The Effect of Adding Dexmedetomidine to Local Anesthetic Mixture for Peribulbar Block in Vitreoretinal Surgeries

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Abstract

In this study, the addition of 25µ dexmedetomidine to the local anesthetic mixture showed the best outcome In this study we tried small doses of dexmedetomidine as adjuvants with tight range increments in combination with the usual mixture of the local anesthetics used in peribulbar block (15µg, 20µg and 25 µg) comparing it with a control group to detect precisely which dose will be the best. We found out that the use of 25µg dexmedetomidine was the best comparatively with the other groups in our study, but other studies showed better outcome when 50µg dexmedetomidine was used.

Keywords:- **Dexmedetomidine,*NSAID*, Vitreoretinal,PDR, EMLA**

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Abbreviations

AMD: age-related macular degeneratrion

BBB: blood brain barrier

BRVO: branch retinal vein occlusion

BSS: balanced salt solution

CME: cystoid macular edema

CN: cranial nerve

CNV: choroidal neovascularization

CRVO: central retinal vein occlusion

CSCR: central serous chorioretinopathy

CT: computed tomographgy

EMLA: eutectic mixture of local anesthetics

HR: Heart Rate

ICA: internal carotid artery

ILM: internal limiting membrane

IOP: intraocular pressure

IOFB: intraocular foreign body

MAP: mean arterial pressure

NSAID: non-steroidal anti-inflamatory drugs

PDR: proliferative diabetic retinopathy

pKa: the negative logarithm of the ionization constant of an acid

pH: power of hydrogen

PVD: posterior vitreos detachment

PVR: proliferative vitreoretinopathy

PONV: postoperative nausea and vomiting

SOF: superior orbital fissure

SOR: Silicon oil removal

RPE: retinal pigment epithelium

VEGF: antivascular epithelial growth factor

VRS: Verbal Rating Scale

Chapter 1: Anatomy of the Orbit

ANATOMIC FEATURES

The eye is a special sense organ made up of three coats, or tunics, as follows:

1. The outer fibrous layer of connective tissue forms the cornea and sclera.

2. The middle vascular layer is composed of the iris, ciliary body, and choroid.

3. The inner neural layer is the retina.

Within this globe are three spaces: the anterior chamber, posterior chamber, and vitreous chamber. The crystalline lens is located in the region of the posterior chamber

