Dissertation on

"INCIDENCE OF POSTDURAL PUNCTURE HEADACHE IN CAESARIAN SECTION A COMPARISON BETWEEN 25 GAUGE QUINCKE AND 25 GAUGE PENCIL POINT SPINAL NEEDLES"

Submitted to

THE TAMIL NADU Dr.M.G.R. MEDICAL UNIVERSITY

in partial fulfillment of the requirements
for the award of degree of

M D (BRANCH X)
ANAESTHESIOLOGY

STANLEY MEDICAL COLLEGE
THE TAMILNADU Dr.M.G.R. MEDICAL UNIVERSITY
CHENNAI, TAMILNADU

MARCH 2010

ACKNOWLEDGEMENT

I wish to express my sincere thanks to **Prof. Dr.S.CHITHRA M.D.,** Dean, Government Stanley Medical College and Hospital for having kindly permitted me to utilize the facilities of the hospital for the conduct of the study.

My Heart felt thanks to **Prof. Dr.R.SUBRAMANIYA BHARATHIYAR M.D.,D.A.,** Prof and HOD, Department of ANAESTHESIOLOGY, Government Stanley Medical College, Chennai for his motivation, valuable suggestions, constant supervision, encouragement and for all necessary arrangements for conduct of the study.

I am greatly indebted to **Prof. Dr.P.CHANDRASEKAR M.D.,D.A.**, for his valuble suggestions, **Prof Dr. R.MADAN KUMAR M.D.,D.A.,** member of ethical committee for having helped in the approval of the study, Prof **Dr.PANKAJAVALLI M.D.,D.A.**,for her encouragement and guidance for the conduct of study in Government RSRM hospital, **Prof. Dr.R.LAKSHMI M.D.,D.A.**, and **Prof Dr.PONNABALA NAMASIVAYAM M.D.,D.A.**, **D.N.B,** for their valuable suggestions, **Prof.Dr.B.KALA M.D.,D.A., Prof.Dr.S.GUNASEKARAN M.D.,D.A.,D.N.B,** for their guidance earlier in the study.

I am immensely thankful to **Dr.SATISH LOGIDASAN M.D, D.N.B** and **Dr.SOUNDAPPAN D.A,D.N.B** for their valuble guidance in performing and consolidation of the study.

I thank all the **ASSISTANT PROFESSORS** who evinced interest and gave support for conduct of the study.

I thank **Mr.PADMANABAN** statistician, for helping me in Statistical analysis.

I thank all the Post graduates for their valuable support during the study period.

I thank all theatre personnel for their cooperation.

I thank all the patients without whose participation, this study would not have been possible.

CONTENTS

INTRODUCTION

The history of anaesthesiology is a rich mosaic of interwoven events around the world that have created and defined the specialty. From the days of the ancient Greeks and Romans to the modern operating rooms, the care of the patients remain challenging. With the introduction of general anesthesia in 1846 to the development of regional techniques, anaesthesia has been a evolving specialty.

The complications of general anaesthesia led to the discovery of regional anaesthesia. Spinal anesthesia developed in late 1800s with the work of Wynter, Quincke and Corning. The term " spinal anaesthesia" was coined by Leonard Corning in 1885.

Later in 1898, Karl August Bier injected 10 – 15 mg cocaine into subarachanoid space of seven patients, himself and his assistant Hildebrandt. Bier, Hildebrandt and four of the patients described symptoms associated with postdural puncture headache (PDPH). Bier was **first** to describe postdural puncture headache and attributed this headache to excessive loss of cerebro spinal fluid. It has been over one hundred years since Dr. Bier experienced and wrote about the first reported postdural puncture headache.[1]

The incidence of PDPH was as high as 66% with large gauge medium bevel cutting needles, which reduced to 3-25% with 25 gauge

cutting needles which further reduced to 0-14% with 25 gauge pencil point needles. Thus, in the last 50 years with the development of fine gauge needles and needle tip modification, there is a significant reduction in the incidence of postdural puncture headache.

The incidence of PDPH is high in obstetric population because of their young age, sex and wide spread use of central neuroaxial blocks. PDPH is the third most common reason for litigation in obstetric anaesthesia.[2]

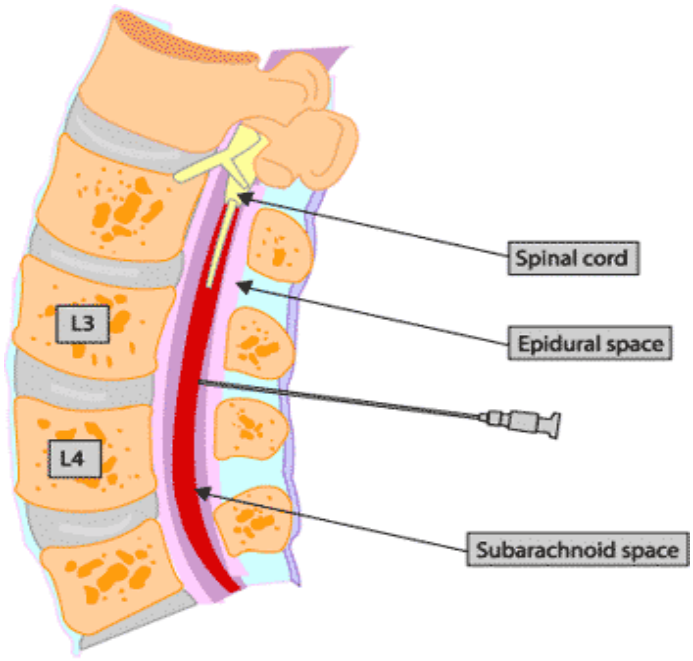
Despite obvious advantages of regional over general anaesthesia for obstetrics, regional techniques was not popularized. The period from 1930 to 1950 has often been referred to "**dark ages of obstetric anaesthesia**" . In 1951, after the development of pencil point spinal needles by Whitacre and Hart, and changes in needle tip design, there was a significant reduction in incidence of postdural puncture headache.

This randomized control study, was done in Government RSRM hospital, affiliated to Government Stanley medical college , Chennai. The aim of the study is to compare the incidence of PDPH with 25 gauge Quincke and 25 gauge pencil point spinal needles in patients undergoing caesarian section under spinal anesthesia.

AIM OF STUDY

To compare the incidence of postdural puncture headache with 25 gauge Quincke and 25 gauge pencil point spinal needles in patients undergoing caesarian section under spinal anesthesia.

ANATOMY OF SPINAL COLUMN



The spinal cord ends at the level of L2 in adults and L3 in children. Dural puncture above these levels is associated with a risk of damaging the spinal cord . An important landmark is that a line joining the top of the iliac crests corresponds to L4 vertebra or L4 –L5 interspace this is called the " **Tuffier's line**".

ANATOMY OF SPINAL DURAMATER

The spinal duramater is a tube extending from foramen magnum to second segment of sacrum.It contains the spinal cord and nerve roots that leave it.The duramater is a dense connective tissue made up of collagen and elastic tissue running in longitudinal direction. Hence,orienting the

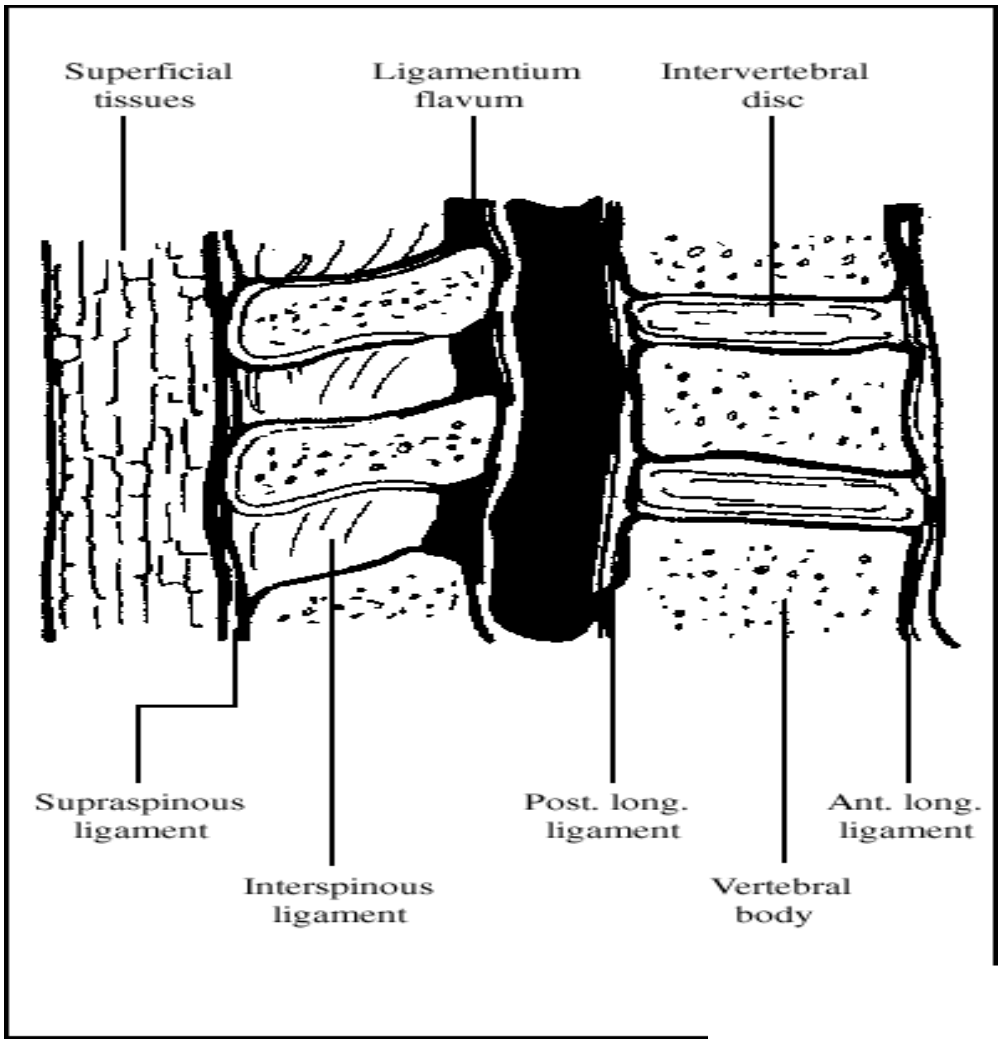
needle in right angles to fibre tend to cut the fibres which are under tension, will retract and increase the longitudinal dimensions of dural perforation increasing the likelihood of post spinal headache.[3]

The structures that the needle will pierce before reaching the CSF

1. **The skin**
2. **The Subcutaneous fat.**
3. The **supraspinous ligament** that joins the tips of the spinous processes together.
4. The **interspinous ligament** which is a thin flat band of ligament running between the spinous processes.
5. The **ligamentum flavum** is thick, up to about 1cm in the middle and is mostly composed of elastic tissue. It runs vertically from lamina to lamina. When the needle is within the ligaments it will feel gripped and a distinct "give" can often be felt as it passes through the ligament and into the epidural space.
6. The **epidural space** contains fat and blood vessels. If blood comes out of the spinal needle instead of CSF , it is likely that an epidural vein has been punctured. The needle should simply be advanced a little further.

7. **The duramatter.** As the needle is advanced a second "give way" is felt when needle pierces the pierces dural sac.

8. The **subarachnoid space**. This contains the spinal cord and nerve roots surrounded by CSF. An injection of local anaesthetic will mix with the CSF and rapidly block the nerve roots with which it comes in contact. [4]

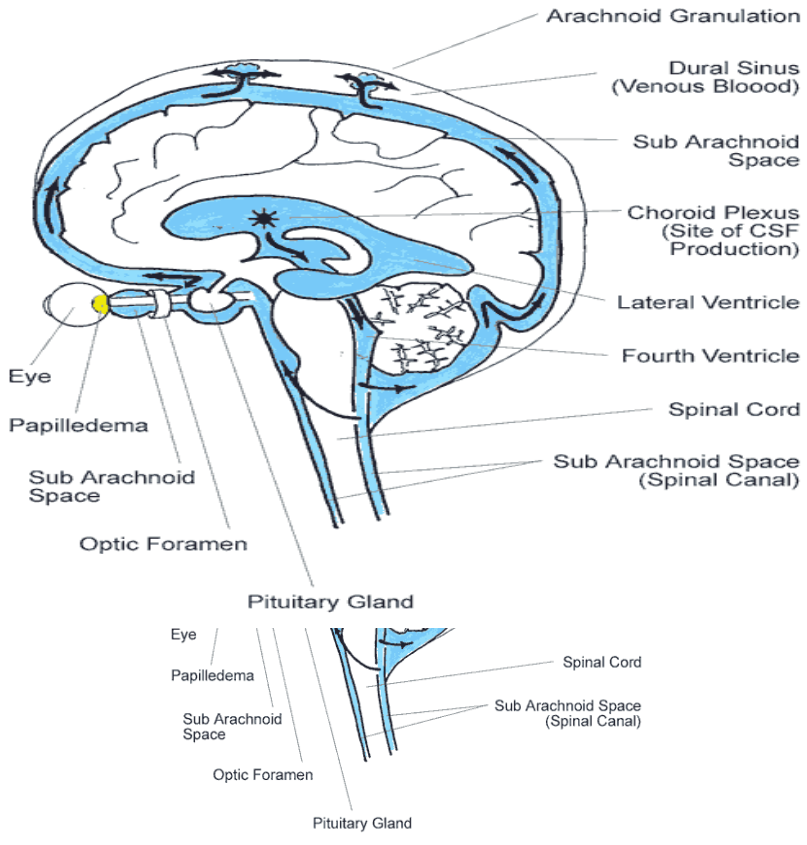


CIRCULATION OF CSF

The cerebrospinal fluid **(CSF)** is produced from arterial blood by the choroid plexuses of the lateral and fourth ventricles by a combined process of diffusion, pinocytosis and active transfer. A small amount is also produced by ependymal cells. The **choroid plexus** consists of tufts of capillaries with thin fenestrated endothelial cells.

The total volume of CSF in the adult is about 140 ml. The volume of the ventricles is about 25 ml. CSF is produced at a rate of 0.2 - 0.7 ml per minute or 600-700 ml per day.

The circulation of CSF is aided by the pulsations of the choroid plexus and by the motion of the cilia of ependymal cells. CSF is absorbed across the arachnoid villi into the venous circulation. The arachnoid villi act as one-way valves between the subarachnoid space and the dural sinuses.



PHYSIOLOGY OF SPINAL ANAESTHESIA

Local anesthetic solution injected into the subarachnoid space blocks conduction of impulses along all nerves with which it comes in contact, although some nerves are more easily blocked than others. There are three classes of nerve: motor, sensory and autonomic. Autonomic and sensory fibers are blocked before motor fibers. This causes vasodilation and fall in blood pressure to occur first followed by sensory and motor blockade.[4]

EVOLUTION OF SPINAL NEEDLES

The history of the design of spinal needle tips evolved from the first needles used by J. Leonard Corning in 1885 to innovative, modern needle designs .The shape of the needle tip started as a cutting bevel and developed into the atraumatic tip and later the pencil-point tip came to use. The first used spinal needles had a cutting bevel with a large gauge which was associated with high incidence of PDPH. The various cutting bevel spinal needles were **Corning's needle, Quincke's spinal needle, Bier's spinal needle, Bainbridge's spinal needle.** All these spinal needles cut the dural fibres which led to a large rent and resulted in high incidence of PDPH.

