

Efficacy of the modified Brisson+Devine procedure for the treatment of concealed penis

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Abstract. – OBJECTIVE: This study was performed to evaluate the clinical efficacy of the modified Brisson+Devine procedure in the management of concealed penis.

PATIENTS AND METHODS: In this retrospective study, the medical data of 45 children diagnosed with concealed penis who underwent modified Brisson+Devine procedure in the Department of Urology of Anhui Provincial Children's Hospital between January 2019 and December 2021 were analyzed. Follow-up visits were performed at one, three, and six months postoperatively, and outcome measures included postoperative complications and parental satisfaction.

RESULTS: All 45 children completed the surgery uneventfully. At 3-4 days after surgery, the penile dressing and the urinary catheter were removed. The patients were discharged 4-5 days postoperatively without ischemic necrosis of metastatic flaps. The follow-up visits spanned from 7 to 33 months, with a mean of 14.6 months. A statistically significant increase in the penile length after surgery was observed ($p<0.05$). The postoperative penile appearance was good, and the parents of the children had high treatment satisfaction ($p<0.05$). 38 children developed postoperative transferred flap edema, and the edema disappeared at 3 months postoperatively.

CONCLUSIONS: The modified Brisson+Devine procedure for concealed penis allows maximum use of the foreskin to improve the appearance of the penis and has a high safety profile by reducing postoperative complications, and provides high treatment satisfaction.

Key Words:

Modified Brisson+Devine procedure, Concealed penis, Satisfaction.

Introduction

Concealed penis is a common congenital malformation of penile in pediatric patients. It man-

ifests as a concealed penis under the skin, short penile appearance, and non-attachment of the foreskin to the penile body. Posterior pushing of the skin around the penis can reveal a normal penile body¹. Currently, controversies exist regarding the staging of concealed penis, the determination of surgical indications, the surgical types, and the age of patients for surgery. Concealed penis requires adequate preoperative evaluation to achieve uniform foreskin coverage of the penile body. The case data of 45 children with concealed penis² treated with the modified Brisson+Devine procedure in the Department of Urology of Anhui provincial Children's Hospital from January 2019 to December 2021 were summarized and analyzed.

Patients and Methods

Patient Clinical Features

In this retrospective study, the medical data of 45 children with concealed penis who underwent modified Brisson+Devine procedure in the Department of Urology of Anhui provincial Children's Hospital between January 2019 and December 2021 were obtained for analysis. The patients were aged 3-11 years, with a mean age of 6.5 years. The included children showed typical manifestations of concealed penis. The penis was completely concealed under the skin, and only a conical mound was visible; the skin at the root of the penis could be pushed back by finger pressure to reveal the normally developed penile body; the foreskin opening was narrow, the angle of the foreskin opening was greater than 90°², and the foreskin could not be flipped out to reveal the glans. Children with a small penis, short penis due to obesity, mild to moderate concealed penis, and previous history of penile surgery were excluded. The main clinical manifestations of the included children were narrow foreskin orifice,

inability to flip the foreskin to reveal the head of the penis, short penis appearance, thin urine line with difficulty in urination, foreskin scar or foreskin bulge during urination, and urinary tract infection. This study has been approved by the Ethics Committee of Anhui provincial Children's Hospital (Approval No. 116123S21), and all the children and their guardians signed informed consent.

Surgical Methods

All 45 children received the modified Brisson+Devine procedure.

- 1) A longitudinal incision was made in the ventral middle of the penis to cut the skin and subcutaneous tissue. The narrow ring at the junction of the inner and outer prepuce was released to the root of the penis.
- 2) The foreskin was flipped out to reveal the glans and was separated from the glans to the coronal sulcus, followed by a treatment with iodine.
- 3) The glans was sutured using 5-0 polydioxanone (PDS) absorbable thread. The inner foreskin prepuce was incised about 5-8 mm from the coronal sulcus. The surface of Buck's fascia was freed and decorticated to the root of the penis, and the fibrous cords and part of the superficial penile suspensory ligament attached to the dysplasia were excised to completely reveal the penile body, with the cut edge of the ventral lateral prepuce in a "V" shape.
- 4) The dermis of the penile skin was sutured to the corresponding white membrane of the penile corpus cavernosum using 4-0 PDS absorbable sutures on the dorsal side of the penile root to avoid damage to the neurovascular bundle within Buck's fascia.
- 5) The dorsal penile-tipped island flap was freed with a size that can cover approximately the ventral penile corpus cavernosum. The area of the vascular tip fascia without obvious vessels was perforated and the flap was transferred to the ventral side of the penis to cover the penis body.
- 6) The excess inner prepuce at the penile tether was trimmed, and the tether was reconstructed. The transfer flap was trimmed to fit the ventral "V" outer prepuce, and the inner and outer prepuce of the dorsal and ventral foreskin were sutured intermittently at 5-0 PDS.
- 7) A Foley catheter was indwelt, and the penis was wrapped with petroleum jelly gauze and an elastic bandage (Figure 1A-F).

