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Two Stage Bayar's Flap Technique in Proximal Penile Hypospadias: Retrospective Study

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Abstract
Hypospadias is the third most prevalent congenital abnormality, with an occurrence rate of 3-4 per 1000 live births. Proximal hypospadias with chordee is the most complex form to surgically repair. Despite numerous documented surgical procedures, there is ongoing debate regarding the most effective method for managing severe hypospadias. While Single stage repair has demonstrated efficacy in certain cases, a staged approach is often preferred for cases with severe chordee to ensure sufficient straightening and lengthening of the penis. We conducted a study at our center from 2019-2024, including 50 patients with proximal penile hypospadias and severe chordee, some of whom also had other associated congenital problems. Data collected includes patients age at operation, degree of chordee, complications and cosmetic outcomes. All patients underwent staged Bayar's flap surgery. The first stage involved chordee release and Bayar's flap mobilization, followed by urethroplasty in the second stage after 6-18 months. Patients were followed up for a minimum of one year after the second stage. The age group of 1.5-5 years had the highest number of patients (28), followed by the 5-10 years group (14) and the 10-15 years group (8). Among the 50 patients, 38 had proximal penile hypospadias, 10 had penoscrotal hypospadias, and 2 had scrotal hypospadias. Complications included urethro-cuteaneous fistula (5 patients), meatal stenosis (1 patient) and glans dehiscence (3 patients). There were no cases of complete disruption of repair, epididymitis orchitis, recurrence of chordee, or flap necrosis. The two-stage procedure using Bayar's technique is a challenging but effective approach for proximal hypospadias. It reduces the rate of fistula formation, disruption, and stenosis and provides satisfactory cosmetic results. The success of the repair heavily depends on the accurate measurement of the urethral strip in the second stage, with all surgeries performed by a single surgeon.

INTRODUCTION

Hypospadias is the third most prevalent congenital abnormality, following clubfoot and hydrocele, with an occurrence rate of 3-4 per 1000 live births. Occasionally, it may be accompanied by cryptorchidism, renal malformations, hernias and other congenital abnormalities. Numerous surgical procedures have been documented for the treatment of hypospadias, highlighting the challenge of achieving optimal outcomes in addressing this issue[1]. Proximal hypospadias with chordee is the most complex form of hypospadias to surgically repair[2]. Over the past decade, there has been considerable debate about the management of severe hypospadia[3]. There is a debate about the most effective method for treating proximal hypospadias. While single stage repair has demonstrated efficacy in certain types of cases, for cases with proximal hypospadias with severe chordee, many still prefer using a typical phased method to ensure sufficient straightening and lengthening of the penis during the initial treatment. This can be done through dorsal mobilization of Bayar's flap (inner preputialskin) brought ventrally in stage one and later on after 6 months tabularization of Bayar's flap stage 2.

MATERIALS AND METHODS

We have data from our centreduring the period from 2019-2024. We included cases of proximal penile hypospadias with severe chordee. we included all the patients of other associated congenital problems like undescended testis and other renal anomalies. We have collected data of 50 patients of proximal penile hypospadias at our institute in the department of surgery. we collected data including patient age at operation, degree of chordee, proximal penile hypospadias, complications and cosmetic outcome. All patient were examined in OPD. All patients underwent anesthesia check up and preoperative profile done. The age of the patients ranged from 1.5-up to 15years. All Patient included in our study operated underwent staged Bayar's flap surgery. All the patients underwent two stage surgery with 6-18 months interval. All patients were followed up for minimum of 1 year after second stage surgery. The first procedure was to release the chordee and mobilization of Bayar's flap with raise of glans wings. Bayar's flap brought ventrally on penile surface and sutured till the glans tip. The second procedure was the urethroplasty.

