CURRENT THERAPY IN OPHTHALMIC SURGERY

SPAETH/KATZ

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Bending Moment Modeling in Radial Keratotomy

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ANESTHESIA FOR OPHTHALMIC PROCEDURES

ADVANCED OPHTHALMIC ANESTHESIA

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Retrobulbar anesthesia and peribulbar anesthesia are not separate entities. Rather they are on a continuum. As the anesthetic needle moves laterally from the retrobulbar space, the injection starts to become a peribulbar injection, and vice versa. Gills and Loyd, influenced by Kelman, have developed a modified retrobulbar technique. Gills has attempted to keep the needle in the retrobulbar area but in the lateral part of the ocular muscle cone. He emphasizes the importance of inserting the needle parallel to the optic nerve. Others inject even more laterally, i.e., in the periconal area (Fig. 1).

TECHNIQUE

Gills-Loyd Modified Retrobulbar Block

Before the anesthetic is administered, the patient's vision is checked and the A scan examined. Then, prior to the first injection, 2 drops of proparacaine are given topically. The eyes are either fixed in primary gaze or directed slightly superiorly, avoiding the superonasal position (Fig. 2). With sharp 27 gauge needles, entry is effected at LE 4:00, RE 8:00, 5 mm medial to the lateral canthus. The needle is inserted parallel to the optic nerve. A preretrobulbar injection of 1.5 ml of pH adjusted Xylocaine is administered subconjunctivally. After 30 seconds, a 5.0 ml retrobulbar injection of pH adjusted bupivacaine and hyaluronidase is injected with a 25 gauge, 1¼ inch needle. After 8 or 9 minutes, the eye is checked for akinesia. A 1 to 3 ml supplemental injection of full strength anesthetic is given as needed to complete the block (Fig. 3). A 1.0 ml bolus is administered subdermally into the inferolateral lid to anesthetize the distal branches of the seventh cranial nerve; this technique does not require a total seventh nerve block. Next 0.5 ml of cefazole is injected subconjunctivally, and gentle eye compression is administered for 30 to 60 minutes with a Super Pinky Decompressor prior to surgery (Tables 1, 2).

Solutions Used for Ocular Anesthesia (Gills-Loyd Technique)

1. Topical anesthetic solution
   Proparacaine, 0.5 percent
2. Preretrobulbar solution
   Xylocaine, 1.0 percent, with epinephrine, 1:100,000
   Indomethacin sodium trihydrate, 0.17 mg per ml
   Sodium bicarbonate, 8.4 percent, 1 mg per ml to adjust pH to 6.8 to 7.0
   Hydrocortisone sodium succinate, 1.3 mg per ml
3. Retrobulbar solution
   Bupivacaine hydrochloride with epinephrine, 1:200,000
   Hyaluronidase, 150 USP units per ml; 0.35 to 4.0 ml per 30 ml bupivacaine (1.75 units per ml)
   Hydrocortisone sodium succinate, 1.3 mg per ml
4. Prophylactic antibiotic therapy
   Cefazole, 0.4 g per ml

Indomethacin, a nonsteroidal anti-inflammatory drug, is added to the preretrobulbar solution. The presence of indomethacin creates a large and stable pupil at

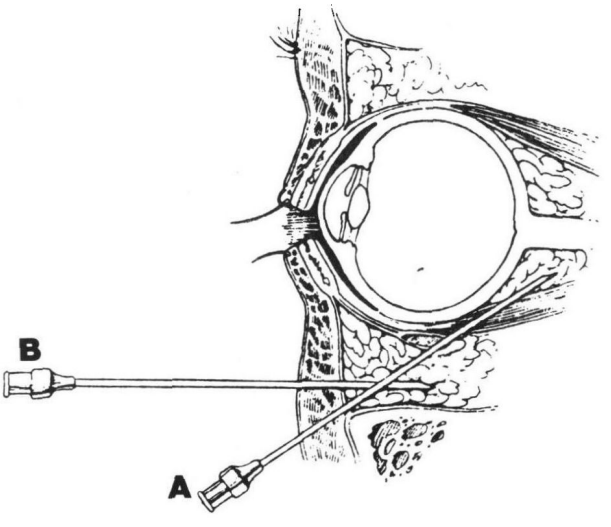

Figure 1 *A*, Retrobulbar injection. *B*, Peribulbar injection.

