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Outcomes in Patients Undergoing Nephrectomy for Renal Cancer on Chronic Anticoagulation Therapy

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Abstract

Aims—To report our experience on surgical resection of renal tumors for patients with a history of chronic anticoagulation (ACT) or aspirin use.

Methods—We performed a retrospective analysis of 2,473 patients who underwent surgery for renal tumors between 2005 and 2012. Prior to surgery, 172 were on chronic ACT and 695 on aspirin. Multivariable linear and logistic regression models were used to compare transfusion and overall complication rates between patients undergoing renal surgery who were on therapy to patients who were on aspirin and to patients with no therapy.

Results—Compared to no therapy and aspirin patients those on ACT were older (57.3 (IQR 48.4–66.10) vs 63.9, (IQR 57.3–71.5) vs 68.4, (IQR 60.4–73.5); $p < 0.001$), with a higher percentage having an ASA score of 3 or 4 (42.4 vs 57.9 vs 82.6%; $p < 0.001$), respectively. ACT patients had a higher 30-day transfusion rate, 22.7% vs 7.6% vs 6.9%, and 90-day complication rate, 17.4% vs 7.2% vs 7.3%, both $p < 0.001$. The median length of stay differed statistically between groups ($p < 0.001$), with a modest longer stay in the anticoagulation group (OR 1.11 SE 0.26; $p < 0.001$). Transfusion and complication rates for patients on therapy undergoing minimally invasive surgery vs open surgery were not statistically different.

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Conflicts of Interest

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Conclusions—Patients on chronic ACT had higher transfusion and overall complication rates compared to patients on no treatment or on chronic aspirin. These findings did not correlate to clinical differences in length of stay or grade 3–5 complications.

Keywords

kidney neoplasms; nephrectomy; anticoagulants; intraoperative complications

Introduction

Detection of incidental renal masses is an increasing occurrence in our contemporary healthcare system; this is likely due to the widespread use of abdominal imaging. [1] Concurrently, improvements in health care have prolonged the lives of our patients, and many with medical conditions often requiring the use of chronic anticoagulation therapy (ACT) now face the prospect of surgery. Approximately 4 million outpatients in the United States are receiving chronic oral ACT, with warfarin being the predominant form. [2, 3] Chronic use of ACT may place these patients at increased risk for intraoperative and/or postoperative complications. Furthermore, interruption of therapy places the patient at increased risk for thromboembolic events. [4] Thus, it is crucial for patients who are on chronic ACT and undergoing elective surgery to be managed appropriately. Furthermore, aspirin as a cardioprotective agent has become a commonly prescribed medication. While it has been previously contraindicated for urological procedures, due to concerns of increased bleeding, several small retrospective studies have shown its continued use to be safe during robotic prostatectomies and during endoscopic resection of bladder cancer. [5–7]

Patients with incidental renal masses have multiple treatment options, but surgical excision with either partial nephrectomy (PN) or radical nephrectomy (RN) continues to be the standard of care. Given the small sample sizes of previous reports, [8, 9] we sought to assess the outcomes of patients who were being treated with chronic ACT following surgical treatment of their renal tumors. We compared our patients on ACT to patients on aspirin as well as to patients with no history of either therapy.

Materials and Methods

After institutional review board approval, we performed a retrospective review of data for 2473 patients who underwent renal surgery at MSKCC between January 2005 and November 2012. We identified and analyzed data for 172 patients who were on chronic ACT and 695 on chronic aspirin (either 81mg or 325mg daily) prior to renal surgery. ACT included warfarin, clopidogrel, enoxaparin sodium, and tinzaparin sodium. Patients with aspirin use were not included in our ACT cohort. The consulting medical physician discontinued ACT prior to surgery within the recommended time based on the therapy used by the patient. Chronic warfarin therapy was discontinued 5–7 days prior to surgery and those patients were bridged to a short acting anticoagulant, which was discontinued 24 hours prior to surgery. Clopidogrel was discontinued 5–7 days prior to surgery. Enoxaparin sodium and tinzaparin sodium were discontinued 24 hours prior to surgery and aspirin was stopped 5–7 days prior to the surgery. All patient stopped their ACT or aspirin prior to surgery.

