



## Comparative Study Between Quincke's (23G, 25G) and Whitacre (25G) Induced Post Dural Puncture Headache After Neuraxial Blockade in Lower Abdominal Surgeries

### KEYWORDS

1. Post dural puncture headache(PDPH) 2.Quincke needle 3. Subarachnoid block(SAB) 4.Whitacre needle

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**ABSTRACT** A Prospective, Randomized, Comparative Study was designed to evaluate the occurrence of post dural puncture headache following the use of two different needles of same Gauge (25G) with one pencil point needle(Whitacre) and conventional cutting (Quincke) needle and between different gauges in same Quincke needle(23G , 25G)in patients undergoing lower abdominal surgical and gynaecological procedures.

### Aims and objectives:

A Prospective, Randomized, Comparative Study was designed to evaluate the occurrence of post dural puncture headache following the use of two different needles of same Gauge (25G) with one pencil point needle(Whitacre) and conventional cutting (Quincke) needle and between different gauges in same Quincke needle(23G , 25G)in patients undergoing lower abdominal surgical and gynaecological procedures.

### Introduction

Spinal anaesthesia has enjoyed a long and successful history since 1885. Spinal anaesthesia remains an upto date technique due to its ease of use. Patient remains conscious and airway is maintained. The technique is cost effective. But is often followed by post dural puncture headache, a distressing complication of spinal anaesthesia. Introduction of needles with pencil point tips has changed the practice of anaesthesia to reduce the incidence of post dural puncture headache.

### Materials and Methods

The study population was randomly divided into three groups with 50 patients in each group where:

Group I - Patients who received SAB with Quincke 23G needle

Group II - Patients who received SAB with Quincke 25G needle

Group III - Patients who received SAB with Whitacre 25G needle

**Inclusion Criteria :** Age between 20 and 70 years of both sex, ASA Grade I and Grade II, height between 155 to 168 cms, Elective lower abdominal and gynaecological surgeries under spinal anaesthesia, with duration of surgery less than 90 – 120 minutes.

**Exclusion Criteria :** Age <20 years and > 70 years, ASA class III and above, Emergency surgeries, Upper abdominal surgeries, patients with chronic headache / migraine / backache, any contraindication to SAB, patients with abnormal or distorted anatomy of the spine.

Preanaesthetic check up was done where detailed medical, surgical and personal history were taken. General

physical and systemic examination was done. Standard routine and relevant specific investigations were done.

Patients were premedicated with tablet Alprazolam 0.5mg and tablet ranitidine 150 mg orally at bed time the previous night before surgery. They were kept Nil by mouth for solids for 6-8 hours and for clear fluids upto 2 hours before spinal anaesthesia.

After securing IV access with 18G cannula, an infusion of normal saline or ringer lactate was started at a rate of 1-2 ml/kg/hour. A preload of 500ml of ringer lactate solution was administered before SAB. All patients were given a premedication of IV Ondansetron 0.1mg/kg and IV Ranitidine 1mg/kg half an hour prior to surgery. In the operating room patients were monitored non-invasively with NIBP, ECG and pulse oximeter.

SAB was done in right or left lateral decubitus position. Under all aseptic precautions SAB was given in the midline in L 3-4 / L4-5 space. Adequate local anaesthesia was infiltrated and SAB was performed using midline approach. One of the needle was taken randomly. Introducer if needed was introduced in the selected space lumbar puncture was done with the needle bevel facing cephalad. Identification of the free flow of CSF was marked as the success of SAB. If CSF flow was not identified, the needle was withdrawn and redirected. Any withdrawal of the needle was considered as an attempt. After ensuring free flow of CSF, Bupivacaine 0.5% heavy 3cc without any adjuvant was injected through the spinal needle at rate of 1ml/10sec.

Following withdrawal of needle, patient was turned to supine position. Onset of action was assessed by checking the sensory block achieved at 5min by cold swab or pinprick method. Maximum height achieved after the drug settled down was considered as the height of the block which was about 15-20 minutes after procedure. Changes in parameters like HR, Blood Pressure were recorded at regular intervals. Solutions of ringer lactate, dextrose, saline and colloids were infused as maintenance fluids according to blood loss, patient's condition, response of surgery, or according to hemodynamic stability. Intra-operative complications like nausea, vomiting and bradycardia were managed symptomatically. Post-operatively all the patients

were questioned regarding regression of block using Bromage Scale.

Patients were followed up postoperatively. If patient complained headache then its onset, location, severity, effect of position, character, duration, associated symptoms like nausea, vomiting, auditory and ocular symptoms were asked and then proper diagnosis of headache was done.

