dopsin in a micellar species, which results in a modified conformation.

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Key words: rhodopsin, detergent removal, regeneration.

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Retrobulbar injection of bupivacaine (Marcaine) for anesthesia and akinesia. R. Brian Smith and Jay G. Linn, Jr.

Bupivacaine (Marcaine), 1-n-butyl-DL-pipericaine-2-carboxylic acid-2, 6-dimethylanilide hydrochloride, is a new long-acting anilide local anesthetic introduced into clinical practice in the United States in 1973. It was synthesized in 1957 by Af Ekenstam, Egner, and Pettersson. Bupivacaine is closely related structurally to mepivacaine (Carbocaine). It differs from mepivacaine in that a butyl group was substituted for a methyl group. The drug has been extensively used in other countries for pain relief, epidural, and regional anesthesia.

Because of its unique long action, retrobulbar blocks were performed using bupivacaine for various ophthalmologic procedures on seven patients. Bupivacaine is available in concentrations of 0.25 per cent, 0.5 per cent, and 0.75 per cent with and without epinephrine 1:200,000. A concentration of 0.75 per cent is recommended for motor block. Patients were premedicated with hydroxyzine, 50 mg. intramuscularly, 45 minutes preoperatively. In the operating room 2.5 mg. increments of intravenous diazepam were administered to a total ranging from 5 to 10 mg. A 30 ml. 0.75 per cent solution of bupivacaine was mixed with 150 international units of hyaluronidase (Wydase). Two milliliters of this solution was used for retrobulbar block. A facial nerve block using a modified Van Lint technique was performed using between 5 and 7 ml. of solution. Tetracaine (Pontocaine) 0.5 per cent was applied topically to the cornea in all cases prior to the retrobulbar block. In two patients tetracaine was repeated once during the procedure.

The results are shown in Table I. Onset of akinesia was between 10 and 15 minutes. In Patient 1, the retrobulbar block was repeated because of incomplete akinesia. Patients 1 and 2 were observed for return of eye movement. The first detectable movements were 130 and 135 minutes and complete movements returned in 240 and 285 minutes, respectively.

Patient 6 was a 35-year-old female who was 11 weeks pregnant. Local anesthesia was chosen because of pregnancy.
Table I. Results

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Age</th>
<th>Procedure</th>
<th>Onset akinesia (min.)</th>
<th>Duration of procedure (min.)</th>
<th>Partial kinesia (min.)</th>
<th>Complete kinesia (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75</td>
<td>Cataract extraction</td>
<td>12</td>
<td>50</td>
<td>130</td>
<td>240</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>Cataract extraction</td>
<td>15</td>
<td>65</td>
<td>135</td>
<td>285</td>
</tr>
<tr>
<td>3</td>
<td>65</td>
<td>Corneal transplant</td>
<td>10</td>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>78</td>
<td>Corneal transplant</td>
<td>—</td>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>Trabeculectomy</td>
<td>12</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>35</td>
<td>Detached retina</td>
<td>11</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>68</td>
<td>Detached retina</td>
<td>15</td>
<td>130</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All patients recovered uneventfully from surgery and anesthesia. There were no complications.

A comparative study of anesthetic agents used for retrobulbar block was made by Russell and Guyton. The duration of near maximum akinesia of extraocular muscles using procaine and lidocaine in a solution containing epinephrine 1:20,000 is as follows: Procaine 4 per cent—40 minutes, Procaine 4 per cent Wydase (10 to 20 U. per cubic centimeter)—30 minutes, Lidocaine 4 per cent—90 minutes, and Lidocaine 4 per cent Wydase (10 to 20 U. per cubic centimeter)—60 minutes.

Everett, Vey, and Finlay studied the duration of akinesia in monkeys following retrobulbar block with procaine, monocaïne, lidocaine, tetra- caine, and carbocaine. The longest duration of akinesia was with carbocaine 2 per cent, the average duration being 55 minutes.

These observations show that bupivacaine 0.75 per cent with hyaluronidase may be successfully used for ophthalmic surgery of more than two hours duration. This may significantly affect the choice of procedures to be performed under local anesthesia. If needed, the duration of retrobulbar block produced by bupivacaine could be prolonged omitting hyaluronidase and adding epinephrine 1:200,000 if so desired.

Thus the majority of ophthalmologic surgical procedures can now be performed, when indicated, under local anesthesia.

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Key words: retrobulbar block, bupivacaine (Marcaine), cataract, retinal detachment, corneal transplant, trabeculectomy.

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