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 blockade.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 Huested 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, Jaamer1 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
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
occurred 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.5

<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>
</tr>
</tbody>
</table>

Our results indicate that in the ranges studied, tem-
perature of local anesthetic solutions injected peridurally
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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