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Pyelectasis

Related terms:

Cyst, Pelvis, Hydronephrosis, Choroid Plexus, Bladder, Echogenic Bowel, Aneuploidy, Trisomy 21, Trisomy 18

Kidney and Urinary Tract Disorders

Roland Devlieger, An Hindryckx, in Fetal Medicine (Third Edition), 2020

Mild Isolated Pyelectasis

Mild pyelectasis is a common and usually benign finding (see Fig. 33.6). In some cases, however, it may be secondary to vesicoureteral reflux (VUR) or obstruction. Prenatal ultrasound follow-up should be performed to ensure that the dilation does not increase with gestation. Postnatal ultrasound is advocated 6 weeks after birth unless symptomatology suggestive of urinary tract involvement occurs (e.g., fever).

The prevalence of mild pyelectasis is somewhat greater in fetuses with trisomy 21 than in euploid fetuses, and this finding has been used for screening. In the presence of midtrimester pyelectasis, other soft markers for fetal aneuploidy should be sought and the risk for aneuploidy, especially trisomy 21, calculated.[10] Male fetuses tend to have a larger renal pelvis. Therefore the likelihood ratio for aneuploidy associated with this finding is smaller in male than in female fetuses.

Ultrasound Markers for Aneuploidy in the Second Trimester

Malavika Prabhu MD, ... Joseph R. Biggio jr., MD, MS, in Perinatal Genetics, 2019

What Is the Significance of Urinary Tract Dilation?

UTD was previously described with variable terminology, including pyelectasis, pelviectasis, and hydronephrosis. In 2014, a consensus statement defined norms for antenatal UTD based on anterior-posterior renal pelvis diameter (APRPD), with less than 4 mm being normal between 16 and 27 weeks' gestation and less than 7 mm being normal between 28 weeks' gestation and delivery (Fig. 10.5).[73] To fully assess and classify UTD, additional ultrasound features to be evaluated include presence of calyceal dilation, parenchymal thickness and appearance, ureteral dilation, bladder abnormalities, and amniotic fluid volume. The complete evaluation of the urinary tract results in classification of A1 (low risk) versus A2-3 (increased risk) UTD, which guides antenatal management as well as postnatal follow-up (Table 10.1).

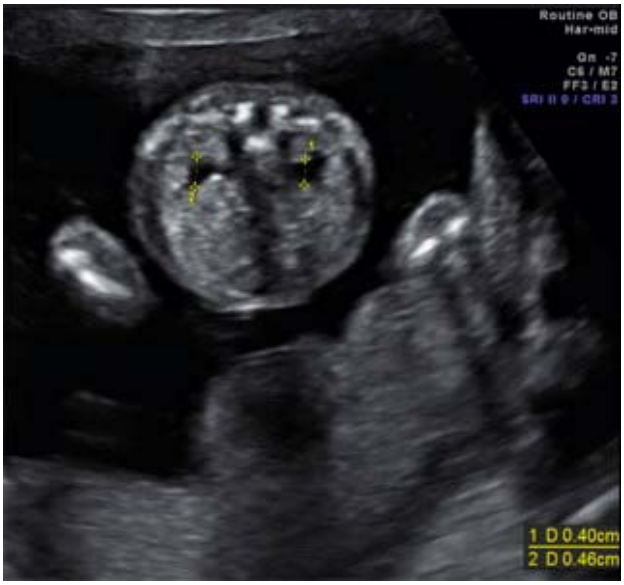


FIG. 10.5. Urinary tract dilation.

Courtesy of Bryann Bromley, MD.

