

Ophthalmic Block Hands-On Simulation Workshop

FACULTY

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AGENDA

0700 Breakfast

0730 Orbital Anatomy

0930 Break

0945 Ophthalmic Blocks

1145 Lunch

1215 Simulation Training

1415 Workshop Concludes

**SPEAKER DISCLOSURE INFORMATION
OPHTHALMIC BLOCK HANDS-ON WORKSHOP**

Randy Harvey None to Disclose

1. ORBITAL ANATOMY

EXTRAOCULAR MUSCLES OF THE EYE (Figure1)

Superior Rectus Muscle: Moves Eyeball Upward (Supraduction)

Inferior Rectus Muscle: Moves Eyeball Downward (Infraduction)

Medial Rectus Muscle: Moves Eyeball Nasally (Adduction)

Lateral Rectus Muscle: Moves Eyeball Laterally (Abduction)

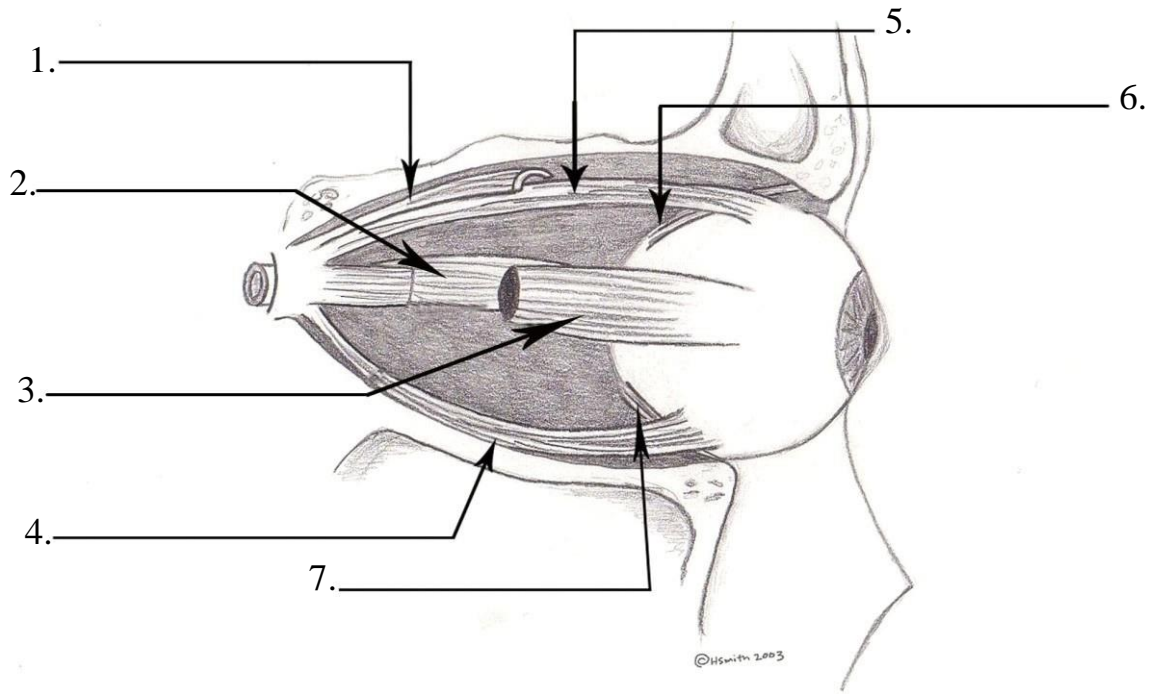
Superior Oblique Muscle: Depresses and Rotates Eyeball inward (Intorsion) on its axis

Inferior Oblique Muscle: Elevates and Rotates Eyeball outward (Extorsion) on its axis

RETRACTOR MUSCLES OF THE EYE LID

Levator Palpebrae Superioris: Raises the Upper Eye Lid (**Figure1**)

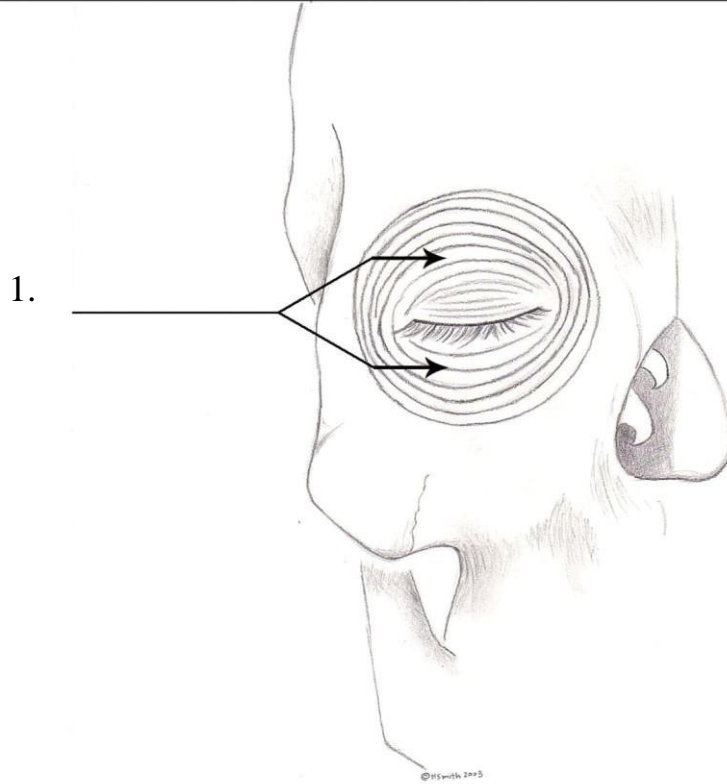
Muscles (Figure 1)



MUSCLES OF THE EYELIDS

Orbicularis Oculi: Closes the Eyelid (**Figure 2**)

Muscles of the Lids (Figure 2)



CRANIAL NERVES

Optic: C.N.II – Vision

The orbital portion of the optic nerve is 25-30 mm long and travels from the globe posteriorly within the muscle cone into the cranial cavity.

The optic nerve is continuous with the meninges of the brain. The fibrous wrappings of the dura, arachnoid and pia enclose the optic nerve.

The optic nerve sheath also contains the central retinal artery and vein.

Oculomotor: C.N. III – Motor Function to the following muscles: (Figure 3)

Superior rectus

Inferior rectus

Inferior oblique

Medial Rectus

Levator palpebrae superioris

Parasympathetic fibers to the iris sphincter muscles will constrict the pupil

(Figure 4)

Trochlear: C.N. IV (Figure 3)

Motor function to the Superior Oblique Muscles

Trigeminal: C.N. V – Sensory Nerves of the Orbit, Globe and Face (Figure 4)

Ophthalmic branch: pain, touch, and temperature to the cornea, ciliary body, iris, lacrimal gland, conjunctiva, nasal mucosa, eyelid, eyebrow, forehead, and nose

Maxillary branch: pain, touch, and temperature to the upper lip, nasal mucosa, and scalp muscle

Abducens: C.N. VI: (Figure 3)

Motor Function to the Lateral Rectus Muscle

Facial: C.N. VII

Motor Function to the Orbicularis Oculi, Superficial Face, and Scalp

Vagus: C.N. X:

Motor Function to the Intrinsic Muscles of the larynx, heart, lungs, and the GI tract. The nerve also forms a reflex arc with the trigeminal nerve via the extraocular muscles.