Anticoagulation and aspirin therapy were restarted at time of discharge if the patient's vitals, urine output and hemoglobin remained stable. Adjuvant hemostatic agents, such as sealants, glues, and blood clot-inducing material, and meticulous intraoperative hemostasis were used for patients at the discretion of the surgeon.

All patients followed an institutionally-approved postoperative care pathway, including guidance for pain control and early ambulation beginning on postoperative day 1. This pathway was followed if no contraindications were present, such as clinical signs of bleeding and prolonged intubation or complications that may have affected the patient's recovery.

Demographic characteristics identified and reviewed for patients included age, race, body mass index (BMI), American society of anesthesiologist (ASA) score, surgical technique, and pathological stage as per the 2002 AJCC staging system. Clinical parameters analyzed included operative duration, estimated blood loss (EBL), length of stay (LOS), intraoperative and 30-day transfusion rates, as well as 90-day complication rates. Surgical complications were reported according to a previously published study on the modified Clavien classification system used by our institution.¹⁰

For univariable analyses, the Chi-square test was used for categorical variables and the Kruskal-Wallis test was used for continuous variables. Patient, disease, and operative characteristics were compared across patients receiving ACT, patients receiving no treatment, and patients on chronic aspirin. Surgical outcomes included operative duration, EBL, LOS, transfusion rates, number of packed red blood cells (pRBC) transfused, complication rates, and complication grade (1–2 vs 3–5) among those with a complication. We used multivariable linear and logistic regression models adjusting for age at surgery, BMI, ASA score, stage, and year of surgery to compare surgical outcomes between the ACT cohort, the no treatment cohort, and the chronic aspirin cohort. Additionally, among patients on chronic ACT, surgical outcomes were compared between those who underwent minimally invasive (MIS) vs open procedures and those who underwent radical nephrectomy (RN) vs partial nephrectomy (PN). MIS included both laposcopic and robot assisted surgery. All analyses were performed using SAS version 9.2 software (SAS Institute, Cary, NC).

Results

Patient demographics and tumor characteristics are found in Table 1. The median age of patients on ACT was significantly older at 68.4 years (IQR 61.2–74.3) compared to 57.3 years (IQR 48.8–66.1) for patients not on ACT and 63.9 (IQR 57.3–71.5) for patients on chronic aspirin use, $p<0.001$. Patients in the ACT cohort had a higher proportion of ASA 3 and 4 scores compared to the no therapy and aspirin users (82.6% vs 42.4% vs 57.9, respectively, $p<0.001$). We found no differences in pathological stage, the percentage of patients undergoing PN, and the percentage of patients undergoing MIS (Table 1).

The majority of our patients were prescribed either clopidogrel (97/172, 56.4%) or warfarin (67/172, 39.0%). Enoxaparin sodium (5/172, 2.9%) and tinzaparin sodium (3/172, 1.7%)

were used by the remainder of the patients. Of the 172 patients on ACT, 54 (31.4%) had cardiac arrhythmias, 63 (36.6%) had a history of coronary artery disease or of myocardial infarction, 15 (8.7%) suffered from a cerebral vascular accident, 13 (7.6%) had a history of a deep venous thrombosis (DVT), 8 (4.7%) had a history of a hypervascular state, 9 (5.2%) had a history of a pulmonary embolus (PE), 7 (4.1%) were diagnosed with peripheral vascular disease, and 3 (1.7%) had a history of valvular disease or replacement. We identified no significant difference in EBL, transfusion rates, and median number of pRBC transfused or complications between the patients on chronic clopiogrel and those on chronic warfarin.

