Review of UPJ Obstruction

November 7, 2007

Chris Hoag, PGY5 UBC Urology

References

- CWU9 – Ch115
- AUAUS 2007 – Lessons 5 & 6
- Literature review
- The Centre of the Universe
  - (video from Toronto Sick Kids Hospital)
UPJO Facts

- 1/1500 live births
- Clustering of presentation time:
  - Neonatal/antenatal (now the majority)
  - Adolescence/adulthood (symptoms)
- #1 cause of antenatal hydro (48%)
- Boys > girls (>2:1)
- L > R (2:1)
- Bilateral in 10-40%
- Runs in families
Etiology

- Primary
  - Intrinsic
  - Extrinsic
- Secondary

Primary UPJO

- Intrinsic
  - Adynamic segment/intrinsic narrowing
    - Delayed/failed recanalization after period of obstruction
    - Neuronal depletion in proximal ureter
    - Incomplete development of circular sm. m.
    - Alteration of collagen fiber composition b/w sm. m. cells
  - Valvular (Ostling’s) mucosal folds
  - Persistent fetal convolutions
  - Ureteral polyps
Primary UPJO

- Extrinsic
  - Crossing vessel (anterior)
  - Renal malrotation (over/under)

Pathophysiology of Extrinsic UPJO

- Crossing vessel → two point of kinking
  - Where ureter drapes over
  - Angulated at UPJ
- Ensuing pelvic distension & inflammation
- Further adhesion kinking & 2-point obstruction
- Ischemia, fibrosis, stenosis
Secondary UPJO

- Severe VUR (Grade IV/V) (10%)
  - Kinking of tortuous system at relatively fixed UPJ
  - Lower pole moiety of incomplete duplication

Secondary UPJO

- Severe VUR (Grade IV/V) (10%)
  - Kinking of tortuous system at relatively fixed UPJ
  - Lower pole moiety of incomplete duplication
  - Stone-related scar
  - Iatrogenic (instrumentation)
Associated Congenital Anomalies

- GU Anomalies:
  - Contralateral UPJO = #1 (10-40%)
  - VUR (up to 40%) – usually low grade
  - Renal dysplasia
  - MCDK
  - Renal agenesis (5%)
  - Duplicated system (usually lower moiety UPJO)
  - Horseshoe kidney
  - Ectopic kidney
- Non-GU Anomalies: VATERR (10-20%)
Diagnosis

Presenting S&Sx

- Infants
  - Hydronephrosis on antenatal U/S = majority
  - Palpable abdominal mass
  - FTT
  - Feeding problems
  - Sepsis (UTI) = presenting Sx 30% beyond neonatal period
  - Pain/hematuria (stones)
Presenting S&Sx

- Children
  - Episodic flank/abdominal pain +/- N/V
  - Episodic vomiting alone
  - Hematuria after apparently minor trauma (25%)
- Adults
  - Episodic flank/abdominal pain (esp. with diuresis)
  - HTN

Diagnostic Dilemmas
Diagnostic Dilemmas

- Antenatal hydro doesn’t necessarily = obstruction
  - Hydro from active diuresis (e.g. late gestation fetal kidney $\Rightarrow$ high output, high compliance)
  - Temporary fetal kidney obstruction with spontaneous resolution (mucosal folds/convolutions)
- Minimal hydro doesn’t necessarily = no risk
  - Intrarenal vs. extrarenal pelvis with UPJO
Pediatric UPJO W/U

Post-natal w/u of Antenatal Hydro

- Ultrasound – renal & bladder
Ultrasound

- Delay post-natal U/S at least 48 hours (? 2 weeks) d/t relative oliguria in early postnatal period
  - Neonate GFR doubles in first week
  - Risk of underestimating degree of hydro

Key factors to note:
- Degree of hydrenephrosis
- Thickness of parenchyma
- Echotexture of parenchyma
- Contralateral hypertrophy

Day 1 2 Weeks
SFU Grading System

- Grade 1 = renal pelvis splitting only
- Grade 2 = pelvicalyceal dilation (some calyces only)
- Grade 3 = significant pelvicalyceal dilation (all calyces)
- Grade 4 = Grade 3 + parenchymal thinning
13 infants <1yo (71% male) with hydronephrosis or hydroureteronephrosis

61 of 97 hydronephrotic kidneys = obstructed (lasix renogram)

Using cutoff of Grade 3 or higher for obstruction → 88% sensitive, 95% specific

**Conclusion:** “the radiological diagnosis of obstruction is linked with the grade of hydronephrosis”

Randomly selected ultrasounds shown to group of trainees & staff pediatric urologists twice (7-14 days apart) & SFU grading judged