Motor Nerves (Figure 3)



BLOOD SUPPLY (Figure 5)

Ophthalmic Artery

Central retinal artery

Long and short posterior ciliary arteries

Lacrimal artery

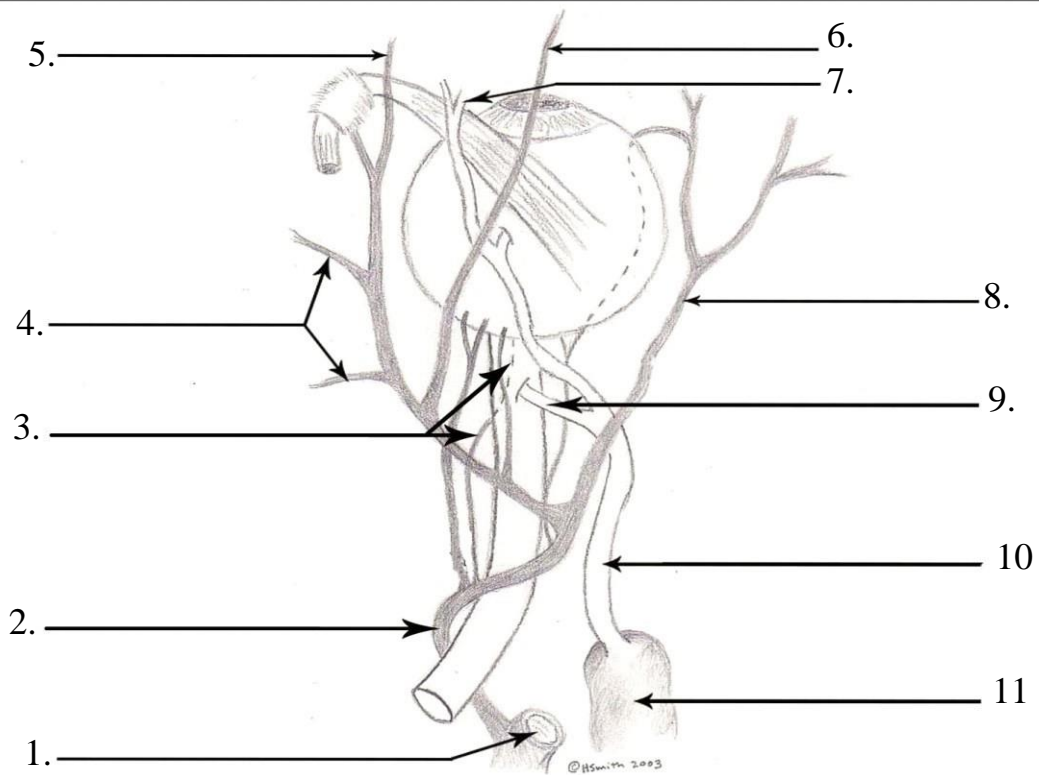
Venous Drainage

Superior and inferior orbital veins

Vortex veins

Central retinal vein

Vasculature of Orbit (Figure 5)



FASCIAL SHEATHS (Figure 6)

Tenon's Capsule:

Main function is to serve as a cavity within which the eyeball moves. It consists of fibrous connective tissue that covers the eyeball from near the corneal limbus where it is fused to the conjunctiva and extends to the optic nerve as it enters into the globe.

Anterior Fascial System:

An array of fibrinous membranes, both well developed and diffuse, which serve to support the globe and anterior orbital structures.

Originally, authors described an intermuscular membrane which connected the rectus muscles forming a separate intraconal compartment.

Later, works by Koornneef demonstrated this previously described separate intraconal compartment does not exist. There are a variety of irregular intermuscular septal membrane connections which pass between the ocular muscles and the orbital walls.

It is however, acceptable to use the terms intraconal and extraconal when describing the needle placement of orbital blocks, with the understanding that these conal areas are created by the changing boundaries of the extraocular muscles in their relationship to the bony orbit and globe. They are not completely separate entities as originally described.

Posterior Fascial System:

Koornneef also demonstrated the connective tissues in the posterior orbit are less developed than the anterior orbit.

There is a reduction in the number of fascial septa and the ocular muscles lie close to the orbital walls.

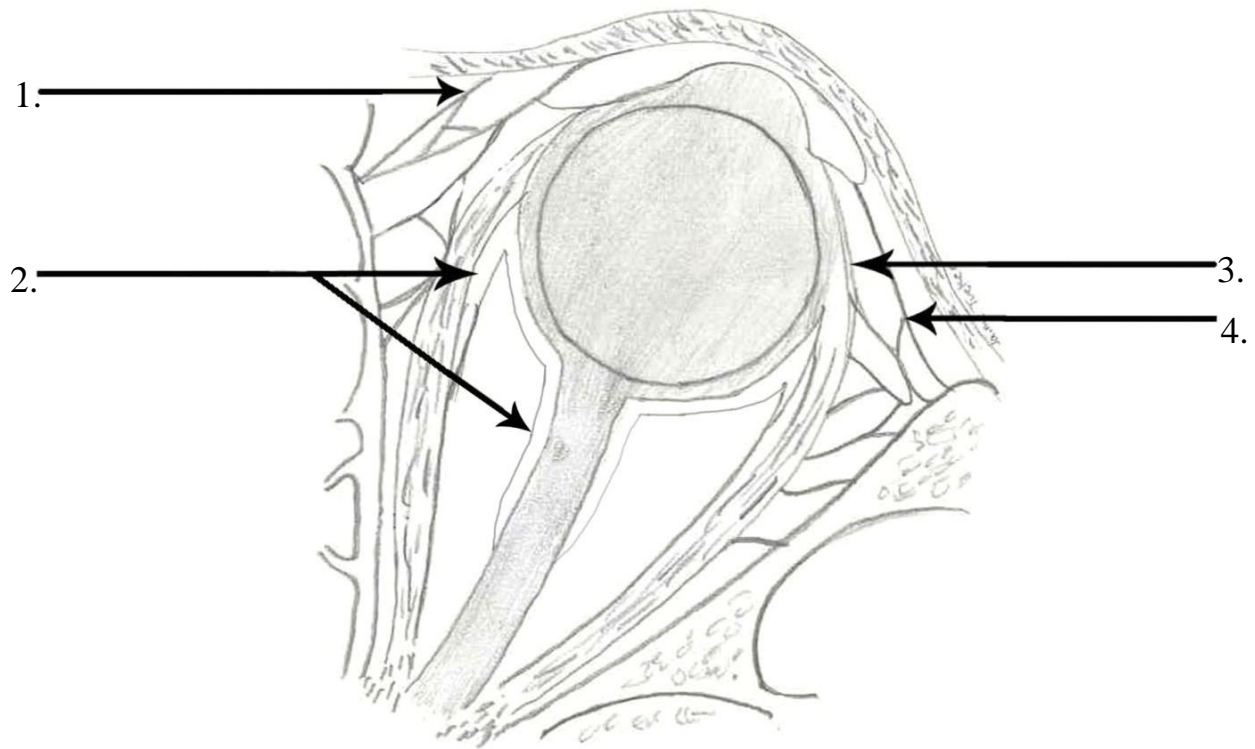
This results in no clear anatomic difference between the intraconal or extraconal compartments in the posterior orbit.

Intraconal and Extraconal Areas

The intraconal area begins in the orbital apex with the origins of the 5 extraocular muscles and continues anteriorly forming a cone shape. The muscle cone ends as the muscles insert into the globe.

The extraconal areas begin appearing in about the mid-orbit as the extraocular muscles move towards the globe, creating a space between the bony orbit and the extraconal areas created vary in size and depth.

