Purpose and Rationale

There has been considerable change in practice regarding optimal postnatal investigation of antenatally-detected hydronephrosis, driven partly by alterations to understanding and management of primary vesico-ureteric reflux in children, and the growing concern regarding the implications of radiation exposure in early childhood. The goal of evaluation is not necessarily to achieve a definitive diagnosis, but to distinguish clinically-significant pathology requiring close follow-up or early intervention, from clinically unimportant dilatation.

This advice is specifically aimed at the investigation and management of neonates, born within Monash Health, in whom hydronephrosis (HN) was detected antenatally. It excludes those who had a specific plan constructed during antenatal consultation. This guideline revises that from March 2005, created using available evidence and expert opinion.

Scope

Babies born within Monash Health and affiliated units, in whom hydronephrosis was identified antenatally. For those babies where a specific management plan was constructed antenatally (for example, through FDU), the specific plan should be followed.

Definitions

Hydronephrosis refers to dilatation of the renal collecting system above normal limits for gestational or postnatal age.

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Incidence and definitions

The incidence of renal abnormalities in population with mild to moderate ANH is ill-defined, but some reports suggest 30-45% (*Ismali et al, J Paed 2004; 144: 759-765*).

There is no universally-applied grading or classification system for ANH. 2 systems are commonly used worldwide:

1. Society for Fetal Urology (SFU) grading system
2. Maximum AP (transverse) renal pelvis diameter (RPD) - significant inter-observer variability

RPD measurement is the most common system used in Victoria. Subjective descriptors of “mild,

"moderate" and "severe" are often used, but there is not a standard for these.

The precise value at which RPD is considered abnormal varies in the current literature. The normal RPD also varies with age and gestation. We use the following values:

Description	*2nd Trimester RPD*	*3rd Trimester RPD*	*Postnatal RPD*
Normal	<5mm	<7mm	<5mm
Mild	5-7mm	7-10mm	5-10
Moderate	7-10mm	10-15mm	10-15
Severe	>10mm	>15mm	>15

Additional features of the sonographic appearance of the urinary tract that are important include:

- calyceal dilatation: presence is concerning
- contralateral kidney: presence, size and appearance
- ureteric dilatation: presence and extent
- bladder: size, wall thickness and emptying

Antibiotic prophylaxis

The role of prophylactic antibiotics has not been definitively delineated by clinical trial, in the context of antenatal hydronephrosis. However, as the consequences of neonatal urosepsis can be life-threatening, and some investigations carry risk of iatrogenic infection, most international centres commence antibiotic prophylaxis at birth. We suggest antibiotic prophylaxis for all patients until the first ultrasound and clinical review. Active decision to cease can then be made, once initial investigations have been completed.

- trimethoprim 2mg/kg or cephalexin 10mg/kg once daily

Postnatal management

Broadly, antenatal hydronephrosis can be stratified into high-risk and low-risk groups, depending on severity of dilatation and associated features. The prenatal history determines stratification. High risk patients need early involvement of specialist urology or nephrology units, if only to guide individualized postnatal evaluation. Low risk patients can be investigated as outpatients and should be spared most invasive, radiation-involved modalities. Surveillance ultrasound is the cornerstone.

The single most important postnatal investigation is a physical examination of the neonate – palpable kidney or bladder mandates early review by urology or nephrology. Initial examination should be conducted soon after birth, assessing for associated anomalies and presence of palpable kidney.

Timing of other investigations is relevant and is determined by the severity and laterality of HN. Timing can affect the interpretation of results, if undertaken soon after birth. Be aware that:

- early sonography (first 72 hours) of urinary tract may be falsely reassuring during the period of relative oliguria. Early ultrasound is appropriate in severe HM or bilateral HN, to allow rapid response if abnormal
- early serum creatinine is affected by maternal levels, but level can be informative by Day 2, in setting of severe HN, bilateral HN or single kidney
- if not severe, ultrasound is best delayed until after D4 or later, to allow urine production to define actual

HN

- BP measurement should be undertaken at least once, whilst the infant is calm
- diuretic renography utilizing MAG3 is more useful than DTPA in infants, as the handling of isotope and response to frusomide is poor in the immature kidney
- hydration status affects ultrasound appearance – it is important the infant be well hydrated for the studies

Vesico-ureteric reflux

VUR is a common cause of HN, however this does *not* mean all infants with HN should undergo MCU. Recent studies have questioned the validity of antibiotic prophylaxis in asymptomatic VUR. There remains no evidence that primary VUR without infection is an ongoing threat to renal status.