Procedure: The patients were at least 1.5 years old to have acceptable size penis. If the penis was relatively small, preoperative aqueous testosterone injection (1-2 mg/kg) was given to enlarge its size. 3 injections were given at the 4 weeks interval and operated after 15 days of the last injection. In the first procedure, the Bayar's flap technique was performed. A 4/0 prolene stitch was placed on the glans for traction and a 6 Fr silastic NG tube was inserted. Surgery was performed under general anaesthesia with infiltration with 1:100000 lignocaine and adrenaline solution. A circumferential dorsal incision was made about 1/2 cm from the base of the glans. This was advanced ventrally along the urethral plate till it passes to the proximal edge of the urethral meatus. Then it extended vertically in the midline proximal to the meatus. The incision is racket shaped.

Complete degloving of the penile shaft was performed till its base and transection and excision of the urethral plate was done just proximal to the glans in every case. Then, artificial erection was performed to demonstrate any residual chordee. Dorsal tunica albuginea plication was performed in patients with persisting chordee even after ventral correction. Glanular wings were raised .The meatus was spatulated. The dorsal preputial skin was then incised in the middle and the two flaps were brought ventrally. Preputial skin flap (Bayar's flap) sutured to cover the raw area created on splaying of the glans wings and on areas created after release of chordee. These were sutured to the glans and to each other in the midline of the shaft (Fig. 1,2). The catheter was removed after 5 days.

The second stage was performed 6-12 months later. A traction suture and 8 Fr silastic NG tube were inserted. Then, the strip of the rotated skin was folded over it to measure the size of future neourethra. The width of this strip was measured according to the catheter circumference. Parallel lines were marked on the ventral side of the penis. Incisions were made along these lines to the tip of the glans. The rotated skin was tabularised around the 8 Fr silastic NG tube to make the new urethra using 5-0 polyglactin edge inverting continuous running suture. This tube must be of a sufficient width to allow the catheter to be removed without tearing the neourethra. A second layer interrupted 5-0 polyglactin sutures were taken from the penile adventitial tissues as a waterproof layer over the first suture line. At last, the penile skin is sutured in two layers (Fig. 3,4). Dynoplast penile dressing was applied. The dressing was changed after 5-7 days and the catheter was removed after 15 days. If the patient is able to pass urine per urethra after this, he is discharged with the advice to return to clinic at 1 week. We followed our patients at 7 days, 15 days, 1 month, 3 months and 6 months.

This is the intraoperative images of stage I and stage II procedure done in our Institute.

RESULTS AND DISCUSSIONS

In a study examining the distribution of patients across different age groups, data revealed that the age group of 1.5-5 years had the highest number of patients, totaling 28. This was followed closely by the

5-10 years age group, which had 14 patients. The number of patients then declined significantly in the older age groups, with 8 patients in the 10-15 years age group.

The table categorizes patients into three age groups: 1.5-5 years, 5-10 years and 10-15 years. The number of patients in each group is listed as follows: 28 patients are in the 1.5-5 years age group, 14 patients are in the 5-10 years age group and 8 patients are in the 10-15 years age group. This distribution indicates a higher prevalence of patients in the youngest age group (1.5-5 years) compared to the older age groups.

The table provides information on the number of patients diagnosed with different types of hypospadias. The types listed are proximal penile, penoscrotal and scrotal. The distribution of patients is as follows: 38 patients have proximal penile hypospadias, 10 patients have penoscrotal hypospadias and 2 patients have scrotal hypospadias. This data shows that proximal penile hypospadias is the most common type among the patients included in our study, while scrotal hypospadias is the least common.

The table details the complications observed in patients, along with the number of patients affected by each. The complications and their respective patient counts are as follows: urethra-cuteaneous fistula developed 5 patients, meatal stenosis in 1 patient, and glans dehiscence affects 3 patients. No patients have been reported with urethral diverticulum, complete disruption of repair, epididymitis orchitis, recurrence of chordee, or flap necrosis. This data indicates that urethrocuteaneous fistula is the most common complication among the patients, while other complications were less commonly seen in our study.

Hypospadias is one of the most common congenital defects of male external genitalia, occurring in approximately 1 in 250 live male newborns, of which proximal hypospadias (penoscrotal, scrotal and perineal types) account for 20% of all cases[4,5].

