URINARY TRACT ABNORMALITIES ON ANTENATAL SCAN
Supporting information

In males with posterior urethral valves diagnosed antenatally, can intrauterine drainage procedures provide benefit?

A review on posterior urethral valves (PUV) (Dinneen, 1996) states: "PUV may be one of the conditions suitable for intrauterine intervention, but the timing and type of intervention has yet to be determined".

It is possible that renal dysplasia may be irreversible by the time it is first detected on ultrasound (Thomas, 1989), and even successful drainage procedures may not return bladder pressures to normal or completely resolve abnormalities of ureteral drainage (Gonzales, 1990).

In the absence of any controlled trials, the evidence for successful prenatal intervention in PUV rests on a small number of case reports (Ropacka, 2001; Quintero, 2000; Shimada, 1998; Nguyen, 1996).

Dinneen MD, Duffy PG. Posterior urethral valves. Br J Urol 1996;78:275-81

Gonzales ET. Alternatives in the management of posterior urethral valves. Urol Clin N Am 1990;17:335-42

Nguyen TH, Thorup JM, Larsen T. Vesico-amniotic shunt-therapy in fetal obstructive uropathy. Ugeskr Laeger 1996;158:5463-4

Quintero RA, Shukla AR, Homsy YL, et al. Successful in utero endoscopic ablation of posterior urethral valves: a new dimension in fetal urology. Urology 2000;55:774

Ropacka M, Markwitz W, Nycz P, et al. Intrauterine therapy of obstructive uropathy: case report. Ginekol Pol 2001;72:153-9

Shimada K, Hosokawa S, Tohda A, et al. Follow-up of children after fetal treatment for obstructive uropathy. Int J Urol 1998;5:312-6

Thomas DF, Gordon AC. Management of prenatally diagnosed uropathies. Arch Dis Child Fetal Neonatal Ed 1989;64:58-63
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1590073/pdf/archdisch00902-0062.pdf

Evidence Level: V

Is there a level of antenatal renal dilatation at a particular stage in pregnancy that is strongly associated with ureteric reflux, irrespective of postnatal scan results?

A study in 111 infants with isolated antenatal hydronephrosis (Phan, 2003) found no correlation between the degree of renal dilatation and the presence or severity of vesicoureteral reflux (VUR). VUR was detected in 16 infants, 10 of whom had mild or absent dilatation.

Another study, in 157 children under 2 years with a family history of VUR in a first-degree relative (Anderson, 2003), found that after 30 weeks gestation, a 4 mm renal pelvis had a sensitivity of 33% and a PPV of 32%. The sensitivity was higher for reflux grades 4 and 5 (75%) than for grades 1-3 (17%). The authors concluded that fetal renal pelvic diameter had a low sensitivity and poor predictive value for detecting VUR, but that this was slightly improved after 30 weeks gestation.

A study of 1,301 fetal renal pelvis measurements over a period of 15 years (Scott, 2001) also found these poorly predictive of VUR, but recommended further investigation of cases >/= 7 mm at 18 weeks gestation.

A prospective study in 257 neonates with prenatally detected renal pelvic dilatation (Coplen, 2006) found that a threshold of 15 mm correctly discriminated obstruction in at least 80% of cases with a sensitivity of 73% and a specificity of 82%.

Anderson NG, Wright S, Abbott GD, et al. Fetal renal pelvic dilatation: poor predictor of familial vesicoureteral reflux. Pediatr Nephrol 2003; 18:902-5

Coplen DE, Austin PF, Yan Y, et al. The magnitude of fetal renal pelvic dilatation can identify obstructive postnatal hydronephrosis, and direct postnatal evaluation and management. J Urol 2006;176:724-7

Phan V, Traubici J, Hershenfield B, et al. Vesicoureteral reflux in infants with isolated antenatal hydronephrosis. Pediatr Nephrol 2003;18:1224-8

Scott JE, Renwick M. Antenatal renal pelvic measurements: what do they mean? BJU Int 2001;87:376-80

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Evidence Level: V

Babies with VUR diagnosed as a result of antenatal scans have an increased risk of renal scarring?

