Sprotte Needle for Obstetric Anesthesia: Decreased Incidence of Post Dural Puncture Headache

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Abstract: Background and Objectives. Reports have emphasized the importance of spinal needle tip configuration in the development of post dural puncture headache (PDPH). Methods. Charts from 366 consecutive obstetric patients receiving spinal anesthesia for labor, cesarean delivery, postpartum surgical procedures, or postpartum tubal ligations were reviewed retrospectively for evidence of PDPH in the five days after dural puncture. Spinal anesthesia was administered to these patients using 25-gauge Quincke (n = 74), 26-gauge Quincke (n = 160), or 24-gauge Sprotte (n = 132) spinal needles. Results. The groups were well matched demographically. The incidence of PDPH in the three groups was 9%, 8%, and 1.5%, respectively. Half of the patients developing PDPH in each group were treated with an epidural blood patch. Conclusions. Our data indicate that the Sprotte spinal needle, with its non-cutting tip, results in a significantly lower (p < 0.05) incidence of PDPH than Quincke cutting-tip needles of smaller gauge. (Key words: Complications, obstetric anesthesia, Quincke needle, spinal anesthesia, post dural puncture headache, spinal needle, Sprotte needle.)

One of the most frequent and troublesome complications of spinal analgesia and anesthesia in the obstetric patient is the occurrence of post dural puncture headache (PDPH). The reported incidence of FDPH varies from 1% to 30%. Factors associated with the development of PDPH include: patient age,²⁻⁴ patient gender,⁴⁻⁶ needle gauge,⁷⁻¹¹ angle of needle approach to the dura,¹²⁻¹³ and needle tip configuration.¹⁴⁻²³

Post dural puncture headache is believed to be caused by the loss of cerebrospinal fluid (CSF) through a persistent hole in the dura after dural puncture. A number of spinal needle designs are available to the anesthesiologist (Fig. 1). The Quincke needle is a long-beveled spinal needle with cutting surfaces along its bevel to aid in penetrating tissue. The sharp bevel, however, may cut dural fibers, resulting in a persistent dural opening. In an effort to decrease the risk of a persistent dural rent and thus decrease the risk of PDPH, several needle designs have been introduced.¹⁴⁻¹⁸ The Greene and Whiteacre needles were developed with the goal to separate rather than cut dural fibers and thereby create a smaller hole through which cerebrospinal fluid might leak. The Sprotte needle is a recent modification of the Whiteacre needle with a more tapered tip and larger side hole (Fig. 1).¹⁶

This retrospective study in an obstetric population compares the incidence of PDPH using either conventional Quincke spinal needles (25- or 26-gauge) or Sprotte spinal needles (24-gauge).

Methods

With institutional review board approval, 366 patient charts were identified from our obstetric anesthesia data base and reviewed retrospectively for the 24-month period ending April 1990. Patients received their care at the University of Washington Medical Center in Seattle, a resident teaching center. Charts were reviewed from all patients receiving spinal analgesia/anesthesia for: labor (0.25–0.3 mg subarachnoid morphine), cesarean delivery (0.75% hyperbaric bupivacaine with 100–200 µg epinephrine with or without 0.25–0.3 mg preservative morphine), vaginal delivery and associated surgical procedures (i.e., lacerations or episiotomy repairs), and postpartum tubal ligation (5% lidocaine with 100–200 µg epinephrine or 0.75% hyperbaric bupivacaine with or without 100–200 µg epinephrine). Dural
punctures in this study were performed by resident physicians in their second or third year of clinical anesthesia training. The type of needle used for the dural puncture was chosen by preference of the anesthesia team providing the care.

A thorough review of each patient’s hospital course was performed from the time of admission until the patient was discharged, or for a maximum of five days after dural puncture. Each chart was also reviewed for outpatient visits up to and through the patient’s first postpartum clinic visit for report of headache or treatment of PDPH (i.e., analgesics, caffeine administration, epidural blood patch).

For this review, a positive PDPH was reported if at any time after dural puncture the nursing staff, obstetric team, or obstetric anesthesia service found the patient to have a postural headache and a member of the obstetric anesthesia service charted that the symptoms were consistent with a PDPH.

Additional data collected during this study included: patient age, height, weight, gravidity, and parity, fetal gestational age, needle type and gauge, midline or paramedian approach to the dura, and indication for dural puncture.

Data were analyzed using analysis of variance for multiple comparisons and Student’s *t* test with Bonferroni correction, and chi-square analysis for a 2 × 3 contingency table, where appropriate. A *p* value less than 0.05 was chosen for statistical significance.

**Results**

With the exception of weight there were no significant demographic differences in the three groups of patients in this study (Table 1). The mean weight of those patients on whom 25-gauge spinal needles were used was significantly greater than for the other two groups.

