

# Robotic-assisted donornephrectomy



*Dr. Mirza M. Idu*

*Dept. Vascular / Transplant Surgery*

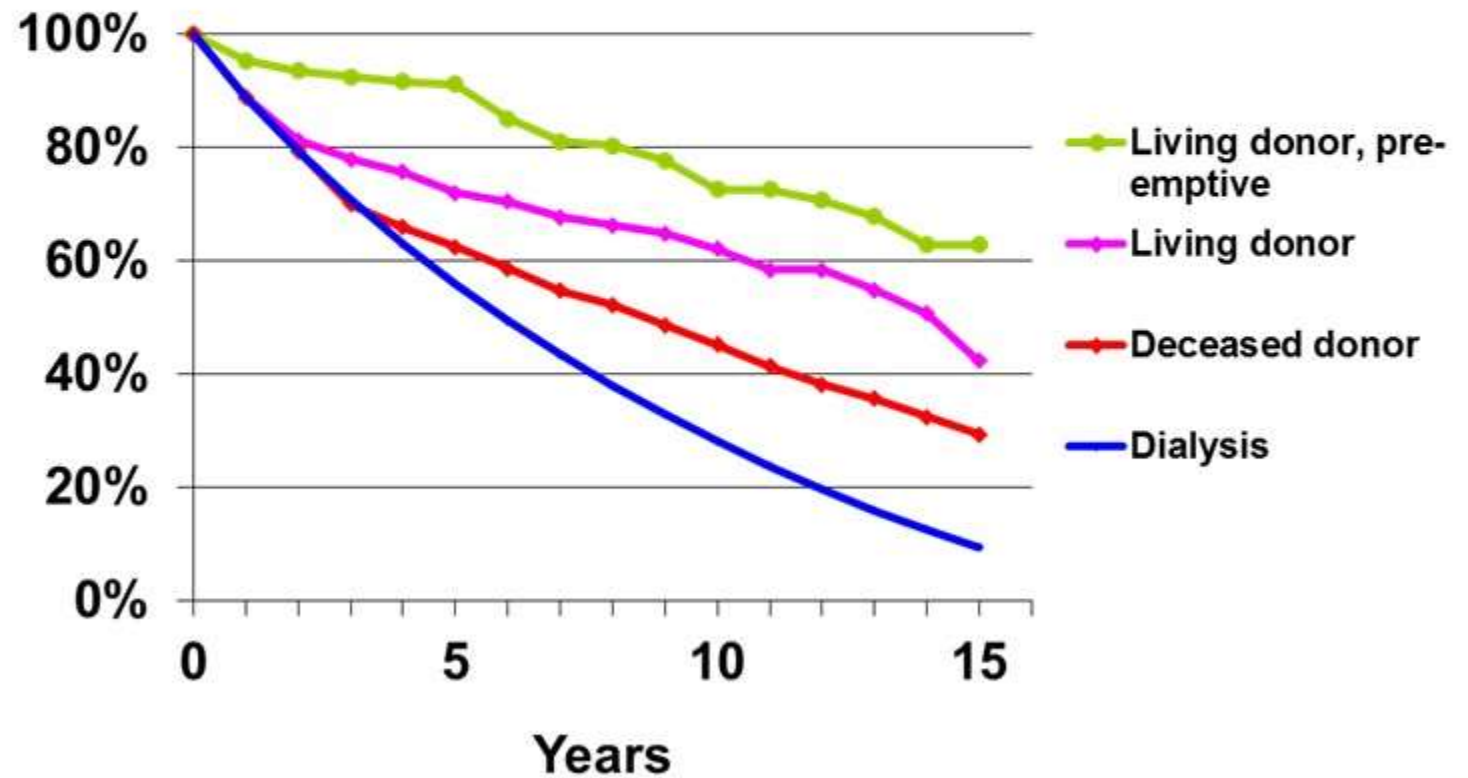
*Amsterdam UMC, locatie AMC*

*The Netherlands*

# Renal transplantation / End-stage renal disease



- Cost-effective
- Quality of life
- Patient survival



# Living donornephrectomy



Open donornefr

Mini-open donor

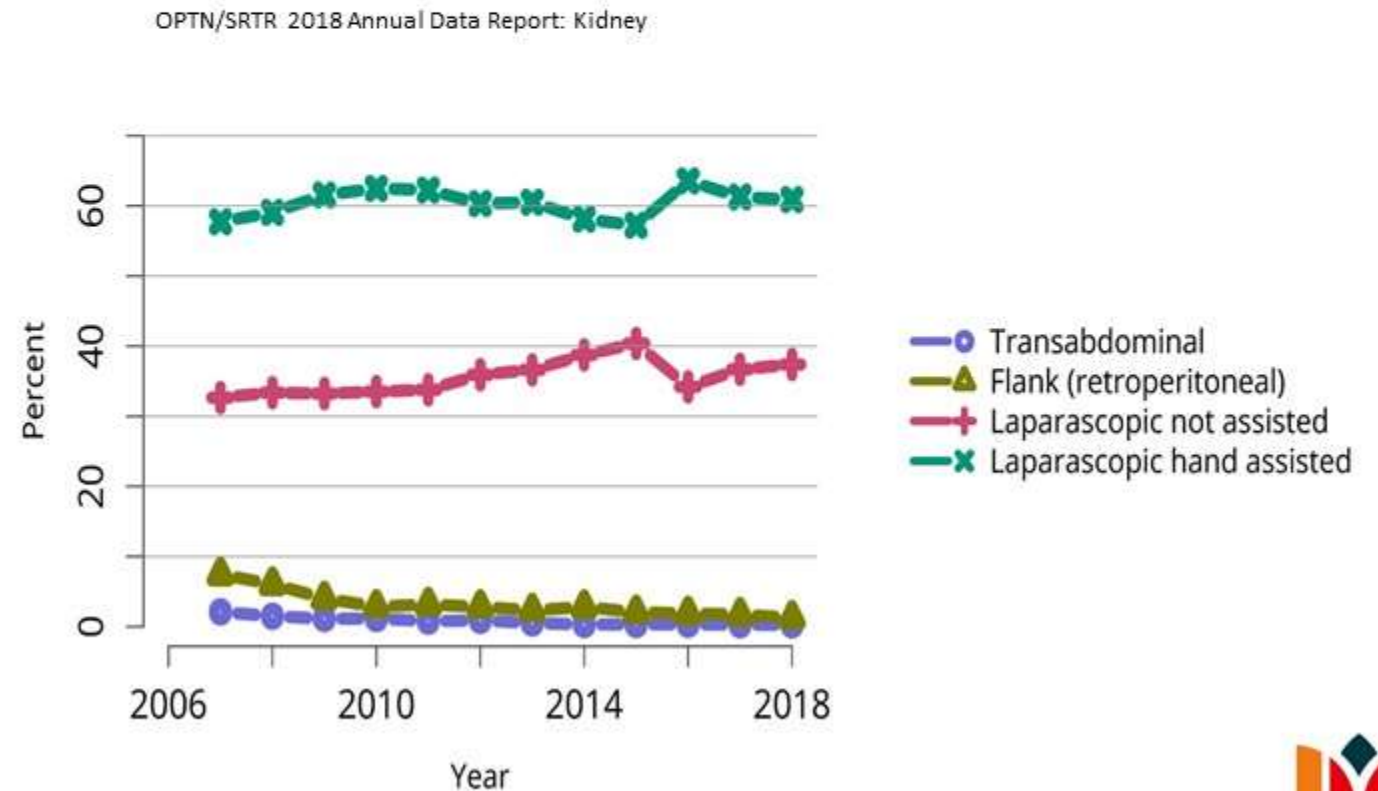
Laparoscopic (1995)

Hand-assisted

- transperitoneal

- retroperitoneal

Robot-assisted (2000)



# Laparoscopic donornephrectomy




Good results

High volume / limited surgeons



## Drawbacks For the Surgeon

- ⊛ There have been multiple reports of carpal tunnel syndrome, eyestrain and cervical spondylosis among unsuspecting surgeons performing multiple laparoscopic procedures in high-volume centres.