Later, these cutting bevel needles were modified by **Herbert Merton Greene** (1923) to a rounded tip by removing the cutting edges of the bevel, which reduced the PDPH rate from 40% to 4%. Later, the bevel was further modified by a American surgeon **Pitkin** to a sharp bevel ground off to a taper of 45 degree, resulting in a rounded, blunted bevel heel. He proposed that the cut dural fibres act as a trap door which was closed by high CSF pressure and limited the CSF loss. (4)

Once the suggestion that dural fibres were less likely to be damaged by non-cutting tips had been publicised, led to the devopement of the completely non-cutting needle tip, with a lateral orifice, the "**pencil point spinal needles".**

Hart and Whitacre (1951) are commonly associated with the design of the first closed-ended, lateral orifice, pencil-point needle to decrease the incidence of PDPH. The needle was of fine gauge, with a solid non-cutting tapering point and an orifice on the conical surface 2 mm from the actual tip of the needle. They quoted a PDPH rate of 9% for the non-cutting needle as opposed to 32% for a cutting needle.(4)

Thirty-seven years after Whitacre's development of the pencil-point needle, **Sprotte** (1987) further modified the needle by increasing the size of the distal orifice to combat the problems of slow CSF flow, difficulty in aspiration and resistance to injection of the local anaesthetic solution. But the size of the lateral hole sometimes caused the orifice to straddle the dural layers, resulting in partial loss of the local anaesthetic solution into the epidural or subdural space and resulted in incomplete blocks.[5]

Sprotte needle (1987).

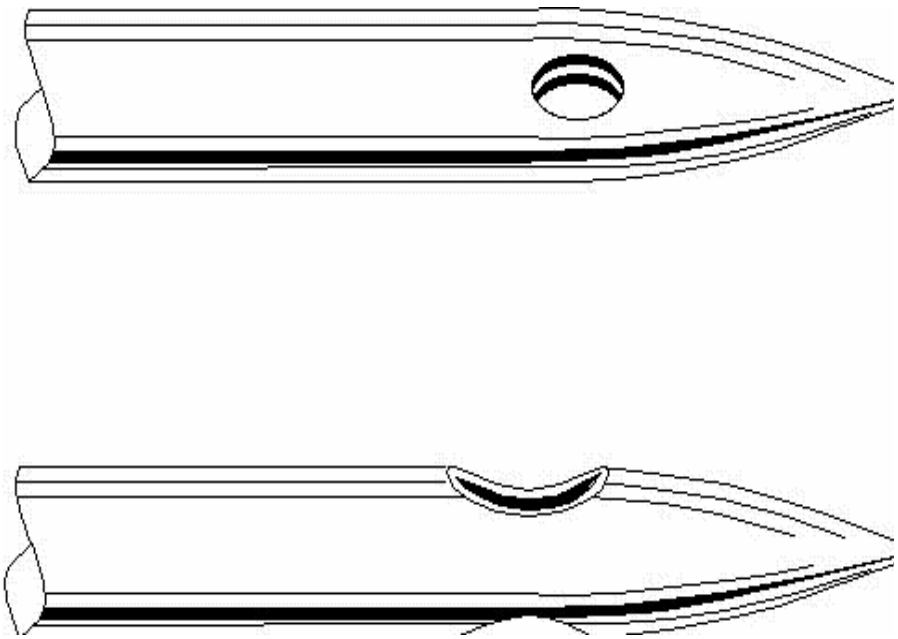
Since the pencil-point needles were relatively blunt, requiring force to insert them, and had a problematic distal bevel, led to the devolopment

of double bevel cutting type of spinal needle the "**Atraucan"** . The Atraucan needle has a double bevel with the sharp point making an initial incision. The second part of the bevel then dilates this incision rather than cutting a larger hole, leaving only a small hole in the dura . The PDPH rate was about 2.5% , and the incidence of other complications was comparable to that using similar gauge pencil-point needles. However, the sharp tip is prone to damage.[6]

Atraucan_ needle (1993)

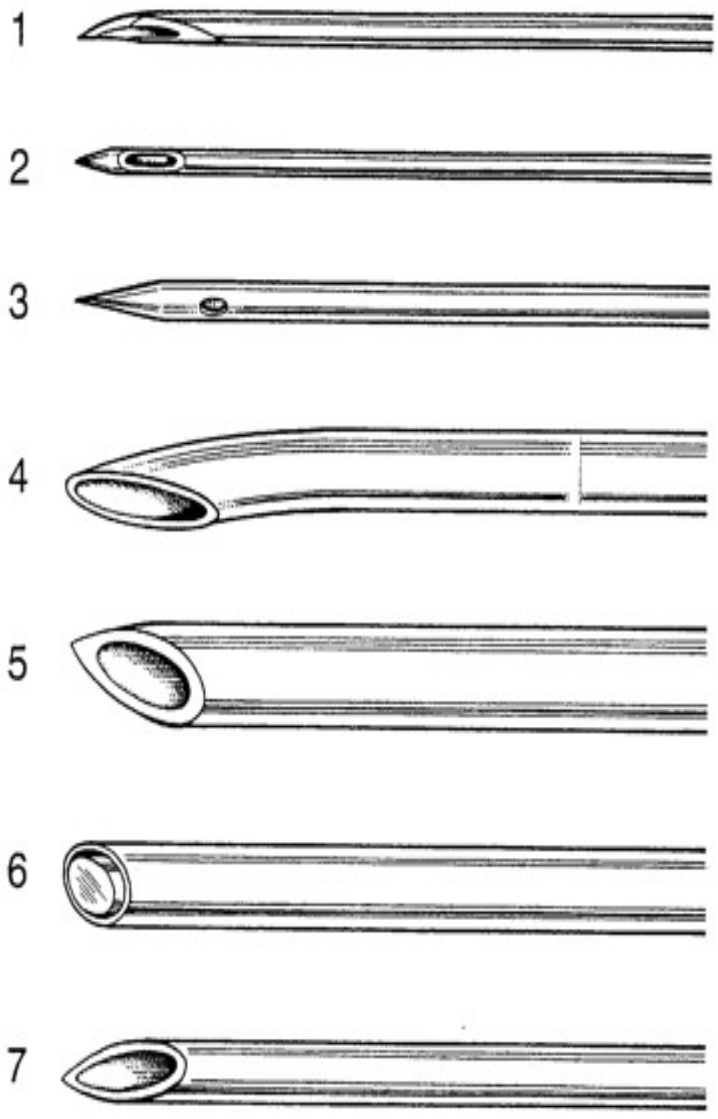
In 1995, Joseph Eldor devoloped the double hole pencil point spinal needle the " **Eldor**" spinal needle.The double-hole pencil-point (DHPP) spinal needle is composed of a closed end blunt ogival or pencil point tip and two circular coaxial holes in close proximity to the tip . Anesthetic solution may be injected through the coaxial holes in a direction parallel to the long axis of the spinal fluid column which allows an even anesthetic distribution with a low dosage required. This spinal needle allows anesthetic solution to be injected even when one of the holes get obstructed by a tissue fragment and rapid reflux of cerebral spinal fluid at twice the rate of single hole spinal needles.[7]

ELDOR SPINAL NEEDLES



In 2000, – a modification of a Quincke needle was made to make a 'tip holed spinal needle' ,the '**Ballpen Needle'** . The proposed advantages of this needle are that the tip of the needle is always completely in the subarachnoid space on removal of the stylet, there is no needle tip projecting beyond the orifice to cause damage to neurological tissue and there is no mechanical weakening at the tip caused by the presence of a lateral orifice. The open end of the needle allows laminar flow of CSF, which results in faster identification of the subarachnoid space.[8]

Ballpen needle (2000).



1, 26G Atraucan Double Bevel Design;

2, 26G Sprotte Style Pencil Point;

3, 22G Whitacre Style Pencil Point;

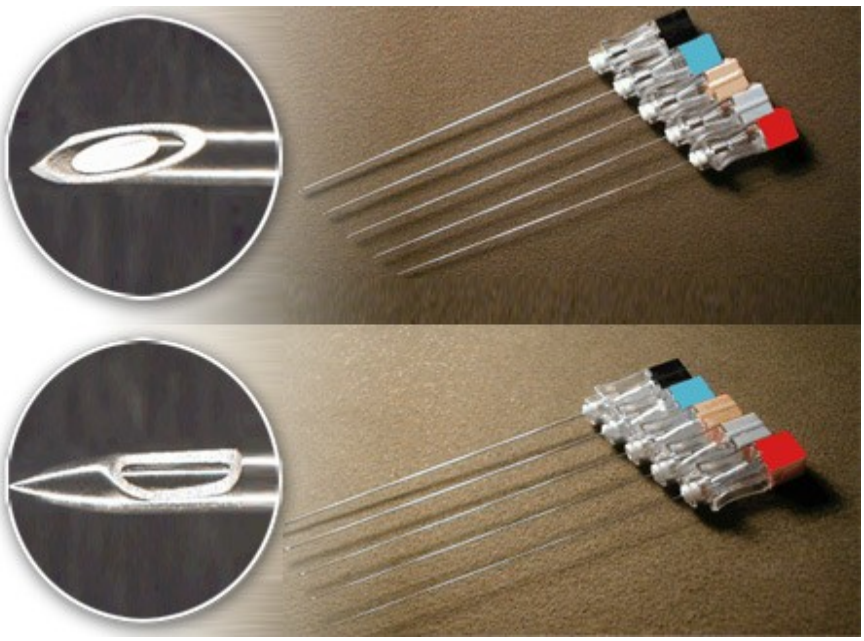
4, 16G Tuohy Needle;

5, 17G Barkers Spinal Needle;

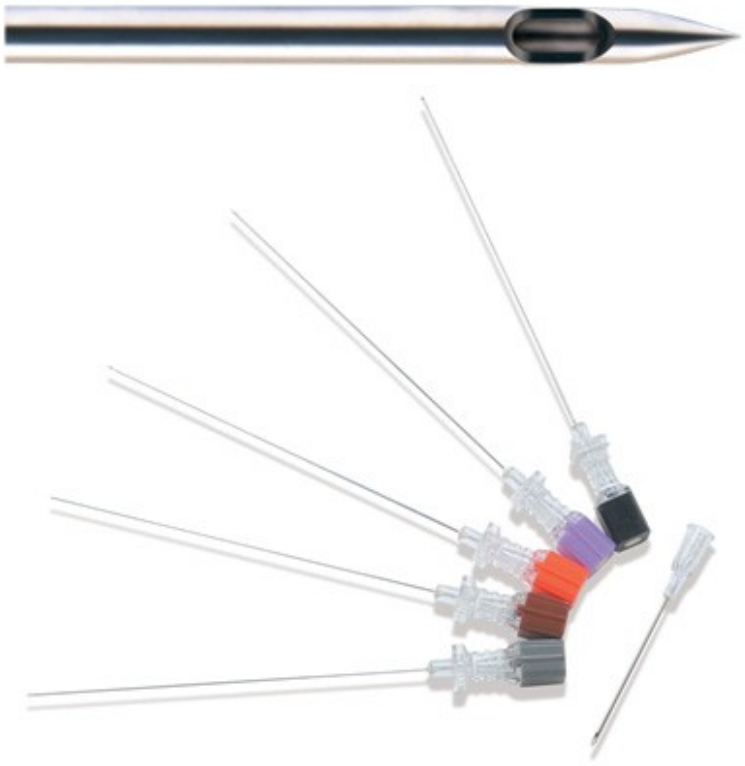
6, Large Gauge Spinal Needle;

7, 18G Crawford Needle.

QUINCKE AND PENCIL POINT SPINAL NEEDLES



PENCIL POINT SPINAL NEEDLE



POST DURAL PUNCTURE HEADACHE

INCIDENCE

The incidence of post-dural puncture headache is related to the size and design of the spinal needle used the experience of the personnel performing the dural puncture, and the age and sex of the patient.

Relationship between needle size and incidence of postdural puncture headache

Needle tip design	Needle gauge	Incidence of post-dural puncture headache (%)
Quincke	22	36
Quincke	25	3–25
Quincke	26	0.3–20
Quincke	27	1.5–5.6
Quincke	29	0–2
Quincke	32	0.4
Sprotte	24	0-9.6
Whitacre	20	2-5
Whitacre	22	0.63-4
Whitacre	25	0-14.5
Whitacre	27	0

PATHOPHYSIOLOGY OF DURAL PUNCTURE

1. CONSEQUENCES OF DURAL PUNCTURE

Puncture of the dura has the potential to allow the development of excessive leakage of CSF. Excess loss of CSF leads to intracranial hypotension and a demonstrable reduction in CSF volume. The adult subarachnoid pressure of 5–15 cm H_20 is reduced to 4.0 cm H_20 or less. The rate of CSF loss through the dural perforation (0.084–4.5 ml s^{-1}) is generally greater than the rate of CSF production (0.35 ml min^{-1}), particularly with needle sizes larger than 25G. The two possible explanations are

First, the lowering of CSF pressure causes traction on the intracranial structures in the upright position. These structures are pain sensitive, leading to the characteristic headache.

Secondly, the loss of CSF produces a compensatory venodilatation *vis-à-vis* the Monro–Kellie doctrine. The Monro–Kellie doctrine, states that the sum of volumes of the brain, CSF, and intracranial blood is constant. The consequence of a decrease in CSF volume is a compensatory increase in blood volume. The venodilatation is then responsible for the headache. (7)

2. FACTORS CONTRIBUTING TO PDPH

Spinal needles have undergone numerous modifications to reduce the incidence of dural puncture headache. The factors contributing are

a) Purpose of Lumbar Puncture :

i) Spinal anaesthesia

Reducing the size of the spinal needle has made a significant impact on the incidence of post-spinal headache. The incidence is ~40% with a 22G needle; 25% with a 25G needle; 2%–12% with a 26G Quincke needle; and <2% with a 29G needle. However, technical difficulties leading to failure of the spinal anaesthetic are common with needles of 29G or smaller.

In 1951, Whitacre and Hart introduced the 'atraumatic' spinal needle . This design offered the handling characteristics of larger needles with a low incidence of post-spinal headache . Needle modifications since that time, such as the Sprotte and Atraucan needles, promise further reductions in post-spinal headache.

ii) Diagnostic lumbar puncture

Diagnostic lumbar puncture is commonly performed with a 20G or even 18G medium bevel cutting needle which is associated with a high incidence of PDPH.

B) PATIENT FACTORS :

i) Age

The greatest frequency for PDPH occurs in age group 20 – 40 years.The decreased frequency in the elderly age group is attributed to a higher pain threshold .

ii) Obstetrics

The parturient is at particular risk of dural puncture and the subsequent headache because of her sex, young age, and the widespread application of epidural anesthesia (inadvertent puncture). The other reasons are dehydration during labour,changes in blood volume and intra abdominal pressure during labour, and lack of postoperative fluid replacement. After a dural puncture with a 16G Tuohy needle, up to 70% of subjects will report symptoms related to low CSF pressure.

iii) Children

Post-dural puncture headache is reported as uncommon in children. Although low CSF pressure or other physiological differences have been proffered as reasons to explain the low incidence in children, it is likely that a low reporting rate is the explanation

c) Factors related to spinal needles :

i) Needle size

Large spinal needles will clearly produce large dural perforations where the likelihood of a dural puncture headache is high. Fine gauge spinal needles, 29G or smaller, are technically more difficult to use, and are associated with a high failure rate. A balance has to be struck between the risks of dural puncture headache and technical failure. 25G, 26G and 27G needles probably represent the optimum needle size for spinal anaesthesia.

ii) Needle orientation

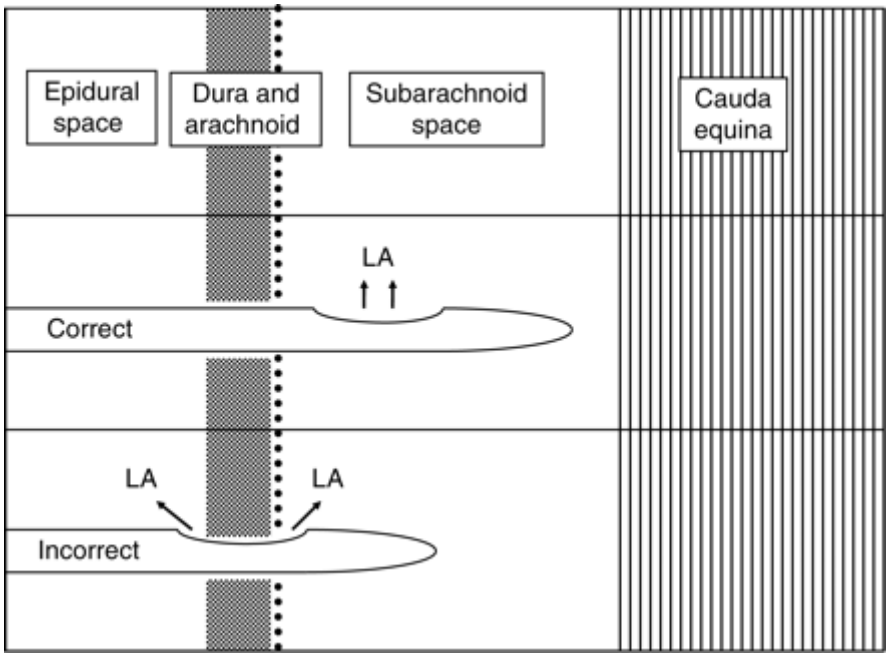
Perpendicular orientation of the bevel of a spinal or epidural needle leads to a reduction in the incidence of post-dural puncture headache.

iii) Needle design

Over the years since Quincke and Bier, a large number of needle designs have been introduced. The Quincke type is the standard needle with a medium cutting bevel and the orifice at the needle tip .In 1926, Greene proposed a needle tip design with a non-cutting edge that would separate the dural fibres to avoid post-dural puncture headache. Later in 1951, the pencil point needles were introduced.