A small study comparing 21 neonates with antenatally detected VUR and 30 with postnatally detected VUR (Ylinen, 2003) found new scarring only in the latter group, and associated with VUR grades 4 and 5. The authors concluded that the risk of acquired renal scarring was significantly higher if dilating VUR was not detected antenatally.

A retrospective review of 202 patients (Chen, 2003) compared 146 presenting with UTI with 56 who had been diagnosed antenatally and found no significant differences between the two, including risk of scarring.

However, VUR diagnosed antenatally tends to be of a higher grade, which may predispose towards increased risk of scarring when combined with infection in postnatal life (Gordon, 1990).

A study in 64 children (Taskinen, 2005) found that renal scars after a first episode of pyelonephritis were generally caused by the infection itself, rather than being associated with abnormalities of the urinary tract.

A retrospective follow-up study of 53 children with prenatally detected VUR (Penido, 2006) found a significant correlation between severe reflux and renal damage scars (RR=3.4, 95% CI 1.4-8.0, p=0.002).

Chen JJ, Pugach J, West D, et al. Infant vesicoureteral reflux: a comparison between patients presenting with a prenatal diagnosis and those presenting with a urinary tract infection. Urology 2003;61:442-6

Gordon AC, Thomas DF, Arthur RJ, et al. Prenatally diagnosed reflux: a follow up study. Br J Urol 1990;65:407-12

Penido SJ, Oliveira EA, Diniz JS, et al. Clinical course of prenatally detected primary vesicoureteral reflux. Pediatr Nephrol 2006;21:86-91

Taskinen S, Ronnholm K. Post-pyelonephritic renal scars are not associated with vesicoureteral reflux in children. J Urol 2005;173:1345-8

Ylinen E, Ala HM, Wikstrom S. Risk of renal scarring in vesicoureteral reflux detected either antenatally or during the neonatal period. Urology 2003;61:1238-42

Evidence Level: V

Children with unilateral multicystic kidney are at increased risk of reflux in the non-affected kidney?

In a series of 48 infants with unilateral multicystic kidney (Zerin, 1998), 9 patients (19%) had VUR into the contralateral kidney. Another series of 59 children (Karmazyn, 1997) found VUR to be the most common concurrent abnormality, detected in 15 patients (25%). Three of seven patients (42%) had VUR in a small retrospective Japanese study (Kaneko, 1995). In the largest retrospective study to date (Eckoldt, 2003), 11 of 110 (12.5%) patients were affected.

A retrospective cohort study in 75 children (Miller, 2004) found contralateral VUR in 19 cases (26.4%), 9 of which were low grade (I – II).

Eckoldt F, Woderich R, Wolke S, et al. Follow-up of unilateral multicystic kidney dysplasia after prenatal diagnosis. J Matern Fetal Neonatal Med 2003;14:177-86

Kaneko K, Suzuki Y, Fukuda Y, et al. Abnormal contralateral kidney in unilateral multicystic dysplastic kidney disease. Pediatr Radiol 1995;25:275-7

Karmazyn B, Zerin JM. Lower urinary tract abnormalities in children with multicystic dysplastic kidney. Radiology 1997;203:223-6

Miller DC, Rumohr JA, Dunn RL, et al. What is the fate of the refluxing contralateral kidney in children with multicystic dysplastic kidney? J Urol 2004;172:1630-4

Zerin JM, Leiser J. The impact of vesicoureteral reflux on contralateral renal length in infants with multicystic dysplastic kidney. Pediatr Radiol 1998;28:683-6

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Evidence Level: IV

What degree of postnatal renal dilatation in a kidney with pelvi-ureteric junction obstruction (PUJO) necessitates surgical correction?

In a retrospective study of 44 children with a prenatal diagnosis of PUJO (Chertin, 2002), 35 (77%) had severe dilatation of the renal pelvis by >3 cm. Despite this, pyeloplasty was delayed until the mean deterioration in renal function was 8.2%, and renal function returned to initial levels in 81% of patients 6-12 months after surgery. The authors concluded that expectant management was prudent and might spare some children unnecessary surgery.

Views on surgical correction range from the extremely enthusiastic (King, 1984) to the extremely cautious (Koff, 1992), with caution generally having the greater support: "A large number of patients with pelvic dilatation are free from other symptoms" (Josephson, 1997). Degree of dilatation does not seem to be a reliable indicator of obstruction and renal damage.

