Clinical Study of Modified Devine's Surgical Technique in the Treatment of Concealed Penis

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Purpose: This study aimed to observe the clinical effect of modified Devine's surgical technique in the treatment of concealed penis.

Materials and Methods: From July 2015 to September 2020, fifty-six children with concealed penis were treated with modified Devine's technique. Recorded the penile length and the satisfaction score preoperatively and postoperatively to confirm the effect of the surgery. Followed up the penis for bleeding, infection and edema one week and four weeks after the operation. Twelve weeks after the operation, we measured the length of the penis and observed whether there was a retraction.

Results: The length of the penis has been effectively lengthened($P < 0.001$). There was significant improvement in parents' satisfaction grades ($P < 0.001$). All the patients had different degrees of penile edema after the operation. Most of the penile edema subsided about four weeks after the operation. No other complications occurred. No obvious penile retraction was found twelve weeks postoperative.

Conclusion: The modified Devine's technique was safe and effective. As a treatment for concealed penis, it is worthy of wide clinical application.

Keywords: concealed penis; devine; modified; curative effect evaluation; surgical treatment

INTRODUCTION

Concealed penis is a congenital penile disease, wherein the penis is concealed under the skin due to the abnormal development of the penile sarcoplasm[1]. This affects the normal development of the penis, resulting in its short length, causing physical and mental stress to patients, and extensively affecting their sex lives in the future[2]. A concealed penis can also increase the risk of urinary tract infections[3,4].

Penile plastic surgery is the main treatment for concealed penis. Devine operation is often used in the treatment of such cases[5]; however, during the surgery. Without a V-Y plasty, the post-surgical appearance of the penis is not similar to that of a conventional penis. In this study, we discuss the effects of the modified Devine operation in the treatment of concealed penis[6].

MATERIALS AND METHODS

Study Population

From July 2015 to September 2020, fifty-six patients with concealed penis were treated with modified Devine operation. The age ranged from 4 to 10 (6.9 ± 1.9) years, and the length of the penis was 0.9-3.7 (2.1 ± 0.4 cm preoperation. After evaluation, the P value of the penis length of patients is 0.754. Obeys normal distribution. Inclusive criteria: (1) The age of the patients ranged from 4 to 10 years; (2) the penis was concealed under the skin. Exclusion criteria: (1) surgical contraindications; (2) Buried penis caused by obesity in children; (3) Hypospadias or epispadias. (4) previous penile surgery. All patients signed informed consent before the operation.

Surgical Procedures

In the modified Devine's technique, general anesthesia was administered before the commencement of the operation. Then, the inner and outer plates of the prepuce were incised circularly at the narrow area of prepuce; Removed the narrow ring of the foreskin, resected the superfluous inner plate, and then, the superficial layer of the deep fascia was dissected to disconnect the thickened fibrous cord. To protect the patient's erectile function, extra caution was taken to protect dorsal blood vessels and nerves. The whole procedure should be performed snugly to the penile tunica albuginea. The prepubic fat pad was not excised. The next stage was to recover the penoscrotal angle[6]. To restore the normal appearance of the penis, a Y-shaped incision was made in the skin between the penis and the scrotum. Be careful not to damage the scrotal arteries on both sides. Continue eliminating pathological traction around the incision. Completely circular resectted the dartos fascia at the bottom of the penis. The penoscrotal angle was also finished[7]. The next stage is to find the body sur-

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Table 1. Following up of penis length and satisfaction score

Variables[a]		Pre-OP	Post-OP	12 weeks	*p*-value
Penile length,cm,mean ± SD (range)		2.1 ± 0.4	3.3 ± 0.6	3.1 ± 0.6	< 0.001
Satisfaction score (0~5)	Morphology	1.6 ± 0.5	4.5 ± 0.6	4.4 ± 0.6	< 0.001
	Penile length	2.2 ± 1.0	4.3 ± 0.7	4.3 ± 0.7	< 0.001
	Hygiene	1.7 ± 0.6	——	4.8 ± 0.5	< 0.001
	Micturition	2.5 ± 0.2	3.4±0.3	4.4 ± 0.1	< 0.001

[a]:Continuous variables were compared by independent samples *t*-test

face projection of the penile root. Suture the dorsal side of the penis and the penile tunica albuginea at 2 o'clock, 10 o'clock and 12 o'clock of the dorsal root of the penis[8]. Which aimed to reduce the impact of pubic fat pad on penis exposure and prevent penis from contracting. The postoperative appearance of the concealed penis is also greatly improved. So the retracted penis was removed from pathological traction eventually and its original length was restored. Sutured the incision after rigorous hemostasis. The individual steps of the surgical procedure was shown in **Figure 1**. The incision was wrapped around the cutting edge with a Vaseline-coated gauze, and the outer layer was properly pressurized and bandaged using elastic bandages. This was done without an indwelling catheter to avoid the pain caused due to it . Patients with a high risk of thrombus were treated with nadroparin calcium. The medication was changed every 3 days. One week after the operation the gauze was removed (**Figure 2**).