Intraoperative and postoperative characteristics by group are found in Table 2. Median LOS for the ACT cohort and for both the aspirin and no therapy cohorts was 3 days (IQR 3–4) and 3 days (IQR 2–4) respectively ($p<0.001$). ACT was associated with higher rates of overall complications (17.4% vs 7.2% vs 7.3%, $p<0.001$), but no difference in Clavien grade 3–5 complications ($p=0.208$). Median EBL for patients on chronic ACT was 265 ml (IQR 100–450), which was not significantly different than our aspirin or no therapy cohorts, 250 ml (IQR 150–450) and 250 ml (150–500), respectively ($p=0.552$). Upon closer analysis, we did not find a difference between the cohorts regarding the median number of units transfused ($p=0.137$), or the percentage of patients receiving a transfusion of >2 units ($p=0.582$) (Table 2). One (0.5%) patients in the ACT cohort suffered a DVT, 9 (5.3%) patients suffered hemorrhage or a hematoma, and only 1 (0.5%) patient developed a new arrhythmia and no patients had a myocardial infarct. Six (0.4%) patients in the no therapy cohort and 3 (0.4%) in the aspirin cohort suffered a DVT or PE, 17 (10.6%) in the no therapy and 1 (0.1%) in the aspirin cohort suffered hemorrhage or a hematoma, and 3 (1.8%) patients in the no therapy and 2 (0.3%) in the aspirin cohort developed a new arrhythmia. One patient in the no therapy cohort and 3 (0.4%) patients in the aspirin cohort suffered from a myocardial infarct. The 30-day readmission rate for the anticoagulation cohort was 8.7% and the 90-day readmission rate was 9.3%. Only four patients (2.3%), 2 after robotic partial and 2 after open partial nephrectomy, required readmission for bleeding complications. All four patients were admitted within 30 days.

We analyzed the patients in the ACT cohort who underwent either MIS or open surgery. The only difference identified was that operative time was longer for patients undergoing MIS (195.5 minutes, IQR 167–229.5) compared to those undergoing open surgery (130.5 minutes, IQR 110–172.5), $p<0.001$ (Table 3).

Comparing the anticoagulation patients who underwent RN and PN identified differences in LOS, 4 days (IQR 3,8) and 3 (IQR 2,4) days, $p<0.001$ and the median numbers of pRBC transfused 2.5 (IQR 2.0, 7.5) and 2.0 (IQR 1.0, 3.0), $p=0.0027$, respectively. We did not identify a difference in overall complication rates between the two techniques. (Table 4)

On multivariable analysis, anticoagulation was associated with increased LOS (OR 1.11 SE 0.26; $p<0.001$), increased transfusion rate (OR 3.11 95% CI 2.00–4.85; $p<0.001$) and overall complication rates (OR 2.41; 95% CI 1.50–3.87; $p<0.001$) as compared to the no treatment group.

Discussion

While it has been suggested that the discontinuation of chronic ACT is not necessary for scheduled minor operations this assumption likely does not hold true for invasive procedures such as renal surgery. [11–14] To our knowledge, we report the largest series of patients undergoing renal surgery while on chronic perioperative ACT. While our patients have their ACT and aspirin stopped their therapy preoperatively the risk of intraoperative complications, due to the long term affect of these medication is not minimal, furthermore the need to start these medications postoperatively also places them at increased risk for complications.

As expected, patients who were on chronic ACT were significantly older and a higher percentage had an ASA score of 3 or 4, placing these patients at higher risk for surgical complications. We found that while there was no significant difference in EBL between our ACT, aspirin and no therapy cohorts, a larger percentage of patients on ACT received a blood transfusion. Similarly, a study where patients underwent laparoscopic renal and adrenal surgery found that patients on ACT (n=25) had an increased transfusion rate of 24%, whereas patients not on ACT (n=762) had a transfusion rate of 5.2%. [9] In our study the transfusion rate was higher for patients on ACT, but the median number of units transfused and the percentage of patients receiving a transfusion of >2 units when compared to our aspirin and no therapy cohort's were similar. In a series of 47 patients, Kefer et al. found that patients on ACT had a lower mean EBL when compared to patients not on ACT, but that did not correlate to differences in intraoperative or postoperative transfusion rates. [8] The observed differences within our study are probably because this was a case-control study with a small amount of PN patients. While speculative, these findings may be a result of the treating surgeon's inclination to transfuse patients on ACT due to concerns of bleeding. Furthermore, 68% of our patients on ACT had associated cardiac comorbidities, which may have further influenced the treating surgeon to order a transfusion. This surgeon bias may also be reflected in the shorter operative time for patients on chronic ACT.

