FREQUENCY OF POSTDURAL PUNCTURE HEADACHE FOLLOWING SPINAL ANAESTHESIA FOR CAESAREAN SECTION: A COMPARISON BETWEEN 25-G AND 27-G PENCIL POINT SPINAL NEEDLES

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ABSTRACT: Spinal anaesthesia is a safe technique for operative obstetrics. The relatively high incidence of postdural puncture headache in obstetric patients is considered to be a major disadvantage of the technique. Spinal needles with a pencil point tip and those of a finer gauge are known to be associated with a lower incidence of postdural puncture headache (PDPH). This study set out to determine if the fine pencil point needles were acceptably easy to use and their effectiveness in minimizing the frequency of postdural puncture headache (PDPH) in routine clinical practice.

Study included 50 women (ASA I and II) undergoing elective and emergency caesarean section were randomly allocated to receive a subarachnoid block using either a 25G or 27G pencil point spinal needle, labeled as group A and group B respectively. Factors determining ease of needle use, adequacy and quality of block, frequency of postdural puncture headache, backache, and neurological sequelae were assessed.

Successful intrathecal injection was achieved in all patients. Using the 27G needle, the anaesthetists failed to reach the subarachnoid space in first attempt in 5 (20%) patients, but subsequently had a successful intrathecal injection in second attempt. The failures in first attempt were attributed to excessive needle flexibility and indistinct dural click. 8% patients in Group A developed non-postdural puncture headache while in Group B, 12% patients had non-postdural puncture headache. Backache was more common in 25G group when compared with 27G group.

There was no postdural puncture headache in both the groups.

We conclude that the final choice of 25G or 27G needle is a balance between the ease of use, failure rate, level and quality of block and possibility of lower frequency of postdural puncture headache with either of them.

KEY WORDS: Spinal anaesthesia, Post dural puncture headache (PDPH), Neurology, Neurological sequelae.

INTRODUCTION

Spinal anaesthesia has become increasingly popular for operative obstetrics, where its speed of onset combined with its predictable and dense analgesia is particularly reliable. Minimal need of instrument, simple technique, limited skill, economy, and little manpower required, are the main factors responsible for its popularity. Good muscular relaxation, less bleeding and contracted gut is the advantages for which some surgeons prefer this method of anaesthesia. In addition, in obstetric patients the mother is awake at the time of delivery ready to receive the newborn and the hazards associated with general anaesthesia are avoided.

Despite these advantages of spinal anaesthesia, one of the principal concerns is postdural puncture headache (PDPH) and it is one of the most common complications of spinal anaesthesia, especially in younger patients.

Headache following spinal anaesthesia i.e. PDPH, which may be incapacitating, is bifrontal and occipital and may involve the neck and upper shoulders. It is aggravated by sitting, standing, coughing, and straining but subsides completely when the patient lies down. It is often accompanied by nausea, anorexia, photophobia, diplopia, vertigo, and neck stiffness and on rare occasion, cranial nerve palsies. However, serious complications may occur including subdural haematoma and death from medullary and tentorial coning has been reported. Postdural puncture headache (PDPH) usually occurs within the first three days of dural puncture and may persist for several weeks or even months causing depression in the patients and anxiety in the anaesthetist.

The pathophysiology of postdural puncture headache (PDPH) is explained with loss of cerebrospinal fluid (CSF) through the hole in the dura mater made by the spinal needle, as first suggested by Bier in 1899 and is considered to be the most plausible cause.

The diameter and the type of tip of the needle are the principal determining factors. In different years, the configuration of the tip of the needles has been the subject of particular attention so that as an alternative to the classical blunt tip of the Quincke, pencil point tip needles such as Whitacre or Sprotte have emerged.
Distribution of elective and EMERGENCY SURGERIES in 2 groups

Group A

Group B

Figure I

HISTOGRAM OF AGE OF BOTH GROUPS

Groups A

Group B

Figure II

which can open the dural fibers without sectioning them $^5$. Pencil point style tips are associated with less postdural puncture headache (PDPH).

Most comparative studies have reported that the pencil point needles are associated with a lower incidence of PDPH than the cut-bevel needles. Further more, the
use of smaller caliber needles also results in lower incidence of PDPH \textsuperscript{11}.

