COMPARE BETWEEN THE EFFECTS OF AMINOPHYLLINE AND PROPOFOL ON THE INCIDENCE AND SEVERITY OF POST-DURAL PUNCTURE HEADACHE IN ELECTIVE CESAREAN SECTION

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ABSTRACT

Background: The most common method of anesthesia for cesarean section is spinal anesthesia. Post-dural puncture headache (PDPH) remains a major complication of this procedure. Nowadays, PDPH is a major cause of morbidity in the parturients after spinal anesthesia. The aim of the present study was to compare between the effects of aminophylline and propofol on the incidence and severity of PDPH in parturients undergoing spinal anesthesia for elective cesarean section.

Patients and methods: This is a randomized controlled trial study was included 156 parturients planned for elective caesarean section under spinal anesthesia at Zagazig University Hospitals. Patients were divided equally into 3 groups (52 parturients each): Group C: Parturients received 50 cc normal saline (0.9%) infusion over 30 minutes after umbilical cord clamping. Group P: Parturients received propofol (30 μg/kg/min) diluted in 50 cc normal saline (0.9%) infusion for 30 minutes after umbilical cord clamping. Group A: Parturients received aminophylline (100 μg/kg/min) diluted in 50 cc normal saline (0.9%) infusion for 30 minutes after umbilical cord clamping.

Results: Propofol group had no cases of neck rigidity associated with PDPH compared to the control group and aminophylline groups. The incidence of intraoperative nausea and vomiting was significantly lower in the propofol group compared with the control and aminophylline groups. There was no significant difference between aminophylline and control groups.

Conclusions: We can conclude that propofol reduced the severity, the duration and the associated symptoms of post-dural puncture headache compared to aminophylline in parturients undergoing spinal anesthesia for elective cesarean section.

Keywords: PDPH, Propofol, Aminophylline, Cesarean section

I. INTRODUCTION:

The most common method of anesthesia for cesarean section is spinal anesthesia. Post-dural puncture headache (PDPH) remains a major complication of this procedure. Nowadays, PDPH is a major cause of morbidity in the parturients after spinal anesthesia. Moreover, this headache is the third most popular reason for claims against anesthesiologists in obstetrics. (Davoudi et al., 2016)

The exact etiology of PDPH is unknown, but many risk factors were associated with its occurrence, and many drugs have been utilized to decrease its incidence (Golfam et al., 2016).

The International Headache Society (IHS) defines PDPH as a postural headache that develops within 5 days after dural puncture and resolves spontaneously in one week and is associated with either neck stiffness, tinnitus, dizziness, photophobia, or nausea (IHS, 2018).
Despite resolving spontaneously, PDPH is a fearful unpleasant experience that restricts ambulation, prolongs hospital stay, and may interfere with the ability of the mother to take care of her baby. There were many studies on the prevention of PDPH as morphine injection into the epidural space and insertion of intrathecal catheter and so on (Nguyen and Walters, 2014).

Currently, the commonly used treatments for PDPH include rehydration, administration of acetaminophen, caffeine, aminophylline or sumatriptan and the application of an epidural blood patch (EBP) (Wu et al., 2016).

Propofol is an ultra-short-acting anesthetic that increases GABA mediated chloride flux which inhibits synaptic transmission, cerebral blood flow, cerebral metabolic rate, and central serotonergic neurons (Sahinovic et al., 2018). These effects may alter the physiological condition of migraine resulting in significant pain reduction. Cerebrovascular vasodilation is the major cause of migraine. (Mosier et al., 2013). Given the similar mechanism of migraine headache and PDPH, propofol was selected to be analyzed in the current study.

Methylxanthines, such as theophylline, have been shown to resolve the symptoms of PDPH. The exact mechanism of action of theophylline in PDPH is unknown (Sadeghi et al., 2012). The aim of the present study compare between the effects of aminophylline and propofol on the incidence and severity of PDPH in parturients undergoing spinal anesthesia for elective cesarean section.

