

### Background (I)

- Radical nephrectomy
  - Gold standard for treating small RCC
  - Gradually impaired renal function
- Nephron-sparing surgery (NSS)
  - Preserving renal function
  - Excellent long-term survival
  - Treatment of choice for small RCC

### Background (II)

- NSS limited in treating VHL disease
  - Multifocal, bilateral, and recurrent RCC
  - Reluctant to repeat NSS
  - Postoperative fibrosis
  - Increasing morbidity

### Background (III)

- Radiofrequency ablation (RFA)
  - Percutaneous approach
  - Repeated treatments
  - Regardless of location or number of RCC
  - Preserving renal function
  - Smaller tumor margin than cryoablation

### Background (IV)

- Previous studies: RCC in VHL
  - Small tumors (<3 cm)
  - Easily accessible
  - Safely treatable
  - Laparoscopic as well as percutaneous
  - No description about technical aspect or outcome of RFA treatment

### Purpose

- To evaluate the technical feasibility, complication, treatment outcome, and renal function change in treating RCC in VHL patients who were not able to undergo repeated surgical procedures due to increasing postoperative morbidity or mortality.

### Subjects (I)

- October 2005 – July 2010
- Seven VHL pts with renal masses
  - Radical nephrectomy (n=4)
  - Partial nephrectomy or enucleation (n=3)
  - One pt excluded due to lung mets

### Subjects (II)

- Finally, six pts with 14 tumors
  - M:F = 4:2; mean age, 36.3 yrs (23 – 51 yrs)
  - Mean FU, 36 months (7 – 53 months)
  - FU CT schedules
    - First year: 1, 6, and 12 months
    - Second year: every 6 months
    - Thereafter annually

### RFA indications

- Inclusion criteria
  - Renal tumor measuring  $\geq 1$  cm
  - Renal tumor without fat tissue
  - Solid mass – more than 20 HU
  - Cystic mass – Bosniak III or IV masses

### Renal tumors (I)

	No. of tumors	Size of tumors
Total renal tumors	14	1.0 – 4.2 cm ( $2.0 \pm 0.9$ cm)
Solid tumors	12	1.0 – 2.3 cm ( $1.7 \pm 0.4$ cm)
Cystic tumors	2	3.4 – 4.2 cm ( $3.8 \pm 0.6$ cm)

### Renal tumors (II)

- Thirteen RCCs in five pts
- One RCC in one pt
- Seven RCCs in right kidney
- Seven RCCs in left kidney
- Two cystic RCCs of Bosniak IV
- No pre-ablation biopsy

### RFA procedure

- Under CT guidance
- Cool-tip RF system
- Mean RFA duration, 7.6 min (1 – 12 min)
- Conscious sedation
  - Pentidine HCl before 2008
  - Fentanyl and midazolam after 2008
- No general anesthesia

### ➔ *Data analysis*

- Feasibility and prevention methods
- Complication: major and minor
- Renal function change: Cr and eGFR
- Residual or recurrent tumor
- New tumor
  - Size < 1 cm, observation
  - Size ≥ 1 cm, RFA

### ➔ *Statistical analysis*

- Wilcoxon sign-rank test
  - Cr and eGFR before and after RFA
- A p value of 0.05
- PASW statistics

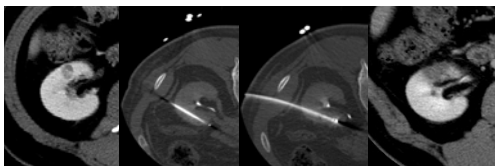
### ➔ *Results: technical feasibility*

- Nine tumors in proximity to organs
  - Bowel in four
  - UPJ or pelvis in two
  - Psoas muscle in two
  - Vascular pedicle in one
  - Pancreas in one

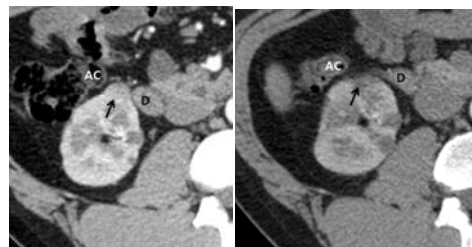
### ➔ *Results: prevention methods*

- Non-invasive methods
  - Position change: colon (n=1), psoas m (n=1)
  - Levering electrode: psoas m (n=1)
- Minimally invasive methods
  - Hydrodissection: duodenum and colon (n=1)
  - Hemodissection: pancreas (n=1), jejunum (n=1)
  - Retrograde catheterization: UPJ (n=1)
- Not performed in following cases
  - Renal pelvis (n=1), vascular pedicle (n=1)

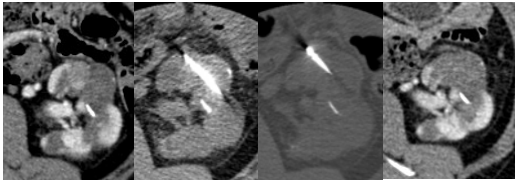
### ➔ *Levering electrode, 24y VHL man*



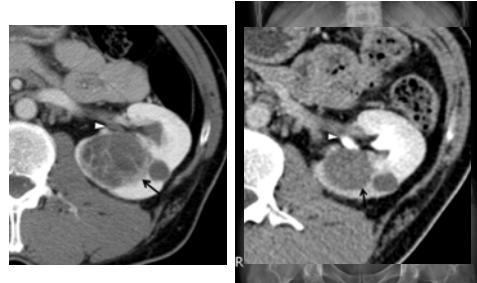
### ➔ *Hydrodissection, 27yr VHL man*



### ➔ No hydrodissection, 40y VHL man



### ➔ Catheterization, 42yr VHL man



### ➔ Results: complications

- Major complication in one session (8%)
  - Pneumothorax requiring aspiration
  - Oblique access impossible due to sinus injury
  - Perpendicular access to the upper tumor
- Minor complication in seven sessions (58%)
  - Five perirenal or subcapsular hematomas
  - Three segmental infarctions
  - Two transient hematomas

### ➔ Renal function: Cr & eGFR

	Before RFA	After RFA	Difference (%)	P value
Cr (mg/dl)	1.11 ± 0.18	1.18 ± 0.19	6.4 ± 1.9	<0.05
eGFR (ml/min)	77 ± 13	67 ± 13	-12.8 ± 5.6	<0.05

### ➔ Results: outcome

- 14 tumors in six pts requiring 23 ablations during 12 sessions
  - 50% (7/14) after one ablation
  - 43% (6/14) after two ablations
  - 7% (1/14) after four ablations
- Three new tumors in two pts at FU CT
  - Size, 7.0 – 9.3 mm
  - RFA scheduled after the tumor size ≥ 1 cm.

### ➔ Limitations

- No pathologic proof
- Retrospective design
- Small number of VHL cases



### ***Conclusion (I)***

- Any small RCCs in VHL pt can be treated with RFA.
- The location or number of RCC in VHL pt is not a problem for percutaneous RFA.
- Prevention methods help to achieve a safe RFA of RCC in proximity to critical organs.



### ***Conclusion (II)***

- Renal function is significantly reduced following RFA even if it is minimal.
- Renal function is gradually impaired because of recurrent RCCs.
- Therefore, RFA can provide a longer dialysis-free survival period compared to surgery.