Intra-rater agreement “good”
- Staff: 69-94%
- Trainees: 63-90%

Inter-rater agreement “modest”
- SFU0 = high
- SFU1,2,4 = fair
- SFU3 = poor
**Ultrasound – ?Other Markers of Obstruction**

- Pelvicaliceal diameter $> 2.0$cm = high risk of requiring surgery
- Renal parenchymal : pelvicaliceal area
  - $< 1.6$ = correlates with obstructive pattern on diuretic renography & need for pyeloplasty
  - $> 1.6$ = can be safely observed
- Serial ultrasounds
  - Worsening hydronephrosis = likely obstruction
  - Compensatory contralateral growth
- Doppler U/S
  - $RI > 0.75$ = more likely obstructed
  - $RI$ findings further provoked with lasix dose
  - Only useful in acute obstruction, not chronic (AUAUS '07-4.5)

**Post-natal w/u of Antenatal Hydro**

- Ultrasound – renal & bladder
- Rule out VUR
  - VCUG
  - Nuclear VCUG
- Low grade VUR common
- High grade VUR may cause secondary UPJO
  - If equivocal obstruction $\Rightarrow$ fix VUR & monitor UPJO
Post-natal w/u of Antenatal Hydro

- Ultrasound – renal & bladder
- VCUG
- Nuclear Renography

Nuclear Renography

- Has supplanted IVP as primary functional diagnostic test
- Considerable controversy in protocols for performing and interpretation b/w centres
- “Well-tempered renogram” (SFU-PNMC)
  - Prehydration with 10-15 cc/kg NS
  - Foley catheter
  - DTPA or MAG3 (usually the latter now)
  - Diuresis (lasix) - ??time (F-15, F0, F+20)
Nuclear Renography

- Nuclear Renography Interpretation
  - Obstruction:
    - Static measures (single test):
      - Rising drainage curve
      - $T_{1/2} > 20\text{min}$
      - Differential $\Gamma_n < 40\%$
    - Dynamic measures (serial tests):
      - Declining differential renal $\Gamma_n$ over time
      - Increasing hydro over time
  - No Obstruction
    - Normal drainage curves
    - $T_{1/2} < 10\text{min}$

- Causes of false positive ($T_{1/2} > 20\text{min}$):
  - Dehydration
  - Suboptimal dose/timing of diuretic
  - Poor renal function/immature kidneys
  - Full bladder (no catheter)
  - ROI poorly drawn

Table 46.11. FACTORS AFFECTING DIURETIC RENOGRAPHY IN THE NEONATE

<table>
<thead>
<tr>
<th>Renal maturity</th>
<th>Volume of urine in bladder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal function</td>
<td>Outlined regions of interest</td>
</tr>
<tr>
<td>Hydration status</td>
<td>Patient position</td>
</tr>
<tr>
<td>Type and dose of radiopharmaceutical</td>
<td>Capacity of upper tract</td>
</tr>
<tr>
<td>Dose of diuretic</td>
<td>Severity of obstruction</td>
</tr>
<tr>
<td>Timing of diuretic administration</td>
<td>Site of obstruction</td>
</tr>
<tr>
<td>Vescicourethal reflux</td>
<td>Method of data interpretation</td>
</tr>
</tbody>
</table>
Post-natal w/u of Antenatal Hydro

- Ultrasound - renal & bladder
- VCUG
- Nuclear Renography
- MRI

MRI

- Not widely used thusfar
- Gadolinium-DTPA enhanced
- Provide anatomical & functional information
- Differential renal f’n
  - Volume of enhancing renal parenchyma
- Renal transit time (akin to T½ of nuclear renogram)
  - Time from first cortical enhancement to contrast in ureter at or below lower pole of kidney after lasix dose (>490sec = obstr.)
Post-natal w/u of Antenatal Hydro

- Ultrasound – renal & bladder
- VCUG
- Nuclear Renography
- MRI
- Whitaker Test

Whitaker Test

- NT & Foley catheter
- Pressure readings from renal pelvis & bladder
- Flow rate @ 5-10cc/sec
- Obstruction = ΔP > 20cmH₂O
- Unobstructed = ΔP < 12cmH₂O

Criticisms:
- Cumbersome
- No one knows how to do it anymore
Post-natal w/u of Antenatal Hydro

- Ultrasound – renal & bladder
- VCUG
- Nuclear Renography
- MRI
- Whitaker Test
- Biomarkers