Chertin B, Rolle U, Farkas A, et al. Does delaying pyeloplasty affect renal function in children with a prenatal diagnosis of pelvi-ureteric junction obstruction? BJU Int 2002;90:72-5
http://onlinelibrary.wiley.com/doi/10.1046/j.1464-410X.2002.02829.x/full

Josephson S. Postnatal management of antenatally suspected pelviureteric junction obstruction: decision factors. In: O'Donnell B, Koff SA (eds). Pediatric urology. 3rd ed. Oxford, Butterworth-Heinemann, 1997. p392-5

King LR, Coughlin PW, Bloch EC, et al. The case for immediate pyeloplasty in the neonate with ureteropelvic junction obstruction. J Urol 1984;132:725-8

Koff SA, Campbell K. Nonoperative management of unilateral neonatal hydronephrosis. J Urol 1992;148:525-31

Evidence Level: IV

How safe are isotope scans in relation to radiation risk?

Any exposure to radiation carries some risk of somatic or genetic damage and there is no threshold or safe dose (Payne, 1975). Findings from both animal and human studies on risk at low doses are, however, inconclusive due to statistical limitations (Ron, 2003; Hall, 2000; Swartz, 1978).

Hall EJ. Radiation, the two-edged sword: cancer risks at high and low doses. Cancer J 2000;6:343-50

Payne JT, Loken MK. A survey of the benefits and risks in the practice of radiology. CRC Crit Rev Clin Radiol Nucl Med 1975;6:425-39

Ron E. Cancer risks from medical radiation. Health Phys 2003;85:47-59

Swartz HM, Reichling BA. The safety of x-ray examination or radioisotope scan. JAMA 1978;239:2031-2

Evidence Level: V

Should babies with two vessels in umbilical cord or external ear abnormalities have renal ultrasound scans to exclude renal abnormality also?

In the largest study of infants with isolated single umbilical artery (SUA) (Bourke, 1993), 8 of 112 (7.1%) infants with the condition were found on renal ultrasonography to have significant renal abnormalities, including 5 (4.5%) with VUR. The authors concluded that all infants with SUA should have a renal ultrasound scan.

A retrospective study in 52 infants with SUA (Doornebal, 2007) found abnormalities in 5 infants (10.4%) on renal ultrasound. A relative subpelvine stenosis was detected in one infant, and the remaining four had mild hydronephrosis without further consequences. The authors concluded that it was unnecessary to perform renal ultrasound in infants with SUA.

In a retrospective series of 42 patients with external ear abnormalities (Wang, 2001), renal ultrasound revealed anomalies in 12 (29%). The authors recommended that renal ultrasound should be performed in infants with isolated preauricular pits, cup ears, or any other ear anomaly accompanied by 1 or more of the following: other malformations or dysmorphic features, family history of deafness, auricular malformations or maternal history of gestational diabetes. Renal ultrasound was considered unnecessary in the absence of these conditions.

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A study in 96 infants with minor ear anomalies (85% of which were preauricular tags) found that, of 91 (95%) undergoing renal sonography, only one infant (1.1%, 95% CI 0.03 – 5.9) had transient unilateral pyelectasia. The authors concluded that routine renal imaging was not warranted in infants with minor ear abnormalities unless accompanied by other systemic malformations (Deshpande, 2006).

Bourke WG, Clarke TA, Mathews TG, et al. Isolated single umbilical artery: the case for routine renal screening. Arch Dis Child 1993;68:600-01
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1029313/pdf/archdisch00549-0072.pdf

Deshpande SA, Watson H. Renal ultrasonography not required in babies with isolated minor ear anomalies. Arch Dis Child Fetal Neonatal Ed 2006;91:F29-30
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2672645/

Doornebal N, de Vries TW, Bos AF. Screening infants with an isolated single umbilical artery for renal anomalies: Nonsense? Early Hum Dev 2007;83:567-70

Wang RY, Earl DL, Ruder RO, et al. Syndromic ear anomalies and renal ultrasounds. Pediatrics 2001;108:E32
http://pediatrics.aappublications.org/content/108/2/e32.long

Evidence Level: IV

Children with a horseshoe, duplex, or pelvic kidney are at increased risk of other renal abnormalities?

