Recent techniques of regional anesthesia in ophthalmic surgery

Essay

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In anesthesia

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Introduction

Most eye operations can be performed under local anesthesia, which can be either topical or orbital regional anesthesia. Recently, the topical anesthesia has become a common modality of anesthesia for cataract surgery. However orbital regional anesthesia is preferred by many ophthalmologists for cataract, as well as other forms of ophthalmic surgery. **(Loaming D.V.; 2006).**

According to recent studies, local anesthetic techniques are preferred, because they can provide orbital analgesia and/or akinesia with a lower incidence of systemic side effects, than general anesthesia. These factors are especially important for frail and elderly patients, who undergo eye surgery**. (Hamilton R.C., et.al; 2004) (Friedman D.S., et.al; 2006).**

Regional orbital anesthesia has many benefits such as good akinesia and anesthesia, minimal influence on intraocular pressure, require minimum equipment, however, it carries also risks like subconjunctival edema, penetration or perforation of the globe, central spread of local anesthetic intravascular injection and anaphylaxis. **(Ruschen H., et.al; 2005).**

Preoperative patients' preparation including careful psychological preparation and assessment is essential. High standard of perioperative monitoring is recommended during regional techniques. **(Ruschen H., et.al; 2005).**

Formerly, the term" local-standby" described the anesthesiologist's role in these cases, However, this term has been replaced by "monitored anesthesia care", since the anesthesiologists should be continually monitoring the patient during surgery and not just "standing by". **(Rajesh K. and Ezanee Mokhtar; 2008).**

ANATOMY

Knowledge of the anatomy of the orbit and its contents is necessary for the successful performance of regional anesthesia for ophthalmic surgery. This will make understanding the techniques described easier. ***(Fischer H. and Pinnock C.; 2004).***

Each orbit is in the shape of an irregular pyramid with its base at the front of the skull and its axis pointing posteromedially towards the apex. ***(Fig.1)***. The optic foramen lies at the apex, transmitting the optic nerve and accompanying vessels while the superior and inferior orbital fissures are located at the base, transmitting the other nerves and the vessels. ***(Fischer H. and Pinnock C.; 2004).***

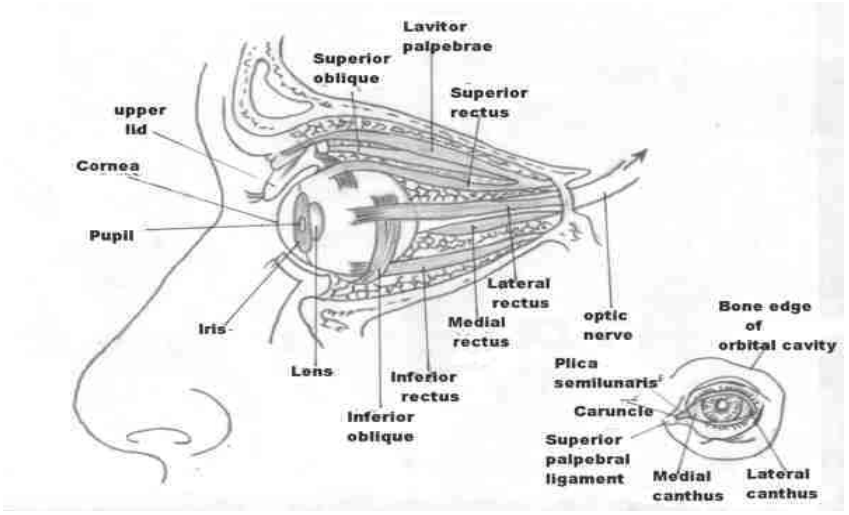


Fig.1: Anatomy of the eye ***(Kumar C. et.al; 2006).***

The orbit measures 40-50mm deep with a volume of approximately 30ml, 7ml of which is occupied by the globe and its muscular cone with the remainder composed of loose connective tissue. ***(Fischer H. and Pinnock C.; 2004).***

