Nephron-Sparing Treatments for Renal Tumors

Mike Eng, PGY-4
University of British Columbia
March 22\textsuperscript{nd}, 2006
Should we do partial Nx for T1b tumors?

What’s an adequate margin for a partial Nx?

What are the intermediate results of MIS Partial Nx?

What is the most recent data on Cryo and RFA?

Did Fenster just take the last doughnut?

Overview

- History
- Open Partial Nephrectomy
- MIS Partial Nephrectomy
- Cryoablation
- Radiofrequency Ablation (RFA)
History of Partial Nx

- 1869- Gustav Simon
  - 1st planned Nx
- 1884- Wells
  - 1st Partial Nx
    (accidentally)
- 1887- Vincenz Czerny
  - 1st planned Partial Nx

1879- 1900:
- Tillman, Tuffier, Bardenheuer, Paoli
- experimental feasibility studies
- Lost favor: fear of Cx

Tuffier in action
### History of Partial Nx

#### 1901-1935: Goldstein and Abeshouse
- 296 cases, 34 for tumors
- Polar small-moderate tumors
- “… contraindicated if opposite kidney was healthy.” JU 38:15, 1937.

#### 1950- Vermooten
- Foundation of modern NSS
- Autopsy studies (Bell, Hale)
- Proposed elective NSS

---

“*There are certain instances, when it is unwise to do a nephrectomy... The question is, whether such a procedure is ever justifiable when the opposite kidney is normal. I am inclined to think that in certain circumstances it may be.*”

JU 64:200, 1950.
History of Partial Nx

- 1960s: Significant improvements in NSS
  - Poutasse: segmental blood supply
  - Kerr and Klotz: renal hypothermia
  - Partial Nx done in essential cases

- mid 1970s:
  - Question Rad Nx even if normal contralateral kidney
    - Puigvert
    - Herr
    - Novick
    - Marberger
History of Partial Nx

- 1981: Era of elective NSS
  - CT scan detection
  - Kidney reconstruction
  - Renal hypothermia
  - Hotly debated

Late 1990s: Standard of Care
- Improved hemostasis techniques
- Long term data (10 yr)
  - Herr 1999
  - Fergany 2000
History of Nephron-Sparing Tx

- MIS Partial Nx
  - 1993- Winfield: 1st case for LP tic
  - 1994- Gill: RP MIS Partial Nx
- Cryoablation
  - 1995– Uchida: 1st report
  - 1998– Gill: MIS Cryo
- RFA
  - 1997– Zlotta: 1st report
  - 2000-2002: early percutaneous experience

Nephron-Sparing Tx: Indications

- Absolute (“Imperative”)
  - Solitary kidney
  - Bilateral tumors
  - Severe renal insufficiency
- Relative
  - Contralateral kidney threatened by:
    - Local conditions: (eg. stones, infxn, RAS, UPJO)
    - Systemic conditions: (eg. DM, HTN)
    - Genetic conditions: (eg. vHL)
- Elective (Normal Contralateral Kidney)
  - Small (<4 cm; ? <7 cm)
  - Young
Open Partial Nephrectomy

Open Partial Nx- Techniques

- Enucleation
- Polar segmental resection
- Wedge resection
- Major transverse resection
- Ex vivo resection & autotransplant
Technique Overview

- Approach
- Inspection of kidney
- Isolation of vessels
- Cytoprotection
- Adequate resection
- Hemostasis & closure

Technique- Warm Ischemia

<table>
<thead>
<tr>
<th>WIT (min)</th>
<th>Immed Renal Fxn Loss (%)</th>
<th>Recovery of Renal Fxn</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Minimal</td>
<td>Complete, min</td>
</tr>
<tr>
<td>20</td>
<td>40-50</td>
<td>Complete, hrs</td>
</tr>
<tr>
<td>30</td>
<td>60-70</td>
<td>Complete, 3-9d</td>
</tr>
<tr>
<td>60</td>
<td>70-80</td>
<td>Often Complete, hrs</td>
</tr>
<tr>
<td>120</td>
<td>100</td>
<td>Incomplete (30-50%)</td>
</tr>
<tr>
<td>180</td>
<td>100</td>
<td>None</td>
</tr>
</tbody>
</table>