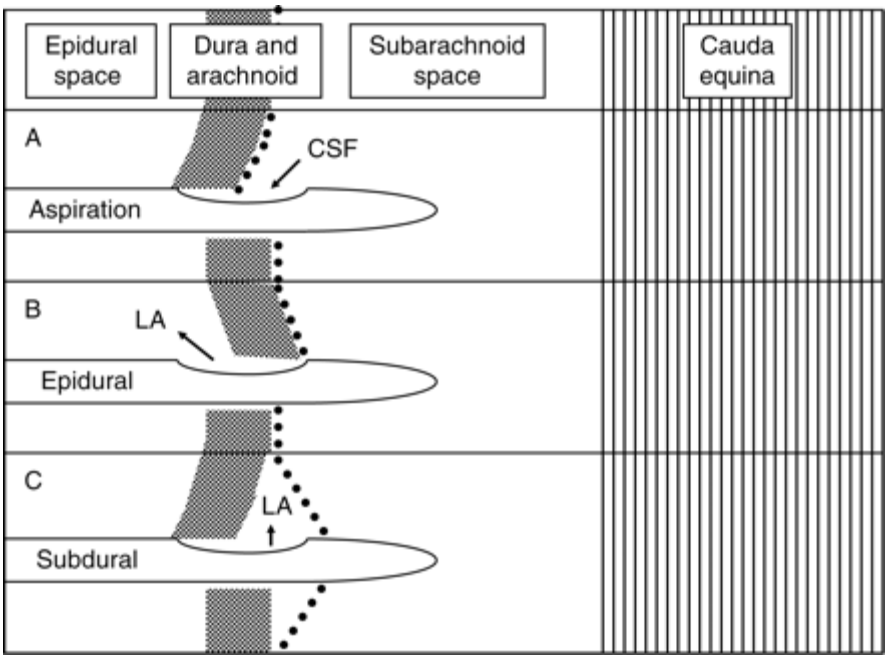
The problem of low CSF flow and paraesthesia seen with the pencil-point needles has promoted the search for novel needle designs. The Atraucan needle has an orifice at the tip of the needle. The Atraucan needle with a narrow cutting tip and an atraumatic bevel, has a low incidence of PDPH.

But the pencil point needles straddles the duramatter due to longer orifice (1mm) than the Quincke needle so that the local anaesthetic solution is misplaced into the epidural or subdural space resulting in high incidence of failed blocks.



The dura or arachnoid mater may act as a ‘flap’ valve across the opening of a pencil point needle. During aspiration (A) the dura/arachnoid arepulled back allowing CSF to enter the needle. During

injection the dura (B) or arachnoid (C) is pushed forward and the local anaesthetic enters he epidural or subdural space leading to faild spinal anaesthesia.[38]



d) Operator skill level and fatigue

The incidence of inadvertent dural puncture during epidural anaesthesia is inversely related to operator experience.Sleep deprivation, operator fatigue and the effect of night work may be a confounding variable producing the higher incidence of inadvertent dural puncture in personnel performing epidural analgesia

PRESENTATION OF DURAL PUNCTURE HEADACHE

Onset

90% cent of headaches occur within 3 days of the procedure, and 66% start within the first 48 h. Rarely, the headache develops between 5 and 14 days after the dural puncture.

Symptoms

The common distribution of headache is over the frontal and occipital areas radiating to the neck and shoulders. The temporal, vertex and nuchal areas are less commonly invoved. The pain is exacerbated by head movement, and adoption of the upright posture, and relieved by lying down. An increase in severity of the headache on standing is the *sine qua non* of post-dural puncture headache.

Other symptoms associated with PDPH include nausea, vomiting, hearing loss, tinnitus, vertigo, dizziness and paraesthesia of the scalp, and upper and lower limb pain.

Diagnosis

PDPH is a diagnosis of exclusion.The history of accidental or deliberate dural puncture and symptoms of a postural headache, neck ache and the presence of neurological signs, usually guide the diagnosis. Additional tests to confirm the diagnosis are:

- A diagnostic lumbar puncture may demonstrate a low CSF opening pressure or a ‘dry tap’, a slightly raised CSF protein, and a rise in CSF lymphocyte count.

- In MRI diffuse dural enhancement, with evidence of a sagging brain; descent of the brain, optic chiasm, and brain stem; obliteration of the basilar cisterns; and enlargement of the pituitary gland.

- CT myelography, retrograde radionuclide myelography, cisternography, or thin section MRI can be used to locate the spinal source of the CSF leak.

Differential diagnosis

Differential diagnosis of dural puncture headache include intracranial tumours, intracranial haematoma, pituitary apoplexy, cerebral venous thrombosis, migraine, chemical or infective meningitis, and non-specific headache. [9]

Duration

The largest follow-up of post-dural puncture headache is still that of Vandam and Dripps in 1956.[10] They reported that 72% of headaches resolved within 7 days, and 87% had resolved in 6 months). In a minority of patients the headache can persist.

Estimated rate of spontaneous recovery from post-dural puncture headache

Duration (days)	Percentage recovery
1–2	24 %
3–4	29 %
5–7	19 %
8–14	8 %
3–6 weeks	5 %
3–6 months	2 %
7–12 months	4 %

TREATMENT

Overview

The literature regarding the treatment of post-dural puncture headache reveal that, with no treatment, over 85% of post-dural puncture headaches will resolve within 6 weeks .

Psychological

All patients undergoing spinal anesthesia ,should be explained of the reason for the headache, the expected time course, and the therapeutic options available. Regular review is essential to monitor the course and therapeutic manoeuvres undertaken.

Simple

Supportive therapy such as bed rest, rehydration, acetaminophen, non-steroidal anti-inflammatory drugs, opioids, and antiemetics may control the symptoms and so reduce the need for more aggressive therapy.

Posture

Patient are encouraged to lie in a comfortable position. The prone position has been advocated, but it is not a comfortable position for the post-partum patient. The prone position raises the intra-abdominal

pressure, which is transmitted to the epidural space and may alleviate the headache. [11]

Abdominal binder

A tight abdominal binder raises the intra-abdominal pressure. The elevated intra-abdominal pressure is transmitted to the epidural space and may relieve the headache.

Pharmacological treatment

The aim of management of post-dural puncture headache is to:

(i) replace the lost CSF

(ii) seal the puncture site

(iii) control the cerebral vasodilatation.

DDAVP, ACTH

Both DDAVP (desmopressin acetate), intramuscular before lumbar puncture and ACTH (adrenocorticotrophic hormone) administered as an infusion ($1.5\ \mu g\ kg^{-1}$), can decrease the headache but inadequate statistical analysis prevents assessment of the value of ACTH. [12]

Caffeine

Caffeine is a central nervous system stimulant that amongst other properties produces cerebral vasoconstriction. I.V. It is available in an oral and i.v. form. The oral form is well absorbed with peak levels reached in 30 min. Caffeine crosses the blood–brain barrier and the long half-life of 3–7.5 h allows for infrequent dosing schedules.[13]

Dose

The dose is 300–500 mg of oral or i.v. caffeine once or twice daily.

Sumatriptan

Sumatriptan is a 5-HT_{1D} receptor agonist that promotes cerebral vasoconstriction, in a similar way to caffeine.[14]

Epidural blood patch

After the observation that 'bloody taps' were associated with a reduced headache rate, the concept of the epidural blood patch has developed. The theory is that the blood, once introduced into the epidural space, will clot and occlude the perforation, preventing further CSF leak.

Technique

The presence of fever, infection on the back, coagulopathy, or patient refusal are contraindications to the performance of an epidural blood patch.. With the patient in the lateral position, the epidural space is located with a Tuohy needle at the level of the supposed dural puncture or an intervertertebral space lower. Up to 30 ml of blood is then taken from the patient's arm and injecting slowly through the Tuohy needle. Should the patient describe lancinating pain of dermatomal origin the procedure must be stopped. At the conclusion of the procedure, the patient is asked to lie still for one to 2 h, and is then allowed to walk.[15]

Contraindications

Contraindications include a raised white cell count, pyrexia and technical difficulties.

Outcome

The technique has a success rate of 70–98% if carried out more than 24 h after the dural puncture. If an epidural blood patch fails to resolve the headache, repeating the blood patch has a similar success rate.

Epidural saline

Concerns have been expressed about the potential danger of an autologous epidural blood patch for the treatment of post-dural puncture headache. The immediate resolution of the headache with a blood patch is attributable to thecal compression raising the CSF pressure. An epidural injection of saline would, produce the same mass effect, and restore normal CSF dynamics. As saline is a relatively inert and sterile solution, epidural saline bolus or infusion appears to be an attractive alternative.[16]

Epidural dextran

Dextran 40, either as an infusion or as a bolus, because of high molecular weight and viscosity slows its removal from the epidural space. The sustained tamponade around the dural perforation allows spontaneous closure. [17]

Epidural, intrathecal and parenteral opioids

Epidural, intrathecal and parentral opiods have been tried with limited success for treatment of PDPH.[18]

Fibrin glue

Fibrinous glue, have been used to repair spinal dural perforations. In the case of lumbar dural perforation, the fibrin glue may be placed blindly or using CT-guided percutaneous injection. [19]

Intrathecal catheters

After accidental dural perforation with a Tuohy needle, it has been suggested that placement of a spinal catheter through the perforation may provoke an inflammatory reaction that will seal the hole.

Surgery

There are case reports of persistent CSF leaks, that are unresponsive to other therapies, being treated successfully by surgical closure of the dural perforation. This is clearly a last resort treatment. [20]

REVIEW OF LITERATURE

1. In 2008, Sprigge et al did a 23 year survey in a district general hospital in United Kingdom to find the incidence of PDPH after accidental dural puncture and subarachanoid in obstetric anaesthesia. There were 167 recognised accidental dural punctures after epidurals (0.91%), with 147 patients (88%) developing post dural puncture headache. Out of 5021 sub arachanoid blocks,52 developed PDPH (1.04%). The incidence of PDPH with cutting bevel needles (Quincke = 163) were 3.5% and 0.8% for pencil point spinal needles (4853). They concluded postdural puncture headache can be a debilitating complication of epidural and subarachnoid anaesthesia.[21]

2. In 2007, O'Connor G, et al, studied the effect of spinal needle design, size, and penetration angle on dural puncture cerebral spinal fluid loss. For this study, 103 cadaver dura samples were punctured with randomly assigned needles at predetermined angle. The results found that there was a 5-fold increase in mean leak (Quincke > Whitacre) between the needle tip design and (25 > 22 gauge), a 6-fold greater mean leakage between needle diameters. Puncture angle demonstrated no significant effect.[22]

3. In 2005, Olubukola O. Nafiu, et al studied the incidence of PDPH in 96 patients undergoing caesarian section.96 ASA I-II consenting mothers who had spinal anaesthesia for caesarean section using 22 G (n=12), 25G (n=46) and 26 gauge Quincke needles(n=38). The incidence of PDPH was 8.3%. 50% of PDPH occurred in 22 gauge quincke needles.

4. In 2005, Jan Muhammad Shaikh et al Studied the incidence of PDPH in caesarian section using 25G Quincke, 27G Quincke and 27G Whitacre spinal needles. Group I (25G Quincke spinal needle: n=168), Group II (27G Quincke spinal needle: n=160) and Group III (27G Whitacre spinal needle: n=152). Frequency of PDPH following the use of 25G Quincke(Group I), 27G Quincke (Group II) and 27G Whitacre (Group III) spinal needles was 8.3% (14/168), 3.8% (6/160) and 2.0% (3/152) respectively.[24]

5. In 2003, Peter T. Choi et al, did a meta analysis of obstetric studies (52 articles) and systematically reviewed the literature on parturients to determine the frequency onset, and duration of PDPH. Parturients have approximately a 1.5% risk of accidental dural puncture with epidural insertion. Of these, approximately half (51.4% to 52.8%) will result in PDPH. The risk of PDPH from spinal needles diminishes with small diameter, atraumatic needles,

but is still appreciable (Whitacre 27-gauge needle, 1.6% to 1.8%). PDPH occurs as early as one day and as late as seven days after dural puncture and lasts 12 hours to seven days. The study concluded that PDPH is a common complication for parturients undergoing neuraxial blockade.[25]

6. In 2002,Anju Shah et al, studied the incidence of PDPH in caesarian section in 75 female patients of young age group (20-35 yrs). They were divided into three groups of 25 patients each according to the size and shape of the needle used for spinal anaesthesia - 25G Quincke (Group I), 27 G Quincke(Group II) and 27G Whitacre (Group III).The incidence of PDPH was 20% in group I ,12.5% in Group II 4.5% in group III, although the differences being statistically insignificant. All the patients who developed PDPH had mild degree of headache. The failure rate was 0%, 4%, 12% with 25 G Quincke, 27 G Quincke, 27G Whitacre spinal needles respectively.[26]

7. In 2001, R.J. Chilvers et al, studied the frequent incidence of PDPH in caesarian section, with 25G Whitacre needle. 2466 cases were studied.The PDPH rate was more 0.97% using 25-gauge Whitacre needles. Inadvertent dural puncture by the introducer

needle may contribute to PDPH rates when using fine-gauge spinal needles.[27]

8. In 2000, Manuel C. Vallejo et al, studied the incidence of PDPH and the epidural blood patch rate for five spinal needles when used in 1200 obstetric patients. 26-gauge Atraucan, 25-gauge Quincke, ath 24-gauge Gertie Marx (GM), 24-gauge Sprotte, and 25-gauge Whitacre. The incidences of PDPH were, respectively, 5%, 8.7%, 4%, 2.8%, and 3.1% for Atraucan, Quincke, GM, Sprotte, and Whitacre needles.[28]

9. In 1997, Lambert DH et al, studied the Role of needle gauge and tip configuration in the production of lumbar puncture headache.The incidence of PDPH after spinal anesthesia with 26- and 27-gauge Quincke and 25-gauge Whitacre needles was studied in a series of 4,125 parturients undergoing spinal anesthesia over a 4-year period. The incidence of PDPH was 8.2% with 26-gauge Quincke needles , 2.7% with 27-gauge Quincke needles, and 1.2% with 25-gauge Whitacre needles. They concluded, use of the smallest gauge needle and one that has a noncutting Whitacre tip produces the lowest incidence of PDPH in parturients.[29]

10. In 1993: Devcic, et al studied incidence of PDPH in obstetric anaesthesia using 24-Gauge Sprotte and 25-Gauge Quincke

Needles and Effect of Subarachnoid Administration of Fentanyl. 194 patients were randomly assigned to receive spinal anesthesia with one of the two needles (Sprotte, n = 96; Quincke, n = 98). All patients were evaluated during the first 4 postoperative days, . The incidence of PDPH was 4.2% in 24 G Sprotte needle and 7.1% in 25 G Quincke needle.The results were not significantly different . The addition of fentanyl to hyperbaric bupivacaine spinal anesthesia did not reduce the risk of PDPH.[30]

11. In 1992, L.E. Shutt et al, Bristol studied 150 women undergoing elective Caesarean section under spinal anaesthesia using 22-gauge Whitacre, a 25-gauge Whitacre or a 26-gauge Quincke needle. Postdural puncture headache (PDPH) was experienced by one mother in the 22-gauge Whitacre group (1.5%), none in the 25-gauge Whitacre group (0%)and five in the 26-gauge Quincke group(7.5%)[31]

12. In 1993, **Ross AW** et al, studied the incidence of PDPH in caesarian section using 24 G Sprotte and 26G Quincke needles in 140 patients. Anaesthesia was administered via 24 gauge Sprotte (n = 104) and 26 gauge Quincke (n=40). Of the 104 patients in the Sprotte needle group there were ten with PDPH (9.6%), two of which were considered severe. Of the 40 patients in the Quincke needle group there were eight with PDPH (20%), three of which were considered severe.[32]

13. In 1993, Celleno, Danilo et al did an Anatomic Study to find the effects of dural puncture with different spinal needles. After removal, the dura was punctured with different needles (22,25, 27, and 29-gauge Quincke, 24-gauge Sprotte, 22-gauge Whitacre, and 18-gauge Tuohy needles) and observed by stereomicroscope to examine the gross morphology. This study confirms that the arrangement of dural fibers is not as uniform as previously thought. Histologic findings confirm that pencil-point needles may be less traumatic than Quincke-type needles. The direction of the bevel of the needle does not appear to have great importance in determining the shape of the hole[33].