?Biomarkers

- NAG = N-Aceytl-ß-D-glucosaminidase
- TGF-ß1

- Both found at increased levels in urine of obstructed kidneys
15 children underwent UPJO repair vs. 11 controls with dilated non-obstructed kidneys

- TGF-β1 measured in renal pelvis, bladder of UPJO kids preop & 3 mos postop
- Bladder TGF-β1 measured in controls

Obstruction = TGF-β1 > 29pg/mg creatinine
**Pediatric W/U Summary**

- Antenatal U/S followed by post-natal U/S at 2 weeks
- VCUG to r/o VUR
- Nuclear renogram to define differential function and drainage
- If acceptable differential function & drainage curves, follow with serial U/S +/- nuclear renograms (esp. if U/S changes)

**Kids - Who to treat?**

- Symptomatic (pain, hematuria, HTN, etc)
- Ultrasound:
  - Evolving parenchymal thinning
  - Contralateral compensatory hypertrophy
- Nuclear renogram:
  - Declining renal f’n (?<40%)
  - Worsening obstruction (?T½<20min)
Who to treat? – Special case

- B/L UPJO (10% cases) & Solitary kidney
- Nuclear renogram & U/S interpretation more difficult as no “normal” kidney for comparison
- Treatment decision making
  - Relies on clinician judgement based on:
    - Drainage curves
    - Degree of hydronephrosis

Adult UPJO W/U Summary

- Goals:
  - Confirm functionally significant obstruction
  - Assessment of differential renal function
  - Delineation of UPJ anatomy
Adult UPJO W/U Summary

- Nuclear renogram
  - Differential function
  - Drainage curves
- CT-angiogram
  - Vascular anatomy (?crossing vessel)
  - Degree of hydro
- ?Retrograde pyelogram
  - Usually at time of definitive Tx to assess stricture length

Adults – Who to Treat?

- Symptomatic
- Complications
  - Infection
  - Stones
- Renal function compromise
Management

Hot Springs, Tofino
Management Options

- Open repair
- Minimally Invasive repair
  - Endoscopic
  - Laparoscopic

Management

- Open surgical repair techniques:
  - Foley Y-V plasty
    - No pelvic reduction
    - Can’t transpose crossing vessel
Management

- Open surgical repair techniques:
  - Culp DeWeerd’s spiral flap
    - Can get significant length with large renal pelvis

- Davis intubated ureterostomy
  - Stent & NT
  - 6 weeks for ureteric wall regeneration
Management

- Open surgical repair techniques:
  - Anderson-Hynes dismembered pyeloplasty
    - Allows transposition anterior to crossing vessels
    - Excision of diseased segment
    - Reduction pyeloplasty
    - Spiral flap can be used for extra length

Management

- Open Approaches
  - Anterior subcostal muscle-splitting
  - Flank – off tip of 12 or supra-12
  - Dorsal lumbotomy
Outcomes of Open Repairs

- No review papers/meta-analysis
- My review of dozens of papers:
  - Consistently >90% (92-100%)
  - Salvage pyeloplasty = 80%+
Management

- Minimally invasive approaches
  - Endoscopic
  - Laparoscopic

Endopyelotomy

- Access:
  - Antegrade or retrograde

- Technique:
  - Balloon dilatation
  - Acucise
  - Cold-knife
  - Hot-knife
  - Laser
Endopyelotomy

- Indications
  - Mild-moderate hydro
  - Good renal function (>30%)
  - Short stenosis (<1.5cm)
  - Absence of crossing vessel
  - Previous pyeloplasty (open/lap) failure

- Predictors of poor outcome:
  - Crossing vessel
  - Severe hydronephrosis (esp. >100cc)
  - Long stricture length
  - Poor renal function (<20%)
  - Prior failed endopyelotomy

Retrograde Endopyelotomy

- Balloon dilatation
- Late 1980’s
- Concept = retrograde pyelolysis & stenting

*British Journal of Urology (1993), 71, 152-155
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Retrograde Balloon Dilatation for Pelviureteric Junction Obstruction

S. McCLINTON, J. H. STEYN and J. K. HUSSEY

*Departments of Urology and Radiology, Royal Infirmary, Aberdeen*
**Retrograde Endopyelotomy**

- 43 UPJ’s in 42 pts.
- 79% primary UPJ
- 30 Fr. Balloon diam.
- 10 Fr. JJ x 6wks
- “Improvement” = >5% increase split f’n OR T½<20min
- 80% improved symptoms (85% 1º; 56% 2º)
- 79% renographic improvement (82% 1º; 56% 2º)

**Retrograde Endopyelotomy**

- Balloon dilatation in kids
- First described in mid-1990’s

**Retrograde Balloon Dilatation for Pelviureteric Junction Obstruction**

S. McClinton, J. H. Steyn and J. K. Hulsey

Departments of Urology and Pathology, Royal Infirmary, Aberdeen

**Retrograde Balloon Dilatation of Ureteropelvic Obstructions in Infants and Children: Early Results**

Hock L. Tan, F.R.A.C.S., Julian P. Roberts, F.R.C.S. (Plast.)
And D. Grattan-Smith, F.R.A.C.R.

