Original Article

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Predictive Value of the Mayo Adhesive Probability Score for Outcomes in Open and Laparoscopic Partial Nephrectomy

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Abstract

Objective: The Mayo adhesive probability (MAP) score is used to predict the presence of adherent perinephric fat. The study aimed to assess the impact of MAP score on intra- and postoperative outcomes in partial nephrectomy (PN).

Materials and Methods: This retrospective analysis encompassed 130 patients treated with either open or laparoscopic PN. MAP scores were calculated, and their relevance to intra- and postoperative characteristics was evaluated.

Results: Cases were seperated into 2 groups according to MAP scores [group 1: MAP score ≤2 (n=86 (66.15%) and group 2: MAP score ≥3 (n=44 (33.85%)]. No significant differences were observed in age, tumor size, body mass index, PN laterality, or radius, exophytic/endophytic, nearness, anterior/posterior location, and preoperative aspects and dimensions used for an anatomical nephrometry scores. Male patients, as well as those with higher American Society of Anesthesiologists scores (≥2) and Charlson comorbidity index (≥4), demonstrated significantly elevated MAP scores (p<0.001, p=0.046, p=0.022). Median operation time was longer [135 (interquartile range (IQR): 120-180) vs 160 (IQR: 140-180) min] in group 2 (p=0.014). Although duration of WIT [28 (IQR: 19.5-37.5) vs 33.5 (IQR: 21.75-41.25) min] and intraoperative bleeding [400 (IQR: 200-700) vs 500 (IQR: 200-900) mL] were higher in group 2, no statistically significant difference was observed (p=0.262, p=0.352). No significant differences were observed regarding intra- and postoperative transfusion requirements or hospital length of stay.

Conclusion: Elevated MAP scores are linked to longer operative times, while having a minimal effect on intra- and postoperative complications and outcomes.

Keywords: Complications, partial nephrectomy, laparoscopic surgery, renal cell carcinoma

Introduction

Partial nephrectomy (PN) is commonly selected for managing small renal masses in suitable patients, as it offers notable benefits regarding oncologic control, preservation of renal function, and overall quality of life (1,2). Various nephrometry scoring systems (NSS) are used to assess surgical complexity of PN for many years, such as preoperative aspects and dimensions used for an anatomical (PADUA) and radius, exophytic/endophytic, nearness, anterior/posterior location (RENAL) (3,4). These scoring systems were designed to standardize the measurement of renal tumor size, location, and depth. The scores obtained from these systems aim to provide objective results for decision-making regarding PN and assess the risks of complications. These imaging-based NSS are beneficial in terms of PN complexity, complication risk assessment and functional outcome prediction (4).

Not only tumor-specific but also patient-related factors may influence PN outcomes. Among them, the structure of perinephric adipose tissue plays an important role. Adherent perinephric fat (APF), characterized by tenacious visceral fat situated between Gerota's fascia and the renal parenchyma, has been linked to prolonged operation time (OT), higher intraoperative blood loss, and an increased likelihood of conversion to an open approach (5,6). The Mayo adhesive probability (MAP) score was created to estimate the likelihood of APF by incorporating two radiologic parameters: posterior perinephric fat thickness (PNFT) and the

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extent of perinephric stranding (PNS) (7). High MAP value was associated with both APF and various intra- and postoperative characteristics in PN (5).

With this study we aimed to assess the potential clinical efficacy of the MAP score in patients who underwent open PN (OPN) or laparoscopic PN (LPN), through identifying factors affecting the MAP score and evaluating intra- and postoperative parameters of PN patients according to their MAP scores.

Materials and Methods

Patient Selection and Study Design

This study conducted retrospectively at a single center for participant enrollment. It was performed in accordance with the established protocol and Good Clinical Practice (GCP) guidelines, as outlined in: ICH harmonized tripartite guidelines for GCP (1996) and the Declaration of Helsinki on medical research involving human participants (originally adopted in Helsinki, 1964; amended in Tokyo, 1975; Venice, 1983; Hong Kong, 1989; and Somerset West, 1996). The study was authorized by the Institutional Review Board and approved by the Institutional Ethics Committee of Marmara University (protocol no: 09.2025.25-0149, date: 11.03.2025).

