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IMPACT OF BODY MASS INDEX ON THE POST DURAL PUNCTURE HEADACHE IN PREGNANT WOMEN FOLLOWING CAESARIAN DELIVERY

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ABSTRACT

Background: Post dural puncture headache (PDPH) can be developed after either spinal or epidural anesthesia during cesarean delivery with incidence of 1%. Several reports mentioned the correlation between maternal obesity and the occurrence of this morbidity with conflicting results.

Objective: is to outline the impact of the maternal body mass index (BMI) on the development of PDPH in pregnant ladies following cesarean delivery.

Methods: A prospective comparative study included 80 pregnant ladies underwent spinal anesthesia for cesarean section. Patients were allocated into two equal groups according to their BMI with cutoff value 30 kg/m². 40 Women with BMI <30 in group I, while 40 women with BMI >30 in group II. Both groups were compared regarding the incidence of PDPH in addition to the descriptive characters of the headache including intensity, onset time and duration.

Results: Both groups were matching in their age, gravidity and parity. Increased body weight, height and sub-

sequent BMI was observed in the second group in comparison to the first group but without statistical significance. Comparison between the groups revealed significantly higher incidence (25%) of PDPH in the first group compared to (12.5%) in the second one. Severity of the headache was comparable between both groups. Onset and duration of the headache didn't show statistical difference between the studied groups.

Conclusion: Incidence of PDPH may be increased in pregnant women undergoing CS in relation to lower body mass index.

INTRODUCTION

Postdural puncture headache (PDPH) is a reported iatrogenic complication in modern neuraxial anesthetic procedures, following either spinal anesthesia or with inadvertent dural puncture during epidural anesthesia (Choi et al., 2003; Webb et al., 2012). Its incidence ranges from 0.16% - 1.3% which may show some variations according to the expert hands (Faure et al., 1994; Hessen et al., 2012). Several reported predisposing factors including female gender, young age, pregnancy, low body mass index (BMI) and multiple dural punc-

tures during the procedure may be associated with increased risk of PDPH (Ayad et al., 2003; Verstraete et al., 2014)

Pregnant women are considered at vulnerable risk for this condition because of their sex, young age, and the widespread use of neuraxial blocks (Peralta et al., 2015). Although PDPH usually regress spontaneously, it has the potential to cause significant morbidity in parturient. It can also interfere with the mother's self care or her baby care. Also it may extend the length of the hospital stay or progress into chronic headache (Angle et al., 2005; Apfel et al., 2010)

Body mass index (BMI) is used for evaluation of obesity and it is calculated by dividing body weight in kilograms by the square height in meters (WHO, 2000). Universally BMI is used to classify the extent of obesity and to adjust the recommended maternal weight gain during pregnancy (Siega-Riz et al., 2009). Maternal obesity is defined when BMI ≥ 30 kg/m², while maternal overweight is defined when BMI is between 25 and 29.9 kg/m² (Wojcicki, 2014). Maternal obesity is further stratified into three classes: class I (BMI 30–34.9), class II (BMI 35–39.9), and class III (BMI ≥ 40) (Forno et al., 2014). Obesity encountered numerous challenges to maternal health care providers, including increased incidence of obstetric complications either through the antenatal period or during labor. A previous work has reported that the incidence of accidental dural puncture is elevated to around 4% in parturients with morbid obesity that defined as body weight >300 lbs (Hood & Dewan, 1993).

Previous publications suggest that an inverse relationship between body

mass index (BMI) and postural puncture headache may exist (Hood & Dewan 1993; Faure et al., 1994; Miu et al., 2014; Peralta et al., 2015).

Increased epidural pressure that usually reported in patients who are overweight compared to thin patients may lead to a declined pressure gradient between the intrathecal and the epidural spaces, with resulting diminished loss of the CSF (Perlow & Morgan 1994; Hirabayashi et al., 1996). However, again, retrospective studies have revealed conflicting results regarding this correlation (Hartopp et al., 2010; Miu et al., 2014; Peralta et al., 2015). Our study target is to figure out the incidence of PDPH in pregnant ladies undergoing CS with low and high BMI and correlate to the hypothesis that greater BMI women would have a less PDPH prevalence than those with lower BMI and subsequently perform proper preventive measures to reduce its related morbidity.

