

To Compare the Incidence of Post Dural Puncture Headache using 23G and 25G Quincke and 23G and 25G Whitacre Needle in Patients Undergoing Elective Cesarean Section

Dr Chiranjeevi Nellore, MD (Anesthesiology), PDCC, IDCCM, EDIC.^{1*}

Dr Srenivasulu Bhadri MD (Anesthesiology)²

Assistant Professor, Department of Anesthesia and Critical Care, Sri Venkateswara Medical College, Tirupati, AP

Assistant Professor, Department of Anesthesia Sri Venkateswara Medical College, Tirupati, AP.

*Corresponding Author

Dr Sreenivasulu Bhadri, MD (Anesthesiology)

Assistant Professor, Dept of Anesthesia and Critical Care, Sri Venkateswara Medical College, Tirupati, AP, India

Abstract

Background: Spinal anesthesia is relatively a safe procedure compared to general anesthesia. It provides good muscle relaxation and avoids fetal as well as maternal risks of general anesthesia. Requires minimum postoperative anesthesia care and provides adequate post-operative analgesia. But one of the limiting factors in the use of spinal anesthesia has been the occurrence of post-dural puncture headache. Its incidence is highest in obstetric patients. There are some attempts to reduce the incidence of this complication.

Aim: To compare the incidence of post-dural puncture headache using 23G,25G quincke and, 23G,25G whitacre needle in patient undergoing elective caesarean section.

Materials and Methods: A prospective comparative study of 100 parturients who were selected randomly from the age group of 20-45 years having a pregnancy of at least 34 weeks gestation with a single uncompromised fetus and uncomplicated pregnancy. The parturients were divided into four groups of 25 patients each. **Group I** and **Group II** Patients who received spinal anesthesia with 23G and 25G quincke needle where as **Group III** and **Group IV** received with 23G and 25G Whitacre needle respectively, using 0.5% heavy bupivacaine 10mg (2ml).

Results: There were no significant differences between groups in all demographic data. Three patients in group I with 23G Quincke (12%), two patient in group II with 25G Quincke (8%), one patient in group III with 23G Whitacre (4%) developed post dural puncture headache and patients in group IV with 25G Whitacre spinal needles had no headache. Post dural puncture headache was statistically compared between group I and group II, group II and group III, group III and group IV and group I and group IV using Chi-square test. The values were 0.632, 0.552, 0.312 and 0.074 respectively.. The values in the study were statistically not significant but clinically relevant.

Conclusion: Use of Whitacre needle was associated with reduced incidence of post-dural puncture headache in our study. It is technically difficult to introduce 25G Whitacre needle. There is a high degree of acceptance on part of the patient with the use of Whitacre needles. 23G and 25G Whitacre needle are associated with low incidence of post dural Puncture headache.

Keywords: Quincke needle, Whitacre needle, Postdural puncture headache, spinal anaesthesia.

I. Introduction

Spinal anesthesia is one of the most common anesthetic procedure done in parturients undergoing cesarean section. This commonly used technique is not without complications. Post dural puncture headache is the most frequent complication of dural puncture. Obstetric anesthesia closed claims update published in American society of anaesthesiologists newsletter, 1999 states that post-dural puncture headache is the third most common complication. This complication may increase the patient's dissatisfaction and patients may not opt for spinal subarachnoid block. However, the incidence of post-dural puncture headache is high in pregnancy due to Physiological changes in pregnancy^{1,2}.

Evidence from various studies proved that the incidence of post-dural puncture headache can be reduced from technique, needle size, the tip of the needle where all can be significant contributing factors³. Keeping these

things in mind the present study was undertaken at our institute as to how the technique, needle size, and needle tip can influence post-dural puncture headache in parturients undergoing a cesarean section.

II. Materials and Methods

The present study was conducted in the department of anaesthesiology, Sri Venkateswara Medical College, Tirupati attached to Government General Hospital, Tirupati. The protocol was approved by the hospital ethical committee. The patients were selected randomly from the age group of 20-45 years having a pregnancy of at least 34 weeks gestation with a single uncompromised fetus and uncomplicated pregnancy posted for elective LSCS. The patients were 100 ASA grade one and two divided into four groups of 25 patients each.

