The Rate of Post-Spinal Puncture Headache in Patients Undergoing Spinal Anesthesia According to the Size of Spinal Needle (G22 versus G24): Case Reference Study

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Abstract

Background: A number of disadvantages have been described in associations with spinal anesthesia such as short duration of pain relief, increased incidence of hypotension and post-spinal puncture headache (PSPH). Post-spinal puncture headache symptom has been explained by intracranial hypotension (low CSF pressure) because of CSF leak at site of puncture, causing traction on pain sensitive structures.

Aim of the study: The present study was aiming at comparing the incidence rate of PSPH in relation to the gauge of used spinal needle.

Patients and Method: The current observational case reference study was carried out at Al-Diwaniyah Teaching Hospital in Al-Diwaniyah Province, Iraq. The beginning of the study is dated back to the 3rd of April 2018 and the study continued till September the 15th 2019. It included 60 patients undergoing spinal anesthesia for various surgical operations. In 30 patients a spinal needle of 22 gauge was used whereas in the second group (n = 30), a spinal needle of gauge 24 was used. All patients were instructed to be nil by mouth overnight.

Results: The Rate of post-spinal puncture headache (PSPH) show significant variation according to needle caliber size. Patients who experienced headache in the first group (gauge 22) were more frequent that those in group 2 (gauge 24), 22 (73.3 %) versus 8 (26.7 %) and the difference was highly significant ($P < 0.001$). In addition, severe headache was only seen in group 1 (gauge 22).

Conclusion: The incidence and severity of post-spinal puncture headache (PSPH) is significantly related to spinal needle caliber size so that narrower needles are associated with less frequent and milder form of headache in comparison with wider bore needles.

Key words: *post-spinal puncture headache, spinal anesthesia, size of spinal needle*

Introduction

Of the well-known types of regional anesthesia, spinal anesthesia involves the introduction of local anesthetic agents, opiods or other agents into the subarachnoid space. Actually it is one common form of neuraxial block [3,13] . Indeed, the inception of spinal anesthesia can be dated back to 1885 when James Leonard Corning (made a description of accidental form of the procedure; however, the first planned procedure was pioneered by August Bier in 1898 [12,16]. August Bier reported the "post spinal puncture headache (PSPH)" in addition to other complications such as vomiting, leg pain and backache and proposed that headache is due to loss of cerebrospinal fluid [13,16]. A number of advantages have been described in association with spinal anesthesia such as negligible failure rate, the onset of anesthesia is very rapid, satisfactory pain relief because of dense neuronal block and avoidance of patient morbidity following major surgical operations [3,4,6] ; however, consensus about these advantages is lacking [13]. Actually, this type of anesthesia is preferred for cesarean section operation

because of rapid onset of action [8]. The conclusions of some meta-analyses and randomized controlled clinical trials provided some controversy about the outcome and advantages of spinal anesthesia [3,18].

A number of disadvantages have been described in associations with spinal anesthesia such as short duration of pain relief, increased incidence of hypotension and post-spinal puncture headache (PSPH) [5,20,22]. Post-spinal puncture headache symptom has been explained by intracranial hypotension (low CSF pressure) because of CSF leak at site of puncture, causing traction on pain sensitive structures [5,22]. Several terms have been used to describe such headache including post lumbar puncture headache, post-spinal headache, lumbar puncture headache post-dural puncture headache (PDPH) and spinal headache [13].

The present study was aiming at comparing the incidence rate of PSPH in relation to the gauge of used spinal needle.

Patients and Method

The current observational case reference study was carried out at Al-Diwaniyah Teaching Hospital in Al-Diwaniyah Province, Iraq. The beginning of the study is dated back to the 3rd of April 2018 and the study continued till September the 15th 2019. It included 60 patients undergoing spinal anesthesia for various surgical operations. In 30 patients a spinal needle of 22 gauge was used whereas in the second group (n = 30), a spinal needle of gauge 24 was used. All patients were instructed to be nil by mouth overnight.

They were given the following premedications: ranitidine 50 mg and metoclopramide 10 mg. An intravenous line was established using the antecubital vein by an 18 gauge cannula on arrival to operative room. Monitering included: pulse oximeter, blood pressure, pulse rate and ECG. An intravenous fluid in the form of ringer lactate was given in a dose of 10mg/kg for 10 minutes before starting subarachnoid block. A midline approach was used with the patient in sitting position at L3-L4 or L4-L5 level with a Quincke spinal needle (22G or 24G). Keeping the needle bevel parallel to dural fiber was assured. Injection of heavy bupivacaine 9-12.5 mg (1.8-2.5ml) was performed once clear CSF fluid was obtained.

The approval of this study was made by the institutional ethical approval committee and a verbal consent was made by every participant. Variables included in the current study were gender, age, type of operation and the development of post-operative headache. The obtained data were transformed into an SPSS (IBM, Chicago, USA, version 23) spread sheet for purpose of statistical description and analysis. Chi-square test was used to study association between categorical variables whereas, independent samples t-test was used to study mean difference of quantitative variables between the two study groups. The level of significance was set at $P \leq 0.05$.

