Shivering during Epidural Analgesia in Women in Labor

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Shivering occurs in 20–50 per cent of patients following initiation of peridural blockades.1,2 Shivering annoys the parturient and wastes energy by increasing oxygen consumption and cardiac output.

The etiology of shivering after peridural blockade remains unclear. In animals, Thauer and Simon3 feel that shivering represents a response to the effect of cold solutions introduced into the epidural space on temperature sensors located in the epidural space or in the spinal cord. To test this hypothesis in a clinical setting, we related the incidence of shivering to the temperature of local anesthetics injected into the epidural space.

METHODS

Subsequent to approval of the protocol by the Clinical Research Practices Committee, 48 ASA Class I women receiving epidural analgesia during active labor were studied. All subjects had uncomplicated obstetric histories and were at term gestation. Fever, phenothiazine administration, or rapid intravenous infusion of crystalloid disqualified parturients from the study.

Subjects were placed in the lateral position, the skin was cleaned with 70 per cent isopropyl alcohol, and the epidural space identified at L3–4 or L4–5 with an 18-gauge Husted needle using the loss of resistance technique with air. To initiate analgesia, 0.25 per cent bupivacaine (10 ml) was injected through the needle. Random selection determined whether subjects received local anesthetic cooled to 15° C, at room temperature (20° C), or body temperature (37° C).

Following injection, an observer blinded to the temperature of the bupivacaine monitored patients for both onset and duration of shivering for 30 min. Levels of blockade were determined by pin prick and recorded at 5-min intervals during the observation period. Cervical dilatation, patient temperature, age, weight, height, room temperature, narcotic and sedative administration, blood pressure and pulse were noted. The unpaired t and chi-square tests were used for statistical comparison.

RESULTS

The groups of parturients receiving bupivacaine solutions of differing temperatures were statistically similar in age, height, weight, cervical dilatation, patient temperature, labor room temperature, levels of analgesia achieved, and the incidence of narcotic or sedative administration. As table 1 shows, neither the incidence nor the time of onset of shivering following the injection of local anesthetic solutions into the epidural space differed significantly between groups. When shivering occurred, it persisted during the observation period for 16 ± 8 (SD) min, 6 ± 1 min, and 7 ± 4 min in the 15°, 20°, and 37° C group, respectively. This represented a statistical difference between the 15° group and the 20° group but not between the 37° C group. Since one-third of the patients who received an injection of cold solution continued to shiver after the observation period ended, we believe this represents a trend toward a longer duration of shivering when the cold solutions were injected.

When women from all three temperature categories were divided into shivering and nonshivering groups and compared, differences of all variables but shivering remained nonsignificant.

DISCUSSION

Invariably, a certain number of parturients shiver during labor and delivery. In parturients without epidural analgesia, Jaameri4 noted a 22.7 per cent incidence of shivering during normal parturition with a 9.6 per cent incidence occurring during the first stage of labor. The 31.2 per cent rate we observed to accompany epidural analgesia during Stage I was three times greater than would have been expected to occur randomly and confirms the findings of other observers.1,2

We attempted to determine a valid incidence of shivering by excluding parturients receiving phenothiazines since these drugs may decrease the incidence of shivering. The rapid administration of cold intravenous fluids disqualified subjects from the study since this form of therapy could cause the recipient to feel cold. We used air for detecting the loss of resistance to avoid injecting any

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Received from the Department of Anesthesia, Bowman Gray School of Medicine of Wake Forest University, Winston-Salem, North Carolina. Accepted for publication June 26, 1981.

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Keywords: Anesthesia: obstetric. Anesthesia techniques: peridural; lumbar. Temperature: shivering.

0003-3022/81/1200/0706 $00.60 © The American Society of Anesthesiologists, Inc.
fluid into the peridural space which could modify the 
temperature of the local anesthetic study solutions.

Warming of the 15° C and 20° C local anesthetic 
solutions to body temperature probably occurred within 
a few minutes after their introduction into the epidural 
space. The epidural space contains a rich vascular supply 
and only a relatively small volume of local anesthetic was 
introduced into it. The onset of shivering probably started 
after the cool local anesthetic solutions had already 
reached body temperature.

Several possible reasons for shivering during epidural 
analgesia exist. The onset of shivering in our subjects 
ocurred when sympathetic blocks should have been 
fairly well-established. Shivering might follow sympa-
thetic blockade as resultant vasodilation increases cuta-
neous blood flow in the involved areas of the body. The 
increased muscle activity could help compensate for heat 
loss from increased cutaneous blood flow. Significant 
absorption of bupivacaine without epinephrine occurs 
from the epidural space in 15–20 min after injection. 
Shivering might represent increased central nervous sys-
tem irritability in response to local anesthetic levels in-
sufficient to cause grand mal seizures. Bromage hypo-
thesizes that local anesthetics introduced into the epidural 
space might act to modify thermal cues from the exterior 
with resultant inappropriate thermal responses to false 
information. Cold sensation takes longer to block than 
warm, probably subjecting many patients to a short 
period of time during the onset of analgesia when warm 
sensation is blocked and cold sensation persists biasing 
the thermal information reaching the central nervous 
system towards cold input. Shivering may represent an 
inappropriate programmed thermal response to raise the 
body temperature.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Incidence</th>
<th>Time of Onset (min ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>37°</td>
<td>4/16</td>
<td>11 ± 5</td>
</tr>
<tr>
<td>20°</td>
<td>5/16</td>
<td>13 ± 8</td>
</tr>
<tr>
<td>15°</td>
<td>6/16</td>
<td>11 ± 7</td>
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</tbody>
</table>

Our results indicate that in the ranges studied, tem-
perature of local anesthetic solutions injected peridural 
does not affect the incidence of shivering. There is a trend 
that the duration of shivering may be longer with the 
cold solutions. The existence of spinal cord or epidural 
thermal sensors fails to explain why parturients shiver 
when receiving epidural analgesia during labor. Neither 
active warming of analgesic solutions nor storing them 
in an area of higher than normal ambient temperature 
will improve patient comfort by decreasing the incidence 
of shivering accompanying epidural analgesia.

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