Dexmedetomidine, propofol or midazolam for sedation in patients undergoing vitreoretinal surgery under peribulbar block

Thesis

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Abstract

Vitrectomy differs from routine ophthalmic operations in these, amongst others, include long duration of surgery, operating in darkness, overcrowding of the theatres, and inaccessibility of the patient during surgery. Many patients, particularly elderly ones, suffer from intercurrent disease. Although the surgery is of a relatively urgent nature, conditions like congestive failure or active chest infections should be treated. The peribulbar block seems to replace the retrobulbar block to some extent due to less incidence of complications.[11] The peribulbar, or extraconal block, placed further from the optic and other orbital nerves, requires larger volumes of local anesthetic and has longer latency of onset. The needle entry point for the block is at the inferotemporal location. The junction of the lateral third and medial two-thirds of the inferior orbital rim in line with the lateral limbal margin has been the conventional access point.[28]

Keyword:

Midazolam- Dexmedetomidine- vitreoretinal-ACTH

بسم الله الرحمن الرحيم

﴿ رب أوزعنى أن أشكر نعمتك التى أنعمت على
و على والدى و أن أعمل صالحا ترضاه و أدخلنى
برحمتك فى عبادك الصالحين ﴾

صدق الله العظيم

الآية (١٩) سورة النمل

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DEDICATION

I dedicate this work to my beloved husband, son and daughter who gave me the strength to complete this work, and also to my beloved parents for their continuous support and faithful Love.

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Abbreviations

- **ACTH** :adreno corticotropic hormone
- **ASA**: American Society of Anesthesiology.
- **AVP**: argenine vasopressin.
- **BIS**: bispectral.
- **CBF**: cerebral blood flow.
- **CNS:** central nervous system.
- **$CMRO_2$**: cerebral metabolic rate of oxygen.
- **CPP**: cerebral perfusion pressure.
- **EEG**: electro-encephalogram.
- **FDA**: food and drug administration.
- **GANA**: general anesthesia no airway.
- **GABA**: γ amino butyric acid.
- **HR**: heart rate.
- **ICU**: intensive care unit.
- **ICP**: intra cranial pressure**.**
- **IOP:** intra-ocular pressure**.**
- **MAC:** monitored anesthesia care**.**
- **MAP:** mean arterial pressure**.**
- **NMDA:** n-methyl d- aspartate**.**
- **OCR:**oculo-cardiac reflex.
- **PONV**: post operative nusea and vomiting**.**
- **RR:** respiratory rate.

- **RSS:** Ramsy sedation score**.**
- **USA:** United State of America**.**
- **VD**: volume of distribution.
- **VDSS**: volume of distribution at steady state**.**
- **VLPO:** ventro-lateral preoptic nucleus**.**

INTRODUCTION

For many ophthalmic surgeons, local anesthesia has become the preferred option over general anesthesia because of the quicker rehabilitation and the avoidance of possible complications of general anesthesia.[1] Several methods of local anesthesia for vitreo-retinal surgery have been described including retrobulbar, peribulbar, sub-tenon's block, and even topical anesthesia in some cases.[2] The classic extraconal (peribulbar) block was introduced in 1986 as a safer alternative to the retrobulbar block in which the needle tip remains outside the muscle cone away from retinal artery and optic nerve. Although peribulbar block has a delayed onset of action but, it is a safe needle block technique.[3]

Many drugs have been used for sedation during eye surgery with a relative risk of oversedation and disorientation, confusion or increased risk of respiratory depression and oxygen desaturation.[3] All of these unwanted effects may hamper patients' cooperation during surgery, and would make these agents less than ideal for the intraoperative management of sedation.[4] Propofol is widely used for sedation during eye surgery because of its short duration of action, no cumulative effect, unique recovery profile as well as its rapid emergence.[3] Benzodiazepines may result in confusion particularly when administered to elderly patients.[4]

In contrast, dexmedetomidine is a highly selective alpha-2 adrenoreceptor agonist with both sedative and analgesic properties and is devoid of respiratory depressant effect.[5] It has been used as premedication and to sedate patients undergoing day case procedures without adverse effects, and patients typically remain cooperative albeit being sedated, these properties along with its relatively short elimination