14. In 1993, Saul Wiesel et al did a randomized prospective study to find the incidence of PDPH in 93 young patients less than 45 years

of age undergoing spinal anaesthesia for non obstetrical surgery using 24 gauge Sprotte and the 27 gauge Quincke needles The results of this study showed the overall incidence of PDPH was 14%, 15% developed in 24 G Sprotte needle and 12.8% in 27 G Quincke spinal needle.There was no statistical significance in the incidence of PDPH between the two groups.[34]

15. In 1992; Mayer et al studied incidence of PDPH using 24-G Sprotte and 27-G Quincke needles in patients undergoing elective and emergency cesarean section (*n* = 298). The needle to be used was assigned in a random manner: group I, 27-gauge Quincke (*n*=147); group II, 24-gauge Sprotte (*n*=151). The overall incidence of PDPH was 2% (*n* = 6), five in the Quincke group (3.5%) and one in the Sprotte group (0.7%). There was no significant difference in the incidence of PDPH between the two groups. Five headaches were classified as mild, and only one was moderate to severe. All headaches resolved quickly with conservative management and without blood patch. It was concluded that the choice between a 27-gauge Quincke and a 24-gauge Sprotte needle does not influence the incidence of PDPH after spinal anesthesia for cesarean section.[35]

MATERIALS AND METHODS

INCLUSION CRITERIA

- Patient age group 17 – 35 years.
- Singelton uncomplicated pregnancy of gestational age > 32 weeks.
- ASA 1, 2 patients.

EXCLUSION CRITERIA

- Pregnancy induced hypertension.
- Cardio vascular disorders.
- Hypovolemia and shock.
- Obesity.
- Infection of the back.
- Anticoagulant therapy.
- Patients requiring more than one attempt.
- Patients with history of migraine.

MATERIALS

- 25 gauge Quincke and 25 gauge pencil point spinal needles.
- 0.5% hyperbaric bupivacaine ampoules.
- IV cannulae, monitors.

- Drugs for general anaesthesia in case of inadequate block.
- Emergency drugs

STUDY METHODS

- Patients were randomly divided into two groups by systematic randomization.
- Group one : Patients who received spinal anaesthesia with 25G pencil point needle (study group).
- Group two : Patients who received spinal anaesthesia with 25G Quincke needle (control group).
- Written informed consent was obtained from all patients.
- All techniques was done by third year postgraduate in Anaesthesiology.
- Detailed history of present and past medical illness was obtained.
- Routine urine and blood investigations were done.
- General and systemic examinations were done.

PREPARATION OF THE PATIENT

- Injection ranitidine 50mg and injection metaclopramide 10mg given slow IV one hour before surgery.
- All patients were preloaded with 500ml ringer lactate.

- Electrocardiogram, heart rate, pulse oximetry were recorded intraoperatively.
- Spinal anesthesia was done in right lateral position.
- Back of the patient cleaned with povidone iodine and draped wih sterile towels.
- Spinal anaesthesia was performed in L2-3, L3-4 interspace with one of the above spinal needles in midline approach.
- 0.5% hyperbaric bupivacaine 1.6 – 1.8 ml injected intrathecally[4].
- After withdrawal of needle, patient turned to supine position with left uterine displacement.
- Level of sensory blockade, heart rate ,and blood pressure were recorded every three minutes for ten minutes and ten minutes there after.
- Inadequate block was converted to general anaesthesia.
- Fall in blood pressure more than 20% below base line was treated with intravenous fluids and 6mg of ephedrine IV incrementally.
- Complications like nausea, vomiting were managed symptomatically.
- All patients were given 1litre of crystalloid intraoperatively followed by postoperative intra venous fluids (ringer lactate or normal saline) 2ml/kg/hour until oral fluids were started[1.]

POSTOPERATIVE FOLLOWUP

- Patients were followed up for seven days. The onset, duration, of headache, aggravating factors and relief with medication were noted.
- Postoperative follow up was done by a blinded resident.
- All patients were allowed to ambulate on the first postoperative day
- All patients who had headache were treated symptomatically with bed rest, adequate hydration, Inj Paracetamol 1 ampoule IM followed by tablet Paracetamol with Caffeine thrice daily.
- All patients were given stamped post card to intimate us if they had any headache in the next three months.

DEFINITIONS

Failed spinal anaesthesia; The word 'failure' implies that a spinal anaesthetic was attempted, but "no block" resulted or was "inadequate" for the proposed surgery. Such inadequacy may relate to three components of the block: the extent, quality, or duration of local anaesthetic action, with more than one factor being inadequate.[38]

Successful puncture : Defined as spinal anaesthetic was adequate for the proposed surgery with respect to extent, quality and duration of local anaesthetic.[38]

Headache related to dural puncture : Headache distributed over frontal and occipital areas radiating towards neck, aggravated on upright posture and straining, and relieved on lying down. It may be associated with nausea, vomiting, visual and auditory disturbances.[37]

Grading of severity of dural puncture headache.

Mild PDPH : No limitation of activity. Not associated with nausea and vomiting.

Moderate PDPH : Limitation of activity. Occasionally associated with nausea and vomiting.

Severe PDPH : Confined to bed. Often associated with nausea , vomiting, auditory and visual disturbances.Unable to feed the baby in sitting position.[37]

OBSERVATION AND RESULTS

The study was conducted in Government RSRM Hospital, affiliated to Government Stanley medical college, Chennai. A random sample of 120 patients undergoing caesarian section under spinal anesthesia was selected from the population. Patients were randomized systematically by numbering them. All odd numbered patients were in the study (pencil point) group and even numbered patients were in the control (Quincke) group.

The continuous data was assessed by means and Standard Deviation (SD). The discrete data was assessed in number and percentage. Chi-square test and Fisher's Exact test for determining the difference between groups. P value < 0.05 was considered statistically significant.

DEMOGRAPHIC PROFILE

The sample of 120 patients was taken for study. Data was expressed as mean ± SD or absolute values.

The demographic profile between the groups were comparable in distribution to age , weight and height. ($P > 0.05$).

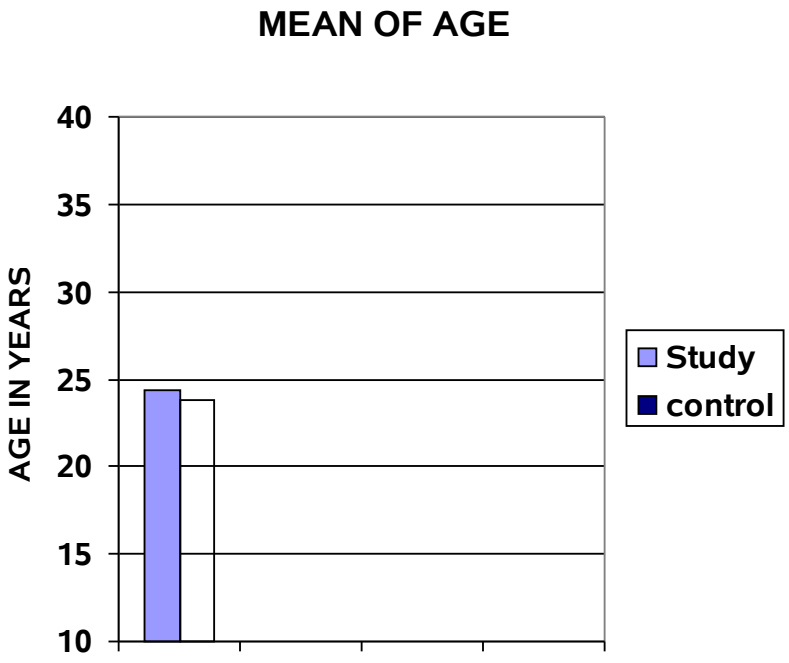
Group one: study group 25 gauge pencil point spinal needle

Group two: control group 25gauge Quincke spinal needle.

COMPARISON OF AGE

	GROUP	N	Mean	Std. Deviation
AGE	STUDY	60	24.3167	3.95951
	CONTROL	60	23.8000	3.55966

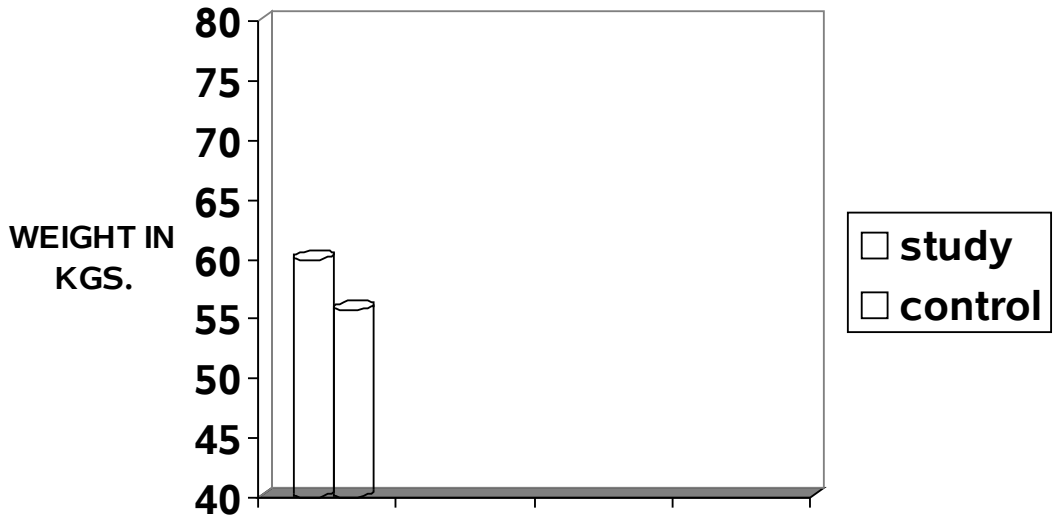
P> 0.05 not significant.



COMPARISON OF WEIGHT

	GROUP	N	Mean	Std. Deviation
WEIGHT	STUDY	60	59.9500	8.02417
	CONTROL	60	55.6833	9.13272

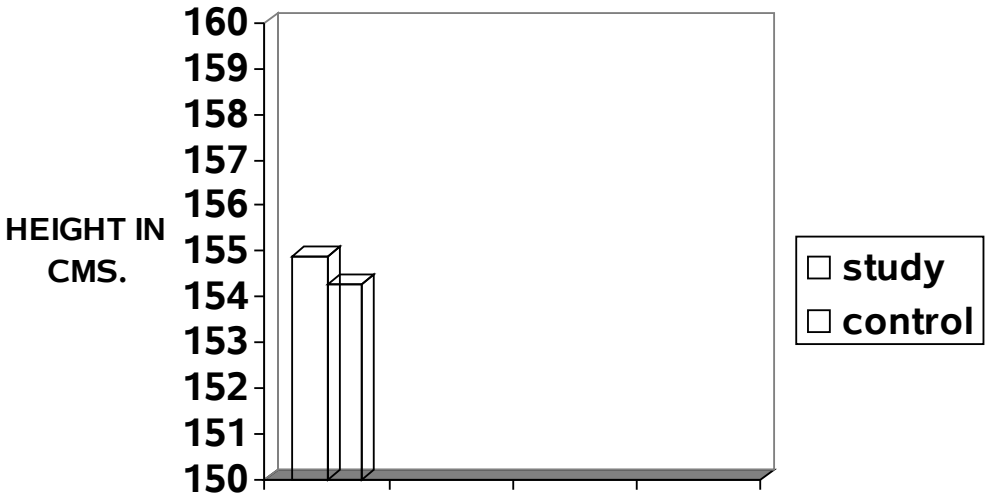
MEAN OF WEIGHT



COMPARISION OF HEIGHT

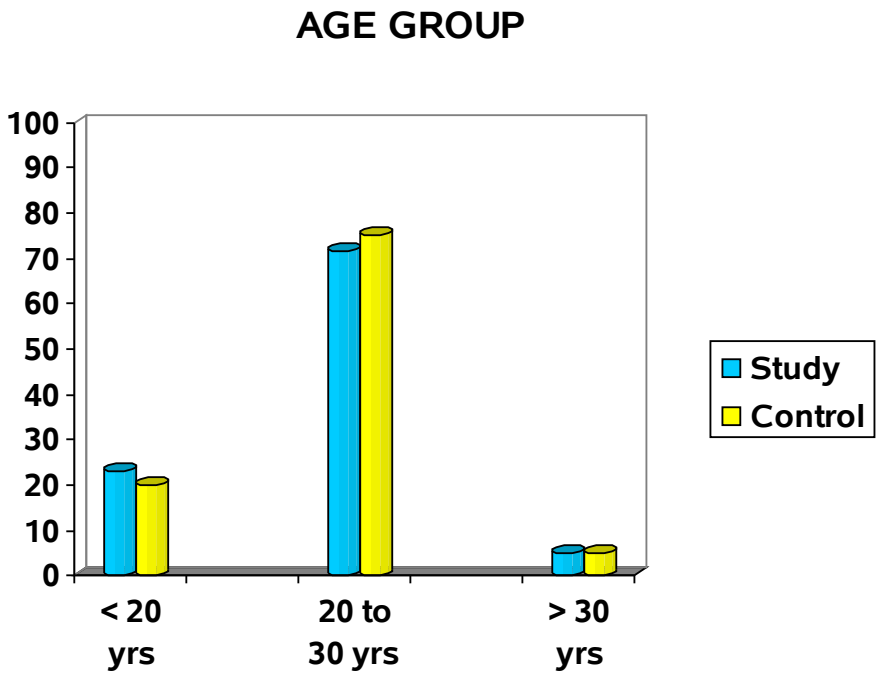
	GROUP	N	Mean	Std. Deviation
HEIGHT	STUDY	60	154.8833	10.05762
	CONTROL	60	154.2667	8.14668