- Technique:
  - 10 Children with obstruction on lasix renogram (3mos – 9 yrs)
  - C&P
  - UVJ dilation to 5 Fr
  - 3.8 F, 8Atm Meditech radial balloon dilator
  - 3 minute dilation (hourglass deformity removed)
  - 4.8 F JJ stent x 6 weeks

Urology 1995 46(1): 89-91
Retrograde Endopyelotomy

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age at Operation (months)</th>
<th>Side</th>
<th>Presentation</th>
<th>Preoperative Urate</th>
<th>Preoperative</th>
<th>Postoperative</th>
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<td>Y</td>
<td>5</td>
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<td>L</td>
<td>Y</td>
<td>Y</td>
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<td>5</td>
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<td>3</td>
<td>42</td>
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<td>Y</td>
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<tr>
<td>6</td>
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<td>L</td>
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<td>Y</td>
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<td>8</td>
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<td>L</td>
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<td>R</td>
<td>Y</td>
<td>Y</td>
<td>34</td>
<td>11</td>
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</tbody>
</table>

Outcomes:
- Median f/u 22mos (4-25)
- Lasix renogram @ 3-6 mos postop = 70% success
  - No obstruction = 6
  - Improved drainage = 1 (T½ 90min → 28min)
  - 3 failed

Urology 1995 46(1): 89-91

Retrograde Endopyelotomy

Acucise

First publication 1994
- 2 kids
Retrograde Endopyelotomy

- Acucise

- No preoperative vascular imaging
- Posterolateral incision of UPJ & JJ stenting
- 78% success
- 4% post-operative hemorrhage (3 pts)
  - 2 required embolization

Acucise Endopyelotomy

- 52-81% radiographic success

<table>
<thead>
<tr>
<th>References</th>
<th>No. Cases</th>
<th>No. Primary UPJO</th>
<th>Follow-up (mos)</th>
<th>% Symptomatic Improvement</th>
<th>% Radiological Improvement</th>
<th>% Complications</th>
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<tr>
<td>Preminger et al\textsuperscript{5}</td>
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<td>64</td>
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<td>26</td>
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<td>61</td>
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<td>4</td>
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</tbody>
</table>
Retrograde Endopyelotomy

- Laser ureteroscopic endopyelotomy

**Long-term results of endoureterotomy using a holmium laser**

Hastuki Hibi,1 Tadashi Ohori,1 Tomohiro Taki,2 Yoshiki Yamada2 and Nobuaki Honda1

1Department of Urology, Kyorinu General Hospital, Nagoa and 2Department of Urology, Aichi Medical University, Aichi, Japan

- 20 ureters in 18 adult patients
- 11 stone-scar, 3 ureteroenteric (neobladders), 5 UPJO, 1 primary ureteric
- 8 Fr semirigid ureteroscope, Holmium @ 10W (1J x 10Hz), incised to fat, 12F JJ stent x6wks

F/U = nuclear renogram or U/S & IVP
- Mean stricture length = 2.25cm
- Mean f/u = 60 mos (46-74)
- 80% success – both ureteric & UPJ
- 1 UPJO failure = high insertion
Retrograde Endopyelotomy

- Laser Endopyelotomy vs. Acucise

Prospective, Randomized Comparison of Ureteroscopic Endopyelotomy Using Holmium:YAG Laser and Balloon Catheter


From the Mansoura Urology and Nephrology Center, Mansoura, Egypt

- RCT, 2001-2003
- 40 adult patients (mean age 39); 20/group
  - 14 primary UPJO; 26 secondary
- Preop w/u = IVP, CT for vasculature, lasix renogram

J Urol 2006, 175: 614-618

Retrograde Endopyelotomy

- Laser Endopyelotomy vs. Acucise
- Techniques:

<table>
<thead>
<tr>
<th>Laser Endopyelotomy</th>
<th>Acucise</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 1.2 J, 10Hz = 12 W</td>
<td>0.5 cc contrast in balloon to ensure position</td>
</tr>
<tr>
<td>- Lateral incision to fat</td>
<td>- 75-100W x 5 sec as 2cc injected in balloon</td>
</tr>
<tr>
<td>- 8 Fr. Semirigid ureteroscope</td>
<td>- re-fire x1 if still waisted</td>
</tr>
<tr>
<td>- Balloon dil’n prn for hemostasis (1 pt)</td>
<td>- Keep inflated x10min for hemostasis</td>
</tr>
</tbody>
</table>