- 30 min WIT

- 90 min (porcine)
  (Laven JU 172: 2471,2004.)
  - Solitary kidney
  - ↓ GFR initial 72 hr
  - GFR normal @ 2 wks
    * @ 1 wk (Baldwin Uro 2004)

Technique– Warm Ischemia

- More functional impairment if:
  - Intermittent (vs. continuous) Wilson 1971
  - Manual compression (vs. clamp) McLaughlin 1978

- Enhanced renal tolerance:
  - Solitary kidney
  - Collateral blood supply

Technique– Renal Hypothermia

- Optimum temp 15°C
  - Canine experiments by Ward 1975
- 20-25 ºC easier to maintain
  - Renal protection for 90 min to 3 hr (Novick 1983)
- Renal surface hypothermia (most common)
- Perfusion hypothermia (equal efficacy)
Technique– Margins

• Frozen section:
  • Method: gross +/- microscopic inspection

• Size of margin:
  • Traditionally: 1-2 cm
  • Current: 5 mm
    • possibly even 2 mm (Sutherland JU 167:61, 2002; Porpiglia JU 173,1098, 2005; Gill JU 170:64,2003)

No residual tumor in Rad Nx specimen
3 of 4 no recurrence
Technique—Margins

DOES THE SIZE OF THE SURGICAL MARGIN IN PARTIAL NEPHRECTOMY FOR RENAL CELL CANCER REALLY MATTER?

SUZETTE E. SUTHERLAND, MARTIN I. RESNICK,† GREGORY T. MACLENNAN AND HOWARD B. GOLDMAN

JU 167:61, 2002

• 44 open partial Nx–41 negative surgical margins
• 49 mo mean f/u
• No local recurrence @ resection site
• Median margin size: **2 mm**
• 42 of 44 cases: <5 mm margin

Technique- Hemostasis

• Suture closure vessels & collecting system
• Argon beam coagulation
• Thrombotic agents:
  • Gelfoam
  • Tisseal
  • FloSeal
  • Surgicel
Complications

NSS Results– Renal Fxn

  - Mayo clinic, n=1730 pt
  - Unilateral RCC w/ normal contralat kidney
  - Rad Nx vs. Partial Nx
  - Matched TNM, grade, tumor size, year
  - Progression to renal insuff. (Cr > 2mg/dl)
    - 12.4% Rad Nx
    - 2.3% Partial Nx (p<0.002)
Open Partial Nx - Results

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. Pt.</th>
<th>% Local Recurrence</th>
<th>% Metastatic Recurrence</th>
<th>Mean Follow-up (mos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacobs et al.</td>
<td>45</td>
<td>20</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>Marberger et al.</td>
<td>22</td>
<td>8</td>
<td>Not available</td>
<td>34.5</td>
</tr>
<tr>
<td>Smith et al.</td>
<td>59</td>
<td>8</td>
<td>Not available</td>
<td>54.0</td>
</tr>
<tr>
<td>Marshall et al.</td>
<td>10</td>
<td>70</td>
<td>70</td>
<td>56.5</td>
</tr>
<tr>
<td>Roswell et al.</td>
<td>81</td>
<td>60</td>
<td>60</td>
<td>66.6</td>
</tr>
<tr>
<td>Couty et al.</td>
<td>86</td>
<td>8</td>
<td>8</td>
<td>46.5</td>
</tr>
<tr>
<td>Gold et al.</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>Not available</td>
</tr>
<tr>
<td>Regen et al.</td>
<td>101</td>
<td>30</td>
<td>30</td>
<td>60.5</td>
</tr>
<tr>
<td>Saffet et al.</td>
<td>100</td>
<td>10</td>
<td>10</td>
<td>46.5</td>
</tr>
<tr>
<td>Spence et al.</td>
<td>144</td>
<td>40</td>
<td>40</td>
<td>36.0</td>
</tr>
<tr>
<td>Bevans et al.</td>
<td>142</td>
<td>24</td>
<td>24</td>
<td>36.5</td>
</tr>
<tr>
<td>Thonar et al.</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>30.0</td>
</tr>
<tr>
<td>Lauer et al.</td>
<td>105</td>
<td>50</td>
<td>50</td>
<td>44.2</td>
</tr>
<tr>
<td>D’Baccaro et al.</td>
<td>19</td>
<td>20</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>Ball et al.</td>
<td>101</td>
<td>30</td>
<td>30</td>
<td>87</td>
</tr>
<tr>
<td>van Dijk et al.</td>
<td>66</td>
<td>10</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Hurrell et al.</td>
<td>65</td>
<td>20</td>
<td>20</td>
<td>47.0</td>
</tr>
<tr>
<td>Botella et al.</td>
<td>41</td>
<td>75</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td>Selmeijer et al.</td>
<td>183</td>
<td>50</td>
<td>50</td>
<td>74</td>
</tr>
<tr>
<td>Lee et al.</td>
<td>79</td>
<td>30</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Total (range)</td>
<td>1,030</td>
<td>100</td>
<td>100</td>
<td>(9-75)</td>
</tr>
</tbody>
</table>