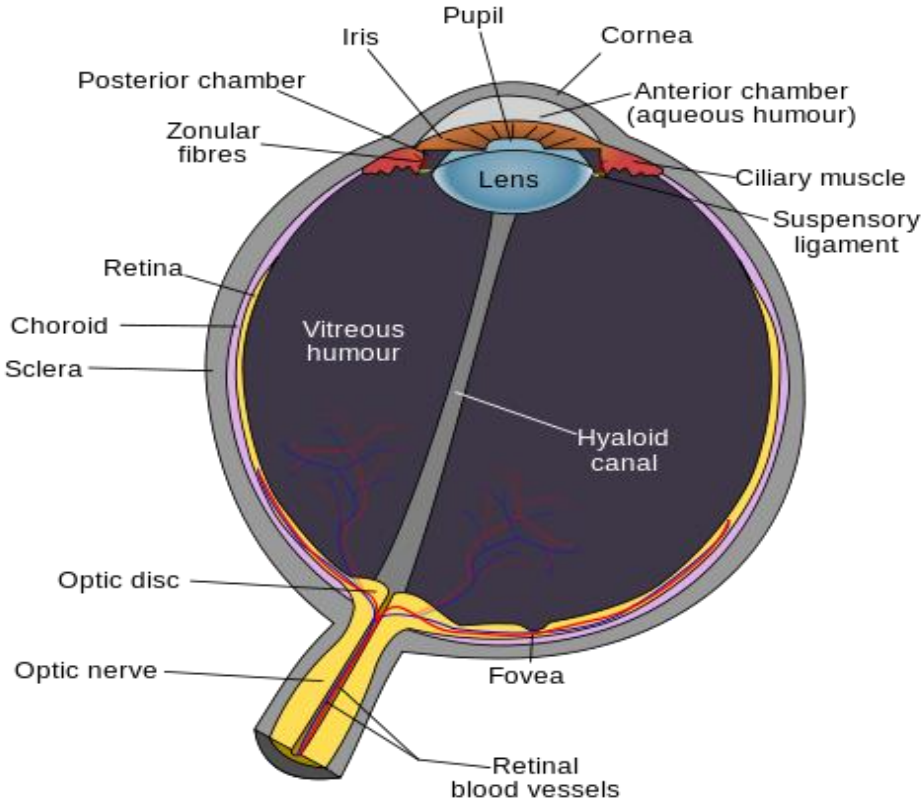

Figure 1: Schematic diagram of the human eye: *From Kronfeld PC: The human eye, Rochester, NY, 1943, Bausch & Lomb Press.*[1]

The Adult Bony Orbit

The orbit is an irregular four-sided pyramid with its apex pointing posteromedially and its base facing anteriorly. The annulus of Zinn, a fibrous ring arising from the superior orbital fissure, forms the apex. The base is formed by the surface of the cornea, the conjunctiva and the lids. The distance from the inferior temporal orbital rim to the annulus measures 42 to 54 mm.

In the adult, the bony orbit is roughly pyramidal in shape. Its volume in the average individual is approximately 25 cm^3. [2, 3, 4, 5, 6, 7]

Within the orbit the eye contributes about 7.2 cm^3 based on the average diameter of about 24 mm. However, a myopic eye will be larger and a hyperopic eye will be smaller.

1) The orbital rim

The orbital rim is rounded and thickened, and serves to protect the eye from facial impacts. The superior rim is the most prominent due to expansion of the underlying frontal sinus. It is more protuberant in adult males.

The medial third of the superior orbital rim is interrupted by a notch or foramen for passage of the supraorbital neurovascular bundle. [8, 9] The notch is situated about 25–30 mm from the facial midline.[9,] 10 The location of this notch is an important guide in avoiding injury to the supraorbital nerve during brow and forehead surgery.

The orbital rim is flatter and less prominent between the supraorbital notch and the medial canthal ligament. A number of important neurovascular structures emerge here, including the supratrochlear and infratrochlear nerves, and the

dorsal nasal artery. Just inside the rim at the superomedial corner of the orbit is the cartilaginous trochlea of the superior oblique tendon.

