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DOES SEVERE OBESITY EFFECT EARLY POSTOPERATIVE RECOVERY AND SURGICAL OUTCOMES IN PATIENTS UNDERGOING PERCUTANEOUS NEPHROLITHOTOMY UNDER SPINAL ANESTHESIA?

AĞIR OBEZİTE HASTALARIN SPİNAL ANESTEZİ ALTINDA PERKÜTAN NEFROLİTİTOMİ UYGULANMASI POSTOPERATİF ERKEN DÖNEM İYİLEŞME VE CERRAHİ SONUÇLARINI ETKİLER Mİ?

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ABSTRACT

Objective: The primary aim of this study is to evaluate if severe obesity has any deleterious effect on the early postoperative course in patients undergoing percutaneous nephrolithotomy (PNL) under spinal anesthesia, and the secondary aim is to determine whether severe obesity changes surgical results.

Material and Method: The study included 100 patients who underwent a PNL operation for kidney stones of ≥2cm in our clinic. Accordingly, those with BMI <35 kg/m^2 formed the first while the severely obese BMI ≥35 kg/m^2 formed the second group. Age, gender, stone burden, pre/postoperative hemoglobin levels, number and regions of access, duration of surgery, perioperative complications and Visual Analogue Scale score at 24h, PACU admission/discharge Aldrete scores, and PACU length of stay were recorded.

Results: The VAS score was 5.0±1.3 in group 1 while it was 5.3±1.8 in group 2 (p=0.32). The length of the hospital stay was 3.3±1.3 days in patients with BMI <35 kg/m^2 and 3.0±1.0 in patients with BMI ≥35 kg/m^2 (p=0.36). A 98% stone-free rate was found in the severely obese group and 96% in the normal BMI group, and there was no significant difference between the groups (p=0.672). There was a statistically significant difference in terms of PACU discharge Aldrete scores between groups

ÖZET

Amaç: Bu çalışmanın birincil amacı, spinal anestezi altında perkütan nefrolititomi (PNL) uygulanan hastalarda ağır obezitenin erken postoperatif seyir üzerinde zararlı bir etkisinin olup olmadığını değerlendirmektir. İkinci olarak, ağır obezitenin cerrahi sonuçları değiştirip değiştirmediğini belirlemektir.

Gereç ve Yöntem: Çalışmaya kliniğimizde ≥2cm böbrek taşı nedeniyle PNL operasyonu yapılan 100 hasta dahil edildi. Buna göre birinci grupta VKİ<35 kg/m^2 olanlar, ikinci grupta ise ciddi derecede obez BKİ≥35 kg/m^2 olanlar oluşturuldu. Yaş, cinsiyet, taş yükü, ameliyat öncesi/sonrası hemoglobin seviyeleri, giriş sayısı ve bölgeleri, ameliyat süresi, perioperatif komplikasyonlar ve 24. saatte Görsel Analog Skala skoru, PACU yatış/taburculuk Aldrete skorları ve PACU kalış süresi kaydedildi.

Bulgular: Grup 1'de VAS puanı 5,0±1,3 iken grup 2'de 5,3±1,8 idi (p=0,32). Hastanede kalış süresi VKİ <35 kg/m^2 olan hastalarda 3,3±1,3 gün, VKİ≥35 kg/m^2 olan hastalarda 3,0±1,0 idi (p=0,36). Ağır obez grupta %98, normal vücut kitle indeksi grubunda %96 taşsızlık oranı saptandı ve gruplar arasında anlamlı fark yoktu (p=0,672). Gruplar arasında PACU taburcu Aldrete skorları açısından istatistiksel olarak anlamlı fark vardı (Grup 1 ve

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(9.9±0.3 vs. 9.6±0.4 in groups 1 and 2, respectively) (p=0.03). Finally, the time interval in PACU was 39.0±7.5 mins in group 1 while it was 58.8±14.0 mins in group 2 (p<0.0001).

