The Egyptian Journal of Hospital Medicine (January 2023) Vol. 90, Page 1588-1591

Urinary Tract Infection after Surgical Correction of Female Patients with Congenital Adrenal Hyperplasia

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ABSTRACT

Background: Congenital adrenal hyperplasia (CAH) is the most common cause of virilized females with disorders of sexual differentiation (DSD) with46XX karyotype.

Objective: To prospectively investigate the correlation between surgical correction using single surgical technique (partial urogenital sinus mobilization) and the occurrence of urinary tract infection in female patients with congenital adrenal hyperplasia (CAH). **Methods:** Our study included 27 CAH female patients who follow up in urology and endocrinology clinic in Cairo university hospitals. We prospectively followed the patients over a period of 4 years. Prader grade of virilization of the patients ranged from II to V. Before surgical correction patients were assessed by filling questionnaire by their parents, doing urine analysis and urine culture. Postoperative assessment by same tools was done after one month, then every three months. Follow up period extended from 26 to 42 months. **Results:** Two patients were classified as Prader type two (7.4%), ten patients as Prader type III (37.1 %), thirteen patients as Prader type IV (48.1%) and two patients as Prader type V (7.4%). All patients were well controlled before surgery with preoperative 17- OH progesterone ranging from 0.16 to 6 ng/dl (Mean ±SD: 1.532 ±1.77). All patients had negative preoperative urine cultures for infection .Postoperative urine analysis and cultures were positive for infection in seven patients (25.9%) after one month of surgery.

Conclusions: Long term urinary tract infection rates don't increase after surgical reconstruction of female patients with partial urogenital sinus mobilization even If early postoperative urinary tract infection rates were high.

Keywords: partial urogenital sinus mobilization, CAH, urinary complications, UTI.

INTRODUCTION

Congenital adrenal hyperplasia (CAH) is the most common cause of virilized females with 46XX DSD [(1)].

Despite it is a rare disease, but we have a good flow of patients from all over Egypt as our center in Cairo university hospitals is a referral center which enabled us to have a sufficient number of cases for our prospective study. In the past before the era of corticosteroids, most of these patients used to die from sever corticosteroid deficiency early in their lives, but after the discovery of cortisone therapy most of them experience normal life as long as their endocrinal profile is under control.

This leads to facing the fact that these children will need genital reconstruction for better cosmetic and functional outcome. Many factors affect linear growth in children with CAH. In order to restore normal adult final height patients should be appropriately controlled clinically and biochemically and adherence to medicinal therapy as well as continued clinical and laboratory surveillance [(2)].

Many surgical techniques have evolved over years to fulfill these goals; however, every technique has its own advantages and disadvantages. The introduction of the concept of urogenital sinus mobilization without separating the urethra from the vagina has a great impact on surgical outcome. Urogenital sinus mobilization has successfully mobilized the urethra and the vagina to the perineum without tension and without circumferential dissection of the vagina with little affection on vaginal vasculature which is reflected on the results and decreasing rate of complications, however division of the pubourethral ligaments raises the concerns about urological outcome and possibility of increasing rate of incontinence and urinary tract infection [(3)].

A modification of the technique has been made in the form of Partial urogenital sinus mobilization with limited division of the pubourethral ligaments with theoretical preservation of continence and decreasing urinary tract infections [(4)].

However postoperative urinary outcomes including urinary tract infection are not well studied and whether changing the anatomical distribution of the introitus in the direction of feminizing genitoplasty has an effect on urinary tract infection rate or not. Here, we present our center experience with partial urogenital sinus mobilization and its effect on postoperative occurrence of urinary tract infections.

PATIENTS AND METHODS

Type and setting of the study

This prospective study included 27 CAH female patients were followed up in urology and endocrinology clinic in Cairo university hospitals over a period of 4 years.

Patient Population

All patients included were toilet trained above the age of three years. Patients with any urological problem like recurrent urinary tract infections, incontinence, urinary stones, neurological disorders, voiding dysfunction or other urinary tract anomalies were excluded. Any previously operated patients were excluded from the study and only patients who were first time to operate were included. Any case of

Received: 10/09/2022
Accepted: 12/11/2022

ambiguous genitalia other than CAH was excluded. Family history and positive consanguinity should be assessed as congenital adrenal hyperplasia is an autosomal recessive disorder. We prospectively followed the patients over a period of 4 years. Prader grade of virilization of the patients ranged from II to V. Preoperative Physical examination of the patients included their weights, heights and body mass index (BMI). Before surgical correction patients were assessed by filling questionnaire by their parents, doing urine analysis and urine culture. Single technique of surgical correction was done by using partial urogenital sinus mobilization. Perioperative genitoscopy and genitogram were done to delineate the internal anatomy and determine the level of confluence and degree of mobilization needed to exteriorize the urethra and vagina. Postoperative assessment by same tools was done after one month, then every three months. Follow up period extended from 26 to 42 months (Mean ± SD :35.3 ± 6.0105).