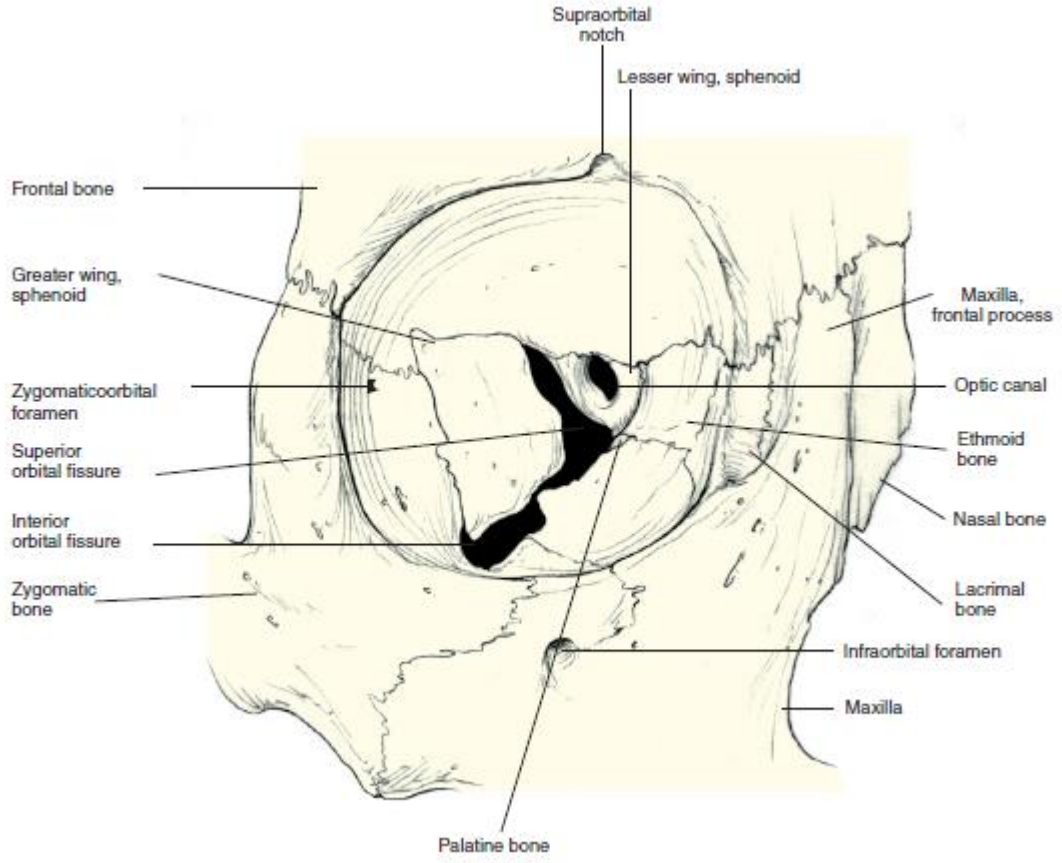

Figure 2: Anterior view of bones of the orbit: Mathers LH, Chase RA, Dolf J et. al., *Clinical anatomy principles, St. Louis, 1996, Mosby* [11]

2) The medial orbital wall

The medial walls of the orbits are approximately parallel to each other and to the mid-sagittal plane. The medial wall measures an average of 42 mm (range 32–53 mm) in horizontal length from the anterior lacrimal crest to the optic canal.[12] The medial wall contains the anterior lacrimal crest and forms the anterior portion of the lacrimal sac fossa. The lacrimal bone is a small, thin and fragile plate situated just posterior to the maxillary process.

The nasolacrimal canal is a bony tube extending from the lacrimal sac fossa to the inferior nasal meatus, and it contains the membranous nasolacrimal duct. The canal measures about 5 mm in diameter and is bordered by three bones, the maxilla, the lacrimal, and the inferior turbinate bones. The canal runs inferolateral and slightly posterior in the medial wall of the maxillary bone. It measures about 12–15 mm in length.

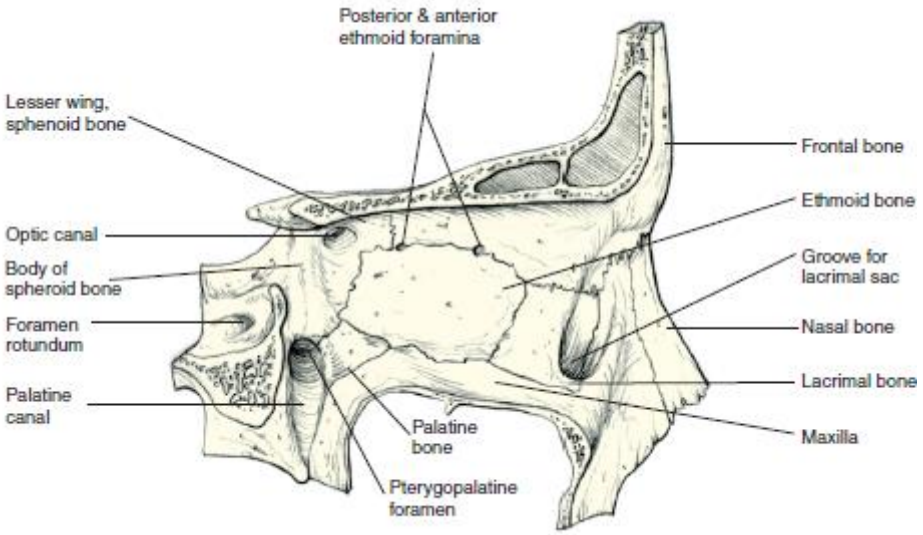

Figure 3: Bones of medial orbital wall: Mathers LH, Chase RA, Dolf J et al., *Clinical anatomy principles, St. Louis, 1996, Mosby* [13]

3) The orbital floor

The orbital floor is a very thin plate surface forms a triangular segment extending from the maxillary-ethmoid buttress on the medial side, horizontally to the inferior orbital fissure on the lateral side, and from the inferior orbital rim back to the posterior wall of the maxillary sinus.

