INCIDENCE OF POST-DURAL PUNCTURE HEADACHE AND EVALUATION OF CONSERVATIVE MANAGEMENT IN PATIENTS FOR CAESAREAN SECTION

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE AWARD OF FELLOWSHIP IN ANAESTHESIA OF THE NATIONAL POST GRADUATE MEDICAL COLLEGE OF NIGERIA (FMCA).

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NOVEMBER, 2009.
DECLARATION

I hereby declare that this work is original. It has not been presented to any College for a Fellowship award nor has it been submitted elsewhere for publication.

_________________________________
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CERTIFICATION

We certify that this study was carried out by Dr. J. O Odesanya of the Department of Anaesthesia, LAUTECH Teaching Hospital, Osogbo, Osun State, Nigeria.

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DEDICATION

This work is dedicated to the Almighty God for making this residency programme a reality and also to my wife Bukola and Children: Favour, Victor and Praise for their love, understanding and full support throughout the Residency Training Programme.
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My deepest gratitude and appreciation goes to my mentor, Prof. (Mrs) E. O Elegbe who was always there to give the needed push and encouragement throughout the course of this study. I also appreciate the management of the LAUTECH Teaching Hospital (LTH) Osogbo, for giving me the opportunity and facilities for the Residency Training.

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LIST OF ABBREVIATIONS

APGAR SCORE - Appearance, Pulse, Grimace, Activity and Respiration score of new born
ASA - American Society of Anesthesiologists’
BMI - Body Mass Index
CSF - Cerebrospinal fluid
CT - Computerized Tomography
EBP - Epidural Blood Patch
et al - And others
g - Gram
G - Gauge
i.e. - That is
I.M - Intramuscular
I.V - Intravenous
Kg - Kilogramme
LAUTECH - Ladoke Akintola University of Technology
LSCS - Lower Segment Caesarean Section
M - Metre
MI - Millilitre
MRI - Magnetic Resonance Imaging
NSAIDS - Non Steroidal Anti-inflammatory Drugs
% - Percentage
PCV - Packed Cell Volume
PDPH - Post-dural puncture headache
P.O - Per Oral
SAP - Systolic Arterial Pressure
SpO₂ - Peripheral Oxygen Saturation
SPSS - Statistical Package for Social Sciences
VAS - Visual Analogue Scale
SUMMARY

Background

Post-dural puncture headache (PDPH) is a well known post-operative complication after spinal anaesthesia. It is one of the major causes of maternal morbidity.

The incidence of PDPH is greatly influenced by needle size and the design of the needle tip. In 1898 when large gauge cutting spinal needle was utilized, the incidence of PDPH was as high as 66%. With the introduction of 22G and 24G in 1956, the incidence of PDPH dropped to 11%. Introduction of fine gauge atraumatic pencil-point spinal needles has further reduced the incidence of PDPH significantly. The pencil-point tip type of needles, e.g. Whitacre and Sprotte, separate the dural fibres while the cutting edge type, (e.g. Quincke) needle cuts through the fibres. In the former when needle is withdrawn the dural fibres re-appose thereby reducing the loss of CSF, this has been associated with reduced incidence of PDPH.

The management options for PDPH are conservative or invasive. The conservative management may include: bed rest, increased fluid intake and analgesics (acetaminophen, NSAIDS or opioid). The invasive management which is the last resort if the conservative management fails is epidural blood patch. The success rate of management with epidural blood patch is more than 90%.
Objectives

To determine the incidence of PDPH and to evaluate the effectiveness of conservative management of PDPH occurring after spinal anaesthesia for Caesarean Section.

Patients and Methods.

Approval was obtained from the Ethical Committee and informed consent was sought from each patient. All the patients were parturients (N=144) with ASA physical status I, II, IE and IIE who had Caesarean section under spinal anaesthesia. They were randomized into two groups. Group A (n=72) had 25-gauge Quincke needle used for spinal anaesthesia and group B (n=72) had 25-gauge Whitacre needle used for spinal anaesthesia. The spinal block was performed under aseptic technique, with patients in sitting position, at L3/4 or L4/5 interspace. Subarachnoid injection of 2-2.8mls of 0.5% hyperbaric bupivacaine was administered depending on the height of the patient. Patients’ blood pressure, pulse rate and peripheral oxygen saturation were monitored intra-operatively. Parturients were followed up post-operatively in the post-natal ward until they were eventually discharged home. They were also allowed to move after the effect of the block had worn off (i.e. after 6 hours). All the parturients had the same post-operative analgesia.

Any history of headache was fully evaluated on a 10cm-visual analogue scale for pain, three times daily. Parturient that developed headache were initially managed by bed rest and hydration (i.e. oral fluid as tolerated by the
patient or by increasing the rate of intravenous fluid). If the headache persisted acetaminophen (300mg I.M 8 hourly or 1g P.O t.d.s) was added and if it did not resolve, non steroidal anti-inflammatory drugs e.g (diclofenac 75mg I.M 12 hourly or ibuprofen 400mg P.O t.d.s) was added. The effectiveness of the above managements were assessed by asking the patients about the resolution of the headache with each management instituted on the 10-cm visual analogue scale.

Results

The groups were comparable with respect to demographic characteristics, (age, weight, height, BMI, parity, ASA physical status) and characteristics of spinal block (volume of local anaesthetic administered and height of block). Eighteen parturients (25%) in the Quincke group and zero (0%) in the Whitacre group (P-value 0.000003) developed the symptoms of post-dural puncture headache. Eight (44.4%), of the headache started during the first day post-operative period (1st DPO), 8(44.4%) in the 2nd DPO and 2(11.2%) in the 3rd DPO. Six (33.3%) of the patients with headache had visual analogue score (VAS) of 2-3/10, 10(55.6%) had VAS of 5-6/10, while 2(11.1%) had VAS of 8/10. Six (33.3%) had frontal headache, 4(22.3%) occipital and 8(44.4%) in both frontal and occipital regions. With conservative management, 2(11.1%) patients had resolution of the headache within a day, 8(44.4%) after two days, 6(33.3%) after three days and 2(11.1%) after four days. None of the parturients who had headache responded to fluid and bed
rest alone, 8(44.4%) responded with addition of acetaminophen (paracetamol) and 10(55.6%) with addition of NSAIDS.

In conclusion, this study demonstrates that (atraumatic) pencil-point tip spinal needle is associated with lower incidence of PDPH compared to the cutting edge type (Quincke) needle when subarachnoid block is instituted for Caesarean section. The conservative management for the treatment of the headache was also found to be effective. None of the parturients with headache needed epidural blood patch to resolve their symptoms.
CHAPTER ONE

INTRODUCTION

Spinal anaesthesia was developed in the late 1800’s following the work of Wynter, Quincke and Corning. However, it was Karl August Bier, a German Surgeon who probably gave the first spinal anaesthesia in 1898. He also had a first hand experience of the disabling headache related to dural puncture.¹

Spinal anaesthesia has been recently popularized in Obstetric anaesthesia; particularly in the operative delivery because the procedure is simple, relatively inexpensive and safe. The parturient is awake; reducing significantly the danger of difficult airway and tendency for aspiration of gastric content as seen when general anaesthesia is administered. Also, the baby is not sedated and is usually born with good to excellent APGAR score provided hypotension is treated promptly.² Added to all these, it gives good pain relief for several hours after the surgery.

