ORIGINAL ARTICLE

Anesthesiological and surgical perspectives on using 8 mmHg versus 12 mmHg pneumoperitoneum pressures during robotic radical prostatectomy: Results of a prospective randomized study

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ABSTRACT

BACKGROUND: This study aims to compare the effects of 8 mmHg and 12 mmHg pneumoperitoneum (PNP) pressures on operative, postoperative, and anesthesiological parameters in robot-assisted laparoscopic radical prostatectomy (RARP).

METHODS: In this prospective study, 43 patients undergoing RARP performed by a single experienced surgeon were randomly assigned to either the low-pressure group (8 mmHg - Group I) or the standard-pressure group (12 mmHg - Group II). We evaluated the operative and postoperative parameters from both urological and anesthesiological perspectives. All patients were treated using the AirSeal® insufflation system.

RESULTS: No statistically significant differences were observed between the groups in terms of console time, estimated blood loss, time to first flatus, or hospital length of stay. PNP was increased due to bleeding in six patients in the 8 mmHg group and two patients in the 12 mmHg group. Except for the heart rate measured five minutes after the initial incision, there were no observed differences between the groups in terms of blood pressure, ventilation, and administered medications. The heart rate was significantly lower in Group I (54.4 vs. 68.8, p=0.006). Additionally, during the surgery, the number of manipulations performed by the anesthesiologists, including drug administrations and ventilator management, was significantly lower in Group I (6.1 vs. 9.6, p=0.041).

CONCLUSION: In RARP, while the 8 mmHg PNP pressure does not demonstrate differences in operative parameters compared to the 12 mmHg pressure, it offers the advantage of requiring fewer anesthetic interventions, thus minimizing the impact on cardiovascular and respiratory systems.

Keywords: Pneumoperitoneum pressure (PNP); low pressure pneumoperitoneum; AirSeal® insufflation system; robot-assisted radical prostatectomy (RARP); intraoperative outcomes; intra-abdominal pressure.

INTRODUCTION

Robot-assisted radical prostatectomy (RARP) is an increasingly preferred surgical method for treating localized prostate cancer, offering benefits such as smaller incisions, minimal bleeding, early discharge, and reduced postoperative pain.[1] However, a significant disadvantage of this technique is the side effects associated with the pressure created by carbon

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dioxide (CO_2) gas used to create a working space in the abdomen. During surgery, the Trendelenburg position, combined with the effects of pneumoperitoneum pressure (PNP), results in the cranial movement of the diaphragm.[2] This leads to lung parenchyma compression, decreased tidal volumes, and increased airway pressures. Carbon dioxide insufflation can cause hypercapnia, leading to respiratory acidosis.[3,4] Additionally, the renin-angiotensin system is activated, impacting blood pressure and cardiac contractility. Decreased cardiac venous return is compensated by an increased cardiac rate, which restores cardiac output.[5] While these physiological changes are typically manageable in younger, healthy patients, they require caution in elderly patients with significant comorbidities, as they may lead to life-threatening complications.[6] These side effects are more pronounced at intra-abdominal pressures of 12-14 mmHg and above.[7] Despite this, many surgeons operate at pressures exceeding these levels to ensure an adequate workspace.[8] However, there is a growing trend towards using the lowest possible pressures in laparoscopic and robot-assisted laparoscopic surgeries to minimize adverse effects while maintaining procedural safety.[9]

There are a limited number of studies in the literature examining the impact of intra-abdominal pressure differentials on RARP operations, particularly from an anesthesiology perspective. Based on this, our study aimed to investigate the effects of 8-mmHg or 12-mmHg PNP on perioperative parameters in patients undergoing RARP from both urological and anesthesiological perspectives.

MATERIALS AND METHODS

This single-center, randomized, prospective trial was conducted after receiving approval from the Institutional Review Board (protocol number: 2022.094.IRB1.040, date: 16. 03. 2022). Patients diagnosed with prostate cancer and undergoing RARP were included in the study, which adhered to the guidelines of the Declaration of Helsinki. Patients were divided into two groups based on PNP and randomly assigned in a 1:1 ratio to either Group I (8 mmHg) or Group II (12 mmHg) using a web-based system (randomizer.org). The AirSeal system (AirSeal®, ConMed, Utica, NY, USA) was used for insufflation in all cases.