While continued aspirin use has been contraindicated due to concern of increased bleeding during urological surgeries many are now questioning this argument. Several studies have looked at the effects of continued aspirin during robotic prostatectomy with one study also analyzing a small cohort of nephrectomy patients. [5, 6] Parikh et al. analyzed 26 patients undergoing robotic nephrectomy, 14 on aspirin compared to 12 not on aspirin, and found no differences in blood loss, operative time and LOS. None of the patients analyzed had a transfusion. [6] Our patients stopped their aspirin use 7 days prior to surgery and thus is a different group of patients than those in the studies described above, we also did not find differences in EBL or rates of grade 3–5 complications between our aspirin, no therapy and ACT patient cohorts. While there was a statistical significant difference in LOS amongst the cohorts it was not clinically relevant. Many patients are unable to discontinue their aspirin use because of cardiac issues thus; more studies will be necessary to estimate the safety of continued aspirin use for patients undergoing urologic surgeries.

A larger portion of patients on ACT experienced any complication within 90 postoperative days. However, more patients in the no therapy cohort experienced grade 3–5 complications

than those in the ACT and aspirin cohort's, 35.6% vs 23.3% vs 24.0%, respectively, though this difference was not statistically significant. Despite an increased risk of hemorrhage or hematoma in the ACT cohort when compared to the no therapy cohort (3.5% vs 0.05%), we feel this low percentage is manageable, especially since all patients were managed with supportive care alone. On multivariable analysis, ACT was associated with an increased LOS, but both cohorts had a median LOS of 3 days. While the patients on ACT may require closer monitoring and careful postoperative care, if managed appropriately, there are no clinical differences in LOS or in grade 3–5 complications. With this in mind we feel that patients on ACT can successfully undergo renal surgery with similar outcomes to patients not on ACT. We also sought to analyze our ACT cohort by surgical technique, open vs MIS. We did not find a difference in EBL, transfusion rates, and complication rates between surgical techniques. Thus, we show that with appropriate preoperative planning and careful surgical technique, patients on chronic ACT can undergo renal surgery either by open or MIS with similar outcomes and is safe in patients who are undergoing either a PN or RN.

There are several limitations to our study. These include the lack of randomization of the ACT cohort and the possibility of selection bias when comparing this group to the no therapy cohort. Furthermore, discontinuation of ACT was not standardized, but the attending physician followed published recommendations for perioperative discontinuation. The possibility of underreporting complications is present, but this is minimized by the use of a prospectively maintained kidney cancer database monitored by an outside third party. All our patients followed an institutional-approved postoperative recovery pathway, thus receiving equal care; decisions to stray from the pathway were based on complications and at the discretion of the attending physician, which we feel is a strength of our study.

We did not find differences in transfusion rates nor complication rates between surgical techniques among patients taking chronic ACT or aspirin. Patients on chronic ACT and aspirin can successfully undergo surgical treatment for renal tumors with appropriate surgical planning and careful postoperative monitoring. Initiation of ACT at the time of discharge may lead to a small but manageable increase in postoperative hemorrhage or hematoma and should therefore not be delayed. We believe our data will provide useful information to surgeons counseling patients who are on chronic ACT and undergoing surgery for renal cancer.