Once the symptoms and signs of PDPH were confirmed and diagnosed, the patients were first treated by conservative means like bed rest, encouraging them to take good intake of fluids. If patient is unable to take oral fluids then IV fluids were given. Pharmacological measures were adopted to treat by either Tab. Aceclofenac 100mg BD or Tab caffeine or Inj. Diclofenac 75mg IM. Proper antibiotic cover was given to each patient complaining of PDPH.

The following parameters like number of attempts, onset, height, regression of block, PDPH, Non PDPH and backache were compared in the study.

### Results

The statistical analysis revealed that the number of attempts to puncture the dura mater was similar in all three groups. 25G Whitacre(Pencil point needle) was associated with early onset of the block, height of the block achieved was more, and low incidence of PDPH when compared to 23G and 25G Quincke's needles. In Quincke(cutting) needle, smaller bore needle(25G) was associated with low incidence of PDPH than 23G Quincke needle.

### Discussion

In 1898, Karl August Bier, was the first to report the symptoms associated with PDPH. Bier presumed that the headache was due to loss of CSF. Later the presence of a CSF leak had been confirmed with radionuclide cisternography, radionuclide myelography, manometric studies, epiduroscopy, and direct visualization at laminectomy.

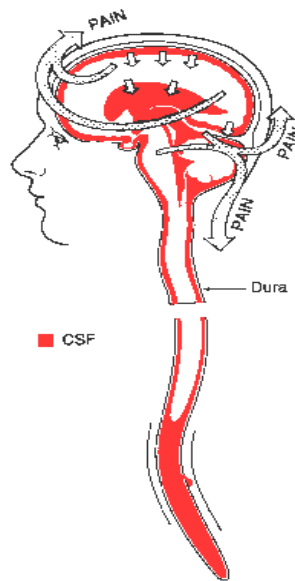
Among the side effects of SAB, PDPH is the most distressing one and results in increased morbidity, prolonged hospital stay, increased cost, and patient dissatisfaction.

Obstetric patients are at high risk of PDPH because of their sex and young age. After delivery of the fetus, the reduced epidural pressure increases the rate of CSF leakage through the dural opening leading to loss of buoyant support of the brain, thereby causing traction on the meninges, a pain-sensitive structure. In addition as a consequence of the decreased CSF volume, there is compensatory vasodilatation and increased intracranial blood volume, according to Monro Kellie hypothesis, leading to a headache.

Incidence and severity of PDPH is proportional to the rate of CSF leakage through the dural hole made by the spinal needle, so the use of finer gauge needles is justified.

## PATHOPHYSIOLOGY OF POST DURAL PUNCTURE HEADACHE

Figure :1



PDPH is caused by leakage of cerebrospinal fluid through the hole created by the needle in the dura.

Bier in 1899 suggested that postdural puncture headache is caused by leakage of cerebrospinal fluid through the needle hole in the dura.

### THEORIES OF POST DURAL PUNCTURE HEADACHE

Leakage of cerebro-spinal fluid (CSF) through dural puncture appears to be the main cause of PDPH and was first proposed in 1902. This leakage theory however is not universally accepted but still majority of investigations favour this "leakage theory" or "low CSF pressure theory", as an explanation for PDPH. This theory states that leakage of CSF through the dural hole causes decreased CSF pressure and volume, followed by gravity dependent downward sagging of the brain resulting in traction on the pain sensitive structure around the brain.

**High CSF pressure theory** explained due to bacterial or chemical arachnoiditis.

PDPH is thought to be caused by CSF leakage through the dural puncture at a greater rate than its production leading to a fall in CSF pressure. This causes headache by **two** mechanisms.

One is the sagging of the intracranial structures in the upright position; with traction on the meninges, cranial nerves and upper cervical nerves causing frontal, occipital and cervical pain.

The second mechanism is compensatory vasodilatation in response to the low intracranial pressure which again causes headache. The upright position worsens the headache by further decreasing the intracranial pressure and also by increasing the rate of loss of CSF through the dural puncture.

### Clinical diagnosis:

A headache was considered as being a typical postdural

puncture headache if it fulfilled the criteria laid down by **Corbey M.P. Berg.P. and Quanar .H**

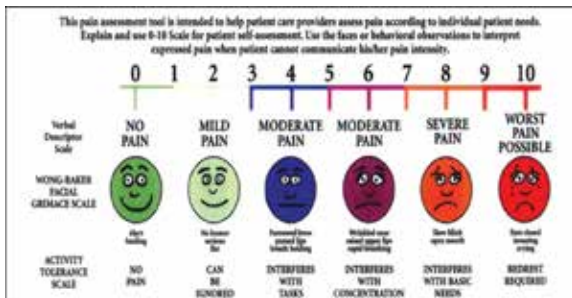
The headache started typically after the patient was in the erect or sitting position, and was relieved by the patients lying flat. The localization was mostly occipital or frontal. The headache was accompanied by vomiting, rigidity of neck and visual or auditory disturbances. Headache may last for 7-10 days post spinal anaesthesia.

