RAPN

in T1b Renal Masses?

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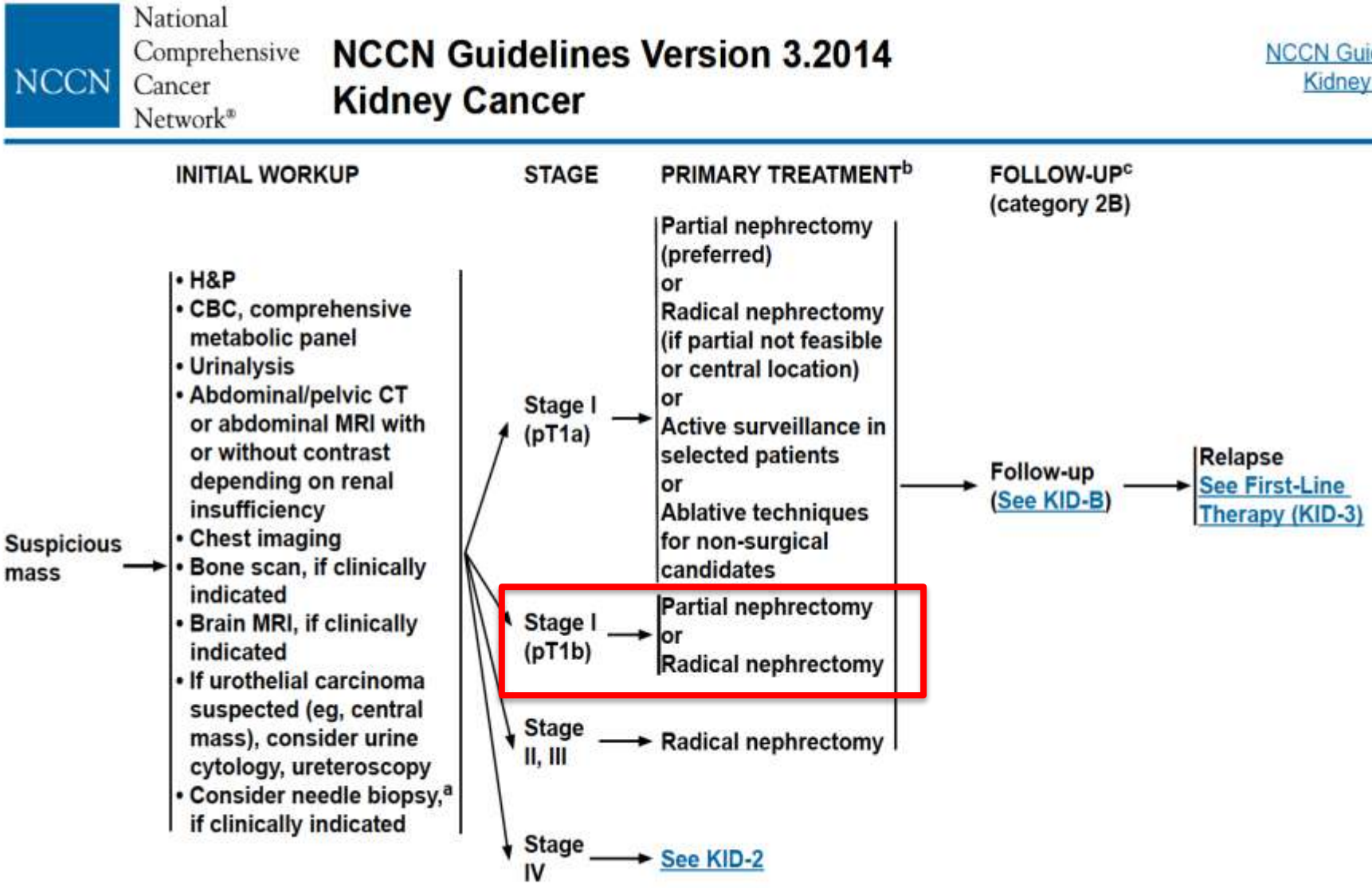
Guidelines on Renal Cell Carcinoma

Clinical stage	AUA, 2009	EAU, 2010
T1b (4-7 cm)	• RN should be discussed as standard of care for patients with normal contralateral kidney • PN should be considered as an alternative particularly when there is a need to preserve renal function	• Whenever technically feasible, NSS is the standard procedure for solitary tumours

Guidelines on Renal Cell Carcinoma

Clinical stage	EAU, 2014
T1b (4-7 cm)	• Nephron-sparing surgery should be favoured over radical nephrectomy in patients with T1b tumour, whenever technically feasible.