TABLE 10.1. Urinary Tract Dilation (UTD): Antenatal Classification of Findings

Ultrasound Findings	**UTD A1**	**UTD A2-3**
AP RPD	16–27w: 4–<7 mm	16–27w: ≥7 mm
	≥28w: 7–<10 mm	≥28w: ≥10 mm
Calyceal dilation	None or central	None, central, or peripheral
Parenchymal thickness	Normal	Normal or abnormal
Parenchymal appearance	Normal	Normal or abnormal
Ureters	Normal	Normal or abnormal
Bladder	Normal	Normal or abnormal
Unexplained oligohydramnios	Absent	Absent or present
Prenatal follow-up	Third-trimester ultrasound	Ultrasounds every 4–6 weeks + consultation with pediatric nephrology/urology

AP RPD, anterior-posterior renal pelvis diameter.

Reproduced from: Nguyen HT, Benson CB, Bromley B, Campbell JB, Chow J, Coleman B, et al. Multidisciplinary consensus on the classification of prenatal and postnatal urinary tract dilation (UTD classification system). *J Pediatr Urol*. 2014;10(6):982–998.

UTD occurs in 1%–2% of pregnancies and is most commonly a transient finding that is a variant of normal.[73] UTD less than 7–8 mm in the second trimester resolves in approximately 80% of cases.[73] However, in a minority of cases, UTD has a pathologic cause. Common pathologic causes include vesicoureteral reflux (the most common etiology), ureteropelvic junction obstruction, ureterovesical junction obstruction, multicystic dysplastic kidneys, and posterior urethral valves. Although some conditions can be diagnosed antenatally, in most cases a diagnosis is made postnatally.[73] After initial diagnosis of UTD, subsequent antenatal evaluation depends on classification (see Table 10.1). At the time of delivery, prenatal diagnosis of UTD A1 or A2-3 should be communicated to the pediatrician; resolved UTD A1, however, requires no postnatal follow-up.[73]

The association between trisomy 21 and UTD has been well described in several series, and the finding of UTD confers a positive LR of 1.5.[25] Among patients already screened for aneuploidy, additional aneuploidy evaluation with a finding of UTD may not be necessary, as the increase in risk, if any, is very low.

Antenatal Assessment of Kidney Morphology and Function

Khalid Ismaili, ... Michelle Hall, in Comprehensive Pediatric Nephrology, 2008

Urinary Tract Dilatation

Fetal renal pelvis dilatation is a frequent abnormality that has been observed in 4.5% of pregnancies.[25] Pyelectasis and pelviectasis are defined as dilatation of the renal pelvis, whereas pelvicaliectasis and hydronephrosis include dilatation of calyces. In practice, these terms are interchanged and used as descriptions of a dilated renal collecting system regardless of etiology.[26]

The third-trimester threshold value for the anteroposterior (AP) renal pelvis diameter of 7 mm is certainly the best prenatal criterion for both the screening of urinary tract dilatation and the selection of patients needing postnatal investigation.[22,25] Yet a 4-mm threshold for AP pelvis diameter during the second trimester of pregnancy should be considered a warning sign, because this finding may reveal a significant urologic abnormality in 12% of cases.[25]

There are several theories that account for the visibility of the renal pelvis during pregnancy. The distension of the urinary collecting system may simply be a dynamic and physiologic process.[27] Persutte et al. found the size of the fetal renal collecting system to be highly variable over a 2-hour period.[28] The tendency of renal pelvis dilatation to resolve spontaneously is supported by normal postnatal renal appearances reported in 36% to 80% of cases followed up after birth.[29,30] However, prenatally detected renal pelvis dilatation may be an indicator of significant urinary tract pathologies.[31] The likelihood of having a clinically significant uropathy is directly proportional to the severity of hydronephrosis.[26] A summary of the literature describing the postnatal uronephropathies found in neonates who presented with fetal renal pelvis dilatation is given in Table 4-2. The incidence and type of pathology vary considerably between studies, reflecting the differences in prenatal criteria and the variability in postnatal assessment. The two main pathologies found are pelviureteric junction stenosis and VUR. US is the first examination to perform after birth.[35] In babies with fetal renal pelvis dilatation, the presence of persistent renal pelvis dilatation or other ultrasonographic abnormalities (such as calyceal or ureteral dilatation, pelvic or ureteral wall thickening, or absence of the corticomedullary differentiation) and signs of renal

dysplasia (such as small kidney, thinned or hyperechoic cortex, or cortical cysts) should determine the need for further investigation. [36,37] In cases where the urinary tract appears normal on neonatal ultrasound examinations, no further evaluation is needed.[29] Based on our experience,[29,36,38] we propose an algorithm for a rational postnatal imaging strategy (Figure 4-2). Using this algorithm, we found that very few abnormal cases escaped the workup and that the risk of complications was very low.