[3] Reports of thenar neuropathy have arisen due to use of awkward thumb grips in case of laparoscopic pistol-grip instruments.[4]



Prevalence of Musculoskeletal Disorders Among Surgeons Performing Minimally Invasive Surgery: A Systematic Review. Alleblas et al. Radboud University Medical Center, Leiden University Medical Center, Delft University of Technology. Ann Surg 2017  
74%



# Ergonomics



An Ergonomic Assessment Of Four Different Donor Nephrectomy Approaches For The Surgeons And Their Assistants. Marçon B et al. Res Rep Urol 2019 Sep

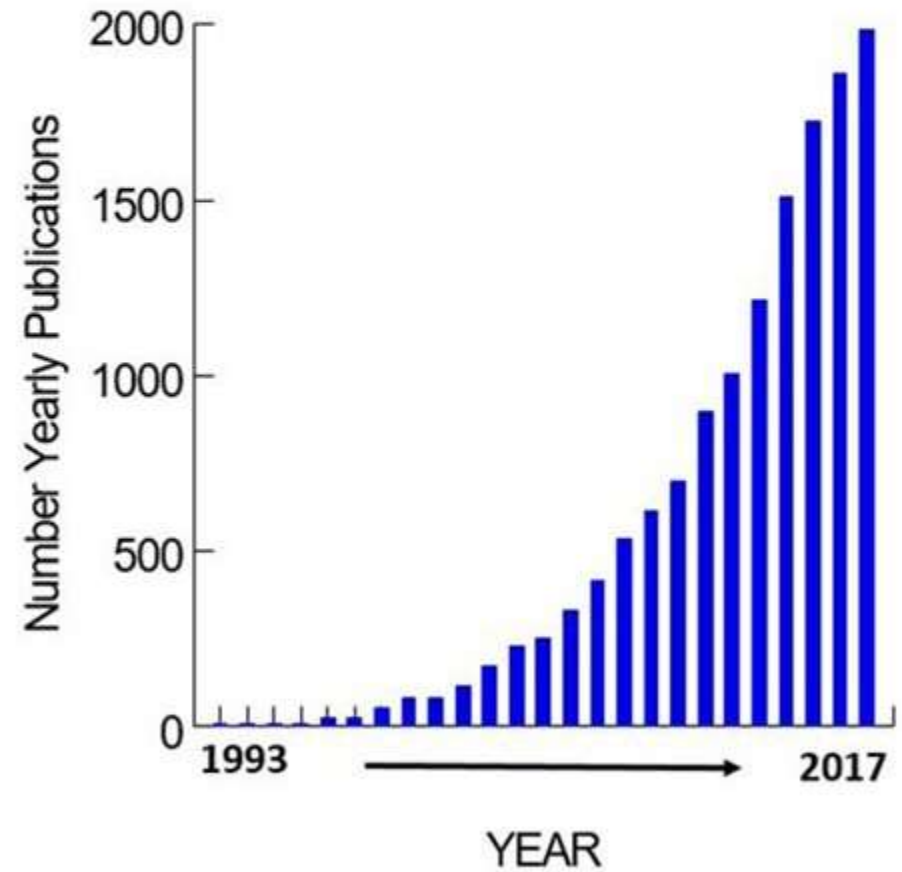
Robotic procedure is better for the surgeon



# Surgical robots



U.S. surgical robots market, by application, 2014 - 2025 (USD Million)