Patients treated with PN for a renal mass between December 2021 and December 2024 were consecutively enrolled in the study. The data of the patients whose abdominal imaging studies were obtained were evaluated retrospectively. PN was performed OPN or LPN. Patient's age, sex, body mass index (BMI), American Society of Anesthesiologists (ASA) score, Charlson comorbidity index were recorded. Tumor characteristics (tumor size, RENAL and PADUA score) detected by imaging methods and results reported in postoperative tumor pathology (T stage, Fuhrman grade, surgical margin, etc.) were collected. In addition, complications, OT, warm ischemia time (WIT), estimated blood loss (EBL) etc. and postoperative characteristics (hospitalization time, transfusion requirement, renal function, etc.) were recorded for statistical analysis.

Radiologic Evaluation and Image Interpretation

Perinephric fat thickness and PNS grade were assessed using preoperative contrast-enhanced computed tomography (CT) or T1-weighted magnetic resonance imaging (MRI). CT evaluations were performed using a 256-slice scanner (Brilliance ICT-256, Philips Healthcare, Eindhoven, the Netherlands), whereas MRI examinations were obtained with a 3T Philips Ingenia system (Philips Healthcare, Eindhoven, Netherlands). All measurements were taken from axial CT sections at the axial level corresponding to the renal vein side scheduled for PN (7,8). The lateral PNFT was defined as the distance from the renal capsule to the posterolateral abdominal wall measured parallel to the renal vein, while the posterior PNFT was assessed as the straight-line distance from the renal capsule to the posterior abdominal wall (7,8). Perirenal stranding, defined as a linear area of soft tissue density within the perinephric space, was documented for each kidney on MRI or CT scans when present and categorized according to its severity. Stranding was graded according to the MAP Score as 0 (absent), type 1 (mild, thin rim of stranding), or type 2 (severe, diffuse, thick stranding) (7). MAP score was calculated by summing the posterior PNFT and PNS scores (Figure 1).

All patient data were reviewed using two PACS systems (Novapacs, Novarad Corporation, United States of America) by two radiologists with 2 and 27 years of experience, respectively. Each radiologist independently evaluated the imaging studies while blinded to clinical outcomes, and recorded their findings. The data were then cross-checked, and any discrepancies (n=2) were reassessed together to reach a consensus. Subsequent comparisons were made between patients who underwent open versus LPN in terms of measurements and postoperative complications.

Surgical Technique

All procedures were conducted at a single institution. LPN was carried out through a transperitoneal route using three or four trocars with the patient positioned in lateral decubitus. OPN was performed retroperitoneally in the same position, utilizing a flank incision with a median length of 14 cm (range 12-15 cm). All operations were undertaken by surgeons who had a minimum of ten years of clinical experience in this field. Both LPN and OPN patients, the collecting system was closed if necessary and renorrhaphy was performed. In all patients, hemostatic agent was placed in the surgical field after tumor removal and hemostatic management.

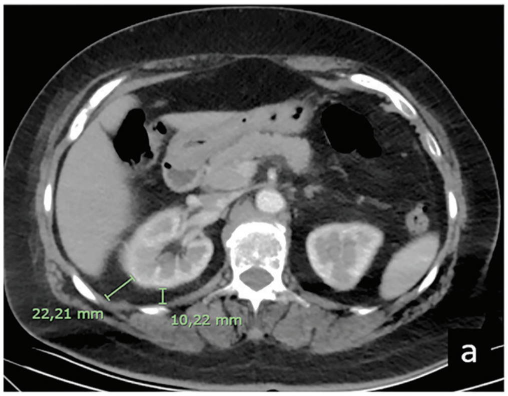
Statistical Analysis

Statistical analyses were performed using IBM SPSS version 25.0. Normality tests were initially applied to evaluate the distribution of the data. Continuous variables are presented as median, mean, minimum, and maximum values, whereas categorical variables are expressed as counts and percentages. The chi-square test was used for categorical variables. The Mann-Whitney U test was applied to compare the patient and control groups due to non-normal distribution of the data. For normally distributed parameters, the independent samples t-test was utilized. A p-value of <0.05 was considered statistically significant.