Exclusion criteria included patients with concurrent surgeries during RARP, a history of bleeding diathesis, chronic kidney disease, chronic opioid use for pain management, and those unable to communicate due to language barriers or mental status. The primary objective was to compare the impact of 8 mmHg and 12 mmHg PNP on the number of manipulations required by anesthesiologists to maintain normal hemodynamic, respiratory, and metabolic parameters (such as respiratory rate, remifentanil infusion titration, and administration of vasoactive agents). Secondary outcomes included anesthesia time, console time, estimated blood loss, time to first flatus, time to oral intake, hospital length of stay, arterial blood gas lactate levels, peak and mean airway pressures, pulmonary compliance, end-tidal CO_2 levels, systolic, diastolic, and mean arterial pressures, heart rate, acute postoperative pain (measured by a numeric rating scale), postoperative morphine consumption, urine output, creatinine levels, hemoglobin levels, pulmonary complications, subcutaneous emphysema, and Clavien-Dindo classification of surgical complications.

Operative Procedure

After the induction of general anesthesia, pneumoperitoneum was achieved using the open trocar insertion technique at a standard pressure of 15 mmHg. Following the initial trocar placement, the patient was positioned at a 30-degree Trendelenburg tilt, and the remaining robotic working trocars were inserted. A 12 mm diameter AirSeal® trocar, which also served as an assistant trocar, was then placed, and the pneumoperitoneum pressure was adjusted to either 8 mmHg or 12 mmHg depending on the study group. All surgeries were performed by a single surgeon (AEC) with extensive experience in RARP, utilizing the same technique without any variations. Obturator lymph node dissection was performed for patients categorized as unfavorable intermediate risk and high risk according to the European Association of Urology prostate cancer guidelines.[10]

Anesthesia Procedure

Anesthesia was induced with 1-2 mg/kg propofol, 1 mcg/kg fentanyl, and 0.6 mg/kg rocuronium. Orotracheal intubation was performed, and a radial artery was cannulated for continuous blood pressure monitoring and regular arterial blood gas analysis. The intraoperative mechanical ventilation mode was set to "pressure control ventilation - volume guaranteed (PCV-VG)" with end-tidal control. Tidal volume was set at 8 ml/kg ideal body weight, Fraction of Inspired Oxygen (FiO_2) at 35%, Positive End-Expiratory Pressure (PEEP) at 6 cmH_2O, and the I:E ratio at 1:2. The respiratory rate (RR) was adjusted to a maximum of 25 to maintain the end-tidal CO_2 ($ETCO_2$) level between 30-40 mmHg and SpO_2 above 95%. If $ETCO_2$ remained above 40 mmHg despite an RR of 25, tidal volume was increased. If SpO_2 fell below 95%, FiO_2 was increased. Anesthesia was maintained with desflurane at 1 MAC and a remifentanil infusion of 0.05-2 mcg/kg/min. The remifentanil dose was titrated according to the hemodynamic response; in cases of hypotension (MAP<55 mmHg), 5 mg bolus doses of ephedrine were administered. For bradycardia (<50 beats/min), 0.5 mg atropine was administered. At the end of anesthesia, neuromuscular blockade was reversed with 200 mg of sugammadex, and the patient was extubated. Fluid therapy was maintained at 3 ml/kg/hour of crystalloid infusion. A 20% decrease from the initial arterial blood gas hemoglobin level or a hemoglobin level below 8 gr/dl was considered an indication for blood transfusion. Each anesthesiological manipulation was recorded and counted at the end of the surgery. Measurements of airway pressures, pulmonary compliance, $ETCO_2$, respiratory rate, SpO_2, arterial blood

pressure, heart rate, remifentanil infusion rate, arterial partial pressures of oxygen and CO2, arterial pH, and lactate levels were recorded at predefined time points. These time points included T0 (first measurement), immediately after tracheal intubation while the patient was in the supine position; Tins (second measurement), after 5 minutes of intra-abdominal insufflation while still in the supine position; TT1 (third measurement), after 5 minutes in a 30-degree Trendelenburg tilt with the target intra-abdominal pressure; TT60 (fourth measurement), 60 minutes after TT1, with subsequent measurements every 60 minutes (TT120, TT180) until the end of the procedure; Tfin (final measurement), after exsufflation of the abdomen, in the supine position, before extubation. Arterial blood gas samples were taken only at TT0, Tins, TT1, and Tfin.

