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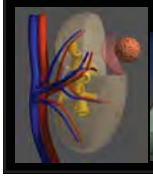
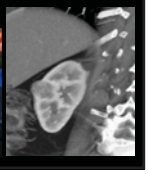
UF | Department of Urology

Minimally Invasive Approaches for Renal Cell Carcinoma and Pheochromocytoma

Li-Ming Su, M.D.

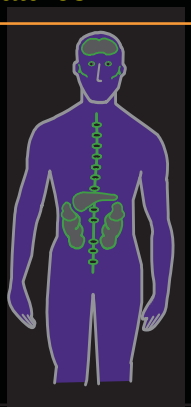
Professor and Associate Chairman of Urology
Director of Robotic and Minimally Invasive Urologic Surgery





VHL Clinical Features

- Tumors develop in:
  - Both Kidneys
  - Adrenal Glands
  - Pancreas
  - Brain or Spine
  - Eyes
  - Inner Ears



VHL: Renal Cell Carcinoma

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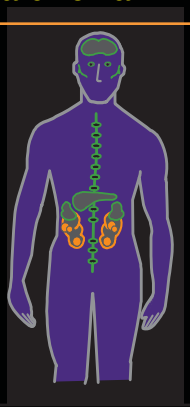
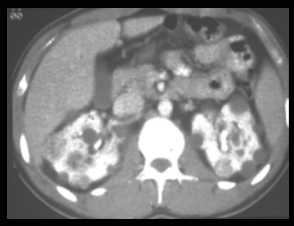


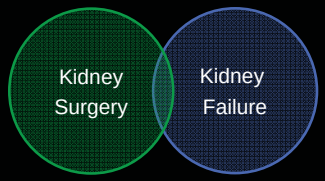
VHL: Renal Cell Carcinoma



CT Scan: Bilateral, Multifocal RCC

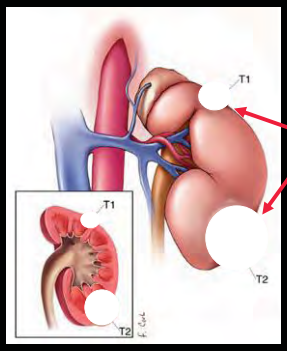
VHL Kidney: Multifocal RCC

Competing Goals



Answer: Partial Nephrectomy

Partial Nephrectomy



Surgically excise tumors while preserving healthy portions of kidney

When to intervene surgically?

THE RELATIONSHIP BETWEEN RENAL TUMOR SIZE AND METASTASES IN PATIENTS WITH VON HIPPEL-LINDAU DISEASE

BRANDEN G. DUFFEY, PETER L. CHOYKE, GLADYS GLENN, ROBERT L. GRUBB, DAVID VENZON, W. MARSTON LINEHAN AND McCLELLAN M. WALTHER*

From the Urologic Oncology Branch (BGD, RLG, WML, MMW), Department of Radiology (PLC), Genetic Epidemiology Branch (GG), and Biostatistics and Data Management Section (DV), National Cancer Institute, National Institutes of Health, Bethesda, Maryland

Size: Kidney tumors < 3 cm have low risk for metastasis

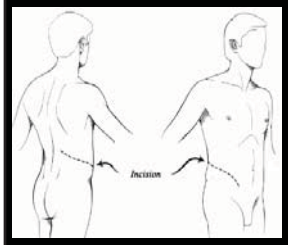
Enhancing Renal Masses With Zero Net Growth During Active Surveillance

David A. Kunkle, Paul L. Crispen, David Y. T. Chen, Richard E. Greenberg and Robert G. Uzzo*

From the Department of Urologic Oncology, Fox Chase Cancer Center, Temple University School of Medicine, Philadelphia, Pennsylvania

Growth pattern: Small kidney tumors with growth rate < 0.3 cm/year have low risk of metastasis