The patients excluded from the study were those having fetal distress, toxemia of pregnancy, CVS/CNS disorders, neuromuscular diseases, hypovolemia, acid-base disturbances, electrolyte imbalance, obese patients, patients with an infection on the back, patients on anticoagulant therapy and vertebral anomalies.

Before including the patient into the study, detailed written informed consent was taken. Patients were divided into four groups, each group consisting of 25 patients.

Group I: Patients who received spinal anesthesia with 23gauge quincke needle.

Group II: Patients who received spinal anesthesia with 25gauge quincke needle.

Group III: Patients who received spinal anesthesia with 23gauge Whitacre needle.

Group IV: Patients who received spinal anesthesia with 25gauge Whitacre needle.

A thorough and detailed history of present and past medical illness, a history of anesthetic exposure with concomitant history of drugs taking in the pre-operative period was also recorded. Routine investigations including coagulation profile were done. General and systemic examination of all the patients was done.

The patients were premedicated with injection ranitidine 50mg and injection Ondansetron 4mg were given IV slowly preoperatively one hour before surgery. In the operating room, ECG and heart rate were monitored. Blood pressure was monitored non-invasively. Pulse oximetry was done using a finger probe. The Patient was preloaded with 500 cc ringer lactate solution before spinal anesthesia.

All procedures were performed in the left lateral decubitus position by Aneshetist with enough experience. The back of the patient was cleaned with Povidone-Iodine and spirit and draped with sterile towels. Spinal anesthesia was performed using a midline approach at the 2nd lumbar and 3rd lumbar interspace with the direction of bevel parallel to the fibers using one of the above spinal needles and 0.5% hyperbaric bupivacaine 2.0 ml was injected. Before the withdrawal of the needle, the stylet was replaced. After the withdrawal of the needle, the patient was turned to the supine position with left uterine displacement.

Level of sensory blockade and changes in parameters like Heart Rate, Blood Pressure were recorded. A Solution of ringer lactate, colloid and blood was transfused as maintenance fluid as and when necessary and also according to the blood loss. Hypotension was treated with Inj. Mephentermine 3 mg was given intravenously. Complications like nausea, vomiting, bradycardia, respiratory depression, skin reaction were managed symptomatically.

Patients were interviewed on day 1, 2, 3, 4, 5 and 6 and were questioned about headache, its severity, location, character, and duration, associated symptoms like nausea, vomiting, auditory and ocular symptoms.

Criteria of post-dural puncture headache were:

Occurs after mobilization.

Aggravated by erect or sitting position and coughing, sneezing or straining.

Relieved by lying flat.

Mostly localized in occipital, frontal or generalized.

The Severity of headache was assessed on a 1-4 scale. (Crocker 1976).

Mild headache which permitted long periods of sitting/erect position and no other symptoms.

Moderate headache, which made it difficult for the patient to stay upright for more than half an hour. Occasionally accompanied by nausea, vomiting, auditory and ocular symptoms.

Intense headache immediately upon getting up from bed, alleviated while lying horizontally in bed. Often accompanied by nausea, vomiting, ocular and auditory symptoms.

Headache that occurred even while lying horizontally in bed and greatly aggravated immediately upon standing up, eating is impossible because of nausea and vomiting.

Post dural puncture headache, when present was treated with bed rest, 500cc of 5% dextrose as an additional fluid and Inj. Diclofenac 75 mg IM. The success and failure rate associated with needle insertion was also recorded.