Guidelines on Renal Cell Carcinoma



RAPN for large renal tumors

Table 4. Perioperative, oncological and functional outcomes of robot-assisted partial nephrectomy for T1b renal tumours

	n	Tumour size (cm)	Renal nephrometry score	OT (min)	WIT	EBL (ml)	Complications (%)	PSMs (%)	Preoperative eGFR (ml/min/1.73 m^2)	Postoperative eGFR (ml/min/1.73 m^2)	eGFR decrease (%)	Follow-up (months)	Local recurrence (%)
Ficarra *et al.* [56]	49	5	10[b]	177	22	120	26.5	5.1	91	84	7.6	12	0
Tiu *et al.*[a] [57]	20	5.4	8.5	197	31	408	15	5	90.8	78.9	13	–	–
Petros *et al.* [58▪]	83	5	8	194	24	200	8.4	0	81.7	–	9	10	1.2
Gupta *et al.* [59]	17	5	9	390	36	500	6	0	107.8	102.2	5.2	22	0
Patel *et al.* [60]	15	5	–	275.5	25	100	26.6	0	86.2	74	12.3	7.9	0

EBL, estimated blood loss; eGFR, estimated glomerular filtration rate; OT, operative time; PSMs, positive surgical margins; WIT, warm ischaemia time.
[a]Laparoendoscopic single-site partial nephrectomy.
[b]PADUA score.

Volpe A, Mottrie A, Curr Opin Urol. 2013 Sep;23(5):403-10

Open PN for large renal tumors

Table 1. Perioperative outcomes of open partial nephrectomy for T1b renal tumours

	n	Mean tumour size (cm)	Mean operative time (min)	Mean WIT (min)	Mean EBL (ml)	Postoperative complications (%)
Sprenkle *et al.* [19▪]	226	5	–	42	400	20
Peycelon *et al.* [20]	61	4.6	163	–	644	36
Joniau *et al.* [21]	67	4.5	97	14.1	462	–
Patard *et al.* [22▪▪]	247	–	172.9	–	703	41.5
Becker *et al.* [23]	69	5.3	122.3	19.2	–	13
Carini *et al.* [24]	71	4.7	–	15.7	–	8.4
Permpongkosol *et al.* [25]	58	–	276	48	427.7	22.4

EBL, estimated blood loss; WIT, warm ischaemia time.

Volpe A, Mottrie A, Curr Opin Urol. 2013 Sep;23(5):403-10

Laparoscopic PN for large renal tumors

Table 3. Perioperative, oncological and functional outcomes of laparoscopic partial nephrectomy for T1b renal tumours

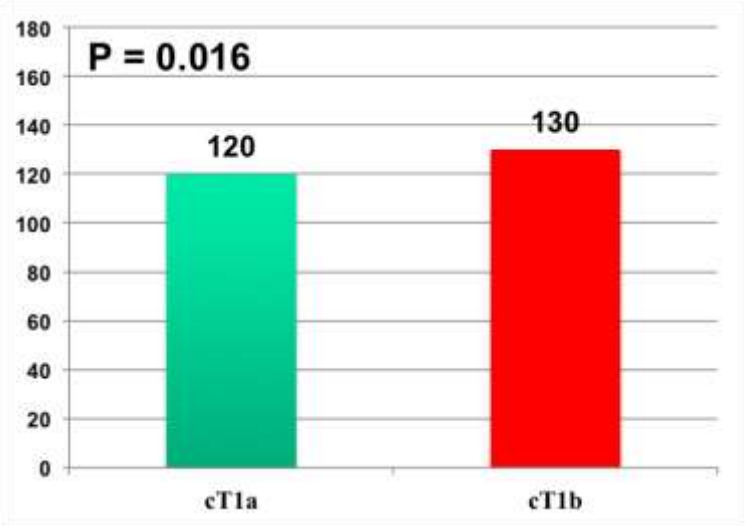
	No.	Tumour size (cm)	OT (min)	WIT	EBL (ml)	Complications (%)	PSMs (%)	eGFR decrease (%)	Follow-up (months)	5-year OS (%)	5-year CSS (%)
Sprenkle *et al.* [19▪]	53*	5.2	–	37	300	33	4	8.1	13	–	–
Porpiglia *et al.* [50]	33	5	134.5	28.4	203.9	27.2	0	3.25	–	–	–
Porpiglia *et al.* [48]	63	4.7	154	25.7	230	26	6.5	–	–	–	–
Deklaj *et al.* [51]	33	4.8	228	–	233	24.2	3	12.5	15	–	–
Simmons *et al.* [45,52▪]	35	4.6	–	37	262	20	0	17.7	44	74	81
Rais-Bahrami *et al.* [44]	34	5.8	199.2	21.9	406	37	5.3	–	–	–	–