PATIENTS & METHODS

This prospective observational study was performed in the Obstetrics and Gynecology department, Benha University hospital. Eighty female patients scheduled for elective lower segment caesarean section according to American Society of Anesthesiologists (ASA) grade I and grade II with various obstetric indications and willing for spinal anesthesia have been enrolled in the study. The study protocol was approved by the local ethical committee with written informed valid consent was signed by all the patients. The patients were carefully evaluated preoperatively and thoroughly explained about the procedure of spinal anesthesia. Patients Body Mass Index was calculated preoperatively by dividing

body weight in kilograms by the square height in meters. Patients with co morbid medical condition or patients who had contraindications to spinal anesthesia or refused the regional anesthesia have been excluded from the study population.

Enrolled women were allocated into two groups each includes 40 patients; patients with BMI <30 as group I while those with BMI >30 as group II. Baseline pulse, BP, SpO₂ and were recorded. Intravenous line with 20 G cannula was secured. Preloading with 500 ml of Ringers Lactate was performed. Under all aseptic precautions patient underwent standard spinal anesthesia where subarachnoid block is carried out using 25 G Quincke spinal needle at the level of L3 – L4 interspace with the bevel of the needle oriented parallel to the longitudinal fibers of the Dura mater. Injection of 2 – 2.2 ml of 0.5% of hyperbaric bupivacaine was used in all patients. All block procedures were completed by the senior anesthesiologist and group of anesthesia residents working under his supervision. Maximum 3 attempts for dural puncture were made and those patients requiring more than 3 attempts were excluded from the study to avoid bias in results due to multiple attempts. The surgical procedure for all patients was completed uneventfully as traditional Caesarian section within a reasonable time. Postoperatively the patients were observed during their hospital stay and advised to inform the medical staff once they feel any attack of headache. PDPH is characterized by being occupied in either the frontal and or the occipital area, worsened when the patient stay in the upright position and can be relieved by lying down. Patients were carefully instructed to inform if experiencing any headache

and subsequent evaluation by the anesthesia team was immediately performed. PDPH was evaluated using the visual analogue scale (VAS) from 0 to 10. Patients were classified into those who had no PDPH (zero scale) and others who had PDPH symptoms (VAS scores 1-10). Severity of PDPH was also determined using the (VAS 1-10); 0= no headache, 1-3 = mild headache, 4-7=moderate headache, > 7= severe headache.

Abstracted data included age, gravidity, parity, height, weight and BMI. In addition development of PDPH, day of onset and duration of PDPH, pain headache score (0–10), conservative treatment of PDPH and epidural blood patch if needed were also recorded. Unintentional dural puncture was managed at the discretion of the attending anesthesiologist. Women developed PDPH were treated using the standard departmental protocol. Conservative treatment was defined as partial rest, oral hydration, recommendations to increase oral caffeine intake, and use of oral analgesics as needed. Subject follow-up included daily visits for a minimum of 3 days. As no cases of severe PDPH, were reported among our patients, invasive measures as epidural blood patch was not required during the study.

Statistical Methods

Descriptive statistical analysis has been performed in the present study. Results of continuous measurement data are demonstrated as Mean+ SD while categorical data measurements are presented in number (%). Significance is estimated at 5% level of significance. Student t test (two tailed, independent) was used to explore the significance of study parameters on continuous scale

between the two groups. When P value < 0.05 it was considered as statistically significant.

RESULTS

In our study totally eighty women of ASA grade I and II underwent spinal anesthesia for elective lower segment caesarean section. Demographic data included age; gravidity and parity were compared between both groups. The mean age (\pm SD) in years was 30.49 ± 6.01 in group I compared to (29.13 ± 5.03) in group II with no detected significant difference. Comparison of gravidity and parity showed no significant difference between the two groups as well. Body weight, height and subsequent body mass index were higher in the first group compared to the second one however this difference didn't reach statistical significance (Table 1).

Our data showed 10 out of 40 patients in group I developed PDPH with incidence of (25 %) while only 5 out of 40 in group II were reported to have PDPH with (12.5%) incidence (P value 0.0036). The difference between the two groups was statistically significant as described in (Table 2).