- 14/7 endopyelotomy stent vs. 7 Fr JJ

J Urol 2006, 175: 614-618
Retrograde Endopyelotomy

- Laser Endopyelotomy vs. Acucise
- “Success” = subjective improvement in Sx with objective improvement in obstruction (T½<20min, improved/stable GFR)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Laser</th>
<th>Acucise™</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean operative time ± SD (min)</td>
<td>64.7 ± 20.4</td>
<td>54.7 ± 20.2</td>
<td>0.04</td>
</tr>
<tr>
<td>Mean hemoglobin deficit ± SD (gm)</td>
<td>0.31 ± 0.19</td>
<td>0.49 ± 0.56</td>
<td>0.08</td>
</tr>
<tr>
<td>Mean hospital stay ± SD (days)</td>
<td>6.1 ± 2.26</td>
<td>6.6 ± 2.26</td>
<td>0.35</td>
</tr>
<tr>
<td>No. complications (%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0.20</td>
</tr>
<tr>
<td>No. objective success (%)</td>
<td>1 (0%)</td>
<td>0 (0%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Primary UPILO</td>
<td>6 (12.6)</td>
<td>4 (40.7)</td>
<td>0.38</td>
</tr>
<tr>
<td>Secondary UPILO</td>
<td>10 (21.3)</td>
<td>9 (40.9)</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Complications:
- Laser = 1 patient (nausea & vomiting)
- Acucise = 4 patients (20%)
  - 1 sepsis
  - 3 post-op bleeds \(\rightarrow\) 1u pRBC’s each, no embolisation

J Urol 2006, 175: 614-618
Retrograde Endopyelotomy

- Laser Endopyelotomy vs. Acucise

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. Patients</th>
<th>Mean Operating Time (min)</th>
<th>% Success</th>
<th>Hospital Stay</th>
<th>% Complications</th>
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<tbody>
<tr>
<td>Retrograde incision:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conlin and Bigley</td>
<td>21</td>
<td>130</td>
<td>81</td>
<td>Mean less than 24 hrs</td>
<td>4.8</td>
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<tr>
<td>Tourek et al</td>
<td>22</td>
<td>96</td>
<td>87.5</td>
<td>Mean less than 24 hrs</td>
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<tr>
<td>Smyth et al</td>
<td>20</td>
<td>64</td>
<td>75</td>
<td>Mean 1.6 days</td>
<td>10</td>
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<tr>
<td>Meta et al</td>
<td>65</td>
<td>60</td>
<td>73.3</td>
<td>Mean less than 24 hrs</td>
<td>11.1</td>
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<tr>
<td>Present series</td>
<td>20</td>
<td>65</td>
<td>85</td>
<td>Mean 1.1 days</td>
<td>10</td>
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<tr>
<td>Acucise™ incision:</td>
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<td></td>
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</tr>
<tr>
<td>Nadler et al</td>
<td>16</td>
<td>100</td>
<td>70</td>
<td>Mean 0.7 days</td>
<td>10</td>
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<tr>
<td>Printz et al</td>
<td>21</td>
<td>45</td>
<td>81</td>
<td>Mean 1.6 days</td>
<td>10.7</td>
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<tr>
<td>Gal et al</td>
<td>33</td>
<td>84</td>
<td>76</td>
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<td>Lebrec et al</td>
<td>36</td>
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<tr>
<td>Present series</td>
<td>30</td>
<td>58</td>
<td>40</td>
<td>Mean 1.6 days</td>
<td>25</td>
</tr>
</tbody>
</table>

