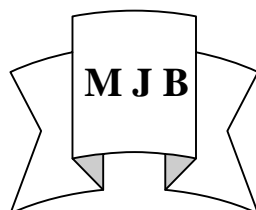


Incidence of Congenital Urinary Tract Anomalies Among Patients With Recurrent Urinary Tract Infection

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Abstract

One hundred and fifty - three patients with recurrent urinary tract infections (UTI): 97(63.3%) males and 56 (36.6%) females, were studied prospectively at the Urology department and outpatient clinic, Specialized surgical hospital, from February 2000 until February 2003. Their age ranged from (1-40) years.

Evaluation of these patients was done by: proper history, physical examination, laboratory tests and radiological imaging studies (ultrasound (U/S), and/or intravenous urography (IVU) and/or voiding cystourethrography (VCU)).

Congenital urinary tract anomalies were detected in 30 (19.6%) of these patients: 18(60%) males and 12 (40 %) females. The upper urinary tract anomalies (kidney and ureter) were predominating found in 26 (86.6%) patients, while lower urinary tract malformations (bladder and urethra) were found in only 4(3.3%) cases.

The most common organism isolated was Proteus species in 15 (50%) of the patients with congenital anomalies.

الخلاصة

اجريت دراسة مستقبليّة على 153 مريض (97 ذكر و 56 انثى) مصاب بالخمج البولي المتكرر، تراوحت اعمارهم ما بين (1 - 40) عام خلال الفترة من شباط 2000 الى شباط 2003 في قسم الجراحة البولية في مستشفى الجراحات التخصصية. تم أخذ التاريخ الطبي الكامل و اجراء الفحص الطبي الشامل لكافة المرضى مع إجراء كافة التحليلات والفحوصات الشعاعية التشخيصية والتي تخص الجهاز البولي.

من خلال هذه الدراسة وجد ان 19.6 % من هؤلاء المرضى قد أصيبوا بشذوذات بولية خلقية، تركز معظمها في الكلتين والحالبين حيث بلغت نسبتها 86.6 % قياساً الى الشذوذات الخلقية التي اصابته المثانة والاحليل حيث كانت نسبتها فقط 3.3 %.

كما اظهرت النتائج ان الكائنات الحية من نوع المتقلبات كانت الاكثر شيوعاً حيث وجدت في 50% من المرضى المصابين بهذه الشذوذات الخلقية.

Introduction

Congenital malformations of the urinary tract system comprise diversity of abnormalities. This wide range of anomalies results from multiplicity of factors that interact to influence urinary tract development in sequential and an orderly manner.

Abnormal maturation or inappropriate timing of these factors at the critical points in development can produce any number of deviations in the development of kidneys, ureters, bladder and urethra(1).

A wide range of abnormalities in the genito-urinary tract system predisposes to infection. An infection with congenital urinary tract anomalies may develop either

from obstruction or reflux. Urinary stasis is the main and most important factor that plays a role during UTI, particularly in congenital urinary tract anomalies(2). Thus, there is a relationship between urinary stasis and infection mostly in reflux or obstructed cases; the final result could be stone formation and/or renal impairment. Therefore, on one side, some of the congenital urinary tract anomalies patients with UTI should be put on prophylactic antibiotics while on the other side, urosurgical management may be recommended for the other patients(2) .

Patients and Methods

One hundred and fifty- three patients with recurrent urinary tract infections (UTI) 97 (63.3 %) males and 56 (36.6%) females (Fig.2), were studied prospectively at the Urology department and. outpatient clinic, Specialized surgical hospital, from February 2000 until February 2003 Their age ranged from (1-40) years

Patients involved in this study, were subjected to: careful medical assessment by history taking, physical examination, and

1- Laboratory tests including the following:

- a- General urine examination (GUE).
- b- Urine for culture and sensitivity (C/S).
- c- Complete blood picture.
- d- Blood biochemistry: (blood urea, serum creatinine, serum electrolytes).

2- Radiological imaging studies including:

- a- Abdominal and pelvic U/S.
- b- IVU.
- c- VCU.