> 90% in recent series

Results – Elective NSS
Long-term Results

  - CCF, sporadic RCC
  - N=107
  - 90% partial Nx imperative indications
  - Min. 10 yr f/u

  - MSK
  - N=70
  - Small tumors w/ normal contralat kidney
  - Mean size: 3 cm
  - Mean f/u: 10 yrs
  - 97 % cancer free survival

<table>
<thead>
<tr>
<th></th>
<th>% 5 Yr survival</th>
<th>% 10 Yr survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>88.2</td>
<td>73</td>
</tr>
<tr>
<td>&lt; 4cm</td>
<td>98</td>
<td>92</td>
</tr>
</tbody>
</table>

Partial vs Radical Nx

- **Retrospective**
- **Controlled for:**
  - Age
  - Gender
  - Tumor size
  - Stage
  - Grade

<table>
<thead>
<tr>
<th>References</th>
<th>Nephrectomy/Nephron Sparing Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Pts.</td>
</tr>
<tr>
<td>Lerner et al.18</td>
<td>200/185</td>
</tr>
<tr>
<td>Bartolias et al.</td>
<td>48/41</td>
</tr>
<tr>
<td>Beldegrun et al.</td>
<td>135/108</td>
</tr>
<tr>
<td>Inhoehn et al.</td>
<td>71/95</td>
</tr>
<tr>
<td>Butler et al.</td>
<td>42/46</td>
</tr>
<tr>
<td>D’Amico et al.19</td>
<td>2149</td>
</tr>
<tr>
<td>Lee et al.10</td>
<td>133/79</td>
</tr>
</tbody>
</table>
Tumor Location

- Central vs peripheral
- Technical considerations
  - Longer clamp time
  - Collecting system repair
- Not prognostic indicator of outcome
  - Renal function
  - Local tumor recurrence
  - 5 yr cancer specific survival


Tumor Size: 4 cm cutoff

  - CCF, 485 patients
  - 4 cm cutoff
  - Lower recurrence rate
    - 5% vs. 16% (p=0.001)
  - Not T1a vs T1b though
    - 50 of 175 pts in >4cm group were >T1
  - No control group undergoing Rad Nx

5 yr cancer-specific survival 96% vs 86% (p=0.001)
Partial vs Rad Nx: 4-7 cm

  - Mayo Clinic
  - Retrospective
  - Heterogeneous:
    - Mean tumor size
    - TNM path stage
    - Histo subtype

<table>
<thead>
<tr>
<th>NSS</th>
<th>Rad Nx</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 yr cancer specific survival</td>
<td>98%</td>
</tr>
<tr>
<td>5 yr recurrence free survival</td>
<td>93%</td>
</tr>
</tbody>
</table>