ConnectiveTissue (Figure 6)



ORBITAL FOSSA (Figure 7)

Apex of the Orbit

Entry portal for all nerves and vessels to the orbit from the intra-cranial area

Optic foramen

Superior and Inferior orbital fissures

Site of origin of all the extraocular muscles except the inferior oblique

Medial Boney Orbit

Ethmoid bone

Lacrimal bone

Lacrimal fossa

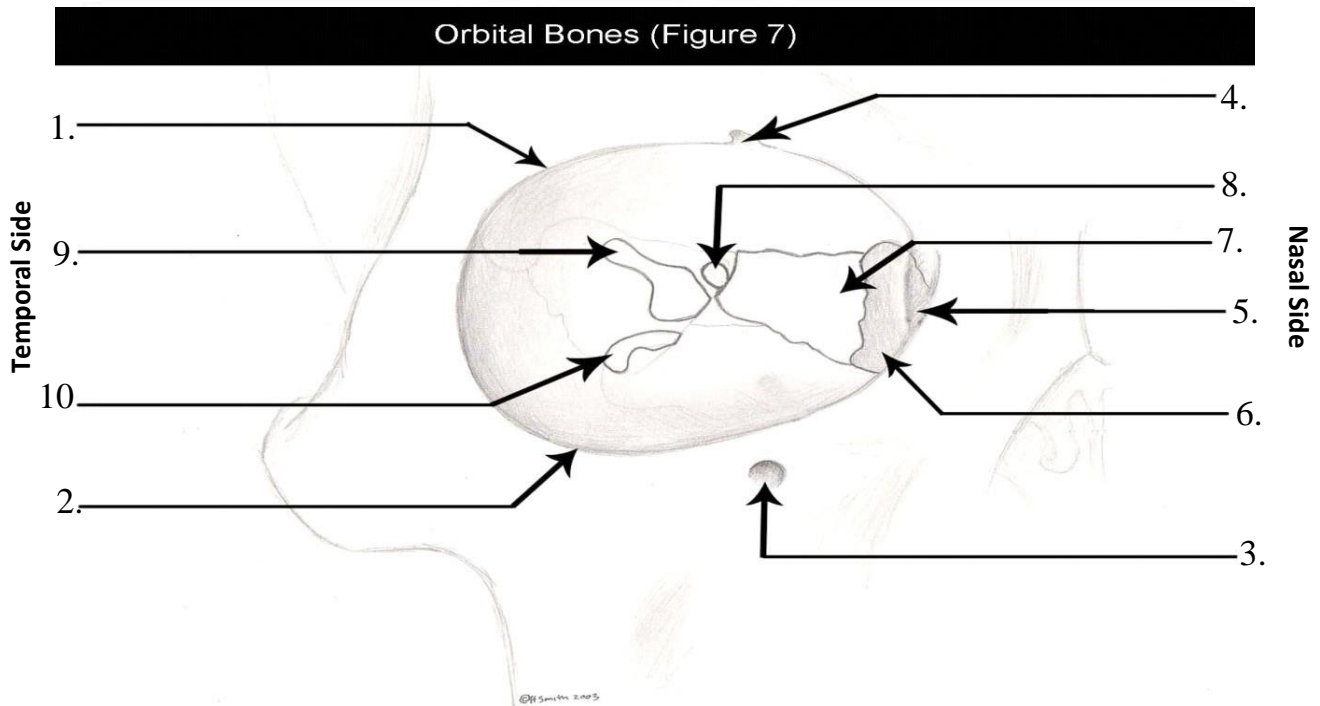
Anterior Orbital Rim

Supraorbital rim

Supraorbital notch or foramen

Infraorbital rim

Infraorbital foramen



EYEBALL (Figure 8)

Globe Diameter – Axial Lengths

Normal 23-23.5 mm

Hyperopic <22 mm

Myopic > 24 mm

Separate Coats or Tunics of the Eyeball

Sclera: outer fibrous protective layer posteriorly, white and opaque

Cornea: outer fibrous protective layer anteriorly transparent and color-less. The corneal endothelial cells actively pump out fluid (aqueous humor) to maintain the cornea's clarity.

Choroid: Middle vascular layer

Retina: Inner nervous layer

Limbus Area

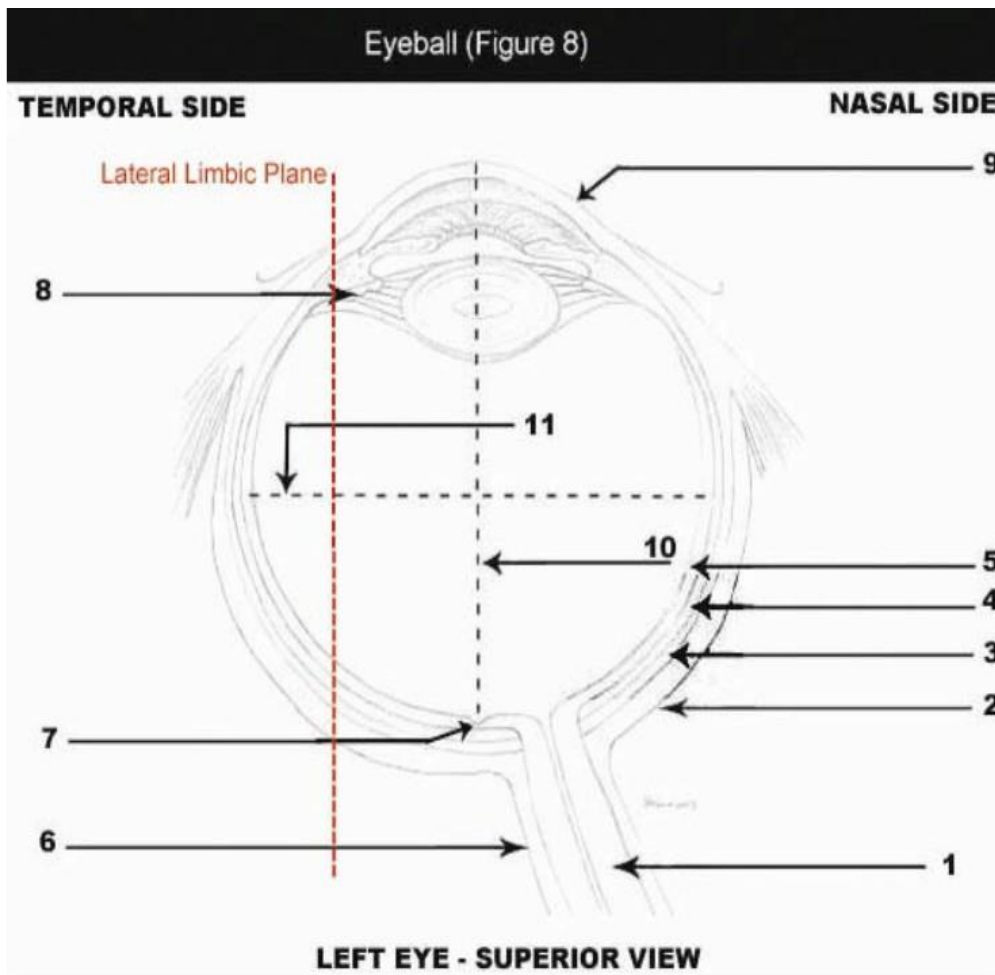
Corneal Scleral Junction

Staphyloma

A bulging balloon like area of the uvea, which includes the iris, ciliary body and choroid into stretched sclera. These may be anterior, equatorial or posterior. Posterior, the staphylomas are commonly located inferior to the posterior pole of the globe.

Conjunctiva

A thin transparent mucous membrane covering the posterior surface of the eyelids and the anterior surface of the sclera.



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Koornneef L. Orbital septa: anatomy and function. Ophthalmology. 1979; 86:876.

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Ophthalmic Blocks / Orbital Epidural Blocks

ANESTHETIC TECHNIQUES – RETROBULBAR BLOCK (RBB)

Atkinson Technique

Patient looks supra-nasally

Insert needle, just above the lower orbital rim, temporally, at the junction of the outer 1/3 and inner 2/3s of the inferior orbital rim transcutaneous or subconjunctival

Continue to insert the needle behind the globe into the muscle cone towards the orbital apex 1 3/8 inch (35 mm)

Aspirate

Inject 3 to 5 ml of the anesthetic solution into the Retrobulbar space (muscle cone)

Withdraw the needle and apply digital pressure

After a few minutes, check the block for akinesia. Ask the patient to look up, look down, look right, and look left.

Adverse Effects Commonly Associated with this Technique

Increased risk of retrobulbar hemorrhage

Increased risk of globe punctures

Increased risk of piercing the optic nerve sheath or blood vessels, resulting in respiratory arrest, seizures and/or loss of vision.