Postoperative Treatment

The blood flow of the head of the penis was monitored. At 3-4 days after surgery, the penile dressing and the catheter were removed, and the incision was disinfected and cleaned. The patient was successfully discharged from the hospital 4-5 days after surgery. The postoperative follow-up visits was 7 months to 33 months.

Efficacy Evaluation

The degree of penile body exposure, penile body skin coverage, foreskin distribution, penile and foreskin appearance, healing of the incision margin, residual stenosis ring were recorded to evaluate the clinical outcome of the surgery. Postoperative complications and adverse events included pain at night, retraction of the penis, foreskin edema, postoperative incision infection and bleeding.

Statistical Analysis

Statistical analyses were conducted via SPSS 22.0 (IBM Corp., Armonk, NY, USA). Measurement data are tested for normality, and data that do not conform to the normal distribution are normality transformed. The measurement data were expressed as mean \pm standard deviation, and two independent samples *t*-test were used for comparison between the two groups. For multi-group comparisons, ANOVA and post-hoc testing were used. All statistical evaluations were two-sided and $p < 0.05$ was established as significance.

Results

All 45 children completed the surgery uneventfully, whereas some cases of occasional postoperative pain at night were reported, which was relieved by oral ibuprofen. Children with dark penile heads and obvious pain were given a slight loosening of the elastic bandage. At 3-4 days after surgery, the penile dressing and the urinary catheter were removed. All children were discharged 4-5 days after surgery. All children's incisions healed well without incision infection, bleeding, or dehiscence, or urinary abnormalities. The patients were followed-up for 14.6 months (7-33 months), and the penile length significantly increased from 1.6 ± 0.64 cm to 6.24 ± 1.36 cm after surgery ($p < 0.05$). The postoperative penile appearance was good, and the parents of the children had high treatment satisfaction ($p < 0.05$). We reported no penile skin necrosis, scar stenosis



Figure 1. A, Preoperative penile appearance. B, Free dorsal tipped island flap. C, Dorsal tipped flap button transfer to ventral side to cover penile body. D, Intraoperative lateral penile appearance. E, Ventral penile appearance after phalloplasty. F, Postoperative penile appearance at six months.

of the incision, painful penile erection, obvious foreskin redundancy, and uneven distribution of foreskin. 38 children developed transferred flap edema, which disappeared at 3 months postoperatively.

Discussion

Concealed penis is a common disease in pediatric urology, and disagreements exist regarding the etiology, classification, diagnosis, and treat-

ment of concealed penis³⁻⁵. Currently, it is commonly accepted^{7,8} that concealed penis is caused by the thickening of the fatty layer in the pubic region at the root of the penis. In patients with severe concealed penis, the fatty layer extends from the root to the front of the penile body, transforming into an inelastic fibrous band, which limits the normal penile exposure. Tang⁶ reported that the use of progesterone-like estrogens during pregnancy may be associated with prepubic fat accumulation in nonobese children, causing short penile appearance. Thus, it was hypothesized that the prepubic fat accumulation in children with concealed penis may be resulting from the exposure to a high estrogen environment during fetal life. The short appearance of the penis caused by obesity usually has a well-developed penile body, and the exposure of the penis can be clinically satisfactory after weight loss. Therefore, concealed penis requires differentiation from short penile appearance due to obesity and simple prepuce. Children with simple prepuce have obvious penile exposure, with squeeze test (-) and improved bird's beak appearance after the narrowing of the prepuce opening is lifted. Haddi¹⁰ found that almost all children with concealed penis had congenital giant inner prepuce (LIP). He also classified concealed penis into three levels of severity according to the degree of abnormal attachment of the sarcolemma and suspensory ligament to the penis body and the presence of excessive prepubic fat found intraoperatively. Grade I is only LIP with normal attachment of the meatus and suspensory ligament. Grade II is LIP with attachment of the meatus and suspensory ligament in the middle part of the penile body. Grade III is LIP with attachment of the meatus and suspensory ligament in the distal part of the penile body and excessive prepubic fat. At present, most of the concealed penis classification is determined by personal subjective experience. Thus, poor postoperative outcomes may be caused by poorly managed surgical indications.