II. PATIENTS AND METHODS:

The current randomized controlled trial was performed at the anesthetic section of Zagazig University hospitals. We enrolled 200 parturients [ASA physical status II] who were planned for elective caesarean section under spinal anesthesia ranging in age from 21-35 years between February to August 2020. This study was carried out in Zagazig University hospitals after approval of Institutional Review Board (IRB). Approval code was (#5638/8/10/2019) and informed written consent from the patients. None of the patients had history of history of migraine, chronic headache or previous PDPH, history of analgesic consumption, substance abuse, and smoking, chronic or gestational hypertension; preeclampsia and liver or kidney failure, hypersensitivity to one of the used drugs, cardiovascular diseases, respiratory system diseases and neurological and psychiatric disorders, more than one trial for administering spinal anesthesia or failure of spinal anesthesia, parturients who suffered from massive blood loss, parturients who suffered from IONV immediately after spinal anesthesia or before delivery of the baby.

200 parturients scheduled for elective cesarean section under spinal anesthesia. Only 156 of them fulfilled the study criteria. Forty four were excluded from the study because of, not meeting the inclusion criteria (n=32), refusing to participate (n=9), and (3 cases were excluded for other reasons). Finally, 156 parturients who were randomly allocated by computer randomization table into three equal groups according to the study drugs used (52 parturients each) figure (1): Group C: Parturients received 50 cc normal saline (0.9%) infusion over 30 minutes after umbilical cord clamping. Group P: Parturients received propofol (30 μg/kg/min) diluted in 50 cc normal saline (0.9%) infusion for 30 minutes after umbilical cord clamping. Group A: Parturients received aminophylline (100 μg/kg/min) diluted in 50 cc normalsaline (0.9%) infusion for 30 minutes after umbilical cord clamping.
All cases were subjected to complete history taking, thorough physical examination, and routine laboratory investigations.

Before surgery, all parturients were kept nil orally (8 hrs for fatty meals, 6 hrs for light meals and 2 hrs for clear fluids), and Ranitidine 50 mg I.M was given to all parturients 90 minutes before the operation.

On arrival to the operating theatre, standard monitoring was applied, including pulse oximetry, electrocardiogram (ECG), non-invasive arterial blood pressure (NIBP) and baseline readings of mean arterial blood pressure (MAP), heart rate (HR) and oxygen saturation (SpO₂ %) were obtained.

The study drugs were prepared and diluted in 50cc normal saline (0.9 %) by a second anesthetist not involved in the investigations and data collection of the study. The infusion rate of the study drugs was controlled by a syringe pump, the exterior color of each syringe and the infusion lines were masked and made indistinguishable by using wrapping paper.

Spinal anesthesia was then performed by paramedian approach in the intervertebral space (L₃-L₄) using a 25 G Quincke spinal needle with the bevel directed laterally, and surgery was commenced when sensory block was confirmed at T4 and Bromage score was 3.

MAP, HR and SpO₂ % were monitored throughout the operation and in the post anesthesia care unit (PACU) and recorded at the following times; baseline, immediately after spinal anesthesia, immediately after delivery of the baby, then at 10 minutes, 20 minutes, 30 minutes and 40 minutes after infusion of the study drugs.
Intraoperative nausea and vomiting (IONV) were evaluated by a score ranging from 0 to 3 and was assigned to grade the severity of IONV: (Grade 0 = no nausea or vomiting), (Grade 1 = nausea alone), (Grade 2 = nausea and vomiting), and (Grade 3 = vomiting more than twice in 30 minutes).

After surgery, there was a 2-week follow-up period, during which a second anesthetist blinded to the study groups made visits to the parturients in the hospital on the first day and then followed them by phone calls every day till the 14th day after discharge from the hospital to evaluate the effects of the study drugs on the incidence, onset, duration, severity, and associated symptoms of PDPH.