CSS, cancer-specific survival; EBL, estimated blood loss; eGFR, estimated glomerular filtration rate; OS, overall survival; OT, operative time; PSMs, positive surgical margins; WIT, warm ischaemia time.
*Including 16 robot-assisted partial nephrectomies.

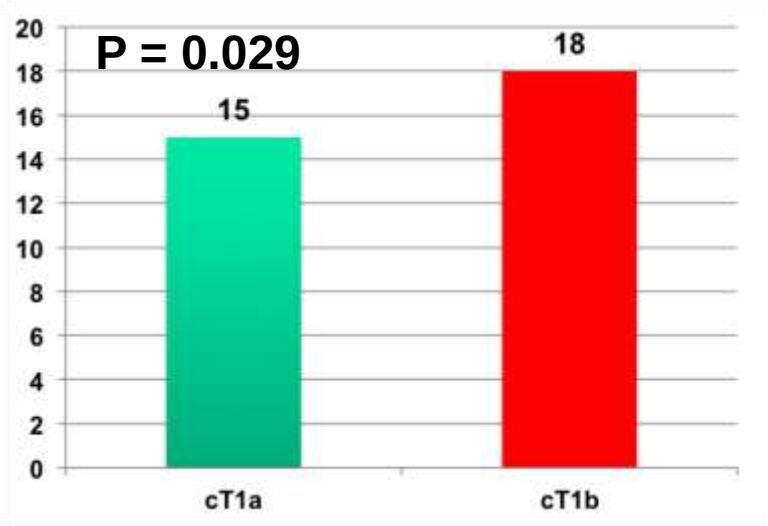
Volpe A, Mottrie A, Curr Opin Urol. 2013 Sep;23(5):403-10