TABLE 4-2. Incidence of Uronephropathies in Neonates with Antenatally Diagnosed Renal Pelvis Dilatation

Authors (ref. no.)	Year	Threshold Value of Renal Pelvis (mm)	Total	Abnormal (%)	UPJS (%)	VUR (%)	Megaureter (%)	Mild Dilatation (%)
Dudley et al. (32)	1997	5	100	64	3	12	3	43
Stocks et al. (33)	1996	4–7	27	70	22	22		26
Jaswon et al. (34)	1999	5	104	45	4	22		8
Ismaili et al. (29)	2004	4–7	213	39	13	11	7	18*

UPJS, Uretero-pelvic junction stenosis; *VUR*, vesicoureteral reflux.

* In this study mild and transient dilatations were considered as nonsignificant findings.

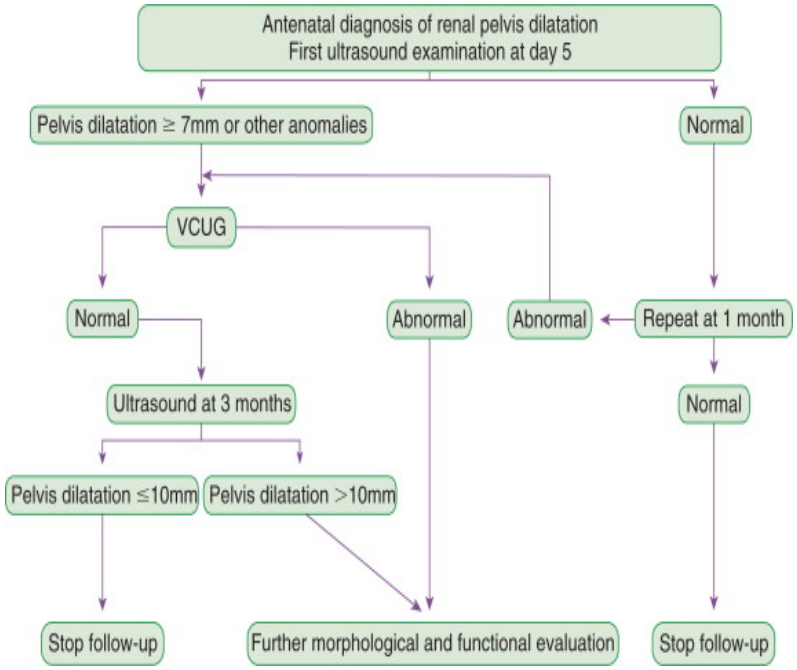


Figure 4-2. Algorithm of a rational postnatal imaging strategy in infants with mild to moderate fetal renal pelvis dilatation.

Trisomy 21

Stephanie L. Gaw, Lawrence D. Platt, in Obstetric Imaging: Fetal Diagnosis and Care (Second Edition), 2018

Differential Diagnosis From Imaging Findings

There are many markers of Down syndrome that share commonality with other diagnoses, including normal variants. Pyelectasis may be due to structural defects of the genitourinary system or be a normal part of the renal filling cycle. Ventriculomegaly may be due to other structural abnormalities, such as aqueductal stenosis or absence of the corpus callosum, or it may be acquired after perinatal infections. Echogenic bowel may be caused by fetal cystic fibrosis, viral infections, or swallowing of blood. Heart defects are common in all aneuploidies and are common isolated defects as well.