**The headache was classified by Corbey M.P. and co workers**

The functional grading (FG grading) of the headache was divided into three categories

- 1) The headache did not interfere with normal daily activity
- 2) Periodical bed rest was necessary to relieve headache
- 3) The head ache was so intense that it was not possible to sit up and eat.

In PDPH pain assessment will be done by assessing severity of headache by applying the visual analogue scale(VAS) which was graded from 0= no pain to 10= the worse pain imaginable.



**Figure :2**

Combining the functional grading and visual analogue the severity of PDPH was classified  
 Grade I = FG1 + VAS1-3 (FG1 = Headache did not interfere with normal activity.)  
 Grade II = FG2 + VAS 4-7 (FG2 = Periodical bed rest was necessary to relieve headache.)  
 Grade III = FG3 + VAS 8-10 (FG3 = Headache was so intense it was not possible to sit up.)

**Grade III was subdivided into**

- IIIA symptoms relieved by bed rest and oral analgesia
- IIIB symptoms not relieved by bed rest or analgesia

The ocular and auditory manifestations usually accompany when the headache is more prolonged and severe. Non specific headache did not fulfil the above criteria. Ocular symptoms such as diplopia, blurring, inability to read, sensitivity to light spots before the eyes and trouble in focusing can manifest.

Auditory symptoms such as decreased hearing, obstruction, tinnitus and often accompanied by vertigo and ataxia. There is an anatomic communication between the subarachnoid space and the cochlea. Experimental work demonstrated that with a decrease in CSF pressure there was a fall in intra labyrinthine pressure followed by a functional inability of the ear to transmit high tones.

The International Headache Society describes PDPH as headache that worsens within 15 min after sitting or stand-

ing and improves within 15 min after lying, with at least one of the following – nuchal rigidity, tinnitus, hypacusia, photophobia or nausea. There should be a history of dural puncture, the headache should develop within five days after dural puncture and should resolve either spontaneously within one week or within 48 hours after effective treatment of CSF leak (usually by epidural blood patch).

**CHARACTERISTICS OF PDPH**

Headache is bilateral frontal or retro orbital, occipital extending into neck – throbbing/constant type. It is associated with photophobia and nausea. Depending on body position – headache is aggravated by sitting or standing, relieved or lessened by lying down flat.

Onset – 12 to 72 hours following dural puncture.  
 Duration – 1 day to 4 days, very rarely upto 1 week.

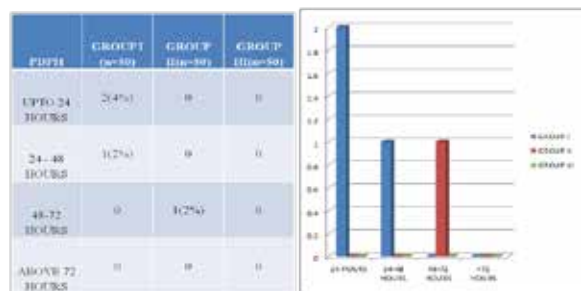
**FACTORS INFLUENCING THE INCIDENCE OF POST DURAL PUNCTURE HEADACHE**

The main factors influencing PDPH can be categorized as :

1. Characteristics of patient population
2. Characteristic of needle used
3. Puncture technique

In the present study, it was found that with use of introducer with smaller Gauge, ease of insertion was better. It is similar between pencil point and cutting type of needle. This resulted in more rapid onset of sensory block with Whitacre needle. Maximum height was obtained with Whitacre needle. The block regression was same in all three groups. In the present study the incidence of PDPH is 6% in group I, 2% in Group II and 0% in Group III. Occurrence of Non PDPH and backache was nil significant.

**Incidence of PDPH**



**Figure: 3**

According to studies, PDPH is due to low CSF pressure consequence upon seepage of CSF through the dural puncture hole and choroid plexus is unable to secrete sufficient fluid to maintain the CSF pressure. More over the negative pressure in the epidural space may draw CSF from sub arachnoid space. PDPH is related to the size of the dural puncture made by the needle.

**Conclusion**

In conclusion, pencil point 25G Whitacre needle is associated with early onset of sensory block, the height of the block achieved was greater and incidence of PDPH was significantly less or not at all when compared to cutting type of 23G or 25G Quincke needle. In the cutting type of needle, 25G Quincke needle is associated with low incidence of post dural puncture headache when compared to 23G Quincke needle. Thus pencil point Whitacre needle is a better choice in view of early onset, more height

achieved, low incidence of PDPH. However, cost factor should be weighed against the complication, quality of analgesia, post operative patient comfort and satisfaction.

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