The severity of the headache was assessed using visual analogue scale, which was explained to all parturients on the first day of the follow-up. If pain severity according to VAS, was ≥3 out of 10. The following measures were taken to treat pain: bed rest, drinking liquids more than the daily need, using caffeinated drinks, use of first-line analgesics including oral paracetamol 500mg every 8 hours and non-steroidal anti-inflammatory drugs. In case of no response to the above measures, oral theophylline 250 mg every 8 hours was recommended.

**Statistical analysis**

Statistical analysis was done using SPSS software version 27 (IBM, 2020). Data was presented in tables. Quantitative data was presented as mean, median, standard deviation and range. Qualitative data was presented as frequencies and proportions. P-value <0.05 was considered statistically significant (S), p-value <0.001 was considered highly statistically significant (HS), and p-value ≥ 0.05 was considered statistically non-significant (NS).

**III. RESULTS:**

Regarding the oxygen saturation (%) there was no statistically significant difference among the studied groups at different times (p-value >0.05) (Table 2).

**Table (2): Peripheral oxygen saturation (SpO2%) in the studied groups at different times:**

<table>
<thead>
<tr>
<th>Oxygen saturation (%)</th>
<th>Group C (n=52)</th>
<th>Group P (n=52)</th>
<th>Group A (n=52)</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: Mean ± SD</td>
<td>98.4 ± 1.1</td>
<td>98.4 ± 1.1</td>
<td>98.4 ± 1.1</td>
<td>0.03</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>After spinal anesthesia: Mean ± SD</td>
<td>98.3 ± 1.0</td>
<td>99.0 ± 1.0</td>
<td>97.7 ± 1.9</td>
<td>0.04</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>Immediately after delivery: Mean ± SD</td>
<td>98.4 ± 1.1</td>
<td>98.4 ± 1.1</td>
<td>98.4 ± 1.1</td>
<td>0.02</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>10 minutes after drug infusion: Mean ± SD</td>
<td>98.9 ± 1.0</td>
<td>98.9 ± 1.1</td>
<td>98.9 ± 1.1</td>
<td>0.03</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>20 minutes after drug infusion: Mean ± SD</td>
<td>98.6 ± 1.4</td>
<td>98.6 ± 1.4</td>
<td>99.0 ± 1.0</td>
<td>0.07</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>30 minutes after drug infusion: Mean ± SD</td>
<td>99.0 ± 1.0</td>
<td>99.0 ± 1.0</td>
<td>99.0 ± 1.0</td>
<td>0.001</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>40 minutes after drug infusion: Mean ± SD</td>
<td>98.3 ± 1.0</td>
<td>98.4 ± 1.1</td>
<td>97.7 ± 1.9</td>
<td>0.4</td>
<td>0.7 NS</td>
</tr>
<tr>
<td>*F</td>
<td>8.2</td>
<td>3.8</td>
<td>9.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>0.7 (NS)</td>
<td>0.8 (NS)</td>
<td>0.6 (NS)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: standard deviation. NS: non-significant. F: one-way ANOVA.
*F: Repeated measures ANOVA. n: number of parturients.
Regarding the heart rate, there was no statistically significant difference among the studied groups (p-value >0.05). While there was statistically significant increase immediately after spinal anesthesia within each group compared to the baseline. Then HR decreased again after delivery and during infusion of the study drugs compared to its value after spinal anesthesia (p-value < 0.005) (Table 5 & Figure 19).

![Figure (18): Changes in heart rate in the studied groups at different times.](image)

Regarding the mean arterial blood pressure (MAP), there was no statistically significant difference among the studied groups (p-value >0.05). While there was statistically significant decrease immediately after spinal anesthesia within each group compared to the baseline. Then MAP increased again after delivery and during infusion of the study drugs compared to its value after spinal anesthesia (p-value < 0.005). (Table 6 & Figure 19).