# Surgical robot



Surgeon's Range of Hand Motion



"Endowrist" Range of Motion



# Robotic assisted donornephrectomy



2000: Chicago (Benedetti).  
Hand-assisted

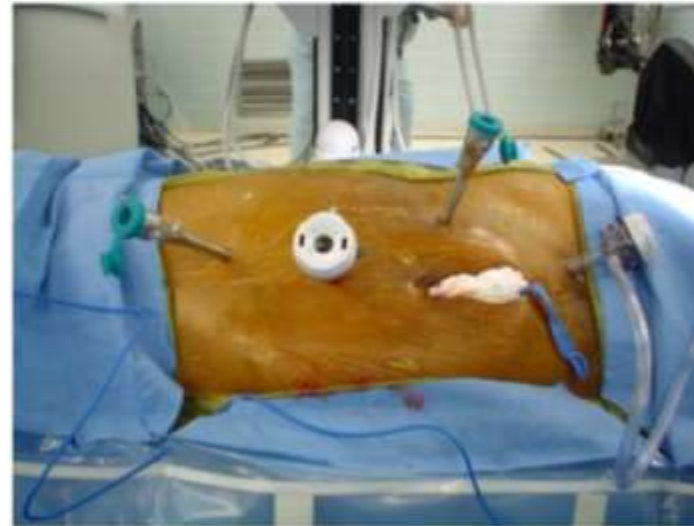


10<sup>th</sup> Worldwide Conference of Clinical Robotics and Surgery Association  
5<sup>th</sup> International Symposium for Hepato-Pancreatic Surgery

**Hand Assisted Robotic Donor Nephrectomy**

Enrico Benedetti, MD, FACS  
Warren H. Cole Chair in Surgery  
Professor and Head  
Department of Surgery

UI Health | UIC





# Robotic assisted vs laparoscopic donornephrectomy



## Systematic review 2019

Robot: longer operation and WIT

Robot less bloodloss

Robot: less pain

Robot shorter length of stay

No difference: function and complication

## Meta-analysis 2019

Lap less bloodloss

No difference in length of stay





## Advantage of robotic surgery:

- 3D-image (HD)
- 10 x Optical Magnification
- Precise / detail surgery (Micro surgery)
- Scaling of movement / Elimination of Physiological tremor
- Endowrist instruments (articulation)
- Ergonomics
- Self controle of the camera
- Self control of the assistant instrument (4th arm)
- Stability of the instruments

*“Literature vs Live experience”*



# Robotic assisted donornephrectomy



Arrival of the robot: november 2018

Observation in december 2018

E-learning (1-2weeks). Exam

Simulator sessions. 2 months.

On-site training.

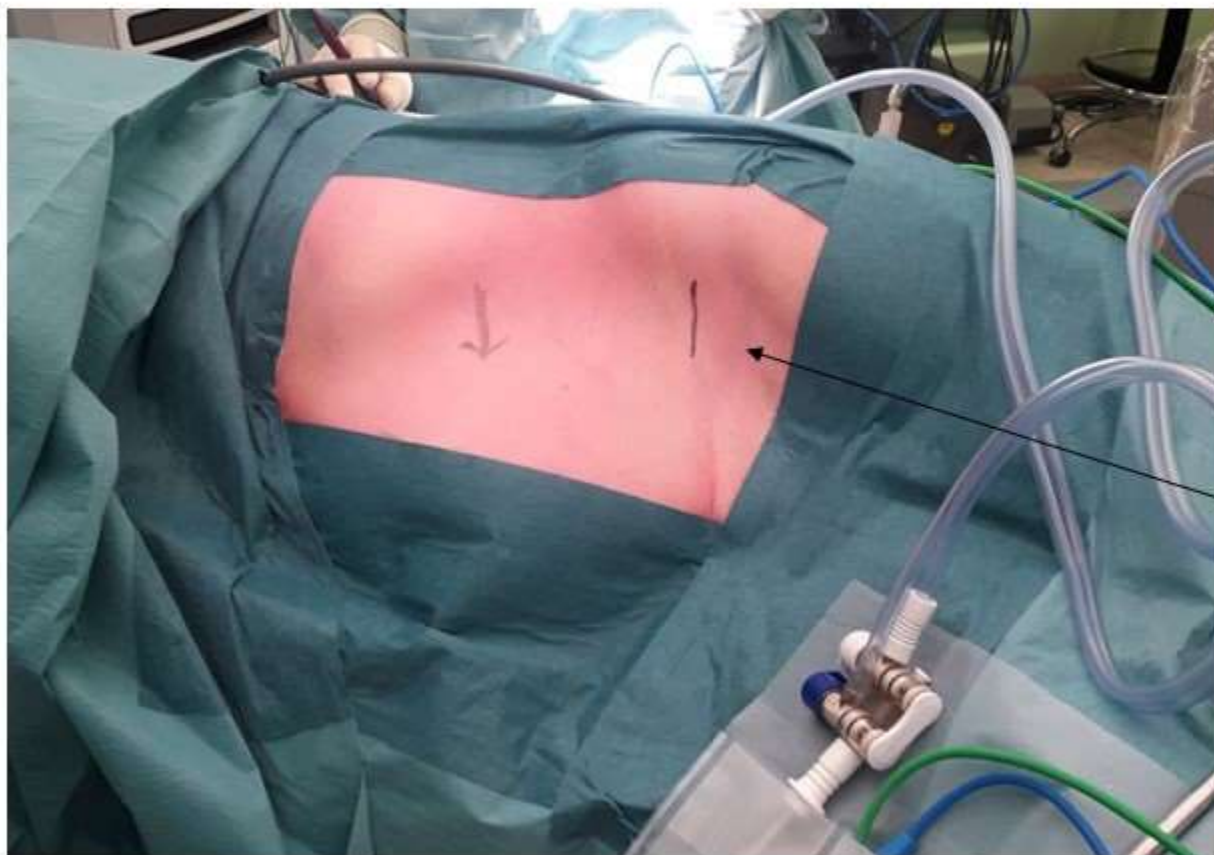
Training in Strassborough (IRCAD)

