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Original Article

Cosmetic and Functional Outcomes of Single-Stage Feminizing Genitoplasty in Children with Congenital Adrenal Hyperplasia

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Abstract

Introduction: Evaluating the cosmetic and functional outcomes in girls with congenital adrenal hyperplasia (CAH) is essential to criticize the effectiveness of single-stage feminizing genitoplasty (SSFG). **Objective:** The aim of this study is to evaluate the outcomes of SSFG in terms of cosmetic and functional results for girls with CAH. **Materials and Methods:** A prospective study involves the performance of SSFG for patients with CAH in two pediatric surgery centers for a period of 9 years. The surgical procedure was either total or partial urogenital mobilization. The cosmetic and anatomical outcomes were evaluated according to Creighton criteria as good, satisfactory, and poor. The patients were followed up for 4–9 years. **Results:** The study included 55 girls with CAH, the mean age at operation was 4.1 ± 1.2 years. Most of cases are prader Stage II (42%). Total urogenital mobilization was performed in 74.5% of patients. Vaginal stenosis was the most common complication (11%). Urinary incontenance registered in 3 cases. The cosmetic and functional outcome was good in (65.5%), satisfactory (21.8%), and poor in (12.7%). **Conclusion:** Early SSFG is effective in providing good cosmetic and functional outcome in patients with CAH.

Keywords: Anatomical and functional outcomes, congenital adrenal hyperplasia, feminizing genitoplasty, urogenital sinus

Introduction

Congenital adrenal hyperplasia (CAH) – the most common cause of ambiguous genitalia, is an autosomal recessive disorder,[1] occurs among all races with incidence of about 1 for every 15,000–20,000 births.[2] It is caused by 21-hydroxylase enzyme defficiency in more than 90% of cases;[3] this enzyme is required for the production of cortisol in the adrenal glands. It hydroxylates 17-hydroxyprogesterone to 11-deoxycortisol, a forerunner of cortisol and furthermore hydroxylates progesterone to deoxycorticosterone, an antecedent of aldosterone, hence there will be lack of these two hormones (cortisol and aldosterone) which result in severe electrolyte disturbance, inability to flourish hypovolemia and may lead to fatal salt losing in some neonate accounting for mortality of children under 5 years.[4,5] The low level of cortisol leads to feedback stimulation of overproduction of adrenocorticotropic hormone resulting in hyperplasia of the adrenal cortex and further overproduction of cortisol forerunners. Some of these forerunners are utilized for the production of sex hormones resulting in questionable genitalia of infants and virilization of girls. Hormonal replacement therapy (glucocorticoid and mineralocorticoid) is the mainstay of treatment but the patient still needs corrective surgery for recreating normal-appearing external genitalia and ensuring normal functions of reproductive adult life and good urinary continence. According to Pena study[6] on total urogenital sinus mobilization (UGS) for the treatment of cloacal anomalies, recent studies suggest surgical intervention early in life of children for more successful result,[7] Rink *et al*.[8] applied this principle to do clitroplasty and vaginoplasty in children with CAH. Genital appearance regarded as an important issue for the child and the parents that had psychsocial and sexual implication during adolescence and adulthood. Surgical reconstruction with hormonal therapy are crucial to achiev this goal. Till now,

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few studies describe the cosmetic and functional outcome of feminizing genitoplasty.[9]

We present this prospective study on female patients with CAH treated with partial or total Urogenital Mobilization (UGM) and then followed up for evaluating the outcomes regarding anatomical appearance and functional ability.

Materials and Methods

A prospective study involves fifty-five girls with CAH operated in two pediatric surgery centers for the period from January 1, 2010, to Feburay 1, 2019. The grade of virilization was evaluated through meticulous check of the external genitalia and the patients were classified using prader classification. All cases were referred from pediatric endocrinologist and already diagnosed as CAH and on hormonal therapy and they underwent single-stage feminizing genitoplasty. The follow-up period was 4–9 years, through which we evaluate the patients for urinary incontinence according to international continance society, site of interoitus, vaginal caliber, and clitoral length and size. The cosmetic and anatomical outcome was classified into good, satisfactory, and poor depending on Creighton *et al*. criteria.[10]

Surgical procedure

One stage clitorolabiovaginoplasty procedure was performed, the first clitoroplasty by clitoral body excision preserving the neurovascular bundle with ventral clitoral glans reduction if the glans was large. In clitorolabioplasty, preputial flaps were also applied to form the labia minora. Regarding UG mobilization, we start with partial UGM and if necessary, we cut the pubovaginal ligament and move to total UGM using U-flap vaginoplasty to increase the vaginal inlet diameter. At the end of the operation, packed vaseline gauze or foleys cather was sited inside the vagin. Cases were discharged on the third postoperative day. Daily changing dressing and the Folys catheter or Vaginal gauze dressing was removed on the 5th postoperative day. A urinary catheter placed during the operation was preserved for 7–10 days. Calibration-dilatation programs of the vagina were done 1 month after surgery, if no stricture, it done every 2 weeks for 2 months then every 6 months for 3 years. Dilatation was performed initially daily in cases with stenosis, then once in 2 days or 3 times in a week and continued for 3–6 months based on the need of the case personally and ended if stenosis healed, if the vaginal stricture showed resistance we moved to dilatation UGA and if the stricture is so tight, we schedule the pateints for revision surgery near puberty. Any lower urinary tract infection or constipation which may cause urinary incontinence was treated in order not to affect our result.