Post-dural puncture headache (PDPH) has been one of the major post-operative complications of the procedure. As earlier noted, the incidence of post-dural puncture headache is related to the needle size and the design of the needle.³ The larger the size of the needle, the higher the incidence of the headache. Regarding the needle design, the cutting edge type of needle [Quincke] cuts through the dural fibres thereby causing more loss of cerebrospinal fluid with attendant higher incidence of PDPH. The pencil-point type of needle [Whitacre and Sprotte] separates the dural fibres hence when the needle is withdrawn, the dural fibres re-appose reducing the loss of CSF.
with consequent reduction in the incidence of PDPH. The Whitacre type of needle has a small orifice about 0.5 mm from the diamond shaped tip while the Sprotte type has a larger orifice and a conical tip.

In the early 1900s the incidence of PDPH was greater than 50% due to the use of large bore cutting spinal needles. From 1956, after the introduction of 22G and 24G spinal needles the incidence dropped to about 9 -11%. Better still, the introduction of fine gauge pencil-point needles (Whitacre, Sprotte) led to a further drop to 0.5 -2%. Nonetheless, dural puncture headache remains a disabling complication of needle insertion into the subarachnoid space. In 2007, Reina et al 2007 carried out an in vitro study of dural lesions produced by 25G Quincke and Whitacre needles on five fresh male patients declared brain dead after excision of T11-L4 dural membranes by anterior laminectomy. In this study, the lesions with 25G Quincke needles resulted in a clean-cut opening in the dural membrane while the 25G Whitacre needle produced a more traumatic opening with tearing and severe disruption of the collagen fibre. It was then hypothesized that the inflammatory reaction produced by the tearing of the collagen fibres after dural penetration, may explain in part lower incidence of PDPH seen with the Whitacre needles. Whitacre needle size 25G has been noted to have the advantage of both lower incidence of PDPH and lower lumbar puncture failure rate.

This study compared the incidence of PDPH with the use of these needles in the pregnant women.
In LAUTECH Teaching Hospital Osogbo, most of the elective and emergency Caesarean section are done under spinal anaesthesia. This study is therefore designed to follow up these patients noting the incidence of PDPH among them as well as evaluating the treatment offered. The conservative management for PDPH include: bed rest, hydration, and use of analgesics [Acetaminophen, NSAIDS, or Opioids].
AIMS / OBJECTIVES

Aims

To determine the incidence of PDPH and to evaluate the effectiveness of conservative management in patients presenting for Caesarean Section.

Objectives

1. To compare the incidence of PDPH between 25G Quincke and 25G Whitacre spinal needles
2. To determine the factors associated with the development of PDPH
3. To evaluate the headache
4. To evaluate the treatment measures available
CHAPTER TWO
LITERATURE REVIEW

Spinal anaesthesia is the temporary neuraxial blockade produced by the spinal injection of a local anaesthetic agent into the subarachnoid space. This procedure can be complicated by post-dural puncture headache. Post-dural puncture headache (PDPH) is a low-pressure spinal headache, which is characteristically throbbing in nature, more severe when standing or sitting, and relieved by lying down. The common distribution is over the frontal and occipital areas radiating to the neck and shoulders. The headache develops within 7–14 days after the procedure due to continuous loss of cerebrospinal fluid. In majority of cases, the symptoms resolve within 14 days.

In 1895, John Corning, was assumed to have given the first spinal anaesthesia with 110 mg of cocaine at the level of T11/12 interspace in a man to treat habitual masturbation. But, from his description and the dose of cocaine administered it is unlikely that the needle entered the subarachnoid space. Karl August Bier, a German Surgeon, in August 1898, injected 10–15 mg of cocaine into the subarachnoid space of seven patients, himself and his assistant Hildebrandt inclusive. The classical symptoms of post-dural puncture headache (throbbing headache, more severe when standing or sitting, and relieved by lying down) occurred in four of his subjects, his assistant and himself. At that time he inferred that the headache was as a result of CSF loss. Subsequently in early 1900, administration of spinal
anaesthesia using large spinal needles were reported in the medical literature, and 50% of subjects were reported to have had headache as a complication. Whitacre and Hart in 1951, developed the pencil-point needle which have led to a significant reduction in the incidence of post-dural puncture headache.

PATHOPHYSIOLOGY OF POST DURAL PUNCTURE HEADACHE

Spinal dural mater is like a tube that extends from foramen magnum to the second segment of the sacrum. The dural mater consists of a dense, connective tissue layer made up of collagen and elastic fibres, described as collagen fibres running in a longitudinal direction, this has been confirmed by histological studies. Based upon this described architecture of the dura, it was recommended that a cutting spinal needle should be orientated parallel to the longitudinal dural fibre to minimize cutting of the dura fibres. Perpendicular orientation will cut more fibres thus increasing the longitudinal dimensions of the dural perforation and the loss of CSF. Post-dural puncture headache has been confirmed clinically to be more likely when the cutting spinal needle was orientated perpendicular to the direction of the dural fibres.

This classical description of the anatomy of the dural mater has been contested by the light and electron microscopic studies of human dura mater. The dura mater arrangement has been described from the studies as consisting of collagen fibres arranged in several layers parallel to the surface with each layer consisting of both collagen and elastic fibres that do not demonstrate specific orientation. The pattern is not uniform throughout the
dural layers, the outer surface may have dural fibres arranged in a longitudinal direction, but this pattern has not been demonstrated in the successive dural layers. Posterior dura has been demonstrated to vary in thickness by recent measurement of the dural thickness. The thickness of the dural at a particular spinal level also vary within an individual or between individuals. This may explain the unpredictable consequences of dural perforation because dural perforation in a thick area of dura may be less likely to cause CSF leak than a perforation in a thin area.

**CEREBROSPINAL FLUID LOSS**

Production of CSF is mainly from choroid plexus (about 70%), with some extrachoroidal production from ependymal lining of the ventricles and brain parenchyma. The rate of production of CSF is 0.35 ml/min approximately 500 ml produced daily. In the adult, the CSF volume is approximately 150 mls, and half is within the cranial cavity. In the lumbar region, the CSF pressure is 5-15 cm H₂O in the horizontal position, increasing to over 40 cm H₂O in erect posture. When the dura is punctured, it allows leakage of CSF, with reduction in CSF volume, thereby producing intracranial hypotension. Radionuclide cisternography and radionuclide myelography have been used to confirm CSF leak associated with the development of PDPH. In the adult, the subarachnoid pressure of 5-15 cm H₂O is reduced to 4.0 cm H₂O or less. There is greater loss of CSF through the dural perforation (0.084-4.5 mls/min) than the rate of CSF production (0.35 ml/min) particularly with needle sizes larger than 25G.
In the presence of post-dural puncture headache, gadolinium-enhanced MRI, frequently demonstrate sagging of the intracranial structures.\textsuperscript{19} Meningeal enhancement\textsuperscript{19} may or may not be demonstrated by MRI. Meningeal enhancement is attributable to vasodilation of thin-walled vessels in response to intracranial hypotension. The actual mechanism producing the headache is unclear although the loss of CSF and lowering of CSF pressure has not been disputed. There is traction on the intracranial pain sensitive structures in the upright position as a result of lowering CSF pressure. This eventually leads to the characteristic headache. The loss of CSF also produces a compensatory vasodilation through the Monro-Kellie doctrine which states that the sum of volumes of the brain, CSF, and intracranial blood is constant. There will be compensatory increase in blood volume to a decrease in CSF volume. It is this vasodilatation that is thought to be responsible for the headache.

**DURA MATER AND RESPONSE TO TRAUMA**

Leakage of CSF has been attributed to perforation of the spinal dura. Neurosurgical experience of dural perforation has shown that perforations need to be closed, either directly or through application of synthetic or biological dural graft material. Adhesion, continuous CSF leak, and the risk of infection may follow failure of closure of dural perforation. There are few experimental studies of the response of spinal dura to perforation.\textsuperscript{20} In 1923, deliberate dural defects in the cranial dural of dogs was noted to take approximately one week to close. Fibroblastic proliferation from the cut edge
of the dural was said to have facilitated the closure. However, this notion was dismissed by a later work published in 1959,\textsuperscript{20} which maintained that dural repair was facilitated by fibroblastic proliferation from surrounding tissue and blood clot. It was also noted that damage to the pia-arachnoid, the underlying brain and the presence of blood clot promoted the repair of the dura.