MEAN OF HEIGHT



COMPARISON OF AGE GROUP

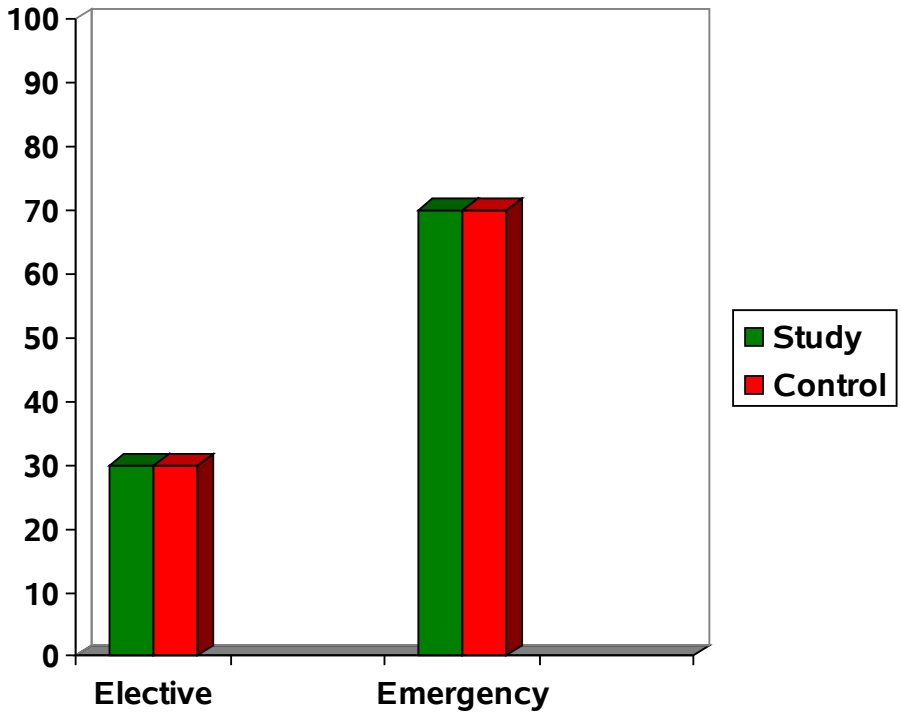
			GROUP		
			STUDY	CONTROL	Total
AGE GROUP	< 20 YEARS	Count	14	12	26
		% within GROUP	23.3%	20.0%	21.7%
	21-29 YEARS	Count	43	45	88
		% within GROUP	71.7%	75.0%	73.3%
	> 30 YEARS	Count	3	3	6
		% within GROUP	5.0%	5.0%	5.0%
	Total	Count	60	60	120
		% within GROUP	100.0%	100.0%	100.0%



COMPARISON OF CASE DISTRIBUTION - ELECTIVE AND EMERGENCY

		GROUP		
		STUDY	CONTROL	Total
ELECTIVE7	Count	18	18	36
	% within GROUP	30.0%	30.0%	30.0%
EMERGENCY	Count	42	42	84
	% within GROUP	70.0%	70.0%	70.0%
Total	Count	60	60	120
	% within GROUP	100.0%	100.0%	100.0%

COMPARISON OF CASE DISTRIBUTION



C'OMPARISON OF HEART RATE

HEART RATE		STUDY	CONTROL	P VALUE	SIGNIFICANCE
PREOP	MEAN	101.68	101.12	0.8063	NOT SIGNIFICANT
	SD	11.24	10.50		
1MIN	MEAN	96.10	99.37	0.1184	NOT SIGNIFICANT
	SD	11.08	11.58		
5MIN	MEAN	93.83	94.88	0.6212	NOT SIGNIFICANT
	SD	11.60	11.56		
10MIN	MEAN	93.47	93.35	0.9551	NOT SIGNIFICANT
	SD	10.19	11.41		
20MIN	MEAN	91.50	93.22	0.3373	NOT SIGNIFICANT
	SD	9.48	9.62		
30MIN	MEAN	89.70	91.35	0.3382	NOT SIGNIFICANT
	SD	9.00	8.85		
40MIN	MEAN	96.55	96.72	0.9482	NOT SIGNIFICANT
	SD	13.46	12.80		
50MIN	MEAN	93.90	94.07	0.9320	NOT SIGNIFICANT
	SD	10.69	10.12		
60MIN	MEAN	92.22	92.00	0.8975	NOT SIGNIFICANT
	SD	9.73	8.85		
POSTOP	MEAN	91.25	93.28	0.1776	NOT SIGNIFICANT
	SD	7.81	10.19		

COMPARISON OF MEAN ARTERIAL PRESSURE

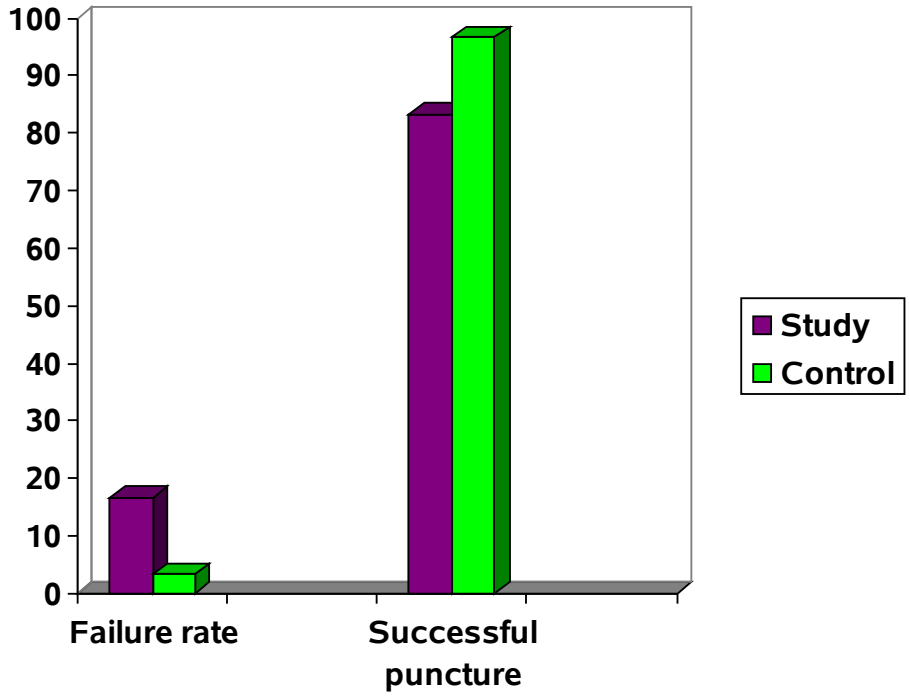
MAP		STUDY	CONTROL	P VALUE	SIGNIFICANCE
PREOP	MEAN	85.65	84.05	0.1627	NOT SIGNIFICANT
	SD	5.70	6.95		
1MIN	MEAN	85.62	84.22	0.2150	NOT SIGNIFICANT
	SD	6.42	5.87		
5MIN	MEAN	83.15	83.03	0.9212	NOT SIGNIFICANT
	SD	6.05	6.39		
10MIN	MEAN	84.15	83.80	0.7610	NOT SIGNIFICANT
	SD	5.76	6.17		
20MIN	MEAN	81.55	82.22	0.4133	NOT SIGNIFICANT
	SD	3.76	4.57		
30MIN	MEAN	82.92	84.00	0.3141	NOT SIGNIFICANT
	SD	5.79	6.75		
40MIN	MEAN	83.35	82.65	0.4888	NOT SIGNIFICANT
	SD	5.14	5.35		
50MIN	MEAN	83.08	84.03	0.4308	NOT SIGNIFICANT
	SD	5.53	6.82		
60MIN	MEAN	83.32	83.00	0.7811	NOT SIGNIFICANT
	SD	5.55	5.19		
POSTOP	MEAN	83.72	83.52	0.9047	NOT SIGNIFICANT
	SD	5.80	6.36		

FAILURE RATE AND SUCCESS RATE OF SPINAL ANAESTHESIA

		STUDY	CONTROL	Total
FAILURE RATE	Count	10	2	12
	% within GROUP	16.7%	3.3%	10.0%
SUCCESSFUL PUNCTURE	Count	50	58	108
	% within GROUP	83.3%	96.7%	90.0%
Total	Count	60	60	120
	% within GROUP	100.0%	100.0%	100.0%

P= 0.029 SIGNIFICANT.

FAILURE AND SUCCESS RATE OF SPINAL ANAESTHESIA

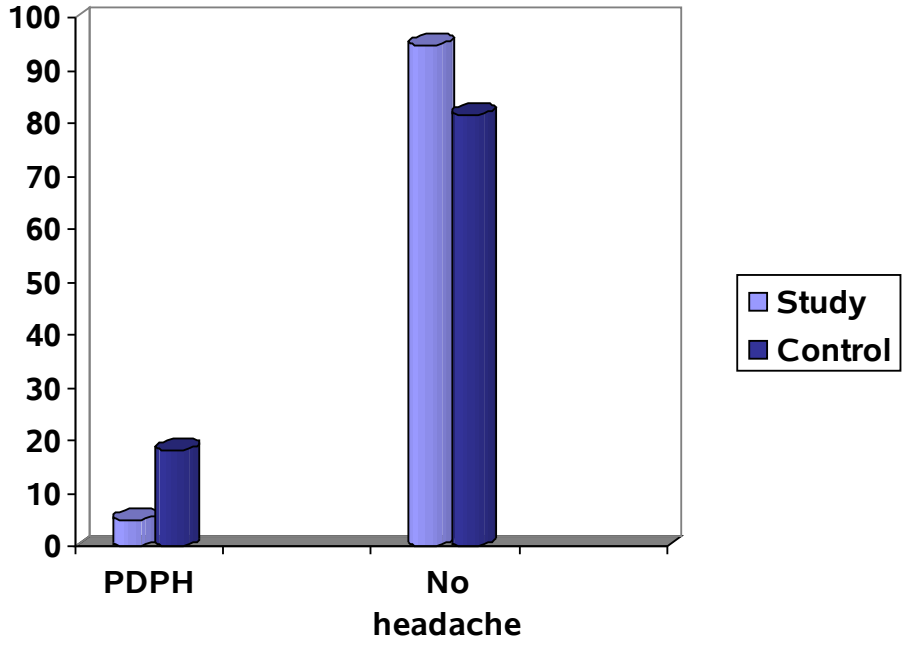


INCIDENCE OF PDPH

		GROUP		
		STUDY	CONTROL	Total
NO HEADACHE	Count	57	49	106
	% within GROUP	95.0%	81.7%	88.3%
PDPH	Count	3	11	14
	% within GROUP	5.0%	18.3%	11.7%
Total	Count	60	60	120
	% within GROUP	100.0%	100.0%	100.0%

P= 0.043 SIGNIFICANT.

INCIDENCE OF PDPH

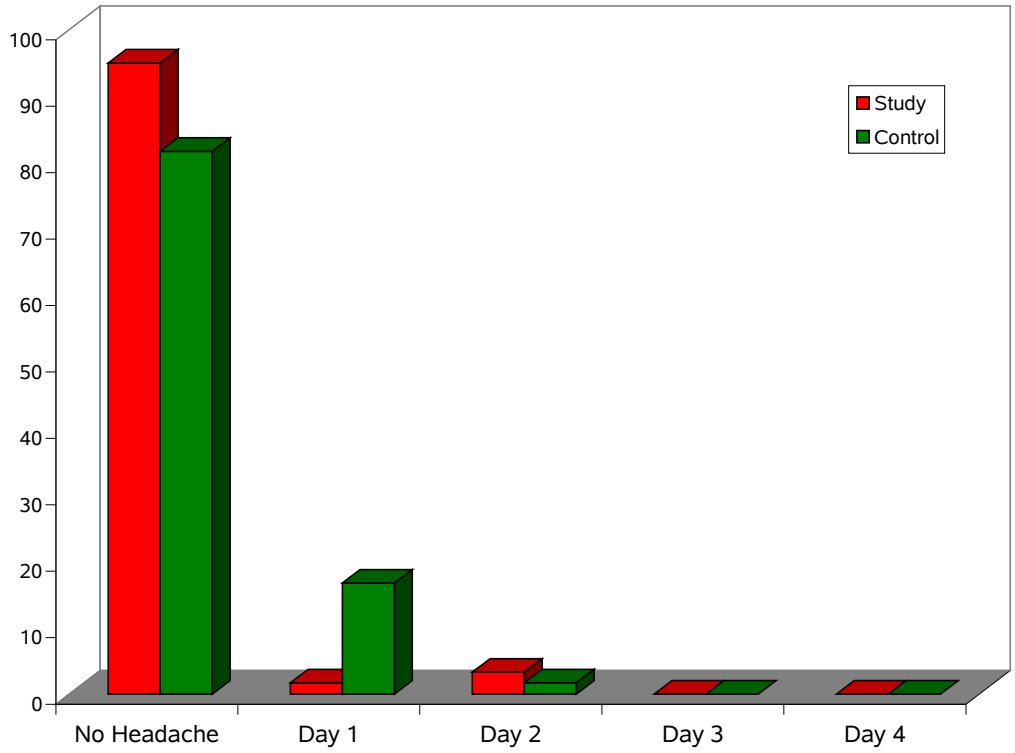


DAY OF ONSET OF PDPH

			GROUP		Total
			STUDY	CONTROL	
ONSET OF PDPH	No Headache	Count	57	49	106
		% within GROUP	95.0%	81.7%	88.3%
	DAY 1	Count	1	10	11
		% within GROUP	1.7%	16.7%	9.2%
	DAY 2	Count	2	1	3
		% within GROUP	3.3%	1.7%	2.5%
	DAY 3	Count	0	0	0
		% within GROUP	0%	0%	0%
	DAY 4	Count	0	0	0
		% within GROUP	0%	0%	0%
	Total	Count	60	60	120
		% within GROUP	100.0%	100.0%	100.0%

			GROUP		
			STUDY	CONTROL	Total
ONSET OF PDPH	No Headache	Count	57	49	106
		% within GROUP	95.0%	81.7%	88.3%
	DAY 1	Count	1	10	11
		% within GROUP	1.7%	16.7%	9.2%
	DAY 2	Count	2	1	3
		% within GROUP	3.3%	1.7%	2.5%
	DAY 3	Count	0	0	0
		% within GROUP	0%	0%	0%
	DAY 4	Count	0	0	0
		% within GROUP	0%	0%	0%
		Count	60	60	120
	Total				

