

complications occurred in 14.6% of patients. No Clavien 4–5 complications were reported. At multivariable analysis, preoperative hemoglobin (OR 0.70, 95%CI 0.57–0.85  $p < 0.001$ ) and open (OR 3.91, 95%CI 1.74–8.77  $p < 0.001$ ) vs robotic surgical approach were found to be the only predictors of postoperative surgical complications.

**Discussion:** In a large contemporary series, PN for complex renal masses is a safe and feasible technique with an acceptable rate of perioperative complications. The robotic approach, when compared to open approach, seems to be protective for the development of complications and may widen the indications to PN. Assessment of long term functional and oncologic outcomes of these patients is needed.

## SC60

### Effects of learning curve on perioperative outcomes after robot-assisted partial nephrectomy of an experienced robotic surgeon

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**Aim of the study:** To determine the impact of learning-curve (LC) on surgical outcomes of patients treated with robotic partial nephrectomy (RAPN) for localized renal masses (stage  $\leq$  cT2a).

**Materials and methods:** We retrospectively evaluated 128 consecutive patients who underwent RAPN for clinically localized renal cell carcinoma (RCC) at single tertiary center between February 2015 and February 2019. We selected 115 RAPN performed by a single surgeon experienced in renal surgery who approached robot-assisted laparoscopic surgery after a modular training in robotic surgery (consisting in: observation of surgical procedures, console training with simulators, performing procedures on ex-vivo models, assistance and training to the operating table and operating console with 40 surgical steps in increasing difficulty supervised by an expert tutor). Complete data were obtained about clinical characteristic, perioperative creatinine clearance ([CC], estimated using Cockcroft-Gault formula), tumor complexity (described according PADUA and RENAL score, furthermore stratified in risk groups), postoperative complication ([PC], graded according the Clavien-Dindo classification [CDC]), histologic type and surgical margins (SM) status. Trifecta was defined as the contemporarily achievement of warm ischemia time (WIT)  $\leq 20$  min, no positive SM and absence of PC. We subdivided the cohort in three consecutive groups with an equal subdivision of patients (38 patients in first group vs 38 patients in second group vs 39 patients in third group), reflecting the gradual progression in the LC. First, we compared clinical and pathological outcomes between groups. Second, we analyzed how the LC impacted on trifecta achievement, operation time (OT) and WIT.

**Results:** The three groups were comparable in terms of demographics and preoperative clinical characteristics. Mean OT was 257,6 min (range 165–410) in first group, while it was 213.6 min (range 120–290) and 187.0 min (range 90–365) respectively in second and third group ( $p < 0.001$ ). Mean estimated intraoperative blood loss was 296 mL (range 90–700), 228 mL (range 100–700) and 235 mL (range 40–500) respectively in first, second and third group ( $p = 0.08$ ). We observed a significant difference between pre and post-operative CC (at 24 hour after surgery), with mean reduction of  $-14.8$  mL/min/1.73 m<sup>2</sup> in first group, vs  $-8.3$  mL/min/1.73 m<sup>2</sup> and  $-6.8$  mL/min/1.73 m<sup>2</sup> of second and third group, respectively ( $p = 0.047$ ). In second and third groups we observed lower PC rate than in first group (13.2% vs 10.3% vs 31.6%,  $p = 0.03$ ), no difference were noted after stratifying for CDC ( $p = 0.14$ ). Mean WIT (excluding clampless approach procedures) was 14.6 min (range 5–30) in first group, 15.0 min (range 7–26) in second group and 12.5 min (range 5.0–23.0) in third group, with a difference in proximity of statistical significance ( $p = 0.08$ ). Trifecta rate was 68.4% vs 81.6% vs 82.1% respectively in first, second and third group ( $p = 0.27$ ).

Fig 1 – Warm ischemia time (stratified in clampless, 1-20 min and  $< 20$  min) distribution between groups.

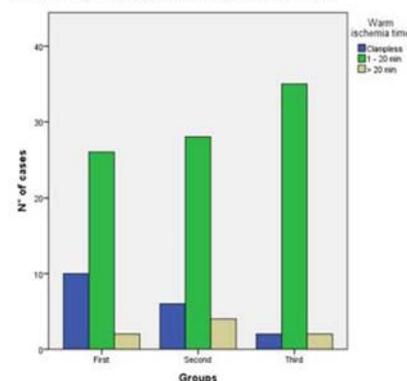


Fig 2 – Box graph of operation time distribution between groups.