The severity of PDPH was assessed based on (VAS). Out of 10 patients in group I 7 patients developed mild PDPH (VAS 1- 3) and 3 patients complained of moderate PDPH (VAS 4- 7) while none of the patients was reported to have severe PDPH (Table 3). In group II out of the 5 patients developed PDPH, 3 patients suffered from mild PDPH (VAS1- 3) and 2 patients encountered moderate PDPH (VAS 4-7) and no women experienced severe form of the headache (Table 3). The onset time of the headache in days \pm SD was (2.5 ± 1.2) in group I compared to (2.1 ± 0.80) in group II. In addition the duration of the headache in days \pm SD was calculated as (4.1 ± 20) versus (4.5 ± 1.8) in the first and second group respectively. No statistical significant difference was reported between the two groups regarding the headache time onset or duration (Table 3). The headache was cured spontaneously or with simple conservative management. None of our patients encountered severe form of PDPH and no patient required more invasive interventional treatment such as epidural blood patch.

Table (1): Demographic characteristics of the Study Groups

Descriptive data	Group I (n= 40)	Group II (n= 40)
Age	30.49 ± 6.01	29.13 ± 5.03
Gravidity	4.26 ± 2.58	3.71 ± 2.72
Parity	2.67 ± 1.43	2.43 ± 1.50
Weight in Kg (Mean \pm SD)	60.46 ± 5.25	78.8 ± 5.16
Height in Cm (Mean \pm SD)	156.4 ± 6.68	154.8 ± 4.55
BMI in kg/m^2	24.716 ± 4.02	35.175 ± 2.25

Table (2): Comparison of Incidence of PDPH in the two groups

Number and percentage of patients experiencing PDPH			
Group I n(40)	10	25%	P Value: 0.0036
Group II n(40)	5	12.5%	

Table (3): comparison in regards to Criteria of the headache (severity, onset and duration)

Description of the PDPH headache in the 2 groups			
Groups	Group I n(40)	Group II n(40)	P value
VAS 1-3 (Mild)	7	3	-
VAS 4-7 (Moderate)	3	2	-
VAS 7-12 (Severe)	0	0	-
Onset time(days)	2.5±1.2	2.1±0.90	0.261
Duration (days)	4.1±2.0	4.5±1.80	0.615

DISCUSSION

Accidental dural puncture is a recognized hazard of neuraxial anesthetic procedures, reported in approximately 1% of spinal, epidural or combined spinal-epidural procedures placed in patients with normal body build (Choi et al., 2003). Obesity constitutes one of the most serious health challenges of the 21st century. The current study comprised of eighty pregnant women of ASA class I or II undergoing elective lower segment caesarean section. Patients with BMI < 30 were included in group I and those with BMI > 30 were allocated in group II. In our data the incidence of PDPH was 25 % in group I compared to 12.5 % in group II. This difference in our analysis was statistically significant. (P value = 0.0036 i.e. $p < 0.05$). The finding of this study reported a significant inverse association in the

magnitude of reporting PDPH with lower BMI after unintentional puncture of the Dura mater during spinal anesthesia. In our sample, we found an optimal cut-off value of 30 kg/m² for the classification of subjects according to the similar effect observed using a WHO-recommended cutoff value of 30 kg/m² for definition of obesity. Our study data are in line with the work published by Peralta F et al, 2016. in which incidence of PDPH in parturients with BMI > 31.5 kg/m² (39%) was lower than in parturients with BMI < 31.5 kg/m² (56%). The difference in the incidence from our work may be reflected to the sample size of each study (Peralta et al., 2015). On contrast our data differ from the findings of Miu et al., (2014) who reported no difference in the incidence of PDPH after unintentional dural puncture using a cutoff BMI value of 30 kg/m². They reviewed data on 18315 patients under-

went epidural and combined spinal-epidural block for various obstetric indications. They identified 125 (0.7%) unintentional dural breaks or post-dural puncture headaches. Women were distributed into two groups: non-obese (BMI <30 kg/m²), and obese (BMI 30 kg/m²). Their results showed no evidence supported that greater BMI is associated with less prevalence of PDPH or that the nature of the headache and the use of epidural blood patch were different. Differences in the study by Miu et al., (2014) and the current study may explain the differences in findings. In 125 parturients, Miu et al., (2014) showed an incidence of PDPH after unintentional dural puncture of 82%, much greater than the incidence reported in the current work.