Of pregnancies in which a fetal renal anomaly has been detected, 19.6% fail to produce a surviving child, often because of co-existing abnormalities in the urinary tract or elsewhere (Scott, 2002). A study of 560 deaths among 2,857 infants with urinary tract abnormalities between 1984 and 2000 (Scott, 2002) revealed that a renal anomaly was the cause of death in 323 (57.7%) cases. 209 deaths were caused by anomalies in other systems but with a renal anomaly present, of which 36 (54.5%) had a horseshoe kidney.

In a study of 52 children with horseshoe kidney (Cascio, 2002), more than half (52%) also had VUR or ureteropelvic junction obstruction.

In a retrospective study comparing 19 foetuses with horseshoe kidney and 20 normal controls (Cho, 2005), 15 of the 19 with horseshoe kidney had no other abnormality. However, 4 (21%) had severe complex abnormalities which in 3 cases were associated with trisomy 18.

Many case reports attest to the increased risk of associated abnormalities in duplex (Cheng, 1997; Rossleigh, 1996; Bellah, 1995) and in pelvic kidneys (Hill, 1994; Takeuchi, 1994; Donahoe, 1980).

Bellah RD, Long FR, Canning DA. Ureterocele eversion with vesicoureteral reflux in duplex kidneys: findings at voiding cystourethrography. Am J Roentgenol 1995;165:409-13

Cascio S, Sweeney B, Granata C, et al. Vesicoureteral reflux and ureteropelvic junction obstruction in children with horseshoe kidney: treatment and outcome. J Urol 2002;167:2566-8

Cheng SW, Sheih CP, Liao YJ, et al. Ultrasonic demonstration of ectopic urethral ureter in duplex kidney: report of two cases. Acta Paediatr Sin 1997;38:149-51

Cho JY, Lee YH, Toi A, et al. Prenatal diagnosis of horseshoe kidney by measurement of the renal pelvic angle. Ultrasound Obstet Gynecol 2005;25:554-8

Donahoe PK, Hendren WH. Pelvic kidney in infants and children: experience with 16 cases. J Pediatr Surg 1980;15:486-95

Hill LM, Grzybek P, Mills A, et al. Antenatal diagnosis of fetal pelvic kidneys. Obstet Gynecol 1994;83:333-6
http://onlinelibrary.wiley.com/doi/10.1046/j.1469-0705.1995.05060391.x/epdf

Rossleigh MA. Neonatal diagnosis with Tc-99m dimercaptosuccinic acid of intra-uterine reflux nephropathy in duplex kidneys. Clin Nucl Med 1996;21:897

Scott JE. Fetal, perinatal, and infant death with congenital renal anomaly. Arch Dis Child 2002;87:114-7
http://adc.bmj.com/content/87/2/114.long

Takeuchi T, Hara H, Nakashima Y, et al. Pelvic kidney: three case reports – reconstructive surgery for associated urinary tract abnormalities. Nishinihon J Urol 1994;56:61-6

Evidence Level: IV

Is cephalexin the most appropriate antibiotic to be given prophylactically to infants with obstructed or refluxing kidneys?

A randomised trial in 236 patients (Garin, 2006) comparing antibiotic prophylaxis with a variety of third generation cephalosporins versus no treatment found no statistically significant differences between the two groups at one-year follow-up

A commentary on this study (Wald, 2006) points out that patients with VUR grades higher than III may produce different results, and that further research in these patients is necessary.

Garin EH, Olavarria F, Nieto VG, et al. Clinical significance of primary vesicoureteral reflux and urinary antibiotic prophylaxis after acute pyelonephritis: a multicentre, randomized, controlled study. Pediatrics 2006;117:626-32

Garin EH, Olavarria F, Garcia N et al. Clinical significance of primary vesicoureteral reflux and urinary antibiotic prophylaxis after acute pyelonephritis: a multicenter, randomized, controlled study. Pediatrics 2006;117:626-32.

Wald ER. Vesicoureteral reflux: the role of antibiotic prophylaxis. Pediatrics 2006;117:919-22

Evidence Level: II

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