Conclusions: Severe obesity does not alter surgical outcomes in patients undergoing PNL under spinal anesthesia, and in our opinion, spinal anesthesia in PNL is a safe and effective anesthesia modality for renal stone(s) in obese and morbidly obese patients.

Keywords: obesity, PACU, PNL, spinal anesthesia, prospective

2'de sırasıyla 9,9±0,3 ve 9,6±0,4) (p=0,03). Son olarak PACU'da zaman aralığı grup 1'de 39,0±7,5 dk iken grup 2'de 58,8±14,0 dk idi (p<0,0001).

Sonuç: Şiddetli obezite, spinal anestezi altında PNL uygulanan hastalarda cerrahi sonuçları değiştirmez ve bize göre PNL'de spinal anestezi, obez ve morbid obez hastalarda renal taş(lar) için güvenli ve etkili bir anestezi yöntemidir.

Anahtar Kelimeler: obezite, PACU, PNL, spinal anestezi, prospektif

INTRODUCTION

Obesity is a major worldwide health problem, and nowadays, as a result of a sedentary lifestyle, decreased physical activity, and high-fat diet, the number of obese individuals has rapidly increased in both developed and developing countries (1, 2). Although no single etiology is known to be fully responsible for the association between obesity and urolithiasis, with increasing BMI, metabolic disorders such as hypercalciuria, hyperoxaluria, hyperinsulinemia, and low urine volume may be contributing factors in patients with metabolic syndromes (3). Because of all these, obese patients are more likely to be faced with a renal stone disease (4). Consequently, it can be considered that urologists everywhere will encounter obese patients with kidney stones more frequently.

Currently, many treatment methods to eliminate renal stones are available, including extracorporeal shock wave lithotripsy (SWL), flexible ureterorenoscopy (f-URS), and percutaneous nephrolithotomy (PNL). Due to technical reasons such as thicker skin and subcutaneous tissue in obese patients, the inability to obtain clear images under fluoroscopy, and the incompatibility with a SWL table, SWL is insufficient for most cases, especially on large stones (5). The effectiveness of f-URS on kidney stones smaller than 2 cm in size has been shown in obese patients, but the need for multiple interventions as the stone size increases is an significant disadvantage (6, 7). Recently, PNL remains one of the most important treatment options for renal stone treatment (4).

Percutaneous nephrolithotomy is an effective minimally invasive surgical treatment method that is generally applied under general anesthesia in the treatment of large, multiple, and complex stones in the upper urinary system (8). On the other hand, many studies conducted in recent years have shown that regional anesthesia can be performed safely and effectively in patients undergoing PNL (9, 10). However, data regarding PNL under spinal anesthesia in obese patients is limited.

The primary aim of this comparative prospective study is to evaluate if severe obesity has any deleterious effect on the early postoperative course in patients undergoing PNL under spinal anesthesia. Secondly, it is to determine whether severe obesity changes surgical results.

Complications related to the respiratory tract during and after operations are more common in obese patients due to general anesthesia and may show a destructive course. In addition, patients can more easily tolerate the common pain problems after surgery with spinal anesthesia, and their analgesic needs are reduced. For the anesthesiologist, the separation of obese patients from postoperative positive pressure ventilators is quite challenging, and it requires great effort to provide spontaneous breathing (9, 10). Considering all this, we think that the prevention of complications due to general anesthesia that may be encountered during early postoperative period will increase the surgical success by all means.