Results

The study comprised 130 cases with available CT or MRI images. Among them, 78% (n=101) underwent CT scans, while 22% (n=29) had MRI scans, all of which were retrospectively evaluated. Clear renal cell carcinoma (RCC) was the most frequent pathological subtype identified in the surgical specimens (n=85, 66.2%). Fourteen (11%) patients had chromophobe RCC and 6 (4.7%) had papillary RCC. Nine (7.1%) patients had oncocytoma and 10 (7.9%) had angiomyolipoma. Regarding staging of the tumors, 88 (87.1%) were stage T1, 6 (5.9%) were T2 and 7 (6.9%) were T3. Majority of the patients had Fuhrman grade 1 (12.6%) and Fuhrman grade 2 (66.3%) RCC on pathology. Positive surgical margins were observed in only 2 patients (1.6%).

Demographic, preoperative, and postoperative characteristics of the patients are summarized in Table 1. The mean age was 57.57±12.12 years, with 86 patients (63.2%) being male and 50 (36.8%) female. The median BMI of the patients was



		Scoring
Posterior Perinephric Fat Thickness (PNFT) (mm)	**<10**	**0**
	10-19	**1**
	≥20	**2**
Perinephric Stranding (PNS) (Grade)	**None**	**0**
	Type 1	**2**
	Type 2	**3**
Mayo Adhesive Probability Score = posterior PNFT + PNS		

Figure 1. The scoring of perinephritic fat thickness and perinephritic stranding

a: Lateral PNFT was measured from the renal capsule to posterolateral abdominal wall in parallel to the renal vein and posterior PNFT was measured from the renal capsule to the posterior abdominal wall as a direct line. Stranding was graded as 0 (b: no stranding), type 1 (c: thin rimlike mild stranding), or type 2 (d: diffuse, thick banded severe stranding). The Mayo adhesion probability (MAP) score was obtained by summing the posterior PNFT and PNS scores

PNFT: Perinephritic fat thickness, PNS: Perinephritic stranding

28.72 [interquartile range (IQR): 25.85-31.135)]. Seventy-three (53.7%) patients underwent right sided PN while 63 (46.3%) underwent left PN. Off-clamp PN was performed for 61 patient. Remaining 69 patients' WIT time was 37 minutes (IQR: 28-42) for laparoscopic cases and 23.5 minutes (IQR: 16.25-33.5) for open cases. Patients had a median ASA score of 2 (IQR: 1-2) and median Charlson comorbidity index of 3 (IQR: 2-4). The median tumor size was 31 mm (IQR: 23-44.75). The median RENAL nephrometry score was 5 (IQR: 4-6), and the median PADUA nephrometry score was 7 (IQR: 6-8). The median OT was 140 (IQR: 120-180) minutes. Median intraoperative EBL was 400 mL (IQR: 200-800) and the median hospital stay was 5 (IQR: 3-6) days. The median measured posterior PNFT was 14 mm (IQR: 9-21) and posterolateral PNFT was 17 mm (IQR: 12-25). Median MAP score was calculated as 2 (IQR: 1-3) in patients whose PNS scores were summed with posterior PNFT.

Patients were divided into group 1 [MAP score ≤2 points, n=86 (66.15%)] and group 2 [MAP score ≥3 points, n=44 (33.85%)] (Table 2). No statistically significant difference was observed in age [(56.43 (±12.26) vs 60.68 (±1.36)], BMI [28.12 (25.4-31.25) vs 29.31 (26.41-31.45)] and PN side [right side 50 (58.1%) vs 21 (47.7%)] (p=0.1, p=0.14, p=0.259 respectively). Tumor size, RENAL and PADUA nephrometry score were similar between the groups (p=0.275, p=0.296, p=0.181 respectively). Male patients [42 (48.8%) vs 39 (88.6%)] had significantly higher MAP scores (p<0.001). Patients in group 2 had a higher ASA score [1 (1-2) vs 2 (1-2)] and higher Charlson comorbidity index confidence interval [3 (2-4) vs 4 (3-5)] (p=0.046, p=0.022, respectively).

