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Investigating the outcomes of full thickness skin graft in the reconstruction of concealed penis in children aged 7 to 14 years

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Abstract

Introduction Concealed penis is a congenital anomaly that affects not only the appearance but also the function of the external genitalia in the male sex. Different surgical methods have been proposed to correct this disorder, including removal of the previous scar, penile shaft, penile trunk skin reconstruction with flap, penile skin fixation in penopubic and penoscrotal angles, and removal of extra pubic fat. In this study, we will discuss the results of definitive surgery in one stage using autogenous skin grafts and examine the details of this technique.

Methods This study was conducted as a clinical trial in Hospitals related to the Isfahan University of Medical Sciences. Children over the age of 7 years old. A full-thickness graft with a length of 1.5 times the defect and a width of 1 cm was taken from the non-dominant thigh and defatted. The inguinal skin was chosen because it is hairless and next to the penis, and the resulting scar is easily hidden under clothing. Then, the graft was transferred to the operation site and fixed.

Results and conclusion We proposed a method of treatment for concealed penis, using a full-thickness inguinal graft. Our technique showed promising results with minimal and negligible complications. To fully highlight each process's benefits and limitations and evaluate them against one another, these procedures should, however, be tested on larger populations and compared comprehensively.

Trial registration The study was conducted in accordance with the ethical standards of the Isfahan University of Medical Sciences Research Ethics Committee (ethical code: IR.MUI.MED.REC.1402.073) And was registered on 27/05/2023 as a clinical trial in Iranian registry of clinical trials. (IRCT code: IRCT20230513058160N1)

Keywords Concealed penis, Pediatric, Autogenous skin graft, Urology

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Introduction

Concealed penis is a congenital anomaly and the congenital form of buried penis that affects not only the appearance but also the function of the external genitalia in the male sex [1]. There are many confusing terms regarding the concealment condition of the penis, such as buried, trapped, webbed, hidden, inconspicuous, and concealed. A buried penis occurs when the fundiform ligament of the penis saddles abnormally on the dorsal shaft. This anomaly is frequently associated with insufficient penile skin, inadequate subcutaneous attachment to Buck's fascia, and usually, a narrow opening of the prepuce. Another form, the trapped penis, is related to cicatrix formation after circumcision. Last, in a webbed penis, the CP has scrotal skin continuing up to the penile ventral shaft [1]. Concealed penis (CP) is usually seen in children and affects patients both physiologically and psychologically [2, 3]. This congenital defect is characterized by insufficient skin on the external part and incomplete attachment of subcutaneous tissue to the fascia. CP is a condition with a penis that appears to be small but has a normal stretched penile length (SPL) when measured from the pubic symphysis to the tip of the glans. CP can lead to phimosis, balanitis, and urination disorders [4, 5].

Some patients are mistakenly treated with circumcision, which may have severe consequences for the sexual life of patients in adulthood. This disease has recently received more attention from doctors and parents. However, its classification, pathogenesis, pathology, and treatment are controversial [6].

Different surgical methods have been proposed to correct this disorder, including removing a previous scar, degloving the penile shaft, reconstructing the penile trunk skin with a flap, fixing the penile skin in penopubic and penoscrotal angles, and removing extra pubic fat [7]. Many postoperative complications have been reported, including perineal stenosis, skin necrosis, long-term perineal edema, inappropriate appearance, and deformed scars [8, 9].

Considering the necessity of correcting this disorder and eliminating its physical, mental, and health complications in the period before and after puberty, as well as fertility and health problems, and considering the controversial nature of various surgical methods and the lack of ideal treatment in some of these methods, in this study, we will discuss the results of definitive surgery in one stage using an autogenous skin graft. We will examine the details of this technique. The complications of skin graft implantation include graft site infection, seroma formation, hematoma, and tissue contracture, which are investigated in this study.

Methods

This study was conducted as a clinical trial in Hospitals related to Isfahan University of Medical Sciences. Children over the age of 7 years old suffering from concealed penis were included in this study. The children with any coagulation disorder and children whose parents didn't consent were excluded from this study, and eventually, the study population was 25 patients with this condition. All the participants were suffering from congenital concealed penis without a history of previous surgery. The sample size was calculated using the following equation:

$$n = \frac{(z_{1-\beta} + z_{\frac{\alpha}{2}})^2 \times \sigma^2}{d^2}$$

In this study, the confidence interval and the power were considered 95% and 80% respectively. The hypothesized difference and population variance were considered 0.5 regarding the similar studies on this matter [10].

After examining the patient at the first visit and after diagnosing the disorder, a detailed history of being term or preterm at the time of delivery, the mother's illnesses during pregnancy, possible disorders in other children of the family, type of delivery, and history of hospitalization was taken from parents. Then, pre-operative paraclinical evaluations, including coagulation tests and blood cell count, were evaluated.