Recommended Modification of the Atkinson RBB Technique: (Figure 9)

Eye Position

Avoid the supranasal position

Use the primary gaze position

Use the down and out gaze position

Upward gaze position can be used with a parallel approach (Gills/Loyd Technique)

Needle length/depth of insertion

Use needles 1 to 1 ¼ inches

Insert the needle to a depth of approximately 1 inch (25mm), range ¾ inch (19mm) to 1 ¼ inches (31mm)

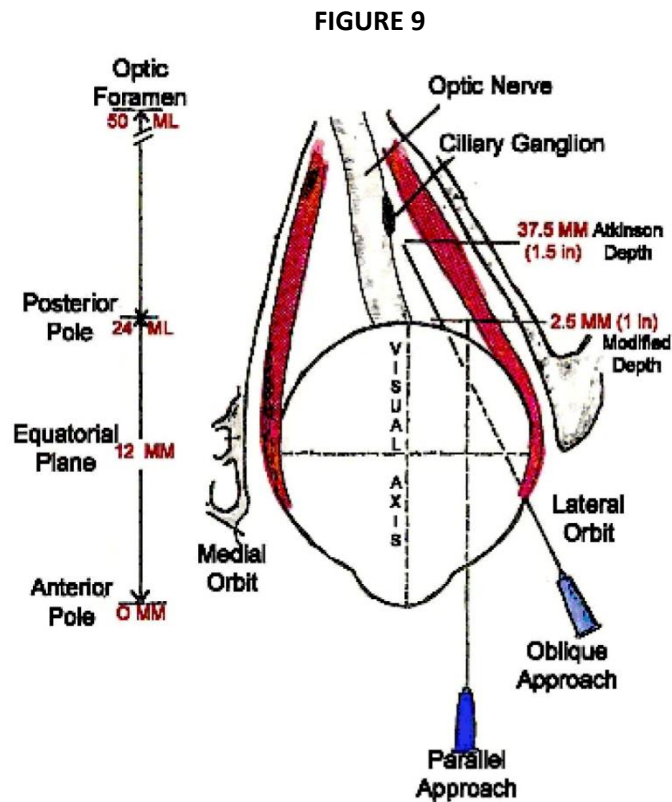
Needle angle or direction

- i. Angle or direct the needle more lateral to the orbital apex
- ii. Angle or direct the needle lateral to the lateral limbic margin/plane (parallel to the visual axis)
- iii. **Needle types specific for ocular blocks**

Sharp needles

Flat grind needles

Curved needles
Pinpoint needles



ORBITAL BLOCK TERMINOLOGY

Retrobulbar Blocks

Describe blocks where the needle is placed posterior to the globe.

Peribulbar, Periocular, Periconal, Retrobulbar, Ocular and Orbital Blocks

Describe blocks around the globe. If the needle tip is posterior to the posterior pole of the globe the blocks are also retrobulbar. Therefore, one can make a good argument that most of these blocks are Peribulbar/Retrobulbar blocks

Intraconal and Extraconal Areas

In keeping with Koornneef's works, I have defined the Intraconal and Extraconal areas as the changing boundaries of the extraocular muscles in their relationship to the bony orbit and globe.

Block Definition by Anatomical Site

Needle Site Placement

Infratemporal site* (approximately 2mm lateral to the lateral limbic margin/plane and approximately 2mm inferior to the globe)

Supratemporal site** (lateral to the 12 o'clock position along the lateral limbic margin/plane below the supraorbital rim)

Medial caruncle site*** (the medial caruncle)

Needle Depth and Angle

Intraconal: A needle inserted at the infratemporal site* to a posterior depth of 1-inch (25mm), or greater and angles 10 degrees or more towards the visual axis will enter the intraconal space.

Extraconal: A needle inserted at the infratemporal site or the Supratemporal site** to a posterior depth of 1-inch (25mm) angled parallel to the visual axis should remain in the extraconal space.

Extraconal: A needle at the medial caruncle*** site to a depth of approximately 12.5mm (½ inch), angled medially toward the lacrimal bone and away from the visual axis will remain in the extraconal space

Generic Block Names

Intraconal Peri/Retrobulbar

Commonly referred to as retrobulbar and modified retrobulbar blocks

Infratemporal insertion site

Needle tip inserted 1 inch (25mm) or greater and angled towards the visual axis

Extraconal Peri/Retrobulbar

May be referred to as peribulbar, periocular, periconal, and ocular blocks

Needle insertion sites

Infratemporal

Supratemporal

Needle tip must not angle towards the visual axis, less than 10 degrees, or exceed a depth of approximately 1 inch (25mm) to be extraconal

i. Extraconal (Peribulbar)

1. Medical Caruncle insertion site
2. The depth of the needle tip insertion is anterior to the posterior pole of the globe

A Geometrical Method Applied to an Orbital Block

Randolf Harvey, CRNA, BS, Florida Eye Clinic / ASC, Altamonte Springs, FL

BACKGROUND

Overview

At what distance should the needle be inserted around the globe before the tip can be safely rotated into the intraorbital space? This fundamental question, asked by practitioners, has not been clearly defined. With the development of a clinically applicable geometrical calculation assist the practitioner in determining the safe minimal distance to insert the needle before rotating intraorbitally!

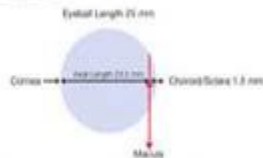
METHOD

Geometric Formula

Devise a geometrical formula to calculate in millimeters the distance to the equatorial plane of the globe from the infraorbital insertion site. Once the needle tip reaches the equatorial plane, the tangential point of a sphere, the curvature of the globe is no longer posterior to the needle. Beyond this calculated point the needle may be rotated intraorbitally.



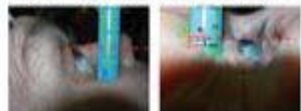
- Calculate the length of the eyeball:
Axial length (AL) 23.5mm + Corneal Scuris (C-S) length 1.5mm=25mm



- Calculate the distance to the Equatorial Plane (EP) of the globe:
Length of the eyeball 25mm/2=12.5mm



- Measure the patient's Orbital-Globe Relationship, the distance the globe extends over the infraorbital rim. This key measurement is taken by using a surgical marking pen's ruler in millimeters. The pen is placed against the skin infraorbitally at the superior edge of the infraorbital rim approximately 2mm lateral to the lateral limbic line.



The measurement is taken by observing the distance to the tip of the cornea, average distance from (7).

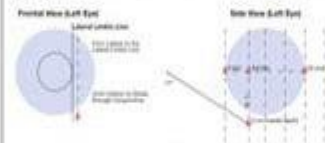
Orbital Block Technique

The measurements are derived from the frontal plane of the orbit and directed posteriorly. Therefore, the equation is for blocks performed in the same direction. That is lateral and parallel to the lateral limbic line/plane without any oblique angulations. These techniques have been in use for over 25 years. Gills and Loyd reported their technique in 1983 (2).

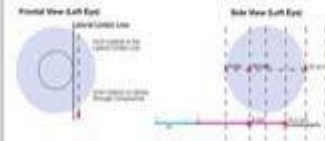
Analyzing this needle track to the mid orbit demonstrates a lack of vital orbital structures along the projected needle path except for the globe (1). However, Gills and Loyd do not address the question of needle insertion depth around the globe before the intraorbital rotation.

The Author's Technique

An infraorbital transconjunctival needle insertion is made with a 25-gauge (1-inch) needle with its bevel towards the globe, approximately 2mm lateral to the lateral limbic margin/sclera (cornea-sclera junction) and approximately 2mm inferior to the globe. The needle tip is directed approximately 120 degrees towards the orbital floor, until the conjunctiva is penetrated approximately 2mm. This angle avoids the needle tip pointing at the globe.



This needle tip is then redirected 90 degrees to the frontal plane of the orbit, parallel to the visual axis. Reassess your landmarks, then slowly advance the needle tip posteriorly approximately 0.5 inches (12.5mm) passing the equatorial plane of the globe.