The angle between the lateral walls of the two orbits is approximately 90° and the angle between the lateral and medial walls of each orbit is nearly 45°. Thus, the medial walls of the orbit are almost parallel to the sagital plane; the sagital plane passes directly from front to back of the body. ***(Fig.2) (Fischer H. and Pinnock C.; 2004).***

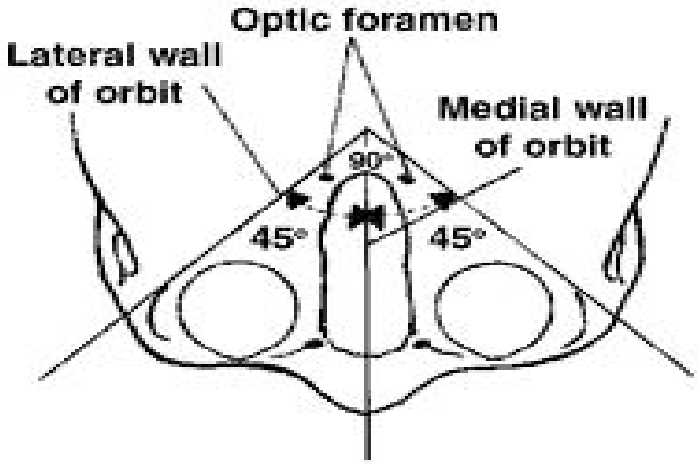


Fig.2: An illustrated view of both orbits ***(Fischer H. and Pinnock C.; 2004).***

The orbit contains the globe, orbital fat, extraocular muscles, nerves, blood vessels and part of the lacrimal apparatus. ***(Fig.3) (Kumar C., et.al; 2006).***