Aalst series

Operative time

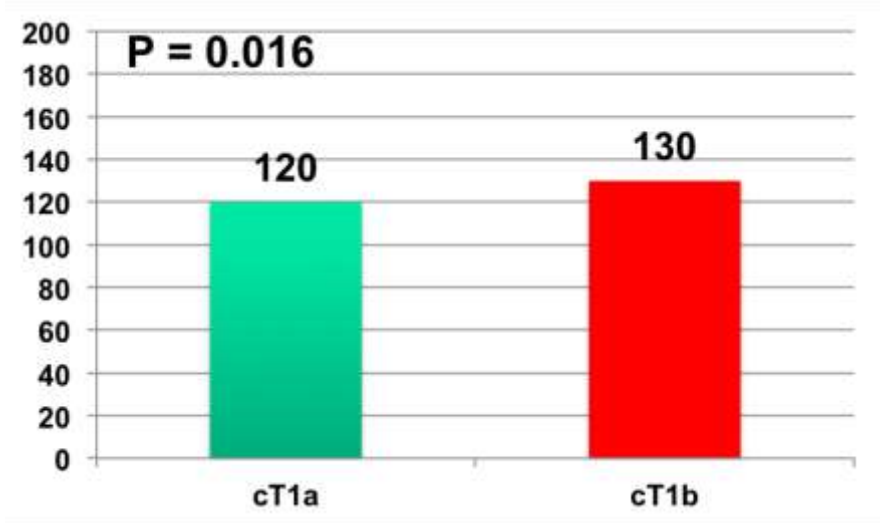


Warm ischemia time

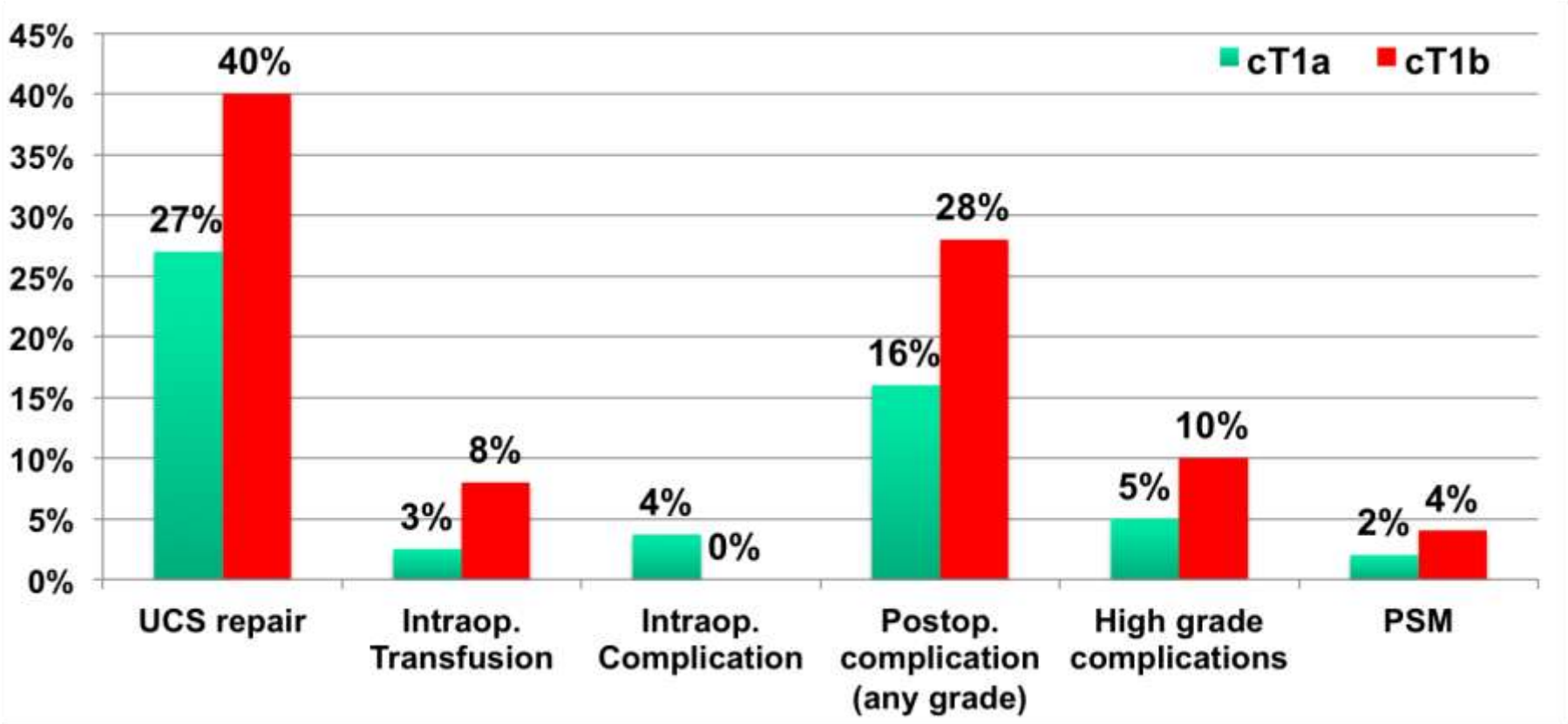


140 cT1a vs 40 cT1b treated from 2006 to 2012

Blood loss



Aalst series



All p value > 0.05

GQI-RUS dataset

(Global Quality Initiative on Robot-Assisted Urologic Surgery)

Covariate	cT1a (n= 791)	cT1b (n= 221)	P value
Median operative time (min)	180 (130 – 200)	204 (150 – 258)	<0.0001
Median EBL (ml)	100 (50 – 200)	150 (80 – 300)	<0.0001
Median WIT (min)	16 (11 – 21)	19 (15 – 24)	<0.0001
Intraop. complications	4%	2%	0.129
Intraop. transfusion	5%	12%	0.001
Any grade postoperative complications	12%	18%	0.049
High grade postop. complications	2.7%	7.3%	0.004
Positive surgical margin rates	3%	3%	0.943