Rotate the needle tip cephalad until the hub of the needle gently rests on the infraorbital rim about 60° to the frontal orbital plane. Reassess landmarks, and then slowly advance the needle tip to a depth of 25mm from the infraorbital rim. After negative aspirates, inject the local anesthetic at the rate of about 1-ml every 6 to 8 seconds until the orbit is full, approximately 6ml.



Reversing the insertion technique and withdrawing the needle angled at approximately 120-degrees, towards the orbital floor, to avoid the needle tip pointing towards the globe.

RESULTS

Geometrical Formula

Formula to calculate the distance to the equatorial plane

Axial Length (AL)	+23.5mm
Corneal Scuris (C-S)	+ 1.5mm
Eyeball Length	+25.0mm
Equatorial Plane (EP)	25mm / 2
Cornea to EP	+12.5mm
Cornea to Infraorbital Rim (IR)	8mm
Orbit-Globe Relationship (measured)	
Infraorbital Rim to the EP	13mm
Cornea to IR	+8.0mm
Distance to the EP	4.8mm

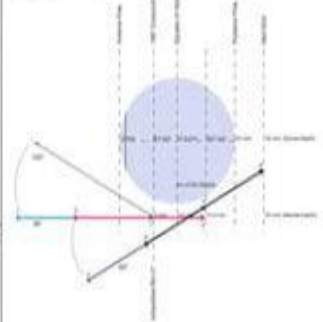
For the ease of clinical application the clinician may round all numbers to the next highest even whole number (i.e. AL 23.5 to 24, and C-S 1.5 to 2)

Axial Length (AL)	+24.0mm
Corneal Scuris (C-S)	+ 2.0mm
Eyeball Length	+26.0mm
Equatorial Plane (EP)	26mm / 2
Cornea to EP	+13.0mm
Cornea to Infraorbital Rim (IR)	8mm
Orbit-Globe Relationship (measured)	
Infraorbital Rim to the EP	13mm
Cornea to IR	+8.0mm
Distance to the EP	5mm

This slight elongation of the globe measurement also adds a margin of safety to the calculation.

Application of the Formula to an Block

The geometrical formula calculates the distance to the equatorial plane of the globe. Applying this distance to the author's block technique allows the practitioner to advance the needle tip a safe distance posterior to the equator before the intraorbital rotation.



Calculations Applied to Orbital Block

	Minimum	Normal	Maximum
Axial Length	20 mm	24 mm	30 mm
Cornea / Sclera	+2.0mm	+2.0mm	+2.0mm
Eyeball Length (AL)	22 mm	26 mm	32 mm
Equatorial Plane (EP) = (E) / 2	11 mm	13 mm	16 mm
Orbit / Globe Measured	-4 mm	-4 mm	-4 mm
Distance to EP	5 mm	9 mm	8 mm
Needs Inserter 0.5 inch	12.5 mm	12.5 mm	12.5 mm
Distance to EP	-2.0 mm	-5.0 mm	-5.0 mm
Needs tip distance beyond EP	-9.5 mm	-7.5 mm	-4.5 mm

Total blocks performed by the author utilizing the geometrical formula, including Axial Lengths of 20 mm and 30 mm

660

Total injuries to globe

000

CONCLUSION

Summary

A clinically useful geometrical formula can be used to calculate the distance to the equatorial plane of the globe, beyond which the globe, as a sphere, naturally curves away from the advancing needle tip. Utilizing the above described block technique, the practitioner may determine the depth beyond the equatorial plane they consider safe before the intraorbital rotation. This knowledge may potentially reduce binding injuries to the globe secondary to needle perforations. In the absence of distance marks on the needle, the use of a 1-inch (25mm) needle allows the practitioner to visualize when approximately 0.5 inch (12.5mm) of the needle has been inserted. In the author's experience with 666 blocks the distance has been several millimeters beyond the equatorial plane. There may be some rare circumstances when the 12.5mm is only slightly longer or shorter than the equatorial plane, therefore calculating the distance is preferable. This formula may also use empirical data if the axial length is not available.

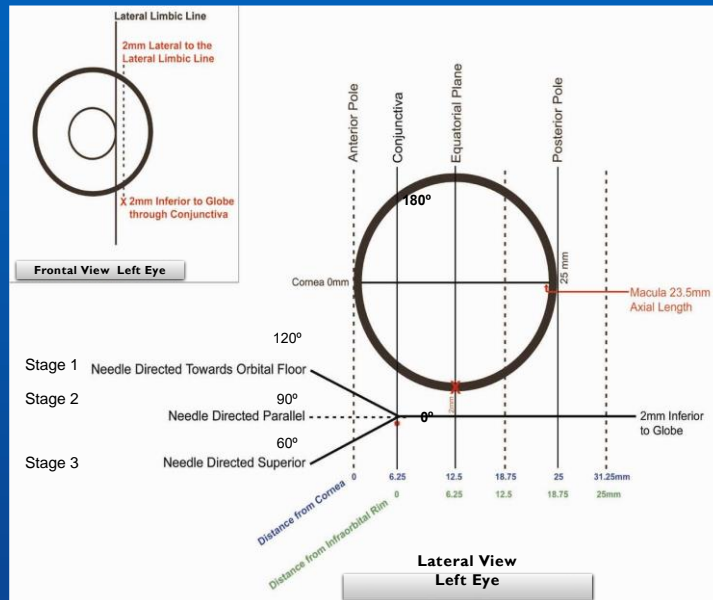
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For Further Information

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Globe and Needle



INFRATEMPORAL INTRACONAL PERI/RETROBULBAR BLOCK

Equipment

1-6ml or 10 mL syringe with 25-gauge 1 inch (25mm needle)

4X4 gauze pad

1" paper tape

Medications

Include, but are not limited to, the following medications and guidelines. These medications may be used separately or in any combination to achieve the desired effect.

Proparacaine 0.75%

Bupivacaine 0.75%

Lidocaine 2.0%

Hyaluronidase 2 units/ml

Technique

Patient reclined in a comfortable position; instill proparacaine eye drops in the lower conjunctival cul-de-sac.

The patient is requested to look directly overhead or primary gaze position.

Stage 1 – Infratemporal transconjunctival needle insertion is made with the bevel towards the globe. The needle tip is directed 120 degrees towards the orbital floor until the conjunctiva is penetrated approximately 2mm. **(Figure 10)**

Stage 2 – The needle tip is then redirected to 90 degrees parallel to the visual axis. Reassess your landmarks, and then slowly advance the needle tip posterior approximately 12.5mm (½ inch) passing the equatorial plane of the globe. Resistance may or may not be felt as the needle is advanced. **(Figure 12)**

Stage 3 – At this point, redirect the needle tip cephalad until the hub of the needle rests gently on the infraorbital rim about 60 degrees or less. Reassess your landmarks, and then slowly advance the needle tip behind the globe to a depth of 25mm (1 inch) measured from the infraorbital rim. Resistance may or may not be felt as the needle is inserted. **(Figure 12)**

After negative aspiration, inject 6 ml (+/- 2 ml) of the local anesthetic at the rate of 1ml per 6 to 8 seconds, until the orbit is full. **(Figure 13)**

The needle is withdrawn by reversing the 3-stages with the needle tip angled towards the orbital floor. This technique avoids the needle tip pointing towards the globe.

After withdrawing the needle, fold a 4X4 gauze and place over the closed eyelid. **Apply a moderate digital pressure for at least one minute before evaluating the block.**

This will reduce the increased orbital pressure by spreading the LA throughout the orbit and discover and reduce, if present, an orbital hemorrhage.

Block Evaluation – Instruct the patient to look superiorly, inferiorly, laterally and medially to evaluate for ocular muscular movement. The anesthetized eye is then taped closed.

The infratemporal intraconal Peri/Retrobulbar block may be repeated or an extraconal block technique may be used to achieve the desired effect as long as the total drug dosage does not exceed the maximum recommended dose for the anesthetic(s) administered.

