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Use of Inner Preputial Flap and Buck's Fascia Versus Buck's Fascia Only during Coronal and Subcoronal Hypospadias Repair

Anik Dawre[1] Tahmina Akhter Chowdhury[2] Md. Abdullah Al Farooq[3]
Tanvir Kabir Chowdhury[4*]

Abstract

Background: Reconstructive surgery for hypospadias is very challenging with multiple complications. Hence several approaches were addressed. To strengthen neourethra second and third layer of vascular tissue flaps are tried. The aim of the present study was to compare the outcome between inner preputial flap and Buck's fascia covering with Buck's fascia only covering over neourethra in coronal and subcoronal hypospadias.

Materials and methods: This was a quasi-experimental study conducted at Department of Paediatric Surgery in Chittagong Medical College Hospital, Chattogram from June 2021 to September 2023. A total of 32 patients of coronal and subcoronal hypospadias aged below 12 years with urethral plate >8 mm wide were included in this study. The even number patients were used both preputial flap and Buck's fascia (n_1=16) for covering andodd number patients (n_2=16) were treated with only Buck's fascia. Postoperative wound infection, wound dehiscence, urinary stream, Urethrocutaneous (U-C) fistula and meatal stenosis during 3 consecutive follow up were compared.

Results: The median age of the patients in inner preputial flap and Buck's fascia group and only Buck's fascia were 5.5 and 7 years respectively. In both preputial flap and Buck's fascia group 14 (87.5%) had coronal hypospadias and 2 (12.5%) patients had subcoronal hypospadias. In Buck's fascia group, 12 (75.0%) had coronal hypospadias while 4 (25.0%) patients had sub-coronal hypospadias. Inbothinner preputial flap and Buck's fascia group, 5 (31.3%) patients had spray of urinary stream postoperatively whilein the Buck's fascia group, 3 (18.8%) patients had spray of urinary stream postoperatively (p=0.685). Among the 16 patients in both preputial flap and Buck's fascia group, 5 (31.3%) developed UC fistula while among the 16 patients in the Buck's fascia group, 3 (18.8%) developed UC fistula (p=0.685). None of the patients in either group developed wound infection, wound dehiscence or meatal stenosis.

Conclusion: For coronal and subcoronal hypospadias additional inner preputial flap does not significantly improve outcome than single layer cover by Buck's fascia over neourethra.

Key words: Buck's fascia; Coronal hypospadias; Inner preputial flap; Subcoronal hypospadias; Urethrocutaneous fistula.

1. Resident Doctor of Pediatric Surgery
Chittagong Medical College Hospital, Chattogram.
2. Associate Professor of Pediatric Urology
Chittagong Medical College, Chattogram.
3. Associate Professor of Pediatric Surgery
Chittagong Medical College, Chattogram.
4. Associate Professor of Paediatric Surgical Oncology
Chittagong Medical College, Chattogram.

***Correspondence: Dr. Tanvir Kabir Chowdhury**
Cell : 01771 47 77 66
E-mail: ivan_tanvir@yahoo.com

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Introduction

Hypospadias occurs in approximately 1 in 300 live births.[1] The surgical goals of hypospadias repair include not only achieving full straightening of the penis but also creating a urethral meatus at the tip of the penis and ensuring adequate cosmetic appearance. Despite advancements in medical techniques, complications like urethrocutaneous fistula, meatal stenosis, urethral flap necrosis and dehiscence can still occur in procedures involving the urethra. For that second and sometimes third layer coverage after urethroplasty is needed. The covering flap of the neourethra is usually raised from the inner preputial skin may result in penile torsion and devascularization of the preputial skin that is often used in reconstruction of the penile skin. Using a ventral dartos flap to cover the neourethra can help prevent complications such as urethral fistula formation or urethral stricture. Complications can still occur despite modifications in hypospadias repair techniques.[2]
There have been attempts to apply Buck's Fascia (BF) and the glans as integral covering tissues, providing an intermediate layer to cover the neourethra in Tubularized Incised Plate (TIP) which has better outcome than that of simple pedicled Dartos Fascia (DF). Bucks fascia is the toughest fascia of the penis so if the neourethra is covered by Bucks fascia it gives more strength. Inner preputial flap is also a vascularized layer by covering this layer neourethra can get more

vascular layers coverage so it gives more strength to neourethra.[3]

In Bangladesh, no study has been done comparing two layers versus one layer covering urethroplasty by TIP procedure. In this study we aimed to find out the outcome of the inner preputial flap and Buck's fascia covering versus Buck's fascia covering only in repair of coronal and subcoronal hypospadias.