Postoperative Analgesia Technique

A standard postoperative analgesia regimen was employed. During the intraoperative period, 1 g of paracetamol, 800 mg of ibuprofen, and 0.05 mg/kg of morphine were administered 20 minutes before extubation. In the postoperative period, patients were provided with intravenous (iv) morphine patient-controlled analgesia (PCA) devices, set at a 1 mg bolus with a lock-in time of 8 minutes.

Postoperative Anesthesia Care Unit (PACU) Monitoring: Pain scores were recorded upon patients' arrival at the PACU by pain nurses who were blinded to the study groups. Patients with a numerical rating scale (NRS) pain score of 4 or higher received 25 µg of fentanyl. For those with NRS scores of 7 or higher, 50 µg of fentanyl was administered.[11] If NRS scores did not decrease following a bolus dose, the same dose of fentanyl was repeated 10 minutes later. Total fentanyl dose requirements in the PACU were recorded, along with side effects such as nausea, difficulty breathing, and shivering. Usage of the PCA bolus dose during the PACU period was also documented. Patients were educated on PCA use and instructed to press the bolus button for NRS scores of 4 or higher.

Surgical Ward Monitoring: Patients received 1 g of paracetamol three times daily and 800 mg of ibuprofen twice daily. NRS pain scores were recorded at 1, 3, 6, 12, and 24 hours post-surgery. Side effects, including nausea, vomiting, and shoulder pain, were documented. At the 24-hour mark, patient satisfaction with the analgesic regimen was evaluated. If NRS scores were 7 or higher during follow-ups, 1 mg/kg of tramadol was administered. Total consumption of morphine and tramadol was recorded.

Statistical Analysis

Descriptive statistics included means and standard deviations (SD) for continuous variables, and numbers and percentages for categorical variables. Continuous variables were analyzed using the t-test, and categorical variables were analyzed using the chi-square test. All statistical tests were two-sided, with p-values less than 0.05 considered statistically significant. Analyses were conducted using SPSS (Statistical Package for the Social Sciences) 22.0 (Chicago, Illinois) software.

RESULTS

A total of 43 patients were included in the study. The mean age and body mass index (BMI) of the study cohort were 63.0±6.8 (range 49-74) and 27.2±3.3 (range 22.1-34.5), respectively. Demographic, operative, and postoperative data are presented in Table 1. There were no statistical differences between groups in terms of age, BMI, American Society of Anesthesiologists (ASA) scores, Charlson Comorbidity Index, and ARISCAT (Assess Respiratory Risk in Surgical Patients in Catalonia) score (p=0.215, p=0.294, p=0.129, p=0.191, p=0.999, respectively) (Table 1). Operative parameters such as console time, anesthesia duration, and estimated blood loss showed no statistical differences between Group

Table 1. Comparative analysis of demographic, operative, and postoperative data between groups

	Total (n=43)	8-mmHg Group (n=22)	12-mmHg Group (n=21)	p
Age (years)	63.0±6.8 (49-74)	61.7±6.5 (49-71)	64.3±6.9 (52-74)	0.215
BMI	27.2±3.3 (22.1-34.5)	27.7±3.6 (23.8-34.5)	26.6±3.0 (22.1-33.6)	0.294
ASA (1/2/3)	6/36/1	5/16/1	1/20/0	0.129
CCI	4.0±0.9 (2-6)	3.8±0.9 (2-6)	4.1±0.8 (3-6)	0.191
ARISCAT Score	27.0±4.2 (19-43)	27.0±4.6 (19-43)	27.0±3.8 (26-43)	0.999
Console Time (min)	219.4±42.7 (150-330)	225.2±41.1 (165-330)	213.3±44.6 (150-290)	0.368
Anesthesia Time (min)	271.0±45.2 (190-370)	276.6±43.1 (205-370)	265.2±47.8 (190-340)	0.419
Estimated Blood Loss	175.5±168.4 (50-800)	193.1±169.2 (50-700)	157.1±169.7 (50-800)	0.490
Time to Flatus (hours)	37.3±14.8 (15-72)	30.2±12.0 (15-46)	42.7±15.0 (20-72)	0.095
Hospital Length of Stay (days)	3.45±0.968 (2-6)	3.3±1.0 (2-6)	3.5±0.8 (3-6)	0.638

BMI: Body Mass Index; ASA: American Society of Anesthesiology; CCI: Charlson Comorbidity Index, ARISCAT: Assess Respiratory Risk in Surgical Patients in Catalonia.

