Isolated single umbilical artery – the case for routine renal screening

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Abstract

To determine the incidence of silent renal anomalies in infants with isolated single umbilical artery (SUA), all infants with SUA and without other obvious congenital anomalies, identified over a six year period, were screened using renal ultrasonography. Over 35 000 placentas were examined. An isolated single umbilical artery was identified in 112 (0.32%). Nineteen infants had abnormal renal imaging. Eight of 112 (7.1%) had significant persisting abnormalities. Vesicoureteric reflux was found in five infants (4.5%). It is recommended that renal ultrasonography be performed for all infants with isolated SUA.

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Although the association of single umbilical artery (SUA) with other congenital abnormalities was alluded to as early as 1870¹ it was not systematically studied until 1955.² There are many reports of renal anomalies in association with SUA.³⁻⁶ However, the association of silent renal anomalies with single umbilical artery, as an isolated finding, has been controversial. Feingold *et al* reported an incidence of 33% for renal anomalies in infants with SUA but without symptoms or renal findings.⁴ This high incidence was not confirmed in a number of subsequent studies.⁷⁻⁹ More recently Leung and Robson, in the largest series of SUA to date, found five of 27 (18.5%) asymptomatic infants with SUA had renal anomalies on screening with ultrasonography or intravenous pyelography.¹⁰

This study was undertaken to determine the incidence of renal anomalies in a large number of infants with isolated SUA. Renal ultrasonography was used as a screening tool in these infants.

Patients and methods

The presence of a single umbilical artery was determined in placentas from all liveborn infants in the Rotunda Hospital by careful examination of the severed end of the cord.

Between April 1986 and March 1992 all cases of isolated SUA had renal ultrasonography performed within the neonatal period. They were reviewed at the 6 week baby check visit when a clean catch midstream urine culture was obtained. Infants with SUA and obvious coexistent congenital abnormalities were not included in the study.

In infants with abnormal renal ultrasonography, subsequent appropriate investigations were carried out. Monthly urine cultures

were undertaken in all infants with abnormal renal imaging.

Results

Over 35 000 placentas were examined. SUA was present in 112 (0.32%). Nineteen infants had abnormalities on renal ultrasonography. Eight infants with SUA (7.1%) had persistent significant abnormalities. The remaining 11 were normal on follow up renal imaging.

Of those with persistent renal abnormalities (table 1) vesicoureteric reflux was a common finding, being present in five patients with SUA (4.5%), and was bilateral in four of these. Three patients have so far had confirmed urinary tract infections. Two patients had morphological abnormalities unassociated with infection or vesicoureteric reflux; one had an isolated right megaureter and another had both kidneys on the left with one in the normal position and the other in the pelvis. The remaining patient had significant dilatation of the left collecting system but micturating cystourethrography was normal and the urine was sterile. The results of follow up renal investigations on this patient are awaited.

The remaining 11 infants were subsequently shown not to have significant renal anomalies (see table 2).

Discussion

This is the largest study of renal anomalies in infants with isolated SUA. In the series ultrasonography was used as an initial screening procedure for all infants with SUA.

The overall incidence of SUA in previous studies has varied from 0.2% to 1% which correlates well with our findings. The incidence of silent renal abnormalities in our study is less than that reported in studies by Feingold *et al*⁴ and Leung and Robson.¹⁰ Leung and Robson found five of 27 (18.5%) asymptomatic infants had underlying renal anomalies on screening with ultrasonography or intravenous pyelography. However, in their study only a small proportion of all infants with isolated SUA were screened. Although it is not indicated how infants were selected for screening, the authors note that the proportion of infants with anomalies was less when those in high risk groups were excluded. In our study, all infants identified with SUA had renal screening. The lower incidence of anomalies in our study might be accounted for by a lack of selection bias.

Nevertheless the incidence of renal anomalies in this study is significant. Our findings represent a fivefold increase in overall renal anomalies, and six to sevenfold increase in

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Table 1 Patients with significant renal pathology

Case No	Sex	Findings on ultrasonography	Finding on micturating cystourethrography	Follow up
1	M	Mild to moderate dilatation of left collecting system	Normal	UTI at 3 months. Grade II–III reflux into right ureter and collecting system at 4 months
2	F	Moderate to severe dilatation of right ureter with visual reflex on ultrasonography	Grade II to III bilateral reflux, right > left	UTI at five months. Reflux less marked on repeat micturating cystourethrography
3	M	Bilateral mild dilatation of collecting system	Bilateral reflux: Grade III on right, grade II on left.	Right 'Sting' procedure. Continues to reflux
4	M	Moderate bilateral hydronephrosis	Bilateral grade IV reflux	No renal scarring on DMSA scan at 4 months
5	F	Dilatation of right collecting system during voiding	Bilateral grade II reflux with duplex collecting system and ectopic ureter on right	UTI at one month
6	M	Dilated collecting system and ureter to bladder	Normal	Isolated right megaureter on ultrasonography and intravenous pyelogram
7	F	No kidney on right side. Normal left kidney and left pelvic kidney		Awaited
8	F	Significant dilatation of left collecting system	Normal	Awaited

DMSA=dimercaptosuccinic acid, UTI=urinary tract infection. 'Sting'=endoscopic correction of vesicoureteric reflux.

Table 2 Patients with minor ultrasonographic abnormalities and found to be normal on subsequent follow up

Case No	Sex	Findings on ultrasonography	Finding on micturating cystourethrography	Follow up
9	M	Minimal dilatation of left collecting system	Normal	Normal ultrasonography at 6 months
10	F	Minimal dilatation of left collecting system	Normal	
11	M	Mild dilatation on left	Normal	
12	M	Mild dilatation on left	Normal	Extrarenal pelvis normal
13	M	Dilatation of right collecting system	Normal	Normal repeat ultrasonography
14	M	Dilatation of left collecting system	Normal	UTI at 1 week old
15	M	Mild dilatation on right	Grade I reflux on right	UTI at 6 weeks
				Normal ultrasonography and micturating cystourethrography at 1 year old
16	F	Right extrarenal pelvis	Normal	Normal repeat renal ultrasonography
17	M	Left extrarenal pelvis		
18	F	Slight dilatation of left upper pole collecting system		
19	M	Mild dilatation of left collecting system and ureter	Normal	

UTI=urinary tract infection.

vesicoureteric reflux, for infants with SUA over that found in population screening studies by Steinhart *et al*¹¹ and Scott *et al*¹²

The spectrum of silent renal anomalies reported in the study by Feingold *et al* included one documented case of vesicoureteric reflux and it may have accounted for the intravenous pyelography appearances in one of the other seven cases. Otherwise vesicoureteric reflux has not been previously recognised in association with SUA.

Vesicoureteric reflux and urinary infection are important contributors to the development of reflux nephropathy, a major cause of hypertension and chronic renal failure in later life. The early detection and treatment of urinary infection in our patients should help prevent some of the damage which leads to reflux nephropathy.¹³

In young infants, mild dilatation of the collecting system may be within normal limits and the high incidence of minor ultrasound abnormalities, unconfirmed on subsequent renal imaging, reflects the spectrum of normality in this age group. In cases of SUA, where there exists a high index of suspicion for the presence of silent renal pathology, these minor abnormalities require further follow up. This should not detract from the cost effectiveness

of renal screening in this group of infants.

In conclusion we have confirmed the association of silent renal anomalies with isolated SUA, in particular vesicoureteric reflux. We recommend all infants with SUA have routine renal screening with ultrasonography.

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