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Original Article

EVALUATION OF CONGENITAL UPPER URINARY TRACT ANOMALIES IN HYPOSPADIAS

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Abstract

Background : Hypospadias may be associated with other congenital upper urinary tract anomalies. Literature showed various opinions to evaluate or not to evaluate upper urinary tract in hypospadias patient. Frequency of upper urinary tract anomalies also varies. This study was carried out on this background to avoid confusion. Objectives : Morphological evaluation of upper urinary tract to find out the frequency of upper urinary tract anomalies associated with uncomplicated hypospadias patients and give a guideline for investigation of such patients. Methods : This prospective study was designed and accomplished in the Departments of Paediatric Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka; Dhaka Medical College Hospital (DMCH), Dhaka and Chittagong Medical College Hospital (CMCH), Chittagong; Bangladesh.from October 2004 to June 2006. Eighty five (85) patient with hypospadias having neither any congenital anomalies, nor other genital ambiguity, nor any secondary vesicoureteric reflux (VUR) or meatal stenosis were selected for the study. Detailed history and examination were carried out. Upper urinary tract of all patients were evaluated by Ultrasonography (USG), Intravenous Urography (IVU), and Micturating Cystourethrography (MCU).To exclude genital ambiguity in perineal hypospadias, karyotype were done to ascertain male sex. Results were analyzed by SPSS with the help of Chi-square and Z approximation test . Result : Eighty five (85) patients were taken. All patients were evaluated by USG, IVU and MCU to detect congenital upper urinary tract anomalies. Four (4) patients had had upper urinary tract anomalies. One (1) patient found to have left sided pelviureteric junction obstruction (PUJO) while one (1) patient had right sided pelviureteric junction obstruction (PUJO). One (1) patient was found to have left sided pelviureteric duplication and the last patient with left renal agenesis. USG detected three (3) anomalies in 85 patients (3.53%) and IVU detected all four (4) anomalies in 85 patients (4.7%), but no primary reflux was detected by MCU. Overall frequency of upper urinary tract anomalies was 4.7%. Eighty one (81) patients (95.3%) had no anomalies. USG detected 3 (three) anomalies out of 4 (four) patients (75%) & IVU detected all four anomalies (100%). Absence of upper urinary tract anomaly was statistically significant.

Conclusion : Frequency of upper urinary tract anomalies are significantly low (4.7%) in uncomplicated hypospadias. USG can detect 75% congenital upper urinary tract anomalies in hypospadias patients. So USG is good enough and recommended to evaluate upper urinary tract anomalies in uncomplicated hypospadias patients. There is no need to evaluate upper urinary tract by IVU or MCU in such patients, if asymptomatic otherwise.

Keywords: Upper urinary tract anomaly, Hypospadias, Ultrasonogram

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Introduction:

Normally, external urethral orifice is located at the tip of the glans penis[1]. Hypospadias is a developmental anomaly characterized by a urethral meatus that opens into the ventral surface of the penis proximal to the end to the glans. The meatus may be located anywhere along the shaft of the penis from the glans to the scrotum, or even in the perineum. Incidence of hypospadias is 1 per 300 male live birth [2] . According to Barcat,[3] hypospadias is classified by meatal location after release of curvature. These are anterior hypospadias, middle hypospadias (middle penile) and

posterior hypospadias. Anterior hypospadias is further classified into glanular, coronal and anterior penile variety and posterior hypospadias further classified into posterior penile, penoscrotal, scrotal and perineal variety . Upper urinary tract anomalies include anomalies of the kidneys, anomalies of the pelves, anomalies of the ureteropelvic junctions and ureters.

Anomalies of the kidney may be classified as anomalies of number, volume and structure, anomalies of ascent, anomalies of form and fusion, anomalies of rotation, anomalies of renal vasculature and anomalies of the collecting system. Anomalies of pelvis are extrarenal pelvis, bifid pelvis [4]. Anomalies of ureteropelvic junction may be intrinsic, extrinsic and secondary [5]. Anomalies of the ureter are anomalies of termination, anomalies of structure, anomalies of number and anomalies of position [6].

