

# MJA

## Macedonian Journal of Anaesthesia

A Journal on Anaesthesiology, Resuscitation, Analgesia and Critical Care

**Number 6. May 2019**

Journal of the Macedonian Society of Anaesthesiologists  
and Macedonian Society of Critical Care Medicine

---

**Publisher:**

Department of Anaesthesia and Reanimation, Faculty of Medicine,  
"Ss. Cyril and Methodius" University, Skopje, Macedonia

# Apotel® 1000mg/6.7ml

## I.V. Paracetamol

### БЕЗБЕДНА АНЕЛГЕЗИЈА

менаџирање на болка кога сте загрижени за безбедноста



**I.V. paracetamol** за прв пат во Европа е применет во 2001 година, а денес поради неговата докажана безбедност и ефикасност е прв од избор **аналгетик и антипиретик**.

#### Предоперативна и Интраоперативна Аналгезија:

Предоперативна аналгезија е дефинирана како третман кој што започнува пред оперативниот зафат се со цел да се превенира воспоставувањето на централна сензибилизација на болка.

**i.v. paracetamol** е безбеден, добро толериран лек со докажана ефикасност како **предоперативна и интраоперативна аналгезија** за умерена до средна болка при оперативни зафати.

**Голем број на клинички студии** ја докажуваат ефикасноста на **i.v. paracetamol** како **предоперативна и интраоперативна аналгезија**.

#### КЛИНИЧКА СТУДИЈА:

Ефект од **предоперативен i.v. paracetamol** за постоперативни аналгетски потреби кај пациенти кои се подложни на оперативни зафати. A Sreenivasulu, R Prabhavathi, 2015

**Цел:** Да се утврди ефикасноста на **предоперативната употреба на 1000mg i.v. paracetamol** кај постоперативните болки и аналгетски потреби кај пациенти подложни на хируршки зафати.

**Метод:** 60 пациенти беа поделени во две рандомизирани групи од по 30 пациенти.

**На I. Група** им беше администрирано **ампула од 1000mg i.v. paracetamol разредена 0,9%NaCl** p-ор 30 минути пред индукција (**ГРУПА П**),

**На II. Група** им беше администрирано **i.v. 0,9% NaCl** p-ор **100мл** 30 минути пред индукција (**ГРУПА НС**)

Сите пациенти беа индуцирани со **i.v. thiopentone 5mg/kg**, **i.v. fentanyl 2µg/kg**, **i.v. vecuronium 0.1mg/kg**

Постоперативниот резултат на болка беше мерен со **Визуелна Аналогна Скала (ВАС)** од "0-10". Исто така беше забележувана и **постоперативната употреба на tramadol** како спасувачки аналгетик. Инциденцата на **постоперативно гадење и повраќање (ПОПП)** и други компликации исто така беа забележувани во пост оперативниот период.

**Резултатот** на постоперативната болка беше забележуван во интервали 15 мин, 30 мин, 1 час, 2 часа, и 6 часа.

**Заклучок:** Предоперативна администрација на **1000mg i.v. paracetamol** кај пациенти подложни на оперативен зафат обезбедува **статистички задоволителна аналгезија**, и ја **намалува постоперативната употреба на tramadol**. Оттука **1000mg i.v. paracetamol** може безбедно да се администрира како превенција при оперативни зафати.

#### Резултат:

**Табела 1:** Споредба на средниот резултат на болка (ВАС) помеѓу двете групи

Интервали	I Група П	II Група НС	P вредност
15 мин	2.06 ± 0.63	2.61 ± 0.56	0.0006
30 мин	2.35 ± 1.17	3.84 ± 1.55	0.0001
1 час	2.42 ± 1.12	2.87 ± 0.99	0.0989
2 часа	2.13 ± 1.06	2.52 ± 0.89	0.1219
6 часа	2 ± 0.52	2.52 ± 0.89	0.0549

