1. RENAL LENGTH IS NOT A GOOD MEASURE OF RENAL FUNCTION
2. CORTICAL THICKNESS IS A GOOD SURROGATE FOR RENAL FUNCTION
3. RI IS WORTH THE EFFORT—establishes renal disease and potential reversibility
4. SMALL RENAL MASSES—difficult to detect with US and may not require surgery

WHAT WILL WE DISCUSS?

- Composed of; cortex, medulla, interstitium
- Evaluated by: length, cortical thickness, Resistive Index (RI), echogenicity
- US detection of parenchymal disease is non-specific and a kidney Bx is necessary for specific etiology
- Cortex is the simplest measure
- Cortex thickness is a surrogate for renal disease

INTRINSIC RENAL DISEASE
Often Overlooked by the Radiologist

- Decreased parenchyma/cortex
- Increased echogenicity
- Wavy border
- Replacement lipomatosis

INTRINSIC RENAL DISEASE:
Ultrasound may be first indicator of renal disease

Creatinine is 6.5 mg%
Renal Length Misses the Mark
- Mean length was 10 cm (8.5-12.4)-yet chronic renal disease in all kidneys

Results-End Stage Kidneys
- Mean cortical thickness was 5.9 mm- normal is >10mm

Resistive Index-RI
- What have we learned in twenty years?
- What can the RI do?

Resistive Index-a potent tool
- Ultrasound is not able to always define the existence or etiology of renal failure
- RI can determine the presence of parenchymal ds
- RI>.80 (7.70) not reversible and likely progressive
- Relied on by clinicians to determine therapy
RI and Outcome in Chronic Nephropathies

- RI greater than 0.70 predictive of unfavorable outcome
- Strong correlation between initial RI and final renal function

Parolini C et al. Renal Resistive Index Radiology 2009

RI is a Predictor of Long term outcome

WHY IS RI NOT USED MORE?

- It requires extra work
- The lack of acceptance of RI may reflect our lack of understanding of renal disease
- Often normal despite severe renal dysfunction
  - glomerular disease (only 5% of kidney)
  - variable in obstruction

Tublin M, Budde K, Platt J. RI in Doppler Sonography. AJR 2007;189

New topic

The Incidental Renal Mass

- Half of patients over 50 years have at least one renal mass
- The overwhelming majority are benign
- Most pts with RCC are asymptomatic
- Approximately 25% of solid renal masses are benign
- Benign solid mass should be excluded – CT, MR, Bx

Renal Cell Carcinoma

- 2% of all cancer diagnosis
- 30,000 new cases/year
- 12,000 deaths/year
- Resistant to radiation and chemo
- Improved survival depends on early diagnosis
- Most renal masses are found incidentally
Incidence of Renal Cell Carcinoma

- RCC incidence rising steadily
- Increased incidence is not explained by imaging procedures
- 38% increase between 1974 and 1990
- Between 1975-1995 increased approximately 3%/year
- Increasing incidence greater among Blacks

Chow WH, JAMA 281; 1999

CT vs US in Small Renal Masses

- CT depicts more and smaller renal masses than US
- CT is no better than US for characterization
- A substantial number of lesions under 1cm will not be detected

DETECTION RATE OF RENAL MASSES

<table>
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<th>LESION SIZE MM</th>
<th>CT</th>
<th>US</th>
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<td>47%</td>
<td>0%</td>
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</tr>
<tr>
<td>25-30</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Jamis-Done CA, Choyke PL et al. Small Renal Masses: Detection with CT versus US RADIOLGY 1996;208

Early Diagnosis/Stage Improves Survival

- Most incidentally detected RCC are stage T1 or T2-improves survival

CT/MRI Are The Optimal Technique to Search For And Characterize A RENAL MASS

US is not the search tool for renal masses- in spite of low cost and non-invasive
RENAL MASS AND SIZE

- Less than 3 cm - "small renal mass" these do not metastasize
- Direct relationship between malignancy and size of the mass
- Less than 1.5 cm - "too small to characterize"
  - no data regarding follow up and management

THE SMALLER THE RENAL MASS - THE MORE DIFFICULT TO CHARACTERIZE
- more likely it is to be BENIGN

Surveillance Imaging - for lesions too small to characterize and old age

SURVEILLANCE IMAGING
The Elderly

- NO IMPROVEMENT IN SURVIVAL WITH INTERVENTION FOR T1 RCC >75 YEARS
- 86% AFTER NEPHRECTOMY FACED RENAL DYSFUNCTION

Lane BR et al, Active Treatment of Localized Tumors may not impact overall survival in patients >75 years CANCER 2010

BACKGROUND - Prior Decade

- All Renal masses are surgical lesions
- Biopsy not performed because of
  - Track seeding
  - Inconclusive pathology

Old knowledge

EXCEPTIONS TO THE RULE - HISTORY
Is Critical!

- Lymphoma
- Metastasis
- Focal pyelonephritis
- Abscess
- Infarct
- Angiomyolipoma
- Oncocytoma

90% yield for image guided biopsy of solid renal masses

These entities comprise the 25% benign processes on biopsy masses less than 3 cm
Bland et al, AJR 2007;189

Renal biopsy now has a role in renal mass assessment

This particularly is true for small renal masses
- differentiates primary from metastatic lesion
- designates benign masses
- precursor to ablation procedures
Limits of imaging: Kidney removal for benign masses ups costs, complications

Approximately one in six patients who had their kidneys removed due to renal cell carcinoma were later found to have a benign renal mass, underscoring the challenge diagnostic imaging faces in distinguishing between benign and malignant renal tumors, according to a study published Aug. 12 in the American Journal of Managed Care.

Imaging is wasting $$$ because 1/6 masses are benign.

SOLID RENAL MASS-options

1. Benign
2. Malignant
   -surgery
   -surveillance
   -ablation

Renal mass biopsy rules out:
- benign process
- infection
- lymphoma
- extra-renal malignancy


SUMMARY

We have reviewed:
- renal parenchyma and renal length
- RIs
- the small renal mass