J Urol 2006, 175: 614-618

Retrograde Endopyelotomy

- 73-85% radiographic success

<table>
<thead>
<tr>
<th>References</th>
<th>No. Cases</th>
<th>No. Primary UPJO</th>
<th>% Crossing Vessels</th>
<th>Cutting Method (No.)</th>
<th>Follow-up (mo)</th>
<th>% Symptomatic Improvement</th>
<th>% Radiological Improvement</th>
</tr>
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<tr>
<td>Giddens and Grasso</td>
<td>23</td>
<td>18</td>
<td>17</td>
<td>Laser</td>
<td>19</td>
<td>Not available</td>
<td>83</td>
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<tr>
<td>Gerber and Kim</td>
<td>22</td>
<td>18</td>
<td>Not available</td>
<td>Electrocautery (16), laser (6)</td>
<td>20.5</td>
<td>91</td>
<td>82</td>
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<tr>
<td>Matar et al</td>
<td>45</td>
<td>40</td>
<td>Not available</td>
<td>Laser</td>
<td>23.2</td>
<td>65.4</td>
<td>73.1</td>
</tr>
<tr>
<td>Conlin and Bigley</td>
<td>21</td>
<td>15</td>
<td>57%</td>
<td>Electrocautery (14), laser (6), cold knife (1)</td>
<td>23</td>
<td>Not available</td>
<td>81</td>
</tr>
<tr>
<td>Rennet et al</td>
<td>24</td>
<td>27</td>
<td>Not available</td>
<td>Laser</td>
<td>18</td>
<td>Not available</td>
<td>85</td>
</tr>
</tbody>
</table>
Antegrade Endopyelotomy

- Adults & older children/adolescents
- Via nephrostomy tract (posterior middle calyx)
- Dilation, cold-knife, electrocautery, or laser
- Endopyelotomy stent x6wks

Advantages:
- Concomitant PCNL
- Anatomic factors that preclude ureteroscopy
- Direct vision

Disadvantages:
- Multiple anesthetics
- Increased morbidity
- Longer hospital stay
Antegrade Endopyelotomy

Endopyelotomy in Childhood: Our Experience with 37 Patients

BÉLA TÁLLAI, M.D., MORSHED ALI SALAH, M.D., PH.D., TIBOR FLASKÓ, M.D., CSABA TÓTH, M.D., D.SC., and ATTILA VARGA, M.D., PH.D.

- 1990-2002
- 37 children with primary UPJO
- Mean age 11.5 yrs (4.5-17)
- Preop Dx = U/S & IVP (no renograms)
- All percutaneous antegrade endopyelotomy
- F/U = IVP at 1 year postop

Technique:
- Ureteral catheter → methylene blue in pelvis
- Middle calyceal puncture
- Dilated to 26 Fr.
- Wire placed antegrade across UPJ (catheter removed)
- Cold endopyelotomy knife – dorsolateral incision to fat
- 6-12 Fr. JJ stent or “trans-renal drain” x 6 weeks
- Antegrade nephrostogram extravasation confirmed full-thickness incision
Antegrade Endopyelotomy

Outcomes:

Complications:
- 2 children required exploration d/t bleeding from crossing vessel → ligation & open pyeloplasty
- 4 children with fever → ampicillin & acetaminophen
- Hospital stay = 2-10 days (mean = 6)
- 81% “good”, 8% “satisfactory”, 11% failures

Antegrade Endopyelotomy

73-88% radiographic success

<table>
<thead>
<tr>
<th>References</th>
<th>No. Cases</th>
<th>No. Primary UPIO</th>
<th>Cutting Method (No.)</th>
<th>Follow-up (mos)</th>
<th>% Symptomatic Improvement</th>
<th>% Radiological Improvement</th>
<th>% Complications</th>
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</thead>
<tbody>
<tr>
<td>Van Cauwenbergh et al(^a)</td>
<td>102</td>
<td>81</td>
<td>Cold knife</td>
<td>60</td>
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<td>73</td>
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<tr>
<td>Kletscher et al(^b)</td>
<td>50</td>
<td>49</td>
<td>Cold knife</td>
<td>12</td>
<td>92</td>
<td>88</td>
<td>6</td>
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<tr>
<td>Gupta et al(^c)</td>
<td>401</td>
<td>235</td>
<td>Cold knife</td>
<td>51</td>
<td>Not available</td>
<td>85</td>
<td>Not available</td>
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<tr>
<td>Dammert et al(^d)</td>
<td>80</td>
<td>80</td>
<td>Cold knife</td>
<td>26</td>
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<td>81</td>
<td>13</td>
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<tr>
<td>Shallav et al(^e)</td>
<td>63</td>
<td>40</td>
<td>Electrocautery</td>
<td>31</td>
<td>89</td>
<td>85</td>
<td>27</td>
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<tr>
<td>Knudsen et al(^f)</td>
<td>89</td>
<td>61</td>
<td>Electrocautery (77), laser (3)</td>
<td>55</td>
<td>Not available</td>
<td>67</td>
<td>Not available</td>
</tr>
</tbody>
</table>

TABLE 1: Worldwide data on antegrade endopyelotomy 2006
So long ago, I can’t remember…