MATERIAL AND METHOD

Patients undergoing PNL were prospectively included between May 2017 and November 2017 for this study that took place in the Urology Clinic of Health Sciences University Konya Training and Research Hospital. The patients were divided into 2 groups according to their body mass index (BMI). Accordingly, those with BMI<35 kg/m^2 formed the first group while the severely obese BMI>35 kg/m^2 formed the second group. Exclusion criteria were defined as chronic renal failure, congenital anomalies of the kidney (horseshoe kidney, etc.), and patients with solitary kidneys. Age, gender, median stone burden, pre/postoperative hemoglobin (Hb) levels, number and regions of access, duration of surgery, perioperative complications and Visual Analogue Scale (VAS) score at 24 hours, Post Anesthesia Care Unit (PACU) admission/discharge Aldrete scores, and PACU length of stay were recorded. The Aldrete score is utilized to evaluate patients to see if they can be safely discharged from the PACU (11). Patients should be scored at least 9 out of 10 to be discharged from the PACU. Additionally, the time interval between the admission and discharge from the PACU seems to be a good marker for early postoperative recovery. The stone burden was obtained by the formula lengthxwidthxπx0.25 in mm^2.

All surgeries were performed by the same team. Prior to the procedure, all patients were hydrated using a 20 mg/

kg saline bolus to prevent hypotension. Spinal anesthesia was performed in the sitting position using a 25 Gauge Whitacre needle at the estimated L3-4 or L4-5 interspace, and 15 mg of hyperbaric bupivacaine was injected. Sensory block height was examined using ice, and 5 minutes after spinal anesthesia, the dermatome level was recorded. It is left to the anesthesiologist to decide whether the operation will be started or not. After spinal anesthesia induction, all patients were sedated using bolus doses of 1 mg midazolam to reach the 2 mg Ramsey sedation score, and the same bolus doses were used to maintain the same sedation level.

After the 6 Fr open-ended ureteral catheter and 14 Fr Foley catheter were placed in the lithotomy position, the patients were placed in the prone position for PNL. A fluoroscopy was used to determine access and obtain stone status during surgery. For access, a 0.038-inch guidewire was used to guide the dilation achieved through an 18 Gauge needle and Amplatz dilators (up to 30 Fr). The stones were visualized using a 26 Fr nephroscope, and a pneumatic lithotripter was used for lithotripsy. Stones were removed using forceps. A 14 Fr nephrostomy tube was placed in all patients. The urethral catheter was removed, and Hb values were obtained on the first postoperative day. The nephrostomy tubes of the patients were removed on the second postoperative day, and the patient was discharged on the same day after observing that there was no leakage from the Access point. When patients needed analgesics on the first postoperative day, paracetamol was used initially, and tramadol was added to the treatment if sufficient pain palliation was not achieved. The total permissible doses of paracetamol and tramadol were 4 g/day and 400 mg/day, respectively.

Continuous variables for statistical analysis were given as mean or median (interquartile range) when necessary. Categorical values are given as frequency or percentage. T-test, Welch T-test, and Mann Whitney U tests were used for continuous variables. A chi-square test was used for categorical variables. A p value of <0.05 was considered statistically significant. SAS University Edition was used for statistical analysis.

Approval for this study was obtained from the Ethics Committee of Selçuk University (Date: 13.04.2017, No: 137).

RESULTS

The whole study cohort consisted of 100 patients (50 patients in both groups) with a mean age of 49.6±13.4 years. There were 62 males (62%) and 38 females (38%). The mean age of patients in group 1 was 46.5±15.2 while it was 52.2±10.8 in group 2 (p=0.02). Group 1 consisted of 36 males (72%) and 14 females (28%) whilst group 2 included 26 males (52%) and 24 females (48%) (p=0.04) (Table 1).

Mean BMIs were 22.3±2.8 kg/m^2 and 37.6±4.9 kg/m^2 in groups 1 and 2, respectively (p<0.001). The duration of surgery was 68.3±25.6 mins in group 1, and it was 77.5±28.6 mins in group 2 (p=0.09). The median stone burden of the first group was 282.3 mm^2 (range 131.7-477.3 mm^2) while the second group had a median 289.7mm^2 (range 139.3-520.9 mm^2) stone burden (p=0.08). An overview of the patient data is given in Table 1.