Challenging cases

- Size is not sufficient to define challenging cases
- Hilar lesion (tumor located in the region of the renal hilum in physical contact with renal artery and/or renal vein on CT scan), Endophytic tumors and multiple lesions
- Nephrometry systems
  - RENAL nephrometry
  - PADUA score
- System providing information about tumor proximity to the kidney center
  - C index

Perioperative and renal functional outcomes of elective robot-assisted partial nephrectomy (RAPN) for renal tumours with high surgical complexity

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Variable	Value
Median (IQR; range):	
Operative time, min	120 (94, 132; 60–230)
EBL, mL	150 (80, 200; 25–1200)
WIT, min	16 (13.8, 18, 5–35)
Intraoperative complications, n (%)	2 (4.5)
Median (IQR; range):	
Postoperative haemoglobin level, g/L	128 (116, 137; 95–167)
Length of stay, days	5.5 (5, 7; 4–16)

RAPN for complex renal tumors

Postoperative complications

Clavien grade	N (%)	Complication (n)	Treatment
Grade 1	5 (11.4)	– Pneumonia (1)	– Antibiotic therapy
		– Chylous leak (1)	– Low-fat diet
		– Fever (2)	– Antibiotic therapy
		– Haematuria (1)	– Delayed catheter removal
Grade 2	1 (2.3)	– Anaemia (1)	– Blood transfusion
Grade 3	4 (9.1)	– Urinoma (1)	– Application of ureteric stent
		– Bowel occlusion (1)	– Laparoscopic adhesiolysis
		– Renal bleeding (1)	– Percutaneous embolization
		– Renal bleeding + MRSA infection + acute kidney injury (1)	– Percutaneous embolization + antibiotic therapy + blood transfusion

MRSA, methicillin-resistant Staphylococcus aureus.

Volpe A, Mottrie A, et al. BJU Int. 2014 Mar 27. doi: 10.1111/bju.12751.

RAPN for complex renal tumors

Pathological data

Pathology (n)	N (%) or n/N
Benign histology	10 (22.7)
Malignant histology	34 (77.3)
Benign histology (10):	
Oncocytoma	6/10
Angiomyolipoma	4/10
Malignant histology (34):	
Clear cell RCC	23 (67.7)
Papillary RCC	4 (11.8)
Chromophobe RCC	7 (20.5)
Fuhrman grade (34):	
Low 1–2	27 (79.4)
High 3–4	7 (20.6)
Surgical margins (44):	
Positive	2 (4.5)
Negative	42 (95.5)

Volpe A, Mottrie A, et al. BJU Int. 2014 Mar 27. doi: 10.1111/bju.12751.

RAPN for complex renal tumors

Renal function

	Preoperative	Postoperative day 3	Postoperative month 3	Postoperative month 6
Mean (SD) serum creatinine level, µmol/L	89.3 (26.5)	121.1 (48.6)*	110.5 (63.6)*	96.4 (30.9)
Mean (SD) eGFR (MDRD), mL/min/1.73 m^2	77.6 (19.7)	62.6 (25.5)*	67.7 (23.4)*	74.8 (34.2)

**Significant difference vs preoperative value.*

Volpe A, Mottrie A, et al. BJU Int. 2014 Mar 27. doi: 10.1111/bju.12751.