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References

1. Gill IS, Aron M, Gervais DA, Jewett MA. Clinical practice. Small renal mass. The New England journal of medicine. 2010; 362:624–634. [PubMed: 20164486]
2. Wysowski DK, Nourjah P, Swartz L. Bleeding complications with warfarin use: a prevalent adverse effect resulting in regulatory action. Archives of internal medicine. 2007; 167:1414–1419. [PubMed: 17620536]

3. Garcia DA, Schwartz MJ. Warfarin therapy: tips and tools for better control. *The Journal of family practice*. 2011; 60:70–75. [PubMed: 21301641]
4. Poller L, Thomson J. Evidence for "Rebound" Hypercoagulability after Stopping Anticoagulants. *Lancet*. 1964; 2:62–64. [PubMed: 14158680]
5. Nowfar S, Kopp R, Palazzi-Churas K, Derweesh IH, Kane CJ. Initial experience with aspirin use during robotic radical prostatectomy. *Journal of laparoendoscopic & advanced surgical techniques Part A*. 2012; 22:225–229. [PubMed: 22393926]
6. Parikh A, Toepfer N, Baylor K, Henry Y, Berger P, Rukstalis D. Preoperative aspirin is safe in patients undergoing urologic robot-assisted surgery. *Journal of endourology / Endourological Society*. 2012; 26:852–856. [PubMed: 22201268]
7. Carmignani L, Picozzi S, Stubinski R, et al. Endoscopic resection of bladder cancer in patients receiving double platelet antiaggregant therapy. *Surgical endoscopy*. 2011; 25:2281–2287. [PubMed: 21301885]
8. Kefer JC, Desai MM, Fergany A, Novick AC, Gill IS. Outcomes of partial nephrectomy in patients on chronic oral anticoagulant therapy. *The Journal of urology*. 2008; 180:2370–2374. discussion 734. [PubMed: 18930273]
9. Varkarakis IM, Rais-Bahrami S, Allaf ME, et al. Laparoscopic renal-adrenal surgery in patients on oral anticoagulant therapy. *The Journal of urology*. 2005; 174:1020–1023. discussion 3. [PubMed: 16094036]
10. Shabsigh A, Korets R, Vora KC, et al. Defining early morbidity of radical cystectomy for patients with bladder cancer using a standardized reporting methodology. *European urology*. 2009; 55:164–174. [PubMed: 18675501]
11. Rhodes DA, Severson EP, Hodrick JT, Dunn HK, Hofmann AA. Discontinuation of warfarin is unnecessary in total knee arthroplasty. *Clinical orthopaedics and related research*. 2010; 468:120–126. [PubMed: 19844768]
12. Sofer M, Watterson JD, Wollin TA, Nott L, Razvi H, Denstedt JD. Holmium:YAG laser lithotripsy for upper urinary tract calculi in 598 patients. *The Journal of urology*. 2002; 167:31–34. [PubMed: 11743269]
13. Tran HA, Chunilal SD, Harper PL, Tran H, Wood EM, Gallus AS. An update of consensus guidelines for warfarin reversal. *The Medical journal of Australia*. 2013; 198:198–199. [PubMed: 23451962]
14. Watterson JD, Girvan AR, Cook AJ, et al. Safety and efficacy of holmium: YAG laser lithotripsy in patients with bleeding diatheses. *The Journal of urology*. 2002; 168:442–445. [PubMed: 12131284]

Table 1
Patient demographic and tumor characteristics. Numbers presented are median (IQR) or Number of patients (%)

