RENAL CELL CARCINOMA

50 yr old man with a LP RCC 3.5cm T1N0M0. How to counsel and perform a partial nephrectomy? How to follow him up?
History

• First planned open nephrectomy → Gustav Simon 1869
• First planned open partial nephrectomy → Gustav Simon 1870 (hydronephrosis)
• First open planned partial resection for tumour → Czerny (1888)
• 1950 → Vermooten published paper on imperative, relative and elective indications for NSS
• Poutasse concept of renal hypothermia
# RENAL Nephrometry score

<table>
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<th></th>
<th>1pt</th>
<th>2pts</th>
<th>3 pts</th>
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<tbody>
<tr>
<td><strong>Radius</strong></td>
<td>≤4</td>
<td>&gt;4 but &lt; 7</td>
<td>≥ 7</td>
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<tr>
<td>(R)adius (maximal diameter in cm)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Exophytic/Endophytic properties</strong></td>
<td>≥ 50%</td>
<td>&lt;50%</td>
<td>Entirely endophytic</td>
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<tr>
<td>(E)xophytic/endophytic properties</td>
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<tr>
<td><strong>Earliness of the tumor to the collecting system or sinus (mm)</strong></td>
<td>≥7</td>
<td>&gt;4 but &lt; 7</td>
<td>≤4</td>
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<td>(N)earliness of the tumor to the collecting system or sinus (mm)</td>
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<tr>
<td>(A)nterior/Posterior</td>
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<tr>
<td><strong>Location relative to the polar lines</strong></td>
<td>Entirely above the upper or below the lower polar line</td>
<td>Lesion crosses polar line</td>
<td>&gt;50% of mass is across polar line (a) or mass crosses the axial renal midline (b) or mass is entirely between the polar lines (c)</td>
</tr>
<tr>
<td>(L)ocation relative to the polar lines*</td>
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</tbody>
</table>

* suffix “h” assigned if the tumor touches the main renal artery or vein

![Diagram](image-url)
How to counsel ptt?

Have a discussion with ptt and if he wants, family members together

Explain the extent of disease briefly i.e. stage

Assuming ptt has opted for partial nephrectomy:

1. Explain regarding the procedure i.e. needs GA, may or may not need blood transfusion, will have drains and a urinary catheter post-operatively, needs fasting etc, expected stay, lap vs open
How to counsel ptt? (2)

2. Explain benefits of preserving the nephrons

3. Explain risks of procedure
   - Bleeding requiring → transfusion (1-8%)
     → convert – nephrectomy
     → wound breakdown
     → urine leak / urinoma (1-14%)
     → ARF(1-12%, 3% → perm HD)
     → others (MI/DVT/PE)
Pre-Operative Considerations

• Comorbid – assessment for fitness for surgery
• Lab evaluations – FBC, Creatinine, LFT, Coagulation profile, Urinalysis
• Imaging – CT/MRI (plain and contrasted), 3D-CT
  → size & location of tumour
  → vascular anatomy
  → ipsilateral and contralateral kidney
  → staging info (more advanced disease, LN)
  → tumour multifocality
How to perform a partial nephrectomy?

• Consent
• No bowel prep
• GA
• Prophylactic IV abs at induction
• Preventive measures ➔ Venoflow cuffs/TED
• RT for left sided surgery
• Ptt positioning ➔ lateral, padding at pressure areas, breaking table (hyper-extend the flank)
Approach

- Transperitoneal
- Extraperitoneal
Skin incision

- Midline
- Kocher’s subcostal
- Flank
- Flank 12\textsuperscript{th} rib
- Flank 11\textsuperscript{th} rib
- Thoracoabdominal
Principles of NSS Surgery

• Mobilization of kidney with early vascular control
• Avoid prolonged renal ischemia
• Complete tumour excision with negative surgical margins
• Closure of collecting system
• Careful hemostasis and closure of renal defect
Positioning

Extra Auxillary Procedure → Ureteric catheter into renal pelvis under fluoroscopy before positioning for open surgery, then Foley’s for bladder drainage

Incision → Extraperitoneal flank, supracostal incision on 11th rib

Positioning → Standard flank, table break or kidney rest between contralateral 12th rib and iliac crest, mild Trendelenburg (increases flank space)
Positioning (2)

**Positioning** ➔ Axillary roll, Pillow between legs (upper leg extend, lower leg flexed), double arm board, pad pressure points, strap down ptt to table

**Watch out for problems with reduced venous return (↓ BP)**

➔ increase hydration

➔ reduce break of table / kidney rest
Positioning (3)

Figure 6.5 Standard flank positioning. The patient is well padded, the lower leg flexed, while the upper leg is extended. A bean bag is placed in order to maintain stability and the kidney rest is elevated. An axillary roll must be placed and all pressure points are padded.
Incision