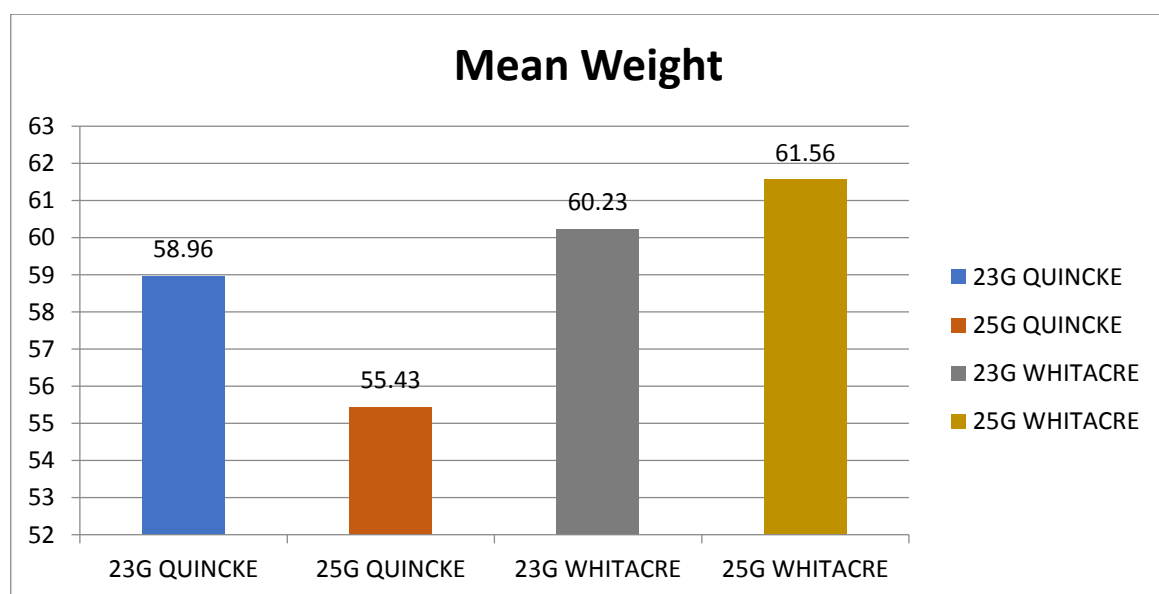
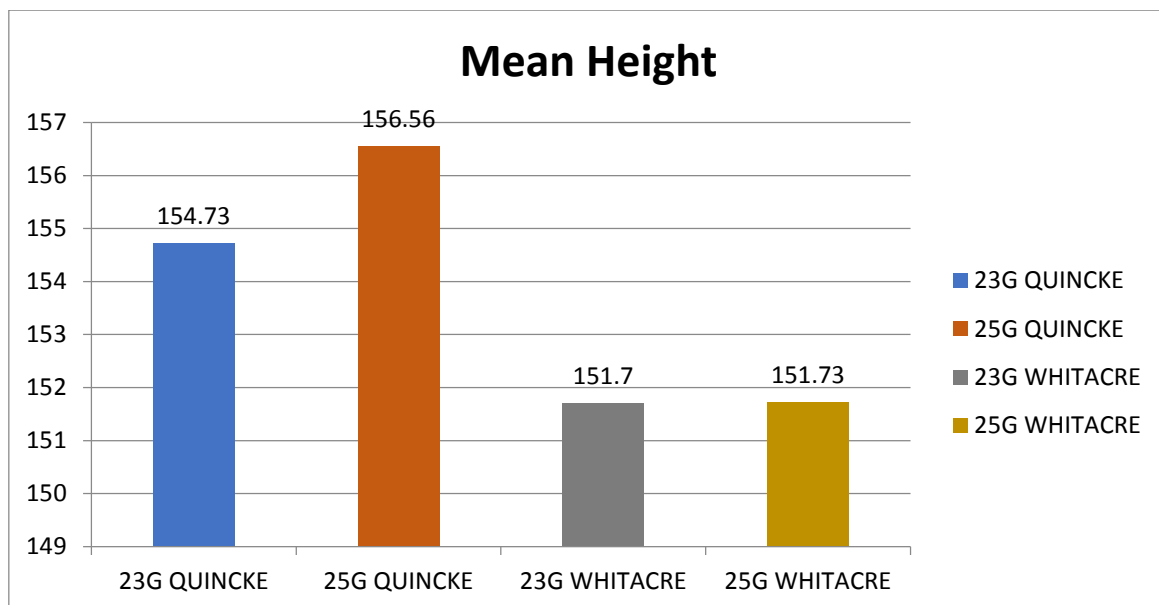
At the end of the study, data were compared and statistically analyzed using the Chi-Square test.

III. Observations and Results

The present study was conducted in 100 patients and was divided into four groups of 23 G quincke, 25G Quincke, 23G Whitacre and 25G Whitacre of 25 patients each. The mean age, weight, and height of the patients are distributed as follows.