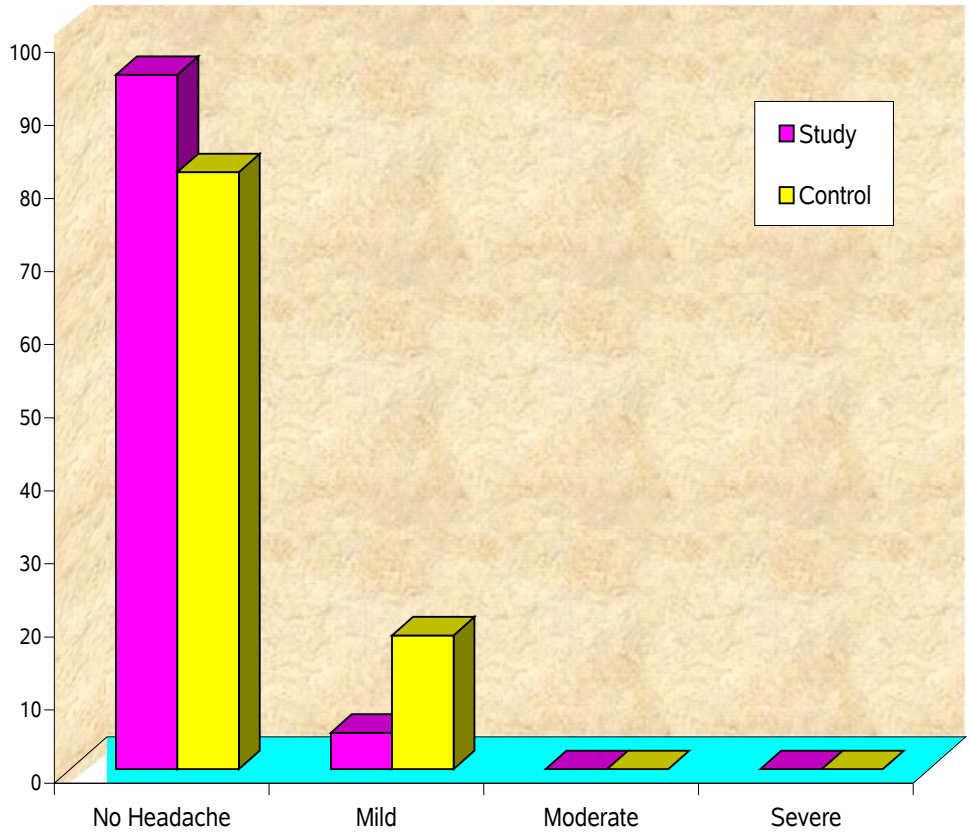
DAY OF ONSET OF PDPH



SEVERITY OF HEADACHE - MILD/MODERATE/SEVERE

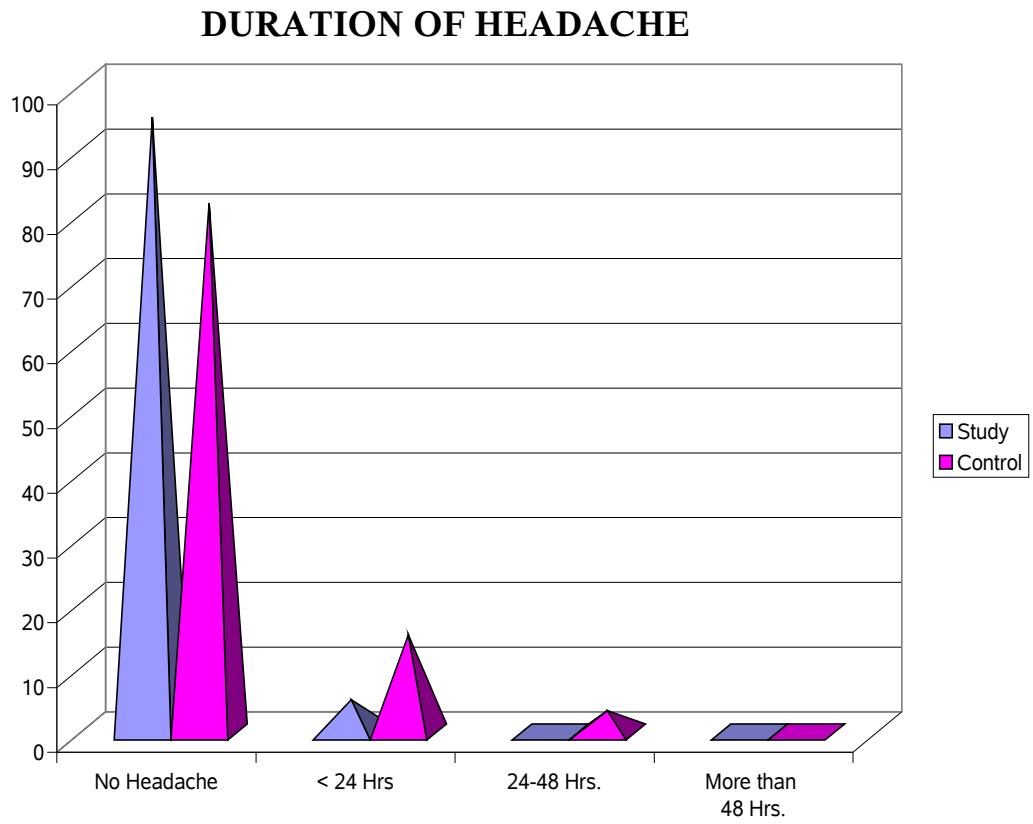
		GROUP		
		STUDY	**CONTROL**	**Total**
SEVERITY OF PDPH	NO HEADACHE	57	49	106
		95.0%	81.7%	88.3%
	MILD	3	11	14
		5.0%	18.3%	11.7%
	MODERATE	0	0	0
		0%	0%	0%
	SEVERE	0	0	0
		0%	0%	0%
	Total	60	60	120
		100.0%	100.0%	100.0%

SEVERITY OF HEADACHE - MILD/MODERATE/SEVERE

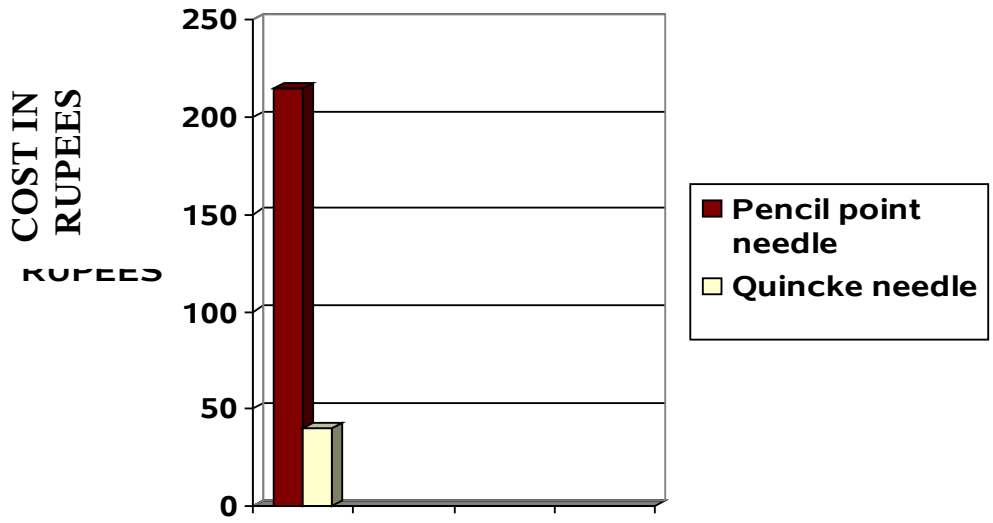


DURATION OF HEADACHE

			GROUP		
			STUDY	CONTROL	Total
DURATION OF PDPH	NO HEADACHE	Count	57	49	106
		% within GROUP	95.0%	81.7%	88.3%
	< 24 HOURS	Count	3	9	12
		% within GROUP	5.0%	15.0%	10.0%
	24 tO 48 HOURS	Count	0	2	2
		% within GROUP	.0%	3.3%	1.7%
	> 48 HOURS	Count	0	0	0
		% within GROUP	0%	0%	0%
	Total	Count	60	60	120
		% within GROUP	100.0%	100.0%	100.0%



COMPARISON OF COST OF SPINAL NEEDLES



DISCUSSION

Various studies as mentioned in review of literature, has studied the incidence of dural puncture headache and failure rate of spinal anesthesia in patients undergoing caesarian section using cutting and non cutting bevel spinal needles.

This randomized control study was done in 120 healthy, ASA 1 and 2 young parturient undergoing elective and emergency caesarian section under spinal anaesthesia.

The mean age, height and weight of the patients in the two groups were similar. Spinal anaesthesia was given for elective (n=36) and emergency (n = 84) cases. There was no significant difference in patients undergoing elective or emergency caesarian section between the two groups.

The most important contributing factor for the high incidence of PDPH is gauge and type of spinal needle used. The observed incidence of PDPH in this study was 11.7%.(14/120). The incidence of PDPH was 5% in study group (pencil point needle=3/60) and 18.3% in control group (Quincke needle = 11/60).The difference in incidence of PDPH is statistically significant (P=0.043). The headache was distributed over frontal and occipital areas radiating towards neck, aggravated on upright

posture and straining, and relieved on lying downward. It was occasionally associated with nausea, vomiting.[24]

Most headaches appear on the first and second postoperative day. In the analysis by Vandam et al, approximately 75% occurred by end of third postoperative day and 85% by the sixth postoperative day.[10] In concordance with the above study ,PDPH occurred in 11 patients on the first postoperative day (78.57%) and 3 patients on second postoperative day (21.42%) after spinal anaesthesia.

In a study by Lynch et al (1991) the mean duration of headache was 48hours (range 24 – 64 hrs) and 57.5 hrs (range 8 -80 hrs) in 25 and 22 gauge groups respectively [36]. In this study,the duration of PDPH was less than 24 hours in 12 patients and less than 48 hours in two patients. The mean duration of headache in this study was 27.42 hours. None of the patients had headache more than 48 hours.

The severity of PDPH ranged from mild headache to severe form in which the patient was confined to bed. In a study conducted by Brownridge et al, the severity of PDPH was mild in 8%, moderate in 3% and severe in 2.3% of cases[37] . In this study ,all patients had mild form of PDPH (11.7%) with no limitation of activity and was not associated with nausea and vomiting. The headache was relieved by bed rest, adequate hydration and simple analgesics (Tablet Paracetamol with

Caffeine). None of the patients developed severe headache due to fine gauge of the needle used, adequate hydration and immediate treatment.

In 2009, W.Fettes et al, studied the mechanisms, management and prevention of failed spinal anaesthesia and showed that pencil point spinal needles straddle the dural fibres more than the cutting needles leading to partial loss of local anaesthetic solution into epidural or sub dural space even after successful aspiration of CSF [38].In this study, the failure rate for spinal anaesthesia was 16.7 % with the study group (pencil point needle = 10/60) compared to 3.3% with the control group (Quincke needle = 4/60). The difference in failure rate was statistically significant (P= 0.029).

There was no clinically significant difference in the heart rate, fall in mean arterial pressure between the two groups.

There was difficulty with the use of pencil point spinal needles than Quincke needles because of operators inexperience with non cutting spinal needles.The cost of pencil point spinal needles was five times higher than the Quincke spinal needles which may be in an important factor that limit the widespread use of pencil point spinal needles.

SUMMARY

We studied the incidence of PDPH using two different spinal needles. Group one using 25 gauge non cutting (pencil point) spinal needle and group two using 25 gauge cutting spinal needle (Quincke) in patients under going elective or emergency caesarian section.

There was no statistical significant differences between groups in demographic data. There was no significant difference in patients under going elective or emergency caesarian section between the two groups.

There was statistically significant rate of decreased incidence of PDPH in the study group (pencil point = 5%) compared to the control group (Quincke = 18.3%).

There was a statistically significant failure spinal anaesthesia in study group (pencil point = 16.7%) compared to the control group (Quincke = 3.3%).

CONCLUSION

From this randomized control trial in 120 patients undergoing caesarian section, it was concluded that the incidence of PDPH was significantly low with 25 gauge non cutting bevel (pencil point = 5%) spinal needles compared with 25 gauge cutting bevel (Quincke = 18.3%) spinal needle .

The incidence of failed spinal anaesthesia was significantly more in non cutting (pencil point= 16.7%) spinal needles than cutting (Quincke = 3.3%) spinal needles.

ANNEXURES

PROFORMA

Name of the patient :

Group :

Age :

Weight :

Height :

IP No :

Associated medical illness :

ASA Status :

Informed Consent :

Last Oral intake :

Elective / Emergency :

Indication :

Premedication :

Shifted to theatre :

Monitors :

IV ACCESS :

Positioning :

Lumbar puncture :

Number of attempts :

Supine position :

Sensory level :

Failed Spinal :

Intra operative complications :

Duration of surgery :

	Pre-Operative	Intra-Operative								Post-Operative
		1 Min.	5 Min.	10 Min.	20 Min.	30 Min.	40 Min	50 Min.	60 Min.	
Heart rate										
Blood Pressure										
Saturation										

Post op follow up

PDPH present/ absent :

Postdural puncture Headache :

Day of onset 1/2/3/4 :

Severity Mild/ moderate/severe :

Duration <24 hrs/ 24- 48 hrs/ > 48 hrs :

Relieved by medications :

MASTER CHART

Sl. No.	Name	IP No.	Age (Yrs.)	Group	Age group	Weight (kg.)	Height (Cm)	Elective / emergency	Failed spinal	PDPH yes/ no	day of onset 1/2/3/4	Mild/ moderate/ severe	< 24hrs/ 24- 48hrs/ > 48hrs	Relieved by medications
1	Vijayalakshmi	7784	18	Group one	< 20 yrs	58	155	Emergency	Yes	No				
2	Muthuram	7823	18	Group one	< 20 yrs	56	160	Elective	Yes	No				
3	Kamala	924	22	Group one	20 -30 yrs	60	150	Emergency	No	Yes	Day 1	Mild	< 24 hrs	Yes
4	Vanaselvi	7993	23	Group one	20 -30 yrs	60	148	Emergency	No	Yes	Day 2	Mild	< 24 hrs	Yes
5	Kumari	7938	20	Group one	< 20 yrs	55	160	Emergency	Yes	No				
6	Regana	7987	20	Group one	< 20 yrs	55	151	Emergency	Yes	No				
7	Tamil Selvi	7986	20	Group one	< 20 yrs	48	160	Elective	Yes	No				
8	Shanthi	7981	20	Group one	< 20 yrs	52	165	Elective	Yes	No				
9	Kalyani	7522	20	Group one	< 20 yrs	74	158	Emergency	Yes	No				
10	Parveen Banu	7990	20	Group one	< 20 yrs	62	166	Emergency	Yes	No				
11	Susheela	8018	20	Group one	< 20 yrs	60	160	Emergency	No	No				
12	Meenakshi	7937	20	Group one	< 20 yrs	72	168	Elective	No	No				
13	Maheshwari	8019	20	Group one	< 20 yrs	60	154	Emergency	No	No				
14	Sarala	8041	23	Group one	20 -30 yrs	66	161	Emergency	No	Yes	Day 2	Mild	< 24 hrs	Yes
15	Suseela Begam	8039	20	Group one	< 20 yrs	56	150	Emergency	Yes	No				
16	Dhanam	8042	20	Group one	< 20 yrs	54	156	Emergency	No	No				
17	Bhavani	8018	20	Group one	< 20 yrs	60	155	Emergency	No	No				
18	Kalaivani	8043	21	Group one	20 -30 yrs	77	155	Emergency	No	No				
19	Parameshwari	7581	21	Group one	20 -30 yrs	52	162	Emergency	No	No				
20	Sakeela Banu	7110	21	Group one	20 -30 yrs	55	150	Elective	No	No				
21	Pavithra	7885	22	Group one	20 -30 yrs	64	145	Emergency	No	No				
22	Datchayani	7826	22	Group one	20 -30 yrs	66	140	Emergency	No	No				
23	Deepa	7863	22	Group one	20 -30 yrs	66	155	Elective	No	No				

Sl. No.	Name	IP No.	Age (Yrs.)	Group	Age group	Weight (kg.)	Height (Cm)	Elective / emergency	Failed spinal	PDPH yes/ no	day of onset 1/2/3/4	Mild/ moderate/ severe	< 24hrs/ 24- 48hrs/ > 48hrs	Relieved by medications
24	Vanathy	7879	22	Group one	20 -30 yrs	55	170	Emergency	No	No				
25	Geetha	7893	22	Group one	20 -30 yrs	62	152	Emergency	Yes	No				
26	Janaki	7091	22	Group one	20 -30 yrs	70	170	Emergency	No	No				
27	Gunasekari	7905	23	Group one	20 -30 yrs	54	152	Emergency	No	No				
28	Pushpa	7900	23	Group one	20 -30 yrs	48	142	Emergency	No	No				
29	Kalaiselvi	7906	23	Group one	20 -30 yrs	75	168	Elective	No	No				
30	Sathya	1873	23	Group one	20 -30 yrs	58	152	Emergency	No	No				
31	Vitchara	7913	24	Group one	20 -30 yrs	52	146	Elective	No	No				
32	Radha	7915	24	Group one	20 -30 yrs	80	160	Emergency	No	No				
33	Indumathi	7950	25	Group one	20 -30 yrs	57	160	Emergency	No	No				
34	Sugunya	7877	30	Group two	20 -30 yrs	53	150	Elective	No	Yes	Day 1	Mild	< 24 hrs	Yes
35	Sathya	7920	25	Group one	20 -30 yrs	52	150	Emergency	No	No				
36	Rosy	7928	25	Group one	20 -30 yrs	60	160	Emergency	No	No				
37	Mohana Priya	7896	25	Group one	20 -30 yrs	48	160	Emergency	No	No				
38	Ragini	7872	25	Group one	20 -30 yrs	66	170	Elective	No	No				
39	Faridha	2646	25	Group one	20 -30 yrs	66	161	Elective	No	No				
40	Kalai Selvi	8386	26	Group one	20 -30 yrs	72	150	Elective	No	No				
41	Gunavathy	8378	26	Group one	20 -30 yrs	72	160	Emergency	No	No				
42	Krishnaveni	899	26	Group one	20 -30 yrs	58	149	Emergency	No	No				