- Supracostral 11th rib incision over the 11th rib from anterior to posterior axillary line
- If need further exposure, extend anteriorly towards rectus sheath
- Skin → s/ficial fascia → latt. dorsi & serr. post muscle (transected with cautery) → 11th rib

Figure 6.6 A supracostral incision is made. The incision is made directly over the rib. The latissimus dorsi and serratus posterior inferior muscles are divided. Anteriorly the external oblique and internal oblique muscles are divided. Great care is used in avoidance of inadvertent injury to the intercostal nerves.
Incision (2)

- Dissect off the ext IC muscle of 11\textsuperscript{th} rib (upper)
- Periosteal elevator dissect off the inner IC muscle thus exposing extrapleural fascia
- Dissection in direction from tip of rib to post. axillary line
- Care to avoid injury to pleura
- Open up the lumbodorsal fascia (tip of rib), extend incision over the ext & int oblique (w/out for IC nerve)

\textbf{Figure 6.7} The periosteal elevator is insinuated under the periosteum of the rib. It is used to develop a plane between the rib and the underlying extrapleural fascia, in order to prevent injury to the pleura.
Mobilization of Kidney

- Gerota’s fascia is dissected off psoas postero-medially
- Ureter identified inferiorly, freeing lower pole
- Ureter looped, peritoneal reflection dissected off anteromedially exposing hilum
- Gonadal vein identified and followed proximally to IVC (R) or RV (L) (can be used to reach RV on left kidney)
- Right kidney → Kocherize the duodenum medially exposing the IVC
- Loop both RA and RV separately, AV (L)
- Release Gerota’s fascia superiorly

Figure 6.8 Renal hilar control is obtained by placing vessel loops around the renal artery (blue loop) and the renal vein (red loop).
Mobilization of Kidney (2)

- Administer mannitol IV
- Gerota’s fascia incised (away from tumour site)
- Dissection within the fascia exposing renal capsule till area around tumour
- Administration of surface hypothermia
Renal Hypothermia

Induces
- Short term suspension of renal metabolism
- Cellular protection
- Minimizes post-ischemic renal injury

How is it done?
- Ice slush placed around the kidney (bowel bag) after clamping the renal artery
- Sometimes RV also clamped if central tumour
- Wait for 10 minutes to allow core temperature to reduce to 15-20°C
Renal Hypothermia (2)

How to prepare ice slush?

• Soft ice formed by freezing physiologic irrigating fluid (commercially synthesized UF of plasma) for 4 hours

• During last 2 hours, each freezing bottle shaken vigorously every 20-30 minutes
Tumour Resection

After 10 minutes of ice slush exposure

• Electrocautery used to make circumferential incision through the renal capsule about 1cm from the tumour edge

• May use intra-operative USG if deep tumour or to confirm extent of tumour, closeness to vessels

Figure 6.10 Intraoperative ultrasound is performed for a tumor that is impalpable. A spinal needle is used to identify the area in which the tumor is present (A). The depth of the tumor and its location can be determined by the interference pattern that the spinal needle causes on the ultrasound image. The tumor (B) is seen within the arrows.
Tumour Resection (2)

- Continue dissection with fingers, artery forceps or electrocautery to excise tumour with surrounding normal parenchyma
- Larger segmental arterial branches identified and suture ligated (2/0 or 3/0 Monocryl)
Once tumour resected out, random biopsies of parenchyma of the crater sent for frozen section to confirm tumour free margin status

While waiting for frozen section, suture ligation of vessels are done

Release RV clamp and ask for Valsalva manoeuvre to check for further venous bleeds to secure

Methylene blue or indigo carmine through the ureteric catheter will identify any collecting system leaks, repair if any (3/0 Monocryl)
Tumour Resection (3)

• If tumour free margins confirmed from frozen section, coagulate base of tumour with argon beam coagulator (avoid the sutures) → extra 2-3mm coagulation

• Can also use tissue sealants such as Floseal
Closure of Tumour Bed

- Once hemostasis confirmed and collecting system closed, can use FloSeal on the resected bed (hemostasis in 1-2 minutes)
- Then pack the base with Surgicel (oxidized cellulose)
- Then suture the renal parenchyma close over the packed bed using blunt tip needle (Liver suture – horizontal mattress)
- Depth of suture ⅓ down in parenchyma
- To avoid suture slipping or tearing through, can use Gelfoam bolsters on the parenchyma or Hemolocks
Closure of Tumour Bed (2)

- Once capsule reapproximated, renal artery unclamped, look for reperfusion
- If heavy bleed, reclamp RA, open up the tumour bed and secure hemostasis
- May need nephropexy if ureter is kinked after partial nephrectomy
- Perinephric fat secured over the suture line of the parenchyma and Gerota’s fascia reapproximated
- Drain inserted along psoas posteriorly (Passive)
- Remove vessel loops
- Pleurotomy (if any) closed after asking the anaesthetist to fully inflate lung
Midpole Tumour Resection

- Place a stent only if major reconstruction has been done.
- Suture a Penrose drain adjacent to the repair by the long route.
- If the defect is large, apply absorbable collagen or omentum.
- A free peritoneal graft may be applied.