In the mid and posterior orbit, the floor ends at the inferior orbital fissure, and the posterior extent of the maxillary sinus. It is important to keep in mind that the orbital floor does not extend all the way to the apex, but rather ends at the pterygopalatine fossa. The floor is, therefore, the shortest of the orbital walls,

extending only about 35–40 mm from the inferior rim to the posterior wall of the maxillary sinus. However, the distance from the rim at the infraorbital canal to the optic canal is greater, measuring 48 mm (range 41–57 mm). [14]

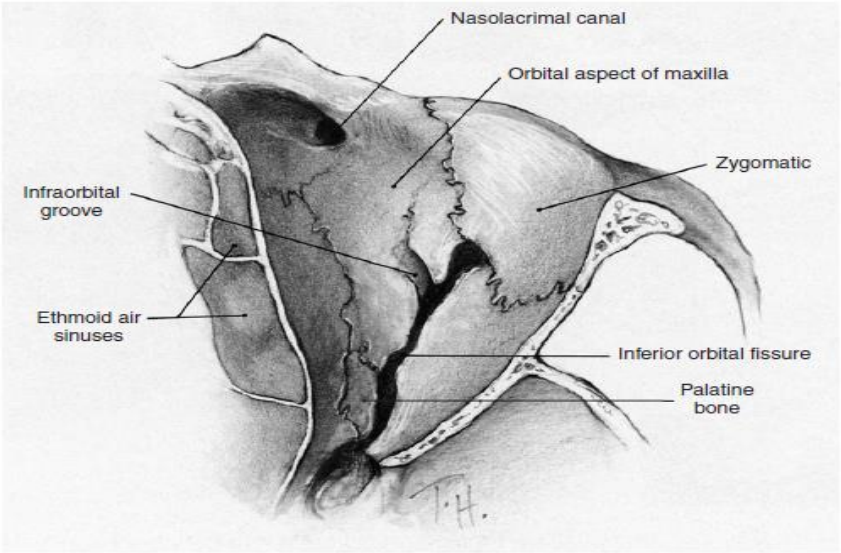

Figure 4: Bones of orbital floor: Bones of orbital floor: *Doxanas MT, Anderson RL, Clinical orbital anatomy, Baltimore, 1984, Williams & Wilkins.*[15]

4) The lateral orbital wall

The lateral wall of the orbit is the thickest. It is separated from the floor by the inferior orbital fissure, and from the roof, in part, by the superior orbital fissure.

The lengths of the lateral and medial walls, from orbital rim to apex, are about the equal. Because of the oblique orientation of the lateral wall, the lateral rim lies about 10 mm posterior to the medial rim.[16] The length of the lateral wall from the lateral rim at the frontozygomatic suture to the optic canal is about 47 mm (range 39–55 mm).

At the junction of the lateral wall and roof is the superior orbital fissure (SOF). The superior orbital fissure transmits most of the vascular and neural structures

from the middle cranial fossa into the orbit, with the major exception of the optic nerve and ophthalmic artery, which pass through the optic canal.

The central portion of the fissure is anatomically divided by the annulus of Zinn, which serves as the tendinous origin for the rectus muscles. The central opening defined by the annulus, called the oculomotor foramen, transmits structures into the intraconal orbital space. Most of these structures subserve ocular function and motility. These include the superior and inferior divisions of the oculomotor nerve, the abducent nerve, and the nasociliary nerve.[16]

Other structures passing through the superior orbital fissure but outside the annulus are mainly associated with the extraconal orbital space, or are *en route* to extraorbital sites. These include the trochlear nerve, the frontal and lacrimal branches of the trigeminal nerve, and the superior ophthalmic vein above the annulus, and the inferior ophthalmic vein beneath the annulus.

Several small foramina perforate the lateral orbital wall just behind the rim laterally and inferiorly near the anterior end of the inferior fissure. These transmit branches of the lacrimal artery and zygomatic nerve out of the orbit as the zygomaticotemporal and zygomaticofacial neurovascular bundles.[16]