Editorial

URINARY TRACT INFECTION

Although third common infection in pediatric age group, urinary tract infection (UTI) has gained importance because of the sinister long term effects which may culminate in hypertension, end stage renal disease (ESRD) or toxemia of pregnancy in adult life(l). Awareness that the beginning of relentlessly progressive renal damage due to UTI occurs in infancy and early childhood, and early detection and prompt treatment can prevent renal scars, is essential. More than 50% children with UTI have underlying structural or functional defects with or without obstruction, which should be diagnosed by imaging techniques so that early medical and surgical treatment can be instituted. The first attack of UTI in infancy and early childhood (below 5 years) is usually not a single attack but beginning of a continuum process with risk of recurrences in both boys and girls. Long term surveillance by periodic urine cultures and use of appropriate drug to eliminate the infections are vital therapeutic decisions that the caring pediatrician has to make to steer these children safely towards healthy adolescence and puberty.

UTI has its own share of controversies and well established standard methods of diagnosis and management. This editorial addresses these issues pertaining to the diagnosis and management of UTI in child-hood.

Diagnosis

The clinical signs and symptoms of UTI are nonspecific and vague in the first 3 years of life. In neonates, symptomatology suggestive of septicemia necessitates urine culture as an important investigation for diagnosis of UTI. In infants, fever is the most definite clue especially without any focus of infection. Urine culture is mandatory in every febrile child with acute illness. Urinary complaints are rare and only after 5 years of age the typical triad of abdominal pain, vomiting and fever with chills or suprapubic pain are common presentations of upper and lower UTI. Hence a high index of suspicion should be maintained by practicing pediatricians during the first 5 years and urine culture ordered whenever required.

Urine culture, colony count and antibiotic sensitivity report is the "gold standard" for diagnosis of UTI which helps in rational choice of antibiotic for treatment. Proper collection of freshly voided clean catch mid-stream urine sample in sterile container and storing it at 4°C for 24 hours, if facilities for inoculation on culture medium are not available immediately, are important steps for accurate diagnosis of UTI. Bacterial count of 10^5 or more/ml of urine is defined as significant bacteriuria, which is prerequisite for diagnosis of UTI in an associated clinical setting(2). The controversial issue pertains to diagnosis of UTI with lower counts, *i.e.,* 10^2-10^4/ml of urine in presence of clinical setting and pyuria(3,4). High fluid intake, antibiotic use, acidic urine and cystitis are causes of low colony count in the presence of UTI. It is well established that mixed growth of more than one organism or sterile pyuria (>10-12 leucocytes/HPF) should not be treated as UTI and repeat cultures may be done to rule out UTI. Presence of 1-2 organisms of uropathogenic strain of Gram negative bacterium in urine obtained by suprapubic

aspiration is sufficient evidence of UTT. Bladder aspiration is safe, easy and reliable in neonates or incontinent or acutely ill children. Urine collected in bags is likely to be contaminated, but a negative culture rules out UTI. Chemical tests for diagnosis of UTI are unreliable.

Level diagnosis of UTI: Differentiation of acute pyelonephritis from cystitis should be quick so that prompt treatment can be started to prevent renal damage. Presence of fever, raised CRP and ESR are simple and reliable indicators of acute upper UTI or pyelonephritis. Other direct and indirect methods of level diagnosis are unreliable and routinely not available(2).

Imaging and urologic evaluation is mandatory in all infants and children with the first attack of symptomatic UTI, because it may be the initial indication of an underlying congenital or acquired obstructive or non obstructive abnormality of urinary tract. Some of the obstructive lesions require surgery at the earliest possible age (posterior urethral valves or severe ureteropelvic or vesicoureteral obstructions) to minimize the permanent damage consequent to obstruction. Permanent renal scars due to loss of cortical tissue develop during first 5 years due to combination of UTI, VUR (primary or secondary to structural or functional obstruction) and intrarenal reflux associated with compound or concave renal papillae which are present in many individuals from birth. If untreated, many of these children may eventually develop hypertension or ESRD.