There is a clear association between VUR and congenital renal dysplasia, so specialist review is recommended if renal parenchyma is sonographically abnormal.

Role of MCU

Micturating cystourethrography is an invasive test, with implications regarding iatrogenic infection, trauma and radiation. It is very useful in specific circumstances, but should not form a routine part of postnatal investigation of HN. All male infants with moderate-severe *bilateral* hydronephrosis or severe unilateral hydro-*ureteron*ephrosis should undergo MCU, to assess for posterior urethral valves. This study should be undertaken under antibiotic cover, ideally before the baby leaves hospital. All other consideration for MCU should be under guidance of a paediatric urologist or paediatric nephrologist.

Timing of investigations

Timing of first postnatal ultrasound depends on severity of antenatal hydronephrosis. Timing and nature of all other investigations depends on the first postnatal ultrasound. We recommend:

- HN >15mm (>10mm if bilateral or solitary kidney) → USS within 72 hours (repeat at 4 weeks if this is normal or mild)
- HN<15mm and unilateral → USS within first month

A repeat scan is necessary to confirm an initial normal USS *Ismaili et al J Pediatr 2004, 144: 759-65*

- 2 normal ultrasounds in first 3 months in a well infants excludes significant congenital urinary tract pathology

Follow-up

Follow-up should include weight, BP measurement, urine analysis and clinical evaluation. US is the most useful longitudinal modality, being non-invasive and involving no ionizing radiation. US images need to be compared with previous images to identify changes in appearances

Referral to specialist centre

Referral to paediatric nephrologist and / or urologist should be considered in infants with:

- obstructive uropathy (PUJ obstruction, VUJ obstruction, posterior urethral valves)
- renal asymmetry >1cm
- abnormal renal parenchyma
- severe VUR (Gr IV-V)
- reduced renal function
- increasing HN grade or RPD >50% increase
- solitary kidney
- recurrent UTIs (2 or more in first year of life)

References.

- Intervention for primary vesicoureteric reflux. Cochrane Database. Hodson E, Wheeler D, Vimalchandra D et al: Syst Rev 2007; 3: CD001532
- Infection pattern in children with vesicoureteral reflux randomly allocated to operation or long-term antibacterial prophylaxis. The International Reflux Study in Children. Jodal U, Koskimies O, Hanson E et al. J Urol 1992; 148: 1650
- Primary vesicoureteric reflux and renal damage in first year of life. Lama G, Russo M, De Rosa E et al: Pediatr Nephrol 2000; 15: 205
- Dimercapto-succinic acid scintigraphy instead of voiding cystourethrography for infants with urinary tract infection. Hansson S, Dhamey M, Sigstrom O, Sixt R, Stokland E, Wennerstrom M et al: J Urol 2004; 172: 1071
- Relationship Among Vesicoureteral Reflux, Urinary Tract Infection and Renal Damage in Children. Swerkersson S, Jodal U, Sixt R, et al. J Urol 2007; 178: 647
- High Grade Primary Vesicoureteral Reflux in Boys: Long-Term Results of a Prospective Cohort Study. Alsaywid BS, Saleh H, Deshpande A, et al. J Urol 2010; 184: 1598

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Keywords or tags

Pyelectasis, PUJ obstruction, renal dilatation, duplex system, ureterocoele, pelvi-calyceal dilatation, posterior urethral valves, urinary obstruction, megaureter, vesico-ureteric reflux, reflux nephropathy, MCU. MAG3, VUR

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