First 2 cases with a proctor (march 2019)



# Robot: Da Vinci Xi

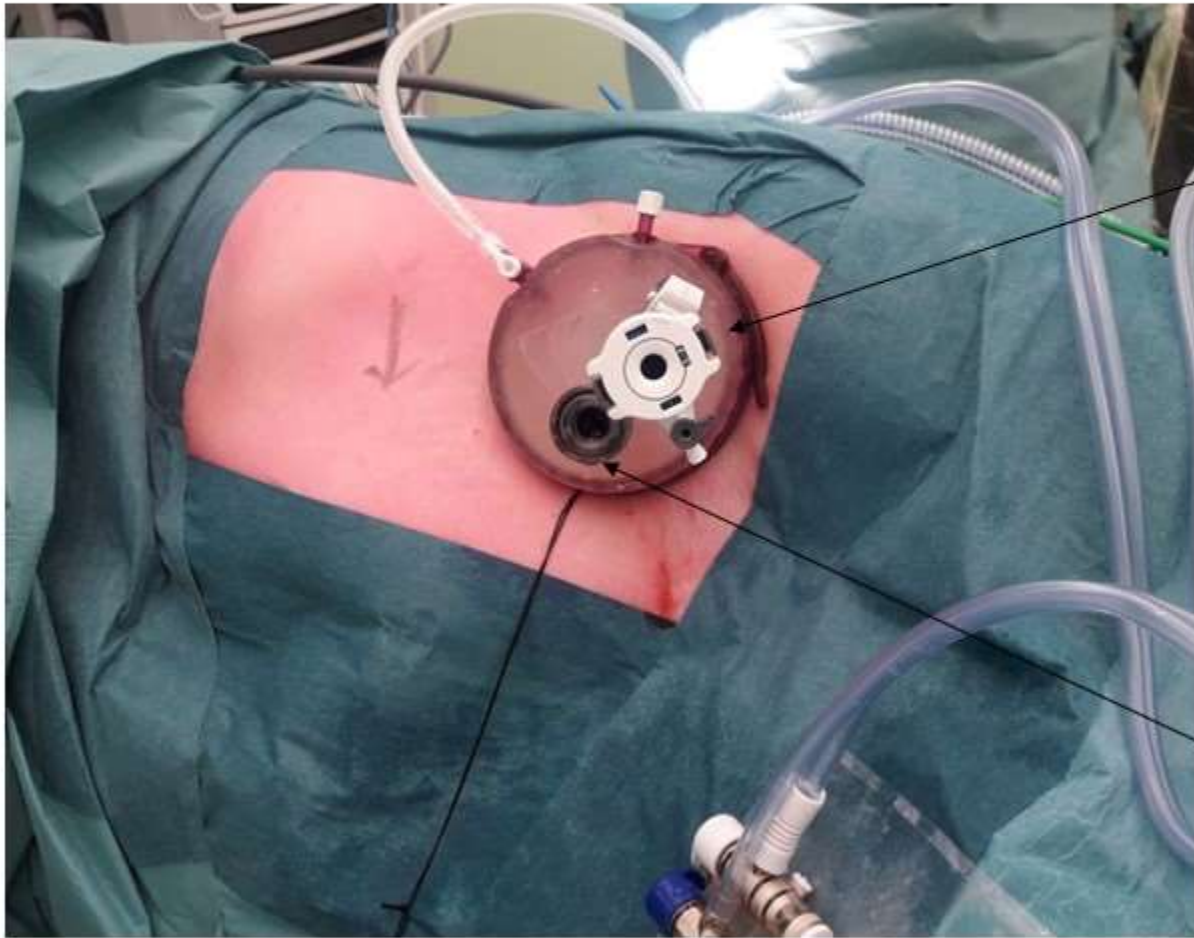
Lateral decubitus position



Kidney extraction site:  $\pm$  5 cm incision



# “Gelpoint” in kidney extraction site



8 mm Robot trocar, 4 th arm