Conflicting reports in regard to the incidence of upper urinary tract abnormality associated with hypospadias have appeared in the urologic literature. The expected incidence in normal people is less than 3% [7]. Kennedy evaluated 489 patients with hypospadias and found a 6 percent incidence of upper urinary tract anomalies[8]. Fallon and associates [9] evaluated 160 hypospadias patients with excretory urogram, 6.25% of whom had significant upper urinary tract abnormalities that required surgical correction. Felton[10] evaluated 125 autopsy cases and found 2% upper urinary tract anomaly in normal person. He found one each of crossed renal ectopia, bifid upper urinary tract and ureteric dilatation. All of them recommended continued routine screening in these patient populations .

Khuri and associates [11] found upper urinary tract anomalies in 10.4% patient but 3% required surgery. They evaluated 460 patients and found 10 renal agenesis, 18 VUR, 8 PUJO. They found upper tract evaluation unnecessary. McArdle & Lebowitz [12] in a series of 200 patients found 3% upper urinary tract anomalies which is near to present study (4.7%) .They found, 1 absent left kidney, 1 VUR, 2 duplicated system. They did not recommend for upper tract evaluation. This study was conducted to evaluate the upper urinary tract by ultrasonography and intravenous urography and micturating cystourethrography to see the frequency and types of congenital upper urinary tract anomalies in hypospadias patients.

Materials and Methods:

Study design: Prospective study

Period of study: Study period was between October 2004 to June 2006 (21 months)

Place of study: This study was carried out in the departments of Paediatric Surgery, Bangabandhu Seikh Mujib Mujib Medical University (BSMMU), Dhaka; Dhaka Medical College Hospital (DMCH), Dhaka and Chittagong Medical College Hospital (CMCH), Chittagong; Bangladesh.

Study Subjects: Patients with hypospadias admitted in Paediatric Surgery Departments of BSMMU, DMCH and CMCH were evaluated. Within the study period 103 patients were

primarily selected (study population 103) . Final evaluation done as per exclusion criteria (Patient with other congenital anomaly, *e.g. anorectal malformation*, congenital asymmetry *e.g. hemi hypertrophy*, patient with true genital ambiguity, meatal stenosis, patients with secondary VUR to select uncomplicated hypospadias patients. Eighty five (85) hypospadias patients fulfilled the study criteria.

Sample size: Eighty five (85)

Data Collection:

The ethical committee of BSMMU, had approved the protocol prior to commencement of the study. After proper counselling & written consent, detailed history was taken and recorded from parents of each patient in a preformed data collection sheet. Fourty seven (47) patients had chordee and site of urethral meatus noted after release of chordee. Thirty eight patients had no chordee and location of meatus noted. Hypospadias classified accordingly. Urinalysis were done to exclude urosepsis. Serum creatinine were done to see renal functional status & as a pre-requisite IVU were carried out .To exclude genital ambiguity in perineal hypospadias, karyotype were done to ascertain male sex. Upper urinary tract (Kidney, Pelvis, Pelviureteric junction, Ureter & Vesicoureteric junction) were evaluated by USG, IVU, & MCU. Congenital anomalies found were recorded. Data was analyzed by SPSS. Binomial (based on 'Z' approximation) & Chi-square test were employed. P value < 0.01 considered significant.

Results :

In the present series following results were noted. *Age Distribution:* Age ranged from 4 months to 12 years 6 months. Patients were divided into four age groups to see the most common age of presentation.

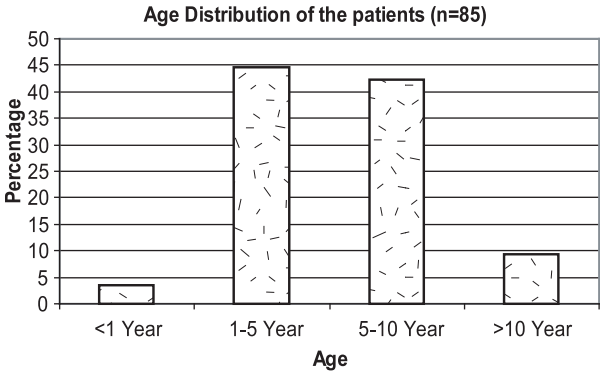

Fig.-1 : *Age distribution of the patients*

Thirty eight (38) patients presented between the age 1 to 5 years (44.70%) and 36 patients presented between 5 to 10 years (42.35%). So patients presented most commonly between age 1 to 5 years (44.7%). Only 3 patients presented below 1 year (3.53%), it is the age for least common presentation. Eight patients (9.41%) presented after 10 years.