**Табела 2:** Споредба за потребите од tramadol помеѓу двете групи

Интервали	I Група П	II Група НС	P вредност
До 1 час	4 (12.90%)	15 (50%)	0.0002
1-2 часа	3 (9.68%)	2 (6.45%)	0.64
2-6 часа	1 (3.23%)	3 (9.68%)	0.301
<b>Вкупно</b>	<b>8 (25.81%)</b>	<b>20 (64.52%)</b>	<b>0.002</b>

**Табела 3:** Споредба на ПОПП помеѓу двете групи

ПОПП	
I Група П	II Група НС
0	4

i.v. Paracetamol + јак опоид	<b>МНОГУ ЈАКА БОЛКА</b>
i.v. Paracetamol + слаб опоид	<b>ЈАКА БОЛКА</b>
i.v. Paracetamol + NSAID i.v. Paracetamol + rescue medicine	<b>УМЕРЕНА БОЛКА</b>
i.v. Paracetamol + rescue medicine	<b>СЛАБА БОЛКА</b>

**Мултимодално менаџирање на постоперативна болка**  
**I.V. Paracetamol** е атрактивна компонента за мултимодално менаџирање на болка.

- Синергистичко делување
- Зголемување на аналгетски ефект
- Значително намалување на болка
- Редукција на дозата на опоидни лекови за - 40% во првите 24 часа
- Намалување на несаканите ефекти поврзани со монотерапија на NSAID и опоидни лекови
- Ублажување на акутна и хронична болка

Увозник и дистрибутер:  
Марти Алко - Битола 047/203 615

## Macedonian Journal of Anaesthesia

A Journal on Anaesthesiology, Resuscitation, Analgesia and Critical Care

#### Editor-in-Chief

Mirjana Shosholcheva

#### Deputy Editors:

Andrijan Kartalov

Biljana Kuzmanovska

#### Associate Editor

Marija Jovanovski-Srceva

#### Editorial Board:

Marija Sholjakova (Macedonia)

Nikola Jankulovski (Macedonia)

Karin Khuenl-Brady (Austria)

Quirino Piacevoli (Italy)

Zorka Nikolova-Todorova (Macedonia)

Radmilo Jankovic (Serbia)

Olegs Sabelnikovs (Latvia)

Jannicke Mellin-Olsen (Norway)

Meral Kanbak (Turkey)

Nebojsa Ladjevich (Serbia)

Zoran Karadjov (Macedonia)

Hristo Bozov (Bulgaria)

Zuhal Aykaç (Turkey)

Katarina Sakic (Hrvatska)

Jasmina Jakupovich-Smajich (BIH)

Jasminka Nancheva (Macedonia)

Vojislava Neskovic (Serbia)

Daniela Miladinova (Macedonia)

Jordan Nojkov (Macedonia)

Paul Zilberman (Israel)

Antigona Hasani (Kosovo)

Biljana Shirgovska (Macedonia)

Atanas Sivevski (Macedonia)

Hülya Bilgin (Turkey)

#### Production Editor

Vanja Gievski

#### Publisher:

Department of Anaesthesia and Reanimation, Faculty of Medicine, "Ss. Cyril and Methodius"

University, Skopje, Macedonia

Proofreading Daniela Nacevska Stojcevska

Printed by ASKOLOR

## ARTERIAL BLOOD GAS ALTERATIONS IN RETROPERITONEAL AND TRANSPERITONEAL LAPAROSCOPY

Gavrilovska-Brzanov A<sup>1</sup>, Shosholcheva M<sup>2</sup>, Kuzmanovska B<sup>1</sup>, Kartalov A<sup>1</sup>, Mojsova – Mijovska M<sup>1</sup>, Jovanovski Srceva M<sup>1</sup>, Panovska Petrusheva A<sup>1</sup>, Kokareva A<sup>1</sup>, Stavridis S<sup>3</sup>, Gjorchevska E<sup>1</sup>, Brzanov N<sup>4</sup>