Table 1 Patient Characteristic in four study groups

Variable	23Gauge Quincke needle (n=25)	25Gauge Quincke needle (n=25)	23Gauge Whitacre needle (n=25)	25G Whitacre needle(n=25)
Age (yrs)	24.36±3.2	23.96±3.02	24.76±2.80	24.24±2.77
Height(cm)	154.4±4.24	156.4±3.92	150.96±6.04	150.92±5.36
Weight (kg)	58.44±4.15	54.88±5.33	60.52±5.8	62.24±3.7
Gravidity	2.4±1.04	2.12±0.67	2.32±0.99	2.72±0.74
Parity	1.16±0.69	1.12±0.67	1.6±0.96	1.56±0.71



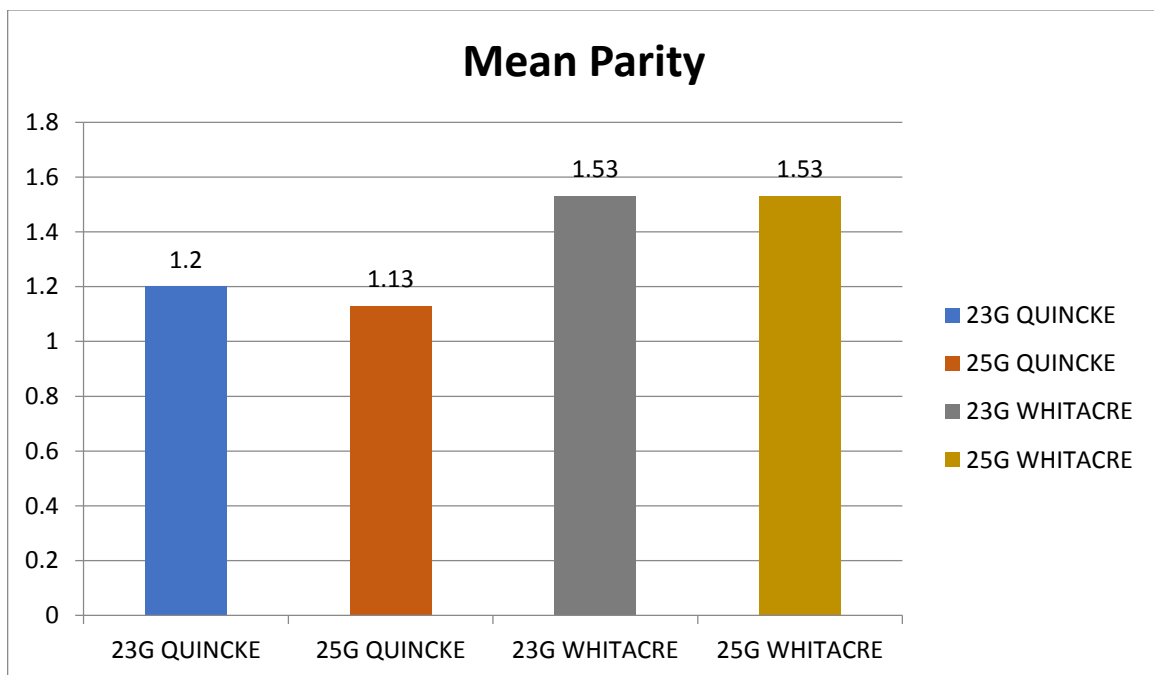
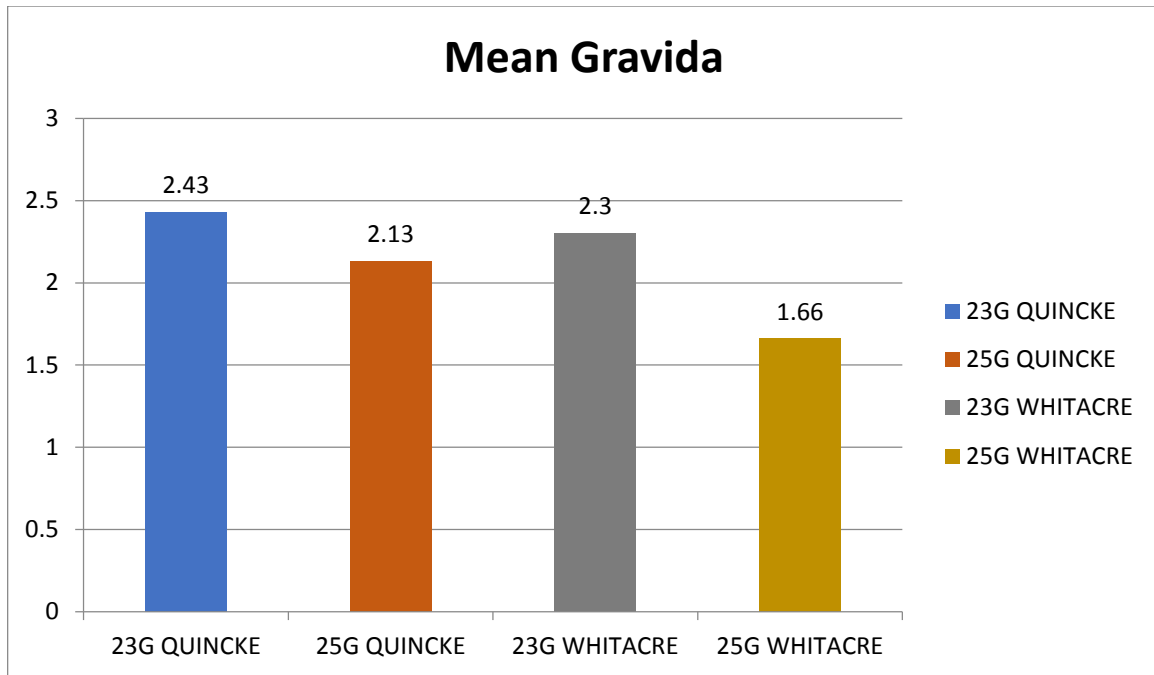