All patients selected for the study were evaluated in view of clinical picture, response to antibiotics, and number of recurrence of UTI in order to determine whether the infection is significant or not. The patients examined comprised many categories: some of them had symptomatic

UTI, were treated by a short course of antibiotics with recurrence of symptoms, others had asymptomatic UTI.

Statistical analysis was done by using Chi-square test and p value.

Results

I- The general urine examination of most patients showed the following findings:

- Red blood cells ranged from 4-10 cells/HPF.
- Pus cells ranged from 4-50 cells/HPF.
- Albumin from (+) to (++).

Proteus species were the main pathogen identified on C/S.

However, all patients with congenital urinary tract anomalies were found to be resistant to all antibiotics tested.

II- Significant infection, on basis of clinical picture, response to antibiotics and number of recurrent UTIs; were detected in 25(83%) of patients with congenital urinary tract anomalies; while only 10(9%) of patients without congenital urinary tract anomalies had significant infection (Table 1).

III- Our results were studied and classified as follows:

A. Anatomical site of congenital urinary tract anomalies Fig.(1):

1- Upper urinary tract anomalies (kidneys and ureters):
n = 26 patients (86.6%)

- a- Ectopic kidney
- b- Incomplete duplicate ureters
 - Unilateral
 - bilateral
- c- Renal agenesis
- d- Mal-rotated kidney
- e- Horse-shoe kidney

- f- Pelvi-ureteric junction obstruction (unilateral)
 - g- Adult polycystic kidney
 - h- Vesico-ureteric reflux 2
 - i- Ureterocoele
 - j- Supranumerary kidney
- 2- Lower urinary tract anomalies (bladder and urethra):
- n = 4 patients (13.3%)
 - a- Posterior urethral valve
 - b- Bladder neck hypertrophy

B. Congenital urinary tract anomalies according to age distribution Table (2).

C. Types of pathogens that caused the infection. Table (3).

Discussion

The congenital urinary tract anomalies may contribute to end-stage renal disease. A significant proportion will have persistent abnormal anatomical and physiological characteristics of the urinary tract, requiring more attention, more evaluation and may lead to reconstructive surgery to preserve renal function (3).

The complicating UTI in these patients are due to urinary stasis which happens by 2 processes: either obstruction or reflux (4) and these may lead to pyelonephritis or stone formation.

Diamond et al., in a retrospective study done on 270 consecutive pediatric stone former patients over 27 years period, concluded that one-third of them had anatomical lesions (Kidney-ureteric junction obstruction, megaureter, and ureterocoele); contributing to recurrent UTI. He also showed that *Proteus mirabilis* accounted for 82% of pure urine cultures(4).

Newbould et al, on the other hand, carried out a retrospective study on 89 infants dying with features of oligohydramnios sequence with particular reference to anomalies of renal tract, by autopsy examination between 1976 and 1990 in Royal Manchester Children's Hospital. His study had shown that 41(46%) of these infants had congenital urinary tract anomalies resulting in oligohydramnios sequence(5).

In a prospective study, Huang et al; confirmed the importance of using U/S, IVU and VCU in children with UTI to detect the associated congenital urinary tract anomalies. They found that 67(46.85%) of the 143 children studied had genito-urinary anomalies (6).

The population at risk for UTI includes: newborn particularly premature, prepuberty girls, young boys, and elderly males and elderly females. The presence of leukocytes in urine is of increasing diagnostic importance in complicated UTI Although the importance of C/S tests can not be underestimated because a concentration as low as 100 colony forming units/mL can cause acute UTI in healthy women (7).

However, most complicated UTI in older men or women occur with obstruction, instrumentation, surgery, anatomic abnormalities, or stones. The majority of patients with uncomplicated infections should receive treatment for 3-5 days. Response to the therapy and long-term cure rates in complicated UTI are related both to the type of underlying abnormality and to the species of the infecting organism(7).

In our study, we focused our attention on those patients with symptoms of UTI that means: dysuria, frequency, urgency and possibly fever who require treatment specially in patients with recurrent UTI on clinical objective basis. The congenital anomalies in those patients were detected by use of radiological studies, i.e. U/S, IVU and VCU. Most of these anomalies were found in the upper urinary tract involving kidneys and ureters that

subsequently had its impact on renal function.