**NEEDLE TIP DEFORMATION AND DURAL PERFORATION.**

Contact with bone during insertion may lead to spinal needle tip deformation,\textsuperscript{21,22} which could lead to an increase in the size of the subsequent dural perforation. Cutting type spinal needle have been demonstrated by in vivo studies to be more susceptible to deformity after contact with bone than comparable pencil-point needles.\textsuperscript{22} However, an increase in the size of dural perforation has not been demonstrated by any study where damage needles were used.

**INCIDENCE OF PDPH WITH NEEDLE SIZE AND DESIGN**

In 1898, the incidence of post-dural puncture headache was as high as 66%.\textsuperscript{1} This was attributable to the use of large gauge, cutting spinal needle. With the introduction of 22G and 24G needles in 1956, the incidence was estimated to be 11%.\textsuperscript{5} With the use of fine gauge pencil-point needles such as the Whitacre and Sprottle, the incidence of post-dural puncture headache has reduced significantly.\textsuperscript{3,6}
Table 1 Relationship between needle size and incidence of post-dural puncture headache

<table>
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<td>23</td>
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<tr>
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</tr>
<tr>
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<td>26</td>
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With the use of fine gauge spinal needle, 29G or smaller, high failure rate for spinal anaesthesia with technical difficulty\textsuperscript{30,31} has been noticed. There must therefore be a balance between the risk of dural puncture headache and technical failure. The optimum needle sizes for spinal anaesthesia may thus be 25G, 26G, and 27G.\textsuperscript{32}

Clinical and laboratory studies have confirmed that pencil-point needles\textsuperscript{17} produce fewer PDPH than medium bevel cutting needles. However, paraesthesia has been observed with the pencil-point needle. The reason may be the distance from the tip of the needle to the orifice. The tip has to be at least 0.5mm into the subarachnoid space before the orifice enters the
subarachnoid space. The tip may easily impinge on the stretched cauda equina. Giving credence to this hypothesis, paraesthesia is uncommon with the short bevel needles or the Atraucan needle.33

In Nigeria, Imarengiaye et al,24 reported incidence of PDPH as 22.7% with 25G Quincke needle among 119 parturients scheduled for caesarean section. Fyneface –Ogan et al34, compared the incidence of PDPH in 25G and 26G Whitacre needles and reported 6% incidence with the 25G needle. Nafiu, et al35 in Korle-bu Teaching Hospital Ghana studied 96 Ghananian women using spinal needles 22G, 25G and 26G Quincke needles and reported a significant incidence of 33% with 22G, and no significant difference between the 25G and 26G needles, 4% and 5% respectively.

**SPINAL ANAESTHESIA**

When used for lower segment Caesarean section (LSCS), spinal anaesthesia has many advantages. The patient is awake and the problems of difficult airway and risk of aspiration of gastric content are avoided. The baby is not sedated and is usually born with good to excellent APGAR score provided hypotension is avoided.2 With experience the technique is as fast as giving a general anaesthesia and It has the advantage of giving good pain relief some hours after surgery, it is easy to learn and teach. It is inexpensive and appropriate for virtually most cases except those with unresuscitated pre-operative hypovolaemia and those with the specific contraindications of bleeding disorder, sepsis at the site of injection or allergy to local anaesthetics.
Spinal anaesthesia should be avoided in a patient who is suspected of having raised intracranial pressure; because of the risk of coning of the brain stem and patients with hypertensive disease of pregnancy should have their clotting profile checked.

**OBSTETRICS**

Physiological and anatomical alterations occur in many organ systems during the course of pregnancy and delivery. The changes are due in part to the metabolic demands brought on by the foetus, the placenta and the uterus and in part, to the increased levels of pregnancy hormones, particularly progesterone and oestrogen. Spinal anaesthesia normally produces block up to T5/T6 which is adequate for Caesarean section. The increased venous volume within the rigid spinal canal reduces the capacity of the extradural and intrathecal spaces hence, increases the spread of injected drugs. There is therefore 30% reduction in volume of local anaesthetic solution required at term when compared to the non-pregnant woman. Distension of the extradural veins heightens the risk of vascular damage during institution of a regional block.

**POST- DURAL PUNCTURE HEADACHE AND PRESENTATION**

PDPH is described as throbbing in nature, more severe when standing or sitting, and relieved by lying down. It is commonly distributed over frontal and occipital areas and it radiates to the neck and shoulders. It is aggravated by head movement and adoption of the upright posture and relieved by lying down. Other symptoms associated with dura puncture headache may include:
nausea, vomiting, hearing loss, tinnitus, vertigo and dizziness. In the parturient, bonding and breast-feeding may be affected. Unless a headache with postural features is present, the diagnosis of PDPH should be questioned, and other serious intracranial causes of headache must be excluded.\textsuperscript{37}

Ninety percent (90\%) of headaches will occur within 3 days of the spinal anaesthesia\textsuperscript{38} and 66\% within 48 hours\textsuperscript{39}. Occasionally, the headache develops between 5 and 14 days after the spinal anaesthesia. Rarely the headache may start immediately after dural puncture,\textsuperscript{40} on such rare occasions, alternative causes should be considered.

**Diagnosis**

Usually a history of accidental or deliberate dural puncture followed by the symptoms of PDPH will guide the diagnosis, additional tests may confirm the clinical findings where there is doubt regarding diagnosis of PDPH. On MRI diffuse dural enhancement with evidence of a sagging brain; descent of the brain, optic chiasma, and brain stem; obliteration of the basilar cisterns, and enlargement of the pituitary gland\textsuperscript{41} may be demonstrated. The spinal level of the CSF leak can be located by CT myelography, retrograde radionuclide myelography, cisternography or thin section MRI. Although history of dural puncture and the presence of postural headache usually reveal the diagnosis of PDPH, other pathologic conditions that can present with headache such as: Viral, chemical or bacterial meningitis\textsuperscript{42}, Intracranial
haemorrhage\textsuperscript{43}, Cerebral Venous thrombosis\textsuperscript{44}, Migraine\textsuperscript{39}, Sinus headache, Pre-eclampsia, should be borne in mind.

**Duration**

The work of Vandam and Dripps in 1956\textsuperscript{5} remains the largest follow-up of PDPH. Seventy two percent of the headache was reported to resolve within 7 days, and 87\% resolved in 6 months. The duration has remained unchanged since that reported in 1956.\textsuperscript{29} Occasionally, the headache can persist longer;\textsuperscript{40} case reports of persistent headache for as long as 1-8 years after dural puncture\textsuperscript{45} have been described. Persistent headaches are usually treated with an epidural blood patch.\textsuperscript{46}

**Table 3 Estimated rate of Spontaneous recovery from PDPH\textsuperscript{5}**

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Percentage recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 2</td>
<td>24</td>
</tr>
<tr>
<td>3 – 4</td>
<td>29</td>
</tr>
<tr>
<td>5 – 7</td>
<td>19</td>
</tr>
<tr>
<td>8 – 14</td>
<td>8</td>
</tr>
<tr>
<td>3 – 6weeks</td>
<td>5</td>
</tr>
<tr>
<td>3 – 6 months</td>
<td>2</td>
</tr>
<tr>
<td>7 – 12 months</td>
<td>4</td>
</tr>
</tbody>
</table>
A 10cm-visual Analogue Scale was used to assess the severity of headache. It bypasses the cognitive level of brain and gives a truer representation of headache. It indicates the intensity of headache as perceived by the patient on a coloured gradient and graduated line. It is more beneficial than a descriptive version like, (I feel terrible), because it helps the patient to rate their relative level of pain without interference from other thought and preconceived notions.