Pre and postoperative Hb levels were similar in both groups (14.3±2.0 and 12.3±1.9 in group 1, 14.2±1.9 and 12.2±1.8 in group 2) (p=0.86). Subcostal access was used in 45 patients (90%) in group 1, and intercostal access

Table 1: Overview of two groups

	Group 1 BMI <35 kg/m^2	Group 2 BMI ≥35 kg/m^2	p
Patient number	50	50	1
Gender (%)			
Male	36 (72%)	26 (52%)	**0.04**
Female	14 (28%)	24 (48%)	
Mean age, year (SD)	46.58 (15,24)	52.62 (10.81)	**0.02**
Mean BMI, kg/m^2 (SD)	22.30 (2,86)	37.65 (4.98)	
Laterality, n (%)			
Right	20 (40%)	22 (44%)	0.69
Left	30 (60%)	28 (56%)	
Access site (%)			
Subcostal	45 (90%)	39 (78%)	0.1
Intercostal	5 (10%)	11 (22%)	
Duration of surgery, min (SD)	68.36 (25,63)	77.50 (28.60)	0.09

Table 2: Postoperative parameters of patients

	Group 1 BMI <35 kg/m²	Group 2 BMI ≥35 kg/m²	p
Time interval at the PACU, min (SD)	39.04 (7.54)	58.48 (14.06)	<**0.0001**
PACU admission Aldrete score, n (SD)	9.02 (.071)	8.2 (0.88)	**<0.0001**
PACU discharge Aldrete score, n (SD)	9.9 (0.3)	9.62 (0.49)	**0.03**
Total Parasetamol dose, mg (Q1-Q3)	500 (0-1000)	500 (0-500)	0.15
Total Tramadol dose, mg (Q1-Q3)	100 (100-200)	100 (0-200)	0.91
VAS score at 24th hour (SD)	5.02 (1.35)	5.34 (1.84)	0.32
Length of hospital stay, day (SD)	3.30 (1.34)	3.08 (1.07)	0.36

was used in 5 (10%) while 39 patients (78%) in group 2 received subcostal access whereas 11 (22%) received intercostal access (p=0.1). VAS score at the postoperative 24th hour was 5.0±1.3 in group 1 while it was 5.3±1.8 in group 2 (p=0.32). On the other hand, the length of the hospital stay was 3.3±1.3 days in patients with BMI <35 kg/m² and 3.0±1.0 in patients with BMI ≥35 kg/m² (p=0.36).

Stone-free status was achieved in 97 patients in the study. Therefore, the overall stone-free rate (SFR) rate was 97%. According to the groups, a 98% stone-free rate was found in the severely obese group and a 96% rate in the normal BMI group, and there was no significant difference between the groups (p=0.672).

PACU admission Aldrete scores showed a statistically significant difference (9.0±0.7 in group 1 and 8.2±0.8 in group 2, p<0.0001). Also, there was a statistically significant difference in terms of PACU discharge Aldrete scores between groups (9.9±0.3 vs. 9.6±0.4 in groups 1 and 2, respectively) (p=0.03). Finally, the time interval in the PACU was 39.0±7.5 mins in group 1 while it was 58.8±14.0 mins in group 2 (p<0.0001).

In regards to the analgesic dose required, the mean paracetamol and tramadol use in the first 24 hours was 500 mg (0-1000) and 100 mg (100-200), respectively in group 1 where it was 500 mg (0-500) and 100 mg (0-200) in group 2. There was no statistically significant difference between the groups (p=0.15 and 0.91 for paracetamol and tramadol, respectively). Table 2 gives a summary of the postoperative findings.

DISCUSSION

To our knowledge, there is inadequately published literature on the use of regional anesthesia in obese patients who are undergoing PNL. This forms the basis of our current study.