Types of hypospadias : Fourty seven (47) patients had chordee and site of urethral meatus noted after release of chordee. Thirty eight (38) patients had no chordee and location of meatus noted. Hypospadias classified accordingly. Anterior hypospadias was the most common variety. Then posterior hypospadias. Middle hypospadias is the least common of all. No posterior penile or scrotal hypospadias was found. Among all types, coronal hypospadias is the commonest variety.

Table I

Types of Hypospadias (n = 85)

Types of Hypospadias	No. of patients	Percentage
Anterior Hypospadias	(56)	(65.88)
• Glanular	15	17.64
• Coronal	36	42.35
• Anterior penile	5	5.88
Middle penile	(3)	(3.53)
Posterior Hypospadias	(26)	(30.58)
• Posterior penile	0	0
• Penoscrotal	14	16.47
• Scrotal	0	0
• Perineal	12	14.11

Investigations:

Total 85 hypospadias patients were evaluated by USG, IVU and MCU to evaluate upper urinary tract anomalies.

Table II

Anomalies detected by imaging studies

USG (n=85)	IVU (n=85)	MCU (n=85)
Anomalies detected 03	Anomalies detected 04	No anomaly detected
Lt. sided hydronephrosis due to	Lt. sided hydronephrosis due to	
Lt. pelviureteric junction obstruction	Lt. pelviureteric junction obstruction Lt. pelviureteric duplication	No VUR were noted in any patient
Absent left kidney	Absent left kidney	
Rt. sided hydronephrosis due to	Rt. sided hydronephrosis due to	
Rt. pelviureteric junction obstruction	Rt. pelviureteric junction obstruction	

Associated Upper Urinary Tract Anomalies:

Table VI

Associated upper urinary tract anomaly (n = 85).

Total no. of anomalies=4

Type of hypospadias	Upper urinary tract anomaly
Coronal	Lt. sided hydronephrosis due to Lt. pelviureteric junction obstruction
Perineal	Lt. pelviureteric duplication
Penoscrotal	Absent left kidney
Glanular	Rt. sided hydronephrosis due to Rt. pelviureteric junction obstruction

Two (2) pelviureteric junction obstructions (PUJO) were found. One (1) was left sided and another was right sided lesion. Another two (2) anomalies were left pelviureteric duplication and left renal agenesis. No primary vesico-ureteric reflux was found. Overall frequency of upper urinary tract anomalies is 4.70%.

Discussion:

Hypospadias is a developmental anomaly characterized by a urethral meatus that opens into the ventral surface of the penis proximal to the end of the glans. The meatus may be located anywhere along the shaft of the penis from the glans to the scrotum, or even in the perineum [2]. Upper urinary tract anomalies vary from 3% [12] to 25% [13] in the literature. In order to evaluate upper urinary tract anomalies in hypospadias patients, this study was carried out in the Departments of Paediatric Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka; Dhaka Medical College Hospital, Dhaka & Chittagong Medical College Hospital, Chittagong, Bangladesh during the period of October 2004 to June 2006 (21 months). One hundred and three (103) patients who were admitted for surgical treatment were randomly collected for examination. According to the selection & exclusion criteria 85 patients were finally selected for the study. Urinalalysis were done to exclude urosepsis. Serum creatinine level was measured to exclude patient with renal impairment and as pre-requite for intravenous urography. Then USG, IVU and MCU were performed in all cases to detect upper urinary tract anomalies. Karyotypes were done to ascertain male sex in perineal hypospadias. Thirty eight (38, 44.70%) patients were found to present between 1-5 years of age. This is the most common age of presentation in the present study. Only 3 (3.53%) patients presented below one years of age. It is the least common age for presentation. Fallon, Devine & Horton studied that commonest age of presentation is between 1 to 2 years (29%). They found only 3.5% patients presented below one years of age [9]. The probable cause of least presentation below 1 year is due to the false belief that they are already circumcised. Most commonly anterior hypospadias was found in 56 patients (65.88%). Among anterior variety coronal hypospadias was the commonest, 36 patients (42.35%). No patient presented with posterior penile or scrotal variety. But 12 patients (14.11%) of perineal hypospadias was noted in the present study. Cerasaro, Brock & Kaplan studied 301 cases and found anterior hypospadias about 87%. Among them coronal variety is the commonest (35%). They found posterior penile variety 2%, scrotal variety 1.2% and perineal variety 1% [7]. The probable explanation is that there may be some racial variation, sample size was small and the data were collected only from tertiary care hospitals.