![Figure (19): Changes in MAP in the studied groups at different times.](image)
Regarding intraoperative nausea and vomiting (IONV) there was a highly statistically significant difference among the studied groups in the occurrence of IONV, as group P had the least proportions of IONV compared to the other groups (p-value <0.005). Meanwhile, there was no statistically significant difference between group C and group A (p-value >0.05). The proportion of no nausea or vomiting (Grade 0) was highest in group P (80.8%) as compared to group C (26.9 %) or group A (30.8 %)(Table 7).

Table (7): The incidence of intraoperative nausea and vomiting (IONV) in the studied groups.

<table>
<thead>
<tr>
<th>Grades of IONV</th>
<th>Group C (n=52)</th>
<th>Group P (n=52)</th>
<th>Group A (n=52)</th>
<th>$\chi^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0: No nausea or vomiting (%)</td>
<td>14 (26.9%)</td>
<td>42 (80.8%)</td>
<td>16 (30.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 1: Nausea alone (%)</td>
<td>10 (19.2%)</td>
<td>6 (11.5%)</td>
<td>8 (15.4%)</td>
<td>41.5</td>
<td>&lt;0.001 (HS)</td>
</tr>
<tr>
<td>Grade 2: Nausea and vomiting (%)</td>
<td>20 (38.5%)</td>
<td>4 (7.7%)</td>
<td>22 (42.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 3: Vomiting more than twice in 30 min (%)</td>
<td>8 (15.4%)</td>
<td>0 (0.0%)</td>
<td>6 (11.5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS: non-significant. HS: highly significant. $\chi^2$: Pearson’s chi-squared.
1 Group C versus Group P. 2 Group C versus Group A. 3 Group P versus Group A.

Regarding the incidence of PDPH in the control group, the headache occurred in 12 cases (23.1% of all cases). The onset of headache was recorded in 6 cases (50.0% of them) on the 1st day, while it was recorded in 4 cases (33.3%) & in 2 cases (16.7%) on the 2nd & 3rd days respectively (Table 6). In the propofol group, PDPH developed in 6 cases (11.5% of all cases). The onset of headache was recorded in 4 cases (66.7% of them) on the 1st day & 2 cases (33.3%) on the 2nd day (Table 6). In the aminophylline group, 8 cases (15.4%) developed PDPH. The onset of headache was recorded in 4 cases (50%) of them on the 1st day & the other 4 cases (50%) on the 2nd day (Table 6). However, there was no statistically significant difference among the studied groups regarding the incidence and the onset of PDPH (p-value >0.05). Moreover, the incidence of PDPH on the 1st three days after spinal anesthesia in all groups didn’t show any significant difference (p-value >0.05) (Table 6). Regarding the severity of PDPH, group P recorded the least severity score (VAS= 3) compared to group C (VAS= 5.5) and group A (VAS= 4.5). This represented a statistically significant difference (p-value <0.05). On the other hand, there was no statistically significant difference between group C and group A (p-value >0.05) (Table 8& Figure 20).

Regarding the duration of PDPH, group P recorded the shortest duration (4 days) compared to group C (6.5 days) and group A (5.5 days) This represented a statistically significant difference (p-value <0.05). Meanwhile, there was no statistically significant difference between group C and group A (p-value >0.05) (Table 8& Figure 21).