	Overall (n=2473)	None (n=1606; 65%)	Aspirin (n=695; 28%)	Anticoagulation (n=172; 7%)	p- value ^d
Age at surgery (years)	60.3 (51.6, 68.7)	57.3 (48.8, 66.1)	63.9 (57.3, 71.5)	68.4 (60.4, 73.5)	<.001
Race					0.648
White	2176 (88.0)	1398 (87.0)	625 (89.9)	153 (89.0)	
Black	129 (5.2)	87 (5.4)	36 (5.2)	6 (3.5)	
Asian	90 (3.6)	61 (3.8)	23 (3.3)	6 (3.5)	
Other	31 (1.3)	21 (1.3)	6 (0.9)	4 (2.3)	
Missing	47 (1.9)	39 (2.4)	5 (0.7)	3 (1.7)	
Body mass index ²	28.9 (25.6, 32.6)	28.6 (25.3, 32.5)	29.3 (26.1, 32.8)	29.6 (26.8, 33.0)	0.001
ASA score					<.001
1	63 (2.5)	57 (3.5)	5 (0.7)	1 (0.6)	
2	1182 (47.8)	867 (54.0)	286 (41.2)	29 (16.9)	
3	1184 (47.9)	662 (41.2)	386 (55.5)	136 (79.1)	
4	42 (1.7)	19 (1.2)	17 (2.4)	6 (3.5)	
Missing	2 (0.1)	1 (0.1)	1 (0.1)	0 (0.0)	
Surgical Type					0.797
Partial Nephrectomy	1780 (72.0)	1150 (71.6)	507 (72.9)	123 (71.5)	
Radical Nephrectomy	693 (28.0)	456 (28.4)	188 (27.1)	49 (28.5)	
Surgical Type					0.242
MIS	606 (24.5)	386 (24.0)	184 (26.5)	36 (20.9)	
Open	1867 (75.5)	1220 (76.0)	511 (73.5)	136 (79.1)	
Stage					0.008
pTx	52 (2.1)	42 (2.6)	7 (1.0)	3 (1.7)	
pT0	136 (5.5)	102 (6.4)	27 (3.9)	7 (4.1)	
pT1a	1171 (47.5)	762 (47.7)	325 (46.9)	84 (48.8)	
pT1b	363 (14.7)	233 (14.6)	105 (15.2)	25 (14.5)	

	Overall (n=2473)	None (n=1606; 65%)	Aspirin (n=695; 28%)	Anticoagulation (n=172; 7%)	p- value ^d
pT2	122 (5.0)	80 (5.0)	35 (5.1)	7 (4.1)	
pT3a	376 (15.3)	229 (14.3)	129 (18.6)	18 (10.5)	
pT3b	227 (9.2)	137 (8.6)	63 (9.1)	27 (15.7)	
pT3c	3 (0.1)	3 (0.2)	0 (0.0)	0 (0.0)	
pT4	14 (0.6)	11 (0.7)	2 (0.3)	1 (0.6)	

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¹ p-value from Chi-square test when categorical and Kruskal-Wallis test when continuous.

² 4 patients were missing body mass index in the none group and 4 in the aspirin group. IQR=interquartile range; ASA=American Society of Anesthesiologists; MIS=minimally invasive surgery

Table 2

Intraoperative and postoperative characteristics by anticoagulation. Numbers presented are median (IQR) or Number of patients (%)

	Overall (n=2473)	None (n=1606; 65%)	Aspirin (n=695; 28%)	Anticoagulation (n=172; 7%)	p- value ^J
Operative time (min)	150.0 (118.0, 194.0)	149.0 (118.0, 195.0)	151.0 (120.0, 192.5)	145.0 (114.0, 189.0)	0.392
Estimated blood loss (mL)	250.0 (150.0, 500.0)	250.0 (150.0, 500.0)	250.0 (150.0, 450.0)	265.0 (100.0, 450.0)	0.552
Length of stay (days)	3.0 (2.0, 4.0)	3.0 (2.0, 4.0)	3.0 (2.0, 4.0)	3.0 (3.0, 4.0)	<.001
Transfusion					<.001
Yes	203 (8.2)	111 (6.9)	53 (7.6)	39 (22.7)	
No	2270 (91.8)	1495 (93.1)	642 (92.4)	133 (77.3)	
Number of pRBC (among transfused)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 2.0)	2.0 (1.0, 4.0)	0.137
>2 pRBC (among transfused)					0.582
Yes	123 (60.6)	69 (62.2)	29 (54.7)	25 (64.1)	
No	80 (39.4)	42 (37.8)	24 (45.3)	14 (35.9)	
Any complication					<.001
Yes	198 (8.0)	118 (7.3)	50 (7.2)	30 (17.4)	
No	2275 (92.0)	1488 (92.7)	645 (92.8)	142 (82.6)	
Complication grade					0.208
1-2	137 (69.2)	76 (64.4)	38 (76.0)	23 (76.7)	
3-5	61 (30.8)	42 (35.6)	12 (24.0)	7 (23.3)	

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^J p-value from Chi-square test when categorical and Kruskal-Wallis test when continuous.