I and Group II (p=0.368, p=0.419, p=0.490, respectively), and blood transfusions were not required in either group. Postoperative parameters including time to first flatus and hospital length of stay, also showed no statistically significant differences between the groups (p=0.095, p=0.638, respectively) (Table 1).

Table 2. Comparison of intraoperative anesthesia monitoring and postoperative pain assessment follow-ups (Group 1: 8 mmHg, Group 2: 12 mmHg)

	Group	T^{t0}	T^{t5}	T^{t60}	T^{t120}	T^{t180}	T^{fin}
SAP	1	98.8±19.3	121.4±19.5	110.6±16.3	109.0±17.0	106.6±14.3	112.5±21.1
	2	99.7±19.7	125.6±20.9	101.3±20.4	103.4±14.8	106.7±16.2	98.6±16.7
	p	0.925	0.608	0.284	0.504	0.990	0.118
DAP	1	56±9.7	72.6±12.5	64.1±13.1	62.4±10.0	62.2±7.1	63.0±9.5
	2	59.5±16.7	77.0±10.9	64.2±7.6	65.4±5.8	65.7±6.8	56.8±4.7
	p	0.583	0.422	0.486	0.248	0.204	0.076
Heart Rate	1	67.5±12.6	54.5±7.9	55.0±9.7	55.3±8.4	58.7±8.1	62.0±10.6
	2	75.8±16.4	68.8±11.8	62.1±10.4	62.1±10.4	66.1±12.9	68.2±12.6
	p	0.232	0.006*	0.086	0.162	0.335	0.253
PAP	1	16.4±1.6	27.1±2.7	28.1±3.2	26.8±2.8	25.2±4.5	19.1±2.7
	2	18.0±3.3	28.3±5.3	27.2±4.1	28.8±4.2	28.2±4.0	19.9±3.1
	p	0.198	0.535	0.626	0.284	0.072	0.375
MAP	1	9.6±0.7	13.7±0.8	14.1±1.3	13.7±0.9	12.8±1.9	10.8±0.9
	2	10.4±1.2	14.0±1.7	14.0±1.4	14.1±1.8	14.0±1.5	11.1±1.1
	p	0.103	0.729	0.865	0.619	0.255	0.549
Pulmonary Compliance	1	54.6±9.0	27.4±5.6	26.7±6.3	27.4±5.1	31.4±24.5	42.1±9.3
	2	48.2±8.0	26.0±6.6	26.4±5.6	24.1±5.5	24.5±6.3	40.4±11.3
	p	0.112	0.636	0.905	0.239	0.130	0.731
ETCO2	1	31.7±3.9	32.6±1.8	31.8±1.8	31.3±2.3	31.0±1.7	32.2±1.9
	2	30.9±1.4	32.9±1.9	31.8±3.0	32.2±3.5	33.0±1.5	33.9±7.0
	p	0.507	0.738	0.911	0.531	0.060	0.495
RR	1	11.4±1.9	11.5±1.6	11.7±1.8	11.5±1.9	11.6±2.6	11.5±1.9
	2	13.1±1.5	13.1±2.9	12.9±2.3	13.2±2.3	13±2.3	12.7±2.1
	p	0.138	0.157	0.185	0.249	0.357	0.228
SpO2	1	97.4±1.9	98.4±1.4	98.4±1.6	98.5±1.6	99.0±0.7	99.0±1.7
	2	97.7±1.4	90.1±1.6	98.3±1.2	98.0±1.1	98.5±1.3	99.0±1.2
	p	0.717	0.340	0.901	0.465	0.546	1.000
Remifentanil	1	1.0±1.6	5.4±3.0	5.0±3.0	5.4±3.8	4.2±3.5	1.5±1.8
	2	2.1±1.9	6.8±3.5	5.6±3.8	4.2±3.7	4.5±4.8	1.6±2.0
	p	0.172	0.373	0.695	0.524	0.888	0.879
	Group	Po 0	Po 1st hr	Po 3rd hr	Po 6th hr	Po 12th hr	Po 24th hr
NRS	1	2.8±2.5	1.6±1.7	1.7±2.0	1.2±1.5	0.9±1.4	0.5±1.0
	2	3.7±2.5	2.1±1.6	1.86± 2.1	1.1±2.1	0.8±1.5	1.2±1.8
	p	0.232	0.365	0.825	0.810	0.919	0.110
Morphine	1	0.1±0.3	2.2±1.3	6.1±3.2	9.1±5.7	11.7±7.3	20.2±12.5
	2	0.3±0.6	2.0±1.9	5.7±5.2	8.9±7.8	12±10.1	16.8±11
	p	0.082	0.725	0.746	0.946	0.918	0.351

