AN EVALUATION OF HYPOBARIC PONTOCAINc FOR SPINAL ANESTHESIA WITH A REPORT OF 200 CASES

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Although the conventional hyperbaric spinal anesthesia solutions in common use are adequate for spinal anesthetics and desirable for most, hypobaric solutions have some desirable features. Except for the work of Lund and his associates (1, 2), an evaluation of hypobaric pontocaine has not been written. It is our purpose in writing this paper to review our experiences during the past two years with light pontocaine for spinal anesthesia.

Operations in the prone and lateral positions present difficulties from the anesthetic standpoint if conventional heavy spinal anesthetic agents are used. The drug must be injected in the sitting or lateral position. The patient must then be turned on his back into the supine or Fowler's position to allow the agent to block the posterior roots. Then, after more or less motor paralysis has set in, he must be turned to the lateral or prone position for the surgical procedure. These changes in position are strenuous and uncomfortable for both the patient who is turned and for those who must turn him. Hypobaric pontocaine is a convenient agent which eliminates these difficulties.

Pontocaine,† 0.1 per cent, was used in this study. It was prepared by diluting crystals of pontocaine hydrochloride (pontocaine "Nipha-noid") in distilled water so that each cubic centimeter contained 1 mg. of the drug. Each ampule contained 20 cc., of which 4 to 18 cc. was used. At normal body temperature this solution has a specific gravity of 1.003. The specific gravity of spinal fluid varies from 1.003 to 1.008 (3). The hypobaric pontocaine solution was used at room temperature without dilution with spinal fluid, and without the addition of any other drug. The large volume in each dose helped toward accuracy, and we found that the use of a solution directly from an ampule was a rapid, simple method for giving spinal anesthesia.

When an operation is to be done with the patient in some position other than on his back, we frequently prefer hypobaric pontocaine if spinal anesthesia is elected. The operations in this group are the fol-

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lowing: (1) rectal cases such as hemorrhoids, rectal polyp, and fissure or fistula-in-ano in which the surgeon elects the jackknife position, but not when lithotomy position is to be used; (2) pilonidal cyst; (3) operations on the spinal column and cord; (4) kidney operations in the lateral position, and (5) superficial operations on one leg or flank for which the lateral position is to be used.

The dose of hypobaric pontocaine in rectal and pilonidal cases varied from 6 to 7 mg., for the leg and flank cases from 6 to 8 mg., and for the operations in the kidney area and on the spinal column from 10 to 16 mg. Most of the renal cases were done with the segmental fractional spinal technic described by Saklad et al. (4), using hypobaric pontocaine. When the segmental technic was used, the initial dose was 10 mg. or less, and 1 to 4 mg. was added when necessary. In the shorter renal cases in which the single injection technic was used, 14 mg. of hypobaric pontocaine was sufficient.

The rate of injection was varied according to the spread of spinal anesthesia desired; that is, in hemorrhoid operations the solution was injected at the slow rate of about 1 cc. every five seconds in order to "float" the pontocaine into the lower subdural area. In the kidney operations about 1 cc. per second was given in order to obtain a good spread of anesthesia.

The position of the table was 5 to 15 degrees Trendelenburg while the spinal agent was administered. This position was chosen to guard against an undue rise of the spinal anesthesia. The patient was either left in this position or turned prone immediately after the spinal injection was completed. Further, in the rectal cases, the patient was immediately placed in the extreme jackknife position so that the sacrum was the highest point and the pontocaine rose toward it. In the kidney cases, the table was broken in the lumbar area as required for the surgical procedure, which at the same time permitted the anesthetic agent to concentrate itself about the lower dorsal and upper lumbar segments as desired. The usual result in renal cases was that the patient was able to move the leg on the nonoperative side even while he had complete anesthesia in the operative site.

It was thus possible to concentrate the agent around those nerve roots supplying the part to be operated upon without the necessity of further moving the patient after motor paralysis had set in.

Hypobaric pontocaine produced much higher spinal anesthesia than we wanted or considered safe in several cases in which the patient raised his head and trunk above the level of the lumbar area and so allowed the drug to rise too high in the subarachnoid space. This is especially likely to happen while the patient turns himself from the lateral to the prone position after the spinal agent has been injected. After turning into the jackknife position and while waiting for the operation to start, many patients will raise themselves on their arms and hands. We have, therefore, developed the habit of placing a restraining hand on the back of the patient's head when instructing him to turn
into the prone position, and of warning him strongly against raising his head and trunk after he has turned.