IQR=interquartile range

Table 3

Intraoperative and postoperative characteristics of anticoagulated patients by type of operation. Numbers presented are median (IQR) or Number of patients (%)

	Overall (n=172)	Minimally invasive (n=36; 21%)	Open (n=136; 79%)	p-value ^I
Operative time (min)	145.0 (114.0, 189.0)	195.5 (167.0, 229.5)	130.5 (110.0, 172.5)	<.001
Estimated blood loss (mL)	265.0 (100.0, 450.0)	200.0 (100.0, 300.0)	300.0 (150.0, 500.0)	0.086
Length of stay (days)	3.0 (3.0, 4.0)	3.0 (2.0, 4.5)	3.0 (3.0, 4.0)	0.520
Transfusion				0.157
Yes	39 (22.7)	5 (13.9)	34 (25.0)	
No	133 (77.3)	31 (86.1)	102 (75.0)	
Number of pRBC (among transfused)	2.0 (1.0, 4.0)	1.0 (1.0, 2.0)	2.0 (1.0, 4.0)	0.080
>2 pRBC (among transfused)				0.229
Yes	25 (64.1)	2 (40.0)	23 (67.6)	
No	14 (35.9)	3 (60.0)	11 (32.4)	
Any complication				0.890
Yes	30 (17.4)	6 (16.7)	24 (17.6)	
No	142 (82.6)	30 (83.3)	112 (82.4)	
Complication grade				0.517
1–2	23 (76.7)	4 (66.7)	19 (79.2)	
3–5	7 (23.3)	2 (33.3)	5 (20.8)	

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^I p-value from Chi-square test when categorical and Kruskal-Wallis test when continuous.

IQR=interquartile range

Table 4

Intraoperative and postoperative characteristics of anticoagulated patients by type of nephrectomy. Numbers presented are median (IQR) or Number of patients (%)

	Overall (n=172)	Partial nephrectomy (n=123; 72%)	Radical nephrectomy (n=49; 28%)	p-value ^I
Operative time (min)	145.0 (114.0, 189.0)	145.0 (115.0, 184.0)	145.0 (110.0, 203.0)	0.617
Estimated blood loss (mL)	265.0 (100.0, 450.0)	200.0 (100.0, 400.0)	300.0 (200.0, 500.0)	0.054
Length of stay (days)	3.0 (3.0, 4.0)	3.0 (2.0, 4.0)	4.0 (3.0, 6.5)	<.001
Transfusion				0.720
Yes	39 (22.7)	27 (22.0)	12 (24.5)	
No	133 (77.3)	96 (78.0)	37 (75.5)	
Number of pRBC (among transfused)	2.0 (1.0, 4.0)	2.0 (1.0, 3.0)	2.5 (2.0, 7.5)	0.027
>2 pRBC (among transfused)				0.095
Yes	25 (64.1)	15 (55.6)	10 (83.3)	
No	14 (35.9)	12 (44.4)	2 (16.7)	
Any complication				0.114
Yes	30 (17.4)	25 (20.3)	5 (10.2)	
No	142 (82.6)	98 (79.7)	44 (89.8)	
Complication grade				0.034
1–2	23 (76.7)	21 (84.0)	2 (40.0)	
3–5	7 (23.3)	4 (16.0)	3 (60.0)	

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^I p-value from Chi-square test when categorical and Kruskal-Wallis test when continuous.

IQR=interquartile range