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Brainstem anesthesia: An infrequent yet catastrophic complication of peribulbar block

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ABSTRACT: Peribulbar block was introduced in ophthalmic anesthesia practice in order to reduce the complications from retrobulbar anesthesia such as retrobulbar hemorrhage, brainstem anesthesia and scleral perforation. However, peribulbar block is also far from innocuous. Here, we describe a case of brainstem anesthesia following peribulbar block along with literature review regarding the incidence, etiology, diagnosis and management of this potentially fatal complication if unrecognized.
Key words: Peribulbar block, brainstem anesthesia

I. INTRODUCTION:

Brainstem anesthesia is a temporary loss of function of brain stem. It is a serious complication, more frequently described with retrobulbar blocks. With the advent of peribulbar blocks this complication is markedly reduced. We report a case where in the patient became unconscious and apneic shortly after administration of peribulbar block. The quick clinical recovery without any neurological sequelae supports the diagnosis of brainstem anesthesia and stresses on the availability of adequately trained anesthesia personnel and resuscitation equipment before embarking on needle blocks for ophthalmic surgery.

II. CASE REPORT:

A 65-year-old, male presented for left eye combined trabeculectomy and cataract extraction. On examination, he was hypertensive and on telmisartan with ASA grade II. Optometry and preoperative investigations were unremarkable. Preoperative 100 ml intravenous mannitol was given in lieu of raised intraocular pressure and pupil dilating drops were used only in the left eye. Aseptic precautions taken and standard monitoring included pulse oximetry and non-invasive blood pressure. Peribulbar block was administered. Local anesthetic injected by a 25 mm long, 24 G sharp disposable needle as a 1:1 mixture of 2% lignocaine and 0.5% bupivacaine with 25 IU/ml of hyaluronidase. With the eye in neutral gaze position, by transcutaneous insertion of needle, tangential to the floor of the orbit to a depth of 2.5 mm, 5 ml of drug was injected infero-temporally (junction of the lateral 1/3 and medial 2/3 of the inferior orbital margin) after negative aspiration of blood or CSF. No undue resistance was encountered during injection. After 5 minutes, 3 ml of drug was supplemented in the medial conal space. In about 5 minutes after the second injection, slight desaturation (sPO_2 88%) noticed along with shallow respiration which rapidly progressed to complete apnea and patient became unresponsive to verbal stimuli. Artificial ventilation with bag and mask was commenced immediately followed by intubation & ventilation with Bain's circuit with 100% oxygen from anesthesia workstation. For bradycardia of 48 beats/ min, injection atropine 0.6 mg was given and Ringer Lactate infusion started for hypotension of 80/40 mm Hg. No arrhythmia noted. Both pupils were dilated. After 20 minutes, spontaneous respiration started and patient was extubated. Patient was fully conscious and had no recall of the event. A good state of anesthesia and akinesia of left eye prompted the decision to go ahead with the surgery. Intraoperative and postoperative periods were uneventful. No neurological sequelae noted except for right eye pupillary dilatation which resolved in three hours. Fundus exam of right eye was normal.

III. DISCUSSION:

The estimated incidence of brainstem anesthesia with retrobulbar and peribulbar block is about 0.2% and 0.02% respectively.[1,2] It has a variable onset of 2 to 40 minutes with complete recovery within an hour. Literature is replete with numerous manifestations of brainstem anesthesia with retrobulbar blocks like abnormal shivering, dysarthria, contralateral amaurosis, cranial nerve palsies, hemiplegia, aphasia, respiratory arrest, coma,[3] cardiac arrest[4] and mydriasis.

