred following PSA nerve block. Ngeow et al., reasoned that the loss of power of accommodation is an effect of the paralysis of the ciliary muscle following an injury or anesthesia of oculomotor nerve. Although, complete paralysis of the nerve results in ptosis, external strabismus, dilation of the pupil and loss of power of accommodation, occasionally, partial paralysis affecting only a part of the nerve may result in purely one of the above mentioned symptoms. Similar partial paralysis of the nerve (specifically the short ciliary nerves) might have occurred in our patient resulting in loss of accommodation for near objects only. But, the pathways facilitating the anesthetic solution to reach the area of orbit need detailed investigation.

Various theories have been postulated to explain the oculomotor disturbances after intraoral injection of local anesthetics; however, the causal link is probable rather than certain. The suggested explanations include simple diffusion of anesthetic solution from the pterygomaxillary fossa to the orbit through defects in the bone or through the vascular, venous and lymphatic networks that connect these spaces. Panarrocha et al. suggested
a mechanism whereby ophthalmic complications are caused by the direct diffusion of the anesthetic solution from pterygomaxillary fossa through the sphenomaxillary cavity to the orbit, thereby affecting the ciliary ganglion located between optic nerve and the lateral rectus muscle of the eye. Though the explanation appears conceivable, the suggestion that loss of power of accommodation resulted purely due to diffusion seems to us to be unlikely as, should it have occurred, we might expect other nerves in the region to be affected as well.

Another possible mechanism suggested is the retrograde flow of local anesthetic solution to the cavernous sinus area. Studies in rhesus monkey indicated that carotid blood flow is reversible and even a small amount of anesthetic solution when injected into a branch of the external carotid artery, through retrograde circulation may reach the cerebral circulation via common and internal carotid artery. Since any cerebral disease causing pressure on the cavernous sinus may lead to paralysis of oculomotor nerve due to its close proximity, deposition of local anesthetic via retrograde flow might have resulted in paralysis of the nerve.

Kiderman et al., indicated that the tractional force exerted during extraction of the maxillary teeth can be felt all over the face and head, leading to a stressful sensation. This stress due to extraction force along with mental stress during the treatment and local epinephrine could cause elevation in blood pressure leading to ocular vasospasm and hence ocular complication. However, the author concludes it to be an unproven theoretical explanation.

Besides, the generally accepted explanation is that of inadvertent intra-arterial deposition of drug into the superior alveolar artery which by reverse flow reaches the internal maxillary artery and to the middle meningeal artery, the orbital branch of which anastomoses with the lacrimal branch of the ophthalmic artery (Figure 1). Henceforth, the anesthetic solution deposited in the infratemporal surface of the maxilla reaches the orbit.

![Figure 1: This illustration shows the potential route of dissemination of local anesthetic from posterior superior alveolar artery to the short ciliary nerves that innervates the ciliary muscles](image-url)
Previous reports have advised on performing an aspiration test prior to depositing anesthetic solution. Aspiration significantly minimizes the possibility of an intravascular injection. The goal of aspiration is to avoid the accidental placement of the tip of the needle within a blood vessel during the anesthetic administration. However, in few clinical situations the needle tip may enter the blood vessel but bevel of the needle abuts the wall of the vein. In such cases, on aspiration vein wall may suck into needle tip producing a false negative aspiration test. Hence, to overcome such scenario, rotating the syringe barrel 45 degrees and reaspirating will provide a true positive aspiration. However, though these initial aspiration tests show negative finding, minor movement of the patient and minimal movement of the needle after aspiration and during deposition of the solution may subsequently cause penetration of arterial wall and injection of anesthetic solution in the arterial system. In our patient complication did occur even though local anesthetic was injected after confirming negative aspiration in the two aspiration tests. Hence, our case also concludes that even following two negative aspiration tests such complication are still possible, perhaps due to minor movement of the patient or needle during deposition of anesthetic. It also emphasis the need for several additional aspiration tests during administration of anesthetic drugs.

While many of these mechanisms may at least partially explain the complications involved, none of these may be considered to perfectly explain the cause in our case. In our patient the symptoms developed following a PSA nerve block and had a relatively slow onset, i.e., 3 hours after the injection procedure and lasted for 16 hours. Only six other cases have been reported with an akin condition in which visual disturbances lasted for 24 – 96 hours, however, only four of those cases had a delayed onset time ranging from 4 – 48 hours, with just two patients recovering without further treatment and one patient recovered with laser treatment.\(^\text{10}\)

To our knowledge, this might be the one of the rare case reported with only loss of power of accommodation following PSA nerve block without any other associated symptoms. Fortunately, the complication was transient and patient recovered completely.

Taking into consideration the above complication, one have to adopt the following steps when administrating PSA nerve block:

1. An accurate medical and dental history with focus towards any complication during the previous dental treatment should be obtained.
2. Avoid block anesthesia when extracting single or two maxillary teeth, which can be comfortably completed under supraperiosteal infiltration.
3. If a block anesthesia is planned, have the confidence that successful anesthesia can be achieved without any complications. This may reduce the unwanted minor movement of the needle during anesthetic deposition.
4. Communicate with the patient throughout the procedure that may avoid unwanted movement of the patient during anesthetic administration.
5. Use a short and small gauge (27) needle for PSA nerve block.
6. Over penetration of the needle has to be avoided. Perform a careful aspirate in two planes before injection. If possible repeat the aspiration procedure for every 1 ml of anesthetic solution deposition.
7. Deposit the solution slowly with the least possible pressure. Provide appropriate concentration and minimal volume of anesthetic solution.
8. Look carefully for any complications. As early recognition may lead to prompt management.
4. The patient should be escorted home and advised against driving and operating machinery until normal sight returns.

5. It is reasonable to telephone the patient later in the day to check the progress. If the ocular complication last longer than 6 hrs, refer patients to an ophthalmologist for evaluation.

Complications are not always preventable, and their occurrence does not essentially entail poor technique by the dental surgeon. However, it is imperative that the dentists develop extended knowledge regarding the prevalence and significance of these unusual complications and their proper management. In addition a thorough knowledge of the relevant anatomy pertinent to the various injections used in dentistry is essential. Fortunately, these complications are almost always transient and so early recognition goes some way in reducing the patient’s as well as the surgeon’s concerns.

CONCLUSION

A thorough knowledge of the relevant anatomy pertinent to the various injections used in dentistry and awareness pertaining to the prevalence and significance of few unusual complications and their proper management is essential.

REFERENCE


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