Original Research Article

Evaluation Of Preputial And Buccal Mucosal Grafts In Two-Stage Repair Of Severe Proximal Hypospadias.

Abstract

Aims: to evaluate the results of staged surgical repair of proximal forms of hypospadias according to Bracka's method using preputial or buccal grafts in the department of urology, Tanta university hospital between January 2019, and January 2022.

Study design: prospective comparative randomized study

Place and duration of study: urology department, Tanta university hospital, between January 2019 and January 2022.

Methodology: fifty male patients with severe proximal hypospadias associated with moderate to severe chordee and or poor urethral plate underwent two-stage repair with buccal mucosal or preputial graft in the department of urology, Tanta university hospital between January 2019, and January 2022 cosmetic and functional outcomes were assessed.

Results: native meatus was at proximal penile in 1, penoscrotal in 13, scrotal in 19, and perineal in 17 cases. 25 patients underwent staged hypospadias repair using preputial graft in the 1st stage and 25 patients underwent staged hypospadias repair using buccal mucosal graft. The mean age of the patients at the 1st stage was 9.5 and 8.7 months in the preputial and buccal mucosal groups respectively. The graft take was successful except only in 5 patients needed graft redo after the 1st stage. Success rate was 54.5% with preputial group and was 62% in buccal mucosal group.

Conclusions: two-stage repair with Bracka's technique is safe and feasible for repair of primary cases of sever proximal hypospadias. Both preputial and buccal mucosal grafts are reliable and suitable urethral substitutes in staged hypospadias repair with comparable results and complications rate.

Keywords: *hypospadias · proximal · severe chordee · graft ·*

1. Introduction.

Hypospadias is a congenital anomaly of the anterior urethra of males where the urethral opening presents in the under surface of the penis. [1]hypospadias may be associated with abnormal ventral curvature of the penile shaft which is called chordee that leads to functional and cosmetic impairment. [2]

Hypospadias is usually classified according to the location of the urethral meatus: distal hypospadias, middle (penile) hypospadias and proximal hypospadias. [3]

Indication for hypospadias surgery includes the need for the correction of penile deviation, ectopic urethral meatus, and penoscrotal transposition. The ideal result of surgery is construction of a good caliber urethra with a slit-like urethral meatus at the tip of the glans and a straight penis. [4]

The surgical techniques used to repair hypospadias are almost as diverse with hundreds of described methods. Given the large number of patient and operative factors that may influence outcomes. This is especially true for proximal hypospadias where, regardless of whether a single or multistage surgery is used, complication rates range from 8% to 70%. [5]

Over the years, so many techniques have evolved and these range from a one stage technique, where correction of chordee and creation of neo-urethra is 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. [6]

Single stage technique has a limitation in dealing with the full spectrum of hypospadias. By contrast, the two-stae method deals with everything from coronal hypospadias, through to the most severe proximal cases, even if circumcised or having already been the victim of multiple failed repairs. [7]

Originally, Bracka's method described usage of preputial skin graft, and only in cases of its absence buccal mucosa. The application of preputial skin graft is less traumatic in comparison with buccal mucosa, which requires a second site surgery during the first stage.[8]

Our objective in this study was to analyze the results of staged surgical repair of proximal forms of hypospadias according to Bracka's method to compare the outcomes and complications of treatment using preputial versus buccal grafts.

Our hypothesis was that buccal mucosa is the optimal tissue for use in the Bracka's method urethroplasty. As its availability give us the chance for correction of sever forms of hypospadias with long urethral defect without difficulties in penile skin and glanular closure.

2. Material and methods / experimental details / methodology

2.1 study design:

This is a prospective comparative randomized study performed on patients with severe proximal hypospadias who underwent staged repair in the period between January 2019, and January 2022.

2.2 research ethics:

This study was approved after the review by the research ethics committee in Tanta university.

2.3 study population:

50 patients with severe hypospadias were randomized by simple randomization using computer-generated random numbers which randomly assign the patients in the two groups.

Group i: 25 patients underwent staged hypospadias repair using preputial graft in the 1st stage.

Group ii: 25 patients underwent staged hypospadias repair using buccal mucosal graft in the 1st stage.

2.4 statistics:

All statistical analysis was performed using SPSS version 26 software (IBM SPSS STATISTICS, IBM CORP., ARMONK, NY).

2.5 surgical technique:

A. First-stage repair

Initial skin incision was done extending in a u-shaped fashion around the hypospadias meatus and 5mm from the corona. Degloving of the penile skin was done dorsally down to the

penopubic angle, then we shift ventrally to the plane between the corpus spongiosum around the plate and the skin dartos to completely deglove the penis. (Figure 1).