Partial vs Rad Nx– T1a/b

  - 7 international centers (Europe & UCLA)
  - n = 1454, pathological T1
  - Mean f/u: 62.5 mo
Open Partial vs Radical Nx- T1a/b
Cancer Specific Survival

T1a: Partial vs Radial Nx No difference
T1b: Partial vs Radial Nx No difference

Open Partial vs Rad Nx– T1a/b
Recurrence

Table 3: Analysis of type of recurrence according to tumor size and type of surgery

<table>
<thead>
<tr>
<th>Type of Recurrence</th>
<th>T1a Tumor (N=10)</th>
<th>T1b Tumor (N=8)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local recurrence</td>
<td>2 (20%)</td>
<td>0 (0%)</td>
<td>0.60</td>
</tr>
<tr>
<td>Distant recurrence</td>
<td>2 (20%)</td>
<td>3 (37.5%)</td>
<td>1.00</td>
</tr>
<tr>
<td>No recurrence</td>
<td>6 (60%)</td>
<td>5 (62.5%)</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Partial Nx:
T1a vs T1b
No difference

T1a: Partial vs Radial Nx
No difference
T1b: Partial vs Radial Nx
No difference
NSS- Local Recurrence

- Incomplete resection of tumor
- Occult multifocal disease
- Development of new 1º or metastatic focus

Results– Multifocal RCC

Stage, grade, histological subtype
Open Partial Nx– Results Summary

• NSS for T1a (<4cm)
  • Equivalent oncological efficacy
  • 90-100% cancer specific survival
  • Renal function preserved
  • Multifocal RCC: 5%
  • Local Recurrence: 0-7%
• ? Expand indications to T1b

Laparoscopic Partial Nephrectomy
Technique– Approach

- Transperitoneal
- Retroperitoneal

Laparoscopic Ultrasound

- Endophytic, central
- Lower positive margin
  - 14% vs. 3%
  (Wash U: Ames JU 171(4 suppl), 2004)
- ? Multifocal tumor
  - No advantage compared to pre-op CT
Technique– Hypothermia

• If expect WIT >30 min
• Surface contact renal hypothermia
  • Endocatch II bag (Gill et al. JU 170:52, 2003.)
  • Intra-arterial iced RL (Janetschek. JU 171, 2004)
    • Angiocath into renal artery via femoral
• Retrograde endoscopic
  • Ureteral access sheath (Landman. Urology 2003)

Technique- Hilar Clamping

  • Retrospective, n=28
  • Group 1 (no clamp, ultrasonic & bipolar)
  • Group 2 (clamp, ureteral catheter cooling)
Technique– Hemostasis

- Tourniquets (w/o hilar clamping)
  - Regional hypoperfusion
  - Cable-tie, double-loop & Vicryl mesh
  - Peripheral/polar tumors
  - Unreliable
- Argon beamer
- Tissue sealants
  - ↓ hemorrhage & urine leak (Spalviero.CCF. JU 171(4 suppl),2004)

Technique- Hemostasis

- Coagulative Energy
  - Animal studies: Water-Jet dissector, Laser
  - Suboptimal: Ultrasonic, Bipolar, Microwave
  - RF Coagulation: peripheral tumor
    (Winfield J Endo 2005; Cadeddu AUAUS 2004)
  - **Standard: Suture closure reconstruction**
    - Especially larger & central lesions
Technique - Closure

- Watertight closure collecting system
- Vessels
- Floseal
- Surgicel ‘cigar’
- Sutures w/ Hem-o-Lok clips or LapraTy

MIS - Complications

- CCF. n=200, 25% central, 71% pelvicaliceal repair
- 7.5% solitary, Open conversion in 1%
- Floseal: ↓ hemorrhage to 3%, ↓ urine leak to 1.5%
MIS- Central Tumors

- Conversion
  - Open Partial (1)
  - MIS Rad Nx (1)
- Early Post-Op Cx
  - Hemorrhage (3.9%)
  - Urine leak (1.3%)