Median OT was significantly higher [135 (IQR: 120-180) min vs 160 (IQR: 140-180) min] in group 2 (p=0.014). According to the MAP score, although the duration of WIT [28 (IQR: 19.5-37.5) vs 33.5 (IQR: 21.75-41.25) min] and the intraoperative EBL [400 (IQR: 200-700) vs. 500 (IQR: 200-900) mL] were higher in group 2 patients, no statistically significant difference was observed (p=0.262, p=0.352 respectively). There was no difference between group 1 and 2 in terms of peri- and postoperative transfusion requirements and length of hospital stay (p=0.906, p=0.876, p=0.533 respectively). Effect size analysis showed a small but significant effect size for OT (r=0.216), while other parameters (WIT: r=-0.151, EBL: r=-0.083, hospital stay: r=-0.055) demonstrated negligible effects without statistical significance (Figure 2).

Fifty-four of the patients (41.54%) underwent LPN and 76 (58.46%) underwent OPN. Patients who underwent OPN and LPN were evaluated separately according to MAP score and their surgical characteristics are shown in Table 3. In OPN patients, OT was significantly longer in those with higher MAP scores (p=0.013). Although OT was also higher in LPN patients with elevated MAP scores, the difference was not statistically significant (p=0.275). WIT and EBL tended to be higher in both OPN and LPN patients with MAP scores ≥3, but these differences

Table 1. Demographic, preoperative and postoperative characteristics of patients		
		PN patients (n=130)
Age (year) mean ± SD		57.57±12.12
BMI (kg/m²) median (IQR)		28.72 (25.85-31.135)
PN side n (%)	Right	73 (53.7)
	Left	63 (46.3)
Gender n (%)	Male	86 (63.2)
	Female	50 (36.8)
Surgery type n (%)	Laparoscopic	54 (41.54)
	Open	76 (58.46)
ASA score median (IQR)		2 (1-2)
Charlson comorbidity index median (IQR)		3 (2-4)
Tumor size (mm) median (IQR)		31 (23-44.75)
RENAL score median (IQR)		5 (4-6)
PADUA score median (IQR)		7 (6-8)
Operation time (min) median (IQR)		140 (120-180)
WIT median (IQR)		30 (19.25-38.75)
Perioperative bleeding amount (mL) median (IQR)		400 (200-800)
Perioperative transfusion requirement n (%)		21 (15.4)
Postoperative transfusion requirement (n) %		17 (12.5)
Number of hospitalization day median (IQR)		5 (3-6)
Posterior PNFT median (IQR)		14 (9-21)
Posterolateral PNFT median (IQR)		17 (12-25)
Posterior PNFT score n (%)	<10 mm	33 (25.2)
	10-19 mm	61 (46.6)
	>20 mm	37 (28.2)
PNS (n) %	No	80 (61.1)
	Type 1	49 (37.4)
	Type 2	2 (1.5)
MAP score median (IQR)		2 (1-3)

BMI: Body mass index, PN: Partial nephrectomy, RENAL: Radius, Exophtic/endophtic, nearest, anterior/posterior, location, PADUA: Preoperative aspects and dimensions used for an anatomical, ASA: American Society of Anaesthesiologists, WIT: Warm ischemia time, PNFT: Perinephric fat thickness, PNS: Perinephric stranding, MAP: Mayo adhesive probability, IQR: Interquartile range, SD: Standard deviation

did not reach statistical significance ($p>0.05$). No significant differences were observed in peri- or postoperative transfusion requirements or hospital length of stay.

