Update on the Management of Ureteropelvic Junction Obstruction

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Overview

- Background
- What about observation?
- Utility of 3D-CT prior to surgical Tx
- Results retro- and antegrade endopyelotomy
- Results lap pyeloplasty
- Percutaneous endopyeloplasty
- Tx options for 2° UPJO
- What I have learned
- Conclusion
Background-UPJO

- Defined as the impediment to urinary flow from the renal pelvis to the ureter
- Usually discovered in pre-, postnatal period
- Adult cases can present at any age; common to present as teens/young adults
- L>R; bilateral 10-40%
- Anterior crossing vessel to lower pole in 40-60% of adult cases (even higher in lap pyeloplasty series)
- ? Crossing vessel exacerbates a pre-existing intrinsic lesion

What about Observation?

- Many pts ask; risk of silent obstruction over time with loss of kidney (must document in chart pt aware)
- Peds literature-mild to mod hydro in pts with UPJO often non-progressive
- What is optimal imaging protocol
  - Ultrasounds-change in cortical width
  - CT-change in cortical width
  - Renogram-change in % function
Indications for Surgery for UPJO

- Symptoms—pain, n/v
  - But many pts may only have rare bouts of discomfort
- Complications of obstruction
  - Stones, pyelo-, hematuria, renal trauma with minor mechanism of injury, HTN (rare)
- Evidence of renal damage with observation
  - Declining split function
  - Reduction in renal cortical width

Preoperative Imaging

- Majority of pts have undergone renal U/S, IVP, or CT-KUB with finding of hydronephrosis
  - Study may be normal if intermittent obstruction (? crossing vessel)
  - If normal study and ↑ clinical suspicion → rpt when symptomatic
- Lasix renogram positive for obstruction in vast majority; may be negative if intermittent obstruction
- IVP or retrograde pyelogram optional esp. if retrograde to be performed at time of surgery
Preoperative Imaging

• Kinks, angulations and loops at the UPJ have low sensitivity and specificity for finding of crossing vessel in close proximity AD Smith

• However, common finding of severe hydronephrosis in the presence of a crossing vessel (77%) Van Cangh et al, 1996

UPJ Retrograde Pyelogram
Utility of 3-D CT

- Initial use in the evaluation of potential kidney donors
- Routine at many centers prior to open or lap partial nephrectomy
- Allows detailed assessment of vascular anatomy particularly the relationship of crossing vessels to UPJ
- Time-consuming reconstructions for rad techs
- Limited availability
- ? Replacement with MR Angiogram

3D-CT-visualization of Crossing Vessel
Utility of 3-D CT

• Can visualize vessels 1 mm diameter
• Close apposition of crossing vessel to UPJ apparent on CT- fibrous bands often present at time of lap pyeloplasty
• Not all crossing vessels a problem!
• Limited at VGH to pts being considered for endopyelotomy, or evaluation of pt with prior failed pyeloplasty or endopyelotomy

What to do when clinical suspicion for UPJO is high and the investigations are “normal”

• Scan pt when symptomatic
• Trial of stenting or perc tube
• Whitaker test- helpful in pts with equivocal renograms; prior surgery for UPJO
• 3-D CT to look for anterior crossing vessel to explain intermittent obstruction
• Book surgery and “damn the torpedoes, full speed ahead”- the Prussians-from-VGH approach
**Tx Options Available**

- Observation- serial U/S, renograms
- Chronic internal ureteral stent-poor op candidate
- Open/lap simple nephrectomy- nonsalvagable
- Antegrade endopyelotomy
- Retrograde endopyelotomy
- Lap pyeloplasty
- Open pyeloplasty

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**How do you make a Tx decision with so many options?**

- Questions to ask yourself?
  - Is the kidney salvagable?
    - Surgery to prevent further deterioration; no catch up growth
  - Is the pt symptomatic, developed complications of the obstruction, reasonable life-expectancy
  - What is the risk of renal deterioration over time?
    - Reduction in parenchymal width
    - Declining renal function
  - Success rate of each procedure, durability
Antegrade Endopyelotomy

- Based on Davis intubated ureterotomy; healing by secondary intention
- Incision of UPJ into periureteral fat under direct vision (can look for pulsations)
- Ideal in setting of renal calculi Tx with PNL; if stone-free proceed with posterolateral incision/balloon/stent (7/14 Fr x 6 weeks)
- 60-85% success rate
- No crossing vessel and no severe hydro $\rightarrow$ 95% success (Van Cangh et al, 1994)

Van Cangh et al, 1994
Streem, 2003
Motola and Smith, 1993

Antegrade Endopyelotomy

- Segura-argues UPJ must be dependent for Endopyelotomy
- ? presence of high v. dependent ureteral insertion unlikely to affect outcome (Chow and Streem, 1999)
- reduction in volume of the renal pelvis depends on tone
- Type of stent may not be important (Gupta and Smith 1997, Van Cangh et al, 1994; Segura 1998)
Results Antegrade Endopyelotomy