Expanding Treatment Options



Surgical Technique

Before 1990
- **Open Radical Nephrectomy**
- **Open Partial Nephrectomy**

Since 1990
- Laparoscopic Radical Nephrectomy

Since 1993
- Laparoscopic Partial Nephrectomy

Since 2007
- Robotic Partial Nephrectomy

Since 1997
- Radiofrequency Ablation
- Cryoablation
- High Intensity Frequency Ultrasound

Expanding Treatment Options

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Open Partial Nephrectomy

- Gold standard treatment

Advantages:
- Entire kidney and all tumors exposed
- Multiple tumors surgically removed in one setting

Disadvantages:
- Large flank incision
- Hospital stay 3-5 days

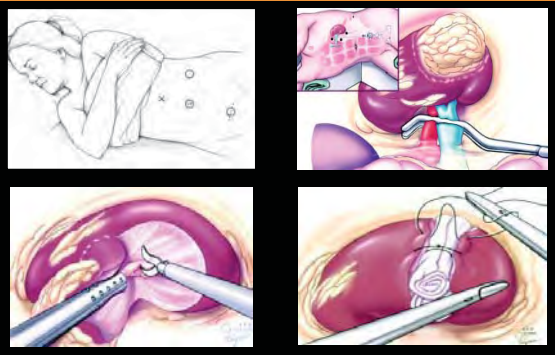
Laparoscopic Partial Nephrectomy

- Less invasive alternative to open partial nephrectomy

Advantages:
- 3-4 small 1-cm incisions
- Less pain, better cosmesis
- Hospital stay 1-2 days

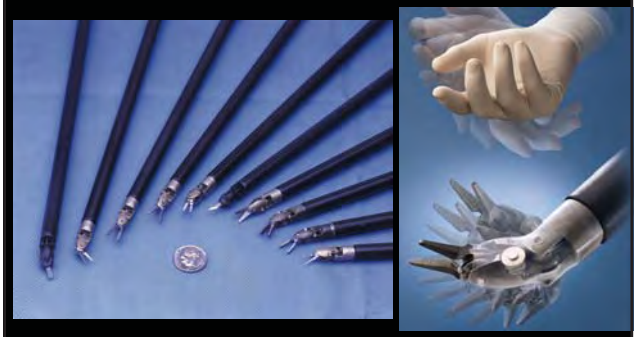
Disadvantage:
- Excision of multiple tumors challenging
- Requires advanced laparoscopic training (e.g. fellowship)
- Standard of care for small, peripheral tumors in select centers of excellence

Laparoscopic Partial Nephrectomy



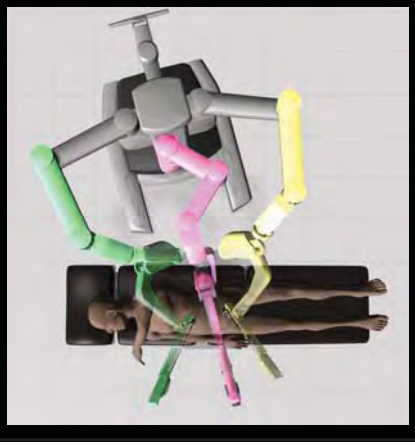
Robotic Surgery: daVinci Surgical System

