Minimally Invasive Partial Nephrectomy: The New “SOC”

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Objectives

1. Review newest guidelines pertaining to kidney sparing procedures
2. Compare outcomes of different surgical approaches for nephron sparing surgery
3. Describe results of partial nephrectomy (both open and robotic) and thermal ablation of renal tumors for imperative circumstances
There is a Role for Open Partial Nephrectomy (OPN)
Partial Nephrectomy
Solitary Kidney
Anatomic Variant – Crossed Fused Ectopia
PT1aN0 4.0 cm Clear Cell RCCA
Margins negative
Incomplete Cryoablation

**CAD and Hypertension**

Persistent enhancement s/p cryotherapy

33 months s/p salvage partial nephrectomy
Solitary Thoracic Kidney – Bochdalek Hernia

Physicians should prioritize PN for the management of the cT1a renal mass when intervention is indicated. (Moderate Recommendation; Evidence Level: Grade B)
2017 AUA Guidelines for Renal Mass and Localized Renal Cancer

- Prioritize NSS for patients with **solid** or **Bosniak 3/4** complex cystic renal masses and:
  - Anatomic / functional solitary kidney
  - Bilateral tumors
  - Known familial RCC
  - Preexisting CKD
  - Proteinuria
  - Young in age
  - Multifocal masses
  - Moderate to severe hypertension
  - Diabetes mellitus
  - Recurrent urolithiasis
  - Morbid obesity

**Imperative Indications**

- Moderate Recommendation; Evidence Level: Grade C

**Relative Indications**

- Conditional Recommendation; Evidence Level: Grade C
Surgical Principals

“In patients undergoing surgical excision of a renal mass, a minimally invasive approach should be considered when it would not compromise oncologic, functional and perioperative outcomes.” (Expert Opinion)
Thermal Ablation (TA)

- Physicians should consider TA as an alternate approach for the management of cT1a renal masses <3 cm in size.....a percutaneous technique is preferred over a surgical approach whenever feasible to minimize morbidity. (Conditional Recommendation; Evidence Level: Grade C)

- Counseling about TA should include information regarding an increased likelihood of tumor persistence or local recurrence after primary TA relative to surgical extirpation, which may be addressed with repeat TA if further intervention is elected. (Strong Recommendation; Evidence Level: Grade B)
Is there a standard of care?
Single Surgeon Annual Partial Nephrectomies by Approach
Single Surgeon Trends in Type of Robotic Approach to Partial Nx
Is MIS the New SOC?

For me a resounding YES......However:

1. Perioperative complications
2. Renal Function
3. LOS/ recovery
4. Oncologic outcomes
5. Cost
Partial Nephrectomy Complications

• Bleeding (immediate vs. delayed)
  – EBL / transfusions
  – Selective embolization

• Conversions
  – MIS to open
  – Partial to radical

• Urinary fistula / urine leak

• Progression to kidney insufficiency / failure

• Injury to adjacent structures / infections

• Death
Complications and EBL

- Postoperative complications within 60 days ($p=0.06$)
  - Open 52% (13% of total were grade IIIa-IV)
  - Transperitoneal RAPN 43% (13% grade IIIa-IV)
  - Retroperitoneal RAPN 16% (4% grade IIIa-IV)

- Intraoperative complication rate
  - No significant difference between open vs. RAPN (OR, 0.86; 95% CI, 0.42 to 1.76; $p = 0.68$)

- Postoperative complications favored RAPN
  - Minor complications (OR, 0.62; 95% CI, 0.46 to 0.83; $p = 0.001$)
  - Major complication (OR, 0.57; 95% CI, 0.36 to 0.91; $p = 0.02$)

- EBL and transfusions favor RAPN

Xai et al, J Endourol 2017 Sep;31(9):893-909*
Renal Function

• Post-op eGFR possibly more dependent on **Excisional Volume Loss** of affected kidney:
  – Surgical precision – excision of volume of benign parenchyma
  – Iatrogenic injury associated with reconstruction

• Functional loss attributed to warm ischemia recoverable
  – *Although some suggest cold ischemia for imperative indications*

• Tumor complexity not as important/predictive

Renal Function

- Median eGFR change, mL/min/1.73 m² (IQR), (p=0.66)
  - Open 6 (0-16)
  - Transperitoneal RAPN 10 (0-20)
  - Retroperitoneal RAPN 10 (0-16)

- % Change in eGFR for completely endophytic tumors (p=0.22)
  - Open (11.9 mL/min/1.73 m² = 17.1%)
  - RAPN (13.7 mL/min/1.73 m² = 14.8%)

- Meta-analysis data – no change in eGFR

Kara et al, BJU Int 2016; 118: 946–951
Shen et al. World J. Surg Oncol (2016) 14:220
Xai et al, J Endourol 2017 Sep;31(9):893-909
LOS & Recovery