By USG one (1) patient with coronal hypospadias had left sided hydronephrosis due to left pelviureteric junction obstruction (PUJO), and another patient with glanular hypospadias had right sided hydronephrosis due to right PUJ obstructoin, which were confirmed by IVU. In a patient with penoscrotal hypospadias USG failed to detect the left kidney. IVU also failed to detect any renal tissue on left side. It was a case of left sided renal agenesis. IVU detected another patient with left sided pelviureteric duplication. But USG did not give any clue about the anomaly. It was found in a patient with perineal hypospadias. Out of 4 upper urinary tract anomalies USG detected 3 anomalies (75%). No primary VUR was found by MCU. USG detected 3 anomalies in 85 patients (3.53%). Upper urinary tract anomalies were less than 3% in normal people[7]. IVU was excellent to detect all the anomalies(100%) in the present study. Out of 85 hypospadias patients, 4 patients have upper urinary tract anomalies. Overall frequency of upper urinary tract anomalies is 4.70%. Eighty one (81, 95.30%) patients had no upper urinary tract anomaly in 85 hypospadias patients. Upper urinary tract anomaly is absent significantly, p- value is <0.01. In anterior hypospadias out of 56 patients 2 patients presented with upper urinary tract anomaly (3.57%) and 54 patient had no anomaly (96.43%). Upper urinary tract anomaly is significantly absent, p value is <0.01. In posterior variety, 26 patients were studied. Two had upper urinary tract anomaly (7.7%), 24 patients had no anomaly (92.3%). Upper urinary tract anomaly is absent significantly, p value is <0.01. There is no significant statistically difference between anterior, middle or posterior variety regarding the presence of upper tract anomaly, p value is < 0.01.

Felton evaluated 125 autopsy cases and found 2% upper urinary tract anomaly in normal person. He found one each of crossed renal ectopia, bifid upper urinary tract and ureteric dilatation[10]. The incidence of upper urinary tract anomalies in normal people is less than 3% [7]. In the present study total upper urinary tract anomaly is more (4.7%) in hypospadias patient.

The possible reason is that one genitourinary anomaly may increase the risk of other anomaly.

After evaluation 489 hypospadias patients Kennedy[8] found the incidence of upper urinary tract anomaly is 6%, which is 1.27 times more than the present study. He found 3 cases of duplication of collecting system, 1 PUJO, and 1 renal agenesis. Fallon and associates found 6.25% patient with hypospadias having significant upper urinary tract anomalies which is 1.33 times the current study. They evaluated 160 patients. They found that 3 cases of duplication, 2 cases of renal agenesis, 5 cases of reflux and 3 cases of PUJO[9]. McArdle & Lebowitz in a series of 200 patients found 3% upper urinary tract anomalies which is near to present study (4.7%) .They found, 1 absent left kidney, 1 VUR, 2 duplicated system[12] Khuri and associates[11] found upper urinary tract anomalies in 10.4% patient but 3% required surgery. They evaluated 460 patients and found 10 renal agenesis, 18 VUR, 8 PUJO. Total

frequency of the anomalies is 2.4 times more than the present series. Lutzaker, Kogan & Levitt studied 87 patients and found 16 anomalies (18.4%). It is about 4 times the present study. They found 11 pelvic duplication and one PUJO[14]. In the present study, two (2) PUJO, one (1) pelviureteric duplication and one (1) unilateral renal agenesis were found. No VUR were noted. Because reflux is related to infection and most often acquired condition rather than congenital anomaly [12]. This study does not reflect some of the anomalies (like- pelvic kidney, horse-shoe kidney, renal dysplasia, crossed renal ectopia, retrocaval ureter) that are shown in literatures. This may be due to small sample size or geographical/ racial variation.

This study demonstrates that hypospadias patient with no other congenital anomalies, meatal stenosis with its secondary effects or genital ambiguity, the incidence of upper urinary tract anomalies is very low. So this study will help to avoid unnecessary urinary investigations for such patients.

Conclusion:

From this study it was found that the patients with hypospadias having no other congenital anomalies, genital ambiguity or meatal stenosis, upper urinary tract anomalies are significantly low (4.7%). USG can detect 3.53% congenital upper urinary tract anomalies in hypospadias patients. So USG is good enough and recommended to evaluate upper urinary tract anomalies in such patients. There is no need to evaluate upper urinary tract by IVU or MCU in such patients, if asymptomatic otherwise.

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