Pregnancy After Kidney Transplantation

Marialuisa Framarino-dei-Malatesta, in Kidney Transplantation, Bioengineering and Regeneration, 2017

47.3.1.3 Infections

Infections, such as those involving the urinary tract, are frequent comorbidities during pregnancy in KT recipients[53] owing to the immunosuppression and pyelectasis associated with pregnancy. In their single-center study, Thompson et al. report that one or more episodes of urinary sepsis developed in 26% of their patients.[54] Two other studies report the same urinary tract infection rate ranging from 22.2% to 25%.[55,56] Other reports describe infection rates reaching 42%.[57] Pregnant patients should have urine analyzed and cultured at each prenatal visit (at least monthly), and those with asymptomatic bacteriuria should receive antibiotic

treatment to avoid the high-risk of pyelonephritis.

Owing to the increased risk for other systemic infections related to the use of immunosuppressive medications, a potential risk arises from maternal–fetal transmission of infections. During early pregnancy, cytomegalovirus has a teratogenic potential through a transplacental route and may cause malformations such as migrational disturbances in the fetal brain. The infection can be transmitted during delivery or breast-feeding.[58] Other infections that may pose additional risks in the immunosuppressed mother include toxoplasmosis, primary herpes simplex infection, primary varicella infection, HIV infection, and infection with either hepatitis B or C virus. Immunosuppressed patients should be screened for each of these infections before a planned pregnancy or as soon as an unplanned pregnancy is diagnosed so that they can receive appropriate counseling and undergo risk stratification.[59]

Complications of Pregnancy

Richard Beukema MD, ... Barbara F. Kelly MD, in Family Medicine Obstetrics (Third Edition), 2008

F. Genetic Ultrasound

Fetal aneuploidy is associated with major structural defects and various ultrasonographic markers. Trisomy 21 markers include increased nuchal fold, short femur, short humerus, pyelectasis, and hyperechoic bowel. These markers may be transient during gestation and may not indicate an underlying structural abnormality.[31] Some of these findings are highly associated with an abnormal fetal karyotype, and the more markers a fetus has the more likely it is to be abnormal.[4,31] The finding of a major organ or structural abnormality or the finding of two or more minor anatomic abnormalities indicates a high risk for fetal aneuploidy. These women should be offered invasive diagnostic testing and genetic counseling.[3] A genetic sonogram performed specifically for these ultrasonographic markers improves the odds of detecting the truly abnormal fetus to about 50% and may provide the information needed to clarify the individual risk and allow for only the very high-risk fetuses to undergo invasive diagnostic testing such as amniocentesis.[31]

Renal Pelvis Dilatation

Jennifer S. Hernandez, Jodi S. Dashe, in Obstetric Imaging: Fetal Diagnosis and Care (Second Edition), 2018

Definition

Fetal renal pelvis dilatation is also called *urinary tract dilation* or *hydronephrosis*, though these terms are less precise. It encompasses dilatation confined to the renal pelvis, termed *pyelectasis* or *pelviectasis,* and that which also involves the calyces, termed *caliectasis* or *pelvicaliectasis.* The pelvis is measured anterior to posterior in the transverse plane. Of the various thresholds used to diagnose dilatation, the most common are 4 mm in the second trimester (up to 20 weeks), and 7 mm at approximately 32 weeks in the third trimester.[4,7,8] The second-trimester threshold is used to identify fetuses that need additional US evaluation in the third trimester, and it is also considered a minor marker that confers slightly increased risk for trisomy 21 (see Chapter 152). The third-trimester threshold is used to identify cases that need postnatal evaluation. Criteria have been established

for mild, moderate, and severe renal pelvis dilatation, based on the risk of neonatal renal abnormality in a metaanalysis of more than 100,000 screened pregnancies.[5] These definitions have been endorsed by the Society for Fetal Urology and are listed in Table 12.1.[4,5]

Routine Fetal Anomaly Scan

Meekai To, Susana Pereira, in Twining's Textbook of Fetal Abnormalities (Third Edition), 2015

Soft Markers/Normal Variants

The term 'soft markers' encompasses a large number of sonographic findings, which include:

- Intracardiac echogenic focus.
- Ventriculomegaly.
- Increased nuchal fold.
- Echogenic bowel.
- Pyelectasis.
- Short femur.
- Short humerus.
- Nasal bone hypoplasia.
- Aberrant right subclavian artery (ARSA).