Sl. No.	Name	IP No.	Age (Yrs.)	Group	Age group	Weight (kg.)	Height (Cm)	Elective / emergency	Failed spinal	PDPH yes/ no	day of onset 1/2/3/4	Mild/ moderate/ severe	< 24hrs/ 24- 48hrs/ > 48hrs	Relieved by medications
		6												
43	Mohanavani	8432	26	Group one	20 -30 yrs	62	165	Emergency	No	No				
44	Kala	8433	27	Group one	20 -30 yrs	60	160	Emergency	No	No				
45	Kalavathy	8456	27	Group one	20 -30 yrs	52	168	Elective	No	No				
46	Dhanalakshmi	8540	27	Group one	20 -30 yrs	42	155	Elective	No	No				
47	Padmavathy	8451	27	Group one	20 -30 yrs	58	105	Emergency	No	No				
48	Renana	8462	27	Group one	20 -30 yrs	60	150	Emergency	No	No				
49	Geetha	8461	28	Group one	20 -30 yrs	58	150	Emergency	No	No				
50	Jayalaksmi	8476	28	Group one	20 -30 yrs	56	148	Elective	No	No				
51	Lakshmi	8470	28	Group one	20 -30 yrs	62	158	Elective	No	No				
52	Priya	8468	28	Group one	20 -30 yrs	68	166	Emergency	No	No				
53	Sudha	8471	29	Group one	20 -30 yrs	52	150	Emergency	No	No				
54	Parimala	8477	29	Group one	20 -30 yrs	60	140	Emergency	No	No				
55	Selvi	8484	28	Group two	20 -30 yrs	74	150	Emergency	No	Yes	Day 1	Mild	< 24 hrs	Yes
56	Lavanya	8274	28	Group two	20 -30 yrs	55	152	Emergency	No	Yes	Day 1	Mild	24-48 hrs	Yes
57	Nandheni	8450	30	Group one	20 -30 yrs	66	155	Elective	No	No				
58	Geetha	8426	30	Group one	20 -30 yrs	62	148	Emergency	No	No				
59	Radha	8477	30	Group one	20 -30 yrs	52	142	Emergency	No	No				

Sl. No.	Name	IP No.	Age (Yrs.)	Group	Age group	Weight (kg.)	Height (Cm)	Elective / emergency	Failed spinal	PDPH yes/ no	day of onset 1/2/3/4	Mild/ moderate/ severe	< 24hrs/ 24- 48hrs/ > 48hrs	Relieved by medications
60	Chithra	8459	30	Group one	20 -30 yrs	52	158	Emergency	No	No				
61	Kavitha	8461	33	Group one	30 yrs	68	155	Emergency	No	No				
62	Thenmozhi	8444	34	Group one	30 yrs	46	156	Elective	No	No				
63	Jayanthi	8324	34	Group one	30 yrs	68	148	Elective	No	No				
64	Padmavathi	8316	18	Group two	< 20 yrs	60	148	Emergency	No	No				
65	Samundeshwari	8439	18	Group two	< 20 yrs	45	160	Emergency	No	No				
66	Vimala	8506	18	Group two	< 20 yrs	52	142	Emergency	No	Yes	Day 1	Mild	< 24hrs	Yes
67	Thenmozhi	8499	19	Group two	< 20 yrs	52	152	Elective	No	No				
68	Indirani	8474	20	Group two	< 20 yrs	68	135	Elective	No	No				
69	Devi	8428	20	Group two	< 20 yrs	70	140	Emergency	No	No				
70	Mythili	8376	20	Group two	< 20 yrs	50	152	Emergency	No	No				
71	Jayanthi	7720	20	Group two	< 20 yrs	55	152	Emergency	No	No				
72	Sumithra	8309	20	Group two	< 20 yrs	61	160	Emergency	No	No				
73	Chengame	8299	20	Group two	< 20 yrs	75	170	Elective	No	No				
74	Uma	8305	20	Group two	< 20 yrs	60	148	Emergency	No	No				
75	Shalim Priya	8296	20	Group two	< 20 yrs	55	151	Emergency	No	No				
76	Shanthi	8301	21	Group two	20 -30 yrs	62	142	Elective	No	No				
77	Kalai Priya	8290	21	Group two	20 -30 yrs	44	145	Emergency	No	No				
78	Rani	833	21	Group two	20 -30 yrs	70	165	Emergency	No	No				

Sl. No.	Name	IP No.	Age (Yrs.)	Group	Age group	Weight (kg.)	Height (Cm)	Elective / emergency	Failed spinal	PDPH yes/ no	day of onset 1/2/3/4	Mild/ moderate/ severe	< 24hrs/ 24- 48hrs/ > 48hrs	Relieved by medications
		8												
79	Gunasundari	8336	21	Group two	20 -30 yrs	50	160	Elective	No	No				
80	Komala	8331	31	Group two	30 yrs	52	162	Emergency	No	Yes	Day 1	Mild	24-48hrs	Yes
81	Vennila	8350	35	Group two	30 yrs	60	152	Elective	No	Yes				
82	Prabha	8347	22	Group two	20 -30 yrs	60	152	Elective	Yes	No				
83	Parimala	8336	22	Group two	20 -30 yrs	42	145	Emergency	No	No				
84	Kalaiselvi	8351	22	Group two	20 -30 yrs	45	150	Emergency	No	No				
85	Faridha Banu	8350	22	Group two	20 -30 yrs	52	140	Emergency	No	No				
86	Nirmala	8050	22	Group two	20 -30 yrs	56	155	Emergency	No	No				
87	Avantiga	8055	22	Group two	20 -30 yrs	60	165	Elective	No	No				
88	Bhaghyalakshmi	8052	22	Group two	20 -30 yrs	55	152	Emergency	No	No				
89	Chithra	8057	25	Group two	20 -30 yrs	60	148	Elective	No	Yes	Day 1	Mild	< 24hrs	Yes
90	Arokiyamarry	8060	28	Group two	20 -30 yrs	48	150	Emergency	No	Yes	Day 1	Mild	< 24hrs	Yes
91	Avantrika	8066	22	Group two	20 -30 yrs	72	170	Emergency	No	No				
92	Saraswathi	8068	23	Group two	20 -30 yrs	46	160	Emergency	No	No				
93	Malathy	8070	23	Group two	20 -30 yrs	45	165	Emergency	No	No				
94	Almelu	8076	23	Group two	20 -30 yrs	62	156	Elective	No	No				
95	Saraswathi	8080	23	Group two	20 -30 yrs	54	161	Elective	No	No				
96	Faridha	799	24	Group two	20 -30 yrs	70	155	Elective	No	No				

Sl. No.	Name	IP No.	Age (Yrs.)	Group	Age group	Weight (kg.)	Height (Cm)	Elective / emergency	Failed spinal	PDPH yes/ no	day of onset 1/2/3/4	Mild/ moderate/ severe	< 24hrs/ 24- 48hrs/ > 48hrs	Relieved by medications
		3												
97	Lakshmi	7973	24	Group two	20 -30 yrs	36	160	Emergency	No	No				
98	Saraswathi	7975	24	Group two	20 -30 yrs	54	152	Emergency	Yes	No				
99	Rani	8109	24	Group two	20 -30 yrs	60	150	Elective	No	No				
100	Devi	8099	24	Group two	20 -30 yrs	44	160	Emergency	No	No				
101	Suseela	8100	25	Group two	20 -30 yrs	52	150	Elective	No	No				
102	Kumari	8264	25	Group two	20 -30 yrs	51	160	Emergency	No	No				
103	Meenakshi	8289	21	Group two	20 -30 yrs	70	166	Elective	No	Yes	Day 1	Mild	< 24hrs	Yes
104	Kalyani	7684	25	Group two	20 -30 yrs	45	146	Emergency	No	No				
105	Regana	7922	25	Group two	20 -30 yrs	42	161	Emergency	No	No				
106	Prabha	7991	25	Group two	20 -30 yrs	55	155	Emergency	No	No				
107	Selvi	7936	25	Group two	20 -30 yrs	52	135	Emergency	No	No				
108	Sarala	7985	25	Group two	20 -30 yrs	60	162	Emergency	No	No				
109	Vemila	7990	25	Group two	20 -30 yrs	68	162	Emergency	No	No				
110	Rajashwari	7400	26	Group two	20 -30 yrs	44	155	Emergency	No	No				
111	Kalai	7989	26	Group two	20 -30 yrs	70	162	Emergency	No	No				
112	Kumari	7986	28	Group two	20 -30 yrs	62	160	Elective	No	Yes	Day 1	Mild	< 24hrs	Yes
113	Faridha	8021	28	Group two	20 -30 yrs	60	148	Elective	No	Yes	Day 1	Mild	< 24hrs	Yes

Sl. No.	Name	IP No.	Age (Yrs.)	Group	Age group	Weight (kg.)	Height (Cm)	Elective / emergency	Failed spinal	PDPH yes/ no	day of onset 1/2/3/4	Mild/ moderate/ severe	< 24hrs/ 24- 48hrs/ > 48hrs	Relieved by medications
114	Kala	8019	26	Group two	20 -30 yrs	46	170	Emergency	No	No				
115	Mohana	8030	26	Group two	20 -30 yrs	56	152	Emergency	No	No				
116	Pushpa	7919	26	Group two	20 -30 yrs	45	150	Emergency	No	No				
117	Nirmala	7921	26	Group two	20 -30 yrs	54	154	Emergency	No	No				
118	Vanathi	7925	26	Group two	20 -30 yrs	64	155	Emergency	No	No				
119	Valarmathi	8018	26	Group two	20 -30 yrs	52	158	Emergency	No	No				
120	Geetha	8021	33	Group two	30 yrs	49	161	Emergency	No	No				

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
1	Vijayalakshmi	7784	Group one	110	114	112	104	106	104	110	114	112	104	97	98	83	79	80	79	83	79	83	90
2	Muthuram	7823	Group one	120	98	98	97	92	90	120	98	98	97	90	88	81	80	78	80	88	80	88	84
3	Kamala	924	Group one	112	88	84	86	80	80	112	88	84	86	88	95	79	83	79	83	90	83	90	74
4	Vanaselvi	7993	Group one	134	88	84	86	84	80	134	88	84	86	87	98	88	88	80	88	84	88	84	90
5	Kumari	7938	Group one	100	115	116	102	98	98	100	115	116	102	78	87	88	84	86	84	74	84	74	97
6	Regana	7987	Group one	104	104	82	106	110	112	104	104	82	106	86	77	90	88	80	88	90	88	90	88
7	Tamil Selvi	7986	Group one	110	98	96	96	96	90	110	98	96	96	88	74	100	79	87	79	97	79	97	84
8	Shanthi	7981	Group one	96	102	96	95	97	92	96	102	96	95	97	87	109	80	82	80	88	80	88	83
9	Kalyani	7522	Group	84	99	105	92	90	90	84	99	105	92	93	88	78	78	81	78	84	78	84	83

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
			one																				
10	Parveen Banu	7990	Group one	80	72	102	98	96	92	80	72	102	98	80	84	79	79	82	79	83	79	83	79
11	Susheela	8018	Group one	100	92	92	90	88	89	100	92	92	90	84	94	80	88	85	88	79	88	79	83
12	Meenakshi	7937	Group one	94	88	89	88	84	84	94	88	89	88	79	90	83	70	83	70	78	70	78	88
13	Maheshwari	8019	Group one	98	86	86	87	84	84	98	86	86	87	87	78	88	83	88	83	79	83	79	86
14	Sarala	8041	Group one	98	95	92	88	89	85	98	95	92	88	77	75	84	84	79	84	80	84	80	88
15	Suseela Begam	8039	Group one	100	103	102	98	96	95	100	103	102	98	74	88	88	74	78	74	83	74	83	84
16	Dhanam	8042	Group one	100	102	99	96	95	95	100	102	99	96	87	94	79	90	79	83	88	83	88	74
17	Bhavani	8018	Group one	110	82	80	72	74	74	110	82	80	72	88	88	80	84	80	88	79	88	90	79
18	Kalaivani	8043	Group one	120	82	80	82	78	79	120	82	80	82	84	83	78	74	83	90	80	90	84	78
19	Parameshwari	7581	Group one	120	95	96	92	92	90	120	95	96	92	94	79	79	90	88	84	83	84	74	79
20	Sakeela Banu	7110	Group one	92	98	95	97	94	92	92	98	95	97	90	83	80	97	84	74	88	74	90	80
21	Pavithra	7885	Group one	90	83	66	112	102	100	95	97	94	92	88	88	83	88	88	90	84	90	97	83
22	Datchayani	7826	Group one	98	105	100	96	96	94	66	112	102	100	83	89	78	84	79	97	88	97	88	88
23	Deepa	7863	Group one	87	96	90	88	88	85	100	96	96	94	78	90	79	83	80	88	79	88	84	90
24	Vanathy	7879	Group one	72	93	92	90	90	90	90	88	88	85	75	84	80	83	78	84	80	84	83	84
25	Geetha	7893	Group one	100	83	84	80	84	82	92	90	90	90	88	74	83	79	79	83	78	83	83	74
26	Janaki	7091	Group one	112	84	85	83	80	78	84	80	84	82	94	90	88	83	80	79	79	79	79	90
27	Gunasekari	7905	Group one	121	105	106	102	101	98	85	83	80	78	88	97	84	88	86	80	88	80	83	97
28	Pushpa	7900	Group one	115	101	96	96	96	93	106	102	101	98	83	88	88	86	80	78	70	83	88	88

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
29	Kalaiselvi	7906	Group one	108	96	95	95	94	92	96	96	96	93	79	84	79	88	87	79	83	88	86	84
30	Sathya	1873	Group one	106	90	86	82	82	80	95	95	94	92	83	83	80	84	78	88	84	90	88	83
31	Vitchara	7913	Group one	103	96	90	88	88	84	86	82	82	80	88	83	78	74	79	70	74	84	84	83
32	Radha	7915	Group one	102	88	87	84	80	80	90	88	88	84	86	79	79	90	80	83	80	74	74	79
33	Indumathi	7950	Group one	100	92	64	112	102	96	87	84	80	80	88	83	88	84	88	84	87	90	79	83
34	Kavitha	7877	Group one	100	95	99	102	93	93	64	112	102	96	89	88	70	74	70	74	82	97	78	88
35	Sathya	7920	Group one	98	116	114	111	106	107	99	102	93	93	90	86	83	90	74	90	81	88	79	86
36	Rosy	7928	Group one	97	100	96	97	99	93	114	111	106	107	84	88	84	97	76	84	82	84	80	88
37	Mohana Priya	7896	Group one	88	96	93	92	92	91	96	97	99	93	74	84	74	88	80	74	85	83	83	84
38	Ragini	7872	Group one	84	76	69	74	74	76	93	92	92	91	90	74	90	84	83	90	83	83	88	74
39	Faridha	2646	Group one	89	92	93	96	94	90	69	74	74	76	97	90	97	83	82	97	88	79	79	88
40	Kalai Selvi	8386	Group one	90	100	95	94	90	88	93	96	94	90	88	97	88	83	88	88	79	83	80	79
41	Gunavathy	8378	Group one	100	92	94	90	90	90	95	94	90	88	84	88	84	79	80	84	78	88	83	80
42	Krishnaveni	8996	Group one	102	88	86	78	83	84	94	90	90	90	83	84	83	83	78	83	79	86	88	78
43	Mohanavani	8432	Group one	93	99	95	94	92	89	104	99	101	97	83	83	83	88	79	83	80	88	84	79
44	Kala	8433	Group one	97	114	107	104	99	101	104	100	99	86	79	83	79	86	80	79	83	84	88	88
45	Kalavathy	8456	Group one	94	118	109	104	100	99	114	110	107	86	83	79	83	88	86	83	88	74	79	70

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
46	Dhanalakshmi	8540	Group one	118	126	117	114	110	107	99	95	96	102	88	83	84	84	80	88	90	79	80	83
47	Padmavathy	8451	Group one	112	104	104	99	95	96	73	72	72	106	86	84	78	74	87	86	84	79	78	84
48	Renana	8462	Group one	114	76	79	73	72	72	106	101	100	96	88	74	79	83	80	88	74	80	79	74
49	Geetha	8461	Group one	120	102	110	106	101	100	82	78	76	95	89	90	80	88	78	84	90	83	88	90
50	Jayalaksmi	8476	Group one	105	83	84	82	78	76	102	94	92	92	90	97	83	90	79	74	97	88	70	84
51	Lakshmi	8470	Group one	98	96	99	102	94	92	85	80	80	98	84	88	88	84	80	78	88	84	83	74
52	Priya	8468	Group one	95	90	85	85	80	80	100	104	90	90	74	84	84	74	86	79	84	88	84	90
53	Sudha	8471	Group one	98	95	95	100	104	90	96	96	90	88	90	83	88	90	80	80	83	79	74	97
54	Parimala	8477	Group one	97	100	102	96	96	90	96	96	90	87	97	83	79	97	87	83	83	80		88
55	Thenmozhi	8484	Group one	100	99	102	96	96	90	112	108	103	88	88	79	80	88	82	88	79	78	83	84
56	Jayanthi	8274	Group one	107	115	116	112	108	103	92	90	90	98	84	83	78	84	81	83	83	79	88	83
57	Nandheni	8450	Group one	106	102	94	92	90	90	73	71	70	96	83	84	79	83	82	88	88	88	90	83
58	Geetha	8426	Group one	109	80	82	73	71	70	83	80	78	72	83	74	84	83	85	90	86	70	84	79
59	Radha	8477	Group one	98	89	82	83	80	78	99	97	100	82	79	90	83	88	83	84	88	83	74	83
60	Chithra	8459	Group one	96	110	102	99	97	100	102	101	98	92	83	97	83	90	83	74	84	84	90	88
61	Padmavathi	8461	Group two	95	105	106	102	101	98	96	96	93	97	98	84	83	90	74	90	81	80	88	80
62	Samundeshwari	8444	Group two	92	101	96	96	96	93	95	94	92	112	87	79	84	97	76	84	82	78	84	78
63	Vimala	832	Group	88	96	95	95	94	92	82	82	80	96	77	87	74	88	80	74	85	79	83	79