Table 2 Parametric and Non Parametric Variables

Non-parametric	23Gauge Quincke needle n=25	25Gauge Quincke needle n=25	26Gauge Whitacre needle n=25	25G Whitacre needle (n=25)
Elective cases	25 (100%)	25 (100%)	25 (100%)	25 (100%)
PDPH	3 (12%)	2 (8%)	1 (4%)	0 (0%)
Parametric				
Bupivacaine Dose(cc)	2	2	2	2
No of attempts	1.12±0.33	1.08±0.28	1.12±0.33	1.08±0.28

All patients were considered for an elective cesarean section because labor pains could influence the post-dural puncture headache. Spinal anesthesia was given for elective cases for malpresentation, post maturity, contracted pelvis, bad obstetric history and post-cesarean pregnancy. The distribution of patients according to surgery are given in table 3.

Table 3 Distribution of patients according to surgery

Variable	Group I	Group II	Group III	Group IV
Malpresentation	4	5	4	3
Contracted pelvis	5	5	5	6
Bad obstetric history	5	3	5	3
Post cesarean	8	10	9	10
Post-term	3	2	2	3

The incidence of post-dural puncture headache was studied in 100 patients divided into four groups. Only six patients had a headache in all three groups. Three patients in group I with 23G Quincke (12%), two patient in group II with 25G Quincke (8%), one patient in group III with 23G Whitacre(4%) and no patient in group IV with 25G Whitacre spinal needles had a headache.

The onset of headache was seen on day 2nd and 3rd day in a group I, 3rd day in group II patients and 2nd day in group III patients. The location of the headache was frontal in two patients and generalized in one patient in group I, generalized in group II patients and frontal in group III patient. The headache was mild in two patients and moderate in one patient in group I, mild in group II and mild in group III. The duration of headache was less than 24 hrs in two patients and 48hrs in one patient in group 1, persisted for 48hrs in one patient and 24hrs in another patient group II and less than 24hrs in group III. All patients were conservatively treated for the headache. (Table 4)

Table 4 Nature and Distribution of Headache

	23G Quincke	25G Quincke	23G Whitacre	25G Whitacre
Location				
Frontal	2	2		
Generalized				
Occipital	1		1	
Severity				
Mild	2	2	1	
Moderate	1			
Intense				
Duration				
< 24 hrs	2	2	1	
24 – 48 hrs				
> 48 hrs	1			

Post dural puncture headache was statistically compared between group I and group II, group II and group III, group III and group IV and the group I and group IV using Chi-square test. The values were 0.632, 0.552, 0.312 and 0.074 respectively. The values in the study were statistically not significant but clinically relevant.