SAP: Systolic Arterial Pressure (mmHg); DAP: Diastolic Arterial Pressure (mmHg); PAP: Peak Airway Pressure; MAP: Mean Airway Pressure; ETCO2: End-Tidal Carbon Dioxide; RR: Respiratory Rate; SpO2: Peripheral Capillary Oxygen Saturation; Remifentanil: Remifentanil Infusion Dose (mcg/kg/min); NRS: Numerical Rating Scale Score for Pain; Morphine: Morphine Consumption (mg); Po: Postoperative. *Statistically significant.

In Group I, impaired visual quality due to bleeding necessitated a temporary increase in intra-abdominal pressure to 15 mmHg in six patients: during the dissection of the deep dorsal venous complex (n=3), while dissecting the plane between the bladder and prostate (n=2), and during neurovascular bundle dissection (n=1). In Group II, intra-abdominal pressure needed to be elevated in two patients during the dissection of the plane between the bladder and prostate. Furthermore, in Group II, due to elevated airway pressure, the anesthesiologist requested a reduction in intra-abdominal pressure for four patients. There were no such requests in Group I. Regarding other operative parameters, apart from the heart rate measured at the 5th minute, there were no statistically significant differences between groups in terms of continuous monitoring of systolic and diastolic blood pressure, peak airway pressure, mean airway pressure, end-tidal carbon dioxide, respiratory rate, peripheral capillary oxygen saturation, and remifentanil dose. The heart rate was significantly lower in the 8-mmHg group (54.4 vs. 68.8, p=0.006) (Table 2).

In the early postoperative period, 13 patients (61.9%) in the 8-mmHg group and 9 patients (42.8%) in the 12-mmHg group did not require analgesic medication (p=0.172). Postoperative rescue analgesic usage and total morphine PCA consumptions were similar. During the surgery, the number of manipulations performed by the anesthesiologist was significantly lower in Group I (6.1±3.2) than in Group II (9.6±2.8) (p=0.041). The power analysis for this variable indicated a power of 98%, an effect size of 1.18%, and a margin of error of 5%. No patients experienced complications with a Clavien-Dindo Score of 2 or higher.

DISCUSSION

The RARP operation is performed in a confined pelvic space due to the anatomical location of the prostate. It is important to apply the lowest possible intra-abdominal pressure during the operation.[12] Certain stages, such as cutting the dorsal vein, opening the bladder-prostate plane, or dissecting the neurovascular bundle, involve frequent aspiration due to possible bleeding and urine output from the urinary bladder. During aspiration, sudden pressure drops in conventional insufflators can lead to the loss of the workspace, making the operation more challenging.[13] Consequently, surgeons tend to perform the surgery at higher pressures.[14] The AirSeal insufflation system maintains a constant air pressure independent of air leakage, allowing for operation at lower pressures and preserving both pressure and workspace even during aspiration. This capability enables surgery at low pressures that are unachievable with conventional insufflators.[15] There are few studies in the literature examining the effects of different pressures on outcomes in RARP surgeries.