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
		4	two																				
64	Thenmozhi	8316	Group two	90	90	86	82	82	80	88	88	84	88	74	77	90	84	83	90	83	88	79	88
65	Indirani	8439	Group two	102	96	90	88	88	84	84	80	80	90	87	74	97	83	82	97	88	70	78	70
66	Devi	8506	Group two	93	88	87	84	80	80	112	102	96	80	88	87	80	88	80	88	79	83	79	83
67	Mythili	8499	Group two	97	92	64	112	102	96	102	93	93	83	84	88	78	84	78	84	88	84	80	84
68	Jayanthi	8474	Group two	94	95	99	102	93	93	111	106	107	102	94	84	79	83	79	83	83	74	83	74
69	Sumithra	8428	Group two	118	116	114	111	106	107	97	99	93	96	88	94	88	79	88	79	84	83	88	83
70	Chengame	8376	Group two	112	100	96	97	99	93	92	92	91	95	97	90	70	78	70	78	74	88	79	88
71	Uma	7720	Group two	114	96	93	92	92	91	64	112	102	82	93	88	83	79	83	79	90	90	80	90
72	Shalim Priya	8309	Group two	120	76	69	74	74	76	99	102	93	90	80	83	84	80	80	80	97	84	83	84
73	Shanthi	8299	Group two	105	92	93	96	94	90	114	111	106	84	84	80	88	80	78	83	88	74	88	74
74	Kalai Priya	8305	Group two	98	100	95	94	90	88	96	97	99	89	79	78	84	78	79	88	85	90	84	90
75	Rani	8296	Group two	95	92	94	90	90	90	93	92	92	99	87	79	83	79	80	90	87	97	88	97
76	Gunasundari	8301	Group two	100	88	86	78	83	84	69	74	74	98	77	88	79	88	86	84	79	88	79	88
77	Komala	8290	Group two	100	99	95	94	92	89	93	96	94	97	74	70	78	70	80	74	80	84	80	84
78	Vennila	8338	Group two	95	120	98	98	97	99	95	94	90	100	87	83	79	83	87	90	78	80	88	80
79	Prabha	8336	Group two	98	112	88	84	86	98	94	90	90	102	88	84	80	84	82	97	79	78	84	78
80	Parimala	8331	Group two	97	134	88	84	86	97	86	78	83	108	84	74	83	74	81	88	88	79	83	79
81	Kalaiselvi	8350	Group two	100	100	115	116	102	100	95	94	92	103	94	83	88	83	82	84	70	88	79	88

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
82	Faridha Banu	8347	Group two	107	104	104	82	106	102	98	98	97	89	90	88	79	88	85	83	83	70	78	70
83	Nirmala	8336	Group two	106	110	98	96	96	108	88	84	86	86	88	90	80	90	83	90	74	83	79	83
84	Avantiga	8351	Group two	109	96	102	96	95	103	88	84	86	88	83	84	83	84	88	97	76	84	80	84
85	Bhaghyalakshmi	8350	Group two	98	84	99	105	92	89	115	116	102	90	70	74	88	74	79	88	80	74	83	74
86	Chithra	8050	Group two	96	80	72	102	98	86	104	82	106	80	83	90	84	90	78	84	83	83	88	83
87	Arokiyamarry	8055	Group two	95	100	92	92	90	88	98	96	96	80	84	97	88	97	79	83	82	88	79	88
88	Avantrika	8052	Group two	92	94	88	89	88	90	120	98	98	98	74	88	79	88	80	83	88	90	80	90
89	Saraswathi	8057	Group two	88	98	86	86	87	80	112	88	84	112	83	84	80	84	83	80	74	84	83	84
90	Malathy	8060	Group two	110	98	95	92	88	80	134	88	84	90	88	79	88	90	88	80	88	74	88	74
91	Al	8066	Group two	120	100	103	102	98	98	100	115	116	92	90	80	90	84	84	78	84	90	84	90
92	Saraswathi	8068	Group two	120	100	102	99	96	112	104	104	82	89	84	83	84	74	88	79	83	97	88	97
93	Faridha	8070	Group two	92	110	82	80	72	90	110	98	96	84	74	88	74	90	79	88	79	88	79	88
94	Lakshmi	8076	Group two	90	120	82	80	82	92	96	102	96	84	90	84	90	97	88	70	78	84	80	84
95	Saraswathi	8080	Group two	98	120	95	96	92	90	84	99	105	85	70	90	70	78	74	83	79	83	79	78
96	Rani	7993	Group two	87	92	98	95	97	92	80	72	102	95	83	84	83	79	90	84	80	84	80	75
97	Devi	7973	Group two	72	90	83	66	112	89	100	92	92	95	84	74	84	80	97	74	83	74	83	88
98	Suseela	7975	Group two	100	98	105	100	96	84	94	88	89	74	74	90	74	83	88	83	88	83	88	94
99	Kumari	8109	Group two	112	108	105	106	102	84	98	86	86	79	83	97	83	88	84	88	79	88	90	88

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
100	Meenakshi	8099	Group two	121	105	101	96	96	85	98	95	92	90	88	88	88	90	80	90	80	90	84	83
101	Kalyani	8100	Group two	114	102	96	95	95	95	100	103	102	92	97	84	90	84	78	84	83	84	74	79
102	Regana	8264	Group two	108	92	90	86	82	95	100	102	99	106	93	83	84	74	79	74	88	74	90	83
103	Prabha	8289	Group two	106	92	96	90	88	74	110	82	80	99	80	83	74	90	80	90	84	90	97	88
104	Selvi	7684	Group two	103	82	88	87	84	79	120	82	80	92	84	79	90	97	86	97	88	97	88	89
105	Sarala	7922	Group two	102	102	92	64	112	90	120	95	96	74	79	83	97	88	80	88	79	88	84	
106	Vemila	7991	Group two	100	92	95	99	102	92	92	98	95	94	87	88	88	84	87	84	80	84	83	
107	Rajashwari	7936	Group two	100	110	116	114	111	106	107	102	84	90	77	86	84	83	82	70	78	74	70	78
108	Kalai	7985	Group two	84	106	100	96	97	99	93	96	85	90	74	88	74	83	81	83	79	90	83	79
109	Kumari	7990	Group two	89	102	96	93	92	92	91	95	95	100	87	84	83	84	82	84	80	97	84	80
110	Faridha	7400	Group two	90	78	76	69	74	74	76	82	95	110	88	74	88	74	85	74	83	88	74	83
111	Kala	7989	Group two	100	96	92	93	96	94	90	88	74	120	84	90	90	83	83	83	88	84	83	88
112	Mohana	7986	Group two	102	102	100	95	94	90	88	84	79	120	94	97	84	88	88	88	90	83	88	79
113	Pushpa	8021	Group two	93	92	92	94	90	90	90	112	90	92	90	88	74	90	79	90	84	90	90	80
114	Nirmala	8019	Group two	97	88	88	86	78	83	84	102	92	107	88	84	90	84	78	84	74	97	84	83
115	Vanathi	8030	Group two	94	98	99	95	94	92	89	111	106	93	83	88	97	74	79	74	90	88	74	88
116	Valarmathi	7919	Group two	118	109	114	107	104	99	101	97	99	91	70	78	70	78	80	90	97	84	90	84
11	Geetha	792	Group	112	115	118	109	104	100	99	92	92	76	83	79	83	79	83	97	88	83	97	88

		IP No.		preop	1min	5min	PULSE 10min	RATE 20min	30min	40min	50min	60min	postop	preop	1min	5min	10min	20min	30min	MAP 40min	MAP 50min	MAP 60min	postop
7		1	two																				
118	Selvi	7925	Group two	114	122	126	117	114	110	107	74	74	90	84	80	84	80	88	70	78	70	78	74
119	Lavanya	8018	Group two	120	109	104	104	99	95	96	96	94	90	74	83	74	83	84	83	79	83		
120	Sugunya	8021	Group two	105	78	76	79	73	72	72	94	90	100	83	88	83	88	88	84	80	84		

BIBLOGRAPHY

1. **Wylie** and Churchill-Davidson's A Practice of Anesthesia, 5th Edn.
2. Chadwick HS. An analysis of obstetric anesthesia cases from the American Society of Anesthesiologists' closed claims project database. **Int J Obstet Anesth** 1996,5:258-63.
3 H Ellis S Feldman;Anatomy For Anaesthetists.
4. **Vincent J. Collins** Principles of Anesthesiology: General and Regional Anesthesia.
5. N.Calthorpe The history of spinal needles: getting to the point.Anaesthesia, 2004.
6. Scott, Bruce et al Atraucan(R): A New Needle for Spinal Anesthesia Regional Anesthesia and Pain Medicine. 18(4): 244-249, July/August 1993.
7. Risto Puolakka et al ;. Comparison of double-hole and single-hole pencil-point needles for spinal anesthesia with hyperbaric bupivacaine; Regional Anesthesia and Pain Medicine Volume 23, Issue 3, May-June 1998, Pages 271-277.
8. Thomas Standl et al.Spinal Anesthesia Performance Conditions and Side Effects Are Comparable Between the Newly Designed Ballpen and the Sprotte Needle: Results of a Prospective Comparative Randomized Multicenter Study Anesth Analg 2004;98:512-517.
9. Turnbull DK, Shepherd DB. Post dural puncture headache: pathogenesis, prevention and treatment. British Journal of Anaesthesia 2003; 91: 718–29.
10. Vandam LD, Dripps RD. Long-term follow up of patients who received 10 098 spinal anesthetics. JAMA 1956; 161: 586–91.

11. Handler CE, Smith FR, Perkin GD, Rose FC. Posture and lumbar puncture headache: a controlled trial in 50 patients. J R Soc Med 1982; 75: 404–7

12. Collier BB. Treatment for post-dural puncture headache. Br. J Anaesth 1994; 72: 366–7.

13. Sechzer PH. Post-spinal anesthesia headache treated with caffeine. Evaluation with demand method. Part 2. Curr Ther Res 1979; 26: 440–8.

14 Hodgson C, Roitberg-Henry A. The use of sumatriptan in the treatment of postdural puncture headache. Anaesthesia 1997; 52: 808.

15. Crawford JS. Experiences with epidural blood patch. **Anaesthesia** 1980,35:513.

16. Usubiaga JE, Usubiaga LE, Brea LM, Goyena R. Effect of saline injections on epidural and subarachnoid space pressure and relation to postspinal anesthesia headache. Anesth Analg 1967; 46: 293–6.

17. Lander CJ, Korbon GA. Histopathologic consequences of epidural blood patch and epidurally administered Dextran 40. Anesthesiology 1988; 69: A410.

18. Eldor J, Guedj P, Cotev S. Epidural morphine injections for the treatment of postspinal headache. Can J Anaesth 1990; 37: 710–11.

19 Patel MR, Caruso PA, Yousuf N, Rachlin J. CT-guided percutaneous fibrin glue therapy of cerebrospinal fluid leaks in the spine after surgery. Am J Roentgenol 2000; 175: 443–6.

20. Harrington H, Tyler HR, Welch K. Surgical treatment of post-lumbar puncture dural CSF leak causing chronic headache. Case report. J Neurosurg 1982; 57: 703–7.

21. Sprigge et al.; Accidental dural puncture and post dural puncture headache in obstetric anaesthesia: presentation and management: A

23-year survey in a district general hospital; Anaesthesia, 2008, 63, pages 36–43 .

22. O'Connor G, et al, The effect of spinal needle design, size, and penetration angle on dural puncture cerebral spinal fluid loss.AANA J. 2007 Apr;75(2):111-6.
23. Olubukola O. Nafiu, et al.Post Dural Puncture Headache in Obstetric Patients: Experience from a West African Teaching Hospital. ASA abstracts 2005.
24. Jan Muhammad Shaikh, et al, Post Dural Puncture Headache after Spinal Anaesthesia For Caesarean Section: A Comparison Of 25g Quincke, 27g Quincke And 27g Whitacre Spinal Needles, 2008.
25. Choi PT et al,. PDPH is a common complication of neuraxial blockade in parturients: a meta-analysis of obstetrical studies. Canadian Journal of Anaesthesia 2003; 50: 460–9.
26. Dr. Anju Shah et al, Post Dural Puncture Headache In Caesarean Section - A Comparative Study Using 25 G quincke, 27 G Quincke And 27 G Whitacre Needle. Indian journal of anaesthesia 2002
27. R. J. Chilvers, et al, Postdural Puncture Headache in Obstetric Patients . Anesth Analg 2001;92:1616,
28. Manuel C. Vallejo, MD, et al Postdural Puncture Headache: A Randomized Comparison of Five Spinal Needles in Obstetric Patients .Anesth Analg 2000;91:916-920,
29. Lambert DH, et al, Role of needle gauge and tip configuration in the production of lumbar puncture headache. Reg Anesth. 1997 Jan-Feb;22(1):66-72.
30. Devicic et al. PDPH in Obstetric Anesthesia: Comparison of 24-Gauge Sprotte and 25-Gauge Quincke Needles and Effect of Subarachnoid Administration of Fentanyl Regional anaesthesia and pain medicine1993

31. L.E. Shutt, et al Spinal anaesthesia for caesarean section: comparison of 22-gauge and 25-gauge whitacre needles with 26-gauge quincke needles. British Journal of Anaesthesia, 1992, Vol. 69, No. 6 589-594.

32. **Ross AW**, et al,The Sprotte needle and post dural puncture headache following caesarean section. **Anaesth Intensive Care. 1993 Dec;21(6):889-90.**

33. Celleno, Danilo et al, **An Anatomic Study of the Effects of Dural Puncture With Different Spinal Needles**Regional Anesthesia and Pain Medicine. 18(4):218-221, July/August 1993.

34. Saul Wiesel, Michael JT, Jane E. Postdural puncture headache: arandomized prospective comparison of the 24 gauge Sprotte and the 27 gauge Quincke needles in young patients. Anaesth 1993;40(7):607–11.

35. **David C. Mayer, et al,** Headache After **Spinal** Anesthesia for Cesarean Section. A Comparison of the 27-Gauge Quincke and 24-Gauge Sprotte **Needle**s. Anesth Analg 1992; 75:377-380.

36. J. Lynch, et al Use of 25–gauge Whitacre needle to .reduce the incidence of postdural puncture headache:British Journal of Anaesthesia, 1991, Vol. 67, No. 6 690-693.

37 Brownridge, P : Spinal anesthesia revisited. An evaluation of subarachanoid block in obstetrics. Anesthesia Intesive care , 12,334,1984.

38. **P. D. W. Fettes et al,** Failed spinal anaesthesia: mechanisms, management, and prevention, British Journal of Anaesthesia 2009.

ABBREVIATIONS

PDPH	:	Postdural puncture headache
CSF	:	Cerebrospinal fluid
DHPP	:	Double hole pencil point spinal needle
SHPP	:	Single hole pencil point spinal needle
G	:	Gauge
EBP	:	Epidural blood Patch
SD	:	Standard deviation
ASA	:	American society of anaesthesiologist
MAP	:	Mean arterial pressure

`