<sup>1</sup> University Clinic for Traumatology, Orthopedic Diseases, Anesthesiology, Reanimation and Intensive Care Medicine and Emergency department, Faculty of Medicine, University “Ss Cyril and Methodius”, Skopje, Republic of North Macedonia

<sup>2</sup> University Clinic for General Surgery “St. Naum Ohridski” Faculty of Medicine, University “Ss Cyril and Methodius”, Skopje, Republic of North Macedonia

<sup>3</sup> University Clinic for Urology, Faculty of Medicine, University “Ss Cyril and Methodius”, Skopje, Republic of North Macedonia

<sup>4</sup> University Clinic for Abdominal Surgery, Faculty of Medicine, University “Ss Cyril and Methodius”, Skopje, Republic of North Macedonia

### ABSTRACT

**Background:** Due to its numerous benefits laparoscopic surgery become very popular among physicians, hospitals and patients nowadays. In the urologic pathology laparoscopy can be performed with retroperitoneal or transperitoneal approach. Insufflation of CO<sub>2</sub> for achieving visibility in both of the approaches can be absorbed in the vessels and can lead to alterations in arterial blood gasses.

**Material and Method:** Study population was elective urologic patients scheduled for laparoscopic surgery. Investigated arterial blood gas variables were determined in three time points: T<sub>0</sub> before induction – basal, T<sub>1</sub> after one hour of CO<sub>2</sub> insufflation, and T<sub>2</sub> at the end of the surgery.

**Results:** Alterations in arterial blood gasses were seen in T<sub>1</sub> and T<sub>2</sub> for PaO<sub>2</sub> in retroperitoneal vs transperitoneal group 173.3 ± 19 vs 196.6 ± 29 (p < 0.003) and 95.5 ± 5.4 vs 101.1 ± 8.2 (p < 0.001). The PaCO<sub>2</sub> was also statistically significant in second observed time point T<sub>1</sub> in retroperitoneal vs transperitoneal group 45.9 ± 4.1 vs 38.2 ± 0.3 (p < 0.002).

**Conclusion:** The findings that we have presented can suggest that both approaches are safe although hypercarbia is observed in retroperitoneal group.

**Key Words:** arterial blood gasses, retroperitoneal laparoscopy, transperitoneal laparoscopy, urologic laparoscopy.

**Corresponding author:** Aleksandra Gavrilovska-Brzanov, University Clinic for Anesthesia, Reanimation and Intensive Care, Skopje, Republic of North Macedonia

### Introduction:

Due to its numerous benefits laparoscopic surgery became very popular, clinically applicable and universally accepted among physicians, patients and hospitals (1). The advantages over open surgery are: small incision, less postoperative pain, superior cosmetic results, brief recovery, fewer postoperative complications, decreased length of hospital stay and lower mortality (2). On the other side, laparoscopy requires insufflation of carbon dioxide (CO<sub>2</sub>) and creating pneumoperitoneum for achieving satisfactory visibility and further alterations in position from supine to Trendelenburg (3). There is a wide field of urologic interventions that can be performed laparoscopically either through retroperitoneal or transperitoneal approach (4). Retroperitoneal approach for laparoscopy was started 1979, but due to the inability to create a satisfactory pneumoperitoneum, the same was abandoned and it was only restored after Gaur announced his creative balloon technique of dissection of the retroperitoneal space previous to CO<sub>2</sub> insufflation (5, 6). While retroperitoneal approach for laparoscopy may have some advantages; like secure port placement and decreased manipulation with abdominal vessels, on the other hand, it can be challenging due to limited working space, port closeness, higher CO<sub>2</sub> insufflation for creating pneumoperitoneum and achieving better visibility and bigger Trendelenburg position which require superior anesthesia management and aggressive mechanical ventilation (MV) (7). Due to its high solubility in the blood, CO<sub>2</sub> can enhance alterations in arterial blood gasses (ABG). Therefore, the aim of our study was to compare the alterations in ABG occurring during transperitoneal or retroperitoneal laparoscopic urological intervention.