Table (6): Post-dural puncture headache (PDPH) characteristics in the studied groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group C (n=52)</th>
<th>Group P (n=52)</th>
<th>Group A (n=52)</th>
<th>Test of sig.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence of headache: n (%)</td>
<td>12(23.1%)</td>
<td>6 (11.5%)</td>
<td>8 (15.4%)</td>
<td>$\chi^2$</td>
<td>2.6</td>
</tr>
<tr>
<td>Onset of headache: 1st day n (%)</td>
<td>(n=12)</td>
<td>(n=6)</td>
<td>(n=8)</td>
<td>$\chi^2$</td>
<td>3.0</td>
</tr>
<tr>
<td>2nd day n (%)</td>
<td>6 (50.0%)</td>
<td>4 (66.7%)</td>
<td>4 (50.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd day n (%)</td>
<td>4 (33.3%)</td>
<td>2 (33.3%)</td>
<td>4 (50.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sevety (VAS):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>KW</td>
</tr>
</tbody>
</table>
| Median (Range) | 5.5 (3–6) | 3 (2–4) | 4.5 (4–5) | 7.2 | 0.02 (S)$^1$
| | | | | | 0.09 (NS)$^2$
| | | | | | 0.04 (S)$^3$
| Duration (days): Median (Range) | 6.5 (5.0–7.0) | 4.0 (4.0–5.0) | 5.5 (5.0–6.0) | KW 9.8 | 0.005 (HS)$^1$
| | | | | | 0.07 (NS)$^2$
| | | | | | 0.03 (S)$^3$


$^1$ Group C versus Group P. $^2$ Group C versus Group A. $^3$ Group P versus Group A.

Figure (20): Severity of Post-dural puncture headache (PDPH) in the studied groups.

Figure (21): Duration of Post-dural puncture headache (PDPH) in the studied groups.
Regarding the associated symptoms of PDPH, there was a statistically significant difference among the studied groups in concern of neck rigidity. Whereas, group P didn’t record any case of neck rigidity, group C and A recorded (6) and (4) cases respectively (p-value <0.05). Meanwhile, there was no statistically significant difference between group A and group C (p-value >0.05). On the other hand, there was no statistically significant difference among the studied groups regarding tinnitus and dizziness as associated symptoms of PDPH (p-value >0.05) (Table 9).

Table (9): Incidence of PDPH associated symptoms in the studied groups:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group C (n=12)</th>
<th>Group P (n=6)</th>
<th>Group A (n=8)</th>
<th>χ²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck rigidity</td>
<td>6 (50.0%)</td>
<td>0 (0.0%)</td>
<td>4 (50.0%)</td>
<td>4.9</td>
<td><strong>1 0.02 (S)</strong></td>
</tr>
<tr>
<td>Tinnitus</td>
<td>2 (16.7%)</td>
<td>1(16.7%)</td>
<td>2 (25.0%)</td>
<td>0.2</td>
<td><strong>1 0.9 (NS)</strong></td>
</tr>
<tr>
<td>Dizziness</td>
<td>2 (16.7%)</td>
<td>1(16.7%)</td>
<td>1 (12.5%)</td>
<td>0.1</td>
<td><strong>1 0.9 (NS)</strong></td>
</tr>
</tbody>
</table>

S: significant  χ²: Pearson’s chi-squared  n: number of parturients.  
1 Group C versus Group P. 2 Group C versus Group A. 3 Group P versus Group A.

### IV. DISCUSSION:

The results of the current study revealed that values of SpO₂, HR and MAP didn’t differ between the three groups and all of these values were within the normal range. Moreover, MAP decreased after spinal anesthesia then increased immediately after delivery, and after drug infusion, while HR increased after spinal anesthesia then decreased immediately after delivery, and after drug infusion.

Hypotension is the most common complication after spinal anesthesia especially in parturients undergoing cesarean section. This could be attributed to the sympathetic block induced by spinal anesthesia resulting in a decrease in the systemic vascular resistance, venous return and eventually the maternal cardiac output. Additionally, the vasodilator effect of progesterone may play a role in this complication (Jeon et al., 2010), (Hwang et al., 2012).

The increased level of MAP immediately after delivery was attributed to the auto-transfusion of blood via the uterine contractions and the relief of aorto-caval compression, increasing the cardiac output by as much as 60–80% (Smith et al., 2008).