- Multiple studies demonstrate recuperative and cosmetic advantages to MIS in comparison to open surgery
- Consistent 2 day improvement in LOS favoring RAPN
- Poor data regarding return to work / NADL
- Definite benefits re: flank bulge / muscular denervation
  - 30-50% risk with open flank incisions

Kara et al, BJU Int 2016; 118: 946–951
Xai et al, J Endourol 2017 Sep;31(9):893-909
Tan et al, Cancer 2011, 117;4184
Oncologic Outcomes

- Robotic PN has equivalent positive surgical margin status and local recurrence rates compared to open surgery

Kara et al, BJU Int 2016; 118: 946–951
Xai et al, J Endourol 2017 Sep;31(9):893-909
Radical Nephrectomy Costs, Operating Time Greater With Robotics

Use of robotic-assisted surgery for radical nephrectomy (RN) has increased substantially, and while the modality is not associated with an increased risk of any or major complications compared with conventional laparoscopic RN, it is associated with prolonged operating times and higher hospital costs, new study findings suggest.

In a retrospective study of patients who underwent robotic-assisted and laparoscopic RN at 416 US hospitals from 2003 to 2015, In Gab Jeong, MD, PhD, of the University of Ulsan College of Medicine in Seoul, Korea, and colleagues found that use of robotic-assisted RN grew from 39 (1.5%) of 2676 RN procedures in 2003 to 862 (27%) of 3194 RN procedures in 2015, according to a report published in JAMA (2017;318:1561-1568). In the robotic-assisted and laparoscopic RN
Cost

• Cleveland Clinic – Open vs. Lap vs. RAPN
  – Costs of RPN higher than LPN ($632 median difference, P=.005)
  – Costs of RPN not sig higher than OPN ($313, P=0.14)
    • OR instrumentation and supplies
  – OR costs for LPN and OPN equivalent (P = 0.11)
  – Anesthesia cost lower for RPN/LPN vs. OPN (P =0.002)
  – RPN and LPN lower hospitalization costs than OPN (P <.0001)
    • shorter hospital stay (P <.0001)
    • lower laboratory cost (P <.0001)
    • Pharmacy / blood bank costs not significantly different

*Mano et al, Urology 2015 Mar;85(3):596-603
Laydner et al, Urology 2013 Mar;81(3):533-8*
Cost

- MSKCC – Open vs. RAPN
  - Hospitalization costs higher in OPN ($854 median difference)
  - Surgical costs higher in RPN ($3695 median, P<.001)
  - Total cost of OPN for patients with above-average LOS was lower than RPN ($2680 difference in median costs; P = .001)

- “Cost” studies do not address out of hospital convalescence

Mano et al, Urology 2015 Mar;85(3):596-603
Laydner et al, Urology 2013 Mar;81(3):533-8
Young healthy female
Discovery of right renal tumor during workup of abdominal pain
Managed with robotic right retroperitoneal partial nephrectomy
Robotic Assisted Retroperitoneal Right Partial Nephrectomy
- Middle aged male with h/o polio virus and lower extremity dysfunction
- S/P Right open partial nephrectomy in 2011 – clear cell kidney cancer
- Enlarging left renal mass
- Managed with robotic transperitoneal left partial nephrectomy
Robotic Assisted Transperitoneal Left Partial Nephrectomy
Outcomes for NSS Under Imperative Circumstances
Partial Nx vs. Ablation for Imperative Indications

• Of course there is a selection bias…
• Multicenter study – 284 patients (15 years)
• Indications:
  – Solitary kidney (n = 146)
  – Bilateral tumor (n = 78)
  – Chronic kidney disease (n = 60)
• Procedures:
  – PN, open (n = 146), lap (n = 9), robotic (n = 17)
  – AT, radiofrequency (n = 104), cryoablation (n = 8)]

Partial Nx vs. Ablation for Imperative Indications

• Partial Nx (compared to ablation)
  – Larger tumors and higher RENAL score
  – Worse outcomes (transfusions, LOS, complications)
  – Better Recurrence free survival
  – Similar metastatic recurrence
  – Similar change in eGFR

• Partial Nx offers ability to manage larger, more complex tumors while providing better local control and similar renal function loss

Outcomes for Imperative Clinical Circumstances

- Associated with diminished Recurrence Free Survival
- Associated with diminished Cancer Specific Survival
  - For $\geq$ T2 RCC
  - Bilateral RCC
- Associated with major post-op complications (open & MIS)
- *Robotic imperative PNx vs. robotic elective PNx*
  - Similar functional outcomes
  - Higher risk of major complications with imperative cases

Conclusions

• Minimally invasive surgery benefits are realized in the perioperative period
• RAPN is equivalent to open surgery with intermediate- and long-term follow-up

1. EBL / Perioperative complications (= to ✓ RAPN)
2. Renal Function (=)
3. LOS/ recovery (✓ to RAPN)
4. Oncologic outcomes (=)
5. Cost (= to ✓ OPN)
References


Thank you

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