### Material and Methods:

This prospective non-randomized study was performed on elective urological patients, according the American Society of Anesthesiologists physical status - classification status (ASA) I/II, scheduled for urological laparoscopic intervention in the University Clinic for Anesthesia, Reanimation and Intensive Care and University Clinic for Urology - Clinical Center “Mother Theresa” for the period from January until December 2018. All morbidly obese patients with body mass index (BMI) more than 30, where excluded from the study, other exclusion criteria were cardiac or respiratory insufficiency and renal or liver dysfunction. Each patient signed Informed Consent before enrolment in the study.

All patients underwent standard preoperative evaluations and physical status check-ups. For premedication, patients received diazepam 5mg orally night before surgery and in the morning of surgery. In the operation theatre standard monitoring was placed and radial artery cannulation was done. Induction in anesthesia was with midazolam 1 or 2 mg, fentanyl 2-10 mcg/ kg, propofol 1-2 mg/ kg, rocuronium 0,6 mg/ kg. After 2 minutes patients were intubated and placed on MV. Pressure was controlled/ volume guaranteed with PEEP 5cm H<sub>2</sub>O and 50% mix of air/oxygen, changes in respirator rates and tidal volume were done when decreased oxygen saturation, increased PIP or increased end expiratory CO<sub>2</sub> (Et CO<sub>2</sub>) were observed. Hemodynamic



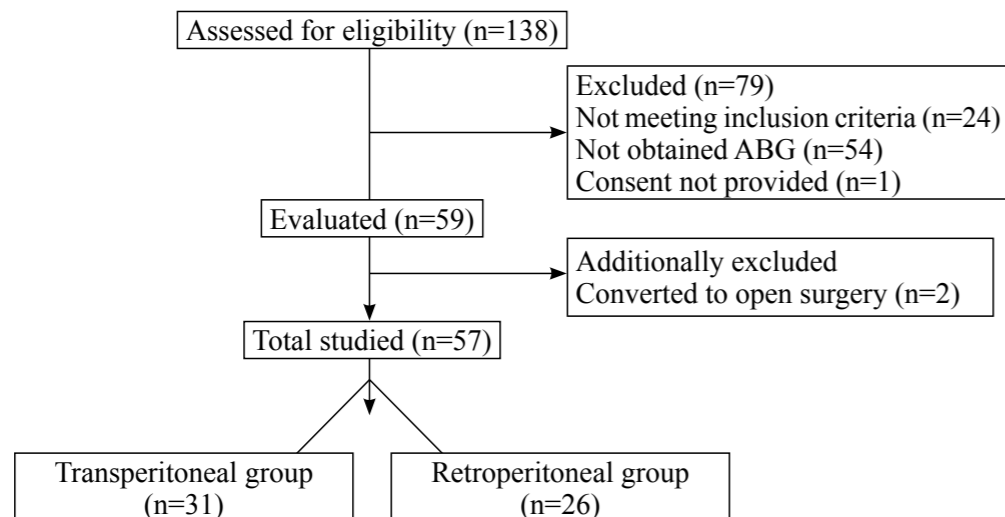
parameters were recorded during whole time of surgery and ABG analyses were investigated at three time points: T<sub>0</sub> before induction – basal, T<sub>1</sub> after one hour of CO<sub>2</sub> insufflation, and T<sub>2</sub> at the end of the surgery.

Statistical analysis was done with STATISTICA version 10; IBM SPSS 20.0. For quantitative variables data are presented as mean and standard deviation (SD), for categorical variables as number and percentage. For analysis, Analysis of Variance U test and Post hoc Tukey HSD test were used. P value of less than <0.05 was considered statistically significant.