Apart from being useful for rating pain, it is also used to evaluate the analgesic properties of the various treatment methods by measuring either the pain relief or the pain severity. The patient points or marks on the coloured bar of the chart by using an “S” or some other symbol to denote severity of her headache.
MANAGEMENT

1. SUPPORTIVE AND PHARMACOLOGICAL METHODS

2. BLOOD PATCH

SUPPORTIVE

Bed rest/Posture

No benefit has been shown from bed rest alone.\textsuperscript{47} Other supportive therapy such as hydration, drugs such as acetaminophen, non-steroidal anti-inflammatory drugs, Opioids, and antiemetics may control the symptoms and reduce the need for more aggressive therapy.\textsuperscript{48} In addition to the aforementioned, the Patient is encouraged to lie in a comfortable position.

Maintenance of supine position before or after the onset of the headache as a means of treatment has not been supported clinically.\textsuperscript{49} Some have advocated prone position, but it is not a comfortable position for the post partum patient. Intra-abdominal pressure is raised in prone position, which is transmitted to the epidural space and may alleviate the headache. Following dural puncture, prone position failed in a clinical trial to demonstrate a reduction in the incidence of PDPH.\textsuperscript{50}

Abdominal binder

Tight abdominal binder raises intra-abdominal pressure which is transmitted to the epidural space and may relieve the headache. But tight binders are rarely used in current practice because they make patient uncomfortable.
Pharmacological treatment

The aim of management of PDPH is to:

i  Control the cerebral vasodilatation and headache

ii  Bring CSF volume to normal value

iii  Seal the puncture site.

Conventional Analgesics

Various analgesics have been tried along with other supportive therapy to control the symptoms of PDPH thereby reducing the need for aggressive therapy. Simple analgesics such acetaminophen (300mg I.M 8 hourly or 1g t.d.s P.O) may control mild PDPH. Non Steroidal anti-inflammatory drugs (NSAIDS) such as diclofenac (75mg I.M 12 hourly or Ibuprofen 400mg t.d.s P.O.) may be needed for mild-moderate PDPH. Opioids analgesics such as oral weak opioid e.g. codeine and stronger opioid like morphine 5-10mg I.M 4 hourly may be needed for moderate-severe PDPH not relieved by Acetaminophen and NSAIDS. Opioid can cause constipation hence straining at defecation, thus increasing the severity of PDPH. Other associated symptoms like nausea and vomiting may require antiemetics.

Hydration by intravenous and/or oral fluids is essential to improve CSF volume. Other therapeutic agents which have been suggested for the management of post-dural puncture headache include; Caffeine, a central nervous system stimulant which produces cerebral vasoconstriction at a dose of 300-500mg P.O or I.V once or twice daily. Sumatriptan, a 5-HT_{1D} receptor agonist used for the management of migraine will stimulate cerebral
vasoconstriction like caffeine and has been recommended for PDPH, at a dose of 6mg subcutaneously. Desmopressin acetate (DDAVP) and adrenocorticotropic hormone (1.5μg/kg as an infusion) have also been tried.

**INVASIVE TREATMENT**

**Epidural blood patch (EBP)**

The concept of the epidural blood patch was developed from the observation that bloody taps were associated with a reduced PDPH.\(^5\) Once the blood is introduced into the epidural space, it will clot and occlude the perforation thereby preventing further CSF leak. Gormley introduced epidural blood patch in 1960 and reported 7 cases where 2 – 3 ml of blood were introduced epidurally.\(^5\) Success rate is 70 – 98% if done 24 hours after the dural puncture.\(^5\) Crawford used 20mls and recorded 98% success rate.\(^5\) Epidural blood patch has high success rate and low incidence of complications and has been the standard against which alternative treatment methods are compared.

Ofoegbu, et al, in Port Harcourt reported a case of PDPH at a free medical missionary outreach programme following spinal anaesthesia. After all available conservative management failed to relieve the PDPH, the patient was offered epidural blood patch, and demonstrated remarkable improvement in both headache and neck stiffness.\(^5\) Contraindications\(^5\) to EBP includes: presence of fever, infection of the back, coagulopathy, patient refusal, technical difficulties and HIV positive patient with active bacteria or viral illness\(^5\)}
**Technique**

The technique is aseptic and requires 2 operators. Sample of the subject’s blood should be sent for culture as a precautionary measure. The epidural space is located with a Tuohy needle at the level of the dural puncture or a space lower, with the patient in the lateral position. About 20 – 30 mls of blood is then taken from the patient’s arm and injected slowly through the Touhy needle. The injection is stopped, if patient experiences excruciating pain of dermatomal origin.53

The volume of blood required for the procedure is debatable. Two-three mls originally described by Gormly is generally agreed to be inadequate by most practitioners. Twenty-thirty mls of blood is recommended to guarantee success.52 Bed rest for one52,56 or preferably, 2 hours57 is also advised at the conclusion of the procedure.

Several studies have reported the degree of spread of the epidural blood patch using radiolabelled red cells58 or an MRI scan.59 Regardless of the direction of the bevel of the Tuohy needle, blood is distributed caudally and cephalad after injection. The blood also passes circumferentially around the anterior epidural space and the thecal space is compressed and displaced by the blood.

The rapid resolution of the headache within 3 hours is explained by presumed elevation of subarachoid pressure from the compression of the theca. However, this is not sustained and the maintenance of the therapeutic effect is likely to be attributable to the presence of the clot preventing further
CSF leakage. CSF has been observed to act as a procoagulant, accelerating the clotting process. There is resolution of the clot at 7-13 hours, leaving a thick layer of mature clot over the dorsal part of the theca. There is widespread fibroblastic activity and collagen formation,\textsuperscript{60,61} 7 days after the administration of an epidural blood patch (EDP). This has been demonstrated by animal studies. If a single EBP fails to resolve the headache a repeat blood patch produces a similar high success rate in resolution of the headache. Repeating the patch for a third or fourth time has also been reported. Alternative cause should be considered if there is persistent severe headache.

**Complications**

Radicular pain with immediate exacerbation of symptoms have been described,\textsuperscript{62} this tends to resolve with simple analgesics. Long term complications of EBP are rare. Non-postural, persistent headache with lower extremity discomfort as a result of inadvertent subdural EBP have been described in a case report.\textsuperscript{63} Other complication are infection, seizures, cauda equina syndrome and pneumocephalus.
CHAPTER THREE

PATIENTS AND METHODS

Inclusion Criteria

Parturients who had Caesarean section with ASA I, II, IE and IIE who consented to participate in the study.

Exclusion Criteria.

The following groups of patients were excluded from the study:

- Patient’s refusal of spinal anaesthesia
- Patient with lumbo sacral abnormality
- Patient with infection along the spine
- Patient with coagulopathy
- Patient with Eclampsia/severe pre-eclampsia
- Patient with type (IV) placental praevia
- Patient with hypovolaemia,
- Patient with neuromuscular diseases e.g. myopathies and neuropathies
- Patient on anticoagulant therapy
- Migraine
Sample Size:

The sample size was calculated using the formula below:

\[
\text{Sample size } n = \frac{k [p_1 (1-p) + p_2 (1-p_2)]}{(p_1 - p_2)^2} \text{ with 80% power}
\]

\[K = 7.849, \quad p_1 = \text{approximate incidence in 25G Quincke needle} = 20\%
\]
\[p_2 = \text{approximate incidence in 25G Whitacre needle} = 5\%
\]
\[n = \frac{(7.849) [0.2(0.8) + 0.05(0.95)]}{(0.15)^2}
\]
\[= \frac{(7.849) 0.16 + 0.0475}{0.0225}
\]
\[= \frac{7.849 \times 0.2075}{0.0225}
\]
\[= 72 \text{ per group}
\]

Methodology

This study was carried out at LAUTECH Teaching Hospital, Osogbo. The approval of the Hospital Ethical Committee and Obstetrics Department were obtained to conduct the study.

