Faculty of Medicine
Department of Anesthesia
Intensive Care & Pain Management

Efficacy of Clonidine as an Adjuvant to Mepivacaine in Sub-Tenon's Block for Ophthalmic Anterior Segment Surgery

A Thesis Submitted For Partial Fulfillment of
M.D. Degree in Anesthesiology

Presented By
Ramy Ahmed Gouda Hassan
M.B.B.Ch., M.Sc. Ain Shams University

Under Supervision of

Prof. Dr. Ahmed Ibrahim Ibrahim
Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Prof. Dr. Amr Essam Eldin Abd El-Hamid
Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Prof. Dr. Hazem Mohamed Fawzy
Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Sanaa Farag Mahmoud
Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Ashraf Hassan Soliman
Lecturer of Ophthalmology
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
2015

(وقُل رَّبِّ زِدْنِي عِلْماً)

سورة طه الآية: ١١٤

Acknowledgment

*First and foremost thanks to **ALLAH**, the most beneficent and merciful.*

*I wish to express my deep appreciation and sincere gratitude to **Prof. Dr. Ahmed Ibrahim Ibrahim**, Prof. of anesthesiology, intensive care medicine and pain management, Ain Shams University, who suggested this subject for reviewing and for his supervision, continuous help and patience. It was a great honor to me to work under his supervision.*

*I wish to express my sincere thanks and deepest gratitude to **Prof. Dr. Amr Essam Eldin Abd El-Hamid,**Prof. of anesthesiology , intensive care medicine and pain management ,Ain Shams University for his eminent guidance, encouragement and revision throughout the work.*

*Also, I would like to express my sincere thanks and deep gratitude to **Prof. Dr. Hazem Mohamed Fawzy,** Prof. of anesthesiology, intensive care medicine and pain management, Ain Shams University, for his keen and valuable guidance.*

*Special appreciation to **Dr. Sanaa Farag Mahmoud ,**Lecturer of Anesthesiology ,intensive care medicine and pain management, Ain Shams University, for her kind advice, valuable instructions and continuous support in the completion of this work.*

*Also, I would like to express my sincere thanks and deep gratitude to **Dr. Ashraf Hassan Soliman,** Lecturer of Ophthalmology, Ain Shams University, for his keen and valuable guidance and encouraging for applying some of these techniques.*

Last but not least, I would like to present a lot of thanks to my family, friends, and to my colleagues, whose without their help and support, this work could not come to birth.

Ramy Ahmed Gouda

Contents

List of abbreviations

ASA	:	American Society of Anesthesiologists
CBC	:	Complete blood count
CSF	:	Cerebrospinal fluid
CT	:	Computerized tomography
DBP	:	Diastolic blood pressure
ECG	:	Electrocardiogram
Fig	:	Figure
HR	:	Heart rate
I.U.	:	International unit
IOP	:	Intraocular pressure
IQR	:	Interquartile range
LA	:	Local anesthetic
LPS	:	Levator palpebrae superioris
Min	:	Minute
P_{CO_2}	:	Partial pressure of carbon dioxide
P_{O_2}	:	Partial pressure of oxygen
RBS	:	Random blood sugar
RR	:	Respiratory rate
SBP	:	Systolic blood pressure
SD	:	Standard deviation
SPSS	:	Statistical Package for the Social Science
VPS	:	Verbal pain score

List of tables

List of figures

Introduction

Regional anesthesia is commonly used for ophthalmic surgery. Various ophthalmic surgeries require a potent motor blockade (akinesia) of the eyeball and eyelids. Retrobulbar anesthesia was the only technique used for many years since the late 1800s, but became more widely used in the 1940s **(Ripart et al., 2000).** Rare but serious complications as globe perforation, brain stem anesthesia, postoperative strabismus, retrobulbar hematoma and optic nerve injury have led many physicians to abandon this technique **(Hamilton, 1998).**

In an attempt to reduce some of the complications of retrobulbar anesthesia, peribulbar anesthesia was introduced in the 1960s. However, peribulbar anesthesia has some limitations. The complications associated with retrobulbar anesthesia have been subsequently described with peribulbar anesthesia with less, but still unacceptable frequency **(Edge and Navon, 1999)**. Another thing is even with a two-injection technique, peribulbar anesthesia has sometimes an excessive rate of imperfect blockade. This necessitates supplemental injection, with a rate of up to 50% in certain series. Performing multiple supplemental injections theoretically increase the risk of complications **(Davis and Mandel, 1994).**

Sub-Tenon's (Episcleral) anesthesia was reported as early as 1884 by Turnbul and subsequently by Swan in 1956. Since then, the place for this technique in ophthalmic surgery has been reaffirmed as a well tolerated, effective, quicker, safer alternative to peribulbar, retrobulbar, or topical anesthesia in anterior and posterior segment eye surgery and even for the therapeutic delivery of drugs to the eye **(Swetha et al., 2009).**

Sub-Tenon's anesthesia, sometimes also called parabulbar anesthesia, places the injection into the episcleral space. This allows the local anesthetic (LA) to spread circularly all around the scleral portion of the globe, thus accounting for high-quality analgesia of the whole globe with relatively low volumes injected (usually 3-5 mL) **(Ripart et al., 1998).**

Injection of local anesthetic agent under the Tenon capsule blocks sensation from the eye by action on the short ciliary nerves as they pass through the Tenon capsule to the globe, akinesia is obtained by direct blockade of anterior motor nerve fibers as they enter the extraocular muscles **(Ripart et al., 2000).**

Additives have been used to prolong the duration of ophthalmic regional blocks. Clonidine (a centrally acting α_2 agonist) has been used in ophthalmic anesthesia several years ago. It was initially used as an oral premedication at a dose of 100 - 150µg. It resulted in a reduction in intraoperative stress associated with surgery and a decrease in intraocular pressure (IOP) **(Weindler et al., 2000).**