**Results:**

A total of 138 patients were operated laparoscopically during the observed period. Only 57 patients from them meet the inclusion criteria and were enrolled in the study. From the other 81 excluded patients: 54 were without ABG analysis, 24 didn't complied with the inclusion criteria, 1 patient refused to participate in the study and 2 patients were converted to open surgery. In Figure 1 the flow chart diagram of the patients is presented.

**Figure 1.** Study's participants flow diagram



In Table 1, we present the demographic characteristics and characteristic of the interventions in both retroperitoneal and transperitoneal group.

**Table 1.** Demographic characteristics and characteristics of the surgery.

Variables	Retroperitoneal group (n=26)	Transperitoneal group (n=31)
Gender (Male/Female)	16 / 10	19/12
Age (years)	44.6 ± 11.5	46.3 ±15.63
BMI (normal 18.5-24.9)	18	20
(overweight 25-29.9)	8	11
Insufflation time (minutes)	105 ± 80.11	107 ± 77.33
Surgery time (minutes)	159.3 ± 79.06	168.1 ± 58.54

Data presented as mean and SD.

After CO<sub>2</sub> insufflation and pneumoperitoneum created in every patient from both groups, EtCO<sub>2</sub> was increased and MV was adjusted according to the changes in order to maintain EtCO<sub>2</sub> in normal ranges. The ABG samples collected over the three investigated time points intervals were analyzed with Siemens rapid point 500 ABG analyzer over 10 minutes period after assembling. There was significant difference between the observed partial pressure of oxygen and partial pressure of carbon dioxide in the observed groups in investigated time points. The PaO<sub>2</sub> in retroperitoneal vs transperitoneal group was statistically significant in T<sub>1</sub> 173.3 ± 19 vs 196.6 ± 29 (p < 0.003) and in T<sub>2</sub> 95.5 ± 5.4 vs 101.1 ± 8.2 (p < 0.001). The PaCO<sub>2</sub> was also statistically significant in second observed time point T<sub>1</sub> in retroperitoneal vs transperitoneal group 45.9 ± 4.1 vs 38.2 ± 0.3 (p < 0.002). The data obtained in ABG analysis are presented in Table 2.

**Table 2.** Arterial blood gas analyses.

Variables	Investigated times	Retroperitoneal (n=26)	Transperitoneal group (n=31)	P value
SaO <sub>2</sub> %	T <sub>0</sub>	94.2 ± 1.65	95.1 ± 1.41	> 0.05
	T <sub>1</sub>	97.7 ± 1.07	98.1 ± 0.5	> 0.05
	T <sub>2</sub>	94.6 ± 1.4	95.1 ± 1.76	> 0.05
PaO <sub>2</sub>	T <sub>0</sub>	95.6 ± 5.1	94.1 ± 6.7	> 0.05
	T <sub>1</sub>	173.3 ± 19	196.6 ± 29	< 0.05
	T <sub>2</sub>	95.5 ± 5.4	101.1 ± 8.2	< 0.05
PaCO <sub>2</sub>	T <sub>0</sub>	35.8 ± 2.3	35.1 ± 2.3	> 0.05
	T <sub>1</sub>	45.9 ± 4.1	38.2 ± 0.3	< 0.05
	T <sub>2</sub>	40.1 ± 3.2	37.01 ± 3.4	> 0.05
Ph	T <sub>0</sub>	7.41 ± 0.02	7.41 ± 0.03	> 0.05
	T <sub>1</sub>	7.31 ± 0.04	7.39 ± 0.05	> 0.05
	T <sub>2</sub>	7.35 ± 0.05	7.35 ± 0.03	> 0.05

Data presented as mean and SD, SaO<sub>2</sub> % - oxygen saturation, PaO<sub>2</sub> – partial pressure of oxygen, PaCO<sub>2</sub> – partial pressure of carbon dioxide.