Recent advances in needle technology have allowed for the production of spinal needles of progressively smaller size (27 and 29 gauge) and of pencil point design. The introduction of Sprotte and Whitacre needles has rekindled interest in spinal anaesthesia and recent studies have demonstrated a reduced incidence of PDPH with these needles when compared to the standard Quincke (cutting bevel) needles \textsuperscript{12}.

Besides the CSF loss, the incidence of PDPH also depends on biometric data such as age and gender and
on the patient's subjective sensations. PDPH is considered more common in females than in males. A high incidence of PDPH in women under 40 years has been reported and women under 29 years seem at particular risk. 

The incidence of spinal headache reported in obstetric patients varies between 6% and 16% and it has acted as a break to the widespread use of this technique of anaesthesia in obstetric practice.

**Purpose of Study**

The availability of 25 and 27 gauge pencil point spinal needles has provided us an opportunity to assess the advantages and disadvantages of these needles with particular reference to ease of use and the incidence of postdural puncture headache.

The purpose of this study is to calculate the frequency of postdural puncture headache in young obstetric patients of status ASA I and II coming to Liaquat National Hospital for elective and emergency caesarean section, and to compare 27 and 25 gauge pencil point (non-cutting type) spinal needles with respect to the frequency of postdural puncture headache (PDPH) and ease of use.

**Study: Patients and Methods**

After approval from the hospital's ethics committee, informed consent was obtained from 50 ASA I and II women, aged between 20 – 35 years, undergoing elective or emergency caesarean section at Liaquat National Hospital, Karachi.

Patients were randomly allocated to receive a subarachnoid block using either a 25 G or a 27 G pencil point spinal needle, labeled as Group A and Group B respectively.

There were 25 patients in each group.

**Inclusion Criteria**

1. ASA physical status I and II
2. Age between 20 – 35 years.
3. Elective or emergency caesarean section under spinal anaesthesia.

**Exclusion Criteria**

Following patients were excluded from the study.

1. ASA physical status greater than II.
2. Age below 20 years and above 35 years.
3. Patient’s refusal.
4. Patients with history of frequent headache or migraine.
5. Patients with an acute obstetric emergency, e.g. fetal distress.
6. Patients with any contraindication of spinal anaesthesia.

There were 19 elective and 6 emergency sections in group A. In group B, 17 were elective and 8 were emergency caesarean sections.

Patients in both groups were comparable in respect of age, weight and ASA status.

**Age**

- Group A 20 – 30 years (25.24±2.95)
- Group B 20 – 30 years (25.27±2.88)
GRADE OF DURAL CLICK

Number of attempts

Group – A
Only 2 patients required 2nd attempt

Group – B
5 patients required 2nd attempt.

Level of Block Group – A

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>PATIENTS</th>
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<tbody>
<tr>
<td>T4</td>
<td>16</td>
<td>64%</td>
</tr>
<tr>
<td>T5</td>
<td>6</td>
<td>24%</td>
</tr>
<tr>
<td>T6</td>
<td>3</td>
<td>12%</td>
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Group – B

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>PATIENTS</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>T4</td>
<td>17</td>
<td>68%</td>
</tr>
<tr>
<td>T5</td>
<td>6</td>
<td>24%</td>
</tr>
<tr>
<td>T6</td>
<td>2</td>
<td>8%</td>
</tr>
</tbody>
</table>

Weight

Group A 56 - 65kg (60.12 ± 2.68)
Group B 56 - 65kg (60.27 ± 2.64)

ASA – status

Group A. ASA – I 9 – 76%
ASA – II 6 – 24%

Group B. ASA – I 20 – 80%
ASA – II 5 – 20%

METHODS

Identical technique was used in all patients. Anaesthetists of all grades familiar with the technique performed the block. Prior to insertion of block, venous access was established with an 18 G cannula and an infusion of Ringer's solution was commenced. Standard monitoring included ECG, Oxygen saturation (SPO2) and noninvasive blood pressure monitoring (SBP, DBP). Patients were placed in sitting position
and the third or fourth lumbar inter space identified. Using aseptic technique dural puncture was performed in midline. 2.2 ml (11mg) of 0.5% isobaric Bupivacaine (Abocaine) was then injected via one of the study needles, with the needle hole placed parallel to the dural fibers.