12 mm trocar for stapler and clipping device

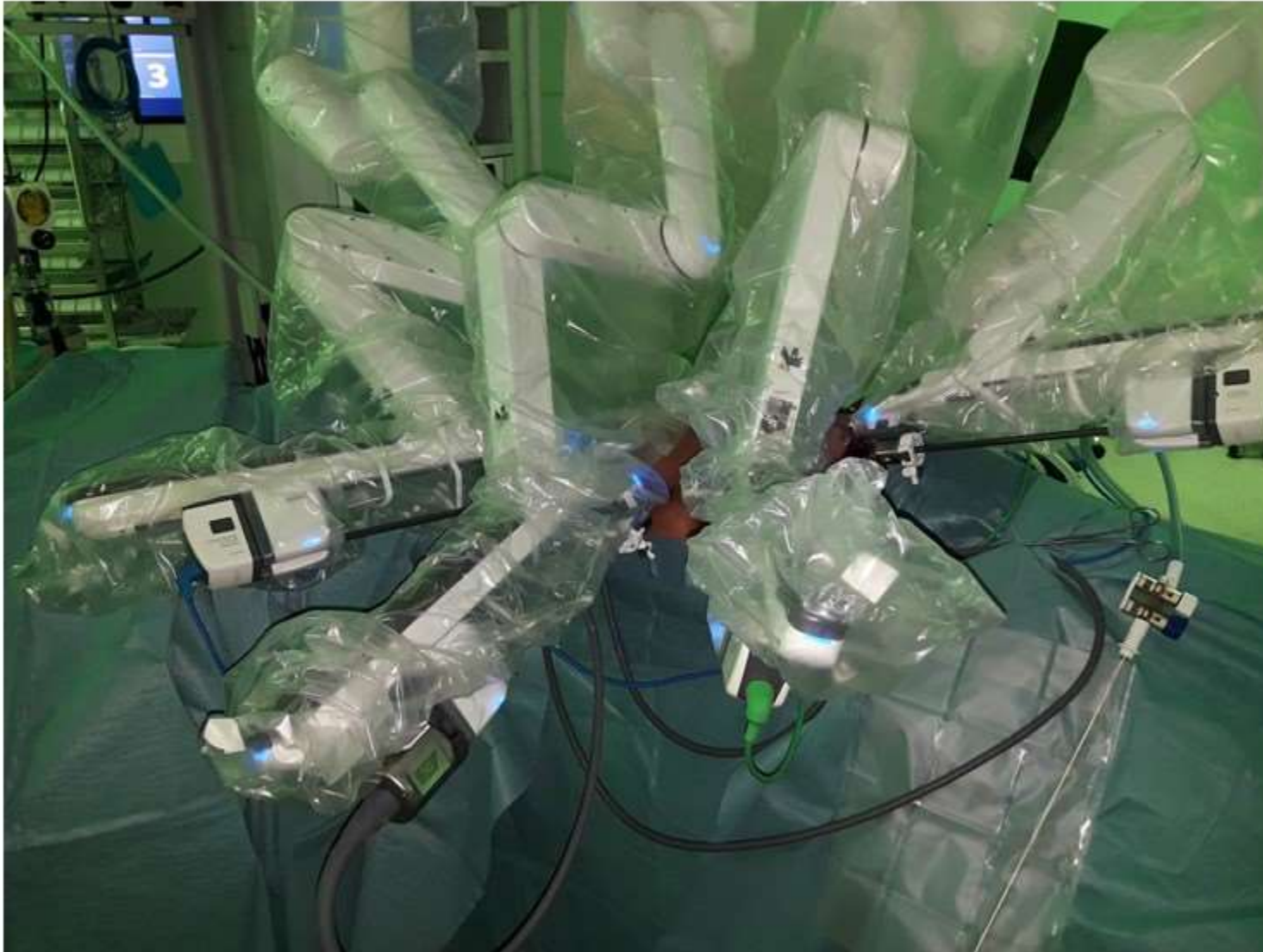




## Trocar position before docking

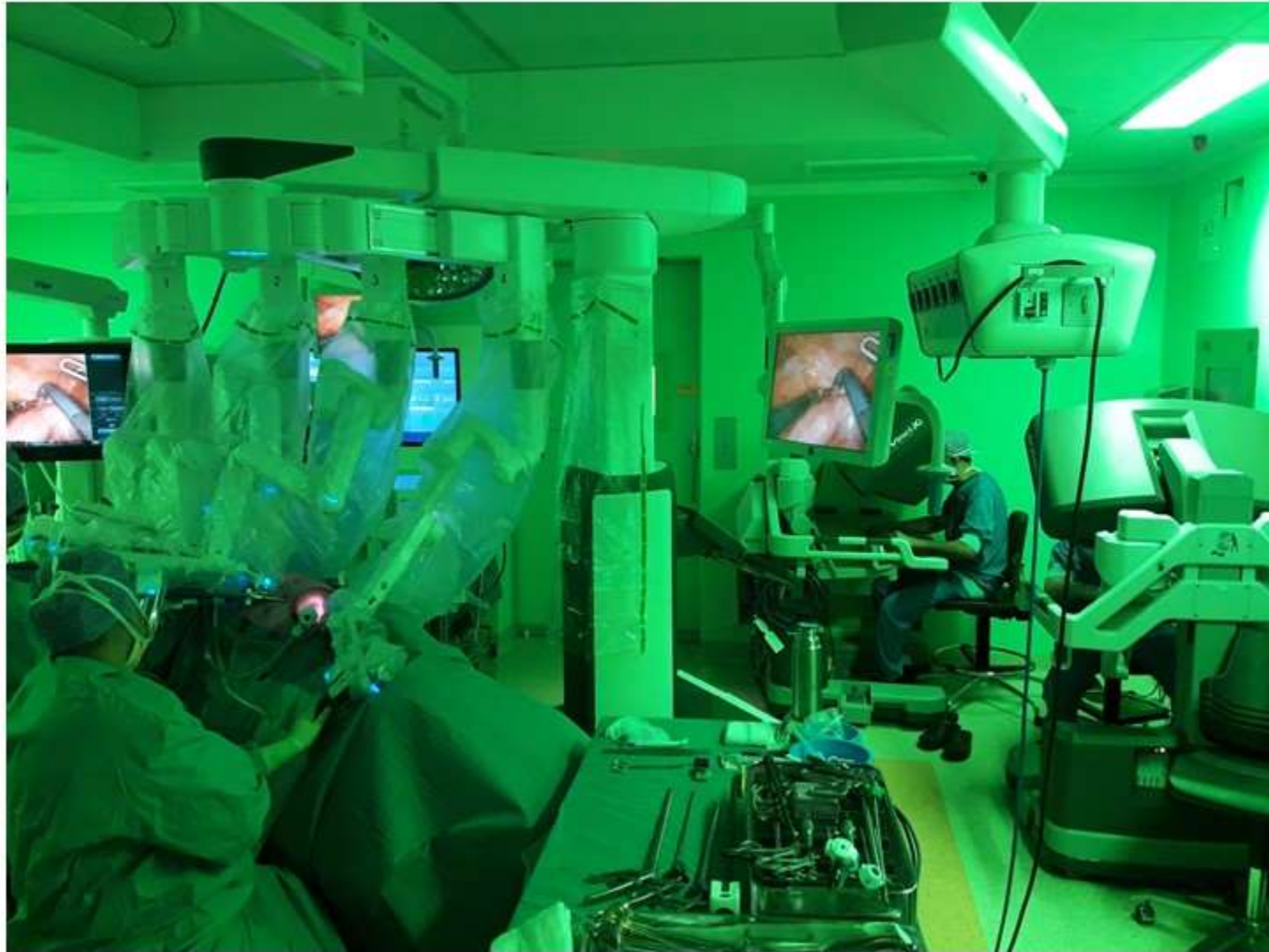


## After docking of the robot





# Robotic assisted donornephrectomy



## Closed incisions after left-sided robotic donornephrectomy