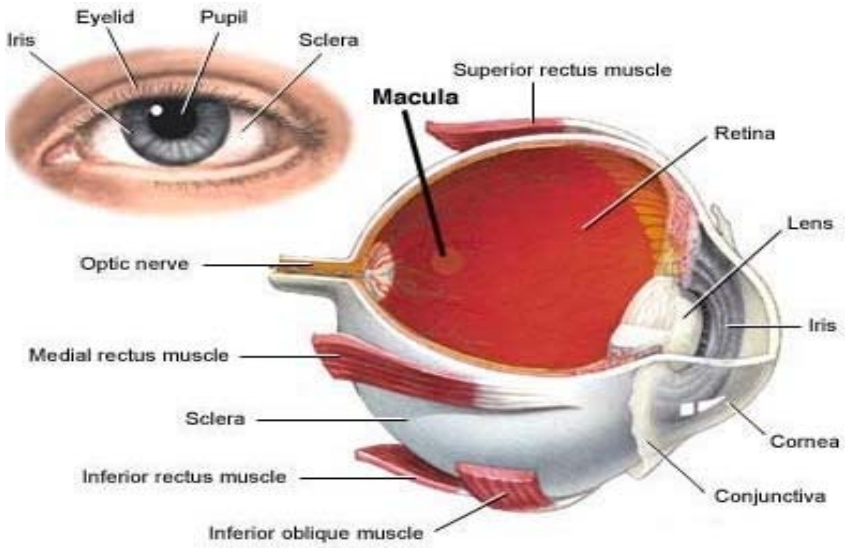


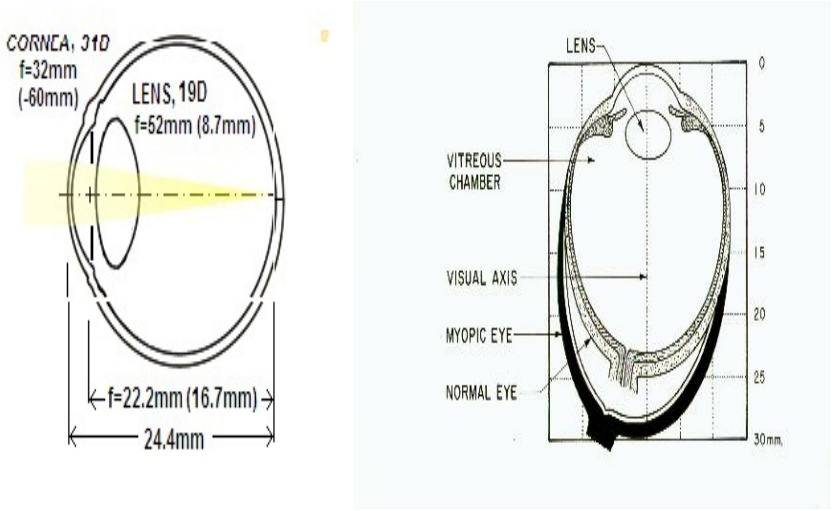
Fig.3: structures of the eye ***(Kumar C., et.al; 2006).***

❖ The globe:

Is situated in the anterior part of the orbital cavity closer to the roof than the floor and nearer to the lateral than the medial wall. ***(Fig.1) (Varvinskiy A.; 1996).***

The axial length of the globe is the distance from the corneal surface to the retina, measuring in adults roughly 25mm (range 12-35mm) and is often measured preoperatively. ***(Fig.4.a) (Varvinskiy A.; 1996).***

As the globe becomes more elongated - in high myopes - the sclera becomes thinned and staphylomata or outpunching of it can occur. This increases the risk of perforation of the globe especially for peribulbar or retrobulbar approaches. ***(Fig.4.b) (Varvinskiy A.; 1996).***



(a) **(b)**

Fig.4: a: The axial length of the globe

b: the axial length of highly myopic globe

(Varvinskiy A.; 1996).

Care should be taken for axial lengths >26mm and a sub-Tenon or general anesthesia technique should be considered, it is important to note that a sub-Tenon approach still carries a small risk of globe perforation under these circumstances. ***(Hammond E. and McIndoe A.; 2005)***.

❖ The sclera:

The sclera is the fibrous layer of the eyeball completely surrounding the globe except the cornea. It is relatively tough but can be pierced easily by needles. The optic nerve penetrates the sclera posteriorly 1- 2 mm medial to and above the posterior pole. The central retinal artery and vein accompany the optic nerve. The cone refers to the cone shaped structure formed by the extraocular muscles of the eye. ***(Fig .3) (Varvinskiy A.; 1996).***

❖ The orbital fat:

Is divided into central (retrobulbar,intracone) and peripheral (peribulbar, pericone) compartments by the cone of the recti muscles. The central space contains the optic, oculomotor, abducent and nasociliary nerves. The peripheral space contains the trochlear, lacrimal, frontal and infraorbital nerves. All the motor and sensory nerves can be blocked by an injection into the orbital fat. ***(Allman K. and Wilson I.; 2006)***.

❖ The extraocular muscles:

Each eyeball is held in position in the orbital cavity by various ligaments, muscles and fascial expansions that surround it. The intraconal space is bounded by the four rectii muscles, from the annulus of

Zinn (The common tendon from which arise the four rectii muscles of the eye and it surrounds the optic foramen) at the orbital apex, to their penetration through Tenon's capsule (A thin membranous socket that envelops the eyeball from the optic nerve to the ciliary region and allows it to move freely) before attaching to the globe. ***(Allman K. and Wilson I.; 2006)***.

Two pairs of rectii muscles run straight to the bony orbit of the skull orthogonal to each other (The superior rectus, the inferior rectus, the lateral rectus and the medial rectus muscles). A further pair of muscles, the oblique muscles (Superior oblique and inferior oblique) is angled as the name implies obliquely**.** These muscles, named extraocular muscles rotate the eyeball in the orbits and allow the image to be focused at all times on the fovea of central retina. ***(Fig.5*****) (Allman K. and Wilson I.; 2006)***.