Conclusions

- Only few data were available in Literature about RAPN in large tumor

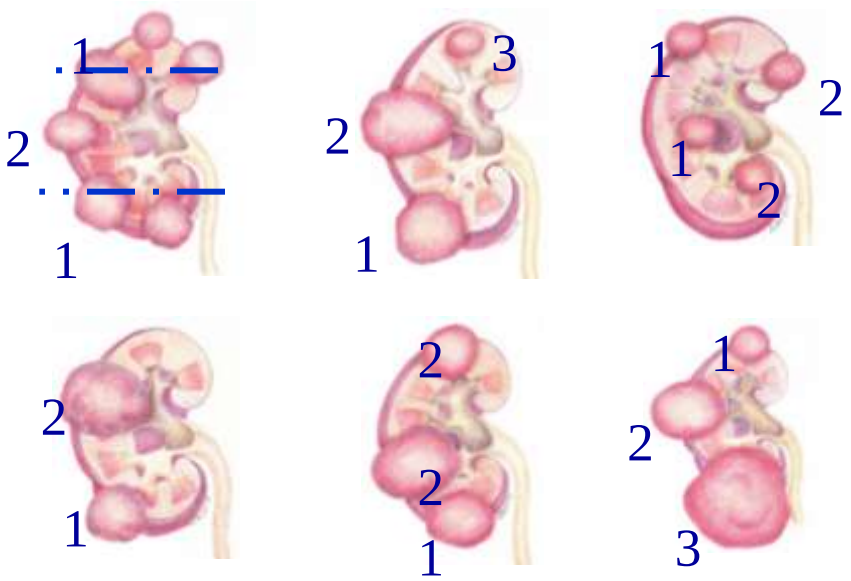
- Nephrometry scores should be used to correctly define the challenging cases better than tumor size only

- RAPN for large and/or challenging tumors is feasible in experienced hands

- Reported perioperative outcomes are very promising

Multi-institutional, international study in robot-assisted partial nephrectomy

PADUA risk group	Cases, no.	Intraoperative complications	Overall postoperative complications
Low (score 6–7), no. (%)	140	0	5 (3.6)
Intermediate (score 8–9), no. (%)	124	5 (4)	23 (16.9)
High (score 10–13), no. (%)	83	5 (6)	13 (15.6)
p value	–	0.02	<0.001



Ficarra V et al. Eur Urol 2012; 61: 395-402

Multi-institutional, international study in robot-assisted partial nephrectomy

PADUA risk groups	**Cases**	**WIT (min)**	**Console time (min)**	**Blood loss (ml)**	**UCS repair (%)**
Low (score 6-7)	140	16 (12-20)	100 (80-150)	77 (50-100)	35 (25%)
Intermediate (score 8-9)	124	20 (15-25)	120 (90-175)	100 (50-197)	55 (44.4%)
High (score 10-13)	83	20 (17-24)	120 (104-164)	100 (50-150)	58 (69.9%)
p value		<0.001	0.004	<0.001	<0.001

Ficarra V. et al. Eur Urol 2012; 61: 395-402

Robot-assisted Partial Nephrectomy in cT1b RCC

Variable	Tumor ≤ 4 cm (n=298)	Tumor > 4 cm (n=49)	P value
Median WIT (min) (IQR)	17 (14-22)	22 (18-28)	<0.001
UCS repair (%) - not performed - performed	 178 (59.7%) 120 (40.3%)	 21 (43%) 28 (57%)	0.02
Median console time (min) (IQR)	105 (90-150)	145 (112-177)	0.004
Median blood loss (ml) (IQR)	100 (50-150)	120 (62-237)	0.001
Intraoperative complications (%)	9 (3%)	2 (4%)	0.87
Postoperative complications (%)	28 (9.4%)	13 (26.5%)	0.001
Positive Surgical margins (%)	6 (2.5%)	2 (5.1%)*	0.37

Ficarra V. et al. World J Urol (submitted)

EUROPEAN UROLOGY 62 (2012) 696–703

available at www.sciencedirect.com
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European Association of Urology

Kidney Cancer

Chronic Kidney Disease After Nephrectomy in Patients with Small Renal Masses: A Retrospective Observational Analysis

Maxine Sun [a,*], *Marco Bianchi* [a,b], *Jens Hansen* [c], *Quoc-Dien Trinh* [a,d], *Firas Abdollah* [b], *Zhe Tian* [a], *Jesse Sammon* [d], *Shahrokh F. Shariat* [e], *Markus Graefen* [c], *Francesco Montorsi* [b], *Paul Perrotte* [f], *Pierre I. Karakiewicz* [a,e]

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A US National Cancer Institute Surveillance Epidemiology and End Results (SEER)–Medicare-linked retrospective cohort of 4633 T1aN0M0 renal cell carcinoma (RCC) patients who underwent PN or RN.