Figure 10

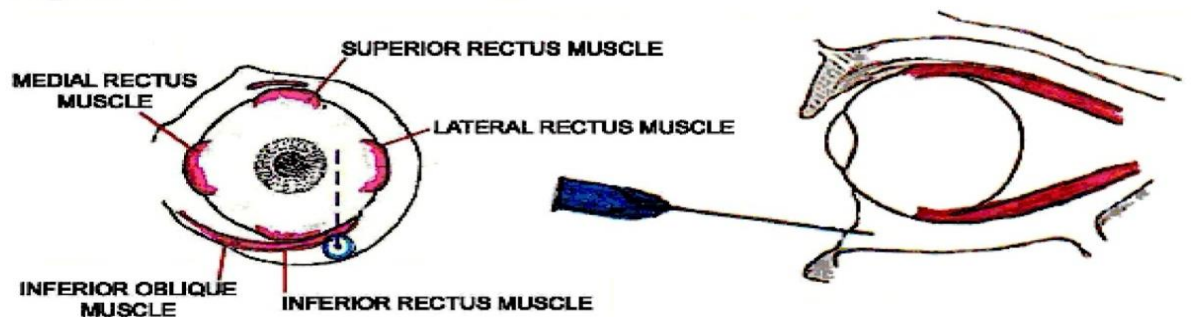


Figure 11 - Stage II

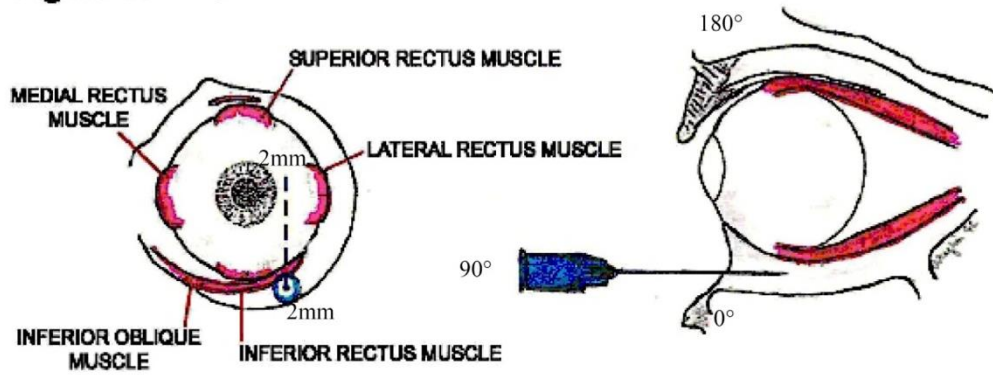


Figure 12 - Stage III

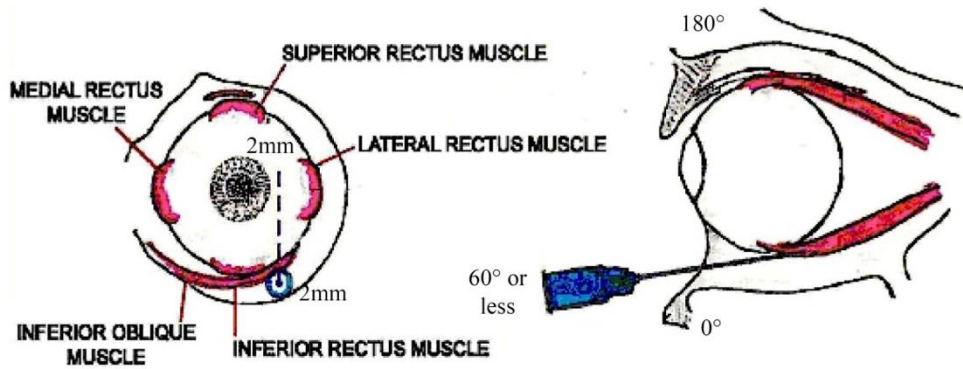
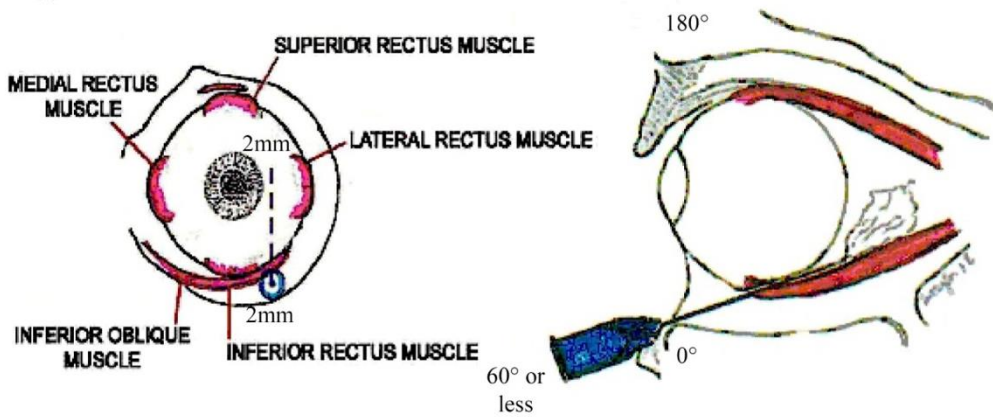


Figure 13 - Stage III



Orbital-Globe Relationship

- Axial Length (AL) = 30mm
(less than 0.1% population; Holiday 2 IOL calculation software 3/29/2011)
- Eyeball length: 30mm + 2 mm = 32mm
- Equatorial Plane (EP): $30/2 = 16\text{mm}$
- Needle insertion depth (IR) to EP
- | EP | IR to Cornea | IR to EP | 12.5mm(0.5inch) |
|------|--------------|----------|-----------------|
| 16mm | -10mm | = 6mm | +6.5mm |
| 16mm | - 8mm | = 8mm | +4.5mm |
| 16mm | - 6mm | =10mm | +2.5mm |
| 16mm | - 4mm | =12mm | +0.5mm |
| 16mm | - 2mm | =14mm | -2.5mm |

EXTRACONAL PERI/RETROBULBAR BLOCKS

Equipment

- 2-6 ml or 1-10ml syringe
- 1-25-gauge needle 1" (25mm)
- Alcohol/Betadine wipes
- 4X4 gauze pad
- 1 inch paper tape

Medications

Include, but are not limited to the following medications and guidelines. These medications may be used separately or in any combination to achieve the desired effect.

- Proparacaine eye drops
- Bupivacaine 0.75%
- Lidocaine 2.0%
- Hyaluronidase 2-15 units/ml

Techniques

Infratemporal Extraconal Peri/Retrobulbar Block

Patient reclined in a comfortable position; proparacaine eye drops are instilled in the lower conjunctival cul-de-sac. The upper eyelid is cleaned with an alcohol/betadine wipe.

The patient is then requested to look directly overhead or primary gaze position.

Stage 1 – Infratemporal transconjunctival needle insertion is made with the bevel towards the globe, approximately 2mm lateral to the limbic margin/plane (corneal-scleral junction) and approximately 2mm inferior to the globe. The needle tip is direction 120 degrees towards the orbital floor until the conjunctiva is penetrated approximately 2mm **(Figure 10)**

Stage 2 – The needle tip is then redirected to 90 degrees, parallel to the visual axis, reassess your landmarks, and slowly advance the needle tip behind the globe to a depth of approximately 25mm (1 inch) as measured from the infraorbital rim **(14b)**. Resistance may or may not be felt as the needle is advanced.

After negative aspiration, inject 6 ml or more of the local anesthetic at the rate of 1 ml per 6 to 8 seconds.

The needle is withdrawn by reversing the 2-stages with the needle tip directed towards the orbital floor. This avoids the needle tip pointing towards the globe.

After withdrawing the needle, fold a 4X4 gauze and place over the closed eyelid. Apply a moderate digital pressure for at least one minute before evaluating the block. This will reduce the increase orbital pressure by spreading the LA throughout the orbit and discover and reduce, if present, an orbital hemorrhage.

The onset of anesthesia is slower than with intraconal injections. The effectiveness of the block may be evaluated in 3 to 5 minutes, however may up to 10 minutes for full effect. Akinesia of the ocular muscles may or may not be achieved.