Discussion

PN is the preferred approach for T1 renal tumors and may also be appropriate for certain larger tumors if technically achievable (1). Both laparoscopic and OPN are commonly used for appropriate renal masses, with comparable functional and oncologic outcomes (9). In our study, tumor features, surgical parameters, and pathological outcomes were consistent with previous reports (9,10). The majority of our patients were male (11,12). The most tumors were classified as T1a or T1b (87.6%). Additionally, the majority of lesions were Fuhrman grade 1 or 2, in line with similar cohorts (12-14). OT and WIT in our study were also comparable to previously published data, where OT typically approaches 2 hours and WIT remains below 30 minutes (5,14).

There are some imaging-based nephrometry scores (RENAL, PADUA) used to assess PN complexity, which usually include anatomical information such as tumor size, tumor location, and tumor depth. However, patient-related characteristics such as APF, PNFT, PNS have also been reported to affect some intraoperative and postoperative outcomes (6,15). The clinical significance of various measurements obtained from imaging methods such as PNFT and PNS has been evaluated in various studies (8). There was a correlation in the posterior and posterolateral measurements of PNFT (8). We measured not only posterior PNFT but also posterolateral PNFT in our study to evaluate this relation. Posterolateral PNFT measurement had similar clinical features as the posterior PFNT. MAP score was found to be consistent with both posterior PNFT and posterolateral PNFT in our study (16).

Davidiuk et al. (7) employed the MAP score, which combines posterior PNFT and PNS, to anticipate the occurrence of APF in patients. The MAP score is linked to APF and various operative characteristics (6,7,17). Perirenal adipose tissue was found to be thicker in men compared to women (8). Therefore, as supported by our study, MAP score ≥3 was significantly more frequently observed in men (16,18). Studies have reported that older age and high BMI are also associated with high MAP score (7,16,18). However, there may be a weak relationship between BMI and perirenal fat (8). In our study, although patients in group 2 were older and had higher BMI compared with group 1, these differences were not statistically significant. Nonetheless, despite the lack of statistical significance, these trends may still be clinically relevant, as increased age and BMI could potentially complicate perioperative management and surgical planning.

Hypertension and diabetes may be considered as risk factors for high APF and MAP scores (6,16). When patient comorbidities are considered, MAP score was higher in our patients with high ASA score and high Charlson comorbidity index. However, tumor-related factors do not seem to be correlated with the MAP score. There was no apparent relation between tumor size, stage, grade, pathology (benign or malignant) or histology of the malignancy and MAP score (16,18). In the present study, according to the MAP scores, there was no difference in tumor size, tumor pathology, PADUA and RENAL nephrometry scores between the groups.

Several studies have explored the association between APF and high MAP scores, suggesting that a higher MAP score may serve as a predictor of APF and influence surgical decision-making, particularly the choice between open and robotic approaches. For example, Walach et al. (18) found that patients with MAP scores ≥3 had a higher likelihood of undergo OPN (53%), while those with MAP scores ≤2 were more commonly treated with robotic surgery (58%). While a high MAP score has been suggested to affect the selection of surgical approach, our analysis found no significant difference in MAP scores between cases undergoing open versus LPN (18).

