Comparative Study between Articaine, Bupivacaine/Lidocaine Mixture and Mepivacaine in Episcleral Peribulbar Anesthesia for Cataract Surgery

Thesis

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بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

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List of Abbreviations

ASA	:	American Society of Anaesthesiologist
BMI	:	Body Mass Index
Ht	:	Height
I.V.	:	Intravenous
Kg	:	Kilogram
LA	:	Local Anaesthetics
M	:	Meter
MAOI	:	Monamine Oxidase Inhibitors
min	:	Minute
OMS	:	Ocular motility score
TCA	:	Tricyclic Antidepressant
VC	:	Vasoconstrictors
Wt	:	Weight
Yr	:	Year

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Introduction

The use of regional anesthesia for ophthalmic surgery has become increasingly popular over the last years, because it is associated with fewer respiratory and hemodynamic adverse effects than general anesthesia. Moreover, postoperative pain, postoperative nausea and vomiting are better controlled ***(Smith et al., 1996)***.

Ophthalmic procedures such as cataract extraction can be performed with either topical or regional anesthesia. Regional anesthesia is still widely used in lengthy or complex procedures ***(Crandall, 2001).***

Peribulbar anesthesia has undergone regular improvement, since it was first described by ***Davis and Mandel in 1986***. These improvements concern not only the number and methods of injections, but also the type of local anesthetic mixture administrated and the site of injection ***(Gillart et al., 1999)***.

Medial episcleral peribulbar anesthesia has been shown to be a valid alternative for ocular regional anesthesia, because of the infrequent complications observed. The site of injection is relatively avascular, which may decrease the risk of subcutaneous hematoma; it is also far from the ophthalmic artery, optic nerve and central retinal blood vessels. Remarkably, relatively small volumes of local anesthetic can be used to achieve adequate akinesia and analgesia with this technique ***(Leonardo et al., 2005).***

Articaine is a local anesthetic synthesized in the 1960s and first investigated clinically in 1974. It is an amide, chemically similar to prilocaine, but it contains a thiophene rather than a benzene ring. Articaine has a low toxicity and appears to diffuse through tissues more readily than other local anesthetic agents. Also, it is metabolized by nonspecific plasma esterases in blood and tissues, leading to rapid clearance ***(Oertel et al., 1997).***

A mixture of 0.5 % bupivacaine and 2% lidocaine is the most frequently used local anesthetic in ophthalmic anesthesia. Limited diffusion of local anesthetic is the main drawback of peribulbar anesthesia, leading to failure to achieve eyeball akinesia. This lack of immobility can hinder surgical success and may require repeated injection of the local anesthetic which may, presumably, increase the risk of traumatic complications. A medial episcleral peribulbar injection technique aims at reducing the morbidity from repeated injections ***(Allman et al., 2001).***

Mepivacaine has been in clinical use for more than 30 years, including for ophthalmic procedures ***(Sanders et al., 1990)***.

Mepivacaine is an amide that has a low pka, which accounts for its rapid onset of action. Besides, the drug spreads readily through tissues. This is useful in eye blocks because the target structures are nerves dispersed throughout the corpus adiposum of the orbit ***(Wong et al., 1991).***

Aim of The Work

The aim of this study is to compare the efficacy and safety of episcleral peribulbar block using Articaine 2%, Bupivacaine 0.5% and Lidocaine 2% mixture and Mepivacaine 1% in patients undergoing cataract surgery.

Anatomy of the Eye and Orbit

A detailed knowledge of appropriate anatomy is essential for practitioners of the art and science of ophthalmic anaesthesia. To embark on orbital regional anaesthesia blocks without this, is to subject patients to unacceptable risk of serious sequel. For those who wish to pursue this thoroughly, cadaver dissection is an excellent means of gaining necessary insights into the three dimensional aspects of the anatomy of this small but vital part of the human body ***(Wong, 1993).***

Planes of the head and orbit:

Planes of the head:

- ***Coronal planes*** of the head are those planes parallel to the frontal plane of the face (e.g. if one's nose were sliced off, the slice would be in the coronal plane).
- ***Sagittal planes*** of the head are at right angles to the coronal planes and in the long axis of the body (e.g. if one's ear were sliced off, the slice would be in the sagittal plane).
- ***Transverse planes*** are at right angles to both coronal and sagittal planes (e.g. if one's head were chopped off at eyebrow level, the chop would be in the transverse plane).