Materials and methods

It was a quasi-experimental study conducted at the Department of Paediatric Surgery, Chittagong Medical College and Hospitalfrom June 2021 to September 2023.Patient aged ≤12 years who were diagnosed as Coronal and Subcoronal hypospadias, urethral plate > 8 millimeters wide were included. Surgeries were performed by a single surgeon. Patients who had previous hypospadias surgery or used testosterone injections were excluded. 16 patients were consecutively selected for each group. The study hypothesis was -In coronal and subcoronal hypospadias repair inner preputial flap with Buck's fascia covering gives better outcome than Buck's fascia covering only. The general objective was to compare the outcome between the inner preputial flap and Buck's fascia covering with Buck's fascia only repair in coronal and subcoronal hypospadias. The specific objectives were to compare fistula formation rate, meatal stenosis, wound dehiscence, urinary stream and rate of infection between two procedures.

For urethroplasty we used only TIP urethroplasty. Under general or spinal anaesthesia, patient was placed in supine position. Preoperative prophylactic dose of antibiotic (Ceftriaxone and flucloxacillin) was given according to body weight. Operative site was cleaned by hexiscrub and normal saline. After painting and drapping, a traction suture was applied to the glans by 4/0 round body proline. A U-shaped incision was made around the urethral plate border and hypospadias orifice. Then circumcoronal preputial incision was made and the penis was degloved. Two parallel longitudinal incisions were made to separate the lateral edges of the urethral plate from the glans wings. An artificial erection test was performed to assess ventral curvature. A midline incision was given and incised urethral plate was tubularized using 6/0 polyglactin sutures over a stent in one layer, turning all of the epithelium into the neourethral lumen. Tubularization of the urethral plate started from distal to proximal After the urethroplasty, a Buck's fascia is harvested and tacked in place using 6-0 vicryl in one group. In another group inner prepitual flaps are created, rotated ventrally and tailored to ensure adequate penile shaft coverage over Buck's layer. The epidermis is closed using 6-0 vicryl. Urethral stent is fixed and kept for 07 days. To prevent the formation of a fistula we tried to avoidance of tissue trauma as far as possible.Tourniquet was used during operative procedure. Initially tourniquets were given for 30 minutes. If needed duration was extended by 20 minutes and 10 minutes.

Data collection instruments include case record form which contains preoperative, operative and post-operative questions including follow up assessment to record meatal location and shape, urinary stream and presence of fistula. The data was entered, cleaned and coded using Statistical Package for Social Sciences (SPSS) version 23. Missing data were checked through frequency run. The numerical data was expressed as mean with standard deviation. The categorical data was expressed as number and percentage and was compared by the use of the Fisher'sexact test. The result was presented in tables. 95% Confidence Intervals (CI) was calculated for these values. It was assumed that the result was comparable one with other studies and after completion the result was prepared for publication and dissemination of ideas.

Descriptive analysis like data of socio-demographic characteristics such as age and number and type of complications was shown by frequency and percentage presented in tables. Inferential analysis was done according to the objectives of the study. Data was presented in tables. Between these group continuous (Age) and categorical variables (Urethrocuateneous fistula, meatal stenosis, wound disruption) was analyzed. Categorical variable was compared by means of Fisher's exact test.

Ethical clearance was obtained from Institutional Review Committee of Chittagong Medical College and Hospital (Memo no- CMC/PG/ 2022/875). The study was performed according to Helsinki declaration.

Results

In the preputial flap group, 13 (81.3%) patients were in 6-12 years age group while inthe Buck's fascia group, 8 (50.0%) were in the 6-12 years age group. The median age of the patients in both preputial flap and Buck's fascia group and Buck's fascia only group were 5.5 and 7.0 years respectively. There was no significant statistical difference between the groups regarding age as the p value was >0.05.