We are no longer using hypobaric pontocaine for operations in the supine, lithotomy, Fowler or Trendelenburg positions. When it is used in the operations previously enumerated for which the patient is not on his back, we have found it to be a satisfactory spinal anesthetic agent. The onset is prompt, the relaxation excellent, and the physiologic disturbances minor. With the doses we have used, no more than seventy-five minutes of spinal anesthesia time may be expected. If this time is to be exceeded, fractional spinal anesthesia should be used.

In table 1 we have made an analysis of the results with hypobaric pontocaine spinal anesthesia in 200 cases. The table is divided into two parts. The first contains the 165 cases in which the operation was done in the positions preferred for hypobaric pontocaine. The second shows the 35 cases done in positions which we now think unsuitable for hypobaric pontocaine spinal anesthesia. Under the last

<table>
<thead>
<tr>
<th>Operative Site</th>
<th>Anes. Method</th>
<th>No. Cases</th>
<th>Av. Dose, Mgs.</th>
<th>Av. Duration* (Min.)</th>
<th>Failures</th>
<th>Inadequate Anesthesia</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No. Cases</td>
<td>Per Cent</td>
</tr>
<tr>
<td>Part I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Renal</td>
<td>Cath Sp. Spinal</td>
<td>14</td>
<td>12</td>
<td>98</td>
<td>0</td>
<td>0</td>
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<td>Minor rectal</td>
<td>Spinal</td>
<td>93</td>
<td>8</td>
<td>35</td>
<td>1</td>
<td>1.07</td>
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<td>Pilonidal cyst</td>
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<td>6.8</td>
<td>37</td>
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<td>0</td>
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<tr>
<td>Intervertebral disk</td>
<td>Spinal</td>
<td>2</td>
<td>12</td>
<td>73</td>
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<td>0</td>
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<tr>
<td>Leg and flank</td>
<td>Spinal</td>
<td>18</td>
<td>9.3</td>
<td>68</td>
<td>1</td>
<td>5.6</td>
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<tr>
<td>Totals</td>
<td></td>
<td>165</td>
<td>2</td>
<td>1.2</td>
<td>4</td>
<td>2.42</td>
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<td>Part II</td>
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<td>Minor genito-urinary</td>
<td>Spinal</td>
<td>13</td>
<td>9</td>
<td>55</td>
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<td>Transurethral</td>
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<td>8</td>
<td>9</td>
<td>30</td>
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<td>Intra-abdominal</td>
<td>Cath Sp. Spinal</td>
<td>3</td>
<td>12</td>
<td>60</td>
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<td></td>
<td>Spinal</td>
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<td>12.5</td>
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<tr>
<td>Miscellaneous</td>
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<td></td>
<td>Spinal</td>
<td>3</td>
<td>9</td>
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<tr>
<td>Totals</td>
<td></td>
<td>35</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>24.6</td>
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</table>

*Av. duration means time from injection of pontocaine to end of operation.
column headed "inadequate anesthesia" we have placed all spinal
anesthesias in which the anesthesia did not last long enough, in which
there was inadequate sensory or motor anesthesia, or in which for any
reason a supplement was necessary. It will be noted that in the 165
cases comprising the group in which we think hypobaric pontocaine
is the agent of choice, there were 4 (2.4 per cent) inadequate anes-
thetias, while in the group of patients done in the supine, lithotomy, or
Trendelenburg position, there were 9 poor spinal anesthesias in 35
cases (24.6 per cent).

The majority of the 24.6 per cent of patients operated on while
lying on their backs in whom the anesthesia was considered inadequate,
suffered pain during the operation, although muscle relaxation in most
of them was excellent. While it is possible to control this pain with a
general anesthetic agent, we believe that, if spinal anesthesia is to be
used, the spinal agent should produce sensory as well as motor block.
For this reason, we have found it necessary in the few renal cases
which were started in the lateral kidney position under hypobaric
pontocaine to add 5 per cent procaine hydrochloride through the con-
tinuous spinal catheter when the surgeons later turned the patient
supine in order to attempt by a transperitoneal approach what they
were unable to accomplish by the lateral route.

There were no deaths in this series attributed to the anesthetic agent
or method, and no deaths within twenty-four hours of operation. How-
ever, it was necessary to intubate and manually inflate the lungs in 2
cases because the anesthesia went too high. For this reason we caution
against the use of this agent except by those equipped to carry out
endotracheal intubation and artificial respiration efficiently and with
dispatch. It is an agent for the anesthesiologist and not for those who
employ spinal anesthesia only occasionally.

SUMMARY

Pontocaine hydrochloride 0.1 per cent in distilled water, a hypo-
baric solution, was used as a spinal anesthetic agent in 200 operations.

We have found the agent satisfactory for the specified operations
done in the prone and lateral positions. We do not think it should be
used when the patient lies on his back during the operation or when
the anesthetist is not equipped to do endotracheal intubation.

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