Elective patients were seen a day before the surgery for pre-operative anaesthetic assessment and were premedicated with oral ranitidine 150mg and 10mg of metoclopramide in the night and 150mg of ranitidine repeated on the morning of surgery. Emergency cases received 50mg of intravenous ranitidine and 10mg of metoclopramide before the surgery. All patients had pre-operative assessment and evaluation for surgery, and laboratory investigations included PCV, urinalysis, blood grouping and crossmatching. Informed written consent were obtained (appendix C) after detailed explanation of the study to the patients.
Patients were divided into group A (25G Quincke needle) and group B (25G Whitacre needle) by randomized single blind sampling technique by asking patient to pick from 144 wrapped ballot papers labelled A or B in a brown sealed envelope. Patients were preloaded with 15mls/kg of normal saline, immediately before instituting the block, after intravenous access was established with 16G or 18G cannula on the dorsum of the non-dominant hand. Parameters monitored included non-invasive arterial blood pressure, heart rate and pulse oximetry. The following resuscitative equipments/drugs were made available; anaesthetic machine with full oxygen cylinders, Laryngoscope, endotracheal tubes (sizes 7.0mm and 7.5mm), suctioning machine with catheter, face mask, oropharyngeal airway and ephedrine injection. General anaesthetic agents were also available in event of failed spinal anaesthesia.

All the spinal blocks were instituted by the researcher, with each patient in a sitting position and feet on the stool, her body bent forward over a pillow on her chest and the assistance helped to flex the trunk. After scrubbing and gloving, the back of the patient was cleaned with povidone iodine and methylated spirit and draped with sterile towels. Spinal block was performed using a midline approach at the level of L3/L4 or L4/L5 interspace using spinal needles 25G Quincke or 25G Whitacre after skin infiltration with 2mls of 1% plain lidocaine. The bevel of 25-gauge Quincke needles were orientated parallel to the direction of the dural fibres during insertion. After free flow of CSF, subarachnoid injection of 2 – 2.8mls of 0.5% hyperbaric bupivacaine
was administered depending on the height of the patient, i.e. height <1.50m had 2mls, 1.50 – 1.59m had 2.2mls, 1.60 – 1.69m had 2.5mls and 1.70m and above had 2.8mls.

After withdrawal of the needle, the site of the injection was dressed with gauze and adhesive tape, patient was then turned to the supine position with left uterine displacement with the help of a wedge placed behind the right flank. Sensory block was tested with methylated spirit and motor block with Bromage scale until it was fixed at sensory level of up to T5/T6 dermatome. Blood pressure, heart rate, respiratory rate and SpO₂ were monitored continuously and recorded every 5 minutes. Patients had supplementary oxygen, when oxygen saturation fell below 95% or during hypotensive episodes. Patients that experienced inadequate analgesia received supplementary analgesia with pentazocine injection 30mg I.V after delivery of the baby. Any patient, whose analgesia was inadequate after spinal anaesthesia and was supplemented by conversion to general anaesthesia, was excluded from the study.

Hypotension, defined as systolic pressure of 20-25% less than the baseline value or less than 90mmHg, was treated with rapid infusion of crystalloids and, if this proved ineffective, ephedrine injection was used. Bradycardia was taken as heart rate less than 50 beats per minute, and was treated with atropine 0.5–1.0mg. Complications like nausea, vomiting, were managed symptomatically. Any patient withdrawing from the study at any point or with prolonged haemodynamic instability was automatically excluded.
from the study. Post-operative fluid regimen was 3L/24hours (30 drops/minute) of 5% Dextrose saline alternating with 5% Dextrose water.

Patients were followed up by the researcher immediately post-operatively in the post-natal ward until they were eventually discharged home. The patients were reviewed at 8am, 2pm and 8pm each day for 7 days post-operatively with the prepared questionnaire (as in the Appendix A, section C to E) regarding headache, its severity, location, character, associated symptoms like nausea, vomiting, auditory, and ocular symptoms.

Patients were allowed to move after the effect of spinal anaesthesia had worn off and they were encouraged to breast feed their babies. Any history of headache was fully evaluated on a 10cm-visual analogue scale for Pain [as in the Appendix A section E].

Patient who developed headache was initially managed by bed rest and hydration i.e. oral fluid as tolerated by the patient or by increasing the rate of intravenous fluid to 35 drops/minute making 3.5L/24 hours. If the headache persisted, acetaminophen [300mg I.M 8 hourly or 1g P.O. t.d.s.] was added, and if it did not resolve, non steroidal anti-inflammatory drugs e.g. [diclofenac 75mg I.M 12 hourly or ibuprofen 400mg P.O t.d.s] was added. The effectiveness of the above conservative management was assessed by asking the patient about the resolution of the headache following institution of each management modality on a 10-cm visual analogue scale [as in the Appendix A section E and F]. Epidural blood patch was reserved for patient with severe headache that did not respond to all of the conservative management above.
All the patients had the same post operative analgesia (30-60mg of pentazocine I.M 6 hourly for 48 hours and I.M piroxicam 40mg start, then 20mg 12 hourly for 48 hours). Associated symptoms like nausea and vomiting were treated with promethazine injection. Patients were informed to report to hospital in case they developed headache at home after discharge from the hospital. Data were collected using data collection form designed with input from a statistician (see Appendix A, section A - F)

**STATISTICAL ANALYSIS:** The data collected was entered into SPSS version 15. Statistical comparison was done using the chi-square ($x^2$) test for categorical variables, ANOVA and student t-test for continuous variables. Data are presented using descriptive statistics, tables, percentages, graphs and charts. A p-value less than 0.05 (<0.05) was considered statistically significant.

**RESULTS:** One-hundred and forty-four parturients completed the study. Sixteen (11.1%) had Electives and 128(88.9%) were Emergencies.

**DEMOGRAPHIC CHARACTERISTICS**

The demographic characteristics of the two groups were comparable. The mean/range age for 25 gauge Quincke group was 30.00 years (21-38 years) and 29.00 years (19-38 years) for 25 gauge Whitacre group (P=0.15),
mean/range weight was 67.36kg (50-84kg) and 70.99kg (54-86kg) P= 0.13 respectively with no statistical difference, see Table 1.

The mean/range height, and body mass index (BMI) were comparable in both groups; Mean/range height was 1.60m (1.49-1.72m) and 1.60m (1.49-1.72m) P= 0.80 respectively, while mean/range BMI was 26.33kg/m² (20.80-33.70kg/m²) and 27.65kg/m² (20-34.2kg/m²) P= 0.15 respectively, see Table 1. In both groups the mode of parity was 1 and the mode of ASA was IIE as shown in Table 1.

**CHARACTERISTIC OF SPINAL BLOCK**

The mean value for the volume of Local anaesthetics administered, and the height of block were also comparable in both groups, see Table 2. Mean/range volume of drugs administered was 2.37mls (2.0-2.8mls) and 2.36mls (2.0-2.8mls) respectively. The mode height of block was T5/T6 in both groups. See Table 2.