<table>
<thead>
<tr>
<th>Author</th>
<th># Pts</th>
<th>Success Rate</th>
<th>F/U (mo)</th>
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<tbody>
<tr>
<td>Gupta and Smith</td>
<td>401</td>
<td>85</td>
<td>6-144</td>
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<tr>
<td>Motola and Smith</td>
<td>212</td>
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<td>36-96</td>
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<td>Kuenkel and Korth</td>
<td>180</td>
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<td>6-43</td>
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<td>Kamihira and Ono</td>
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<td>90</td>
<td>&gt;6</td>
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<td>Danuser and Studer</td>
<td>80</td>
<td>81</td>
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<td>Knudsen and Denstedt</td>
<td>80</td>
<td>67</td>
<td>55</td>
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<td>Szewczyk et al</td>
<td>64</td>
<td>61</td>
<td>4-20</td>
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<td>Streitz et al</td>
<td>52</td>
<td>65</td>
<td>6-84</td>
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<tr>
<td>Kletscher and Segura</td>
<td>50</td>
<td>88</td>
<td>N/A</td>
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</table>

Risks for Failure of Antegrade Endopyelotomy

- Inadequate incision
- Long stricture (> 2 cm) Motola and Smith 1993
- Obliterated UPJ
- Severe periureteral fibrosis (*How do we predict?*)
- Poor renal function Gupta and Smith 1997, Segura 1998
- Untreated infection
- Stent migration/obstruction
- Crossing vessel (42% success), severe hydronephrosis (75% success) Van Cangh, 1994; Tawfick and Bagley, 1998; Knudsen and Denstedt, 2004
Paterson’s Indications for Antegrade Endopyelotomy

- Pre-existing nephrostomy tube (r/o crossing vessel; may need new puncture anyway) AD Smith
- Prior failed open/lap pyeloplasty (R/O crossing vessel 1st)
- PNL planned and no severe hydro and/or crossing vessel Knudsen and Denstedt, 2004
- Dependent UPJ Segura 1984, 1998

Retrograde Endopyelotomy

- Reduced use since lap pyeloplasty
- Ideal for women where access to UPJ with semi-rigid ureteroscope easier
- May require preop stent x 1 week (? reduces risk of distal ureteral strictures)
- Incision of UPJ posterolaterally into fat with hot knife, laser followed by balloon dilation/stenting (7/14 Fr stent x 6 weeks)
- 75-85% success rate with short-term F/U

Conlin and Bagley, 1998
Gerber and Kim, 2000
Thomas et al, 1993
Results Retrograde Endopyelotomy

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Etiol (1°/2°)</th>
<th>Mean OR time</th>
<th>Success Rate (%)</th>
<th>Mean F/U (mo)</th>
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<tr>
<td>Thomas et al</td>
<td>40/9</td>
<td>90</td>
<td>94</td>
<td>15</td>
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<td>Tawfiek and Bagley</td>
<td>24/8</td>
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<td>87.5</td>
<td>10</td>
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<td>Renner et al</td>
<td>27/7</td>
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<td>Conlin et al</td>
<td>15/6</td>
<td>120</td>
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<td>Meretyk and Clayman</td>
<td>16/3</td>
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<td>Biyani et al</td>
<td>5/3</td>
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<td>Gerber and Kim</td>
<td>18/4</td>
<td>63</td>
<td>82</td>
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</table>

Gerber and Kim, 2000

Retrograde Endopyelotomy

- All stones must be removed prior to incision
- Outpatient procedure in majority
- Bagley, Conlin-continued use of endoluminal ultrasound to evaluate for crossing vessels or septum at UPJ; direct incision away from vessel

Bagley et al, 1994
Tawfiek and Bagley, 1998
**Acucise Endopyelotomy** (Applied Medical Resources, Inc.)

- 7 Fr cutting balloon catheter passed cystoscopically and positioned fluoroscopically at UPJ; no preop stenting required
- Cutting balloon positioned laterally in proximal ureter/UPJ; medially in the distal ureter
- Not used for strictures overlying the iliac vessels
- Caution in use for ureteroenteric anastomotic strictures (50% short-term success)

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**Acucise Endopyelotomy**

- Initial enthusiasm in 1990’s; rare use now at academic centers but still common in community
- Poor long-term results- <50% at 1 year and falling
- Potential for significant bleeding complications from injury to crossing vessel (3-4% significant renal vascular injury rate)

Schwartz and Stoller, 1999  
Preminger et al, 1997  
Turk et al, 2003
Laparoscopic Pyeloplasty

- Reproduces the open pyeloplasty
- Dismembered in majority; flaps possible
- Simultaneous pyelolithotomy and nephrolithotomy possible
- Outpt lap pyeloplasty? (Rubinstein and Gill, 2005)
- Significant reduction in endopyelotomy at centers that offer lap pyeloplasty (? Are we throwing out the baby with the bath water)

Port-Sites
What’s Needed for A Good Lap Pyeloplasty?