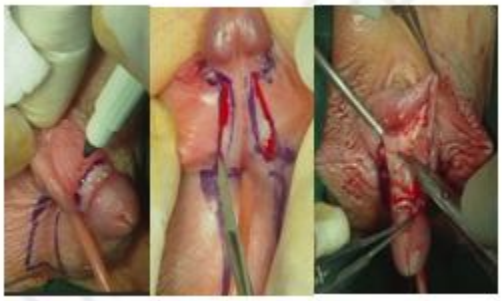

Figure (1): marking, incision of the skin and degloving of the penis.

B. Penile curvature management

Initial artificial erection by test to assess the degree of penile curvature. The degree was then evaluated using a metal protractor or a mobile application after taking photo for the erected penis called Angulus. If the curvature was more than 30 degrees, the urethral plate was excised at the coronal level and fibrous bands of the buck's fascia and aberrant corpus spongiosum that contribute to chordee were dissected off the corpora cavernosa. If the penis was straight, grafting was then fixed. But if it was still ventral bent, a single or multiple superficial transverse ventral corporotomies were done coupled with a dorsal plication (DP) stitch when needed. (Figure 2).

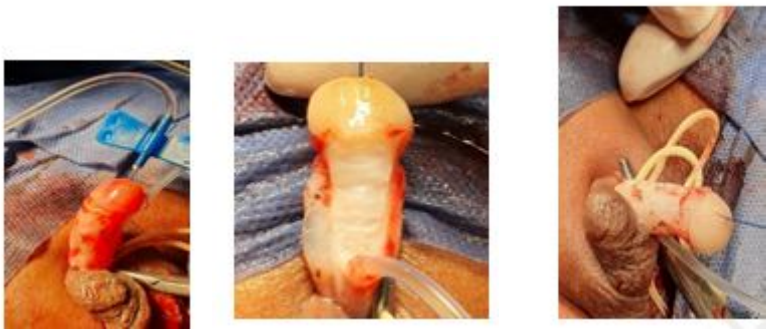

Figure (2): urethral plate transection, ventral corporotomies and dorsal plication of tunica albuginea.

C. Correction of concomitant scrotal anomalies

Penoscrotal transposition of the scrotum was corrected by two incisions at the junction between the scrotum and the penile skin base to get the scrotum into position and reapproximating of scrotal flaps inferior to the penis. (Figure 3) bifid scrotum was also corrected by excision of the midline shiny skin between both hemi-scrotums and the midline anastomosis between the two hemi-scrotums in the midline.

Figure (3): scrotoplasty for penoscrotal transposition.

D. Glans preparation

The glans is incised longitudinally in the midline to create large glanular wings with the spongiosum widely opened to accommodate the graft.

E. Graft application

The graft, which includes the inner prepuce, or the buccal mucosa was harvested. Next, defatted over a finger with fine scissors, then it was put in saline-soaked gauze until required. The donor site for buccal mucosal graft was accurately examined, and bleeding was controlled with bipolar electrocautery, then it was left open for reepithelization. The graft (preputial or buccal) was accurately secured to the ventral aspect of the corpora. (Figures

4,5). A firm ‘tie-over’ dressing was applied holding the graft in place and preventing any hematoma from collecting underneath.

Figure (4): preputial graft harvesting and fixation.

Figure (5): buccal mucosal graft harvesting and fixation.

F. Graft care

The urethral catheter and the ‘tie-over’ dressing were removed together on the 7th day postoperative, and the graft was checked for take or necrosis. Betamethasone 0.1% ointment was administered twice daily for 3 months to improve the quality of the healing and reduce fibrosis.

G. Second-stage repair

A u-shaped incision was designed around the catheter to ensure sufficient width in the constructed urethra and meatus. The u-shaped graft was then dissected along buck’s fascia down to a level proximal to the urethral meatus, ensuring as much preservation of lateral vascularity. The isolated graft strip was tubularized comfortably around the catheter with two layers using a 7/0 vicryl suture. (Figures 6,7)

Figure (6): preputial graft tubularization in two layers of sutures.

Figure (7): buccal graft tubularization in two layers of sutures.

A second layer of tunica vaginalis flap is then secured over the neourethra. The glans was repaired with 6/0 vicryl vertical mattress sutures and the skin was repaired with 6/0 vicryl. A Coban dressing was applied and left for 5 days, and a draining catheter was used for 7–10 days in double diaper technique. (Figure 8)