**NEEDLE INSERTION AND SPINAL ANAESTHESIA**

Dural puncture was successful at first attempt in 54(75%) of the parturients in the Quincke group compared to 66(91.7%) in the Whitacre group (p-value 0.016) and upon second attempt 14(19.4%) in the Quincke group compared to 6(8.3%) in the Whitacre group. Four (5.5%) required third attempt in Quincke while none of the parturients in Whitacre group required more than two attempts. See Table 3. One-hundred and eighteen parturients had adequate analgesia intra-operative while twenty-six parturients had inadequate analgesia necessitating additional systemic analgesics
(pentazocine) to complete the surgery. Adequate analgesia was achieved throughout the surgery after the block in 54(75%) of Quincke group compared to 64(88.9%) in the Whitacre group, see Table 4.

**INCIDENCE OF POST DURAL PUNCTURE HEADACHE**

Post-dural puncture headache (PDPH) occurred in eighteen (25%) parturients in the Quincke group while no member (0%) of the Whitacre group developed PDPH (P value 0.000003), see Table 5.

**EVALUATION OF THE PDPH**

In 8(44.4%), of 18 patients that developed PDPH in the Quincke group, the headache started in the first post-operative day, the headache started in the second post-operative day in another 8(44.4%) parturients and in the remaining 2(11.2%) it started in the third day, see Table 6 and Figure IV.

Six (33.3%) of the patient reported frontal headache, 8(44.4%) reported both frontal and occipital headache while 4(22.3%) reported occipital headache, see Table 7 and Figure III.

Six (33.3%) of the patients with headache had visual analogue score (VAS) of 2-3/10, 10(55.6%) had VAS of 5-6/10, while 2(11.1%) had VAS of 8/10, see Table 7 and Figure1.

All patients with PDPH had resolution of their symptoms by conservative management (Hydration, Bed rest, Acetaminophen and NSAIDS), the PDPH resolved in 2(11.1%) of the parturients within the 1st day of its commencement, 8(44.5%) parturients had relief 2nd day after
commencement of the headache, 6(33.3%) got relief on the 3rd day and 2 (11.1%) had relief on the fourth day. Table 7 and Figure II.

Headache was the only symptom in 8(44.4%) of the parturients with PDPH while the remaining ten had other associated symptoms; 2(11.2%) and 8(44.4%) parturients had associated backache and neckache respectively, see Table 7 and figure V.

Sixteen (88.9%) of the parturients with successful dural puncture upon first attempt at needle insertion developed PDPH while only 2(11.1%) parturients developed PDPH in those in whom the puncture was successful on the second attempt. None of the parturients who had more than two attempts at dural puncture developed headache, see Table 6.

Two (11.1%) of the parturients developed headache after ambulation six hours post-operative, zero (0%) after eight hours and 16(88.9%) after twelve hours. See Table 7. In 2(11.1%) headache prevented the mother from breast-feeding while in 16(88.9%), it did not affect breastfeeding, see Table 7.

**EVALUATION OF THE TREATMENT OFFERED FOR THE HEADACHE**

None of the parturients who developed post-dural puncture headache got relieved with fluid and bed rest only. Eight (44.4%) got relieved with the combination of fluid, bed rest and acetaminophen (paracetamol), while the rest 10(55.6%) got relieved with addition of NSAIDS to fluid, bed rest and acetaminophen. Table 8.
Table 1: Demographic characteristics of the patients (mean/range/mode).

<table>
<thead>
<tr>
<th></th>
<th>25-gauge Quincke</th>
<th>25-gauge whitacre</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) mean/range</td>
<td>30.00 (21-38)</td>
<td>29 (19-38)</td>
<td>0.15</td>
</tr>
<tr>
<td>Weight (kg) mean/range</td>
<td>67.36 (50-84)</td>
<td>70.99 (54-86)</td>
<td>0.13</td>
</tr>
<tr>
<td>Height (m) mean/range</td>
<td>1.60 (1.49-1.72)</td>
<td>1.60 (1.49-1.72)</td>
<td>0.80</td>
</tr>
<tr>
<td>BMI (Kg/m2) Mean/range</td>
<td>26.33 (20.80-33.70)</td>
<td>27.65 (20-34.2)</td>
<td>0.15</td>
</tr>
<tr>
<td>Parity (mode)</td>
<td>Para 1</td>
<td>Para1</td>
<td></td>
</tr>
<tr>
<td>ASA Class (mode)</td>
<td>II E</td>
<td>II E</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Volume of drug used and the height of block attained.

<table>
<thead>
<tr>
<th></th>
<th>25-gauge</th>
<th>25-gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quincke</td>
<td>Whitacre</td>
</tr>
<tr>
<td>Volume of drugs (mls)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean/range.</td>
<td>2.37 (2.0-2.8)</td>
<td>2.36 (2.0-2.8)</td>
</tr>
<tr>
<td>Height of block (mode)</td>
<td>T5/T6</td>
<td>T5/T6</td>
</tr>
</tbody>
</table>
Table 3: - Successful dural puncture compared with number of attempted needle insertions.

<table>
<thead>
<tr>
<th>Number of attempts at insertion</th>
<th>Successful Dural puncture</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25-gauge Quincke (54 (75%))</td>
<td>25-gauge Whitacre (66 (91.7%))</td>
</tr>
<tr>
<td>1</td>
<td>54 (75%)</td>
<td>66 (91.7%)</td>
</tr>
<tr>
<td>2</td>
<td>14 (19.5%)</td>
<td>6 (8.3%)</td>
</tr>
<tr>
<td>&gt;2</td>
<td>4 (5.5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>72 (100%)</td>
<td>72 (100%)</td>
</tr>
</tbody>
</table>

Table 4: - Quality of Spinal Anaesthesia.

<table>
<thead>
<tr>
<th></th>
<th>25-gauge Quincke</th>
<th>25-gauge Whitacre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate Analgesia</td>
<td>54 (75%)</td>
<td>64 (88.9%)</td>
</tr>
<tr>
<td>Inadequate Analgesia</td>
<td>18 (25%)</td>
<td>8 (11.1%)</td>
</tr>
<tr>
<td>Total</td>
<td>72 (100%)</td>
<td>72 (100%)</td>
</tr>
</tbody>
</table>
Table 5: Incidence of Post-dural Puncture Headache (PDPH).

<table>
<thead>
<tr>
<th></th>
<th>25-gauge Quincke</th>
<th>25-gauge Whitacre</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>18 (25%)</td>
<td>0 (0%)</td>
<td>0.000003</td>
</tr>
<tr>
<td>No headache</td>
<td>54 (75%)</td>
<td>72 (100%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72 (100%)</td>
<td>72 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 6: Onset time of the Post-dural Puncture Headache

<table>
<thead>
<tr>
<th>Onset time</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; day post-operative period</td>
<td>8</td>
<td>44.4%</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; day post-operative period</td>
<td>8</td>
<td>44.4%</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; day post-operative period</td>
<td>2</td>
<td>11.2%</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100%</td>
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<tr>
<td>Location</td>
<td>Severity with 10-cm visual analogue scale</td>
<td>Duration</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Frontal (6) 33.3%</td>
<td>2-3cm (6) 33.3%</td>
<td>1 Day(2) 11.1%</td>
</tr>
<tr>
<td>Frontal and Occipital (8) 44.4%</td>
<td>5-6cm (10) 55.6%</td>
<td>2 Days (8) 44.5%</td>
</tr>
<tr>
<td>Occipital (4) 22.3%</td>
<td>8cm (2) 11.1%</td>
<td>3 Days (6) 33.3%</td>
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<tr>
<td></td>
<td></td>
<td>4 Days (2) 11.1%</td>
</tr>
<tr>
<td>Total</td>
<td>18(100%)</td>
<td>18(100%)</td>
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</table>
Table 8: Methods of PDPH Management and PDPH Relief

<table>
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<tr>
<th>Methods of management</th>
<th>Number of patients</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Fluid + Bed rest</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Fluid + Bed rest + Acetaminophen</td>
<td>8</td>
<td>44.4%</td>
</tr>
<tr>
<td>Fluid + Bed rest + Acetaminophen + NSAIDS.</td>
<td>10</td>
<td>55.6%</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100%</td>
</tr>
</tbody>
</table>
Figure I: Severity of PDPH on 10-cm visual analogue scale

![Pie chart showing severity levels of PDPH](image)

- 2-3cm: 33%
- 5-6cm: 56%
- 8cm: 11%

Figure II: Onset Time of PDPH

![Pie chart showing onset times of PDPH](image)

- 1st Day PO: 44.4%
- 2nd Day PO: 44.4%
- 3rd Day PO: 11.1%
Figure III: Bar Chart of Associated symptoms to PDPH.