Our findings indicate no statistically significant differences between the two groups in terms of console time, length of hospital stay, time to first flatus, and estimated blood loss. In the 8-mmHg group, a temporary increase in pressure was required in more patients due to bleeding. In two patients in the 12-mmHg group, an increase in airway pressure necessitated a reduction in PNP pressure. It was observed that the heart rate measured at the 5th minute of the operation was higher in the 12-mmHg group, which was considered part of a compensatory mechanism. No differences were observed between the groups in other cardiovascular and respiratory parameters. One possible explanation is that the pressure in the 12-mmHg group was within a safe limit for cardiovascular and respiratory systems. However, to maintain the stability of cardiovascular and respiratory parameters, significantly more manipulations by anesthesiologists were required in the 12-mmHg group. Despite these manipulations, similar results were achieved in both groups. There was no observed difference in postoperative pain scores or analgesic requirements between the groups.

When comparing our findings with previous studies, Christensen et al., in their retrospective study comparing PNP levels of 12 mmHg and 15 mmHg, found no statistically significant differences between the groups in terms of operative time, blood loss, length of stay, postoperative ileus rates, fistula formation, urinary retention, and hematoma parameters. These findings are consistent with our study and demonstrate that the lower PNP was non-inferior.[16] Rohloff et al. retrospectively examined the outcomes of 400 RARP surgeries. The first 202 patients were operated on at 15 mmHg pressure, and the subsequent 198 patients at 12 mmHg pressure. Upon analysis, it was found that the length of hospital stay and the rate of postoperative ileus were statistically lower in the low-pressure group (1.49 vs. 1.76, p=0.022; 10 patients vs. 25 patients, p=0.014, respectively).[17] However, a significant limitation of this study is that the outcomes in the low-pressure group might have been influenced by the surgeons' learning curve, as these patients were included in surgeries after the high-pressure group. Subsequently, the same team designed a prospective, double-blind, randomized controlled study involving 105 patients who underwent surgery at 12 mmHg and 96 patients at 8-mmHg pressures. Postoperative ileus was in 2% of patients in the 8-mmHg group and 4.8% in the 12-mmHg group, with no statistically significant difference observed (p=0.45). Overall complications were higher in the 12-mmHg group (10 vs. 8). In the 8-mmHg group, 3 patients experienced Clavien-Dindo grade 3b complications, which were reported as unrelated to PNP and attributed to patient-specific anatomical factors. No operation required an increase due to poor visualization. The authors identified smoking and intraoperative intravenous fluid volume as independent variables affecting postoperative ileus and concluded that low PNP was non-inferior to standard PNP.[18] In our study, since the surgeries were performed by a single surgeon experienced in RARP, any differences potentially caused by the learning curve were eliminated, resulting in no observed differences between the groups in terms of operative and complication outcomes.

La Falce et al. reported that RARP surgery can be safely performed with the AirSeal system at a pressure of 8 mmHg.[19] Ferroni et al. compared data from 300 patients who underwent surgery at a 6-mmHg pressure, collected prospectively, with data from the previous 300 patients, which was analyzed retrospectively. In the 6-mmHg group, there was no need for pressure elevation due to poor visibility or progression. The console time was statistically higher in the 6-mmHg group (145.7 vs. 155.2, p<0.001). The mean estimated blood loss was higher in the 6-mmHg group; however, blood transfusions were not required in either group. The average length of hospital stay was shorter in the 6-mmHg group, with 43.3% of patients being discharged on the day of surgery (0.57 days vs. 1 day). No significant difference was observed between the groups in terms of postoperative morphine intake or pain score in the first four hours postoperatively, but there was an 18% increase in pain score in the 6-mmHg group between 5-12 hours. On postoperative day 30, the complication rate was significantly lower in the 6-mmHg group at 4.0% compared to 8.7% in the 15-mmHg group (p=0.02). Additionally, the rate of rehospitalization was markedly reduced, being 1.0% in the 6 mmHg group versus 5.7% in the 15 mmHg group (p≤0.01).[20] Unlike our study, console time, estimated blood loss, average length of hospital stay, complication rates on postoperative day 30, and readmission rates differed between the groups in this study. The main reason for the differing results between the studies could be that the PNP pressures in our study were closer values of 8 and 12 mmHg, while in this study, they were more divergent values of 6 and 15 mmHg. Contrary to Ferroni et al., Johnstone et al. reported shorter console times (120 min vs. 136 min, p=0.053) and lower estimated blood loss (145 vs. 181, p=0.003) in the 6 mmHg group compared to the 15 mmHg group.[21] The authors concluded that ultra-low pressure can be safely applied.