Following is tabulated version of published reports on brainstem anesthesia after

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peribulbar block except for article in French by Boret & Petit[5]

Table

Author names / **Parameters**	**Gomez et al[6]**	**Edge, Davis[7]**	**Carneiro et al[8]**	**Jaichandran et al[9]**	**Kazancioglu L et al[10]**	**Howard D. Palte et al[11]**
Patient age (Years/ gender)	75 / female	69 / male	60 / female	60 / male	68 / female	42 / male
Surgery	Cataract	Cataract	-	Cataract	Cataract	Amniotic membrane graft
ASA Grade	2	3	2	1	2	2
Axial Length	unremarkable	26.70 mm	22.71 mm	25 mm	NA	NA
Needle type	22 G, 25 mm, sharp	25 G, 37 mm, sharp	25.7 mm	NA	25 G, 25 mm	27 G, 31 mm
First injection site and volume	Lower lid sulcus at infero-lateral angle of orbit, 6 ml	Junction of lateral 1/3 and medial 2/3 of inferior orbital margin, 5 ml	Modified infero-lateral, perpendicular to skin for first 10 mm and then supero-medial angulation of remaining needle, 5ml	Infero-temporal orbital rim midway between lateral canthus and lateral limbus, 5 ml	Infero-temporal orbital rim between lateral canthus and lateral limbus, 5 ml	Infero-temporal, trans-conjunctival, 9 ml
Second injection site and volume	-	Junction of lateral 1/3 and medial 2/3 of superior orbital margin, 5 ml	-	-		-
Depth (mm)	25 mm	24 mm			25 mm	
Onset	few seconds	-	Immediate	30 minutes	8 minutes	10 minutes
Clinical features	unconsciousness, apnea, cyanosis, hypertension (HTN), tachycardia, hypotension, bradycardia	complete respiratory arrest, HTN	apnea and loss of consciousness, HTN, bilateral mydriasis	complete ptosis of contralateral eye but patient conscious oriented	Desaturation, cyanosis	paroxysmal tachycardia, HTN, deafness & left facial weakness
Outcome	extubation after 40 min, surgery conducted	extubation after 30 min, block supplementation and	spontaneous movement of limbs after 30	surgery uneventful, complication occurred in immediate	CPR, adrenaline, intubation, surgery abandoned,	surgery aborted, urgent CT ruled out stroke, full

		surgery performed after 1 hr	min, anesthesia plane deepened with propofol and isoflurane and surgery conducted in GA	post-operative period and recovered in 2 hrs without any residual nerve palsy	extubated after 30 min and shifted to ICU	recovery in 3 hrs

The speculated mechanism could be penetration of the dural sheath of intraorbital optic nerve with resultant subdural or subarachnoid spread involving respiratory center and chiasmatic cistern.[12] Drysdale et al,[13] demonstrated the presence of dye in midbrain surrounding the respiratory center when radio opaque dye was injected into intraorbital subdural space. Wang et al,[14] found that intrasheath injection of methylene blue was tracked along the subarachnoid space of the optic nerve sheath to the chiasmatic cistern in the middle cranial fossa. The plausible mechanism in our case could be the similar to these studies. Mydriasis may be only manifestation in subarachnoid space dissemination, affecting dorsomedial and peripheral pupillary fibers of 3rd nerve.[15]

Traditionally, most cases have been reported with retrobulbar injection and sharp needles with eye in Atkinson position. However, our case report does prove that it may occur with shorter and sharp needles in neutral gaze position, irrespective of number and site of injection. Katsev et al,[16] recommended that needles be placed within 31 mm of the orbital rim for both retro and peribulbar anesthesia. Precautions to be taken are neutral gaze position (renders the optic nerve away from needle path), use of smaller needles, limitation of volume and speed of injection and use of alternatives like sub-tenon anesthesia. Although two cases of brainstem anesthesia have been reported with sub-tenon block also.[17]

With the advent of ultrasonography [USG] paving its way in all anesthesia subspecialties,[18] there is no doubt that the needle path and the spread of drug can be nicely visualized and a safer block may be guaranteed, but unfortunately given the high volume of ophthalmic cases and cumbersome nature of USG technique, it seems to be a farfetched goal.

Conclusion: Brainstem anesthesia is a potentially life-threatening complication. None of the newer needle/cannula-based techniques are entirely foolproof and the chance of central spread cannot be completely eliminated. Utilization of standard monitoring should always be employed. Availability of anesthesiologist and all resuscitation equipment cannot be further reiterated. Ophthalmologist and paramedical staff should also be trained to recognize complications.

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