Several studies have reported that fetuses with trisomy 21 have a higher incidence of these 'markers' at the second-trimester scan than euploid fetuses, and as such, the presence of one or more markers can be used to recalculate the risk of Down syndrome in the second trimester. A recent meta-analysis of studies published since 1995, examined the screening performance of second-trimester sonographic markers for the detection of trisomy 21 and calculated pooled estimates for likelihood ratios for trisomy 21 for individual markers. The authors concluded that the markers with a greatest effect on the risk of trisomy 21 were ventriculomegaly, nuchal fold thickness and an aberrant right subclavian artery (ARSA), which each increase the pre-test risk 3 to 4-fold, if isolated, and absent or hypoplastic nasal bone which increases the risk 6.6-fold.[40] The authors suggest that the detection of any one of the markers during the routine scan should stimulate the sonographer to look for other markers or defects but also, that in the absence of all major defects and markers there is a 7.7-fold reduction in risk of trisomy 21.

However, the interpretation of this meta-analysis suffers from significant heterogeneity between the published studies in many factors including the study design (retrospective or prospective), population screened (high or low risk), gestation at assessment and definitions used for the presence of a marker. Furthermore, with improving detection rates for routine first-trimester risk screening for trisomy 21, most cases will already have been identified prior to the second-trimester scan, and hence the implications of finding a 'marker' at this stage must be reconsidered.

FASP have recommended that an established Down syndrome screening result (based on a nationally approved screening test) should not be recalculated at the second-trimester scan. The NHS FASP guidelines encourage the use of the term 'normal variants' rather than 'Down soft markers' and recommend that in women given a 'low-risk' result, neither choroid plexus cysts, dilated cisterna magna,

echogenic foci in the heart or two-vessel cord should be routinely reported and no further assessment of the risk of trisomy 21 should be made. However, for the following findings it is agreed that further assessment is required: nuchal fold greater than 6mm, ventriculomegaly (atrium greater than 10 mm), echogenic bowel (with density equivalent to bone), renal pelvic dilatation (AP measurement greater than 7 mm) or small measurements compared to dating scan (significantly less than 5th centile on national charts).

It is also important to consider the impact of inclusion of soft markers on the specificity of routine ultrasound scanning. By including soft markers Boyd et al reported a 4% increase in detection of malformations (from 51% to 55%) but a 12-fold increase in false-positive rate (from 0.04% to 0.53%).[41]

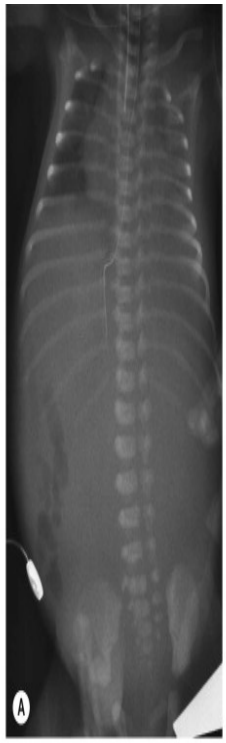
The paediatric renal tract and adrenal gland

Gurdeep S. Mann, in Clinical Ultrasound (Third Edition), 2011

Ureteropelvic junction obstruction

Ureteropelvic junction obstruction (UPJO), also referred to as PUJ obstruction, represents the most common cause of hydronephrosis in the neonate and is also a common cause of renal pelvic dilatation in children. The aetiology is thought to relate to an intrinsic developmental abnormality resulting in a short segment of aperistaltic smooth muscle at the UPJ. Secondary causes include extrinsic compression from a fibrous band, adhesion, crossing vessel or ureteric kink.