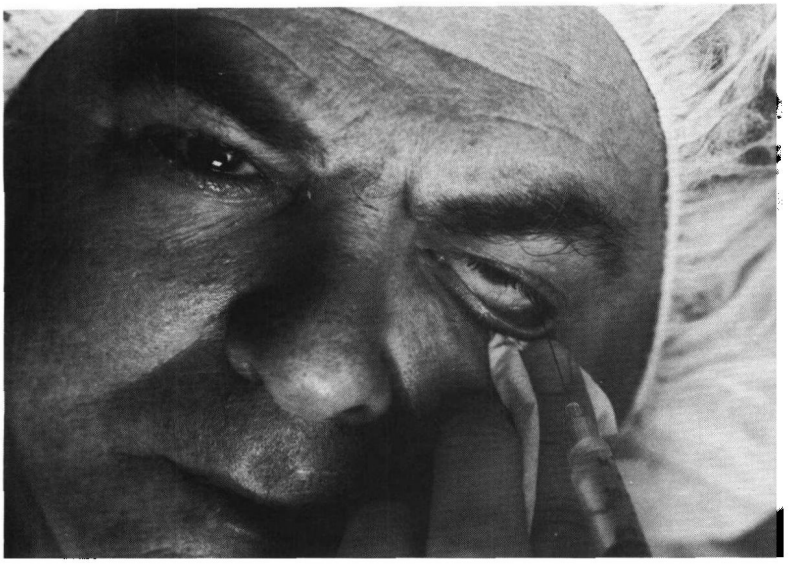

Figure 2 The retrobulbar injection is directed in line with the lateral limbal margin with the eye looking upward but not upward and nasally.

the time of surgery and decreases ocular inflammation after surgery by inhibiting prostaglandin synthesis. Indomethacin is safer than, yet just as effective as, steroids. Thus indomethacin can decrease the use of or replace steroids.

Peribulbar Anesthesia (D.B. Davis)

Stage I includes 2 injections of lidocaine, 1.0 percent. One injection is made inferior to the globe; the other superior (Fig. 4). For the inferior injection, entry is made just above the orbital rim, approximately 10 mm medial to the lateral canthus. One-half milliliter of lidocaine, 1.0 percent, is injected directly into the orbicularis oculi muscle, followed by a 1.0 ml injection of the same solution beneath the muscle. The same procedure is repeated for the superior injection. A folded 4 by 4 inch pad is placed over the injection site to decrease ecchymosis.

Stage II of the anesthesia uses a solution consisting of 4.0 ml of bupivacaine, 0.75 percent, mixed with 4.0 ml of lidocaine, 1.0 percent without epinephrine, and 1.0 ml of hyaluronidase. A 23 gauge, 1¼ inch needle is used. Transcutaneous entry is effected above the inferior rim,

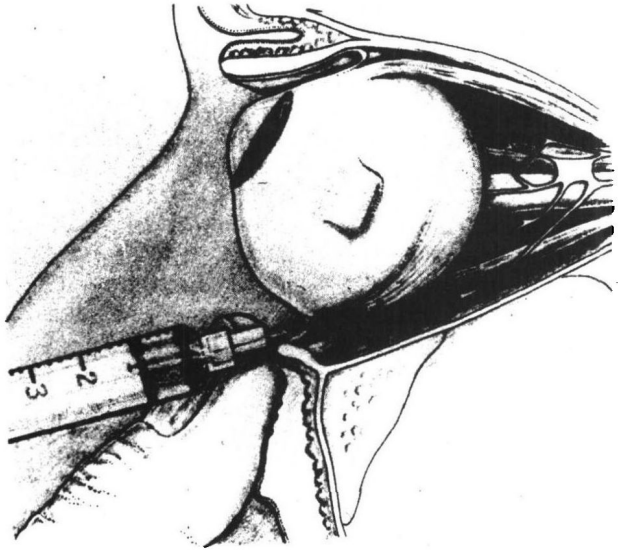

Figure 3 The transconjunctival injection is made tangential to the globe. The slightest scleral contact will cause the eye to turn downward. Puncture of the globe is less likely than with a transcutaneous injection.

TABLE 1 Gills-Loyd Modified Retrobulbar Block

Topical anesthesia of cul de sac
Eyes in primary gaze and relaxed
Needle entry LE 4:00, RE 8:00, 5 mm medial to lateral canthus parallel to optic nerve
Preretrobulbar injection:
27 gauge 1 inch needle
1.5 ml of 1% xylocaine, indomethacin, pH adjusted to 6.8 to 7.0
Wait 30 seconds
Retrobulbar injection:
25 gauge, 1¼ inch needle
5 ml of bupivacaine, hydrocortisone sodium succinate, hyaluronidase, pH adjusted to 6.5
Wait 8 to 9 minutes
3 ml supplemental retrobulbar injection
1 ml subdermal injection for distal branches of seventh nerve
0.5 ml subconjunctival injection of cefazole

TABLE 2 Do's and Do Not's of Ophthalmic Anesthesia

Do not use the orbital rim as a fulcrum.
Do stay in one plane when inserting the needle.
Do not intentionally penetrate anything but conjunctiva.
Do insert the needle only 1 inch.
Do pericone field block for deep set, small orbit myopes, and children.
Do not force the injection; if resistance is encountered, reposition the needle.