Ethical issues

From the parents, an informed consent for feminizing genitoplasty was approved in each case. Full explanation regarding the use of the information for publication and conservation was made with them.

Results

The study included 55 patients, their ages range from 3 months to 14 years with a mean of 4.1 ± 1.2 years. According to prader classification, most of the patient had prader stage III (42%) followed by Prader stage II (34.5%). Forty-one patients underwent total urogenital mobilization (TUM) (74.5%), on the other hand, Partial Urogenital Mobilization (PUM) done for 14 patients (25.5%). Vaginal stenosis was the most common postoperative complications affecting six patients (11%) and it was resistant in two cases that needed surgical revision at puberty. Four patients (7.2%) develop clitoral hypertrophy and required adjustment of hormonal therapy. Complete clitoral atrophy was observed in two cases. According to Creighton *et al*. criteria,[10] the cosmetic and anatomical outcome was good in 36 (65.5%) patient, satisfactory in 12 (21.8%), and poor in 7 (12.7%). Sixteen patients were evaluated for urinary continence after the age of 3 years depending on international urinary continence society. Of those eligible children, 13 (81%) were continent day and night, urinary incontinence was recognized in three pateints (19%); two patients were 6 and 8 years old developed secondary nocturnal enuresis with positive family history treated conservatively for 3 months with no response then oxybutynin added for 3 months with good response then stoped gradually after tapering the dose. The third patient, 5 years old with stress incontinence treated with oxybutanine for 6 months then gradual tapering over 3 months with poor response so we add desmopressin and tofranyl with good response. All those three patients underwent freguent renal system monitoring by ultrasound, urine examination, and renal function test Table 1.

Discussion

The adrenogenital syndrome caused by CAH is a classic example of an inborn error of metabolism, in this case, there is an error involving cortisol synthesis. The most commonly deficient enzyme is 21-hydroxylase responsible for 95% of cases.[11] Abdominal ultrasonography was reported to have a high sensitivity and specificity in the identification of internal female genitalia and can even provide adequate information about the anatomy of the vagina and UGS in more than 90%.[12]

Several techniques have been described for vaginal reconstruction during the last few years.[13-15] A cut back of the urogenital sinus combined with Fortunoff inverted U-shape perineal flap is used in cases with low confluence of the vagina and urethra.[16] However, the use of this technique is inappropriate when the confluence is higher because it leaves the urethral meatus on the anterior vaginal wall, resulting in the accumulation of urine in the vagina. When the vagina enters the urogenital sinus proximal to the external urethral sphincter, cut back of the urogenital sinus should be avoided to prevent division of the sphincter; instead, the vagina is dissected free from the urethra and brought down posteriorly. TUM technique for repair of intermediate length cloaca as described by Pena has the advantage of avoiding the dissection required for

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Table 1: Patients characteristics and operative outcomes

Variables	*n* (%)
Age, mean (range)	4.1±1.2 years (3 months-14 years)
Prader sage	
Stage I	5 (9)
Stage II	19 (34.5)
Stage III	23 (42)
Stage IV	8 (14.5)
Urogenital mobilization	
Total	41 (74.5)
Partial	14 (25.5)
Complications	
Bleeding	3 (5.4)
Vaginal stenosis	6 (11)
Urine incontinence from 16 cases	3 (19)
Clitoral atrophy	2 (3.6)
Clitoral hypertrophy	4 (7.2)
Good	36 (65.5)
Satisfactory	12 (21.8)
Poor	7 (12.7)

separation of the vagina from the urethra.[6] Both the vagina and urethra are mobilized together and brought to the perineum. Previously surgeons demonstrated the feasibility of performing this technique in children without anorectal malformation through a perineal approach, but they discarded the mobilized UGS and created a separate urethral meatus and vaginal introitus. In this study TUM has tremendously facilitated the genitoplasty. Contrary to Ludwikowski *et al*.[17] we did not discard the mobilized UGS, but we use it in all cases. The UGS was split at 6 O'clock orientation and reflected upwards to enlarge the introitus in patients with low confluence; this allows the best mucosal lining and reconstruction of the valvular region. This approach was supported by other investigators in recent literature.[7,12,14] The length of the urethra proximal to the confluence of the vagina and UGS is important. It is generally believed that there is correlation between the severity of virilization and the proximal migration of the junction of the vagina and UGS. Jenak *et al*.[18] applied TUM technique only when the urethra appears normal. They reported that, when the urethra is too short, the risk of incontinence is high and therefore, they use a technique that preserves the urogenital sinus as a urethra and the vagina is then reconstructed using a skin flaps.