Observed hemodynamic parameters are shown in Table 3. We observed the heart rate, systolic and diastolic blood pressure. There wasn't significance in the observed parameters in the investigated time points between groups. Only one patient in the transperitoneal group developed subcutaneous emphysema.

**Table 3.** Hemodynamic parameters.

Variables	Investigated times	Retroperitoneal (n=26)	Transperitoneal group (n=31)	P value
HR	T <sub>0</sub>	90.7 ± 12	85.6 ± 11.3	> 0.05
	T <sub>1</sub>	71.2 ± 8.5	71.2 ± 7.0	> 0.05
	T <sub>2</sub>	69.9 ± 13.5	66.3 ± 10.4	> 0.05
SKP	T <sub>0</sub>	146.5 ± 11.2	145.7 ± 17.2	> 0.05
	T <sub>1</sub>	125.5 ± 10.1	122.7 ± 9.3	> 0.05
	T <sub>2</sub>	120.7 ± 11.5	119.5 ± 10.0	> 0.05
DKP	T <sub>0</sub>	85.1 ± 9.2	87.2 ± 10	> 0.05
	T <sub>1</sub>	76.7 ± 11.9	80.4 ± 14	> 0.05
	T <sub>2</sub>	77.4 ± 12.4	76.3 ± 8.0	> 0.05

Data presented as mean and SD, HR – heart rate, SKP – systolic blood pressure, DKP – diastolic blood pressure.

**Discussion:**

Insufflation of CO<sub>2</sub> in the retroperitoneal or intraperitoneal cavity creates pneumoperitoneum and increases the intraabdominal pressure. Increased intra-abdominal pressure has influence on every organ and organ system in the body (1,8-11). Intraabdominal pressure moves the diaphragm cephalic and compresses the thoracic cavity leading to decreased compliance and increased resistance, lower functional residual capacity to the lung leading to deteriorated gas exchange (11, 12). Furthermore, the gas exchange is deteriorated from the insufflated CO<sub>2</sub> that is absorbed in the blood leading to ventilation mismatch, hypoxia, hypercarbia and ABG alterations (8, 10).

There is still ongoing debate if the retroperitoneal or transperitoneal laparoscopic approach is associated with greater CO<sub>2</sub> absorption. In our study, the investigated alterations in ABG analyses in the second time point or one hour after insufflation of CO<sub>2</sub>, showed that PaO<sub>2</sub> is significantly decreased in retroperitoneal group, compared to transperitoneal group and on the other hand, PaCO<sub>2</sub> is increased in the retroperitoneal group in comparison to the transperitoneal group. Further on, PaO<sub>2</sub> was significantly decreased in the third investigated time point. These results from our evaluation are similar to the results presented from Shah and colleagues in their study of 45 patients whereby they conclude that position of patients was the superior factor that interfered with the ABG changes (8). Another study from Wolf and coauthors, conducted in 63 laparoscopic urological interventions, showed higher CO<sub>2</sub> absorption when compared the retroperitoneal to transperitoneal approach, and also showed that retroperitoneal group had higher risk for developing subcutaneous emphysema (13). Additionally, in other prospective study on three groups with 10 patients in each of them: retroperitoneal nephrectomies, laparoscopic cholecystectomies and control group of open orthopedic surgeries had similar results to our findings. They believe that due to cutting up areolar retroperitoneal tissue, retroperitoneal group has higher CO<sub>2</sub> absorption (14). Contrary, there are studies that do not show increased CO<sub>2</sub> absorption in retroperitoneal laparoscopies - one is the study of Ng et al., which includes prospective evaluation of 51 patients (15).

As for hemodynamic parameters (heart rate, systolic and diastolic blood pressure) our study didn't show any statistically significant results between groups. However, in the literature there are presented findings similar and contrary to ours (1, 8, 16). We believe that this is due to the fact that CO<sub>2</sub> insufflation can provoke hemodynamic changes depending on volume status, anesthesia management, patient's position and the level of intraabdominal pressure that occurred from CO<sub>2</sub> insufflation. The different interaction among these factors can provoke diverse outcomes in different patients.