Following factors were recorded:
- Dural click
- Number of attempts to perform successful subarachnoid injection.

The patients were then turned to the modified supine position with left lateral tilt immediately following completion of block. Maternal blood pressures was measured automatically at 1 minute interval for first 7 minutes and then every 3 minutes interval, till the end of surgery and in the recovery room until fully recovered. Any decrease in systolic blood pressure below 100 mmHg was treated with ephedrine. Level of sensory block was assessed immediately prior to incision using absence of touch or pinprick sensation. Monitoring was continued intraoperatively and postoperatively. Patients were allowed to sit up and get out of bed 24 hours after surgery.

Patients were interviewed 12 hourly on the 1st to 3rd post operative day by an anaesthetist unaware of the size of the needle used, to detect the presence of post dural puncture headache, backache or any neurological sequelae. Post dural puncture headache was defined as a headache which was relieved by lying flat, was frontal, occipital or occipito frontal in site, throbbing in nature or associated with features such as neck stiffness, backache, deafness, tinnitus or cranial nerve palsies. It was further classified as mild, moderate or severe: Mild pain did not interfere with daily routine, was of less than 24 hr duration and was treated conservatively. Moderate pain was such that it interfered with daily routines but still allowed the
Subjective assessment of block

Group A  3 patients out of 25 were aware of pulling, while remaining had no sensation.
Group B  4 patients out of 25 were aware of pulling while 21 patients had no sensation.

Time of Maximum fall in Blood pressure.

Group – A  
After:  2 minutes in 1 patient 4%  
3 minutes in 12 patients 48%  
4 minutes in 9 patients 36%  
5 minutes in 3 patients 12%

Group – B  
After:  3 minutes in 11 patients 44%  
4 minutes in 10 patients 40%  
5 minutes in 3 patients 12%  
6 minutes in 1 patient 4%

mother to care for her baby. Severe pain was a headache requiring bed rest and which precluded caring for the baby. Statistical analyses were performed using paired Student’s t test as appropriate. A level of p<0.05 was considered significant.

RESULTS AND OBSERVATIONS

When the two groups were compared statistically, no significant difference was found between the two groups. However when the data was analyzed on collective basis, Group A was found to have better results regarding dural click, number of attempts, frequency of non-postdural puncture headache (NPDPH), and block height (subjective assessment of block) but the frequency of backache was more with 25G needle (Group A) when compared with 27G needle (Group B).

Space of Lumbar puncture:
Group - A  
3rd Lumbar space in 22 patients.  
4th Lumbar space in 3 patients.
SUBJECTIVE ASSESSMENT OF BLOCK

![Chart showing subjective assessment of block](image)

Figure IX

Group - B
- 3rd Lumbar space in 23 patients.
- 4th Lumbar space in 2 patients.

Grade of dural click
- Group A
  - Distinct in 17 patients – 68%
  - Indistinct in 8 patients – 32%
- Group B
  - Distinct in 5 patients – 20%
  - Indistinct in 20 patients 80%

DISCUSSION

The relatively high incidence of postspinal headache in the obstetric patients is considered to be a major disadvantage of the technique. The majority of research related to spinal anaesthesia is therefore directed towards the improvement of prophylaxis of postdural puncture headache (PDPH). This is due to its significant rate of occurrence – over 20% in some patient groups.

A fundamental role in the pathogenesis of PDPH is played by the diameter and the type of tip of the spinal needle used. This hypothesis is true if we consider the noticeable reduction in the incidence of PDPH achieved when using very thin, or pencil point tip needles 8,10,18. In the literature, there have been reported incidence of 77.5% with 18-G needle (Crawford 1981) and of 0% with a 29 G needle 16.

On the other side, a reduction in the diameter brings greater difficulty in inter vertebral insertion of the needle and the prompt identification of the CSF reflux, while the particular lateral hole, which is a characteristic of a pencil point needle, can negatively affect the outcome of an anaesthetic block (Crone & Vogal 1991).