In the present study, 45 children with severely concealed penis were included with reference to disease typing in literature². Some children have recurrent infections of the foreskin and have difficulty in urination due to the narrowing of the outer prepuce, resulting in foreskin diverticulum. Regarding the age of surgery, a study¹¹ suggested that children over the age of 1 year are suitable for surgical management. However, it has also been suggested that pediatric concealed penis may spontaneously heal with age or weight loss, and the

children with concealed penis showed normal development of the penile body without surgical interventions. It is advocated that the age of surgical correction should be postponed until after the age of 12-14 years when children have higher androgen levels, faster penile development, greater changes in penile appearance, and the redistribution of perineal fat¹². Tang⁶ found that the treatment of concealed penis requires concurrent care of the parents' negative emotions. Therefore, considering patient conditions and psychological status of patients, surgery is discouraged in children under 3 years of age without recurrent foreskin infections and difficulty in urination. The classic concealed penis surgical approaches include the Shiraki, Johnston, Devine, and Brisson approaches¹³, as well as various modified approaches that have emerged in recent years^{14,15}. The Brisson procedure¹⁶ performs a longitudinal incision on the ventral side of the penis to release the stenotic ring of the inner and outer foreskin prepuce and to remove the dysplastic fibrous cords of the penis. However, the lack of skin coverage on the ventral side often compromises the postoperative aesthetic appearance of the penis, and the absence of white membrane fixation of the penile corpus cavernosum results in a high risk of postoperative penile retraction. Therefore, a modified Brisson+Devine procedure was adopted in the present study for severely concealed penis.

The advantages of the modified Brisson+Devine procedure include: (1) Longitudinal incision of the skin and subcutaneous tissue in the ventral median of the penis is conducive to the exposure of the field of operation. It allows adequate penile decortication and facilitates lymphatic flow back to the inner foreskin prepuce after the release of the stenosis ring, leading to reduced edema and rapid regression. (2) The dorsal-tipped island flap is protected from ischemic necrosis of the flap and the dorsal outer prepuce by protecting the vascular tissues of the flap and the subcutaneous fascia tissue of the outer prepuce when freeing the dorsal-tipped island flap. The outer foreskin prepuce covers the ventral side of the penis, and the dorsal side resembles the post-circumcision appearance after the incision heals, thereby optimizing the use of foreskin tissue. (3) The dorsal penile corpus cavernosum white membrane is fixed with the skin dermis, thereby effectively preventing postoperative penile retraction. (4) The penile tether is trimmed and reconstructed, effectively relieving the prepuce at the penile tether and postoperative swelling, while ensuring

the length of the tether and preventing painful traction after erection. (5) The transfer flap is trimmed with attention to the flap surface to facilitate the protection of the flap blood supply and lymphatic drainage. (6) This surgical approach can be combined with scrotoplasty. As an example, concealed penis combined with scrotal fusion effectively improves the appearance of penile scrotal fusion and the establishment of penile scrotal angle. Postoperative catheter and elastic bandage of petroleum jelly gauze were retained for 3-4 days to effectively reduce the edema of the inner foreskin prepuce and prevent bleeding from the incision.

Conclusions

The modified Brisson+Devine procedure for concealed penis allows maximum use of the foreskin to improve the appearance of the penis, has a high safety profile by reducing postoperative complications, and provides high treatment satisfaction.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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Informed Consent

All subjects or guardians of the patients enrolled in the study signed an informed consent form and were informed of the purpose, content, and use of the study.

Ethics Approval

This clinical study protocol has been approved by the Ethics Committee of Anhui provincial Children's Hospital (Approval No. 2020-02-2303).

Authors' Contribution

Conceived and designed the analysis: YSC, TZ. Collected the data: CKM, BP, XL, HC. Contributed to data or tools analysis: CKM, XY, QFD. Performed the analysis: CKM, BP. Wrote the paper: CKM, CY, HC.

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