Correlation between high BMI and reduced incidence of PDPH observed in our work can be explained by the previous published evidence that reported possible alterations in the epidural/intrathecal spaces in an obese parturient that may demonstrate the lower incidence of PDPH in these patients. Evidence suggested that greater epidural pressure noticed with obese individuals compared to lean ones may decrease the pressure gradient from the intrathecal to the epidural space, resulting in decreased leaking of the CSF leak through a dural rent with subsequent lower incidence of PDPH. Increased intra abdominal pressure may reduce non-CSF volume in the epidural space. Parturients with BMI ≥ 30 kg/m² have been found to require less epidural infusate to provide equipotent analgesia compared with parturients <30 kg/m². Hogan et al., (1996) found that magnetic resonance imaging evaluation of CSF/nerve root volume in healthy

volunteers demonstrated an inverse relationship between CSF volume/nerve root volume and body weight. The volume from T11–T12 to the sacral area in obese study candidates showed significant reduction than in observed non obese volunteers (Choi et al. 2003; Panni & Columb 2006). Hogan et al., (1996) also reported that intra abdominal pressure is linearly increased in proportion to higher body weight. The same researchers reported a decline in CSF volume with external abdominal compression that may provoke a static increase in abdominal pressure similar to that found normally in pregnancy. They suggested that the mechanism involves inward movement of soft tissue in the intervertebral foramen. Increased abdominal pressure in the obese pregnant women may also augment the pregnancy-induced epidural venous engorgement, with resultant decrease in the volume of CSF in the lumbar neuraxial canal (Hogan et al., 1996).

The limitations of our study are the small sample size and the single institutional work. Further studies with large number of patients, multicenter nature that may include more groups based on multiple BMI cutoff values identifying the risk of different degrees of the obesity and its impact on the incidence of PDPH may be recommended.

CONCLUSION

From our study we concluded that women with BMI greater than 30 kg/m² undergoing caesarean section under spinal anesthesia have a lower incidence of PDPH when compared to those with lower BMI below 30. However the PDPH incidence was less in women with high BMI, its severity and the required

treatment were not altered by the body weight.

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تأثير مؤشر كتلة الجسم في السيدات الحوامل على الصداع الناتج عن ثقب الأم

الجافية أثناء التخدير النصفى فى الولادة القيصرية

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المقدمة: يمكن ان يحدث الصداع الناتج عن ثقب الأم الجافية بعد التخدير النصفى اثناء الولادة القيصرية وتكون نسبة حدوثه حوالى ١٪ . وقد ذكرت عدة تقارير العلاقة بين السمنة فى الأمهات و امكانية حدوث هذا الصداع مع وجود نتائج مختلفة.

الهدف: هو تحديد مدى تأثير مؤشر كتلة الجسم للأم الحامل على امكانية حدوث الصداع الناتج عن ثقب الأم الجافية في هؤلاء السيدات بعد الولادة القيصرية

المرضى وطرق البحث: تم اجراء دراسة مقارنة اشتملت على عدد ثمانين سيدة من السيدات الحوامل واللاتى خضعن للتخدير النصفى اثناء اجراء عملية قيصرية للولادة. تم تقسيم المريضات إلى مجموعتين متساويتين وفقا لمؤشر كتلة الجسم لديهم مع قيمة ٣٠ كجم / م^٢ كحد فاصل لتقسيم المجموعتين. وضمت المجموعة الاولى ٤٠ امرأة كان قياس مؤشر كتلة الجسم بالنسبة لهن > ٣٠ ، في حين تم وضع ٤٠ امرأة اخرى مع مؤشر كتلة الجسم < ٣٠ في المجموعة الثانية. تمت المقارنة بين المجموعتين بخصوص نسبة حدوث الصداع الناتج عن ثقب الأم الجافية بالإضافة إلى الصفات الخاصة بالصداع بما في ذلك شدة حدوثه ووقت بدء الحدوث والمدة الزمنية لاستمراره.

الاستنتاج: يمكن ان ترتبط زيادة نسبة حدوث الصداع الناتج عن ثقب الأم الجافية في النساء الحوامل الخاضعات للتخدير النصفى اثناء الولادة القيصرية بانخفاض مؤشر كتلة الجسم.

١٠. المجلة المصرية للعلوم الطبية ٣٨ (١) يونيو ٢٠١٧ : ١٢٩-١٣٧.