One important sagittal plane of the eye while held in primary gaze. It corresponds with the visual axis of the globe in primary gaze. Visualization of this plane is important in the safe placement of needles in the intracone space ***(Smith et al., 1996).***

Planes of the orbit:

In computed tomography studies of the orbit, coronal and sagittal planes are usually with reference to the anatomic axis of the orbit. The coronal planes of the orbit are perpendicular to the optic nerve. The sagittal planes of the orbit are parallel to the optic nerve (globe in primary gaze) and at an angle of 23 degrees from the sagittal planes of the head. The sagittal plane of the orbital axis transects the globe, when in primary gaze anteriorly near to the lateral limbus and posteriorly at the point where the optic nerve enters the globe. The optic nerve enters the globe 3 mm to the nasal side of its posterior pole ***(Zonneveld, 1987).***

Osteology:

Geometry of the orbits:

Paired orbital cavities are mirror-imaged, bilaterally symmetrical and located on each side of the mid-line sagittal plane of the skull. Each of the orbits is shaped like a truncated pear lying on its side (heavy end of pear sliced off) and is made up from seven bones: frontal, zygomatic, maxillary, sphenoid, ethmoid, lacrimal and palatine. The medial wall of each orbit is in the sagittal plane of the head and parallel to the contralateral medial orbit wall. The lateral wall of each orbit forms a 90 degree angle with the contralateral lateral orbit wall. The medial and lateral walls of each orbit make a 45 degree angle with each other. The apex including the optic foramen is in the same sagittal plane as the medial orbit wall. Thus the optic foramen is located both posteriorly and medially in the orbit. The globe occupies the front half of each orbit and projects anteriorly beyond it. The visual axis (eye in primary gaze) is sagittal, the anatomic axis of each orbit diverges from the visual axis by 23 degrees ***(Smith et al., 2006).***

The facial, or anterior, aspect of the orbit is known as the orbit rim, which forms a protecting buttress for the vital structures held within, and comprises three bones: zygomatic, frontal and maxillary. Detailed knowledge of the surface anatomy of the orbital rim as palpated through its superficial periorbital coverings is the key to successful regional orbital anaesthesia ***(Smith et al., 2006).***

The rim forms the rounded rectangular base of a pear-shaped pyramid which taper posteriorly to form a tight apex, made up from the greater and lesser wings of the sphenoid bone. The greatest diameter of the orbit is that portion immediately inside the rim. The volume of the adult orbit is 30 ml, while that of an average sized globe is 6.5 ml. The typical dimensions at the rim are 35mm vertically and 40mm horizontally. The depth of the orbit from inferior orbit rim to the optic foramen ranges from 42 to 54mm. The lateral orbit rim is set back 12-18 ml behind the cornea, allowing exposure of the globe to its equator. The orbital margin breaks its continuity at the lacrimal fossa medially ***(Katsev et al., 1989).***

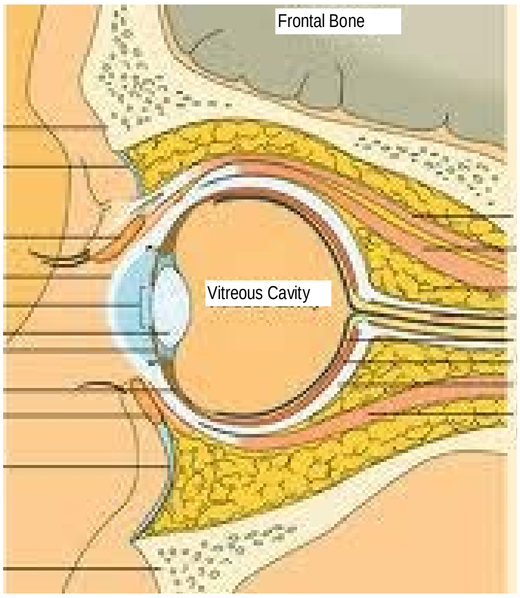

Fig. (1): Diagram illustrating eyeball (Ocular anatomy) ***(Smith et al., 2006).***

Periorbita and orbital septum:

The periosteum of the orbit is known as the periorbita. It blends with the facial bone periosteum and with the orbital septum circumferentially at the anterior orbital margin. Posteriorly at the orbital apex, the periorbita is continuous through the optic canal with the pericranium and with the dural sheath of the optic nerve. It is easily stripped off the underlying orbital bones.

The orbital septum is a weak membranous sheet attached to the anterior margin of the orbit in continuity with the facial periosteum and the periorbita. It defines the anatomical anterior border of the orbit and on the nasal side has attachments with both the anterior and posterior lacrimal crests. Its central attachments are in the upper and lower eyelids and it lies deep to the orbicularis oculi muscle ***(Smith et al., 2006).***

Orbit roof, walls and floor:

The roof, walls and floor of the orbit are all triangular in shape.

Orbit roof:

The roof of the orbit is predominantly formed by the frontal bone with a small contribution from the lesser wing of the sphenoid bone ***(Smith et al., 2006).***