



# Update on the Management of Ureteropelvic Junction Obstruction

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## Overview

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- 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

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- 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?

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- 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

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- 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

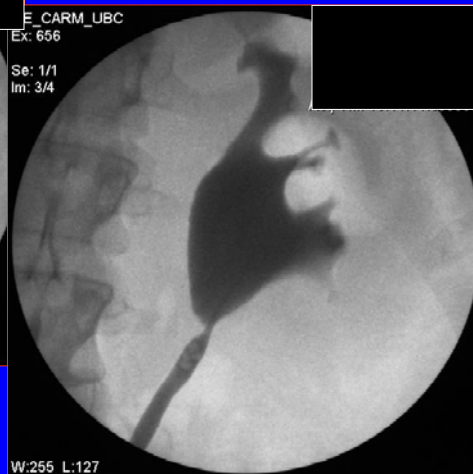
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- Majority of pts have undergone renal U/S, IVP, or CT-KUB with finding of hydronephrosis
  - Study may be normal if intermittent obstruction (? crossing vessel)
  - If normal study and ↑ clinical suspicion → rpt when symptomatic
- Lasix renogram positive 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

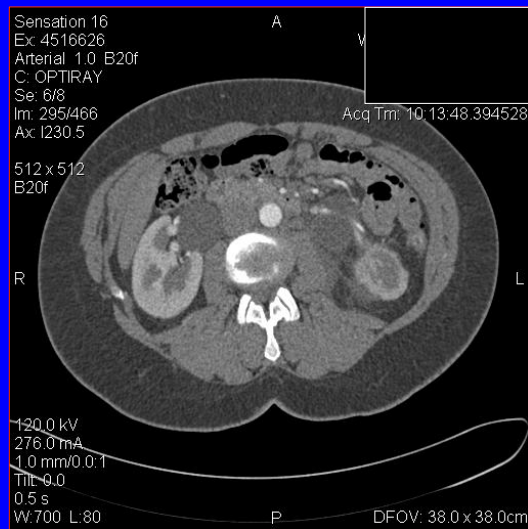
## UPJ Retrograde Pyelogram



## 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

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- 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”

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- 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

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- 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

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

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- 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

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- 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 → 95% SUCCESS (Van Cangh et al, 1994)

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

## Antegrade Endopyelotomy

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- Segura-argues UPJ must be dependent for Endopyelotomy
- ? presence of high v. dependent ureteral insertion unlikely to affect outcome (Chow and Strem, 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

| Author               | # Pts | Success Rate | F/U (mo) |
|----------------------|-------|--------------|----------|
| Gupta and Smith      | 401   | 85           | 6-144    |
| Motola and Smith     | 212   | 86           | 36-96    |
| Kuenkel and Korth    | 180   | 76           | 6-43     |
| Kamihira and Ono     | 90    | 90           | >6       |
| Danuser and Studer   | 80    | 81           | 1.5-72   |
| Knudsen and Denstedt | 80    | 67           | 55       |
| Szewczyk et al       | 64    | 61           | 4-20     |
| Streitz et al        | 52    | 65           | 6-84     |
| Kletscher and Segura | 50    | 88           | N/A      |

## 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; Tawfik and Bagley, 1998; Knudsen and Denstedt, 2004

## Paterson's Indications for Antegrade Endopyelotomy

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

## Retrograde Endopyelotomy

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- 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

| Investigator        | Etiol (1°/2°) | Mean OR time | Success Rate (%) | Mean F/U (mo) |
|---------------------|---------------|--------------|------------------|---------------|
| Thomas et al        | 40/9          | 90           | 94               | 15            |
| Tawfik and Bagley   | 24/8          | 95           | 87.5             | 10            |
| Renner et al        | 27/7          | NA           | 85               | 18            |
| Conlin et al        | 15/6          | 120          | 81               | 23            |
| Meretyk and Clayman | 16/3          | 179          | 79               | 17            |
| Biyani et al        | 5/3           | 38           | 87.5             | 12            |
| Gerber and Kim      | 18/4          | 63           | 82               | 29            |

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  
Tawfik and Bagley, 1998

## Acucise Endopyelotomy (Applied Medical Resources, Inc.)

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- 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)

## Acucise Endopyelotomy

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- 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

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- 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

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## What's Needed for A Good Lap Pyeloplasty?

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- 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

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- 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

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- 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

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### 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

| Author                    | # Pts | OR time | Success | F/U (mo.) |
|---------------------------|-------|---------|---------|-----------|
| Gettman and Bartsch*      | 9     | 139     | 100     | 4.1       |
| Mendez-Torres and Thomas* | 32    | 300     | 89      | 10.3      |
| Palese, Sosa, Del Pizzo*  | 35    | 216     | 94      | 7.9       |
| Jarrett and Kavoussi      | 99    | 252     | 96      | 26        |
| Siqueira and Shalhav      | 17    | 240     | 94      | 14.4      |
| Eden et al                | 50    | 164     | 98      | 18.8      |
| Soulie et al              | 55    | 185     | 87      | 14.4      |
| Turk et al                | 49    | 165     | 98      | 23.2      |
| Davenport and Keeley      | 83    |         | 92      | 15        |

## 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

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### **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

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- 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

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- 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

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- 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

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- 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?

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- 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

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- 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