Evaluation

Evaluated the satisfaction score of the patients preoperative and twelve weeks after the operation. Satisfaction score was assessed by questionnaire. One week after the operation, the gauze was removed to check for infection, edema, hemorrhage and skin necrosis in the incision site. Four weeks after the operation, these were observed again. The length of the penis was measured postoperatively and twelve weeks after the operation. It was compared with original length of penis. To see if the length of the penis was retracted.

Statistical Analysis

SPSS 26.0 was employed for all statistical analyses. The measurement data was expressed as mean(SD), paired t-test was used for component comparison, $P < 0.05$ was considered to be statistically significant.

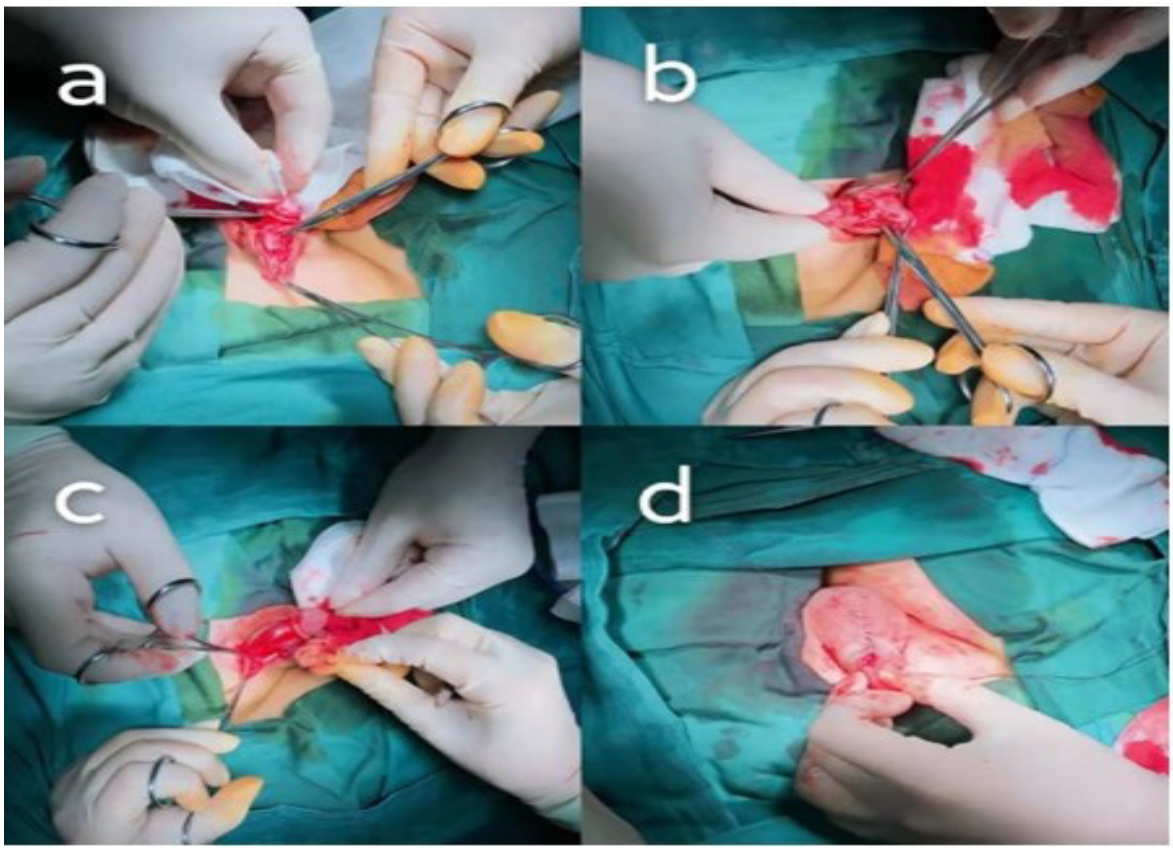

Figure 1. Surgical procedure of the modified Devine's operation. **(a)** Incising circularly at the narrow area of prepuce and disconnecting the thickened fibrous cord. **(b)** Completely circular resectted the dartos fascia and made a Y-shaped incision. **(c)** Suture the dorsal side of the penis and the penile tunica albuginea at the dorsal root of the penis. **(d)** Sutured the incision after rigorous hemostasis.