- Salvagable kidney
- Dependent, funneled anastomosis
- Mucosa-to-mucosa anastomosis
- No tension
- Well vascularized
- Transposition of anterior crossing vessel
- Reduction of renal pelvis if needed

Technique- Lap Pyeloplasty

- Stay in plane between pelvis and inflammatory peel
- Transposition of crossing vessel posterior; no pexy of vessels (relying on subsequent fibrosis)
- Likely no difference in outcome between running and interrupted anastomosis- surgeon preference (_the sleep factor_)
- Beware of the small renal pelvis (intra-renal)- Gil-Vernet dissection required to get more pelvis
Risk Factors for Failure of Lap Pyeloplasty

- Prior surgery-endopyelotomy, open pyeloplasty; success rate ~70-80%
- Tension- #1 worry as less extensive mobilization of kidney c/t open pyeloplasty
- Same risk factors as endopyelotomy

Pure Lap v. Da Vinci Robotic

**Pure Lap Approach**
- Widespread availab.
- Tried-and-true
- Longer operative times, reduce with experience

**Robotic Approach**
- 6-degrees of freedom
- Filters tremor, exaggerated hand motion
- Limited availability
- Time-consuming set up
- ++ cost; ? time saver
- Quick dissection with hook electrode and running anastomosis
Results Lap Pyeloplasty

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<tr>
<th>Author</th>
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<th>Success</th>
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<tr>
<td>Gettman and Bartsch*</td>
<td>9</td>
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<td>Mendez-Torres and Thomas*</td>
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<td>Palese, Sosa, Del Pizzo*</td>
<td>35</td>
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<td>Jarrett and Kavoussi</td>
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<td>Siqueira and Shalhav</td>
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<td>Eden et al</td>
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<td>Turk et al</td>
<td>49</td>
<td>165</td>
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<td>Davenport and Keeley</td>
<td>83</td>
<td>92</td>
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Follow-up Imaging Post-Lap Pyeloplasty/Endopyelotomy

- Ultrasound @ 1 month-r/o early obstruction
- IVP or lasix renogram @ 3 months
- U/S q 1-2 years by GP
- Warn pts that may have some residual pelvicaliectasis
- Warn pts that severely hydronephrotic kidney may “shrink” when obstruction relieved
Advantages

Antegrade Endopyelotomy
- Intermediate success (60-85%)
- Concomitant PNL
- Short hospitalization
- Short operative time

Lap Pyeloplasty
- High success (> 90%)
- Reproduces open operation
- Change relation of crossing vessels to UPJ
- Reduction of pelvis
- Short hospitalization
- Short stent duration

Percutaneous Endopyeloplasty
- Involves perc access to kidney with endopyelotomy with subsequent H-M closure using specialized suturing device under direct vision
- Animal → human studies
- 15 patients, mean operative time 119 minutes; 100% success with mean F/U 11.6mo Desai and Gill, 2004
Summary- Preoperative Imaging
Findings to Determine Tx Option

- Severe pelviectasis → *lap pyeloplasty*
- Anterior crossing vessel → *lap pyeloplasty*
- Renal stones and no crossing vessel, min to mod pelviectasis → *PNL with antegrade endopyelotomy*
- Renal stones and crossing vessel and/or severe pelviectasis → *lap pyeloplasty*
- Minimal parenchyma (<1 cm) → *consider Nx*

Management Options for 2° UPJO

- Difficult to determine degree of fibrosis to be encountered at surgery from pre-op CT
- Length of stricture and “bagginess of pelvis” important
- Determine cause of why 1° procedure failed
  - Missed anterior crossing vessel
  - Prior untreated infection, stent migration/occlusion
- *Dr. Perler- “Eat a big meal before the case, my boy!”*
Vancouver Coastal Health Authority
Experience with Lap Pyeloplasty

• Cases performed at UBC, VGH, SPH, RGH, LGH depending on 1° surgeon
• Experienced lap surgeon in attendance
• Majority at UBC/VGH Hospital
• N=48 last 2 years
• ~ 90% success rate with short-term follow-up
• Open conversion <5%; no transfusions
• LOS 1-2 days

What have we learned at UBC from our Experience with Lap Pyeloplasty?

• Refinement in selection of lap pyeloplasty vs. PNL/Antegrade endopyelotomy in the stone pt with UPJO
• Beware of the small renal pelvis- “the kiss of death”
• Don’t be too cocky on taking on 2° UPJO
  – Very difficult and time consuming
  – Is it going to be a durable repair?
  – Be realistic with pt re: open conversion rate
Conclusion

• Multiple treatment options for UPJO
• Overwhelming Tx with lap pyeloplasty
• Revisiting antegrade/retrograde endopyelotomy
• Success rates important in pt decision making-most go for lap pyeloplasty