Wristed Instruments

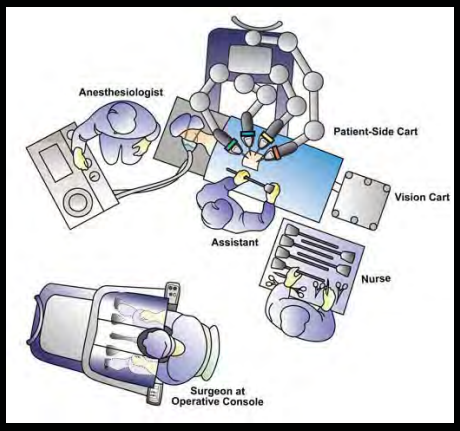


3-D Endoscope

- 3-D view
- 10X magnification
- High definition image



Surgeon Console

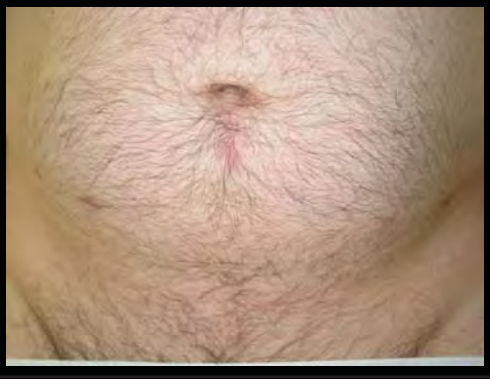


Robotic Partial Nephrectomy Technique Video

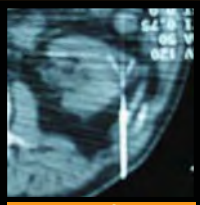
Courtesy of S. Bhayani, M.D., Wash. Univ.

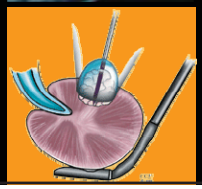
Extraction of Renal Mass

Postoperative Incisions @ 1 month



Needle Ablative Therapy





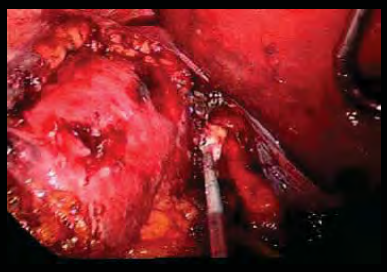
Radiofrequency Ablation (RFA)

- Needle probe with umbrella tines
- Uses heat to kill tumor cells (70-100º C)

Cryoablation (Cryo)

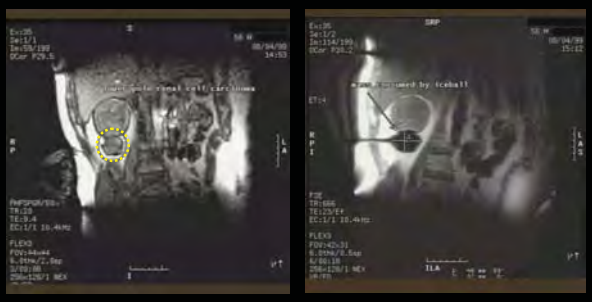
- Single tip needle probe
- Uses freezing temperature to kill tumor cells (-120º C)

Laparoscopic RFA of Renal Mass



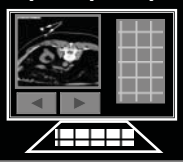
Laparoscopic Cryoablation of Renal Mass

Percutaneous Renal Cryoablation



Remote Computer Control with Robotic Targeting

Operator (Computer)



CT Scan
Patient
(PAKY-RCM Robot)

Needle Ablation: CT Guidance

Needle Ablation Incision

Percutaneous Ablation

Advantages:

- Performed under iv sedation
- Outpatient treatment
- Minimal pain or blood loss

Disadvantage:

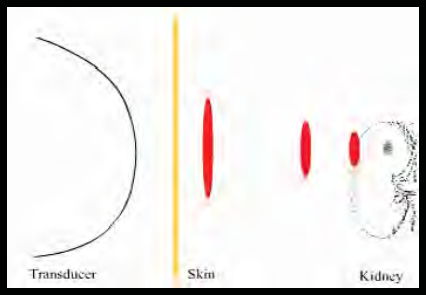
- Lack of long term follow-up or success rates
- May not always have tissue diagnosis

Ablation of Renal Tumors: Intermediate Results

	Recurrence-Free Survival	Mean Follow-up
▪ RFA		
▪ Levinson et al., 2008	90%	61 months
▪ Park et al, 2006	97%	25 months
▪ Cryoablation		
▪ Finley et al., 2008	95%	13 months
▪ Bandi et al., 2007	98%	19 months