**Conclusion:**

Urological laparoscopy can be performed through retroperitoneal and transperitoneal approach. The findings that we have presented can suggest that both approaches are safe although hypercarbia is observed in retroperitoneal group. Moreover, maybe this study can obtain information

about the secure approach in compromised patients and can increase the awareness of the anesthesiologists for careful observation of these patients.

**References:**

1. Shobhana G, Gadani H, Mita P. Comparative Clinical Study Of Preinsufflation Versus Postdesufflation Arterial Blood Gas Analysis In Laproscopic Surgeries. *The Internet Journal of Anesthesiology*. 2009;1:25-29.
2. Hamilton BD, Gatti JM, Cartwright PC, et al. Comparison of laparoscopic versus open nephrectomy in the pediatric population. *J Urol*. 2000;163(3):937-9.
3. Iwasaka H, Miyakawa H, Yamamoto H, Kitano K, et al. Respiratory mechanics and arterial blood gases during and after laparoscopic cholecystectomy. *CAN J ANESTH* 1996;43(2):129-133.
4. Garg M, Singh V, Sinha RJ, et al. Prospective randomized comparison of transperitoneal vs retroperitoneal laparoscopic simple nephrectomy. *Urology*.2014;84(2):335-39.
5. Gaur DD. Laparoscopic operative retroperitoneoscopy : Use of a new device. *J Urol* 1992; 148 : 1137-39.
6. Gaur DD, Agarwal DK, Purohit KC. Retroperitoneal laparoscopic nephrectomy: Initial case report. *J Urol* 1993; 149 : 103-5.
7. Taue R, Izaki H, Koizumi T, et al. Transperitoneal versus retroperitoneal laparoscopic radical nephrectomy: a comparative study. *Int J Urol*. 2009; 16(3):263-67.
8. Shah R, Nama R, Butala B, et al. Comparison of Physiological Changes between Transperitoneal and Retroperitoneal Approach for Urologic Laparoscopic Surgery. *Journal of Clinical and Diagnostic Research*. 2018 Apr, Vol-12(4): UC04-UC07.
9. Kuzmanovska B, Kartalov A. Brain oxygenation during laparoscopy. *Epilepsy and neurology* 2010;37/38:33-37.
10. Kuzmanovska B, Kartalov A, Srceva M. Correlation of the variations of the mean arterial pressure, heart rate, oxygenation of the blood and oxygenation of the brain during laparoscopy. *Medicus* 2012; 12:125-128.
11. Gavrilovska-Brzanov A, Shosholcheva M, Nikolova Z, et al. Evaluation of the effect of increased intraabdominal pressure on the visceral perfusion. *Medicus* 2013; 18(2):37-49.
12. Gavrilovska-Brzanov A, Nikolova Z, Jankulovski N, et al. Evaluation of the Effects of Elevated Intra-abdominal Pressure on the Respiratory Mechanics in Mechanically Ventilated Patients. *Maced J Med Sci*.2013;6:261-265.
13. Wolf JS Jr, Monk TG, McDougall EM, et al. The extraperitoneal approach and subcutaneous emphysema are associated with greater absorption of carbon dioxide during laparoscopic renal surgery. *J Urol*. 1995; 154(3):959-63.
14. Streich B, Decailliot F, Perney C, et al. Increased carbon dioxide absorption during retroperitoneal laparoscopy. *Br J Anaesth*. 2003; 91(6):793-96.
15. Ng CS, Gill IS, Sung GT, et al. Retroperitoneoscopic surgery is not associated with increased carbon dioxide absorption. *J Urol*. 1999; 162(4):1268-72.
16. Baird JE, Granger R, Klein R, et al. The effects of retroperitoneal carbon dioxide insufflation on haemodynamics and arterial carbon dioxide. *Am J Surg*. 1999; 177(2):164-66.