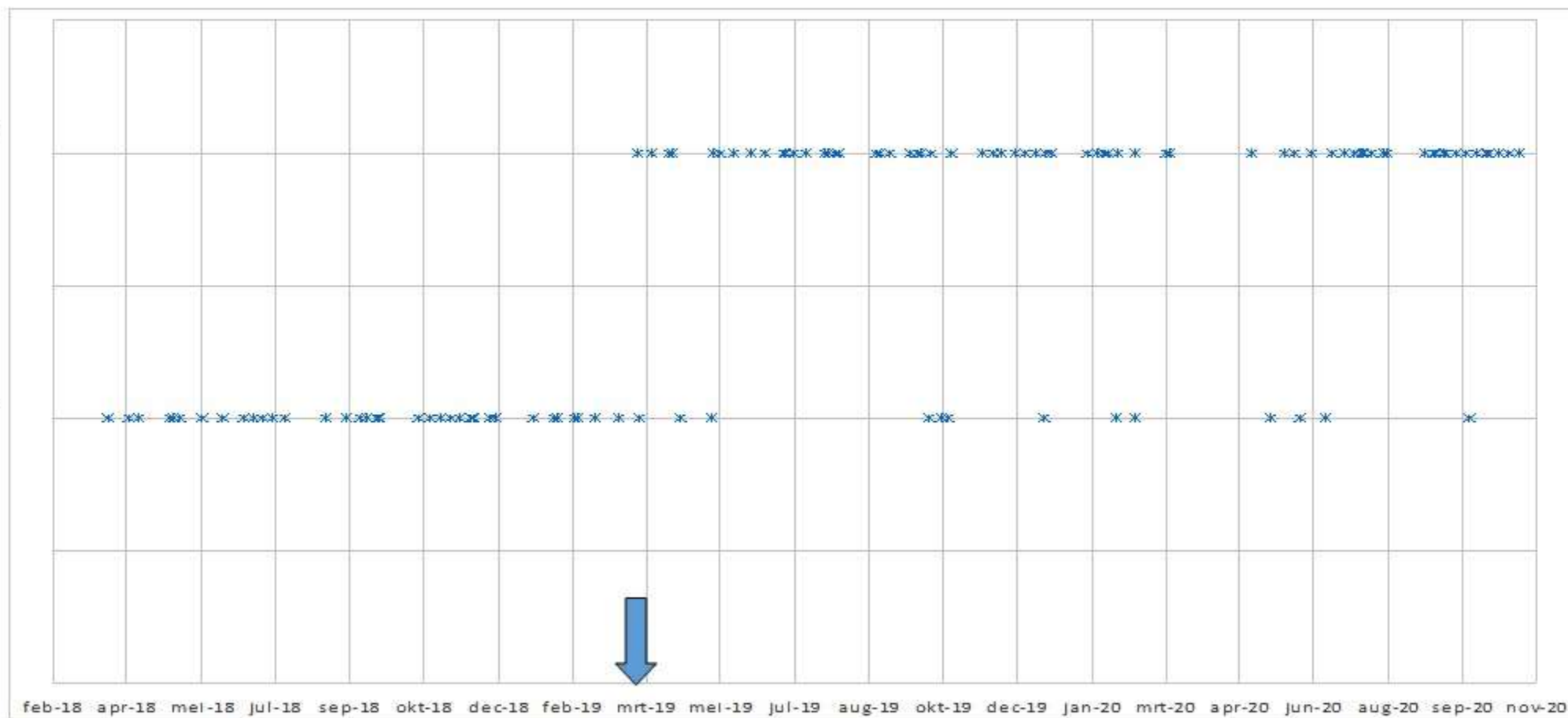


# HADN and RADN



RADN  
N=66

HADN  
N=49





# Results



	<b>HALDN</b>	<b>RADN</b>
	n=49	n=66
Age (median)	58	57
Female	25 (51%)	32 (48%)
Left kidney	37 (76%)	54 (84%)
Complex anatomy	10 (20%)	15 (23%)
BMI (median)	27	25