Patients in this study remained hospitalized for a mean of three days after the procedure that necessitated their dural puncture. There were significantly fewer (*p* < 0.05) PDPHs in those patients in whom Sprotte needles were used than in the two other groups (Table 2). Symptoms of headache occurred within the first three days after dural puncture in 95% of those patients eventually developing PDPH (Fig. 2). Approximately half of those patients in each group with PDPH received an epidural blood patch. Only one epidural blood patch was required per patient.

Approximately 80% of patients, both with or without eventual PDPH, received their dural punctures using the midline approach, (Table 2). Although needle bevel orientation was not routinely recorded on the anesthetic record, it is

<table>
<thead>
<tr>
<th></th>
<th>24-gauge Sprotte (n = 132)</th>
<th>25-gauge Quincke (n = 74)</th>
<th>26-gauge Quincke (n = 160)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age (years)</td>
<td>27 ± 6</td>
<td>26 ± 6</td>
<td>28 ± 6</td>
</tr>
<tr>
<td>Maternal weight (Kg)</td>
<td>77 ± 20</td>
<td>84 ± 19*</td>
<td>73 ± 14</td>
</tr>
<tr>
<td>Maternal height (cm)</td>
<td>160 ± 7</td>
<td>162 ± 6</td>
<td>160 ± 6</td>
</tr>
<tr>
<td>Gravidity</td>
<td>4 ± 2</td>
<td>3 ± 2</td>
<td>4 ± 2</td>
</tr>
<tr>
<td>Parity</td>
<td>1 ± 2</td>
<td>1 ± 2</td>
<td>2 ± 2</td>
</tr>
<tr>
<td>Gestational age (weeks)</td>
<td>37 ± 4</td>
<td>37 ± 5</td>
<td>36 ± 5</td>
</tr>
</tbody>
</table>

*Significantly different from 24-gauge and 26-gauge groups; *p* < 0.05.
TABLE 2. Incidence of Post Dural Puncture Headache

<table>
<thead>
<tr>
<th></th>
<th>24-gauge Sporite (n = 132)</th>
<th>25-gauge Quinke (n = 74)</th>
<th>26-gauge Quinke (n = 160)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of days patients remained hospitalized after dural puncture (mean ± SD)</td>
<td>3 ± 1</td>
<td>3 ± 2</td>
<td>3 ± 1</td>
</tr>
<tr>
<td>Number of patients with post dural puncture headache</td>
<td>2 (1.5%)*</td>
<td>7 (9%)</td>
<td>12 (8%)</td>
</tr>
<tr>
<td>Number of patients requiring blood patch</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Number of attempts before successful dural puncture (mean ± SD)</td>
<td>1.2 ± 0.6</td>
<td>1.4 ± 0.7</td>
<td>1.2 ± 0.7</td>
</tr>
<tr>
<td>Approach for dural puncture: all patients midline/paramedian (%)</td>
<td>85/15</td>
<td>78/22</td>
<td>85/15</td>
</tr>
<tr>
<td>Approach for dural puncture: patients with post dural puncture headache midline/paramedian (%)</td>
<td>100/0</td>
<td>80/20</td>
<td>80/20</td>
</tr>
</tbody>
</table>

*Significantly different from 25-gauge and 26-gauge; p < 0.05.

Discussion

Post dural puncture headache continues to be a concern to anesthesiologists wishing to offer spinal anesthesia to their patients, particularly obstetric patients. A review of the American Society of Anesthesiologists’ closed claims database revealed that headache is the third most common complication resulting in malpractice claims involving obstetric anesthesia and accounts for 12% of all such claims. Half of the claims for headache resulted in payment to plaintiff.

Prevention of PDPH involves avoiding dural puncture, performing the dural puncture asatraumatically as possible. Important technical elements for an atraumatic puncture include: ensuring that the opening in the dura is as small as possible (usually achieved by using small-gauge needles), minimizing the number of attempts at placement (made difficult by extremely small-gauge needles), attention to orientation of the needle bevel (parallel to dural fibers), configuration of the spinal needle tip. Because females are at greater risk than males4–6 and because parturients are generally younger than the general population,7,8 obstetric patients are at greater risk for developing PDPH compared to the general population.

Because of the potential difficulties in retrospective studies, specific precautions were taken in the design of this study to minimize bias. Charts were reviewed of all patients cared for on the obstetric unit receiving a dural puncture over a 24-month period, during which the needle types reported in this study were used regularly. Thus a cohort

![Chart]

**Fig. 2.** Illustrated are all patients developing post dural puncture headache as a function of needle type and day when the headache was reported.