- Backache: 11.20%
- Neck ache: 44.40%
- Nil: 44.40%

Associated Symptoms

Number of Parturients

Percentage
Parturient
CHAPTER FOUR
DISCUSSION

It has been known from the 1950s that headache after dural puncture are more frequent in obstetric patients. The proposal that a cone tipped needle would reduce the incidence of PDPH predates this by thirty years. In this study, the incidence of PDPH in the group of mothers in whom 25-gauge Quincke needle was used was 25%. The difference was statistically significant compared to 0% incidence amongst the Whitacre group. The incidence is similar to findings in the work of Imarengiaye et al, which reported 22.7% incidence with 25-gauge Quincke needle among 119 parturients who had Caesarean section. Nafiu et al in Korle-Bu teaching Hospital Ghana reported a lower incidence of 4% with 25-gauge Quincke in their study. Vallejo et al, also reported lower incidence (8.7%) in their study of randomized comparison of five spinal needles in obstetrics patients. Nafiu et al, studied a small sample of 46 parturients, while Vallejo et al studied 172 parturients in their respective studies with 25G Quincke needle.

The absence of PDPH reported after the use of 25gauge Whitacre in this study agreed with other studies and findings, Dakin et al, and Shutt et al, reported zero (0%) incidence in their studies. A higher incidence of PDPH 3.1% and 6% were found with the studies of Valejo et al and Fyneface-Ogan et al respectively. Vallejo et al, studied larger sample of 201 parturients with 25G Whitacre needle, while Fyneface-Ogan et al studied 100 parturients with both 25G and 26G Whitacre needles. This study is also in tandem with the
work of Dakin et al,\textsuperscript{8} which noted 25-gauge Whitacre needle to have the advantages of both lower incidence of PDPH and lower lumbar puncture failure rate.

The principal factor responsible for development of a dural puncture headache is the size of the dural perforation; this is largely determined by the needle size and design. This was confirmed by the work of Valejo et al,\textsuperscript{3} and Hart et al.\textsuperscript{6} Other factors such as the shape of the dural perforation and the orientation of the spinal needle have less significant roles. A clinical study by Fink et al\textsuperscript{14} demonstrated that post-dural puncture headache was more likely when the cutting spinal needle was orientated perpendicular to the direction of the dural fibres. In this study, all the 25-gauge Quincke needles were orientated parallel to the direction of the dural fibres during insertion.

Successful dural puncture at single needle insertion was more with 25G Whitacre 66(91.7\%) than with 25G Quincke needle 54 (75\%) in this study. The introducer that accompanied the 25G Whitacre needle may have contributed to the ease of insertion. In the 25G Quincke needle group, 21G hypodermic needle was improvised as the introducer. Seeberger et al\textsuperscript{64} asserted that repeated dural punctures increases the incidence of post-dural puncture headache. This was contrary to the finding in this study. The pathophysiology of PDPH has been linked to the loss of CSF and lowering of CSF pressure following dural puncture. Repeated dural punctures therefore is said to increase the loss of CSF which may lower the CSF pressure thereby increase the incidence PDPH.
The headache occurred within the first to third day post operative period. This replicates what is in the literature. Reynolds\textsuperscript{38} reported 90\% of headache occurring within 3 days of the procedure and Leibold et al,\textsuperscript{39} reported 66\% occurring within 48 hours. Headache occurring between 5\textsuperscript{th}-14\textsuperscript{th} day is said to be very rare. Headache may also occur immediately after the dural puncture,\textsuperscript{40} but this is also rare and its occurrence should alert the physician to confirm alternative causes.

The common distribution of the headache documented is the frontal and occipital areas radiating to the neck and shoulders. In this study 6(33.3\%) of the headache was located in the frontal region, while 4(22.2\%) in the occipital and 8(44.4\%) in both frontal and occipital region. Eight (44.4\%) patients complained of associated neck pain and 2(11.1\%) complained of backache. No parturient complained of diplopia or tinnitus. Headache experienced by parturients were assessed on a 10cm-visual analogue scale. Six (33.3\%) of the parturients with headache had VAS of 2-3cm, 10(55.6\%) had VAS of 5-6cm and 2(11.1\%) had VAS of 8cm. From the study of Mayer et al,\textsuperscript{26} 83.3\% of the headache was mild and 16.7\% was found to be moderate to severe. Shaikh et al,\textsuperscript{65} reported similar pattern of severity with 25G Quincke in their study. They reported 5/14(35.7) as mild, 7/14(50.0) as moderate and 2/14(14.3) as severe headache.

In this study, parturients with mild headache (VAS of 2-3cm) got relief with fluid, bed rest and addition of Acetaminophen. Two of the parturients with moderate headache (VAS of 5-6cm) got relief with fluid, bed rest and addition
of Acetaminophen, while the remaining eight got relief with addition of NSAIDS to fluid, bed rest and Acetaminophen. Two parturients with severe headache (VAS of 8cm) got relief with addition of NSAIDS to fluid, bed rest and Acetaminophen. Based on the findings in this study, NSAIDS is effective for moderate and severe PDPH. Other therapeutic agents which have been suggested for the management of PDPH include; caffeine, a central nervous stimulant which also produces cerebral vasoconstriction. A dose of 300-500mg of oral or I.V Caffeine once or twice daily has been recommended. Sumatriptan, a 5-HT\textsubscript{1D} receptor agonist that promotes cerebral vasoconstriction like Caffeine which has been advocated for the management of migraine has also been tried for PDPH, at a dose of 6mg subcutaneously. Desmopressin acetate (DDAVP) and adrenocorticotrophic hormone (1.5µg/kg) as an infusion have also been tried. Epidural blood patch is reserve for severe PDPH that does not respond to conservative management. It was not utilized in this study.

There was 100% resolution of PDPH within four days with conservative management in this study. 10(55.6%) resolved within 1-2 days and 8(44.4%) within 3-4 days. There was faster rate of resolution of the headache in this study compared to the rate of resolution reported by Vandam and Dripps,\textsuperscript{5} they reported 24% resolution within 1-2 days and 29% with 3-4 days respectively. In a minority of patients, the headache has been found to persist\textsuperscript{40} for a longer period and a case report have described the persistence of headache for as long as 1-8 years after dural puncture.\textsuperscript{45}
Sixteen (88.9%) of patients that ambulated 12 hour post spinal anaesthesia developed PDPH while only 2(11.1%) of those ambulated before 12 hours developed the headache. This compares to the work of Spriggs et al\textsuperscript{47} and Jone et al\textsuperscript{49} They are of the view that bed rest and supine position before or after the onset of the headache has no benefit in the prevention and treatment of the headache. From the evaluation of the parturients that developed post-dural puncture headache in this study, none of them responded to fluid and bed rest alone. Eight (44.4%) got relief with addition of paracetamol and the rest 10 (55.6%) got relief with addition of NSAIDS. Mayer et al\textsuperscript{26}, also reported 100% resolution of the headache with conservative management without blood patch.

