Review Article

Articaine versus lidocaine plus bupivacaine For peribulbar anaesthesia in cataract surgery

A protocol of thesis submitted for partial fulfillment of M.D. Degree of anaesthesia

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I: Introduction

Many patients presenting routinely for eye surgery are at extremes of age. The majority of ophthalmic operations (predominantly cataract surgery) are performed as day cases under local anaesthesia.

Peribulbar anaesthesia is the technique of choice for majority of patients undergoing cataract surgery. It is safer than retrobulbar block because the needle is not inserted inside the extraocular muscle cone (Grizzard et al, 1991). Conventionally, a mixture of lidocaine and bupivacaine is used as local anaesthetic solution (Fry et al, 1989). Limited diffusion of local anaesthetic is the main disadvantage of peribulbar anaesthesia, giving rise to the need for repeated injections (Brahma et al, 1994). This also increases the frequency of complications such as globe perforation and haemorrhage (Ripart et al, 1996). To prevent this and increase tissue diffusion, hyaluronidase is added in varying concentration to this mixture. However, hyaluronidase is not easily available in most countries.

Articaine was first investigated in1974 (Winther et al, 1974). It is an amide local anaesthetic agent containing thiophene ring rather than a benzene ring. This thiophene ring contains an additional ester (2-carbomethxy) group, which accounts for its rapid metabolism by plasma and tissue estrases (Allnan et al, 2002). Currently, it is used for dental surgery in most European countries. Features such as low toxicity, quick diffusion and rapid clearance have led to its widespread use (Oertal et al, 1997). Articaine has been shown to be safe and effective in peribulbar anaesthesia compared with standard local anaesthetic agents (Gouws et al, 2004).

И: Aim of work

The purpose of this study is to evaluate the efficacy and safety of articaine2% in comparison to a mixture of lidocaine2% and bupivacaine0.5% for peribulbar anaesthesia in cataract surgery.

Ш: Patients and methods

After medical Ethical Committee approval, informed written consent would be obtained from 60 patients undergoing cataract extraction in Ain Shams university hospital. All patients will be chosen of ASA physical status I : Ш and matched in age, sex, and axial length of eyes and scheduled for cataract surgery under local anaesthesia.

- Exclusion criteria:

  -Communication problems.

  -Previous intraocular surgery.

  -Pregnant women or those of childbearing potential.

  -Those known to have reduced plasma cholinesterase concentration.

  -History of allergy to amide-type local anaesthetics .

All patients will be examined and routine laboratory investigation will do which are the following:

-Complete blood count.

-INR and APPT.

-Liver function test (s.GOT, s.GPT, serum albumin).

-Renal function test (blood urea, serum creatinine, and electrolytes).

-Random blood sugar.

-Chest radiographs only for patient with C.O.A.D, breathlessness, sever chest and cardiac history.

Patients will be randomly allocated to one of two equal groups of 30patients according to the type of local anaesthetic injected:

Group I: patients will receive a peribulbar injection of articaine2% 5ml with 1:200000 epinephrine. If the block is sufficient 5min after the injection, sc injection will be performed into superior eyelid for eyelid akinesia.

Group II: patients will receive a peribulbar injection of a mixture of 5ml bupivacaine0.5% and 5ml lidocaine2% with 1.200000 epinephrine. If the block is sufficient 5min after the injection, sc injection will be performed into superior eyelid for eyelid akinesia.

All patients of these 2groups will receive pre-medication with:

1. Midazolam0.5-1mg I.V.
2. Topical administration of oxybuprocaine0.4%drops.

All patients of these two groups will be assessed and monitored for:

1. Haemodynamic parameters as regards ECG for (HR) and noninvasive mean arterial blood pressure (MAP) which will be recorded before induction, every5min during surgery and then before discharge from recovery room. Using pulse oxymetry throughout surgery will continuously monitor arterial oxygen saturation.

2. Assessment of ocular movement(for onset and duration of akinesia) will be scored for each direction of gaze in the superior, Inferior, medial and lateral direction with maximum scores for each direction of three points and a possible total maximum of 12points. Patients will be considered to be ready for surgery when ocular score (Brahma score) is 5 or less. This scoring will be performed at 1 , 5 and 10min and at the end of surgery.

3. If the total ocular movement score is 6or higher or if there is full movement in any direction, supplementary injection will be performed via the superior-medial transpalpebral route using 3-5ml of same solution.