After admitting the patient to perform the operation, they were placed under general anesthesia and put in the low lithotomy position. After prep and drape, the genital area and lower limbs were placed in the field. A median longitudinal incision was made on the ventral penile skin from the phimotic ring to the penoscrotal junction. For traction with Prolene 5.0, a permanent suture was placed at a distance of 5 mm from the edge of the glans and remained until the end of the operation. A circumferential incision was created near the initial opening. Degloving was performed by dissection of the entire dartos penile fascia and the fibrous tissues of the buck's fascia [11]. The penile shaft remained untouched.

Then, after tying the tourniquet at the base of the penis and injecting normal saline, the amount of Chordia was checked. If the severity of the chordia was more than 10 degrees, it was corrected by Dorsal Plication with 0–5 Prolen thread using the Nesbit method. The subcutaneous tissue of the junction of the penoscrotal was dissected ventrally at the 6 o'clock position. This simplified dissection of the genital adipose tissue from the back to the location of the pubic ligaments at 12 o'clock.

Then, a full-thickness graft with a length of 1.5 times the defect and a width of 1 cm was taken from the non-dominant thigh and defatted. This region was chosen because it is hairless and next to the penis, and the resulting scar is easily hidden under clothing. Then, the graft

Table 1 The mean size of penile root in patients before surgery and in follow-up visits

	Before surgery	1 month after surgery	3 months after surgery	6 months after surgery	1 year after surgery	*P* value
Mean ± SD	1.348 ± 0.543	2.860 ± 0.637	2.884 ± 0.632	2.920 ± 0.717	3.360 ± 0. 685	< 0.001

P value using the repeated measure ANOVA method

was transferred to the operation site and fixed at 12, 3, and 9 o'clock, and at 6 o'clock, the genital area of the graft was repaired in the form of a ring.

A urethral catheter was used based on the patient's age, and Antibiotics were prescribed during the induction of anesthesia and are maintained for 3 to 5 days. The operation was finished by applying a usual dressing for the graft, including layers of Vaseline and wet gauze on the penis. After 48 h, the dressing was removed, and the graft's color and condition were checked.

The patients were visited as an outpatient a week after the operation and were examined for possible complications of the operation (infection, hematoma, seroma). Then, the investigation and the studied variables were examined and recorded in one-month, three-month, six-month, and one-year follow-up periods after the operation on an outpatient basis in the clinic. The deformation of the penis was recorded by measuring its roots with finger pressure on both sides of the penis before surgery and in subsequent visits.

Relevant training was given to the parents to check the improvement of the health status and function of the penis during discharge, which was in the form of evaluation of the reduction of sub-genital debris after surgery (in the improvement of the hygiene status) and assessment of the progress of the child's urinary erection during voiding (in the improvement of the function of the penis). These items were recorded in the checklist during the postoperative visits, after examination, and after asking parents.

Also, a complete examination for unwanted complications such as infection, hematoma, and seroma of the operation site on the first visit or contracture in consecutive visits up to one year is performed and recorded if they occur.

Finally, the data is extracted and analyzed from within the checklist. The analysis will be done in two descriptive and analytical parts. Before-and-after comparisons in the studied subjects will be done using a paired t-test based on quantitative variables or McNemar's test based on qualitative variables. All analyses will be done using SPSS software version 24 and at an error level of 5%.

Results

25 cases of concealed penis were included in this study. The mean age of the participants was 8.32 ± 0.75 years. All the data regarding the demographic information, size and morphology of the penis, function of the phallus, and possible complications were recorded thoroughly in a checklist and analyzed.

Table 2 The significance of correlations between different variables and the mean size of penile root

	variable	*P* value
Mean penile size in term infants *N* = 16	1.138 ± 0.5377 cm	0.001
Mean penile size in preterm births *N* = 9	1.722 ± 0.2635 cm	
Mean penile size in C-sections *N* = 10	1.020 ± 0.5412 cm	0.016
Mean penile size in natural birth *N* = 15	1.567 ± 0.4169 cm	

Table 3 The correlations between BMI and age of mothers with morphology changes

		Pre-surgery morphology	age	BMI
Pre-surgery morphology	Pearson Correlation	1	0.567**	0.499*
	Sig. (2-tailed)		0.003	0.011

We used the size of the penile root as an indicator of morphology. The mean size of the penis root before surgery was measured at 1.348 ± 0.543 cm. The penile root size in follow-up visits is shown in Table 1. The size of penile root is measured with a standard ruler placed on the dorsal side of penis, measured from its root to the glance. This explanation was also added to the manuscript.

According to the repeated measurement analysis, there is a significant difference between the changes in penis size over time by removing the effect of the size before the operation (p-value < 0.05). The type of delivery, BMI of the child, time of circumcision, time of hospitalization, and time of pregnancy did not affect the process of morphological changes (p-value > 0.05).

However, the following factors have effectively determined the patient's initial morphology before surgery. The average morphology is significantly higher during pregnancy in those who were full-term. Also, the average morphology was significantly higher in mothers with natural delivery. Morphology also has a significant positive relationship with age and BMI, so the higher the patient's BMI or age, the higher the average morphology. Also, the average initial morphology was significantly lower in patients with a history of hospitalization. The details of significant relations are shown in Table 2. The correlations between BMI and age of mothers with morphology changes are shown in Table 3 since the levels of maternal

hormones might be related to those factors and may affect the occurrence of concealed penis.