Can we prevent these sinister consequences? The answer is *yes.* Though optimal regimen for investigating children with UTI remains uncertain and recent publications report inadequacy of USG alone in the diagnosis of VUR, inflammation, renal scars and assessment of renal function(5-10), the following guidelines can be employed according to age: *(i)* Infants and children below 5 years with first UTI should be subjected to ultrasonography (USG) to detect hydronephrosis, hydroureter, bladder wall abnormalities, residual urine, atrophic kidneys, *etc.* and urologist's opinion sought, if required. Voiding cystourethrogram (VCU) using radiocontrast is mandatory after treating UTI to diagnose and grade VUR, ureteroceles, diverticuli, and posterior urethral valves; *(ii)* Children above 5 years require USG and if it reveals dilatation of pelvicalyceal system or ureters, intravenous pyelography (IVP) is useful to delineate accurately details of uretro-pelvic junction (UPJ) duplex system, vesicouretral junction (VUJ) ectopic ureters, obstruction, megaureters, *etc.* IVP has been replaced by USG as the first modality of imaging in young children because of risk of acute renal failure due to hyper-osmolar load, allergic reactions, poor visualization due to gas shadows, radiation hazard and cost; though some clinicians and radiologists consider IVP more reliable, accurate and easily available. The "gold standard" for detection of renal scars is Tc99 DMSA renal scan as the radioactive agent is fixed to proximal renal tubules and only 10% is excreted. Hence in addition to USG and VCU, TcDMSA scan has a definite role in the diagnosis of renal damage due to recurrent and complicated UTI.

A nuclear medicine department is an asset to nephrourologic services for diagnosis and follows up of children with complicated UTI. Since last 10 years, all our patients with recurrent UTI, obstructive uropathy, VUR and neurogenic bladder undergo radionucleide scans. This facility should be utilized more often by pediatricians because of advantages such as accuracy and low radiation dose. The main indications of nuclear renography in UTI are: *(i)* Monitoring of old and detection of new renal scars by static DMSA Scan; *(ii)* Tc99 DTPA renal scan with diuretic reno-

graphy is useful in differentiating UPJ obstruction severe enough to need surgery from mild to moderate obstruction with hydronephrosis which can be followed and treated medically by chemo-prophylaxis of UTI; *(iii)* In unilateral hydronephrosis, estimation of function of normal kidney to demonstrate compensatory hypertrophy and to decide the time of surgery to prevent decline in renal function of hydronephrotic kidney; and *(iv)* Follow up of VUR to detect resolution by radionucleide cystography. Urodynamic studies add valuable information in cases of voiding dysfunction with UTI which if missed leads to renal scarring(ll).

Treatment

General measures such as liberal fluid intake, periodic voiding, perineal hygiene, treatment of constipation and pin worms and double micturition are as important as drug therapy.

Drug therapy: The drugs with established efficacy in *uncomplicated UTI* are cotrimoxazole, nitrofurantoin and cephalosporins because of low risk of developing resistant strains of *E. Coli.* The duration of treatment is controversial, but acute pyelonephritis should be treated for 7-14 days whilst lower UTI can be given shorter course of 3-4 days, if repeat urine culture reveals no growth. Neonatal UTI should be treated by parenteral ampicillin and aminoglycosides for 7-14 days(2).

Recurrent UTI or complicated UTI with underlying lesions should be treated with long term single night dose of nitrofurantoin or nalidixic acid or cotrimoxazole (1-3 mg/kg) to keep the urine sterile and prevent renal scars, for a period of 1-3 years in VUR; 6-12 months post operatively in obstructive uropathy; and till symptomatic UTI's are eliminated in neurogenic bladder treated with clean intermittent, catheterization. Antibiotic prophylaxis is very efficacious in prenatally diagnosed hydronephrosis which is persistent post-natally(12).

Surgery is indicated for Grades IV-V VUR, calculi, ureterocele, diverticuli, severe UPJ/VUJ obstruction with declining renal function and posterior urethral valves.

Asymptomatic bacteriuria in children above 5 years need not be treated. Persistent or recurrent significant bacteriuria in children below 5 years should be treated with antibiotics and followed up with annual urine cultures, monitoring of BP, renal growth and general growth for 20 years as there is evidence to show that these children may develop chronic pyelonephritis with hypertension/renal failure(2).

Animal and human experiments have shed light on various mechanisms responsible for recurrent UTI and renal scars in certain individuals due to a number of host factors such as P-blood group, uroepithelial cell adhesiveness and bacterial characteristics such as pili, P-fimbriae, and X-adhesins(13). Based on these studies P-fimbriae vaccine has been developed and its protective effect against development of pyelonephritis in baboons is encouraging(14).

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NOTES AND NEWS

STATE-OF-THE-ART WORKSHOP ON NEONATAL RESUSCITATION

This event is being organized by the Department of Pediatrics, All India Institute of Medical Sciences, New Delhi 110 029 on 7th April, 1996. The workshop is targeted for practising pediatricians/obstetricians, postgraduate students and neonatal nurses. Registration would be limited to 50 participants on the first come first served basis. Please send the draft/cheque of Rs. 100 drawn in favour of CME in Neonatology, AIIMS, New Delhi 110 029, latest by 31st March, 1996. For further details, please contact Dr. Ashok K. Deorari, Associate Professor, Department of Pediatrics, AIIMS, New Delhi 110 029.