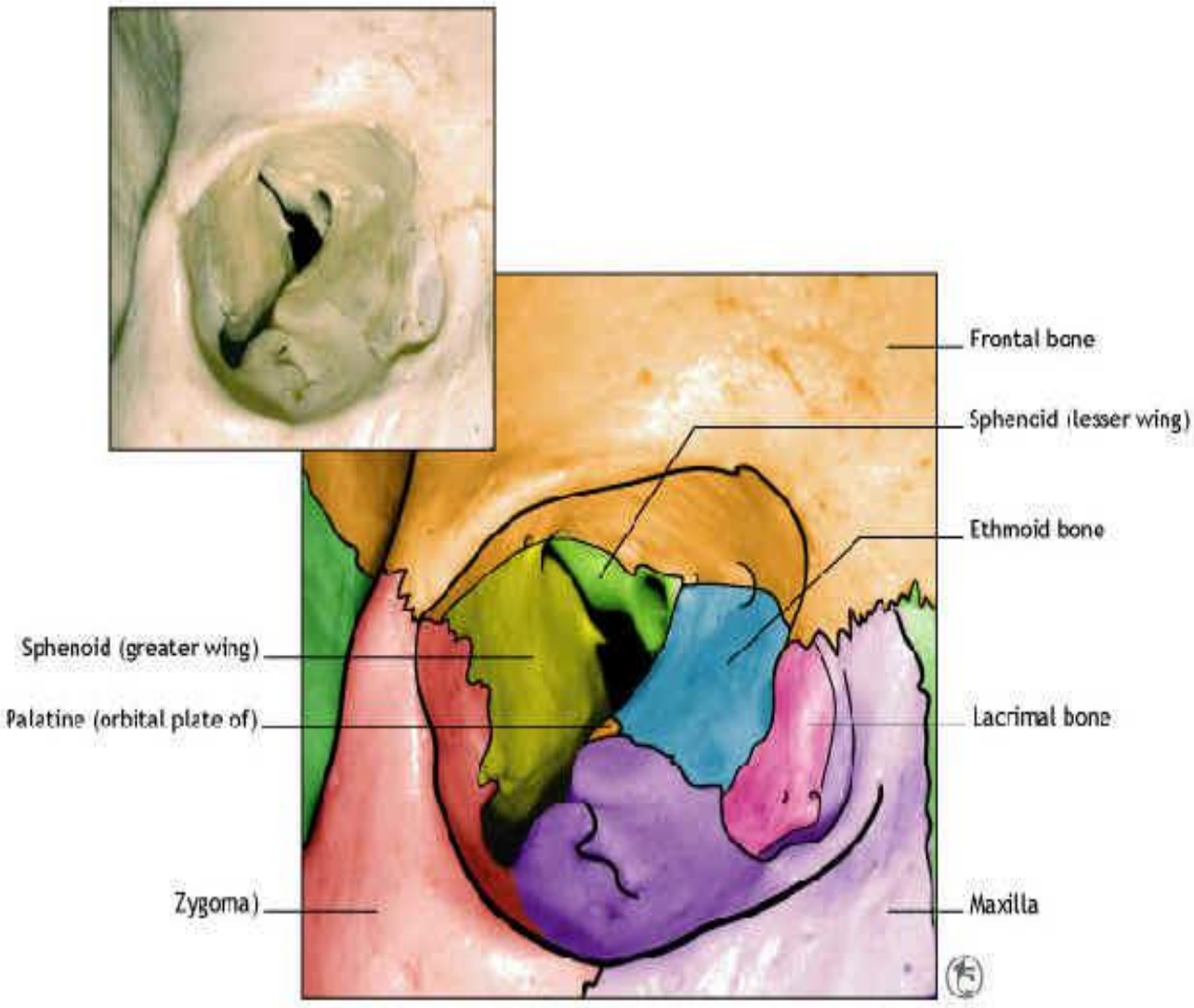
half-life of 2 hours make dexmedetomidine an attractive agent for sedation during monitored anesthesia care for vitreo-retinal surgery.[6]

ANATOMY

As with all anesthetic techniques, thorough knowledge of the anatomy is essential. Anatomy of the orbit and its nerve supply is necessary for the safe practice of ophthalmic regional anesthesia.[7]

Anatomy of the Bony Orbit:

The eyes lie within two bony orbits, located on either side of the root of the nose.