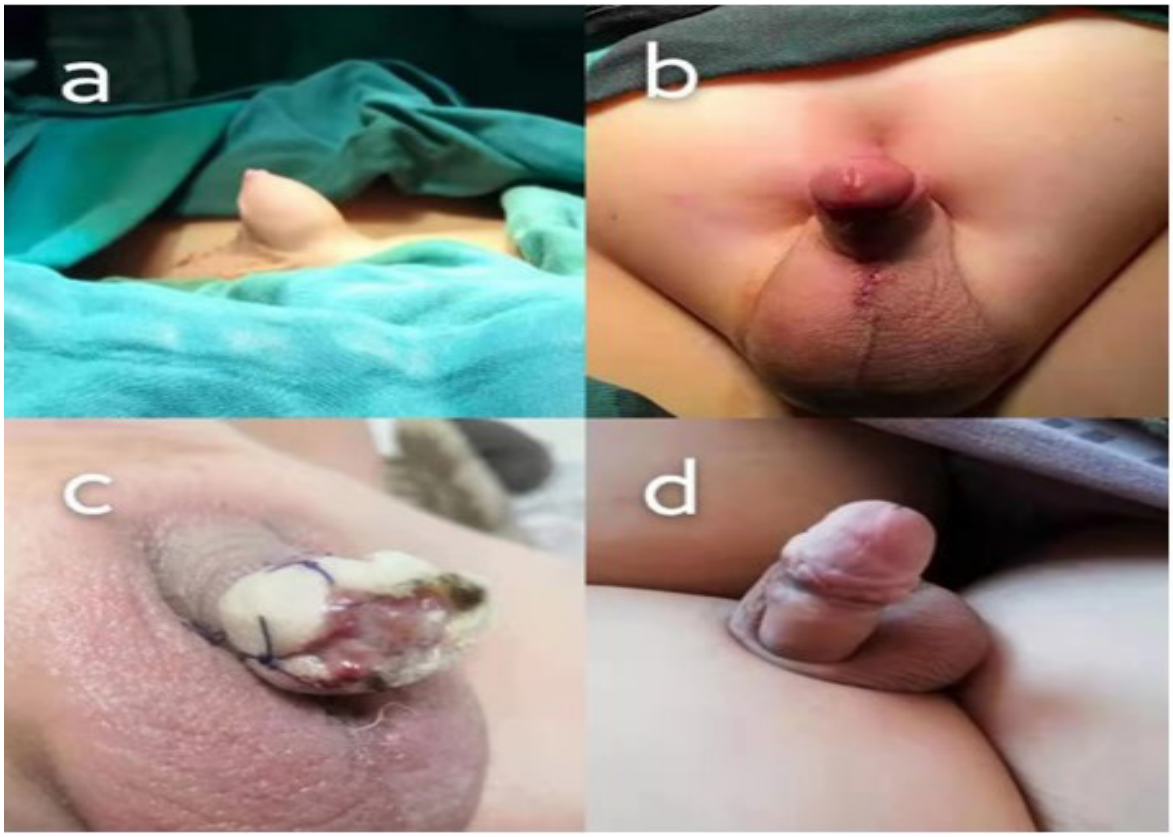

Figure 2. Comparison of surgical outcome. **(a)** Preoperative appearance of penis. **(b)** Postoperative appearance of penis. **(c)** Postoperative visiting (One week after the operation). **(d)** Postoperative visiting (Four weeks after the operation).

RESULTS

Length

The length of penis was 2.1±0.4cm preoperatively and 3.3±0.6cm postoperatively. Twelve weeks after the surgery, the length of penis was 3.1 ± 0.6. Which showed a significant increase in length. ($P < 0.001$, **Table1**); Twelve weeks after surgery, according to the clinical efficacy, the patients were divided into three groups: Effective significantly showed that there was no retraction of the penis; Effective showed that the penis had mild retraction; Invalid showed that there was no significant change in the length of the penis. The results showed that only five patients had mild retraction. The retraction rate is 8.9%.