Conservative management was found to be effective in the management of PDPH in this study. Addition of NSAIDS to the regimen gave a better relief of the symptoms of PDPH. Ten out of twelve parturients who had moderate-severe headache got relief with addition of NSAIDS to the regimen of fluid, bed rest and paracetamol.
CONCLUSION

This study demonstrates the occurrence of PDPH following dural puncture for Caesarean section, it also demonstrates the effectiveness of fine guage (25-guage) atraumatic pencil-point needle in reducing its incidence and the effectiveness of conservative management i.e. a combination of increased fluid intake, acetaminophen and NSAIDS in the resolution of the symptoms when it occurs.
RECOMMENDATIONS

(1) Parturients should be followed up post-operatively after subarachnoid block by the anaesthetist to determine those that will develop PDPH. 25-gauge Quincke needle has been used frequently for spinal anaesthesia in LAUTECH Teaching Hospital Osogbo, but the incidence of PDPH was not thought to be as high as what was revealed from this study. Hospital management should therefore ensure availability of 25G atraumatic pencil-point needle for spinal anaesthesia in obstetric patients.

(2) Parturients should be counselled before the block with respect to post-dural puncture headache, this may reduce the emotional symptoms of PDPH.

(3) Post-natal nursing staff should be updated on diagnosis and management of PDPH, as early management reduces morbidity.

(4) Prompt standard management with bed rest, fluid and analgesics should be instituted when parturients complain of symptoms of PDPH as they are found to be effective from the study.
LIMITATIONS OF THE STUDY

(1) It was difficult to double blind this study so as to prevent assessor’s bias.

(2) Analgesics required for post-operative pain during the first 24-48 hours may mask mild headache. Irrespective of the post-operative analgesia susceptible parturients will still develop the headache when ambulated.

(3) Parturients were expected to move after the effect of spinal anaesthesia block had worn off (i.e. after 6 hours), but most of them are usually not ambulant in the immediate post-operative period and are usually maintained in supine position for the first 24 hours. This has been shown to have no effect on the incidence or duration of PDPH; it only delays the onset until patient ambulates.49
REFERENCES


Alfer Y D.D, Marsh M.L, Shapiro H.M. Post spinal headache or intracranial tumour after obstetric anaesthesia. Anesthesiology 1979; 51: 92 – 4


Eggert S.M, Eggers K.A. Subarachnoid haemorrhage following spinal anaesthesia in an obstetric patient Br J Anaesth 2001; 86: 442 – 4


DATA COLLECTION FORM

SECTION A: BIODATA

i. Serial number in study -

ii. Age (years)

iii. Weight (kg)

iv. Height (m)

v. ASA Class -

vi. BMI - (kg/m²)

vii. Parity -

viii. previous c/s -

SECTION B: PERFORMANCE OF BLOCK

i. Intended needle design -

ii. Site of injection -

iii. Orientation of the needle bevel (Quincke type) -

iv. Number of dural puncture -

v. Volume of local anaesthetic administered -

vi. Assessment of block level -

vii. Quality of analgesia

Supplementary analgesia / sedation given (yes/no) if yes, indicate agent and dose given, and state duration of block before analgesic procedure was converted to general anaesthesia.
SECTION C: POST OPERATIVE ASSESSMENT

i. Time of ambulating

ii. Any history of headache

If yes,

Onset time -

Location -

Severity -

Aggravating factors - e.g. erect posture, coughing, straining

Relieving factors - e.g. supine posture.

Associated symptoms -

Duration -

Does the headache affect breast feeding -

SECTION D: Evaluation of the treatment measure for the headache

i. Does the headache relieved spontaneously with bed rest and hydration.

ii. Does the headache relieved with bed rest, hydration and administration of acetaminophen.

iii. Does the headache relieved with addition of NSAID to management ii above

iv. Does the headache relieved with addition of opioid analgesics to management iii above.

v. Does the headache relieved only by epidural blood pitch-

vi. Any other medication given to the patient to treat any other associated symptoms present -
SECTION E: EVALUATION OF HEADACHE

10cm - visual Analogue scale

0 - no headache

1 0 – 3 - Mild headache (green coloured area)

2 3 – 7 - Moderate headache (yellow coloured area)

3 7 – 10 - Severe headache (red coloured area)

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<tr>
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<th>(2)</th>
<th>(3)</th>
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<td>7</td>
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## SECTION F: EVALUATION OF CONSERVATIVE MANAGEMENT

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<th>C</th>
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<tbody>
<tr>
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<td>Fluid + Bed rest</td>
<td>Fluid, Bed rest + Acetaminophen</td>
<td>Fluid, Bed rest, Acetaminophen + NSAIDS</td>
<td>Fluid, Bed rest, Acetaminophen, NSAIDS + Opioids</td>
</tr>
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<td>2</td>
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</table>
APPENDIX B

ETHICAL CONSIDERATIONS

Confidentiality of data
The data obtained from the study shall be used strictly for the purpose of the study and it will be kept very confidential. The information that will be derived from the study will be used by health care providers to improve anaesthetic management of parturients.

Statement of translation of protocol
Informed consent of the patients will be obtained on the ward. This will involve explaining the scope of the study in simple terms to the patient. For instance, you will be given an injection through a needle at your back and you will be asked thereafter in the ward whether you have headache or not.

Beneficence to the patient
There will be no additional charge for the spinal needle and drugs used on the participants. Each patients will be studied and monitored in the peri-operative period till the time of discharge to the ward.

Non-maleficience to participants
The spinal needles and drugs are efficient and have no danger to the health of the patient. They have been in clinical use for long and are still commonly in anaesthetic practice today. Hypotension is a common intra operative complication which will be managed by increasing rate of fluid infusion, administration of vasopressor and oxygen.

Right of decline / withdrawal from the study without loss of benefit
Each patient has the right to decline or withdrawal from the study without loss of benefit.
APPENDIX C

PATIENT INFORMED CONSENT

Dear Patient,

You have been selected to take part in this research study. The study is not expected to harm you or your baby. The research study is to look at the incidence of headache among obstetric patients following the spinal anaesthesia procedure, which is about 5 – 10% of the population. The spinal block is done in over 80% of obstetric cases in this hospital. The major objective of the study is to evaluate the headache and treatment measure available.

You will be given an injection at your back, in the midline. Few minutes afterwards you will experience numbness in both lower limbs and the site of the surgery which signifies the onset of anaesthesia. You will be awake throughout the period of the surgery but not feeling pain at the site of the surgery. You will hear your baby cry at delivery. For the purpose of this study you will be allocated by chance either to the group that will have anaesthesia with 25G Quincke or 25G Whitacre needle.

Your participation in this study is confidential. Only the investigator will have access to your identity and to information that can be associated with your identity. In the event of publication of this research, no personal identifying information will be disclosed. You will not be required to pay for the spinal needle; this will be provided by the investigator. The result of this study will help in providing better care for patients like you in future. You will not be
exposed to any treatment that is not usually indicated for your surgery. Taking part in this study will not expose you to any added risk. There will be no additional charges to you for taking part in this study.

The choice to enter or not to enter this study is yours. You are in a position to make a decision if you understand what the doctor has explained and what you have read about the research study. If you decide not to participate, all usual and customary treatment will be made available without prejudice. You have the right to withdraw at any time.

I have read this consent form and the research study has been explained to my satisfactions. I am therefore willing to participate.

WITNESS

______________  ______________
Signature       Date

PARTICIPANT

______________  ______________
Thumb print/Signature Date

INVESTIGATOR

______________  ______________
Signature       Date