Results

The present study included 60 patients undergoing spinal anesthesia for various types of operations who were randomly allocated into two groups according to spinal need caliber size (gauge 22 versus gauge 24). The age range and mean age in addition to frequency distribution of patients according to gender are shown in table 1. There was no significant difference in mean age and frequency distribution according to gender between both study groups ($P > 0.05$), table 1. Table 2 shows the frequency distribution of patients according to type of surgical operation.

The Rate of post-spinal puncture headache (PSPH) is shown in table 3. Patients who experienced headache in the first group (gauge 22) were more frequent that those in group 2 (gauge 24), 22 (73.3 %) versus 8 (26.7 %) and the difference was highly significant ($P < 0.001$). In addition, severe headache was only seen in group 1 (gauge 22), table 3.

Table 1: General characteristics of patients enrolled in the current study

Characteristic	**Group 1 (Gauge 22) n = 30**	**Group 2 (Gauge 24) n = 30**	**P**
Age (years)			
Range	30 - 80	38 - 75	0.119 † NS
Mean ±SD	51.60 ±14.02	56.87 ±11.63	
Gender			
Male, n (%)	22 (73.3 %)	24 (80.0 %)	0.542 ¥ NS
Female, n (%)	8 (26.7 %)	6 (20.0 %)	

n: number of cases; SD: standard deviation; †: independent samples t-test; ¥: Chi-square test; NS: not significant at $P > 0.05$

Table 2: Types of operations according to group

Operation type	**Group 1 (Gauge 22) n = 30**	**Group 2 (Gauge 24) n = 30**
Anal fissure	0 (0.0 %)	2 (6.7 %)
Bilateral inguinal hernia	0 (0.0 %)	2 (6.7 %)
Cesarean section	4 (13.3 %)	2 (6.7 %)
Fistula in ano	0 (0.0 %)	4 (13.3 %)
Gluteal mass	2 (6.7 %)	0 (0.0 %)
Hemorrhoidectomy	4 (13.3 %)	2 (6.7 %)
Hydrocelectomy	4 (13.3 %)	0 (0.0 %)
Percutaneous nephrolithotomy	4 (13.3 %)	2 (6.7 %)
Pilonidal sinus	2 (6.7 %)	0 (0.0 %)
Prostatectomy	2 (6.7 %)	0 (0.0 %)
Right inguinal hernia	2 (6.7 %)	6 (20.0 %)
Total abdominal hysterectomy	0 (0.0 %)	2 (6.7 %)
Transurethral resection of the prostate (TURP)	2 (6.7 %)	0 (0.0 %)
Ureteroscopy	4 (13.3 %)	4 (13.3 %)
Vesical stone	0 (0.0 %)	4 (13.3 %)

Table 3: Rate of post-spinal puncture headache (PSPH) according to group

Headache	**Group 1 (Gauge 22) n = 30**	**Group 2 (Gauge 24) n = 30**	**P**
No	8 (26.7 %)	22 (73.3 %)	< 0.001 ¥ HS
Mild	10 (33.3 %)	6 (20.0 %)	
Moderate	6 (20.0 %)	2 (6.7 %)	
Severe	6 (20.0 %)	0 (0.0 %)	

n: number of cases; ¥: Chi-square test "presence versus absence of headache"; HS: highly significant at $P \leq 0.01$

Discussion

In the current study were able to show that post spinal puncture headache is a relatively common complication in association with spinal anesthesia; however, it was obvious that the rate of this complication and it severity is related to the caliber size of the spinal needle in such a way that smaller needle (24G) was associated with less frequent and less severe headache than large bore needle (22G). Therefore we can suppose that narrow needle is associated with minimum CSF loss and therefore little if any dural traction due to reduce subarachnoid pressure.

The use of a large bore spinal needle has been stated to be a risk factor for development of post-spinal puncture headache (PSPH) in addition to a list of other risk factors (Nath et al., 2018; Veličković et al., 2017). The use of a cutting needle, particularly if rotated or inserted perpendicular to the long axis of the fibers of the dura, while, the use of a narrow caliber pencil-tipped spinal needle reduces the risk. The incidence rate has been estimated to be highly variable in available published medical literature; however, it may be as low as 10% to as high as 40%, but the incidence can be very low when using small size spinal needle (less than or equal to 24 gauge) (Akdemir et al., 2017).

The kind and the width of needle are important factors in PSPH, taking into consideration that research clearly highlights that greater dural damage leads to a higher rate of this complication. Quincke cutting needles are often accompanied by a higher rate of PSPH in comparison with pencil-point or blunt needles. Gisore et al. (2010) and Schmittner et al. (2010) concluded a significantly lower rate of PSPH with pencil-point needles in comparison with Quincke cutting needles (4.5% vs. 24.2%, P = 0.042 and 1.7% vs. 6.6%, P = 0.02), in clear support to our current findings. A modification to the Quincke needle has been introduced, with a cutting point and a double bevel to make a small dural hole followed by hole dilation. A number of previous reports have shown that the wider the needle, the more the incidence of PSPH. In addition it has been shown that the severity of headache is also related to the size of spinal needle. This is also in accordance with our findings.

Based on current study findings and some previous reports, the incidence and severity of post-spinal puncture headache (PSPH) is significantly related to spinal needle caliber size so that narrower needles are associated with less frequent and milder form of headache in comparison with wider bore needles.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Al-Diwaniyah Teaching Hospital and all experiments were carried out in accordance with

approved guidelines.

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