In fact, when using thin 29-G Quincke needles, difficulty in positioning them has been reported in 18% of cases 19 and a failure in 3-8%; 20 at the same time, when using the 25-27G Whitacre, there are failures in 6-10% of cases 21-23, and in 4.7-13% cases with the 24-25G Sprotte 17, 24.

Based on the cause of PDPH, one would expect that repeated dural punctures should also increase the incidence of PDPH by increasing leakage of CSF through the multiple dural tears. Indeed, Harrison and Langham found an increased incidence of PDPH when more than one attempt at subarachnoid puncture was made. Seeberger et al also suggested that repeated dural punctures increase the incidence of PDPH. In our
Non-Postdural Puncture Headache.
   Group - A
   2 patients developed NPDPH 8%
   Group - B
   3 patients developed NPDPH 12%

Backache.
   Group - A
   3 patients 12%
   Group - B
   2 patients 8%

Postdural puncture headache (PDPH) occurred in none of the patients in either group.
No postoperative sequelae detected in either group.
Subarachnoid block was successful in all the study patients with 0% failure rate.

study, with 25-G needle (Group-A) only 2 patients i.e. 8% required 2nd attempt while 5 patients i.e. 20% required 2nd attempt with 27-G needle (Group-B). This was probably because of excessive needle flexibility, leading to difficulty in penetrating the strong ligamentum flavum, causing the needle to bend excessively.

When subjective assessment of block was done, more patients in Group B were aware of pulling as compared to Group A but the level of block achieved with 27G needle was higher than with 25G needle. This was probably because of the rate of injection of local anaesthetic in the subarachnoid space, as the anaesthetists of all grades performed the blocks.

Time of maximum fall in blood pressure remained similar in both the groups that is 3-4 minutes. Subarachnoid block was successful in all the study patients with 0% failure rate.

In our study non-postdural puncture headache was found in 12% of patients with 27G needle and 8% with 25G needle. However, backache was more common in 25G group when compared with 27G group.

No postoperative neurological sequelae detected in both the groups. None of our study patients fulfilled the criteria to be labeled as having postdural puncture headache (PDPH) in either of the groups. Other investigators have also conducted studies on similar design and have found higher failure rates with 27G
needle and more incidence of PDPH with 25G needle, when compared with our study.

CONCLUSION

The ease of use of 25G and 27G pencil point needles was found by all grades of anaesthetists and their associated low incidence of postdural puncture headache, has changed our routine technique for elective and emergency caesarean sections from general to spinal anaesthesia.

The final choice of 25G or 27G needle is a balance between the ease of use, failure rate, level, and quality.
Frequency of postdural puncture headache following spinal anaesthesia

Table IX : Overall results

<table>
<thead>
<tr>
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<th>Group A</th>
<th>Group B</th>
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<tbody>
<tr>
<td>Maximum fall in BP</td>
<td>3 min in 48%</td>
<td>3 min in 44%</td>
</tr>
<tr>
<td></td>
<td>4 min in 36%</td>
<td>4 min in 40%</td>
</tr>
<tr>
<td>Subjective assessment of block</td>
<td>12% aware of pulling (3)</td>
<td>16% aware of pulling (4)</td>
</tr>
<tr>
<td>Grade of dural click</td>
<td>Distinct in 68% (17)</td>
<td>Distinct in 20% (5)</td>
</tr>
<tr>
<td>Number of attempts</td>
<td>More than one attempt 8% (2)</td>
<td>More than one attempt 20% (5)</td>
</tr>
<tr>
<td>Level of block</td>
<td>T4 in 64% (16)</td>
<td>T4 in 68% (17)</td>
</tr>
<tr>
<td>Non PDPH</td>
<td>8% (2)</td>
<td>12% (3)</td>
</tr>
<tr>
<td>Backache</td>
<td>12% (3)</td>
<td>8% (2)</td>
</tr>
<tr>
<td>PDPH</td>
<td>0%</td>
<td>0%</td>
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of block, and possibility of low headache with either of them.

REFERENCES


Seeberges MD, Kaufmann M, Staenders, Schneider M, Scheidegger D. Repeated dural punctures increase the

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