The sonographic hallmarks of UPJO are the presence of 'pyelectasis' with renal pelvic dilatation greater than 10 mm in the AP plane and 'calliectasis' – calyceal distension. The degree of pyelocaliectasis is typically proportionate to the degree of renal parenchymal thinning (Fig. 71.34).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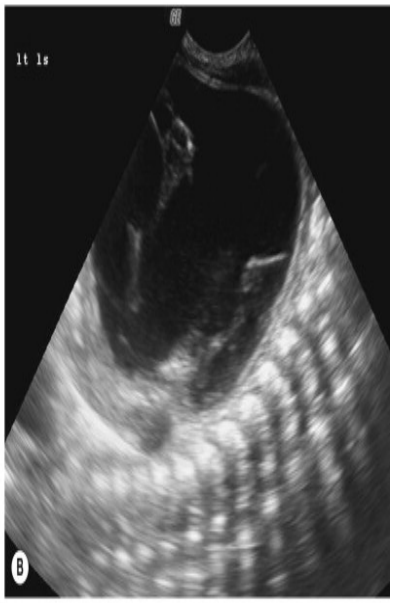
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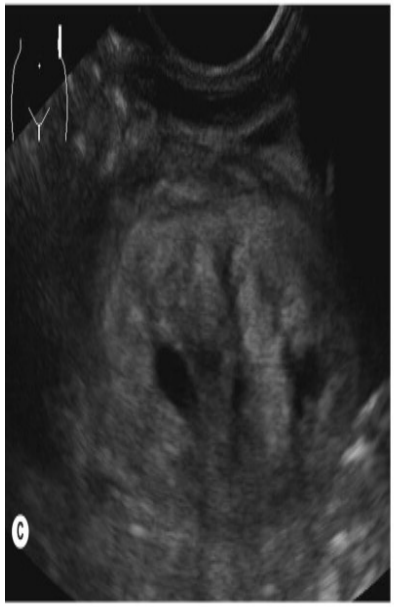
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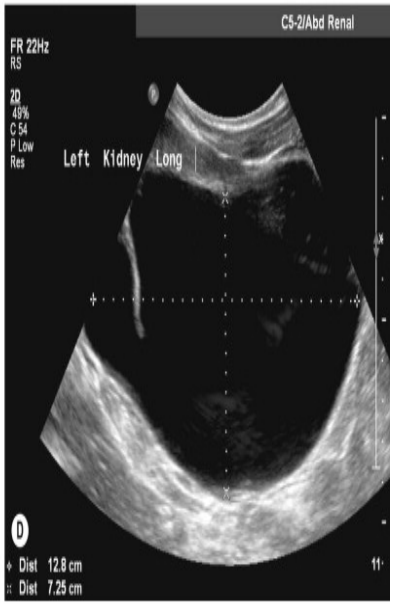
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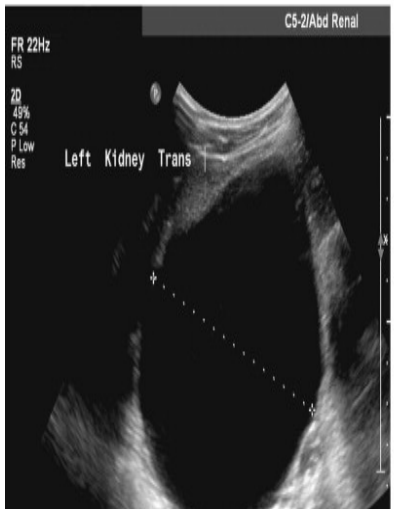
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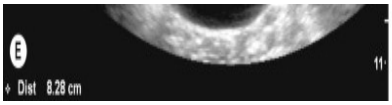

