Combined Topical and Subconjunctival Anesthesia in Cataract Surgery
Charles Joseph Anderson, MD

ABSTRACT
A combined technique of topical anesthesia (TA) and subconjunctival anesthesia (SCA) was used in 73 consecutive patients undergoing scleral tunnel phacoemulsification cataract surgery. Medical records were evaluated preoperatively, intraoperatively, and postoperatively. A patient questionnaire was used to obtain subjective intraoperative and postoperative information. Preoperative and intraoperative sedation of varying degrees was necessary. Ninety-five percent of the patients reported no pain. No patients required additional retrobulbar or peribulbar anesthesia. The most frequent postoperative problems were pain, a need for patching, and headache. The combined TA and SCA technique appeared safe, medically acceptable, and cost-effective.

The first ophthalmologist to use cocaine as a topical anesthetic was Koller, an associate of Freud, in Vienna in 1884.1 The same year, Knapp reported numerous medical and surgical uses for both topical and local cocaine anesthesia, including the first description of retrobulbar anesthesia.2 At the turn of the century, topical anesthesia (TA) often was supplemented by subconjunctival anesthesia (SCA) in cataract surgery.3 Recently, there has been a renewed interest in the use of SCA and TA in phacoemulsification and intraocular lens cataract surgery.

We describe a combined TA and SCA technique for use in cataract surgery that provides anesthesia to the limbal nerve plexus, as well as to the long posterior ciliary nerves that pass through the sclera at the horizontal meridians of the globe.

METHODS
Seventy-three consecutive patients, 58 women and 15 men, underwent phacoemulsification cataract surgery using a combined TA and SCA anesthesia technique. The surgical procedures, performed over 2 months, used a superior scleral-corneal tunnel, a 3.2-millimeter, no-stitch incision, and a 6-millimeter round silicone intraocular lens. The surgery was performed by a single experienced surgeon (C.J.A.).

An anesthesiologist evaluated each patient for the preferred amount of preoperative sedation, and the eyes were anesthetized superficially with proparacaine drops. Three drops of topical 4% sterile lidocaine anesthesia were given every 5 minutes starting 20 minutes before surgery (12 total drops). The patients were prepped and draped, and the lid speculum was inserted.

Immediately before surgery, the SCA was given by the operating surgeon under direct visualization with the operating microscope. The conjunctiva was elevated with a smooth forceps and approximately 0.25 cc of a 50:50 mixture of 4% lidocaine and 0.75% bupivacaine with hyaluronidase was injected subconjunctivally using a 30-gauge needle (Figs 1-2). The chemosis created by the injected anesthetic was spread in both a nasal and temporal direction around the limbus to the horizontal 3 and 9 o'clock positions (Figs 3-4). The purpose of spreading the anesthetic was to remove it from the superior incision site, to give it time to take effect, and to place it closer to the horizontal location of the long posterior ciliary nerves that bifurcate to the iris, ciliary body, and corneal-limbal nerve plexus. In the operating

From the Department of Ophthalmology, University of Wisconsin, Madison, Wis.
Reprint requests should be addressed to C. Joseph Anderson, MD, Davis Duehr Eye Associates, 1025 Regent St, Madison, WI 53715.
room, all patients were monitored by an anesthesiologist or a nurse anesthetist; all were given appropriate sedative and analgesic medication.

Following surgery, objective data from the preoperative, intraoperative, and postoperative periods were collected from the medical records. Subjective data regarding the surgical and postoperative experience were collected by a questionnaire from patients within 1 week of surgery.

RESULTS

A mild preoperative sedation was administered to all patients to provide relaxation and amnesia (Table 1). No intraoperative sedative or analgesic medication was used in the majority of patients (Table 2). Ninety-five percent reported no pain during surgery. The pain experienced by 5% of the patients did not require interruption of surgery or additional use of retrobulbar or peribulbar anesthesia. Intraoperative pain was managed successfully by administering additional topical, subconjunctival, or intravenous sedative analgesic drugs (Table 2). The surgical procedures were uncomplicated, lasting an average of 13.5 minutes (range to 7-33 minutes). Postoperatively, the most common complaints or problems were pain, patching, and headache (Table 3). The most frequent postoperative description of pain was a foreign body sensation on the day of surgery. The operative eye was patched if the patient requested it or it was needed for patient comfort. However, the preference of the surgeon was not to patch operative eyes.