4. Eyelid movement will be evaluated by scoring the maximum score for movement of 2 points. This scoring(Brahma score) will be performed at 1,5 and10min and at the end of the surgery.

5. The need for supplementary local anaesthesia and the total volume of local anaesthetic required will be recorded.

6. The degree of proptosis, chemosis and pain during injection and surgery will be noted.

Patients will be asked after surgery if they are experienced any pain by asking to mark the degree of pain on a horizontal line numbered0-10. immediately after surgery, every two hours in the 1^{st} 12hours after surgery and lastly every six hours till 48hours post operatively. If Visual Analogue Score is 4or higher, patients will be receive an IM injection of diclofenac Na 75mg. The time of a first need for NSAID injection and the total dose used will be measured.

Data will be collected by using descriptive statistical tests and will be analyzed by using the proper tests.

IV:References

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Anatomical considerations for ophthalmic block

Introduction:

When attempting to perform any regional anaesthetic block, it is imperative to be thoroughly familiar with the underlying anatomy. The bony orbit contains a volume of about 30 mL. An average globe (23.5 mm in axial length) is close to 7 mL in volume, the rest of the orbit being filled with blood vessels, nerves, muscles, fat, and connective tissue. The challenge of orbital regional anaesthesia is in learning to place a needle safely past the globe into a fatty compartment devoid of significant blood vessels, nerves, and muscles (Gray,2003).

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Bony anatomy:

The orbit is formed by the union of several small bones: maxilla, frontal, zygomatic, sphenoid, ethmoid, lacrimal, and palatine. It is often viewed as a pyramid whose irregularly shaped square base forms the frontal opening of the orbit. The apex of the orbit lies deep within, the very tip represented by the optic canal, through which passes the optic nerve and ophthalmic artery. The lateral wall is long, compared to the medial wall, and lines drawn along the lateral walls join behind the nose and very nearly form a right angle (Figure1) (Hamilton,1996).

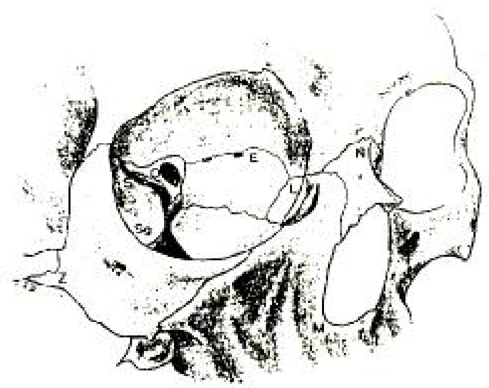

Figure 1: *The orbital margin (Hamilton, 1996).*

The posterior orbit is perforated by the superior and inferior orbital fissures, through which pass the nerves to the extraocular muscles, the branches of the ophthalmic division of the trigeminal nerve and the superior ophthalmic vein. The floor of the orbit contains a canal or groove, through which passes the maxillary division of the trigeminal nerve after entering the orbit through the foramen rotundum. The medial wall of the orbit is composed of the thinnest portion of the ethmoid bone, the lamina papyracea. This bone is extremely thin and sometimes contains small holes. It also contains foramina for the exit of the anterior and posterior ethmoid arteries and nerves from the orbit (Hamilton, 1996).

Extraocular Muscles:

***Origins*:**

The rectus muscles originate from the annulus of Zinn, a fibrous ring encircling the optic canal and the medial aspects of the superior and inferior orbital fissures. The superior oblique muscle origin is from the sphenoid bone just outside of the annulus. The levator palpebrae muscle arises from the sphenoid bone and from the annulus close to the origin of the superior rectus. The inferior oblique muscle takes its origin in the anterior portion of the orbit in the periosteum of the extreme medial portion of the maxillary bone (Figure2)(Johnson, 1995).