Table 5 Number of Attempts

PDPH	GROUP I	GROUP II	GROUP III	GROUP IV
No.of cases	N=25	N=25	N=25	N=25
P-value	Group I vs II Chi- square value = 0.222 P = 0.65 NS	Group II vs III Chi- square value = 0.354 P = 0.55 NS	Group III vs IV Chi- square value = 1.02 P = 0.312 NS	Group IV vs I Chi- square value = 3.19 P = 0.07 NS

The maximum number of attempts made was three in Whitacre group (Group IV) and there were failures in group II, III and group IV There were a several numbers of attempts with 25G Whitacre needles because of the very fine gauge of the needle. All patients in group IV had 22 G introducer in place before spinal anesthesia with 25G Whitacre needle. The success and failure rates with different needles were mentioned in Table 6.

Table 6 Failure Rate

	Group I	Group II	Group III	Group IV
SUCCESSFUL PUNCTURE RATE.	25 (100%)	24 (96%)	23(92%)	22(88%)
FAILURE RATE	0%	01(04%)	02(8%)	03(12%)
CHISQUARE SIGNIFICANCE	Group I vs II 0.312 NS	Group II vs III 0.551 NS	Group III vs IV 0.637 NS	Group IV vs I 0.074 NS

IV. Discussion

Post dural puncture headache or spinal headache is described as dull, no throbbing pain usually fronto-occipital which is aggravated in the upright position and diminished in the supine position.

There is considerable evidence that the post-dural puncture headache is due to low CSF which in turn leads to intracranial venous dilatation resulting in an increase in brain volume in the upright position. Venous dilation and a compensatory increase in brain volume will result in brain sag which in turn will exert traction and stimulate pain-sensitive anchoring structures like dural vessels, basal dura and tentorium cerebelli causing a post-spinal headache.

Larger the hole in dura mater more will be the leakage of CSF and the number of holes in the dura also makes a difference in the loss of CSF. It takes about two weeks or more for the holes to seal.

Age of the patient did not play any significant role in our study since all the patients in varying groups were of age groups. In a study by Rasmussen, the incidence of post-dural puncture headache in the young patients was 27.6 % with 20G and 12.6% with 25G⁴ and parturients are more prone because of the reduction of both the intraabdominal and epidural pressure after delivery, thereby promoting extra leakage of CSF than usual^{5,6}.

The overall incidence of post-dural puncture headache has varied from 0% to 37.2%, as reported by various authors^{7,8}. The most important factor contributing to the higher incidence of post-dural puncture headache was the gauge and type of needle, more the gauge the incidence of post-dural puncture headache^{9,10}. The observed incidence of post-dural puncture headache in the present study was by following the above finding. The incidence of post-dural puncture headache was 12% in group I (23G quincke), 8% in group II (25G Quincke), 4% in group III (23G Whitacre) and 0% in group IV. The difference is statistically insignificant. The results were similar to the study by Hwang et al¹⁰

In five out of six patients who had post-dural puncture headache in the present study, the duration of headache lasted less than 24 hours. In only one patient, the duration of the headache was up to 48 hours similar to Lynch et al¹¹. In four out of six patients who had post-dural puncture headache, the location of headache was frontal region and two patients had a generalized headache which is similar to study by Jones et al¹². The headache was mild in two patients and moderate in one patient in group I, mild in group II and moderate in group III but none of them had any serious neurological sequelae because of the use of finer gauge needles, and immediate treatment with bed rest, hydration and analgesics.

Almost all the recent studies have expressed the opinion that early ambulation does not enhance the incidence of post-dural puncture headache nor does it increase the severity of the symptoms.^{12,13}. However, in the present study, all the patients were instructed to remain in a supine position for 24 hours in the post-operative period.

Once the patient had a headache, she was instructed to take complete bed rest. All the patients received Injection diclofenac sodium, intramuscular (75 mg) 8 hourly and hydration therapy with 5% dextrose 500 cc as an additional fluid within one hour. All the patients responded with this treatment and did not complain of headache after 24 hours, except one, who required a similar pattern of treatment for another 24 hours. None of the patients required epidural blood patch.

Cappe suggested the use of a pencil point lumbar puncture needle and the tip of the pencil point separates the longitudinal dural fibers without producing serious injury¹⁴. When the needle is withdrawn the fibres return to a state of close approximation.

In the present study, 23G Quincke needle was associated with the greatest incidence of successful dural puncture following a single needle insertion (100%). The 25G Whitacre needle was associated with the greatest failure rate (12%) and multiple attempts of less than three were made. The senior consultant anaesthesiologist with enough experience was able to conduct spinal anesthesia when resident failed with 25G Whitacre needles.