Table 2 – Postpropensity unadjusted renal function outcomes following nephrectomy (n = 1680)

Outcomes	Overall	PN (%)	RN (%)	RN vs PN HR (95% CI)	p
No. of patients	1680	840	840	–	–
CKD (stage ≥3)	265 (15.8)	96 (11.4)	169 (20.1)	1.90 (1.48–2.45)	<0.001
ARF	292 (17.4)	123 (14.6)	169 (20.1)	1.47 (1.16–1.86)	0.001
Chronic renal failure/insufficiency	367 (21.8)	134 (16.0)	233 (27.7)	1.83 (1.48–2.27)	<0.001
Anemia in CKD	140 (8.3)	52 (6.2)	88 (10.5)	1.81 (1.28–2.55)	0.001
ESRD	50 (3.0)	18 (2.1)	32 (3.8)	1.83 (1.03–3.27)	0.04

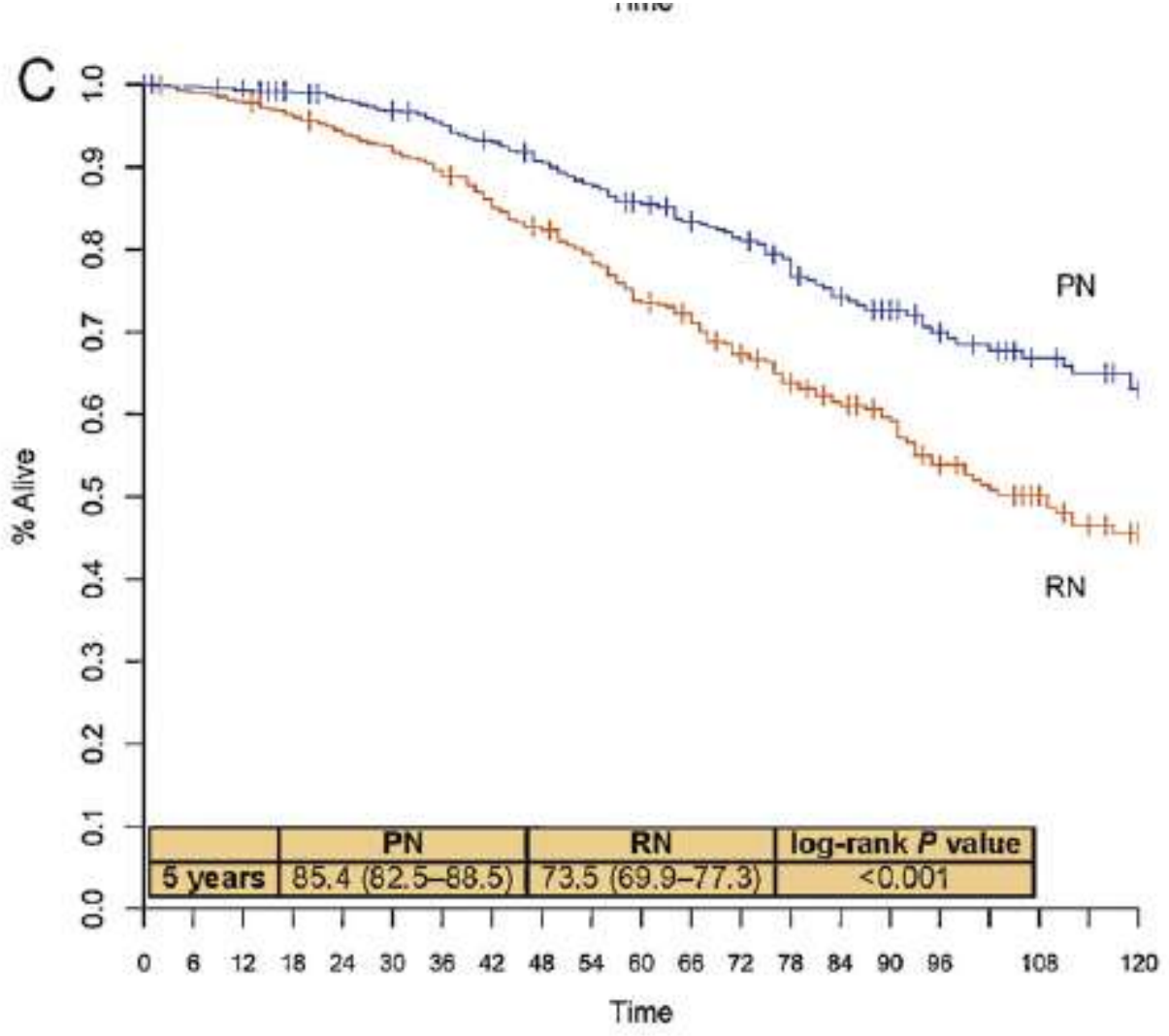
PN = partial nephrectomy; RN = radical nephrectomy; HR = hazard ratio; CI = confidence interval; CKD = chronic kidney disease; ARF = acute renal failure; ESRD = end-stage renal disease.