**Laparoscopic Pyeloplasty**

- First described in adults in 1993 (Kavoussi)
- First described in kids in 1999 (Tan)
- First pediatric robot-assisted described in 2002 (Peters)
- Transperitoneal vs. retroperitoneal
- Probably little advantage in child < 2yrs (DL equally non-morbid)
- **Increasingly the preferred first-line approach**
Laparoscopic Pyeloplasty

Head

Feet

R side down

Laparoscopic Pyeloplasty
Laparoscopic Pyeloplasty

- Outcomes are equivalent to open (symptomatic & objective)

<table>
<thead>
<tr>
<th>References</th>
<th>No. Cases</th>
<th>Approach</th>
<th>Repair Type</th>
<th>% Crossing Vessels</th>
<th>% Open Conversion</th>
<th>Operative Time (Mins)</th>
<th>Hospital Stay (days)</th>
<th>Follow-up (mos)</th>
<th>% Symptomatic Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarrett et al'85</td>
<td>100</td>
<td>Transperitoneal</td>
<td>Dismembered</td>
<td>57</td>
<td>0</td>
<td>252</td>
<td>3.3</td>
<td>26</td>
<td>98</td>
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<tr>
<td>Janetschek et al'9</td>
<td>67</td>
<td>Transperitoneal</td>
<td>Fangerplasty</td>
<td>79</td>
<td>1.5</td>
<td>119</td>
<td>4.1</td>
<td>25</td>
<td>98</td>
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<tr>
<td>Eden et al'77</td>
<td>50</td>
<td>Retroperitoneal</td>
<td>Dismembered</td>
<td>42</td>
<td>5.5</td>
<td>164</td>
<td>2.6</td>
<td>19</td>
<td>98</td>
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<tr>
<td>Turk et al'18</td>
<td>49</td>
<td>Transperitoneal</td>
<td>Dismembered</td>
<td>37</td>
<td>0</td>
<td>165</td>
<td>3.7</td>
<td>23</td>
<td>98</td>
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<td>Soulie et al'95</td>
<td>55</td>
<td>Retroperitoneal</td>
<td>Dismembered (48)</td>
<td>42</td>
<td>5.4</td>
<td>185</td>
<td>4.5</td>
<td>14</td>
<td>100</td>
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<td>Mandhani et al'99</td>
<td>92</td>
<td>Transperitoneal</td>
<td>Dismembered (59), Fangerplasty (7), Foley Y-V (20)</td>
<td>16</td>
<td>6.5</td>
<td>179</td>
<td>4</td>
<td>12</td>
<td>93</td>
</tr>
</tbody>
</table>

- Radiographic success rates: 88-100%

Laparoscopic Pyeloplasty

- Open vs. Lap Pyeloplasty Trials (Adults):
  - Success = radiographic (renogram)

<table>
<thead>
<tr>
<th>Study</th>
<th>F/U</th>
<th>Lap Success</th>
<th>Open Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bauer, 1999</td>
<td>12+ mos</td>
<td>98%</td>
<td>94%</td>
</tr>
<tr>
<td>Klingler, 2003</td>
<td>23 mos</td>
<td>96%</td>
<td>93%</td>
</tr>
<tr>
<td>Baldwin, 2003</td>
<td>5-11 mos</td>
<td>94%</td>
<td>86%</td>
</tr>
</tbody>
</table>

- “Currently, the role of open surgery in the surgical algorithm of UPJO is reserved for patients who require pyeloplasty when laparoscopic surgery is unavailable or technically prohibitive”

  AUAUS 2006
Laparoscopic Pyeloplasty

- Expanding indications:
  - Secondary UPJO
  - Renal calculi (concomitant pyelolithotomy)
  - Solitary kidneys
  - Anatomically anomalous kidneys

Laparoscopic Pyeloplasty

Robotic vs standard retroperitoneoscopic pyeloplasty in children

L.H. Olsen and T.M. Jørgensen
Urology, Section of Paediatric Urology, Sæby Region, Aarhus University Hospital, Aarhus, Denmark

- 15 pure retroperitoneoscopic pyeloplasties vs. first 8 DaVinci-assisted pyeloplasties
- Robot used for anastamosis only
Laparoscopic Pyeloplasty

Robotic vs standard retroperitoneoscopic pyeloplasty in children
L.H. Olsen and T.M. Jørgensen
Urology, Section of Paediatric Urology, Skejby-Sygehus, Aarhus University Hospital, Aarhus, Denmark

- Operative (skin-skin) time significantly shorter for robot (172 vs. 210 min)
- Setup time for robot = 40 min
- Conclusion: for first 8 cases, robot was time neutral, complication neutral, hospital-stay neutral