Ethical approval

All parents voluntarily provided written informed consent for the planned procedure and possible risks as well as for participation in this study. The study protocol was approved by the Research Ethical Committee of Faculty of Medicine, Cairo University. This work has been carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

Statistics were performed using SPSS version 21. Data were expressed as means ± standard deviation. Correlations were done using Ficher's exact test.

RESULTS

All patients were older than three years at time of surgical correction. Age ranged from 3.2 to 18 years (Mean±SD : 7.47±3.6) and had classic CAH due to 21-hydroxylase enzyme deficiency.

Genital examination showed that all patients were virilized with non- palpable gonads; Two patients were classified as Prader type two (7.4%), ten patients as Prader type III (37.1 %), thirteen patients as Prader type IV (48.1%) and two patients as Prader type V (7.4%). Phallic length ranged from 2 -8 cm (Mean ±SD: 4.47 ± 1.61) and distance from the urogenital sinus (UGS) opening to the anus ranged from 4 to 10 cm (mean: 6.19 ± 1.646 SD) (Table 1).

Table (1): distribution of phallic length and Length from UGS opening to the anus

	Phallic length (cm)	Length from UGS opening to the anus (cm)
Mean ± SD	**4.47 ± 1.61**	**6.19 ± 1.646**
Median	**4**	**6**
Minimum	**2**	**4**
Maximum	**8**	**10**

All patients were well controlled before surgery with preoperative 17- OH progesterone ranging from 0.16 to 6 ng/dl (Mean ±SD: 1.532 ±1.77). Urine analysis was free of infection for all patients. Preoperative urine cultures were negative for any bacterial growth. Preoperative labs were done for all patients with hemoglobin ranging from 10.5 to 14 gm/dl (Mean ± SD: 11.83 ± 0.92).

Physical examination of the patients showed diversity of measurements due to wide age range; their weights SDS ranged from -2.53 to + 3 SDS (Mean ± SD:+ 0.12 ± 1.57), heights SDS ranged from -4.50 to + 2.65 SDS (Mean ±SD: -0.78 ± 2.25), body mass index (BMI) SDS ranged from -1.25 to + 3 SDS (Mean± SD: + 0.99 ± 1.16) (Table 2).

Table (2): Distribution of weight, height and BMI among the study participants

	Weight SDS	Height SDS	BMI SDS
Mean ± SD	+ 0.12 ± 1.57	-0.78 ± 2.25	+ 0.99 ± 1.16
Median	+ 0.0050	- 0.8350	+ 0.90
Minimum	- 2.53	- 4.5	- 1.25
Maximum	+ 3	+ 2.65	+ 3

We performed same technique of surgical reconstruction in all patients using partial urogenital sinus mobilization (100%).

Pre and post-operative hemoglobin and blood loss are demonstrated in table 3.

Table (3): Pre- and post-operative hemoglobin and blood loss

	Pre-operative Hemoglobin (gm/dl)	Day 1 Post-operative hemoglobin (gm/dl)	Intra-operative Blood loss (ml)	Intra-operative time (hours)
Mean ± SD	11.83 ± 0.92	10.8 ± 0.91	175.56 ± 71.96	3.22 ± 0.624
Median	11.9	10.6	200	3.5
Minimum	10.5	9.5	50	2
Maximum	14	12.5	300	4

Early postoperative complications are demonstrated in table 4 and figure 1.