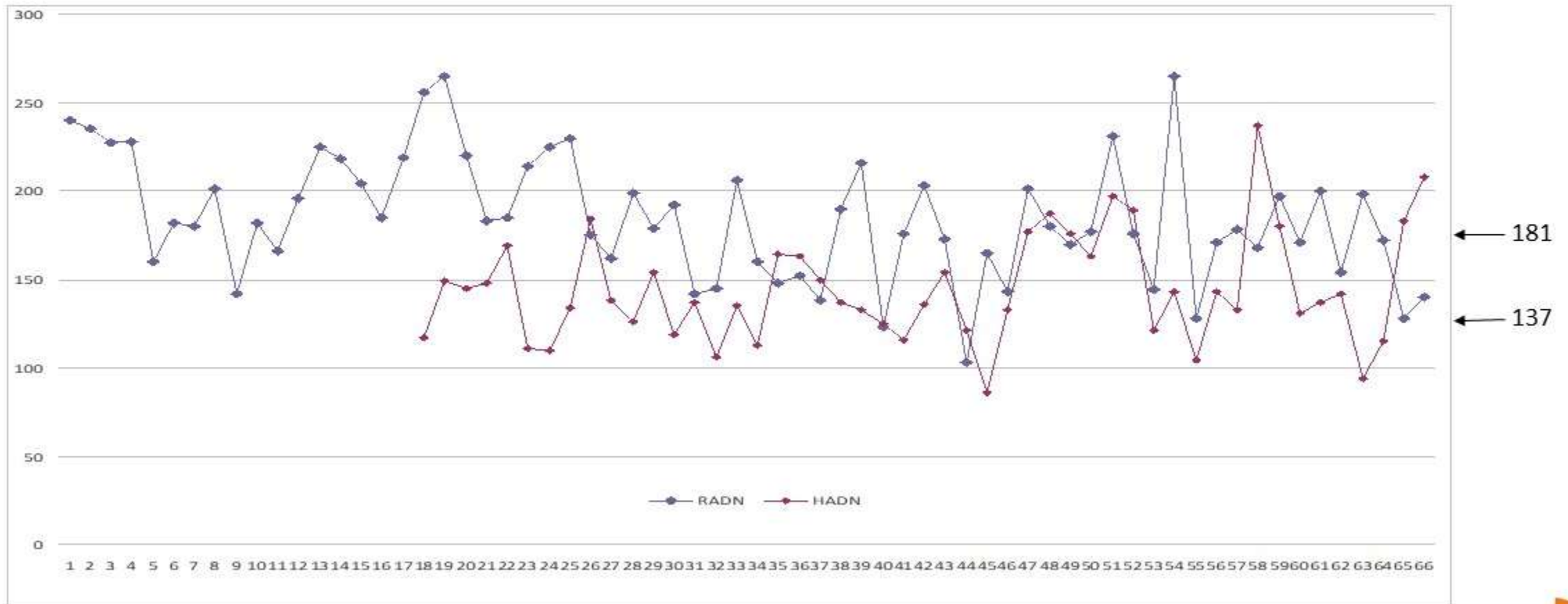


## Results

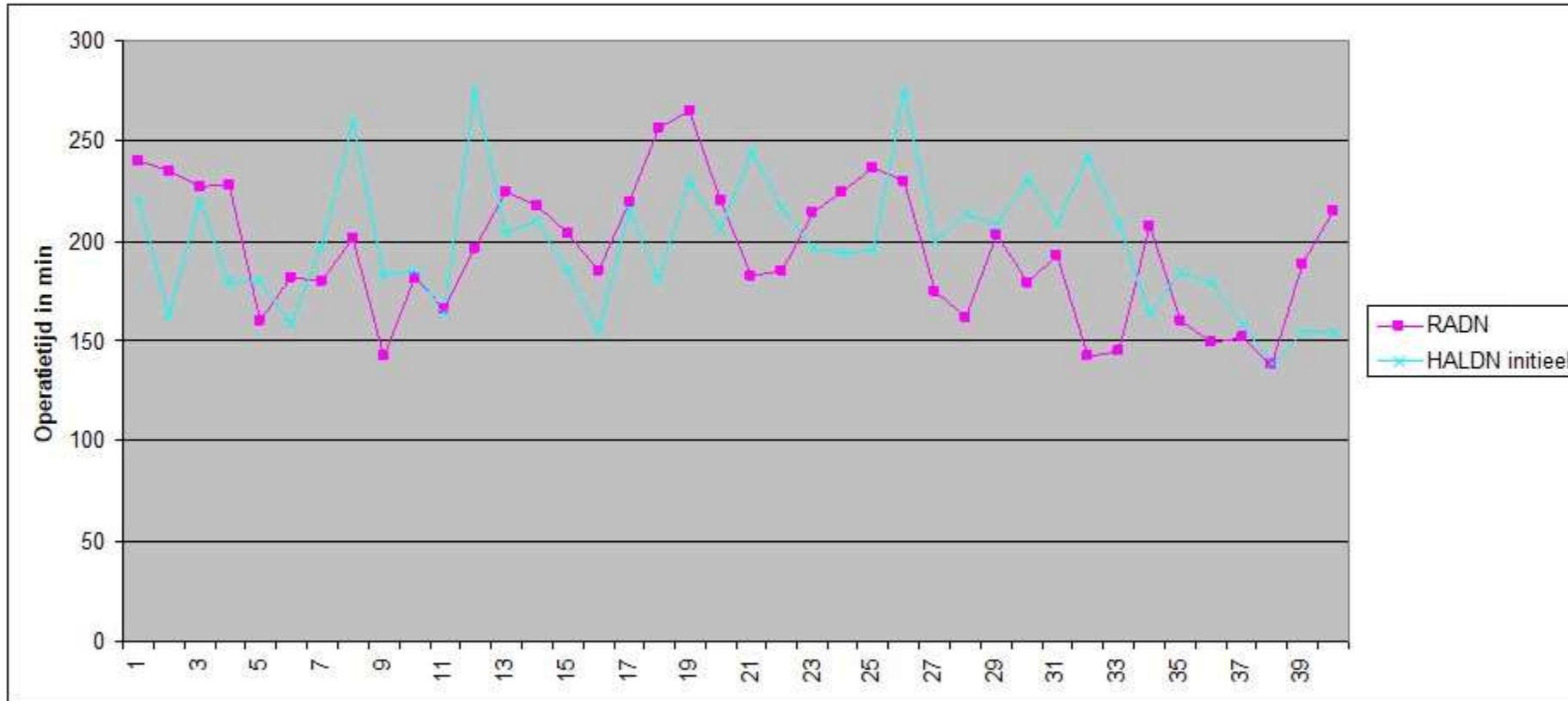
	<b>HALDN</b>	<b>RADN</b>	
	n=49	n=66	
1e WIT (min, median)	2	3	<0,05
Bloodloss (ml, median)	50	20	<0,05
Operation time (min, median)	137	181	<0,05