Laparoscopic Pyeloplasty

- Robotic-assisted Success Rates: 94-100%

<table>
<thead>
<tr>
<th>References</th>
<th>No. Case</th>
<th>Approach</th>
<th>Repair Type (No.)</th>
<th>% Crossing Vessels</th>
<th>Operative Time (min)</th>
<th>Hospital Stay (days)</th>
<th>Follow-up (weeks)</th>
<th>% Symptomatic Success</th>
<th>% Radiological Success</th>
<th>% Complications</th>
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<tr>
<td>Noble et al.</td>
<td>50</td>
<td>Transperitoneal</td>
<td>Dismembered</td>
<td>30</td>
<td>122</td>
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<td>100</td>
<td>0</td>
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<td>Rubino et al.</td>
<td>35</td>
<td>Transperitoneal</td>
<td>Dismembered</td>
<td>29</td>
<td>216</td>
<td>2.4</td>
<td>7.9</td>
<td>94</td>
<td>94</td>
<td>11</td>
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<tr>
<td>Taliq et al.</td>
<td>26</td>
<td>Transperitoneal</td>
<td>Dismembered (23), Poly V (3)</td>
<td>42</td>
<td>243</td>
<td>2</td>
<td>6</td>
<td>95</td>
<td>100</td>
<td>12</td>
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<td>Mundy-Temraz et al.</td>
<td>32</td>
<td>Transperitoneal</td>
<td>Dismembered (31), Dropal (1)</td>
<td>44</td>
<td>300</td>
<td>1.1</td>
<td>10.5</td>
<td>94</td>
<td>94</td>
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<td>Serrato et al.</td>
<td>11</td>
<td>Transperitoneal</td>
<td>Dismembered</td>
<td>36</td>
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<td>5.5</td>
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<td>Snook et al.</td>
<td>10</td>
<td>Retropereitoneal</td>
<td>Dismembered</td>
<td>30</td>
<td>157</td>
<td>2</td>
<td>15</td>
<td>100</td>
<td>100</td>
<td>0</td>
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</table>
Treatment Algorithm (Adult)

Outcomes Summary

<table>
<thead>
<tr>
<th>Technique</th>
<th>Pediatric success rates</th>
<th>Adult success rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open repair</td>
<td>90-100%</td>
<td>86-100%</td>
</tr>
<tr>
<td>Acucise</td>
<td>Limited use</td>
<td>52-81%²</td>
</tr>
<tr>
<td>Laser endopyelotomy</td>
<td>~67%</td>
<td>73-85%²</td>
</tr>
<tr>
<td>Antegrade endopyelotomy</td>
<td>72-92%³</td>
<td>67-88%</td>
</tr>
<tr>
<td>Laparoscopic Pyeloplasty</td>
<td>87-100%</td>
<td>88-100%</td>
</tr>
</tbody>
</table>
Outcomes Summary

- References:

Primary Treatment Failure

- Salvage = try the other option

- 72 adult patients
- Antegrade endopyelotomy
- Mean f/u = 88.5 mos
- 87.5% clinical & radiographic success
Primary Treatment Failure

- Salvage = try the other option

43 adult patients underwent open pyeloplasty after endopyelotomy failure
95% clinical & radiographic success

Post-treatment Follow-up

- Pediatric UPJO:
  - Serial U/S
    - Gradual improvement in hydro is the rule
      - <50% improve within 6 months of repair
      - 80% improve at 2 years
    - Monitor renal growth
    - Worsening hydro should prompt nuclear renogram
  - Indications for nuclear renogram
    - Worsening hydro on U/S
    - Poor renal growth on U/S
    - Persistent symptoms
Histologic Findings in UPJO

- Biopsy findings of kidneys with UPJO
  - Dilation of collecting ducts & Bowman’s space
  - Decreased # glomeruli
  - Interstitial fibrosis & inflammation
  - Global/segmental sclerosis
  - Cortical cysts
Summary

- Diagnosis
  - Kids:
    - U/S
    - VCUG
    - Renogram
  - Adults:
    - CTA
    - Renogram
    - ?retrograde
Summary

- Decision to treat:
  - Symptoms
  - Complications (stones, infection)
  - Declining renal function
    - U/S criteria = parenchymal thinning, contralateral hypertrophy
    - Renogram criteria = worsening split f’n, ?drainage curves, ?T½

Summary

- Treatment modality:
  - Kids:
    - Open > Endoscopic
    - Lap data emerging (esp. age 2+)
  - Adults
    - Lap = Open > Endoscopic
    - First line choice = discretion of clinician
  - Salvage
    - Pyeloplasty → Endoscopic
    - Endoscopic → Pyeloplasty
THE END