Table (4): Early postoperative complications

Early postoperative complications	Number	Percent (%)
Wound infection	3	11.1
Labial edema	2	7.4
Urine retention	1	3.7
Foot drop	1	3.7
Total	7	25.9

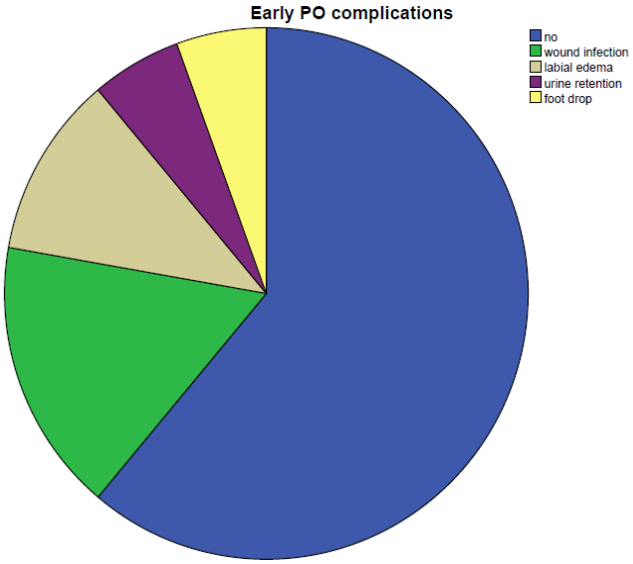

Figure (1): Early postoperative complications.

All patients had negative preoperative urine cultures for infection .Postoperative urine analysis and cultures were positive for infection in seven patients (25.9%) after one month of surgery. Antibiotics according to results of culture and sensitivity were used. After three months results of urine culture and sensitivity showed sterile urine in all patients except for two patients who had asymptomatic UTI. Also, these patients were treated using antibiotics according to cultures and follow up urine analysis and urine culture every three months over a period of 4 years did not show any urinary tract infection in any of our patients.

DISCUSSION

Our study included 27 female patients (46 XX karyotype) with classic congenital adrenal hyperplasia (CAH). They were surgically corrected with feminizing genitoplasty (partial urogenital mobilization "PUM" together with Fortunoff perineal flap).

To know the effect of our surgery on urinary outcome and urinary tract infection postoperatively, we had to wait till all children were toilet trained preoperatively, make sure they were continent to urine and exclude any child who failed to achieve urinary continence or had any urinary tract infections or urinary anomalies.

We performed full correction to permit using the phallic skin to reconstruct the labia. Clitoroplasty and vaginoplasty were performed in the same setting as genital reconstruction is much easier in childhood period than after puberty.

Not performing vaginoplasty at the time of clitoroplasty precludes the use of the mucosa from the urogenital sinus and excessive prepuce that would be discarded and therefore no longer available for reconstruction [(5)].

Timing of surgical correction has been a point of debate for a long time, some surgeons are with early correction and others are with late correction after the patients become adults enough to give consent and can be informed and decide for themselves which gender they would like to be assigned to [(6)].

We observed that age at time of surgery had no impact on early postoperative complications, wound healing or urinary tract infection (p values: 0.421, 0.563, 0.248 respectively).

However, ***Elsayed et al.*** had different results and retrospectively evaluated 61 CAH patients and found that anatomical and cosmetic outcomes were better in children younger than 2 years [(7)].

All of our patients showed no growth of bacteria in preoperative urine cultures. Postoperative urinary symptoms in the form of daytime wetting or stress urinary incontinence were not found. Postoperative urine analysis and culture were positive for infection in seven patients (25.9%) after one month of surgery. Duration of hospital stay after the operation ranged from 4 to 10 days (Mean ±SD: 4.6 ± 1.645) which corresponded to catheterization time which may attribute to postoperative risk of UTI. Proper antibiotics according to cultures were given to the patients and follow up urine analysis and urine culture every three months over a period of 4 years did not show any urinary tract infection in any of our patients.

In normal children, Incidence of UTIs varies with age and gender. It ranges from 7-16% in girls less than 3 years of age and 2-4% in school aged girls older than 3 years[(8)].So our patients have higher incidence of UTI after surgical correction than general population. However it was easily treated and did not recur back during the follow up period over 4 years. This may be attributed to urethra catheter fixation after surgery. Feminization of the genitalia makes it acquires the feminine higher incidence of UTI.However the incidence of UTIs in children with CAH is similar to that in the general population and there is no increased risk of UTIs if surgery is delayed [(9)].

CONCLUSIONS

Long term urinary tract infection rates don't increase after surgical reconstruction of female patients with partial urogenital sinus mobilization even If early postoperative urinary tract infection rates were higher than general population.

DECLARATIONS: I attest consent for publication that all authors have agreed to submit the work.

- **Availability of data and material:** Available.
- **Competing interest:** None.
- **Funding:** No fund.
- **Conflict of interest:** Regarding the publishing of this paper, the authors state that they have no conflicts of interest.

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