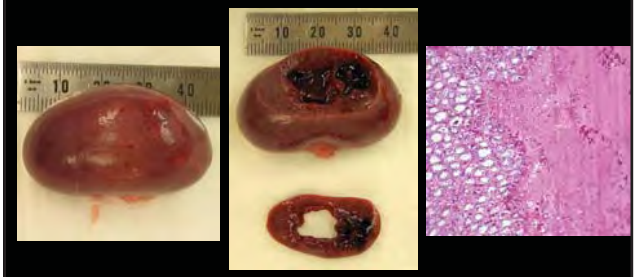
Noninvasive Ablative Therapy

High Intensity Frequency Ultrasound (HIFU)



Noninvasive Ablative Therapy

High Intensity Frequency Ultrasound (HIFU)



Courtesy of William W. Roberts, University of Michigan

VHL: Adrenal Pheochromocytoma

- Tumors develop in:
  - Both Kidneys
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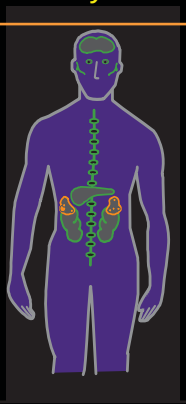

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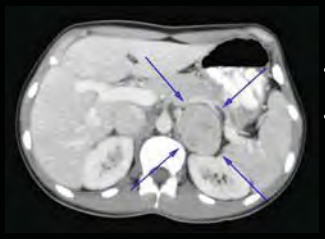


- Rarely malignant
- Severe high blood pressure, headaches, facial flushing, tremors, palpitations

Management of Pheochromocytoma

Step 1:

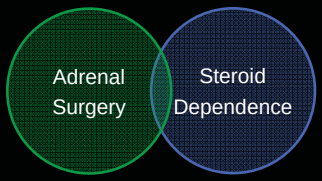
Medical management of high blood pressure

- alpha blockers (phenoxybenzamine)
- calcium channel blockers

Step 2:

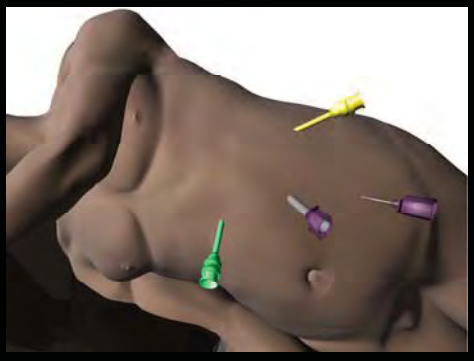
Surgical management to remove tumor

Competing Goals

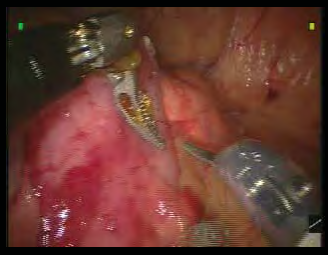


Answer: Partial Adrenalectomy

Robotic Partial Adrenalectomy



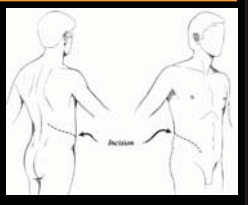
Robotic Partial Adrenalectomy



Evolution of Minimally Invasive Surgery

From….

Knife (Open surgery)



Evolution of Minimally Invasive Surgery

From….

Knife

to

Needle (Ablation)

Evolution of Minimally Invasive Surgery

From….

Knife

to

Needle

to

Nothing (Ultrasound)

VHL: Where We Stand in 2008

For kidney tumors:

- Large, multiple tumors
  - open partial nephrectomy (if possible)
  - laparoscopic or open radical nephrectomy
- Small (< 4cm), solitary tumors
  - open partial nephrectomy
  - lap/robotic partial nephrectomy
  - percutaneous ablation
- However, choice of treatment must be individualized

For pheochromocytoma:

- Lap/robotic partial adrenalectomy

UF | Department of Urology

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