The changes in HR in the current study were similar to the results of the study carried out by Langesæter and Dyer, 2011 in which, the onset of spinal anesthesia was associated with a rapid and profound drop in systemic vascular resistance with a compensatory increase in HR with no significant changes in the stroke volume. A less frequent response to spinal anesthesia is bradycardia with hypotension. This effect is known as the supine hypotensive syndrome and is believed to result from vena-caval obstruction or vagal reflex bradycardia associated with an inadequately filled heart "Bezold–Jarisch reflex" (Kinsella and Lohmann, 1994).

Moreover, There were no significant effects of either propofol or aminophylline infusion on the maternal hemodynamics. These results agreed with the studies carried out by Golfam et al., 2016 which compared between the effects of propofol and placebo on the incidence and of PDPH in parturients undergoing spinal anesthesia for elective cesarean section, and Yang et al., 2019 which compared between the effects of aminophylline and placebo on the incidence of PDPH in parturients undergoing combined spinal - epidural anesthesia for elective cesarean section.

To the best of our knowledge, it is the first study to directly compare the effect of both propofol and aminophylline simultaneously regarding the incidence, onset, severity, duration and associated symptoms of PDPH in parturients undergoing elective cesarean section under spinal anesthesia.
In the current study, there was a two-week follow-up period of PDPH characteristics in the studied groups. However, in all the parturients who developed PDPH, the onset of headache was recorded only on the first three days after the dural puncture. This agreed with the international classification of headache disorders that stated that PDPH develops within five days after the dural puncture (IHS, 2018). Moreover, there were no significant effects of the study drugs on the onset of headache among the studied groups.

The incidence of PDPH after spinal anesthesia for cesarean section varies greatly between the studies, this is mainly due to the difference in the size of the spinal needles used. In the current study we used a 25 G Quincke spinal needle for spinal anesthesia. The reported incidence of PDPH in other studies using the same needle for cesarean section ranged from 23% to 30% (Pal et al., 2011), (Golfam et al., 2016) and (Sumaya et al., 2017), and this agreed with the results of the present study.

In the present study, the incidence of PDPH was highest in the control group compared to the other two groups. Yet, this difference was statistically non-significant. Additionally, the incidence of PDPH on the first, second and third days after spinal anesthesia in the three groups didn’t show any significant difference.

In accordance with the results of the current study, Zajac et al., 2012 showed that aminophylline 250mg once, when administered intravenously, was not effective in decreasing the incidence of PDPH in comparison to caffeine or magnesium sulphate premedication.

In their study, Sirit et al., 2015 compared the effect of aminophylline and placebo on the incidence of PDPH after spinal anesthesia for elective cesarean section. They showed that aminophylline administration didn’t reduce the incidence of headache compared to placebo. Moreover, another study compared between the effects of ondansetron and aminophylline on the incidence and severity of PDPH after spinal anesthesia for elective cesarean section, showed that aminophylline had no effect on reducing the incidence of PDPH (Dehghanpisheh et al., 2019).

On the contrary, in a study conducted by Sadeghi et al., 2012 a single dose of intravenous aminophylline 1 mg/kg significantly decreased the incidence of PDPH in the parturients undergoing elective cesarean section compared to control group. Our study was different because they used meperidine as an adjuvant to the local anesthetic lidocaine which could play a role in decreasing the incidence of PDPH, and the duration of the follow up period was only 48 hours in their study.

A recent study was carried out by Yang et al., 2019 on parturients undergoing cesarean section under combined spinal- epidural anesthesia. They recorded that the pre-administration of 250 mg aminophylline infusion after umbilical cord clamping significantly reduced the incidence of PDPH and it was not associated with any related side-effects. Indeed, these results were different from ours although they used the same size of the spinal needle (25G), but they didn’t specify the type of the spinal needle they used whether it was a cutting or a pencil-point needle.