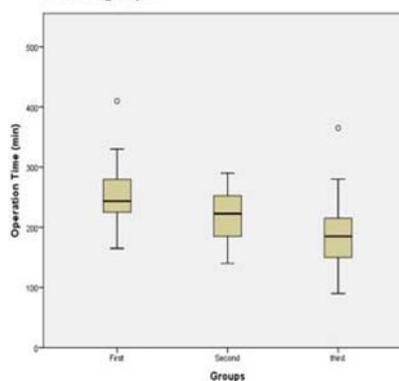


Fig 3 – Box graph of ischemia time distribution between groups.

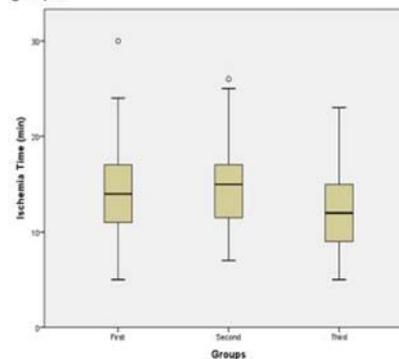


Fig 4 – Representation of the trifecta achievement distribution between groups

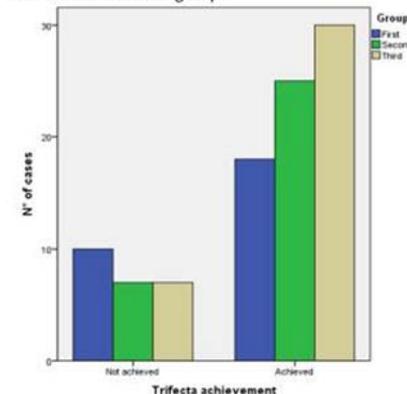


Table 1 – Clinical, perioperative, histological characteristic of examined cohort

Variable	Total
N° patients (%)	115 (100)
Age, years (median, IQR)	63 (54-70)
Sex n° (%)	
Male	79 (68.7)
Female	36 (31.3)
BMI (median, IQR)	25.8 (22.8-28.7)
ASA score n° (%)	
1	16 (13.9)
2	68 (59.1)
3	31 (27.0)
Charlson Score n° (%)	
0-1	15 (13.0)
2-3	87 (75.7)
4-5	13 (11.3)
Clinical size, cm (median, IQR)	3.0 (2.1-4.1)
Side n° (%)	
Right	60 (52.2)
Left	55 (47.8)
PADUA risk n° (%)	
1	44 (38.3)
2	48 (41.7)
3	23 (20.0)
RENAL risk n° (%)	
1	54 (47.0)
2	51 (44.3)
3	10 (8.7)
Surgical time, min (median, IQR)	215 (175-255)
Ischemia time, min (median, IQR)	12 (8-16)
WIT n° (%)	
0 (clampless)	18 (15.7)
≤ 20 min	89 (77.4)
> 20 min	8 (7.0)
Estimated blood loss, mL (median, IQR)	200 (150-330)
Clavien-Dindo Classification	
0	94 (81.7)
1-2	17 (14.8)
3-4	4 (3.5)
5	0 (0.0)
eGFR, mL/min/1.73m <sup>3</sup> (median, IQR)	
Preoperative	84.9 (69.1-107.0)
Postoperative (at 24 h)	76.0 (59.5-96.4)
ΔeGFR perioperative	-9.45 (-17.8 - -1.2)
3 month	71.2 (49.9-88.3)
Hospital stay, days (median, IQR)	4 (3-5)
Histotype, n° (%)	
Clear cell RCC	62 (53.9)
Papillary RCC	27 (23.5)
Chromophobe RCC	6 (5.2)
Benign	20 (17.4)
Grading, n° (%) <sup>a</sup>	
Benign	20 (17.4)
G1	13 (11.3)
G2	52 (45.2)
G3-G4	30 (26.1)
Margins, n° (%)	
Negative	109 (94.8)
Positive	6 (5.2)
Trifecta <sup>b</sup> n° (%)	
Success	89 (77.4)
Failure	26 (22.6)
Follow-up, month (median, IQR)	13.4 (7.1-18.7)
Recurrence, n° (%)	3 (2.6)
Site recurrence <sup>c</sup> , n° (%)	
Local	1 (33.3)
Lungs	1 (33.3)
Skeletal	1 (33.3)

IQR: interquartile range, BMI: body mass index; ASA: American Society of Anaesthesiology, eGFR: estimated glomerula filtration (Cockcroft-Gault formula); Δ: difference; WIT: warm ischemia time; RCC renal cell carcinoma  
<sup>a</sup>sec WHO classification 2016, <sup>b</sup>: Defined as negative resection margins, no complication, WIT ≤ 20; <sup>c</sup> % calculated on 3 recurrence recorded

Table 2 – Clinical and perioperative characteristic stratified between groups during learning-curve period.