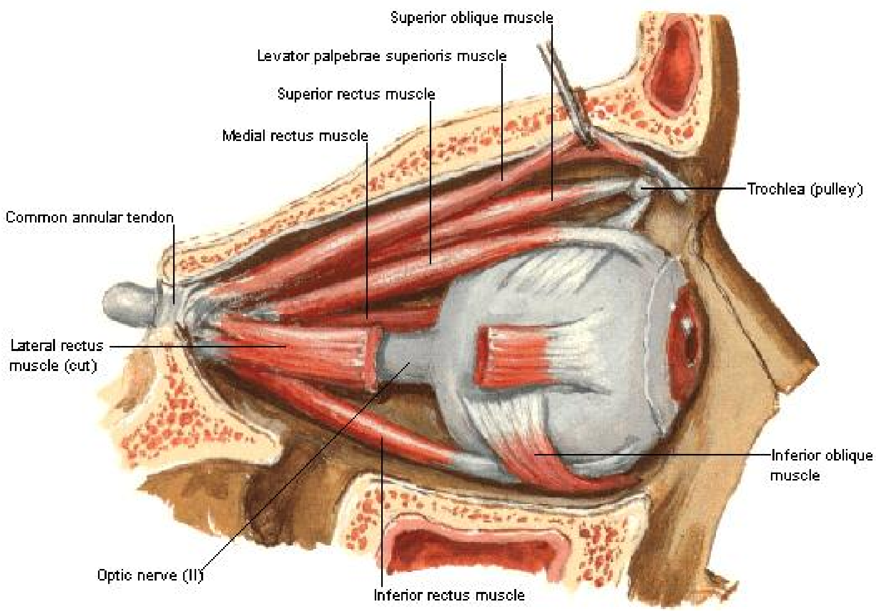

Figure2:*Extra-ocular muscle (Johnson, 1995).*

***Orbital courses and Insertions**:*

As the rectus muscles course forward toward their tendinous insertions on the sclera anterior to the equator of the globe, their intra-orbital relationships vary. The superior rectus muscle lies very close to the levator palpebrae muscle in the superior orbit. In the posterior half of the orbit the inferior rectus and lateral rectus muscles lie relative close to the orbital floor and lateral orbital wall, respectively. The medial rectus muscle is close to the medial wall of the orbit early in its course, but there is a relatively large space between the muscle and the medial wall beginning at the posterior aspect of the globe. The superior oblique muscle hugs the periosteum of the superonasal quadrant as it travels toward the trochlea, where its tendon then courses postero-laterally to insert on the postero-lateral quadrant of the superior portion of the globe. The inferior oblique muscle travels postero-laterally as well, going below the inferior rectus muscle and finally inserting without a tendon on the postero-lateral quadrant of the inferior portion of the globe (Johnson, 1995).

***Intra-orbital Fascia**:*

There is a very complex connective tissue system within the orbit which is described well by Koornneef and Dutton 1994. A delicate structure of connective tissue septa supports all of the intra-orbital structures. These septa may have individual variations and are capable of directing the flow of anaesthetic solutions. The lack of an organized intermuscular septum connecting all of the rectus muscles and forming a connective tissue “cone”. Only in the superolateral quadrant is there a reasonably well-developed intermuscular septum between the levator-superior rectus complex and the lateral rectus muscle. This septum provides support for the lacrimal gland (Dutton,1994).

A distinct release feeling (pop) on insertion of a fine, sharp needle can mean that the needle is entering any of the following: 1) a connective tissue septum (ideally), 2) a blood vessel, 3) an extra-ocular muscle, 4) a nerve, 5) the dura, or 6) the globe. It is decidedly undesirable to touch items 2 through 6 with a needle, so reliability of the feeling mentioned a “pop” when putting needles into the orbit is rather unassertive (Dutton, 1994).

Tenon’s Capsule:

A special connective tissue structure important to anaesthetists is Tenon’s capsule. It begins to encircle the globe 1-3 mm behind the limbus and closely surrounds the globe until it fuses with the dura and sclera where the optic nerve enters (Hamilton, 1996).

During its course it is perforated by the extraocular muscles, blood vessels, and nerves. At these points, the fibers of the capsule merge with the connective tissue sheaths of the penetrating structures. A potential space exists between Tenon's capsule and the episclera. A cannula can be placed into this space and anaesthetic solution injected. As some of the injected solution can diffuse along the sheaths of the extra-ocular muscles and as the posterior ciliary nerves enter the globe directly through this space, excellent anesthesia and akinesia will occur if adequate volumes are injected. It has been shown by ultrasound scanning that solution injected into the subTenon's space may pass through the capsule into the retro-bulbar intra-conal space. This would provide an alternative means by which sensory and motor block may occur and probably explains the variable degree of akinesia obtained with this technique (Hamilton, 1996). .

***Orbital Septum*:**

The orbital septum is a continuation of the periorbita into the lids and is an important part of the entire orbital connective tissue complex. In simplest terms, it forms a barrier for the intraorbital contents and provides support for the eyelids. In young people the septum is using tough and well defined, whereas it can be quite delicate in the elderly(Koornneef,1989).