Table 3 – Multivariable Cox regression analyses for prediction of five renal function-related end points among patients treated between 2001 and 2005

Renal function outcomes	RN vs PN: HR (95% CI)	*p*
CKD stage ≥3	2.04 (1.52–2.73)	<0.001
ARF	1.41 (1.05–1.89)	0.02
CRI	1.95 (1.53–2.50)	<0.001
Anemia in CKD	1.82 (1.20–2.78)	0.005
ESRD	2.45 (1.15–5.23)	0.02

RN = radical nephrectomy; PN = partial nephrectomy; HR = hazard ratio; CI = confidence interval; CKD = chronic kidney disease; ARF = acute renal failure; CRI = chronic renal insufficiency; ESRD = end-stage renal disease.

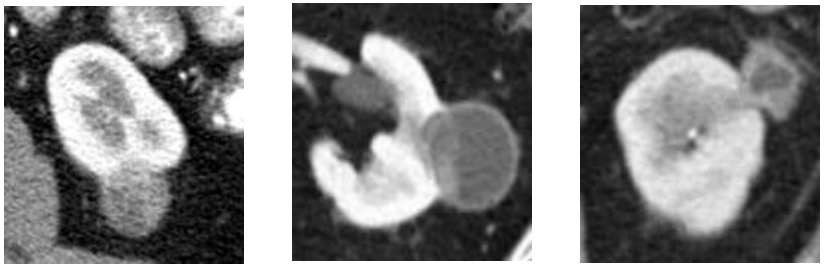
Chronic renal failure



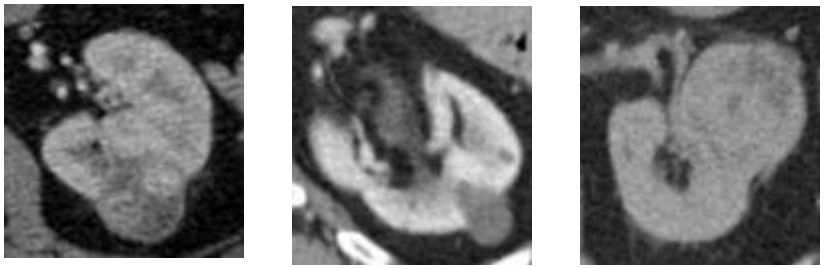
RAPN vs LPN

3. Limits of feasibility

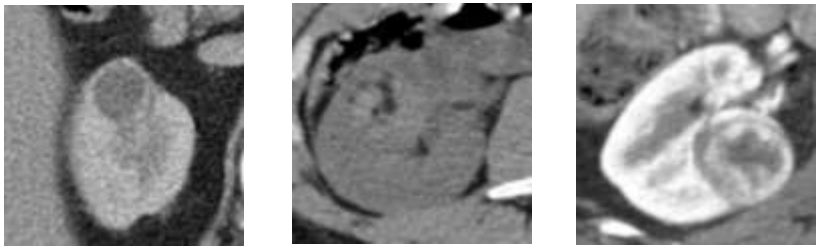
- **Exophytic:**



- **Exo-endophytic:**



- **Endophytic:**



RAPN

Dual console technique

Welcome in O.R. # 11 @ OLV Aalst, Belgium

2 Console for teaching and training

RAPN

Future developments

- **Robotic Suction-irrigator instrument**

RA surgery in the kidney: conclusion

Robotic surgery

- More & more publications prove:
  - Feasibility, even in complex cases
  - Good oncological outcome
  - Promising functional outcome
  - Acceptable learning curve
- Has advantages of a minimal invasive procedure (laparoscopy)
- Accuracy of open surgery

➢ Will take over most indications for nephron sparing surgery

➢ We can probably do more complex cases renal sparing using the robot