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Peripheral</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>154</td>
<td>209</td>
</tr>
<tr>
<td>Size (cm)</td>
<td>3.0 (1-7)</td>
<td>2.4 (0.7-10)</td>
</tr>
<tr>
<td>WIT(min)</td>
<td>33.5</td>
<td>30</td>
</tr>
<tr>
<td>+ Margin</td>
<td>0.8%</td>
<td>0.7%</td>
</tr>
<tr>
<td>IntraOp Cx</td>
<td>5.2%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Early Postop</td>
<td>5.8%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Late Postop</td>
<td>7.8%</td>
<td>7.7%</td>
</tr>
</tbody>
</table>


MIS– Oncological Results

<table>
<thead>
<tr>
<th></th>
<th>CCF JU 175:459, 2006</th>
<th>Hopkins JU 172:871, 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>No RCC</td>
<td>68</td>
<td>48</td>
</tr>
<tr>
<td>F/U (mo)</td>
<td>42</td>
<td>37</td>
</tr>
<tr>
<td>Size (cm)</td>
<td>2.9</td>
<td>2.4</td>
</tr>
<tr>
<td># Pos Margins</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cancer-specific survival (%)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td># local recurrences</td>
<td>0</td>
<td>2 (1 vHL, 1 remote)</td>
</tr>
</tbody>
</table>
### MIS Partial Nx– Summary

- Technically challenging
- Technique evolving
- Intermediate oncological efficacy similar
- Vs. Open:
  - ↑ Intraoperative Cx
  - ↑ GU Cx

### Comparative Analysis of Laparoscopic Versus Open Partial Nephrectomy for Renal Tumors in 200 Patients

<table>
<thead>
<tr>
<th></th>
<th>MIS</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲ Size (cm)</td>
<td>2.8</td>
<td>3.3</td>
</tr>
<tr>
<td>▲ Solitary</td>
<td>41%</td>
<td>54%</td>
</tr>
<tr>
<td>▲ WIT (min)</td>
<td>27.8</td>
<td>17.5</td>
</tr>
<tr>
<td>▲ EBL (cc)</td>
<td>125</td>
<td>250</td>
</tr>
<tr>
<td>▲ IntraOp Cx</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>▲ GU Cx</td>
<td>11%</td>
<td>2%</td>
</tr>
<tr>
<td>Pos Margin</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>▲ LOS (days)</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
Ablation

Ablation– Indications

- Advanced age
- Limited life expectancy
- High operative risk/ Refuse surgery
- Multifocal RCC (eg. vHL)
- Solitary kidney
- Small (<3 cm), exophytic
Ablation Options

- **Cryoablation**
  - Open
  - MIS
  - Percutaneous

- **Thermal Ablation**
  - **Radiofrequency Ablation (RFA)**
  - High Intensity Focused Ultrasound (HIFU)
  - Microwave
  - Laser Induced Thermotherapy (LITT)
  - Interstitial Photon Radiation Ablation
Cryoablation - Mechanism

- Direct cytotoxic injury:
  - Intracellular ice crystals → Hyperosmolar environment
  - Cell dehydration, shrinkage, enzyme denaturation, cytoskeleton & membrane dysfunction
- Indirect ischemic injury
  - Occlusion of local tissue microvasculature
  - Rapid freeze, then gradual thaw
  - Maximizes effect

Cryoablation – Technique

- Approach
- Imaging
- Bx
- 2.4 -4.8 mm cryoprobe
- Double freeze/ thaw
  - Freeze: Liquid N or Ar
  - Thaw: Passive, He gas

Echogenic leading edge of ice ball

Cryoablation- Ice Ball

-19.4°C needed
-U/S, CT, or MRI
-Ice ball overrepresents actual area of ablation
-Aim for ice ball 1 cm greater than tumor
- Minimum 3.1 mm
(Campbell et al. Urology 52:29, 1998)


Cryoablation– Efficacy

- Confirmed tumoricidal effects
  - Chronic (Jang et al. JU 173:720, 2005.)
Post Cryoablation Imaging

- CT or MRI
- Non-enhancing
  - Transient rim enhancement @ 1-3 mo
  - Bx: no RCC
  - ? Reactive changes
- Same or decrease in size