Clonidine is a selective partial agonist for α_2-adrenoreceptors, with a ratio of approximately 200:1 (α_2 to α_1). Clonidine is lipid soluble so, it penetrates the blood-brain barrier to reach the hypothalamus and medulla. Although experience with α_2-agonists as sole anesthetics is limited (**Richard et al., 1990),** data suggest that oral, intravenous, epidural, and intrathecal administration of clonidine potentiates the anesthetic action of other anesthetics, volatile or injectable, and reduces general and regional anesthetic requirements with correspondingly fewer side effects. In addition to its use in the operative setting, the addition of clonidine to local anesthetic increases the duration of analgesia and reduces dose requirements for local and narcotic pain medications **(Rockemann et al., 1995).**

The mechanism of action of clonidine in regional blocks is not completely understood. It may have a direct local anesthetic action on C fibres, act via imidazole receptors on the peripheral nerve or act as a local vasoconstrictor to prolong the action of concomitantly injected local anesthetic **(Ge et al., 2006).**

Addition of Clonidine to local anesthetic in retrobulbar block has several advantages: it decreases IOP, enhances anesthesia and akinesia and increases intraoperative sedation **(Bahy Eldeen et al., 2011).** The duration of lid and globe akinesia, globe analgesia and anesethesia was significantly increased with clonidine in peribulbar block **(Madan et al., 2001).**

A dose-response study by **Madan et al. (2001)** looked at adjuvant clonidine to peribulbar blockade for cataract surgery, the authors concluded that clonidine enhances the duration of anesthesia and analgesia in the 1 µg/kg dose without significant side effects **(Madan et al., 2001).**

Aim of the work

The aim of this work is to study the effect of addition of clonidine to mepivacaine 3% in sub-tenon's block as regard efficacy, safety and satisfaction of the patient

Anatomical Considerations for Ophthalmic Regional Anesthesia

I) Anatomy of the orbit:

1) Structure: The orbit functions to protect, support, and maximize function of the eye. 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. It contains the globe, orbital fat, extraocular muscles, nerves, blood vessels and part of the lacrimal apparatus **(Kumar and Dodds, 2006)**.

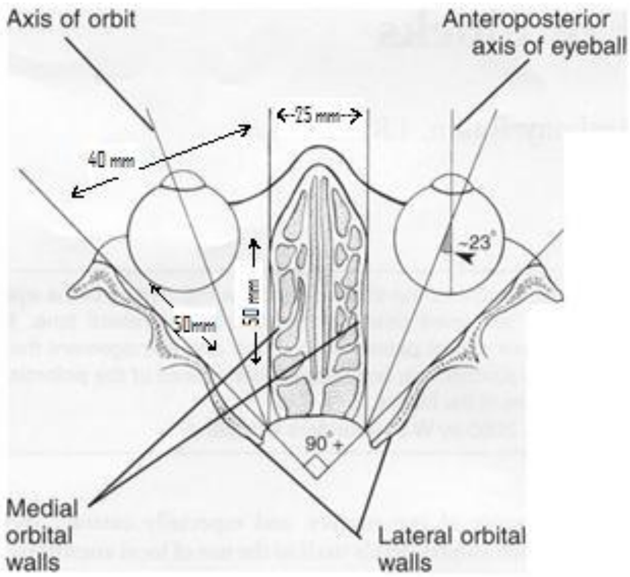

Fig.1: Geometry of the orbits and the eye globes (Rubin 2003).

The orbits are aligned so that the medial walls are parallel to the sagittal plane and lines drawn along the lateral walls join behind the nose and very nearly form a right angle. The arc from medial to lateral wall in each orbit is 45° (**Fig.1)**. The orbital floor rises about 5 degrees while the roof is horizontal **(Rubin, 2003)**.

The orbital axis thus run from behind forwards laterally and slightly downwards towards the base. The orbital axis and visual axis (the position of the eye when in straight, or primary, gaze) do not coincide (**Fig.1)** and the anesthetist must be quite clear as to which one he or she is referring to when describing angles for insertion of needles **(Chishti and Varvinskiy, 2009)**.

The average dimensions of the orbit are as follows (**Fig.1)**:

- Height of orbital margin - 40 mm
- Width of orbital margin - 35 mm
- Depth of orbit - 40-50 mm. The orbital depth measured from the hind surface of the eyeball to the apex is approximately 25 mm (range 12-35 mm).
- Interorbital distance - 25 mm
- Volume of orbit - 30 cm^3

(Petruzzelli and Hampson, 2008).

Because of the irregular shape of the orbit, the lateral wall is longer than the medial wall. As a result, a long (1.5 inch) needle that is inserted along the medial wall can easily reach the optic canal in most patients **(Fanning, 2006)**.

2) Relations:

Above the roof are the frontal air sinuses anteriorly and the meninges and frontal lobe of the cerebral hemisphere. Inferior to the floor is the maxillary air sinus. The infraorbital nerve and blood vessels lie within the infraorbital canal. Laterally the orbit is related to the temporal fossa in its anterior portion and the middle cranial fossa containing the temporal lobe of the cerebral hemisphere and its investing meninges posteriorly. The orbital septum forms its anterior boundary **(Johnson, 1995)**.

Medially, the orbital wall is related to the nasal cavity anteriorly, the ethmoid sinuses in the middle part and the sphenoid sinus posteriorly. The bony walls may be very thin in some individuals and needle penetration is possible. Perforation of the medial wall by a block needle may result in orbital cellulitis or abscess **(Wong, 1993)**.