Satisfaction

Most patients have satisfactory results. The Satisfaction score effect is judged from four aspects: morphology, penile length, hygiene and micturition. These four aspects are also the most troubling for patients and parents. Judging from the results we get, the satisfaction scores have improved, the difference was statistically significant ($P < 0.001$, **Table 1**).

Complications

56 cases of surgical patients all had different degrees of penile edema, but most of them resolved after 4 weeks. Four patients had severe penile edema and subsided 7 weeks after the operation. No other complications like hemorrhage, infection and skin necrosis occurred.

DISCUSSION

Concealed penis involves an abnormal development of the penile sarcoplasm[9]. The elastic penile sarcoplasm becomes fibrous, leading to poor elasticity. The abnormal development of the penile sarcoplasm leads to the adhesion of the penis and its traction towards the body[10]. The penis cannot be exposed normally, which affects the normal development of the penis and leads to a short appearance of the penis called “concealed penis”.

Additionally, a short appearance of the penis can also be caused by obesity. In the outpatient service, we also met a certain number of such patients. Excessive adiposity can lead to penile shortness due to fatty accumulation under the pubic bone[11]. However, the development of penile sarcolemma is normal in this condition. The original length of the penis can be restored by losing weight[12], and the development of the penis is not affected. For this kind of patients, we usually recommend that they should be reexamined after losing weight.

The best way to treat a concealed penis is to operate it as soon as possible. However, there are many surgical methods for the treatment of a concealed penis, such as Devine[5], Shirk[13], and others. Devine operation has been widely used in clinical practice as the main method of treating concealed penis. However, the traditional Devine operation removes the fat pad on the pubic bone which increased the trauma; Without recovering the penoscrotal angle leads to unsatisfactory postoperative appearance; The postoperative indwelling catheter

also brings more pain to the patient. Therefore, a modified Devine operation was developed for the treatment of concealed penis. Several improvements were made on the traditional Devine operation: ① Concealed penis is usually associated with foreskin stenosis. A ring incision was used to relieve the stricture of prepuce on the head of the penis. Resect the redundant inner plate to accelerate the disappearance of postoperative lymphedema; ②Made a Y-Shape incision at the angle of the penis scrotum, further remove the fiber cords located at the root of the penis, to recover the penoscrotal angle. Which can considerably improve the cosmetic appearance. ③The subpubic fat pad was not removed, the operation injury was reduced;④Find the surface projection of the penile angle, and suture the subcutaneous tissue with the penile angle to avoid the effect of fat pads on penis length, prevent further retraction of the penis and ensure the normal attachment between the penis and the skin. ⑤The operation was done without an indwelling catheter to avoid the pain caused due to it. We also counted the main reasons that bothered patients. Find that forty-four percent of the patients came to the hospital because their penis was too short and their parents suspected that penis is stunted. Twenty-one percent of patients came to the hospital because of recurrent urinary tract infection. Twenty-nine percent of patients went to the hospital because of the redundant prepuce and phimosis, and later found out that it was a concealed penis. Their parents afriad they missed the most appropriate stage of treatment, affecting the normal development of the penis. Ridiculed by peers, affecting their mental health. Greatly troubled their lives. Therefore, we should pay more attention to the patients with redundant prepuce or phimosis to find out that whether they are combined with concealed penis. Which also leads to dysuria and urinary tract infections. Additionally, it has been reported that chronic inflammation caused by concealed penis may be a risk factor for penile cancer and gives rise to the possibility of penile resection[14,15]. Therefore, active early intervention is necessary.

The study has some advantages. All the operations were performed by the same doctor. It ensures the consistency of surgical technology. At the same time, the short-term follow-up data were complete, and there were no patients loss to follow-up. But the study also has two limitations. The first is that the study is only a singlecenter study and lacks multicenter study. The second is that the study has a short follow-up time and lacks long-term follow-up.

CONCLUSIONS

To sum up, for patients with concealed penis, the modified Devine operation is safe, feasible and effective. It can release the penis from the traction of the dysplastic fibrous cords, restored the length of the penis. Relieve the circumcision improved the hygiene condition effectively. At the same time, it also had a good cosmetic postoperative appearance. Both the patients and their parents were satisfied with the operation. So it is worthy of clinical widely application.

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CONFLICT ON INTEREST

The authors report no conflict of interest.

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