In both preputial flap and Buck's fascia group, 14 (87.5%) patients had coronal hypospadias while 2 (12.5%) patients had sub-coronal hypospadias. Again,in the Buck's fascia group, 12 (75.0%) patients had coronal hypospadias while 4 (25.0%) patients had sub-coronal hypospadias (Figure 1).

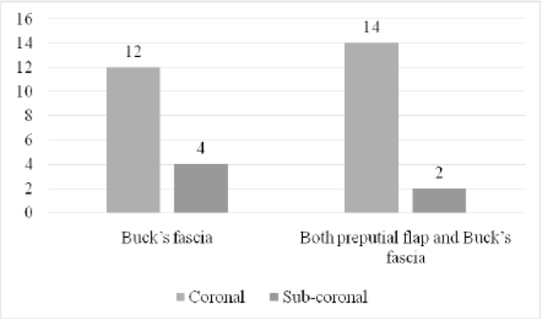

Figure 1 Comparison of type of hypospadias between the groups (n=32)

The median glans urethral plate length of the patients in both preputial flap and Buck's fascia group and Buck's fascia only group were 14.0 and 14.3 mm respectively (Table 1).The preoperative penile length was 38.2 mm which became 39.1 mm postoperatively in both preputial flap and Buck's fascia group. On the other hand, the preoperative penile length was 38.5 mm which became 39.0 mm postoperatively in Buck's fascia group. There was no significant statistical difference between the groups regarding penile length as the p value was >0.05.

Table I Comparison of patients by penile length between the groups (n=32)

Criteria	Buck's fascia Median [IQR]	Both preputial flap and Buck's fascia Median [IQR]	p value
Glans urethral plate length (mm)	14.3 [12.4, 15.2]	14.0 [12.2, 14.9]	0.956*
Preoperative penile length (mm)	38.5 [35.5, 41.9]	38.2 [35.5, 41.5]	0.564*
Postoperative penile length (mm)	39.0 [36.4, 42.6]	39.1 [36.1, 42.1]	0.780*

IQR=Inter Quartile Range, *= Mann-Whitney U test.

In both preputial flap and Buck's fascia group, 11 (68.7%) patients had single stream postoperatively while inthe Buck's fascia group, 13 (81.2%) patients had single stream postoperatively (Table II). There was no significant statistical difference between the groups regarding postoperative urinary stream as the p value was 0.685.

Table II Comparison of post-operative urinary stream between the groups (n=32)

Post-operative urinary stream	Buck's fascia (n=16)	Both preputial flap and Buck's fascia (n=16)	p value
Spray	3 (18.8%)	5 (31.3%)	0.685*
Single stream	13 (81.2%)	11 (68.7%)	

*=Fisher Exact test.

Among the 16 patients in both preputial flap and Buck's fascia group, 5 (31.3%) developed urethrocutaneous fistula while amongthe 16 patientsin Buck's fascia group, 3 (18.8%) developed urethrocutaneous fistula (Table III). There was no significant statistical difference between the groups regarding development of urethrocutaneous fistula as the p value was 0.685. None of the patients in any group developed wound infection, wound dehiscence and meatal stenosis.

Table III Comparison of post-operative complications between the groups (n=32)

Post-operative complications	Buck's fascia (n=16)	Both preputial flap and Buck's fascia (n=16)	p value
Urethrocutaneous fistula	3 (18.8%)	5 (31.3%)	0.685*
Wound infection	0 (0.0%)	0 (0.0%)	N/A
Wound dehiscence	0 (0.0%)	0 (0.0%)	N/A
Meatal stenosis	0 (0.0%)	0 (0.0%)	N/A

*=Fisher Exact test.

Discussion

Hypospadias is a congenital condition with insufficient ventral penile tissue development.[4] The goals of surgical correction for hypospadias are to minimize morbidity while reconstructing the urethra, fixing the chordee and improving cosmesis. Although numerous methods have been detailed, there is not one that is unquestionably the best for urethroplasty. The position of the urethral meatus, the degree of chordee and the surgeon's experience and preference all play a significant

role in the decision about the best technique. One or two stages of repair are possible and most of the time the patient's preputial skin is used for reconstruction.[5] Extra flap during the Tubularization of an Incised Urethral Plate Urethroplasty (TIPU) is thought to reduce postoperative problems. Given the risks involved, it is still controversial whether employing an additional flap is worthwhile.[6]