Most of age groups affected were either young (1-10 years) or the older ones (30-40 years). Proteus was the most common pathogen involved in UTI associated with congenital urinary tract anomalies.

In United Kingdom, the predominance of UTI secondary to Proteus mirabilis is a leading cause of pediatric urolithiasis. The significant recurrence rate suggests the importance of prophylactic antibiotics, surgical correction of congenital anomalies, and long-term follow-up of these patient's population are mandatory(4).

Children without underlying malformations causing the UTI had E. coli as their main pathogen, while those who had congenital urinary tract anomalies gave less growths of E. coli on culture of urine than other pathogens(8).

Conclusion

- 1- Early identification of congenital urinary tract anomalies among patients with UTI is of extreme importance in order to preserve the renal function as much as possible and to prevent further progressive renal damage.
- 2- We found a markedly higher incidence of congenital urinary tract anomalies in younger children group that indicates a higher morbidity and mortality.
- 3- Since over 86% of abnormalities were in upper urinary tract, this may implicate a greater insult on parenchymal tissue. End-stage renal disease develops when the infection was in the upper urinary tract system because of the higher morbidity(9).

Recommendations

- 1- All patients with recurrent UTI mostly from first or second visit or first UTI should be studied carefully and seriously by the radiological tests particularly children, and

mostly by the ultrasonography to screen congenital anomalies of urinary tract system(10). The use of ultrasound is so important primarily prenatally as a diagnostic purpose for urinary system malformations and for intrauterine growth retardation, oligohydramnios or polyhydramnios mothers(11) Ultrasonography has sensitivity of 77.4% and specificity of 92% for diagnostic study(12).

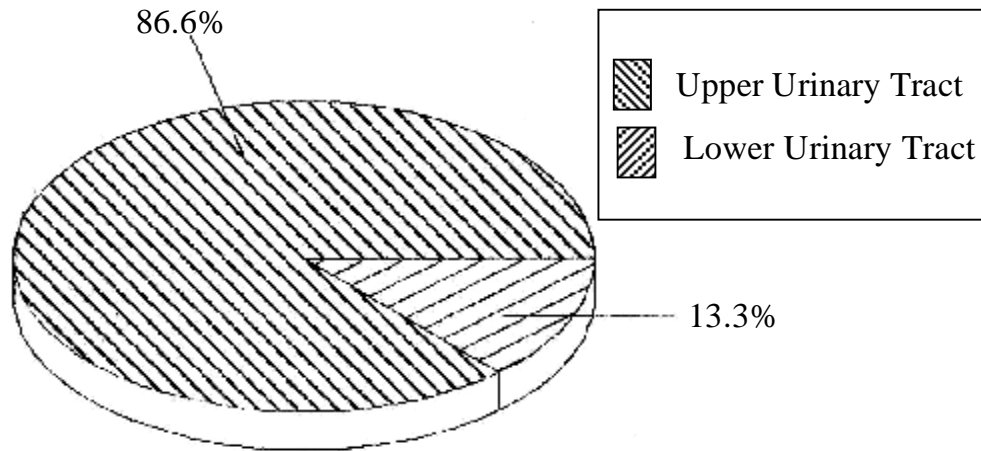
- 2- The use of antimicrobial therapy on sound basis by giving antibiotics only according to the results of culture and sensitivity. It is better to avoid a short course of treatment in these patients with urinary tract infections, in order to prevent bacterial resistance and to minimize recurrence rate of UTI(13).
- 3- Any UTI in children specially in association with congenital urinary tract anomalies must be extensively investigated and aggressively treated. Although, early surgical intervention in children may be recommended as much as possible to preserve the renal function (14).
- 4- The radiological tests should be, by all means, made available in the urological center to help in the diagnosis of congenital urinary tract anomalies among UTI patients. The evaluation of anomalies of urinary tract requires high quality ultrasonography, intravenous urography and occasionally voiding cystourethrography(15). Some centers used DMSA radioisotope scan, as a supplementary test, to evaluate the vesicoureteric reflux associated with congenital anomalies(16).