Shrinkage
Shrinkage

Cryoablation– Results

RENAL CRYOABLATION: OUTCOME AT 3 YEARS
INDERBIR S. GILL,*† ERICK M. REMER, WALFED A. HASAN, BRENDALLA STEZEMPKOWSKI, MASSIMILIANO SPALIVIERO, ANDREW P. STEINBERG, JIHAD H. KAOUK, MIHR M. DESAI and ANDREW C. NOVICK

- 56 pts w/ 3 yr f/u
- Mean tumor size: 2.3 cm (1-5 cm)
- 2 lesions (3.6%) abutting collecting system
- Routine 6 mo post-op Bx in 39 pts (70%)
MIS Cryo 3 yr f/u

- 98% 3 yr cancer-specific survival
- 2 local recurrences (5.6%)
  - Neg routine Bx
  - New MRI enhancement
- Renal fxn– no change

Percutaneous Cryoablation

- MRI guided
  - 22 tumors, 20 pts
  - Mean tumor size: 3 cm (1.8-7 cm)
  - No OR Bx, 2 or 3 mm probe, 3 freeze-thaw
  - Anterior location 20% -- no bowel injuries
  - Mean f/u: 9.1 mo (3-14)
  - No recurrences
    - (1 pt retreated b/c VHL)
Percutaneous Cryoablation

- CT guided
  - N=27 lesions (20 pts)
  - Conscious sedation
  - Size: 2.5 cm
  - 1 pt required pRBC
  - 16 lesions f/u 6 mo
  - 15/16 no enhancement
  - Small, non-central lesions

- U/S guided
  - N=4
  - GA
  - No periop Cx

Complications

- Major/ Bleeding (<1%) JU 172:874,2004
  - Use smaller probes
  - Refreeze
  - Floseal, Surgicel, Argon beam
- Pain/Paresthesia @ probe site
- ?Collecting system
  - Initial prostate cryoablation: urethral sloughing
• No GU fistulas, urinomas
• Similar findings to Sung et al. (JU 170: 619, 2003)
  • Urothelium regrowth @ 1 month
  • Pelvicaliceal warming: no histological difference

Cryoablation—Summary

• Small <3cm
• Non-central lesions
• Monitor ice ball
• Minimal morbidity
• Early f/u: >90% recurrence free
Radiofrequency Ablation (RFA)

RFA– Mechanism

- High frequency electrical current
- Excitation ions
- Frictional heat
- Denature proteins & membrane bilayer
- Need tissue temp >50°C
RFA– Technique

- Open, MIS, Perc
- Difficult to image RFA effect during Tx
- 200 W, Probe tip temp 105-110°C
- Reduce tissue impedance:
  - Wet RFA
  - Internal cooling (CoolTip probe)
  - Multiple tine electrodes
  - Temperature sensing; Impedence monitoring

RFA– Ablate & Resect

- RFA then immediate or delayed Nx
- Mean size: 2.4 cm, N= 11 lesions
- Viable tumor on pathology (H&E):
  - 4 of 5 in acute group
  - 3 of 6 in delayed group
  - 5-10 % viable tumor at margins of Tx areas
- Non-enhancing lesions: 2 of 3 had tumor
- 100 W probe, ? Tissue temp
RFA– Ablate & Resect

- Michaels. Lahey Clinic.
  - 15 patients, 20 tumors
  - Open RFA → immediate Partial Nx
  - Size: 2.4 cm (1.5-3.5 cm)
  - H&E: All 20 — viable tumor w/in RFA lesion
  - NADH:
    - 4 of 5 viable tumor


RFA– Histological Effect

- “Viable” tumor foci early post RFA
  - Full effect of RFA may require more time
  - Cellular changes continue 30-90 days post-RFA

- Accuracy of H&E:
  - Overt histo destruction may not be seen acutely

- NADH: cell viability
  (Marcovich et al. LIJ. JU Oct 2003.)