In their published meta-analysis, El-Taji et al. found that the low-pressure group exhibited a shorter length of operation and lower estimated blood loss, though neither was statistically significant. However, the length of hospital stay and incidence of postoperative ileus were statistically lower in the low-pressure group. There were no statistically significant differences between the low-pressure and standard-pressure surgeries regarding Clavien-Dindo complications, new hospitalizations within 30 days, surgical margin positivity, quality of operating conditions, and safet.[9]

We identified a few limitations in this study. The first one is related to interventions during the operation to prevent any adverse effects on patients' cardiovascular and respiratory parameters, which may have influenced the study results. However, we believe that because the manipulations performed and the treatments administered were recorded and their outcomes compared, the comparison of groups was made directly based on values and indirectly based on treatments in a correct manner. Another limitation is the absence of a patient group with ultra-low pressures, such as 6 mmHg.

CONCLUSION

RARP can be safely performed at both 8 mmHg and 12 mmHg PNP pressures. While there are no significant differences in operative and postoperative outcomes between the two groups, higher abdominal pressures necessitate significantly more anesthesiological manipulations to maintain cardiovascular and respiratory stability. Performing RARP at 8 mmHg PNP is not inferior to 12 mmHg and can be safely implemented.

Ethics Committee Approval: This study was approved by the Koc University Hospital Ethics Committee (Date: 16.03.2022, Decision No: 2022.094.IRBI.040).

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ORİJİNAL ÇALIŞMA - *ÖZ*

Robotik radikal prostatektomide 8 mmHg ve 12 mmHg pnömoperiton basınçlarının karşılaştırılması: Anesteziolojik ve cerrahi perspektiften prospektif randomize kontrollü çalışma

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AMAÇ: Robot destekli laparoskopik radikal prostatektomi (RARP) ameliyatında 8 mmHg veya 12 mmHg pnömoperitonum basınç (PNP) farklılıklarının operatif, postoperatif ve anesteziyolojik parametreler üzerine etkisinin karşılaştırılması amaçlanmaktadır.

GEREÇ VE YÖNTEM: Prospektif dizayna sahip çalışmamızda, RARP ameliyatında deneyimli tek cerrah tarafından yapılan 43 hasta düşük basınç (8 mmHg - Grup I) veya standart basınç (12 mmHg - Grup II) gruplarına PNP'ye göre rastgele randomize edildi. Hastaların operatif ve postoperatif parametreleri ürolojik ve anesteziyolojik açıdan değerlendirildi. Tüm hastalarda AirSeal® insuflasyon sistemi kullanıldı.

BULGULAR: Konsol süresi, tahmini kan kaybı, ilk flatusa kadar geçen süre ve hastanede kalış süresi açısından gruplar arasında istatistiksel olarak anlamlı bir fark bulunmamıştır. PNP, 8 mmHg grubundaki 6 hastada ve 12 mmHg grubundaki 2 hastada kanama nedeniyle 15 mmHg 'ya geçici süre yükseltildi. İlk insizyondan sonra 5. dakikadaki kalp hızı dışında, kardiak, kan basıncı, ventilasyon ve verilen ilaç parametreleri açısından gruplar arasında fark gözlenmemiştir. Kalp hızı, Grup I'de anlamlı derecede düşük olarak gözlemlendi (54.4 vs 68.8, p=0.006). Cerrahi sırasında, anestezistler tarafından yapılan müdahalelerin sayısı (ilaç uygulamaları, ventilatör yönetimi vb.) Grup I'de anlamlı derecede daha düşük izlendi (6.1 vs 9.6, p=0.041).

SONUÇ: RARP ameliyatında 8 mmHg PNP basıncı, 12 mmHg basınca göre operatif parametrelerde farklılık göstermezken, kardiyovasküler ve solunum sistemini tehlikeye atmamak için gereken anestezi müdahalesi gereksiniminin daha az olması avantajına sahiptir.

Anahtar sözcükler: Airseal® insuflatör sistemi; düşük basınç pnömoperitonum; intraperitoneal basınç; intraoperatif sonuçlar; pnömoperitonum basıncı (PNP); robot yardımlı laparoskopik radikal prostatektomi.

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