In obese patients, anesthetic, surgical techniques, and pre-surgical problems can be challenging for urologists (12). Excessive fat tissue decreases the image quality of fluoroscopy screening and reduces the accuracy of defining the appropriate calyx or stone during access. Additionally, identifying a landmark at the beginning of the operation is complicated in obese patients. Also, accessing the pelvicalyceal system and dilating the tract is more challenging. Additionally, an adequate length of a working sheath and working instruments in obese patients has adverse effects on PNL outcomes (13, 14).

PNL was originally performed under general anesthesia (15). Particularly in obese patients, with general anesthesia, there is a risk of tube displacement during change of position from supine to prone, and this carries a higher risk of pulmonary complications, such as reduction in total lung capacity, expiratory lung volume, and functional residual capacity (16). For this reason, a PNL operation was performed in some centers in a supine position instead of a prone position, and it was shown that the operation time was shorter while stone-free, complication, blood transfusion, and postoperative fever rates were similar (17, 18).

Spinal anesthesia generally has a less side effect profile than general anesthesia and is a more economical method (19, 20). Also, the ability to easily change the patient's position during anesthesia is another advantage of spinal anesthesia.

The first description of PNL with regional anesthesia was reported in 1988. The authors evaluated 112 patients who underwent PNL with epidural anesthesia. The authors reported that when compared with local anesthesia associated with sedative analgesia or general anesthesia, epidural anesthesia appeared to be more convenient (21).

Various studies reported comparatively similar results in obese patients in terms of the duration of surgery, the length of the hospital stay, and the Hb drop, in addition to a global study that looked at 5803 patients with different BMI groups and revealed only a longer duration of surgery in morbidly obese patients (22-24). In a recent meta-analysis, PNL in obese patients was shown to have

similar surgical outcomes compared with non-obese counterparts, along with shorter lengths of hospital stays (2). In the study by Kuzgunbay et al. comparing the PNL operations performed under spinal and general anesthesia, they found no statistically significant difference between the two groups in terms of stone-free and complications (16).

Our results show similar results for PNL under spinal anesthesia with no statistically significant differences between the two groups in terms of duration of surgery, Hb drop, and the length of hospital stay. Furthermore, our results indicate there is no difference in mean analgesic use in obese patients, which is in accordance with previous studies.

Another aspect of surgery that should be taken into account is the recovery period. Patients are transferred to PACU after extubating and stay there until they become fit for discharge to their rooms. The Aldrete scoring system is the most widely used clinical tool to assess the physical status of patients recovering from anesthesia (26). Patients need to have at least 9 points out of 10 for a safe discharge. In a study comparing general anesthesia and segmental epidural anesthesia for PNL, the time it took to reach Aldrete's score of 9 was 27.2±5.6 for general anesthesia and 10.4±4.1 for segmental epidural anesthesia. The mean BMI of the study cohort was 22 kg/m^2 with no statistical difference between groups (27). Our results revealed a lower PACU admission Aldrete score, a lower PACU discharge score, and a longer interval in PACU for patients with BMI ≥35 kg/m^2. Therefore, severely obese patients may be informed that it would take a longer time for them to be brought back to their rooms. Moreover, the result of our study showed VAS scores at the postoperative 24th hour are similar in the two groups.

The main limitation of our prospective study is the relatively small number of patients. In addition, age groups were not statistically similar even though the difference between means of the groups is 6 years. We believe that this is a consequence of the peak incidence of obesity, which is observed between 55-65 years of age (28). Also, females were statistically more frequent in group 2 which is possibly a result of female predominance in obesity in the world, as well as in our country (29).

CONCLUSION

Severe obesity does not alter surgical outcomes in patients undergoing PNL under spinal anesthesia, and in our opinion, spinal anesthesia in PNL is a safe and effective anesthesia modality for renal stone(s) in obese and morbidly obese patients. The role of spinal anesthesia must be investigated by further prospective, randomized studies with larger patient volumes.

Ethics Committee Approval: This study was approved by the Selcuk University, Non-Interventional Clinical Research Ethics Committee (Date: 13.04.2017, No: 137).

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