Radiological findings in newborn infants with urinary infection

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Radiological findings in newborn infants with urinary infections. Selective suprapubic urine aspiration was performed in 905 of 12 942 consecutive live-born infants and showed the presence of infection in 64 (0.5%). A majority (84%) of the infected infants were males. Radiological abnormalities were detected in 35 (55%). Because of this high incidence of abnormalities, which when diagnosed might alter management, it is suggested that radiological investigations be performed in newborn infants with proven urinary infection.

The epidemiology of urinary tract infection in schoolchildren is known (Kunin, 1971). However, the spectrum of presenting symptoms and the incidence of renal tract abnormalities during the newborn period has not been known with certainty, due mainly to diagnostic difficulties. Mercy Maternity Hospital is a new obstetric hospital opened in March 1971, and in this hospital all infants are under the care of only two paediatricians. Though this system is not unique, it afforded the opportunity for the proper documentation of information to determine the incidence of renal tract abnormalities in newborn infants with urinary infection.

Subjects and methods

From the opening of the Mercy Maternity hospital until December 1974, particular attention was given to the diagnosis of urinary infection in newborn infants. Suprapubic bladder puncture (Pryles *et al.*, 1959) was performed in all infants presenting with jaundice of unknown aetiology, failure to gain weight, excessive weight loss, diarrhoea, vomiting, or a clinical picture of sepsis. A diagnosis of infection was accepted if there was any bacterial growth from the urine obtained by this method, and all such infants received a course of parenterally administered antibiotics. After 7 days of treatment they were subjected to intravenous pyelography and micturating cystourethrography. At the time of performing the cystourethrogram, urine was collected via the catheter and cultured; in only 2 infants was there still a significant growth of organisms.

Results

Selective suprapubic urine aspiration was performed in 905 infants; 64 were found to have urinary infection, representing 0.5% of all live-births over the 47 months of the study (total live-births 12 942). 54 (84%) were males and 10 (16%) were females. 14 (22%) were born before 37 weeks of gestation and 50 (78%) were term infants. Mean day of age at presentation was day 10 for term infants and day 18 for preterm infants. Mean length of stay of infants in our hospital is 10.6 days; 33% remain 10 or more days. The main clinical presenting features are shown in Table I. 16 (25%) exhibited 2 or more of the listed symptoms. No infant in the series died.

TABLE I
Main clinical feature at presentation

Clinical feature	No. of infants
Jaundice	16
Fever	11
Failure to thrive	9
Vomiting	8
Diarrhoea	3
Pallor and lethargy	3
Collapse	2
Cyanosis	2
Tachypnoea	2
Irritability	1
Poor feeding	1
Offensive urine	1
Multiple subcutaneous abscesses	1
Polyuria	1
Not recorded	3

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Thirty (56%) of the 54 male infants and 5 of the 10 female infants were found to have a radiological abnormality (Table II). In 27 infants vesicoureteric reflux was the only abnormality present. The vesicoureteric reflux was bilateral in 14 and unilateral in 13 infants. 6 infants were found with hydronephrosis; 3 with obstruction and 3 with megasystems associated with gross reflux. The site of the obstruction was pelviureteric in 2 infants and due to an aberrant vessel crossing the junction. In the third infant with obstruction the site of same was lower ureteric. At operation a tilt-valve obstruction (Type 3b—Cussen, 1971–72) with a

TABLE II
Radiological findings in the 64 infants

Findings	No. of infants
Normal	29
Duplex system	2
Hydronephrosis	6
With obstruction	3
With vesicoureteric reflux	3
Vesicoureteric reflux alone	27
Grade IV	9 (15)
III	14 (21)
II	2 (3)
I	2 (2)
Bilateral	14
Unilateral	13
Left	5
Right	8

Note: Numbers in parentheses represent the number of ureters affected.

Grade IV, filling the ureter and dilated pelvicalyceal system; Grade III, filling the ureter and nondilated pelvicalyceal system; Grade II, filling ureter but not pelvicalyceal system; Grade I, minimal and transitory into lower end of ureter.

normal stem of juxtavesical ureter was discovered. In the 3 infants in whom hydronephrosis was associated with megasystems and reflux, the diagnosis was initially suspected on the pyelogram and subsequently proven on the cystourethrogram. The megasystems were each unilateral.

Discussion

The studies of Kunin (1971) resulted in a clear picture of the incidence and epidemiology of urinary infection in schoolchildren. No such clear picture exists for newborn infants. Shannon (1972) showed that a proven urinary infection was present in 1.5% of infants aged less than 12 months who were admitted over an 8-year period to a children's hospital. McCarthy and Pryles (1963) investigated 200 infants in the first 4 days of life and found definite evidence of infection in

1%. However, Newman, O'Neill, and Parker (1967) found no definite evidence of infection in 162 randomly selected, thriving neonates. Abbott (1972) surveyed 1460 normal neonates and found evidence of bacteriuria in 1%. In the present series of 12 942 consecutive live-born infants, symptomatic urinary infection was diagnosed in 0.5%. Upon reviewing the main clinical features that precipitated the collection of urine in the 64 patients, it was obvious that these were variable; however, jaundice, fever, failure to thrive, and vomiting were the main clinical presenting features in 54 (84%) infants. Males predominated, but in only 3 instances had a circumcision been performed within 24 hours of presentation.

The incidence of radiological abnormalities was similar in both sexes and overall was 55%, the most common being vesicoureteric reflux. Although uncertainty exists as to the aetiology and significance of vesicoureteric reflux the association of its presence with renal scarring and failure of renal growth has been documented (Hodson and Edwards, 1960; Rolleston, Shannon, and Utley, 1970). Severe degrees of reflux may require early surgical correction. Hence, it is important to perform radiological investigations on infants with urinary infection acquired in the neonatal period as knowing that vesicoureteric reflux is present permits a more logical approach to management. Hydronephrosis was found in 6 infants; obstruction requiring surgical intervention to prevent permanent renal damage occurred in 3; and megasystems associated with gross reflux in 3. It must be stated that hydronephrosis was not clinically suspected in any of the 6 infants. The incidence of radiological abnormalities diagnosed in the present study is similar to that reported by Smellie *et al.* (1964) in 188 children with urinary infection who were up to 12 years of age and that reported by Shannon (1972) in infants under 12 months of age. Because of the high incidence of abnormalities detected, which when diagnosed might alter management, it is recommended that radiological investigations be performed in all newborn infants with urinary infection.

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