Variable	Group 1	Group 2	Group 3	p
N° of patients	38	38	39	
Clinical size, cm (mean, range)	3.01 (1.2-7.0)	3.08 (1.0-7.3)	3.36 (1.3-5.9)	0.44
ASA score n° (%)				
1	4 (10.5)	5 (13.2)	7 (17.9)	0.31
2	20 (52.6)	22 (57.9)	26 (66.7)	
3	14 (36.8)	11 (28.9)	6 (15.4)	
Charlson Score n° (%)				
0-1	4 (10.5)	7 (18.4)	4 (10.3)	0.60
2-3	28 (73.7)	27 (71.7)	32 (82.1)	
4-5	6 (15.8)	4 (10.5)	3 (7.7)	
PADUA risk n° (%)				
1	17 (44.7)	15 (39.5)	12 (30.8)	0.27
2	12 (31.6)	19 (50.0)	17 (43.6)	
3	9 (23.7)	4 (10.5)	10 (25.6)	
RENAL risk n° (%)				
1	20 (52.6)	18 (47.4)	16 (41.0)	0.43
2	14 (36.8)	19 (50.0)	18 (46.2)	
3	4 (10.5)	1 (2.6)	5 (12.8)	
WIT n° (%)				
0 (clampless)	10 (26.3)	6 (15.8)	2 (5.1)	0.10
≤ 20 min	26 (68.4)	28 (73.7)	35 (89.8)	
> 20 min	2 (5.3)	4 (10.5)	2 (5.1)	
Estimated blood loss, mL (mean, range)	296 (90-700)	228 (100-700)	235 (40-500)	0.08
Margins, n° (%)				
Negative	36 (94.7)	36 (94.7)	37 (94.9)	1
Positive	2 (5.3)	2 (5.3)	2 (5.1)	
eGFR, mL/min/1.73m <sup>3</sup> (median, range)				
Preoperative	78.9 (15.3-199.6)	93.1 (26.7-150.1)	93.3 (50.3-159.4)	0.05
Postoperative (at 24h)	64.1 (8.9-139.3)	84.8 (26.7-150.1)	87.7 (49.4-152.0)	<0.001
ΔeGFR perioperative	-14.8 (-60.3-29.6)	-8.3 (-33.0-20.1)	-6.8 (-40.2-29.6)	0.047
Complication (30 days) n° (%)				
No	26 (68.4)	33 (86.8)	35 (89.7)	0.03
Yes	12 (31.6)	5 (13.2)	4 (10.3)	
Clavien-Dindo Classification				
0	26 (68.4)	33 (86.8)	35 (89.7)	0.14
1-2	10 (26.3)	4 (10.5)	3 (7.7)	
3-4	2 (5.3)	1 (2.6)	1 (2.6e)	

IQR: interquartile range, BMI: body mass index; ASA: American Society of Anaesthesiology, eGFR: estimated glomerula filtration (Cockcroft-Gault formula); Δ: difference; WIT: warm ischemia time; \*: Defined as negative resection margins, no complication, WIT ≤ 20; † % calculated on 3 recurrence recorded

Table 3 – Operation time distribution between groups.

Operation Time	Group 1	Group 2	Group 3	p
Mean, min	247.6	213.6	187.0	<0.001
Range, min	165-410	120-290	90-365	

Table 4 – Analysis of ischemia time between eras (clampless RAPN excluded)

Ischemia Time	Group 1	Group 2	Group 3	p
Mean, min	14.6	15.0	12.5	0.08
Range, min	5.0-30.0	7.0-26.0	5.0-23.0	

Table 5 – Analysis of trifecta achievement between groups

Trifecta	Group 1	Group 2	Group 3	p
Achived, n (%)	26 (68.4)	31 (81.6)	32 (82.1)	0.27
Not achieved, n (%)	12 (31.6)	7 (18.4)	7 (17.9)	
Total	38 (100)	38 (100)	39 (100)	

**Discussion:** LC can positively influence operative and perioperative clinical outcomes.