Regarding the incidence of PDPH with propofol, to the best of our knowledge, the only study done on propofol was carried out by Golfamand her colleagues. They showed that the incidence of PDPH was lower in propofol group compared to placebo group in parturients undergoing spinal anesthesia for elective cesarean section. (Golfam et al., 2016). However, the current study showed that propofol decreased the incidence of PDPH compared to placebo, but this effect was statistically insignificant.

The current study showed that the severity of PDPH in the propofol group was lower compared to the other groups. This came in agreement with Golfam et al., 2016 who showed that the severity of headache was reduced significantly in propofol group 6 hours after surgery compared to control group.

Soleimanpour et al., 2012 studied the effectiveness of intravenous dexamethasone or propofol on pain relief in migraine headache. They concluded that propofol is safe and effective medication for the treatment of migraine in emergency departments. In a similar study carried out on patients with refractory migraine headache, propofol in sub-hypnotic dose was administered intravenously, headache was dramatically eliminated in all patients (Mosier et al., 2013).

The results of the current study revealed that aminophylline didn’t decrease the severity of PDPH compared to the control group. This agreed with Dehghanpisheh et al., 2019 who showed that aminophylline also didn’t reduce the
severity of headache when compared to ondansetron or placebo in parturients undergoing spinal anesthesia for cesarean section. Moreover, Sirit et al., 2015 showed that aminophylline didn’t show a significant effect on the severity of PDPH when compared with placebo. However, another study examined the effect of theophylline on PDPH treatment, revealed that headache was reduced more in 6 patients taking oral theophylline than in 5 patients receiving no theophylline from among 11 patients with PDPH (Mahoori et al., 2013).

Regarding the duration of PDPH, to the best of our knowledge, there were no available studies on the effect of aminophylline (when administered during spinal anesthesia) on the duration of PDPH. In the current study, propofol group recorded the shortest duration of headache compared to the control and aminophylline groups. This agreed with Golfam et al., 2016 who found out that propofol decreased the duration of PDPH.

As regards the associated symptoms of PDPH, the results of this study revealed that propofol group had no cases of neck rigidity compared to aminophylline and control groups. However, there was no statistically significant difference among the three groups regarding the tinnitus and dizziness associated with PDPH.

In the current study, the occurrence of intraoperative nausea and vomiting (IONV) was significantly decreased in the propofol group compared to the other groups. This was similar to a study carried out by Rasooli et al., 2014 who reported that propofol decreased the incidence of IONV compared to placebo without any complications in parturients undergoing spinal anesthesia for elective cesarean section. This may be attributed to the anti-emetic effect of propofol. This also agreed with the results of the study conducted by Niu et al., 2018, as they showed that the incidence of IONV was lower in the propofol group when compared to placebo in parturients undergoing spinal anesthesia for elective cesarean section.

No adverse reactions of aminophylline were recorded in the current study. Clinical pharmacological studies showed that the adverse reactions of aminophylline were mainly allergy, arrhythmia and convulsions. Some studies suggested that 250 mg of aminophylline can be effective in the treatment of PDPH without significant side-effects and it can be used in parturients without affecting lactation (Wu et al., 2018), (yang et al., 2019).

No adverse reactions of propofol were recorded in the current study. This agreed with Golfam et al., 2016 who used the same dose of propofol infusion in their study and didn't record any side effects on the parturients. Moreover, Mosier et al., 2013 showed that the sub-hypnotic dose of propofol used in the treatment of migraine wasn't associated with bradycardia, hypotension or apnea.

V. CONCLUSIONS:

We can conclude that propofol reduced the severity, the duration and the associated symptoms of post-dural puncture headache compared to aminophylline in parturients undergoing spinal anesthesia for elective cesarean section. Also, propofol decreased the incidence and severity of intraoperative nausea and vomiting (IONV) compared to aminophylline in parturients undergoing spinal anesthesia for elective cesarean section. Further studies are recommended to the total analgesic consumption needed to relieve PDPH in parturients after spinal anesthesia.

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