In this study, we found that TUM technique is very beneficial in severely virilized patients with expected short urethral length proximal to the confluence. After completing TUM, the distal part of the UGS was incised and reflected posteriorly to repair the anterior wall of the vagina, while its proximal part was used as a urethra. The clitoral recession which was common in the past but now has been replaced by clitoral reduction to avoid the complication of potential re-growth of the clitoris and also to avoid painful erection. We noted that Kogan technique of clitoral reduction is a safe technique because it assures the preservation of blood supply to the glans.[19]

The 2 cases of complete clitoral atrophy in our series occurred after free isolation of the neurovascular bundle to the glans. Having a planned single-stage procedure seems to give a better outcome than multistage genital surgery, with an expected 88% incidence of good cosmetic results. Repeated surgery may cause more scarring and fibrosis. In our community, this sort of surgery is very embarrassing to the patients and their parents.

We noted that accomplishing genitoplasty as one-stage operation at early infancy was very much appreciated from the parents. A great deal of controversy remains surrounding the proper time of surgery. Most investigators suggest that intervention should take place early from the newborn to 3-year-old period.[2,7] Reasons for this early intervention include easily performed surgery in infant or children than in adolescence, better compliance with dilatation, lessening of parents concerns regarding their child and the assumption that the child later in life does not remember early intervention[2,20] Additional advantage of early surgery include avoidance of genitourinary tract infection. Passerini-Galzel reported that surgery can be performed easily in the first 1–2 months of life but some revision at puberty should be anticipated in some cases.[21] In the current series, the technique was much easier in 12 patients <6 months of age compared to older children with a shorter operative time. The psychological benefit of early vaginoplasty versus the possible need for some revision after puberty should be considered. In patients with CAH and other conditions that involve abnormal-appearing genitalia, the benefits of early intervention outweigh the risks of repeated dilatation at a younger age. Deferring definitive vaginoplasty until puberty, especially when virilization is associated with a high or intermediate vagina, in spite of the opponent suggestion that claims the availability of supple, more robust genital skin in adolescent and adult than in infants. In our study, we noted that the vagina was easy to handle and not thin and fragile in the young infants. Likewise, postoperative regular vaginal dilation is not mandatory in every patient.

Vaginal stenosis is the most commonly reported complication occurring in up to 11% of cases. Vaginal stenosis can be either extrinsic or intrinsic. the extrinsic stenosis is mainly a consequence of poor anatomical preparation of the perineal structures, while intrinsic stenosis is primarily due to inadequate opening or excision of the distal part of a high vagina which is fibrotic and dysplastic. In our series, vaginal stenosis was noted in 6 out of 55 patients who responded to repeated dilatation. To minimize the frequency of postoperative vaginal stenosis, Rink *et al*. and Passirini-glazel[8,21] advocated deeply incise the distal part of the vagina until a wide vaginal lumen is entered. A perineal inverted U-shape Fortunoff flap is used to connect the wide vaginal lumen with the perineal surface.[16] According to some investigators, if stenosis occurs vaginal periodic dilatation or reoperation can be postponed until puberty to take advantage of the hormonal stimulus that occurs during this phase and also to minimize the psychological effects of multiple procedures.[2]

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The cosmetic and anatomic outcomes were considered good in 65.5%, satisfactory in 21.8%, while poor in 12.7% of our patients which is similar to a reported series of 24 females underwent one-stage feminizing genitoplasty, Braga *et al*.[15] reported a good result in 21 children (87.5%) and satisfactory in 3 (12.5%) of the cases. However, the results from Creighton *et al*.[10] are in marked contrast to our results. Using objective measures, they judged that 41% had poor cosmetic results, with 89% of the women who had planned one-stage procedures requiring further major surgery. Apart from dilatation, none of our patients required further surgical treatment. It is not certain that any of them will need a revision surgery such as labial refashioning or introital enlarging procedures when they reach puberty.

Conclusion

Early one-stage genitoplasty can be used safely and effectively to provide adequate introitus with good cosmetic appearance. The procedure is much easier in young infants with less blood loss, shorter operative time and less psychological trauma. The proper technique should be tailored to the severity of the anomaly. Adopting TUM approach has tremendously simplified the feminizing genitoplasty even in cases of high confluence of the vagina and urethera.

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Conflicts of interest

There are no conflicts of interest.

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