Table 2. Comparison of Patients based on the Mayo adhesive probability score				
		Group 1 (MAP score ≤2) n=86 (66.15%)	Group 2 (MAP score ≥3) n=44 (33.85%)	p-value
Age (year) mean ± SD		56.43±12.26	60.68±11.36	0.1
BMI (kg/m²) median (IQR)		28.12 (25.4-31.25)	29.31 (26.41-31.45)	0.14
PN Side n (%)	Right	50 (58.1)	21 (47.7)	0.259
	Left	36 (41.9)	23 (52.3)	
Sex n (%)	Male	42 (48.8)	39 (88.6)	**<0.001**
	Female	44 (51.2)	5 (11.4)	
Surgery type n (%)	Laparoscopic	37(43)	17(38.6)	0.631
	Open	49 (57)	27 (61.4)	
ASA score median (IQR)		1 (1-2)	2 (1-2)	**0.046**
Charlson comorbidity index median (IQR)		3 (2-4)	4 (3-5)	**0.022**
Tumor size (mm) median (IQR)		30 (23-41.25)	35.5 (22.5-64.25)	0.275
RENAL score median (IQR)		5 (4-6)	5 (4-6)	0.296
PADUA score median (IQR)		7 (6-8)	7 (6-8)	0.181
Operation time (min) median (IQR)		135 (120-180)	160 (140-180)	**0.014**
WIT median (IQR)		28 (19.5-37.5)	31.5 (21.75-41.25)	0.262
Peroperative EBL (mL) median (IQR)		400 (200-700)	500 (200-900)	0.352
Perioperative transfusion requirement n (%)		13 (15.1)	7 (15.9)	0.906
Postioperative transfusion requirement (n) %		9 (10.5)	5 (11.5)	0.876
Number of hospitalization day, days median (IQR)		5 (3.25-6)	5 (3-6)	0.533
Posterior PNFT, mm median (IQR)		11 (7-17)	19 (14-24.75)	**<0.001**
Posterolateral PNFT, mm median (IQR)		15 (9.75-20)	23 (19-30.75)	**<0.001**
Posterior PNFT score n (%)	<10 mm	32 (37.2)	1 (2.3)	**<0.001**
	10-19 mm	38 (44.2)	22 (50)	
	>20 mm	16 (18.6)	21 (56.8)	
PNS (n) %	No	79 (91.9)	0	**<0.001**
	Type 1	7 (8.1)	42 (95.5)	
	Type 2	0	2 (4.5)	

BMI: Body mass index, PN: Partial nephrectomy, RENAL: Radius, exophtic/endophtic, nearest, anterior/posterior, location, PADUA: Preoperative aspects and dimensions used for an anatomical, ASA: American Society of Anaesthesiologists Score, WIT: Warm ischemia time, PNFT: Perinephric fat thickness, PNS: Perinephric stranding, MAP: Mayo adhesive probability score, EBL: Estimated blood loss, IQR: Interquartile range, SD: Standard deviation

Patients with high MAP scores have a statistically significant higher OT regardless of surgical technique (11-13,17,18). In our study, OT was significantly longer in group 2 compared with group 1 across all cases. When subgroup analyses were performed according to type of surgery, in patients who underwent LPN, although OT was higher in MAP score ≥3 patients, no significant differences were observed between the groups. Still, this finding may carry clinical relevance, as even modest increases in operative time can impact perioperative risk, anesthesia duration, and resource utilization. However, in patients who underwent OPN, the OT was again significantly high in MAP score ≥3 patients when compared with patients in MAP score ≤2 patients. Yao et al. (12) reported that increased dissection time due to APF prolonged the operation duration in LPN patients with high MAP score, but did not change the WIT time due to renal artery clamping after perirenal fat removal. APF occurrence may be linked to higher MAP scores and prolonged WIT (19). Patients with a MAP score ≥3 exhibited longer WIT in the OPN, LPN, and overall patient groups. However, consistent with previous studies, no significant differences in WIT were observed between groups based on MAP scores (12,18).

Elevated APF and MAP scores are linked to a greater risk of complications and perioperative bleeding (6,13). High MAP scores were associated with increased EBL across all surgical approaches, including open, laparoscopic, and robotic PN (6,12,17). EBL is found to be higher in patients with MAP score ≥3 (18). In our study, peroperative EBL was higher in OPN, LPN patients with MAP score ≥3, but no statistically significant difference was observed. Davidiuk et al. (20) suggested that while APF may lead to slightly longer OT, it does not appear to significantly impact clinically relevant outcomes such as complication rates, transfusion requirements, or length of