A. Simple mattress closure
B. Omental patch
C. Peritoneal patch
Closure of Incision

• Avoid catching pleura or the IC nerve
• Done in 2 layers
  → 1st layer – TA and Int. Oblique
  → 2nd layer – Ext. Oblique
• Posteriorly
  → Ext I/C muscle approximated
  → Latt Dorsi and Serratus Posterior approximated separately
Post-Op

- Incentive spirometry
- Early ambulation
- TED stockinette or venous compressive device
- Not necessary for anticoaguation
- Allow orally
Post-Op (1)

• If drain is minimal and ptt comfortable, can take off
• If drain high output, send drain fluid for creat → if high, likely leak, keep drain and stent ptt and wait for drain to reduce
• If pain, mass +/- fever, possible urinoma
• RPG and stent, may improve, if not need perc drainage
• Foley’s normally taken off at 48 hours if ptt well and ambulating
Post-Operative Urinary Fistula

- Occurs in 0-17% of ptts
- Defined as persistent drainage of > 50ml/day with drain fluid: serum creatinine ratio of ≥ 2

  - Increased risk if:
    - major recon of collecting system
    - tumours > 4 cm
    - centrally located tumours
    - extracorporeal surgery with autotransplant

- Not all require stent, most managed expectantly
- Rarely need pigtail drainage
Complications

Bleeding (*Stevenson J Urol 2004*)
- < 2%
- Usually managed conservatively
- Occasionally may need angioembolization
- Very rarely need nephrectomy

ARF (*Campbell J Urol 1994*)
- 2-13%
- Higher risk if in imperative indication or SFK
- Also if tumours > 7cm, > 50% resection, ischaemia > 60 min
- Permanent HD in only 3%
Complications (2)

Mortality
• 0 – 1.5%
• D/t sepsis, cardiac morbidity, other causes

Length of stay
• Earlier 7-9 days
• Now as low as 4 days (Fast-track or ERAS)
Follow-Up

• TCA in 4 weeks to assess wound, general condition and most importantly HPE!
• Grade of tumour, **Margin status**!
• If margin negative, follow as EAU protocol
• If margin positive, d/w ptt options
  → observe with regular USG, intervene if progressive
  → re-do surgery, resect further margin OR may need nephrectomy
  → ablation (RFA or cryo)
Risk Stratification

- Symptomatic presentation
- Weight loss > 10% of body weight
- Poor performance status (Karnofsky / ECOG)
- Anemia, thrombocystosis, hypercalcemia, ↑ ALP, LDH, CRP or ESR
  → correlated with poor outcomes
- Hypercalcemia, anemia and ↑ ESR
  → independent predictors of cancer specific mortality (CSM)
  \[\text{Magera et al (Urology 2008)}\]

- **SINGLE MOST IMPORTANT PROGNOSTIC FACTOR FOR RCC**
- Organ confined disease has better 5 yr survival (70-90%) → \textit{In this ptt T1aN0M0 (90-100%)}
UISS (UCLA Integrated Staging System)

**A**

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**B**

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INTM - Intermediate

Zisman A et al. JCO 2002;20:4559-4566
## SSIGN Score

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*Frank I et al JOURNAL OF UROLOGY DEC 2002*
SSIGN Score

Five-year cancer-specific survival rates\(^2\) in patients with a score of:

- 0 to 2 (100%)
- 3 to 4 (90%)
- 5 to 6 (64%)
- 7 to 9 (47%)
- 10 (0%) in clear cell RCC

Frank I et al JOURNAL OF UROLOGY DEC 2002
## EAU 2014 Follow-up Regime

### Table 8.1: Proposed algorithm for surveillance following treatment for RCC, taking into account patient risk profile and treatment efficacy

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<th>Treatment</th>
<th>Surveillance</th>
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<td>6 mo</td>
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<tr>
<td>Low</td>
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<td>Intermediate</td>
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<tr>
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*Cryo = cryotherapy; CT = computed tomography of chest and abdomen, or MRI = magnetic resonance imaging; PN = partial nephrectomy; RFA = radiofrequency ablation; RN = radical nephrectomy; US = ultrasound of abdomen, kidneys and renal bed.*

### Prognostic Models

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<td>Post operative Karakiewicz’s nomogram</td>
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References


• Hinman’s Atlas of Urology

• EAU Guidelines 2014