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Congenital Urinary Tract Anomalies



Percentage of Anatomical Site

Figure (1) Anatomical site percentage of congenital urinary tract anomalies

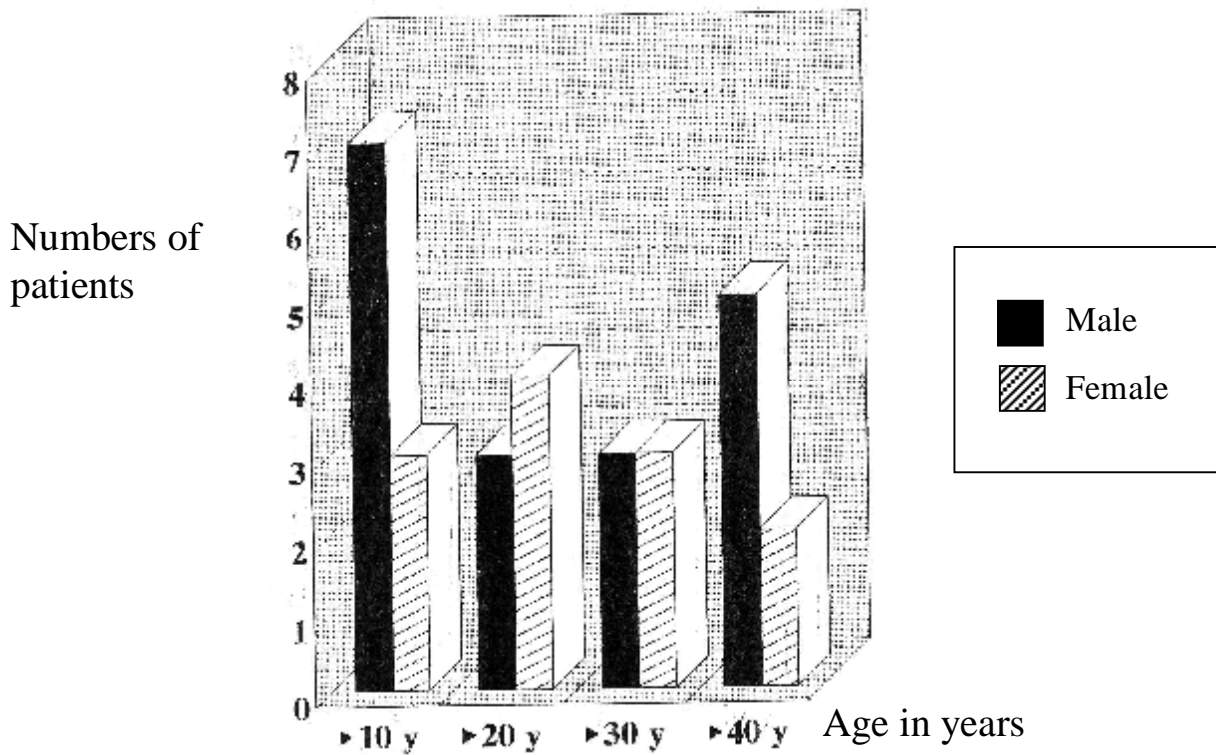


Figure (2) Number of male and female patients in relation to their age

Table (1) Association or relationship between recurrent UTI and congenital unary tract anomalies

	Congenital Anomalies	No Congenital Anomalies	
Significant UTI	25	10	35
Non sign. UTI	5	113	118
	30	123	153

Chi – Square test: $P < 0.01$

Table (2) Congenital urinary tract anomalies according to age distribution

Age of patients	No. of cases	Upper UT anomalies	Lower UT anomalies
0 – 10 years	10	6	4
11 – 20 years	7	7	0
21 – 30 years	6	6	0
31 – 40 years	7	7	0

Table (3) Types of pathogens that caused the infection

Type of Organism	Up to 10	Up to 20	Up to 30	Up to 40
° Proteus	4	4	3	4
Upper UT	3	4	3	4
Lower UT	1	0	0	0
° E. Coli	3	3	0	1
Upper UT	2	3	0	1
Lower UT	1	0	0	0
° Pseudomonas	2	0	2	1
Upper UT	1	0	2	1
Lower UT	1	0	0	0
° Klebsiella	0	0	1	1
Upper UT	0	0	1	1
Lower UT	0	0	0	0

* No growth of bacteria was 1.