Table 3. Operation characteristics of open and laparoscopic partial nephrectomy patients according to mayo adhesive probability score			
Open PN patients (n=76)	**MAP score ≤2 n=49 (64.5%)**	**MAP score ≥3 n=27 (35.5%)**	**p-value**
Operation time (min) median (IQR)	130 (120-175)	160 (140-180)	**0.013**
WIT median (IQR)	24 (17-34)	32.5 (15.75-34.75)	0.632
Peroperative EBL (mL) median (IQR)	550 (300-850)	750 (475-1075)	0.114
Peroperative transfusion requirement n (%)	10 (20.4%)	6 (22.2%)	0.853
Postoperative transfusion requirement (n) %	8 (16.3%)	4 (14.8%)	0.863
Number of hospitalization day median (IQR)	5 (4-7)	6 (4-9.25)	0.38
Laparoscopic PN patients (n=54)	**MAP score ≤2 n=37 (68.5%)**	**MAP score ≥3 n=17 (31.5%)**	**p-value**
Operation time (min) median (IQR)	140 (112.5-180)	150 (126-197.5)	0.275
WIT median (IQR)	30 (26.2-39.25)	42,5 (30.5-53.5)	0.116
Perioperative EBL (mL) median (IQR)	125 (100-300)	225 (150-300)	0.176
Perioperative transfusion requirement n (%)	1 (5.9%)	3 (8.1%)	0.772
Postoperative transfusion requirement (n) %	1 (2.7%)	1 (5.9%)	0.566
Number of hospitalization day median (IQR)	5 (3-5)	4 (3-6)	0.798
PN: Partial nephrectomy, WIT: Warm ischemia time, EBL: Estimated blood loss, MAP: Mayo adhesive probability, IQR: Interquartile range			