Fig(1) :Anatomy of the bony orbit [7]

Each orbit is pear-shaped, with the optic nerve representing the stem. Seven bones conjoin to form the orbital structure **(Fig. 1)**; frontal, zygomatic, maxillary, ethmoidal, sphenoid, lacrimal and palatine bones.[7]

The apex lies near the medial end of superior orbital fissure and contains the optic canal, which communicates with middle cranial fossa.

The_roof (superior wall) is formed by the orbital plate of the frontal bone and the lesser wing of sphenoid. The orbital surface presents medially by trochlear fovea and laterally by lacrimal fossa. [8]The optic foramen, which contains the optic nerve and the large ophthalmic artery, is at the apex. [8]

The floor (inferior wall) is formed by the orbital surface of maxilla, the orbital surface of zygomatic bone and the orbital process of palatine bone. Medially near the orbital margin is located the groove for naso-lacrimal duct. Near the middle of the floor, located infraorbital groove, which leads to the infraorbital foramen. The floor is separated from the lateral wall by inferior orbital fissure, which connects the orbit to pterygopalatine and infratemporal fossa[8]

The medial wall is formed by the frontal process of maxilla, lacrimal bone, orbital plate of ethmoid and a small part of the body of the sphenoid.[8]

The Lateral wall is formed by the orbital process of zygomatic and the orbital plate of greater wing of sphenoid. The bones meet at the zygomatico-sphenoid suture. The lateral wall is the thickest wall of the orbit.[8]

The volume of the adult orbit is 30 ml³; whereas that of an average sized globe is 6.5 ml³. The typical dimensions at the rim are 35 mm vertically and 40 mm horizontally. The depth of the orbit from the inferior orbital rim to the optic foramen ranges from 42 to 54 mm. The lateral orbital rim is set back 12 to 18 mm behind the cornea, allowing exposure of the globe to its equator **(Fig. 2).**[9]

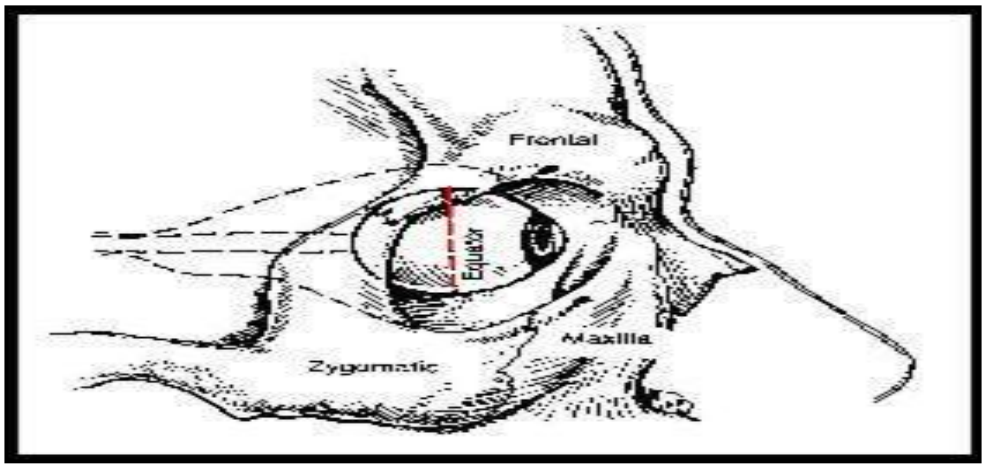


Fig (2): The lateral orbital rim is set back in line with the globe equator [9]

The Orbital Septum:

A thin sheet of connective tissue called the orbital septum encircles the orbit as an extension of the periosteum of the roof and the floor of the orbit. It also attaches to the anterior surface of the levator muscle. Posterior to the orbital septum is the orbital fat. In both the upper and lower eyelids, the orbital septum attaches to the apponeurosis. The orbital septum thus provides a barrier to anterior or posterior extravasation of blood or the spread of inflammation.[10]

Extraocular muscles:

Each orbit contains 6 extraocular muscles that function together to move the eye: 4 recti muscles (superior, inferior, lateral, medial) and 2 oblique muscles (superior, inferior). The levator palpebrae muscle