The Block Evaluation: Instruct the patient to look superiorly, inferiorly, laterally and medially to evaluate for ocular movement. The anesthetized eye is then taped closed.

The total drug dosage should not exceed the maximum recommended dose for the anesthetics administered.

Supratemporal Extraconal Peri/Retrobulbar Block (Figure 14a)

The injection is made **ONLY TRANSCUTANEOUS**, lateral to the twelve o'clock position along the lateral limbic line/plane and just inferior to the supraorbital rim.

Stage 1 – Depress the eyeball with your finger and identify the space under supra-orbital rim and above the eyeball. Insert the needle tip transcutaneous with the bevel towards the globe. Angle the needle tip 45 degrees superiorly away from the globe and visual axis until the skin and orbital septum are penetrated (**Figure 14a**).

Stage 2 – The needle tip is then redirected to 90 degrees, parallel to the visual axis, reassess your landmarks, and slowly advance the needle tip behind the globe to a depth of approximately 25 mm (1 inch) as measured from the supraorbital rim (**Figure 14a**).

After negative aspiration, inject 6ml or more of the local anesthetic at the rate of 1ml per 6 to 8 seconds.

The needle is withdrawn by reversing the 2-stages with the needle tip directed towards the orbital ceiling. This avoids the needle tip pointing towards the globe.

After withdrawing the needle, fold a 4X4 gauze and place over the closed eyelid. Apply a moderate digital pressure for at least one minute before evaluating the block. This will reduce the increased orbital pressure by spreading the LA throughout the orbit and discover and reduce, if present, an orbital hemorrhage.

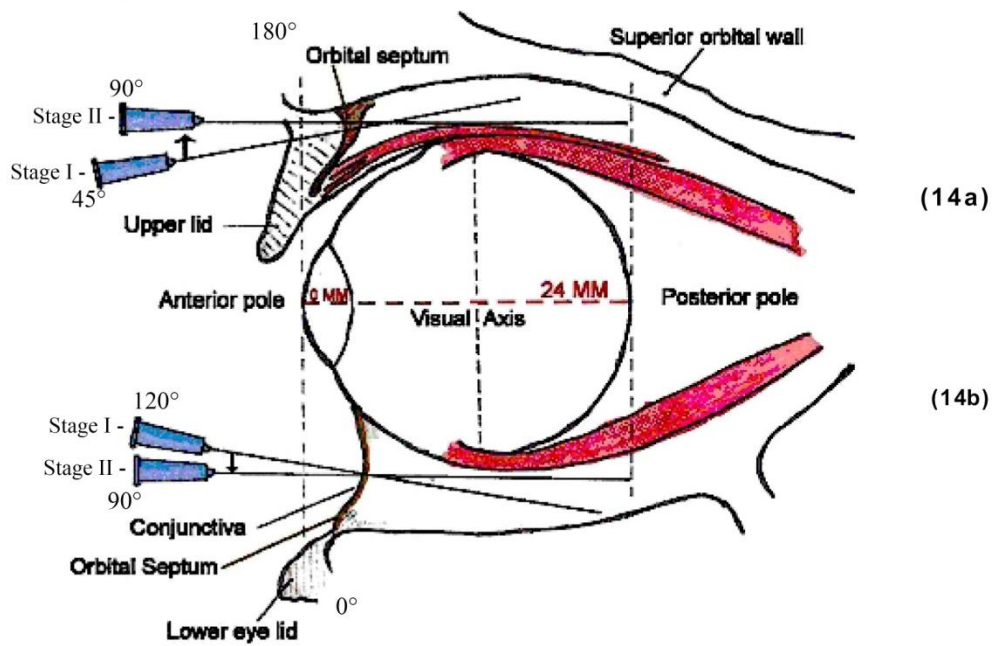
The onset of anesthesia is slower than with intraconal injections. The effectiveness of the block may be evaluated in 3 to 5 minutes, however may take up to 10 minutes for full effect. Akinesia of the ocular muscles may or may not be achieved.

Block Evaluation – Instruct patient to look superiorly, inferiorly, laterally and medially to evaluate for ocular movement. The anesthetized eye is then taped closed.

If residual motility is present, you may repeat the infratemporal injection for lateral or inferior eyeball movement, and the supratemporal injection for superior movement.

These extraconal techniques may also be used for residual motility after an intraconal injection. The total drug dosage should not exceed the maximum recommended dose for the anesthetics administer

Figure 14



MEDIAL CARUNCLE EXTRACONAL PERIBULBAR BLOCK

To provide anesthesia and akinesia of the Medial Rectus, Superior Oblique and the

Orbicularis Oculi Muscles (7th Nerve) for ocular surgery, by injecting anesthetic medications into the extraconal space which exists between the medial wall of the orbit and the medial rectus muscle. **(Figure 15)**

Equipment

1 – 3 ml syringe

1 – 30-gauge ½ inch needle

Medications

Include, but are not limited to, the following medications and guidelines.

These medications may be used separately or in any combinations to achieve the desired effect.

Bupivacaine 0.75%

Lidocaine 2.0%

Hyaluronidase 2 units/ml

Technique

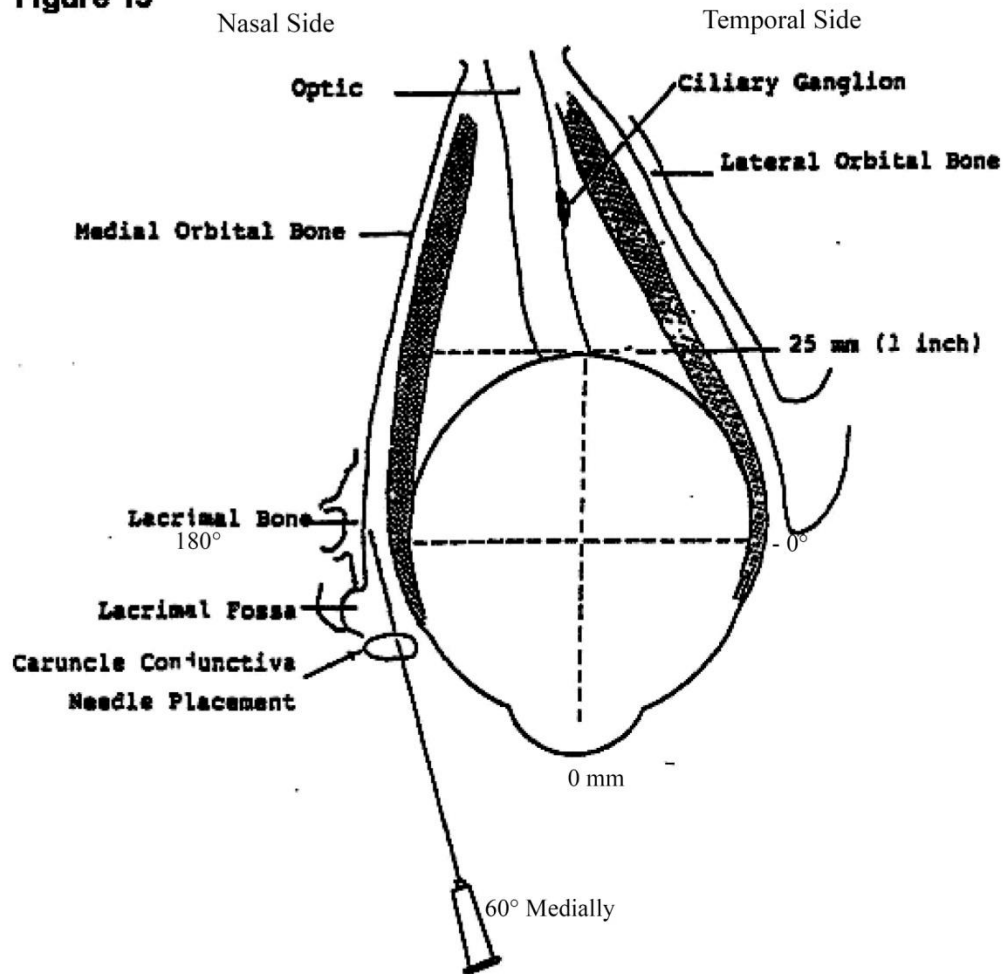
With the needle bevel towards the globe, insert the needle tip through the caruncle conjunctiva at about 60 degrees medially. Proceed medially and posteriorly towards the lacrimal bone, which is posterior to the lacrimal sulcus, to a depth of 12.5 mm (½ inch). After negative aspiration, inject 3 ml or more of the anesthetic solution.