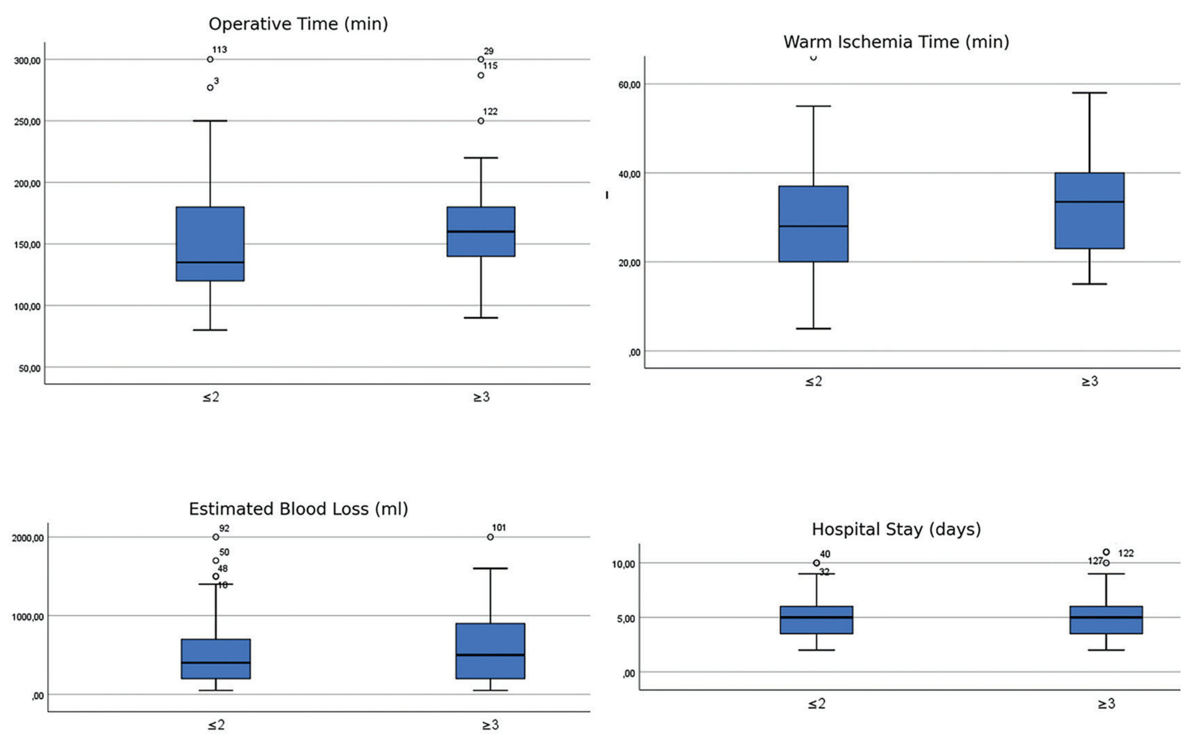


Figure 2. Comparison of surgical outcomes by MAP score group

Box plots show the operation time (OT), warm ischemia time (WIT), estimated blood loss (EBL), and length of hospital stay according to MAP score groups (≤2 and ≥3). Patients with higher MAP scores (≥3) had significantly longer OT (p=0.014). WIT and EBL showed higher median values in the MAP ≥3 group without a statistically significant difference (p=0.262 and p=0.352 respectively). Hospital stay was similar between groups (p=0.533)

MAP: Mayo adhesion probability

hospital stay hence, its effect is considered clinically insignificant. Fang et al. (19) reported that while APF may prolong operative time and increase EBL, it did not significantly affect the choice of surgical approach, transfusion rates, complication rates, or postoperative length of stay. Patients with a MAP score ≥3 showed marginally higher peri- and postoperative blood transfusion needs; however, no significant differences were observed between the groups. Hospital length of stay was also comparable.

Although parameters such as OT and EBL were not statistically significant, the trends observed in patients with higher MAP scores may still be clinically relevant. Factors such as sample size could have influenced statistical significance. Even modest increases in OT, WIT, or EBL can be clinically important, particularly in patients with comorbidities or reduced renal reserve. Therefore, the MAP score may serve as a practical preoperative warning tool, helping surgeons anticipate potential challenges and allocate resources accordingly.

Study Limitations

Several limitations should be considered in interpreting the findings of this study. First, its retrospective design restricts the ability to draw causal conclusions and may introduce selection bias. Second, the relatively small sample size could have limited the statistical power to detect certain differences, particularly in postoperative outcomes. Moreover, intraoperative documentation of APF was not consistently recorded in operative reports, which constrains our capacity to validate the predictive utility of MAP scoring under real-time surgical conditions.

Despite these limitations, our results add to the expanding evidence on the utility of the MAP score in renal surgery. While higher MAP scores were associated with longer OT, they were not linked to an increased risk of intra- or postoperative complications. As such, although the MAP score may offer helpful preoperative information, it should not be the sole determinant guiding the surgical approach (open vs. laparoscopic) or the extent of resection (partial vs. radical). Rather, surgical decision-making should remain individualized, relying on a combination of imaging findings, tumor characteristics, and—importantly—the experience and judgment of the surgeon.

Conclusion

Elevated MAP score calculated from PNFT and PNS was linked to certain intra- and postoperative outcomes in both open and LPN. Male patients, patients with high ASA score (≥2) and high Charlson comorbidity index (≥4) had significantly higher MAP scores. Patients with higher MAP scores experienced significantly longer OTs. Although the WIT and the intraoperative EBL were higher, no significant difference was observed. No significant differences were observed in peri- and postoperative transfusion requirements or hospital length of stay. In conclusion, our findings suggest an association between high MAP score and prolonged OT, while its effect on intraoperative and postoperative complications and outcomes appears limited.

Ethics

Ethics Committee Approval: The study was authorized by the Institutional Review Board and approved by the Institutional Ethics Committee of Marmara University (protocol no: 09.2025.25-0149, date: 11.03.2025).

Informed Consent: Retrospective study.

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Publication: The results of the study were not published in full or in part in form of abstracts.

Contribution: There is not any contributors who may not be listed as authors.

Footnotes

Authorship Contributions

Surgical and Medical Practices: G.Ö., Y.Ş., M.K., İ.T., T.E.Ş., Concept: G.Ö., T.A., M.Y.S., Y.Ş., T.E.Ş., Design: G.Ö., C.Ç., M.K., T.E.Ş., Data Collection or Processing: G.Ö., C.Ç., İ.B.A., M.Y.S., Analysis or Interpretation: G.Ö., T.A., M.Y.S., Literature Search: G.Ö., C.Ç., T.E.Ş., Writing: G.Ö., C.Ç., T.A., T.E.Ş.

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