# Operation time RADN vs latest HADN



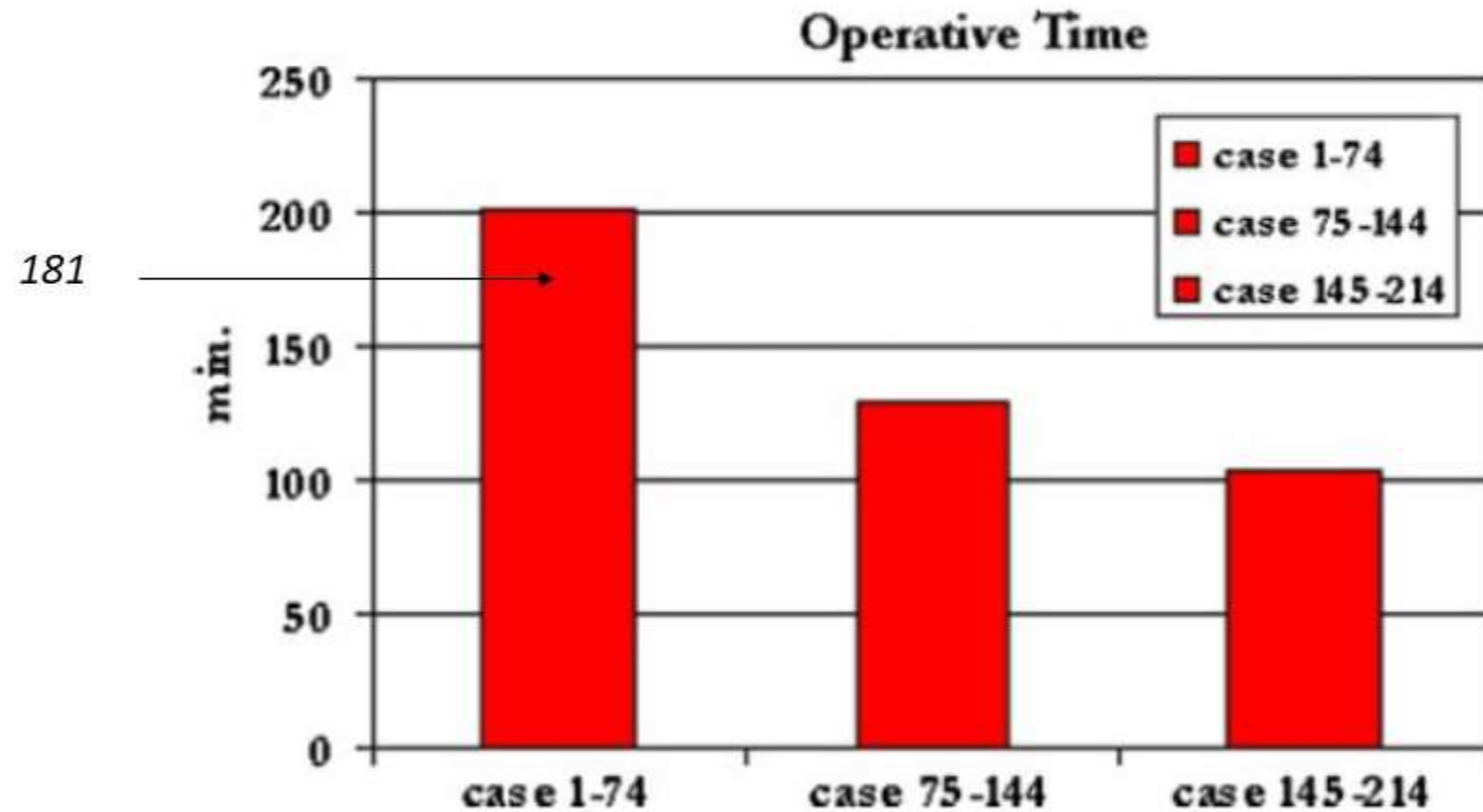
# Operation time RADN vs initial HALDN



# Operation time – learning curve RADN



Group: Horgan/Benedetti - Chicago





# Results



			HALDN n=49	RADN n=66	
Post-operative length of stay (days, median)			3	3	ns
Median Painscores (VAS)					
	Day 0	rest	2	2	ns
		activity	3	3	
	Day 1	rest	2	2	
		activity	3	3	
	Day 2	rest	2	2	
		activity	3	3	
	Day 3	rest	1	2	
		activity	2	3	





# Results

		HALDN n=49	RADN n=66
Peroperative compl			
		2x lesion upperpole art	1x stapler dysfunction
Postoperative compl			
		2x re-admiss pneumonia	1x re-adm migraine
		1x re-admiss abd pain eci & superficial wound infection	1x re-adm UTI
			1 long adm for abd pain eci
			2 x woundhernia





# Results

		HALDN	RADN	
		n=49	n=66	
At 1 week post-operative				
	Serum Creatinine	158	133	ns
	eGFR	37	45	
At 1 month post-operative				
	Serum Creatinine	137	123	ns
	eGFR	48	51	
<i>(all values median)</i>				





# Shin et al 2019, Korea

Xi, N=56

	RADN	HADN
Operation time	150	210
Length of stay	7	7
Bloodloss	<100	300
Transfusion	0	17%



Rest comparable





# Spaggiari, Benedetti. Chicago. July 2020

*Spaggiari, Benedetti et al. Ann Surg 2020 Jul 9.*

N= 1090 robotic

7 conversion

Median operation time: 159 min

Median WIT 3 min

Bloodloss 50 ml

Median length of stay 3 days

Re-admission: 7,9%

Complications: 19 %







## Disadvantages

- No tactile feedback. (Need to adjust your operation technic)
- Slower procedure in case of unexpected major bleeding.
- 1 extra 8 mm trocar in stead of 2 trocars HALDN (10 en 12 mm).
- Oblique lower abdominal incision in stead of Pfannenstiehl
  
- Kosten:
  - Dposables
  - Price of the system *(Epic ?, ergonomics surgeon?)*



# Remarks

Fixed operation team

First assistant: Surgeon / Resident / Medical student / OR nurse

Extraction site vs number of incisions

No Air-Seal insufflator





## Conclusions:

RADN is safe for the donor and the kidney

“Next level” of minimal invasive surgery for the kidney donor  
(peri-operative advantage for the surgeon)

Costs is the biggest drawback for the implication