During the last 5 years, the approach to severe hypospadias has been controversial[6]. This controversy exists with regard to the best approach to proximal hypospadias. There have been many operations described for repair of hypospadias, which reflect the difficulty in getting optimum results from the surgery for this condition[7]. Although one-stage repair has been shown to be successful for some forms of proximal hypospadias, many still favour a more traditional-staged approach when moderate to severe chordee is present to achieve adequate straightening and lengthening of the penis at the time of the first-stage repair. This is achieved either by division of the urethral plate or Bayars' flaps are created and mobilized ventrally to cover the ventral shaft of the penis[8].

Hypospadias is usually accompanied by a band of fibrous tissue that extends from the abnormal meatus to the glans and this band frequently shortens the ventral aspect of the penis. This chordee produces a downward curvature of the penis, noted during erection.

Fig. 1: Catheter removed

Fig. 2: Catheter removed after 5 days

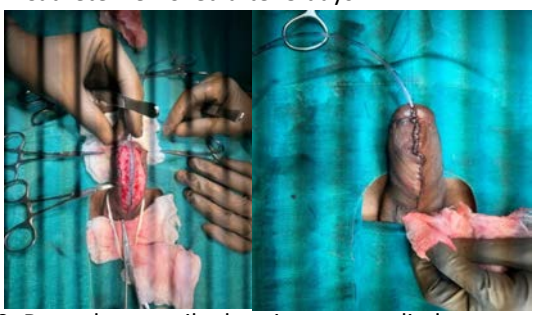

Fig. 3: Dynoplast penile dressing was applied

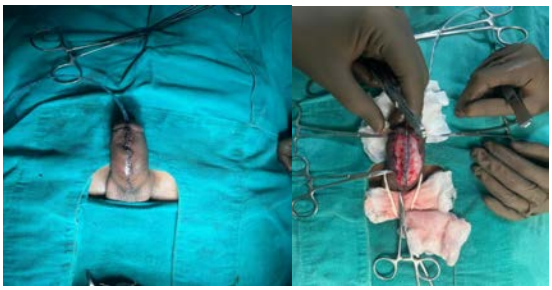

Fig. 4: The dressing was changed after 5-7 days and the catheter was removed after 15 days

Table1: Age group.

S. no.	Age group	No. of patients
1	1.5-5 years	28
2	5 -10 years	14
3	10-15 years	8

In Table 2: Types of Hypospadias.

S .no	Types of hypospadias	No. of patients
1	Proximal penile	38
2	Penoscrotal	10
3	Scrotal	2

In Table 3: Complications observed in patients, along with the number of patients affected by each.

S. no	Complications	No. of patients
1	urethro cuteaneous fistula	5
2	Meatal stenosis	1
3	Urethral diverticulum	
4	Glans dehiscence	3
5	Complete disruption of repair	nil
6	Epididymitis orchitis	nil
7	Recurrence of chordee	nil
8	Flap necrosis	Nil

Notwithstanding the dispute on single-stage versus two-stage repairs, agreement exists that procedure assignment in hypospadias repair is based on the patient's individual anomaly and on the surgeon's experience and preference. However, the ultimate surgical goal is common and that is to reconstruct a normal or near-normal appearance of penis mimicking that of postcircumcision one, to have adequate calibre, water-proof neourethra extending to the apex of glans for upright voiding with normal urine stream, to create a straight penis adequate for sexual intercourse and to prevent complications[9].

Over the years, so many techniques have evolved and these range from a one-stage technique, where correction of chordee and creation of neourethra are done simultaneously to a two-stage operation, where creation of the new urethra is performed as a second-stage procedure after an earlier operation for chordee correction. Creation of this urethral tube ranges from using buried skin strip as in the Dennis Brown operation to using skin graft either from preputial skin or thick split-thickness skin graft[8]. Other techniques use vascularized skin flaps either pedicled on the subcutaneous adventitial tissue of the penis[10,11] or as a transposed skin flap as in Bayar's operation[12]. Single-stage procedures are often associated with complications such as fistulae, stricture, metal stenosis, and require reoperations[13,14,15]. There has been a resurgence of the two-stage procedure for such severe proximal hypospadias cases in recent years[16]. No single surgical procedure is ideal and the quest for such a procedure continues[17].