- No long-term post-RFA histo studies

RFA— Postablation Imaging

- Low density, wedge-shaped
- Minimal shrinkage
- Fibrotic halo of fat (exophytic)
- Fat infiltration (50%) (endophytic)

Matsumoto. JU 172:45,2004

<table>
<thead>
<tr>
<th></th>
<th>Date</th>
<th>N</th>
<th>Size (cm)</th>
<th>F/U (mo)</th>
<th>‘Success’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ogan</td>
<td>2002</td>
<td>13</td>
<td>2.4</td>
<td>4.9</td>
<td>93% (CT)</td>
</tr>
<tr>
<td>Pavlovich</td>
<td>2002</td>
<td>24</td>
<td>&lt;3</td>
<td>2</td>
<td>79% (CT)</td>
</tr>
<tr>
<td>Roy-Choudhury</td>
<td>2002</td>
<td>15</td>
<td>3.0</td>
<td>13.6</td>
<td>87%</td>
</tr>
<tr>
<td>Su</td>
<td>2003</td>
<td>35</td>
<td>1.9</td>
<td>3.2</td>
<td>95% (CT)</td>
</tr>
<tr>
<td>Gervais</td>
<td>2003</td>
<td>42</td>
<td>3.2</td>
<td>42</td>
<td>100% exophytic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5/11 central</td>
</tr>
</tbody>
</table>
RFA– New Data

  • 64 tumors, Perc(34)/ MIS(28)/ Open(2)
  • F/u 13.7 mo
  • 97% (62/64) nonenhancing

RFA– New Data

  • 17 pts, hereditary RCC, 24 tumors
  • 2.26 cm
  • F/U: 1 year
  • 23 of 24 (96%) non-enhancing post RFA
RFA– New Data

• Gervais et al. MGH. AJR. 185:64, 2005.
  • 100 tumors
  • CT-guided percutaneous RFA
  • Size: 3.2 cm (1.1-8.9 cm)
  • Mean F/U: 2.3 yrs
  • 90% non-enhancing post RFA

Gervais et al. 2005

• Location:
  • Exophytic—100% (67/67)
  • Central—78% (7/9)
  • Mixed—61% (11/18)

• Size:
  • <3 cm: 100% (4/52 needed 2 RFA sessions)
  • 3-5 cm: 92% (17/36 needed 2 or 3 RFA sessions)
  • >5 cm: 25% (2/2 needed 2 or 3 RFA sessions)
    • Note: no tumors >5.5 cm completely ablated
RFA– Complications

- Low morbidity (9.2% minor Cx)
  - Most common: pain/paraesthesia @ probe site
- <2% major Cx:
  - Bleeding, UPJ obstruction, urine leak
- No bowel injury
  - Patient selection

RFA– Complications

- ?Collecting system (Janzen. UCLA. JU 173:1368, 2005)
  - Swine model
  - High rate urothelial damage acutely (60-90%)
  - @ 30 days, intact urothelium
  - No clinical fistula/urinoma

- 2% ureteral injury (Gervais AJR 185,2005)
RFA– Summary

- <3 cm
- Non-central
- Minimal morbidity
- Early f/u: >90 % recurrence free
- Multiple RFA treatments may be needed

Cryo vs RFA

- ↓ intraoperative pain
- Monitor ice ball
- Confirmed acute & chronic tumor kill
- ? ↓ collecting system injury
- More hemostatic
- Lower cost
- ↓ probe site pain

44

Suspicious Renal Mass < 7cm

Young age
Operative candidate

Limited life expectancy
Non operative candidate

< 4 cm

Non-central
< 3 cm

MIS Partial Nx
Cryoablation
RFA
Open Partial Nx
Observe

MIS/Open Radical Nx
Open Partial Nx
MIS Partial Nx

> 4 cm

Per/MIS Cryo
Per/MIS RFA
Observe

Open Partial Nx
MIS Partial Nx

Should I do an open partial Nx or an MIS radical Nx?

Should I learn how to do MIS Partial Nx or will ablation be the way to go?

Should I be even treating small renal lesions? Or should we observe them?

Should I do a fellowship in Interventional Radiology?