Figure 71.34. **Ureteropelvic junction obstruction (UPJO):** two cases. (Case 1) Newborn male child presenting with a large abdominal mass **A:** Abdominal radiograph showing abnormal displacement of the stomach and bowel to the right side of the abdomen. **B:** Portable ultrasound confirming the mass to be a large cystic lesion containing internal septations occupying most of the left side of the abdomen and pelvis but separate to urinary bladder. The right kidney was normal. A percutaneous drainage catheter was placed into the cyst draining urine. **C:** Appearances of the left kidney 1 week following decompression showing an echogenic dysplastic kidney. (Case 2) **D, E:** Longitudinal **(D)** and transverse **(E)** sonograms of a 1-year-old child with a severely hydronephrotic kidney with marked thinning of the renal parenchyma but no ureteric dilatation due to a UPJO. A MAG-3 isotope renogram confirmed poor drainage. A pyeloplasty procedure was subsequently performed.

Renal complications of UPJO range from minimal cortical thinning to more severe dysplasia with echogenic parenchyma, dysplastic cortical cysts and urinoma formation.

The presence of pyelectasis alone with no calyceal distension or parenchymal thinning should alert the sonographer to the diagnosis of a prominent extrarenal pelvis which in itself is not clinically significant (Fig. 71.13A).

Most cases of UPJO are diagnosed on routine antenatal sonography and require serial follow-up including postnatal ultrasound assessment. Around 10% of cases are bilateral. Occasionally UPJO may be massive, resulting in a large cystic mass lesion occupying most of the ipsilateral abdomen and pelvis with an imperceptible shell of renal parenchyma (Fig. 71.34) and making the organ of origin difficult to assign. Cyst decompression with a percutaneous nephrostomy and urinalysis may be indicated. Rarely the ipsilateral ureter may reflux and here the diagnostic dilemma is to determine whether there is both ureteric reflux and obstruction. As in other cases of ureteric dilation a VCUG and MAG-3 renogram are helpful in determining the level of obstruction and presence of VUR.

Ultrasound and Biochemical Screening for Fetal Aneuploidy

Howard Cuckle, Ran Neiger, in Fetal Medicine (Third Edition), 2020

Second Trimester Anatomy Scan

The sonographic assessment of fetal anatomy, traditionally performed in the late second trimester, is sometimes referred to as the 'genetic' sonogram because it is used not only to evaluate the fetus for structural malformations but also to search for sonographic markers of genetic disorders. The finding of a major fetal anomaly is considered a risk factor for aneuploidy. In addition, various soft sonographic markers that may be detected during the sonographic study have been identified; the presence of one or more such markers suggests an increased risk for aneuploidy. These markers include increased NF, short femur and humerus lengths, renal pyelectasis, an echogenic intraventricular cardiac focus, echogenic bowel and an aberrant right subclavian artery (ARSA).

A recent meta-analysis summarised the accumulated data on the screening performance of second-trimester sonographic markers for DS.[74] Forty-eight studies were included in the analysis. Two LRs were estimated for each marker–one to be used when the marker is present and another when absent. They were 5.8 and 0.80 for intracardiac echogenic focus, 28 and 0.94 for ventriculomegaly, 23 and 0.80 for increased NF, 11 and 0.90 for hyperechogenic bowel, 7.6 and 0.92 for pyelectasis, 3.7 and 0.80 for short FL, 4.8 and 0.74 for short HL, 21 and 0.71 for ARSA and 23 and 0.46 for absent or hypoplastic NB. The combined negative LR, obtained by multiplying the values of individual markers, was 0.13 when FL but not HL was included and 0.12 using HL but not FL. For most *isolated* markers, there was only a small effect on DS risk, but with isolated ventriculomegaly, NF and ARSA there was a three- to fourfold increase in risk and with hypoplastic NB six- to sevenfold.

Women who do not present until the late second trimester could be screened using the anomaly scan. The best estimate of DR is from the FaSTER study group that used modelling to predict a DR of 59% for an FPR of 3%.[75] FaSTER also assessed the possibility of improving the quad test by routinely using anomaly scan markers. The model predicted DR was 80% for an FPR of 3%.