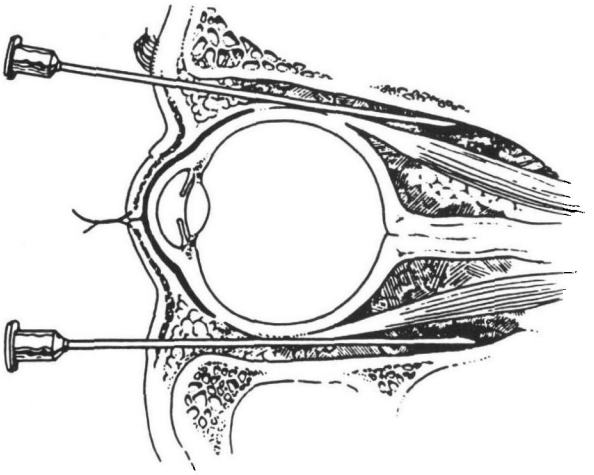

Figure 4 Lateral view of injection sites. Stage I of Davis' peribulbar anesthesia includes injections inferior and superior to the globe. (From Davis DB, Mandel MR. Posterior peribulbar anesthesia. J Cataract Refractive Surg 1986;12:183.)

15 mm medial to the lateral canthus. Stage II includes six injections of the anesthetic solution:

1. 1.0 ml beneath the orbicularis oculi.
2. 1.0 ml at the equator of the globe.
3. The barrel of the syringe is angled over the malar eminence, and the needle is advanced 1¼ inch in a superior and medial direction, at which point 1.0 to 2.0 ml is injected.
4. 1.0 ml beneath the orbicularis oculi medial to the needle entry point.
5. 1.0 ml at the superonasal equator.
6. 1.0 ml posterior to the superior orbital fissure.

Next a folded 4 by 4 inch pad is placed over the closed eyelids with firm pressure for 1 minute. A Super Pinky Decompressor is then applied for 30 to 60 minutes. Three to 4 ml supplemental injections of the full strength anesthetic are given as needed to achieve complete akinesia.

An Alternative to the D.B. Davis Peribulbar Technique

First, 2 drops of proparacaine are given to effect topical anesthesia of the cul de sac. The eyes are fixed in primary gaze. The first injection, the preperibulbar injection, is given using a sharp 27 gauge, 1¼ inch needle. Entry is effected at LE 4:00, RE 8:00, 5 mm medial to the lateral canthus. Then 1.5 ml of pH adjusted Xylocaine is administered subconjunctivally. This is a comfortable injection that sufficiently desensitizes the periorbital area so that the peribulbar injections with full strength anesthetic can be administered, with a significantly reduced level of pain. After 30 seconds, two peribulbar injections are given. The first is made transconjunctivally, LE 4:00, RE 8:00, 5 mm medial to the lateral canthus. Five milliliters of bupivacaine is injected using a 25 gauge, 1¼ inch needle. The needle is inserted 1¼ inches. Two minutes later the second peribulbar injection is given. The needle is inserted transcutaneously to a depth of 1¼ inches between the superior orbital rim and the globe, 2 mm medial to the center line through the iris. Here 5.0 ml of the anesthetic solution (a mixture of 2.5 ml of bupivacaine, 0.75 percent, and 2.5 ml of carbocaine, 2.0 percent) is injected. Supplemental peribulbar injections of full strength anesthetic are given as needed to complete the block.

ANATOMIC CONSIDERATIONS

Koorneeff suggests that the ocular muscle cone is permeable, variable in structure, and incomplete (Fig. 5). Anteriorly there are well formed intermuscular septa

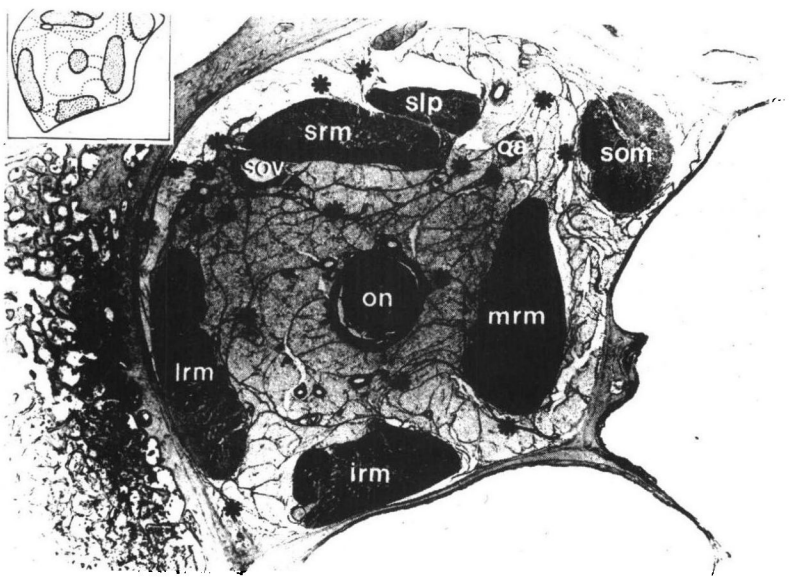

Figure 5 Section taken 8.9 mm from the back of the eye. Vertical diameter, 2.0 cm; transversal diameter, 2.2 cm. Enlargement approximately 3.5×; on = optic nerve; slp = superior levator palpebrae muscle; srm = superior rectus muscle; lrm = lateral rectus muscle; irm = inferior rectus muscle; mrm = medial rectus muscle; som = superior oblique muscle; oa = ophthalmic artery; sov = superior ophthalmic vein; and * = connective tissue septa.