The median age of the patients in both preputial flap and Buck's fascia group and Buck's fascia only group were 5.5 and 7.0 years respectively. Overall age ranged from 1.5 years to 12 years in both groups. Das et al. performed a prospective interventional study among 60 patients who underwent hypospadias repair using the Snodgrass technique and observed that the mean age of the patients was also within this range.[7]

In the both preputial flap and Buck's fascia group, 11 (68.8%) patients had single stream and 5 (31.3%) patients had spray of urinary stream postoperatively. In the Buck's fascia group, 13(81.2%) patients had single stream and 3(18.8%) patients had spary of urinary stream postoperatively. In the retrospective study of Zhang et al. all patients had straight stream. Our study shows spray of urinary streams may be due to suboptimal meatal reconstruction.[8]

One of the most frequent issues following hypospadias repair surgery is an urethrocutaneous fistula, which can develop at different rates and is an intrinsic complication of the procedure. Although numerous changes to TIP urethroplasty have been made to lower the incidence of urethrocutaneous fistula formation, no one surgical method can be regarded as a gold standard for preventing fistula formation.[7] In both preputial flap and Buck's fascia group, 31.3% patients developed urethrocutaneous fistula while in Buck's fascia group, 18.8% patients developed urethrocutaneous fistula and this difference was not statistically significant. The incidence of fistula formation was 6.2% in the study of Zhang et al. Overall fistula formation is more in this study may be due to less expert surgical team.[3]

For the second layer coverage, the inner preputial layer was taken from the dartos fascia. This additional layer did not give any extra benefit to the patients in terms of post-operative complications as we found no significant difference between the groups regarding this issue. Chakraborty et al. evaluated the outcome of TIPU with or without a Preputial Dartos (PD) flap and found that this additional flap did not affect the post-operative complications.[6] Moreover, the use of additional flap, increases the operative time by 30–45 min for isolating the flap and covering the neourethra. This prolonged surgery and subcutaneous epinephrine use might have additional unfavorable effects on the postoperative outcome of urethroplasty.[8,9]

Wound dehiscence is a very rare complication and only few cases are reported. Wound dehiscence and infection rate is <1% in the study. In both group wound dehiscence and infection rate was 0% in our study may be due to proper tissue dissection and use of 2 antibiotics.

The incidence of meatal stenosis was 3.1% in the study of Alsharbaini and Almaramhy.[2] No meatal stenosis developed in our study as because we made an adequate neo meatus over a stent.

The overall complication rate in this study was 25.0%. A 12% complication rate was reported by Snodgrass et al. following up on 792 cases of initial repair of hypospadias.[10] The multicenter study of Zhang et al. used Buck's Fascia in one stage hypospadias repair and found that the complication rate was 8.5% to 16.1%.3 This rate was lower than the present study probable causes have already explained.[8]

The present study shows Buck's fascia only covering and Buck' fascia with inner preputial fascia covering has no significant outcome in coronal and subcoronal hypospadias repair. Rather, the fistula formation rate is a little bit higher in Buck's fascia and inner preputial group than that of Buck's fascia only group.

Limitations

- It was a single center study. So, the findings of the study were not representative of the whole population of Bangladesh.
- Consecutive sampling technique was applied in this study which might result in some selection bias.
- As the study was a quasi experimental study, causal relationship between factors and outcome could not be determined.

Conclusion

In coronal and subcoronal hypospadias, inner preputial flap with Buck's fascia covering and Buck's fascia only repair shows no significant difference in outcomes after urethroplasty in term of fistula formation. Rather UC fistula formation and spray of urine are little bit more in Buck's fascia and inner preputial layer covering than Buck's fascia only covering. Single layer (Buck's fascia only) covering can be used torepaircoronal and subcoronalhypospadias and additional inner preputial layer is not needed.

Recommendation

Our study recommends that to do single layer Buck's fascia coverage after urethroplasty for coronal and sub coronal hypospadias. Additional second layer inner preputial flap does not improve outcome.

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Contribution of authors

AD-Acquisition of data, data analysis, drafting and final approval.
TAC-Data analysis, interpretation of data, drafting and final approval.
MAAF-Design, critical revision and final approval.
TKC-Conception, interpretation of data, critical revision and final approval.

Disclosure

All the authors declared no conflict of interest.

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