DISCUSSION

In this consecutive series, the combined TA and SCA technique provided excellent anesthesia with no serious complications. A number of other authors have docu-
TABLE 1
Preoperative Sedation (Combined TA/SCA [n = 73])

<table>
<thead>
<tr>
<th>Agent</th>
<th>Percent of Subjects</th>
<th>Average Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midazolam</td>
<td>100</td>
<td>1.99 mg</td>
</tr>
<tr>
<td>Alfentanil</td>
<td>4</td>
<td>417 μg</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>1</td>
<td>10 μg</td>
</tr>
<tr>
<td>Flumazenil</td>
<td>1</td>
<td>0.2 mg</td>
</tr>
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</table>

TABLE 2
Intraoperative Medications (Combined TA/SCA [n = 73])

<table>
<thead>
<tr>
<th>Agent</th>
<th>Percent of Subjects</th>
<th>Average Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Midazolam</td>
<td>25</td>
<td>1.31 mg</td>
</tr>
<tr>
<td>Alfentanil</td>
<td>7</td>
<td>400 μg</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>3</td>
<td>25 μg</td>
</tr>
<tr>
<td>Labetalol</td>
<td>21</td>
<td>5.5 mg</td>
</tr>
<tr>
<td>Flumazenil</td>
<td>1</td>
<td>0.1 mg</td>
</tr>
</tbody>
</table>

TABLE 3
Postoperative Complaints and Problems (Combined TA/SCA [n = 73])

<table>
<thead>
<tr>
<th>Complaint</th>
<th>Percent of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>21</td>
</tr>
<tr>
<td>Patched</td>
<td>8</td>
</tr>
<tr>
<td>Headache</td>
<td>5</td>
</tr>
<tr>
<td>Vomit</td>
<td>1</td>
</tr>
<tr>
<td>Ptosis-diplopia</td>
<td>0</td>
</tr>
</tbody>
</table>

mented the effectiveness of SCA used alone. TA also has been reported effective used alone. Combining the two techniques, TA and SCA, may provide optimal anesthesia not obtainable by either administration technique alone. TA provides excellent superficial anesthesia at the cornea and conjunctiva. However, its effectiveness in providing adequate anesthetic concentration in the anterior chamber and iris structures is not well documented. On the other hand, SCA has been shown in rabbit studies to provide measurable concentrations in the anterior chamber and iris. SCA, in contrast to TA, is not diluted by tears. Furthermore, SCA can be spread around the limbal nerve plexus toward the horizontal meridians near the scleral long posterior ciliary nerves. These two long ciliary nerves (branches of the nasociliary nerves) are a major source of sensory innervation to the iris, ciliary body, and cornea.

The major benefit of the combined technique is its safety. The needle tip is directly visualized by the operating surgeon during the SCA injection. Other local anesthetic techniques, such as retrobulbar and peribulbar involve blind-needle injections and resulted in cases of globe perforations, especially in axial myopes. An additional safety feature is the relatively low amount of anesthetic needed to provide anesthesia. Higher-volume retrobulbar and peribulbar techniques have been associated with other ocular complications, including retrobulbar hemorrhage, optic atrophy, retinal vascular occlusion, diplopia, blindness, and systemic complications such as seizures and respiratory arrest. Additionally, the combined TA and SCA technique obviated administering a separate preoperative local anesthetic, saving time and money.

An especially gratifying benefit of the combined TA and SCA technique was the high level of patient satisfaction. The nonpatched patients all were pleased they could see out of the operative eye immediately after surgery.

TA, SCA, or other minimal anesthetic techniques have some potential disadvantages. Intraoperative and postoperative patient discomfort is possible and could create a major problem. Although severe intraoperative pain was not encountered in the present series, the surgeon should be prepared to handle it with a retrobulbar or peribulbar anesthetic if necessary. Also, prolonged surgery might require additional local anesthetic.

Another potential problem is the lack of akinesia during surgery. In the present series, stabilization of the eye was adequate during two-handed phacoemulsification. Also, fixation was possible with forceps. Lack of akinesia allowed the patient to look down for exposure, obviating a superior bridle suture. Eliminating the bridle suture prevents accidental penetration with the needle, which could cause subconjunctival hematomas.

In addition, extraocular muscle tension could raise intraocular pressure during surgery. However, as compared with more conventional retrobulbar or peribulbar anesthesia, no added pressure or vitreous thrust was noted in our series. In fact, the pressure seemed less, probably because only a small amount of SCA (0.25 cc) was injected, as opposed to the 3 to 10 cc of anesthetic injected in retrobulbar or peribulbar administration.

In summary, while this uncontrolled study cannot be used to compare the combined TA and SCA technique with other techniques, it did provide safe, medically acceptable, time-efficient, and cost-effective anesthesia technique in 73 consecutive small-incision cataract surgeries.
REFERENCES