The needle is withdrawn with the needle tip continuing to be directed towards lacrimal bone. This avoids the needle tip pointing towards the globe.

After withdrawing the needle, fold a 4X4 gauze and place over the closed eyelid. Apply a moderate digital pressure for at least one minute before evaluating the block. This will reduce the increased orbital pressure by spreading the LA throughout the orbit and discover and reduce, if present, and orbital hemorrhage.

Block Evaluation – Instruct the patient to look superiorly, inferiorly, laterally and medially to evaluate for ocular movement. The anesthetized eye is then taped closed.

Figure 15



BLOCK EVALUATION

Analgesia of the Globe generally proceeds akinesia of the eye muscles

Eye muscles

Superior Rectus: Moves eye upward – C.N. III

Inferior Rectus: Moves eye downward – C.N. III

Medial Rectus: Moves eye medially – C.N. III

Lateral Rectus: Moves eye laterally – C.N. VI

Superior Oblique: Depresses and rotates the eye on its axis, nasally (intorts) – C.N. IV

Inferior Oblique: Elevates and rotates the eye on its axis laterally (extorts) – C.N. III

ORBICULARIS OCULI ANESTHETIC (7TH NERVE BLOCK)

Equipment

- 1 – 6 ml syringe
- 1 – 30-gauge ½ inch needle
- 1 – alcohol/betadine wipes
- 1 – 4X4 gauze pad
- 1 – inch paper tape

Medication

Include, but are not limited to the following medications and dosage guidelines. These medications may be used separately or in any combination to achieve the desired effect.

Bupivacaine 0.75%

Lidocaine 2.0%

Technique

Patient reclines in a comfortable position.

The upper and lower eyelids are cleaned with an alcohol or betadine wipe.

Lower Eyelid: Identify the area infratemporally at the junction of the outer one-third and the inner two-thirds of the infraorbital rim. Insert the needle tip subcutaneously into the lower eyelid, with the needle tip bevel towards the globe. After negative aspiration, inject 1 to 2 ml of the anesthetic solution. Remove the needle and digitally distribute the LA throughout the lower eyelid.

Upper Eyelid: Identify the area supranasally at the junction of the outer two-thirds and the inner one-third of the supraorbital rim. Insert the needle tip subcutaneously into the upper eyelid, with the needle tip bevel towards the globe. After negative aspiration, inject 1 to 2 ml of the anesthetic solution. Remove the needle and digitally distribute the LA throughout the upper eyelid.

After the needle is withdrawn, apply light pressure over each injection site to decrease superficial bleeding and ecchymosis.

PROTOCOL FOR HONAN CUFF

To decrease intraocular pressure before surgery

The patient is placed in a sitting to reclined position.

The head strap is placed behind the patient's head.

The eye is taped closed

A 4X4 gauze pad is folded and placed over the closed and taped eye

The cuff is inflated to 30 mm hg.

CANTHOTOMY

To reduce ocular pressure after retrobulbar hemorrhage

Equipment

1 – straight hemostat

1 – plastic scissors

Procedure

If possible, inject lidocaine along the lateral cantus before performing the canthotomy.

Place hemostat in temporal direction along the lateral canthus extending to 4 to 6 millimeters over skin and clamp hemostat

Remove hemostat

Use plastics scissors and incise in the crush marks left by the hemostat

If bleeding in the area of the crush marks persists, clamp the bleeders with the hemostats

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Suggestions for Ophthalmic Block Preparation

Needles:

1-inch (25 mm) 25g BD or preference

1/2-inch (12.5 mm) 30g BD or preference

Mark the bevel on the shoulder of the needle

Medications:

0.75% Bupivacaine 5ml

2% Lidocaine 5 ml

Hyaluronidase 2 units/ml (20 units)

Mark the 4 ml and 6 ml on a 10 ml syringe so you can see the volume injected if the #'s are not visible.

Block Plan:

Keep needle bevel towards globe

1st Block; use Stage I and II with 1/2-inch 30g needle, 3 ml syringe with 0.25-0.5 ml of local anesthesia

2nd Block; use Stage I, II and III with 1-inch 25g needle, 10 ml syringe with appropriate volume of local anesthesia (ie: 6 ml +/- 2 ml)

Orbital Anatomy Answer Sheet

Muscles Figure 1

1. Levator Palpebrae Superiours
2. Medial Rectus
3. Lateral Rectus

4. Inferior Rectus
5. Superior Rectus
6. Superior Oblique
7. Inferior Oblique

Muscles of the Lids Figure 2

1. Orbicularis Oculi

Motor Nerves Figure 3

1. Superior Branch Oculomotor CN III
2. Inferior Branch Oculomotor CN III
3. Abducens CN VI
4. Trochlear CN IV

Sensory / Motor Nerves Figure 4

1. Trigeminal CN V
2. Maxillary Branch of the Trigeminal Nerve CN V
3. Infra-orbital Nerve Branch of the Maxillary Nerve
4. Ophthalmic Branch of Trigeminal Nerve CN V
5. Nasociliary Nerve Branch of Trigeminal Nerve CN V & its Intraconal branches
6. Lacrimal Nerve Branch of Trigeminal Nerve CN V
7. Frontal Nerve Branch of the Ophthalmic Nerve
8. Supra-orbital Nerve Branch of the Ophthalmic Nerve
9. Ciliary Ganglion
10. Short ciliary Nerve, a parasympathetic branch of the Oculomotor Nerve CN III

Vasculature of the Orbit Figure 5

1. Internal Carotid Artery
2. Ophthalmic Artery
3. Central Retinal Artery
4. Anterior & Posterior Ethmoidal Arteries
5. Supratrochlear Artery
6. Supraorbital Artery
7. Superior Ophthalmic Vein
8. Lacrimal Artery
9. Central Retinal Vein
10. Superior Ophthalmic Vein
11. Cavernous Sinus

Connective Tissue Figure 6

1. Medial Canthal Tendon

2. Tenon's Capsule
3. Tenon's Capsule
4. Lateral Canthal Tendon

Orbital Bones / Structures Figure 7

1. Superior Orbital Rim
2. Inferior Orbital Rim
3. Infraorbital foramen
4. Supraorbital Notch or Foramen
5. Lacrimal Fossa
6. Lacrimal Bone
7. Orbital Plate of the Ethmoid Bone
8. Optic Foramen
9. Superior Orbital Fissure
10. Inferior Orbital Fissure

Eyeball Figure 8

1. Optic Nerve
2. Tenon's Capsule
3. Sclera
4. Choroid
5. Retina
6. Tenon's Capsule
7. Macula
8. Ciliary Body & Muscle
9. Cornea
10. Visual Axis / **Axial Length**
11. **Equatorial Plane** of the Globe

**Ophthalmic Block Workshop / Simulation Training Program
Ophthalmic Anesthesia Society**

WORK SHOP PARTICIPATION: EYE BLOCK SIMULATOR RECORD:

I performed the following ophthalmic blocks on the simulator during this workshop:

Peri/Retrobulbar Block:

Intraconal Infratemporal approach: _____

Peri/Retrobulbar Block:

Extraconal Infratemporal approach: _____

Supratemporal approach: _____

Peribulbar Block:

Extraconal Medial Caruncle approach: _____

Name (print) _____ Date _____

_____ Practitioner Signature

This Ophthalmic Regional Block Workshop does NOT certify a participant to administer an ophthalmic regional block.

Clinical privileges to administer an ophthalmic block must be approved by the governing body of the facility in which the participant practices.

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