Obstructive uropathy in infants – guidelines of EAU/ESPU

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Structural anomalies detected on ultrasound prenatally

- Central nervous system: 50 %
- Genitourinary tract: 20 %
- Gastrointestinal tract: 15 %
- Cardiopulmonary system: 8 %

Elder 1997
# Prenatally detected uropathy

<table>
<thead>
<tr>
<th>Condition</th>
<th>Thomas, 1998</th>
<th>Homsy, 1990</th>
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<tbody>
<tr>
<td>UPJ obstruction</td>
<td>35.2%</td>
<td>64.0%</td>
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<tr>
<td>Vesicoureteral reflux</td>
<td>19.5%</td>
<td>9.1%</td>
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<tr>
<td>UVJ obstruction</td>
<td>9.8%</td>
<td>13.4%</td>
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<tr>
<td>Posterior urethral valves</td>
<td>8.6%</td>
<td>2.1%</td>
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- **Thomas, 1998**: Data from 426 cases
- **Homsy, 1990**: Data from 187 cases
Bilateral hydronephrosis

Megaureter

Megavesica
Antenatal hydronephrosis

is being detected in as many as 1,4% of fetuses, and is persisting postnatally in half of these cases. (Grignon et al. 1986)

Significant prenatal dilatations
> 10 mm (second trimester)
> 15 mm (third trimester)
Antenatal hydrenephrosis

- mostly transient anatomical obstruction
- fetal interventions give poor results

Conservative approach!!!
Postnatal evaluation
(Guidelines EAU and ESPU 2009)

- Postnatal ultrasound
  - Dilatation (uni- or bilateral)
    - Voiding cystourethrogram (VCUG)*
  - No dilatation
    - Repeat ultrasound after 4 weeks
  - Diuretic renography

Low-dose antibiotic prophylaxis!
Neonatal ultrasound – timing
(Wiener and O’Hara 2002)

At age 5 to 10 days (not before 48 hours)

After birth (in the first 48 hours)
- In oligohydramnios
- In bilateral dilatation (± bladder distension)
- In potential loss of followup
Low grade hydronephrosis (postnatal classification SFU)

Gr 1 Slight pelvic dilatation
Gr 2 pelvic dilatation, few calyces visualized
High grade hydronephrosis (postnatal classification SFU)

**Gr 3** - Pelvicalyceal dilatation

**Gr 4** - Pelvicalyceal dilatation + thinning of renal parenchyma
Bladder ultrasound

Examination of full and empty bladder

- Bladder size, thickness of the wall
- Retrovesical megaureter, ureterocele
- Dilatation of urethra
Postnatal evaluation
(Guidelines EAU and ESPU 2009)

Postnatal ultrasound

- Dilatation (uni- or bilateral)
  - Voiding cystourethrogram (VCUG)*
  - Diuretic renography
- No dilatation
  - Repeat ultrasound after 4 weeks

* VUR in 15 – 25 % of neonatal hydronephrosis – with unknown significance in non-dilated ureter!!!
Voiding cystourethrography

- Abnormal ureter or bladder
- Suspected infravesical obstruction
Postnatal evaluation
(Guidelines EAU and ESPU 2009)

Postnatal ultrasound

- Dilatation (uni- or bilateral)
- Voiding cystourethrogram (VCUG)*

- No dilatation
  - Repeat ultrasound after 4 weeks

Diuretic renography
Standardized diuretic scintigraphy in infants (Convey and Maizel 1992, Gordon et al. 2001)

- **Intravenous hydration** (15 ml/kg in 30 min.)
- **Standard radionuclid and furosemid application** – (F-15, F0, F+20 protocols)

*(Bladder catheterization only in VUR, dysfunction, dystopic kidney)*

To postpone until the neonate is 1 month of age because of immature tubular function
Diuretic scintigraphy

$^{99m}$Tc-MAG3

Differential renal function
pathological \( \rightarrow \) obstructive nephropathy

Diuretic curve
pathological (T1/2>20 min) \( \rightarrow \) obstructive uropathy

O'Reilly 2003, Eskild-Jensen et al. 2004
Differential renal function

corresponds to the time interval when radionuclid localizes in the tubules
Diuretic curve

Clearance of half of radionuclide \((T_{1/2})\)
- > 20 min…… …obstruction
- 15-20 min…… indeterminate
- < 15 min………normal

Diuretic curve seems to be less reliable than differential function!
Diuretic curve is influenced by renal function and pelvic size.

In the severely dilated pelvis drainage may not be detected.
Diuretic curve is influenced by

gravity and fullness of the bladder

Residual activity
after micturition and in upright position
(standards ??)
DMSA scintigraphy
in upper renal segment anomaly
Obstruction

- Restriction to urinary outflow that, left untreated, will cause progressive renal deterioration.

- Current techniques cannot reliably diagnose primary obstruction without including an observation period.

(Homsy and Koff, 1988)
Treatment

UPJO in neonates

No indication for immediate pyeloplasty in infants with prenatally diagnosed hydronephrosis who demonstrate good function postnatally (Ransley 1990)

UPJ obstruction is supposed in reduced differential renal function < 35% – 40%
Rational for conservative approach

Progressive decrease of hydronephrosis during first 2\(\frac{1}{2}\) years

Increasing renal function in 15/16 poorly functioning

Koff and Campbell 1994

Ulman et al. 2000
Neonatal hydronephrosis – careful observation

In stable morphological picture
In stable clinical status
In stable good renal function
Careful observation is based on

Repeat ultrasound ........ in 1-3 months

Repeat scintigraphy ........ in 3-12 months

(in GI-II  US only !!)
Kidney function > 40 %

G I – II
US only

Dilatation
Grade III-IV

- Decreasing
  - US
- Stable
  - Repeat US and scintigraphy
- Progressive
  - Surgery

Deterioration of renal function
Prognostic factors for surgery

- Renal function less than 30% (Koff 1994)

- AP diameter > 50 mm, dilated calyces (Dhillon 1998)
Indications for surgery
(Guidelines EAU and ESPU 2008)

decreasing renal function
increasing hydronephrosis
manifesting symptoms

- severe hydronephrosis in solitary and bilateral systems
- repeated lower split renal function (< 40 %)
- persistent high grade hydronephrosis
Surgery

will be performed in 19-25%

according to prospective studies if more strict criteria are applied

Renal deterioration is reversible after surgery
Irreversible d. is caused by inadequate followup!!!
Diuretic scintigraphy before and after pyeloplasty
Ultrasonography and Diuretic scintigraphy before and after pyeloplasty
Ultrasonography and Diuretic scintigraphy before and after pyeloplasty
Ultrasonography and Diuretic scintigraphy before and after pyeloplasty in solitary kidney
Conclusions

Conservative approach
- in 75 % of hydrenephroses (in 80-90% of megaureters)

- It is mandatory to achieve a **balance between the excessive imaging and risk of surgery**

- **Close follow-up** should be applied to prevent irreversible renal deterioration

Surgery
- in ureterocele, ectopic ureter
- posterior urethral valves