Comparison of phallus function status before and after surgery in children with CP

The percentage of people with unfavorable phallus function before the operation is 100%, and after the operation, it increases to a favorable condition every four measurement times.

Comparison of genitalia and phallus hygiene status before and after surgery in children with CP

The percentage of people with an unfavorable hygiene condition before the operation is 100%, which increases to a favorable condition of 100% after the operation every four measurement times.

Comparison of complications after surgery in children with CP in four measurement times

Only the first time after surgery did 12% of children have complications (1 case of seroma and 2 cases of infection), which decreased to 0% in the following three measurements and remained stable without complications.

Overall, our results showed a favorable result for using a full-thickness skin graft, while all the variables showed favorable results in the follow-up visits.

Preoperative figure of a patient is shown in Fig. 1. There are photos of the surgical procedure is shown in Figs. 2 and 3 shows the results after 10 days.

Discussion

Concealed penis is a congenital anomaly that affects not only the appearance but also the function of the external genitalia in the male sex. Concealed penis is usually seen in children and affects patients both physiologically and psychologically [2, 3].

Different surgical methods have been proposed to correct this disorder, which includes complete penile degloving, excising the scarring due to previous surgery, removing excess suprapubic fat, reconstructing the penile skin with local flaps, and fixing the penile skin at the penopubic and penoscrotal angles [7]. Others have reported that various methods for rectifying the hidden phallus have been documented. These approaches encompass the liberation of anomalous dartos connections and the envelopment of the penile shaft with inner preputial skin, as well as the utilization of multiple Z-plasties for reordering and elongating the penile integument [12–15].

Maizels et al. conducted research regarding the prepubertal fat and concealed penis. These authors conducted surgical correction in seven young males using a transverse suprapubic incision, removing adipose or lax elastic tissue and fastening the base of the penis to the periosteum of the pubis, and achieved favorable results [16].

Fig. 1 Preoperative state of the concealed penis

Fig. 2 Surgical procedure showing both the concealed penis and the graft site

In 1995, Joseph et al. suggested a new technique. In this process, a careful examination is conducted at the base of the male genital organ, reaching deep into the corporal structures. Any fibrous tissue that attaches to the penile shaft is removed. The elongated penile shaft is secured

Fig. 3 The results of the surgery 10 days post-op

at its foundation by sewing the adjacent tissue onto the tunica. This procedure had positive results all in all, but it had complications such as secondary chordee and the penis getting reverted [17].

Cromie and colleagues provided a comprehensive description of a straightforward degloving technique in which the penile dermis is securely fastened to the tunica albuginea proximally [18].

In the research of Alter et al., surgery was carried out on 6 adults and 7 children for the treatment of hidden penis resulting from various causes. In all cases, sutures were placed from the subdermis of the ventral penoscrotal junction to the tunica albuginea. Additionally, a combination procedure involving either suprapubic dermatolipectomy, tacking of the penopubic subdermis to the rectus fascia, penoscrotal Z plasty, circumcision revision, or lateral penile shaft Z plasty was also performed in certain patients. They also reported 3 cases of wound complications [19].

Penoplasty, performed through a T-shaped incision and employing three-point fixation, has also been described and was found to be a highly effective method in diminishing the occurrence of postoperative preputial edema, particularly in cases where the edema is moderate to severe, during the treatment of a concealed penis [20].

But still, there have been postoperative complications, including perineal stenosis, skin necrosis, long-term perineal edema, inappropriate appearance, and deformed scars [8, 9] and there is still no consensus on the best surgical technique for treatment of this condition.

We proposed a surgical technique of using an inguinal full-thickness split graft in the correction of the concealed penis. We achieved great results and only had 3 cases of minor wound complications, which were negligible.

However, to fully highlight the benefits and limitations of each process and evaluate them against one another, these procedures should be tested on larger populations and compared comprehensively.

Conclusion

We proposed a method of treatment for concealed penis, using a full-thickness inguinal graft. Our technique showed promising results with minimal and negligible complications.

However, to fully highlight the benefits and limitations of each process and evaluate them against one another, these procedures should be tested on larger populations and compared comprehensively.

Abbreviations

CP Concealed penis
BMI Body Mass Index

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Author contributions

M.H and A.F contributed in the supervision of the conception and design of the study. data acquisition, analysis, and interpretation was conducted by D.M. and S.S. All authors contributed equally to all stages of drafting and revising the manuscript, and final approval of the version to be published.

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Data availability

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the ethical standards of the Isfahan University of Medical Sciences Research Ethics Committee (ethical

code: IR.MUI.MED.REC.1402.073) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. And was registered on 27/05/2023 as a clinical trial in Iranian registry of clinical trials. (IRCT code: IRCT20230513058160N1). Informed consent was obtained from all individual participants' parents included in the study. All participants' parents gave their consent for their personal and medical data to be published in this article.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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