In our institute, we prefers to perform surgery when the child is 1.5 years of age. Furthermore, at 1.5 years of age, the penis is of acceptable size to make surgery relatively easier. The second stage of the surgery is done 6 months later to allow time for adequate scar maturation and the surrounding tissue to be supple enough for further handling and surgery. The range of patients in our study was 1.5 years-15 years. We did not include patients after the age of 15 years.

Bayar's two-stage operation is the most common operation performed in our department for proximal penile hypospadias. It was performed on 50 patients. Being a vascularized skin flap, it is very reliable when used in the first stage and at the same time, there is abundant vascularized skin available to resurface the raw area that has been created as a result of chordee correction. This need for a large vascularized flap to cover this raw area is especially seen after release of chordee in penoscrotal hypospadias.

We have done some modifications in our procedure like we take adequate thickness of inner prepucial skin so that in second stage we can get adequate tissue to tabularised the Bayar's flap. we mobilize the urethra which has receded down after chordee correction so that the Bayar's flap which brought ventrally doesn't fall short.

We also repaired glans in two layersit help in prevention of glans dehiscence. It is very important to measure the size of the strip in Bayar's technique because if we keep it large then it leads to diverticulae formation and small leads to stricture and meatal stenosis., further, it will complicate by fistula formation and complete disruption of the repair.

We did not use any suprapubic catheter in our study. The second layer is also important in providing an extra layer to prevent fistula formation. we had only 5casse of fistula in our study. We have done dynoplast dressing with bactigrass in the inner most layer of dressing. Major complications of the staged repair include fistula formation, metal stenosis, suture line dehiscence, stricture and diverticulum formation. Most of the urethroplasty complications tend to occur in the first 6 months after the second stage[18]. Other complications of surgery for hypospadias are complete disruption, postoperative bleeding and recurrence of chordee or excess skin at the glans. The most common complication is fistula formation. The incidence of fistula formation is reported to be from 3%-50%, and it is higher in the more proximal hypospadias[12]. In this series, the fistula rate was 10% (5 out of 50 patients). Meatal stenosis in one patient and glans give way in three patients seen in our study.

Furthermore, all of our patients or their parents were satisfied with cosmetic appearance and the penile length after chordee correction and urethroplasty. Cosmetic appearance was judged by circumcised penis, opening at the tip and less scarring in our study. Satisfactory cosmetic results were achieved in all cases. According to Bracka, one of the major advantages of staged repair is the possibility to achieve a good cosmetic result with placement of the

urethra deep in the glans and creation of a natural slit-like meatus. Accordingly, most series report an excellent cosmetic result and patient satisfaction[8,9,17,19,20]. In our series, all patients had meatus at the tip, passing urine in good single stream. In severe chordee cases during which a poor urethral plate must be transacted, these techniques usually cannot reconstruct the neourethra in one-stage. In recent years, there has been renewed interested in treating those severe cases with two-stage repair[21,22]. Although the two-stage procedures are more time-consuming and more costly, they usually provide a healthier urethral bed and tough tissue around the urethra.

On follow-up, we recommended urinary antibiotic on empirical basis without any culture. It helped us prevent urinary tract infection after using NG tube for 12-15 days.

CONCLUSION

Two-stage procedure using the principles of Bayar's technique is a challenging operation that can be used for the proximal hypospadias. It decreases the rate of fistula formation, disruption and stenosis and gives a satisfactory cosmetic appearance. In our view, the key to success of the repair depends on the urethral strip measurement in the second stage of Byar's technique. Most important complete surgery from stage to second stage is done by single person.

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