The present study clearly showed the advantages of using Whitacre needle associated with a low incidence of post-dural puncture headache. The designing of atraumatic needle tip spinal needles and their association with a low incidence of post-dural puncture headache demonstrates that more and more patients accept regional anesthesia and relieves anesthesiologists from third most common litigation in anesthesia practice.

V. Conclusions

- 1) Whitacre needles are associated with reduced incidence of post-dural puncture headache in our study. It is technically difficult to introduce 25G Whitacre needle.
- 2) There is a high degree of acceptance on part of the patient with the use of Whitacre needles
- 3) 23G and 25G Whitacre needle are associated with a low incidence of post-dural puncture headache
- 4) Patients with headache were treated conservatively.
- 5) Post dural puncture headache causes morbidity. Efforts and techniques to minimize its incidence should be adopted.

References

- [1]. Krueger, J.E., Stoelting, V.K. and Graf, J.P.; "Etiology and treatment of postspinal headaches". *Anesthesiology* 1951; 12: 477-85.
- [2]. Vandam, L.D. and Dripps, R.D.; "Long term follow-up of patients who received 10,098 spinal anesthetics. Syndrome of decreased intracranial pressure (headache and ocular and auditory difficulties)". *Journal of the American Medical Association* 1956; 161: 586-91.
- [3]. Post dural puncture headache(PDPH) and associated factors after spinal anesthesia among patient in the University of Gondar Referral and Teaching Hospital, Gondar, North West Ethiopia. Kassa AA, Beyen TK, Denu ZA(2015).*J Anesth clin Res* 6:536. Doi:10.4172/2155-6148. 1000536.
- [4]. Rasmussen, B.S., Blom, L., Hansen, P. and Mikkelsen; "Post spinal headache in young and elderly patients. Two randomized double-blind studies that compare 20 and 25 gauge needles". *Anaesthesia*, 44: 571, 1989.
- [5]. Krueger, J.E., Stoelting, V.K. and Graf, J.P.; "Etiology and treatment of post-spinal headaches". *Anesthesiology* 1951; 12:477-85.
- [6]. Vandam, L.D. and Dripps, R.D.; "Long term follow-up of patients who received 10,098 spinal anesthetics. Syndrome of decreased intracranial pressure (headache and ocular and auditory difficulties)". *Journal of the American Medical Association* 1956; 161: 586-91.
- [7]. Shutt, L.E., Valentine, S.J., Wee, M.Y.K., Page, R.J., Prosser, A. and Thomas, T.A.; "Spinal anaesthesia for Caesarean section – Comparison of 22 gauge and 25 gauge Whitacre needle with 26 gauge Quincke needles". *Br. J. Anaesth* 69: 589, 1992.
- [8]. Flatten, H. And Reader,J.; "Spinal anaesthesia for outpatient surgery". *Anaesthesia*, 40: 1108, 1985.
- [9]. Kaukinen, S., Kaukinen, L., Kannisto, K. and Kataja, M.; "The prevention of headache following spinal anaesthesia". *Ann Chir Gynaecol* 191; 70: 107-11
- [10]. Hwang, J.J., Ho, S.T., Wang, J.J. and Lier, H.S. et al; "PDPH in Caesarean section. Comparison of 25 gauge Whitacre with 25 and 26 G Quincke needle". *Acta. Anaesthesiol. Sin.* 35(1): 33-37, 1997.
- [11]. Lynch, J., Krings-Earnst, I., Strick, K., Topalidis, K., Schaaf, H. and Fieblg, M.; "Use of a 25 gauge Whitacre needle to reduce the incidence of post dural puncture headache". *Br.J. Anaesth.* 67:690, 1991.
- [12]. Jones, R, "The role of recumbency in the prevention and treatment of post-spinal headache". *Anesthesia and analgesia*, 53: 788, 1974.
- [13]. Hafer, J., Rupp, D., Woller, UCK M., Engel, J. and Hemplemenn G; "The effect of needle type and immobilization on post-spinal headache". *Anesthetist*, 46(10): 860, 1997.
- [14]. Cappe B.E. and Park, N.M.; "Prevention of post-spinal headache with a 22 gauge pencil-point needle and adequate hydration". *Anesthesia and analgesia Current researches*, 39: 463-65, 1960.