**Table 3. Indications for Dural Puncture**

<table>
<thead>
<tr>
<th>Indications</th>
<th>24-gauge Sporite (n = 132)</th>
<th>25-gauge Quinke (n = 74)</th>
<th>26-gauge Quinke (n = 160)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Analgesia</td>
<td>23 (17%)*</td>
<td>27 (36%)</td>
<td>12 (7%)</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>50 (38%)</td>
<td>29 (39%)</td>
<td>86 (51%)</td>
</tr>
<tr>
<td>Tubal ligations</td>
<td>46 (35%)</td>
<td>10 (14%)*</td>
<td>46 (27%)</td>
</tr>
<tr>
<td>Instrument deliveries or</td>
<td>11 (10%)</td>
<td>8 (11%)</td>
<td>16 (10%)</td>
</tr>
<tr>
<td>postpartum procedures</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significantly different from the other two needle types; p < 0.05.
patients was generated in which similar techniques for the
dural puncture were likely to be employed. Specific criteria
for presence or absence of PDPH were used to help eliminate
reviewer bias. The introduction of the Sprotte needle was
accompanied by the claim of reducing PDPH; the choice of
needle used by the anesthesiologist may have been influ-
enced by this information. That is, if for some reason a
patient was believed to be at particular risk for PDPH, the
anesthesiologist may choose to use a Sprotte needle instead
of the conventional Quincke needle. However, the Sprotte
needle was new and unfamiliar to the anesthesiologists in this
study. These factors may have resulted in a slightly lower
PDPH incidence in the Quincke group and slightly higher
PDPH incidence in the Sprotte group.

The present study found that there were significantly fewer
PDPHs in obstetric patients after the use of the Sprotte tip
needle compared to regular Quincke tip needles of smaller
gauge. The patients in each group were well matched except
for weight. The patients on whom 25-gauge Quincke needles
were used had a mean weight greater than the other two
groups of patients. This is not surprising in that many
anesthesiologists use larger needles on patients in whom they
feel it will be more difficult to initiate a spinal anesthetic.
Even though there were differences in the proportion of
patients receiving a dural puncture for a particular indication,
there was no relationship between the procedure for which
the spinal anesthetic was given and the occurrence of PDPH.

The overall incidence of PDPH in our study may be
slightly higher than in some other departments since ours is a
residency training program. Both PDPHs in the 24-gauge
Sprotte group occurred in the first 30 patients for whom the
needle was used, perhaps indicating an initial learning period
with the needle. The incidence of PDPH in the three patient
groups in our study is similar to the incidence recently
reported by Cesearini et al. when either 25-gauge diamond
tip needles or 24-gauge Sprotte needles were used to admin-
ister spinal anesthesia for cesarean delivery.

Bevel orientation has been shown to be an important
determinant in the occurrence of PDPH. Although bevel
orientation was not specifically controlled, it is our practice
to teach residents to always position the bevel of the spinal
needle parallel to the dural fibers. It is not apparent that the
orientation of the Sprotte needle would affect how it passes
through the dura. However, we usually place the Sprotte
needle with its side port directed cephalad in order to
facilitate cephalad spread of anesthetic. The majority of our
patients received their spinal anesthetics using a midline
approach to the dura. However, the distribution of patients
receiving midline compared to paramedian approaches in the
three groups was similar so that angle of approach is unlikely
to have contributed to the differences seen in the incidence of
PDPH.

With the exception of one case, all PDPHs were reported
within the first three days after dural puncture. All patients
were informed of the possibility of headache at the time
consent was obtained. The patients were asked specifically
for the presence of headache at the time of their first
postoperative visit. Subsequently, the patients in the three
groups were not formally questioned for presence of PDPH.
Headaches were noted only if the patient volunteered symp-
toms consistent with a PDPH. Strict criteria were established
before a headache reported in the medical record was deemed
PDPH. This was essential because the incidence of headache
in the peripartum period not associated with the administra-
tion of an anesthetic may be as high as 30-40%. That some
patients may have developed PDPH after being discharged
cannot be ruled out. Our incidence of PDPH is lower than
that reported when patients were studied using formal ques-
tionnaires. The women in this study were a cohort of
consecutive patients, all of whom received spinal analgesia
or anesthesia over a 24-month period using whichever needle
the anesthesiologist selected for the case. If under-reporting
of PDPH occurred, it should be similar in all three groups and
the relative differences in incidence of PDPH would not be
affected. However, we believe that the study was able to
identify the clinically significant headaches, that is, those
requiring intervention and treatment.

The Sprotte needle may reduce the incidence of spinal
headache, particularly in obstetric patients in whom anesthes-
iologists may be reluctant to use spinal anesthesia. The
reduced incidence of PDPH makes this needle a valuable
addition to the armamentarium of the anesthesiologist.

Editor's Note

Refer to Correspondence for further discussion.

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