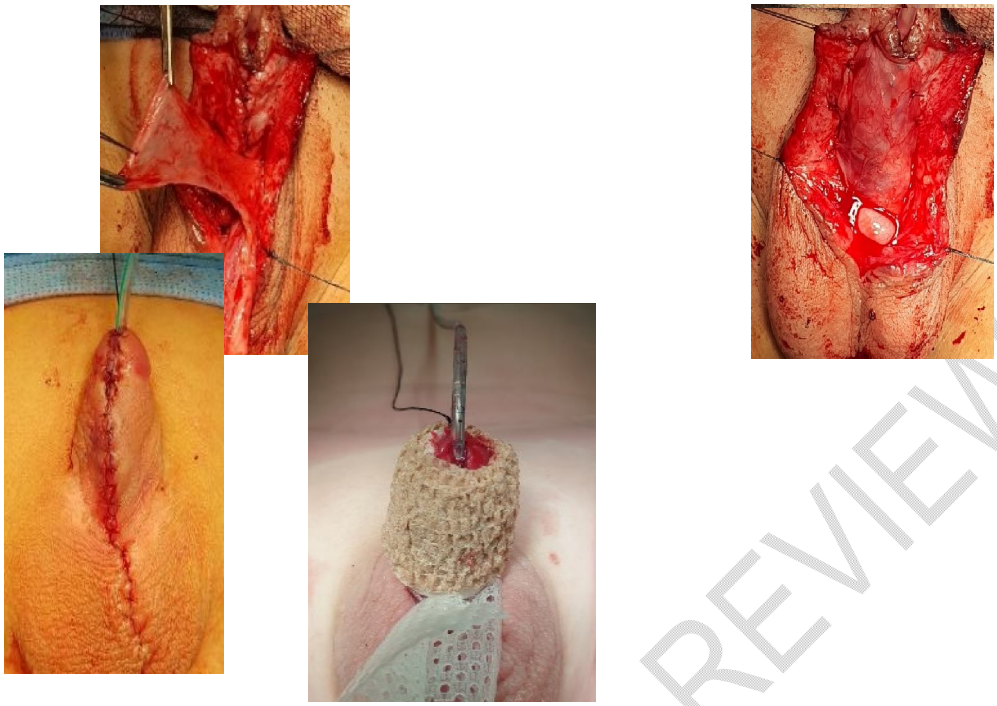

Figure (8): tunica vaginalis flap wrapping and skin closure

Follow up visits were scheduled weekly for the 1st month, monthly for 3 months, 3 months, and 6 months postoperatively for success or presence of early or late complications. The success of the primary outcome was determined by achieving normal like meatus at the tip of the glans without meatal stenosis, fistula or diverticulum with straight penis and minimal skin scarring. Secondary outcome was functional evaluation of the voiding pattern and urine stream and ultrasound measured residual urine (pvr), for all patients at last clinic visit at least 6 months after second stage. The pediatric penile perception score (PPPS) as a tool for assessment after hypospadias repair.**(** Figure 9.10)

Figure (9): follow up of some cases with preputial graft six months postoperative.

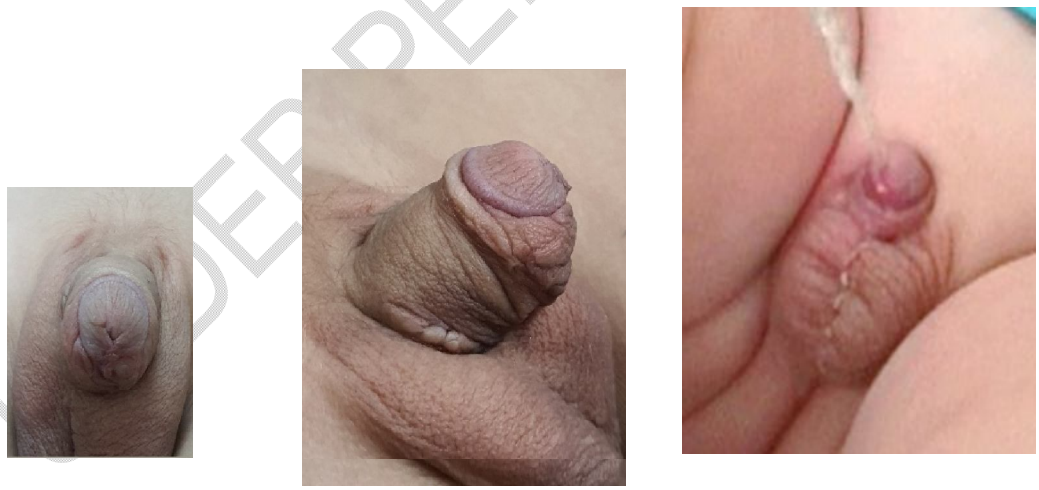

Figure (10): follow up of some cases with buccal graft six months postoperative.

2. Results

The sample size was calculated to detect a mean difference 40% in percent of urethrocutanous fistula occurrence between the study groups. A total number of 44 patients at least were needed to have a study power of 80%, an alpha error of 0.05 and proportion of the experimental to the control group 1:1.

From January 2019, and January 2022, we operated on 50 children with primary proximal hypospadias, 25 (group i) patients were treated by two stage repair with preputial graft in the 1st stage and 25 (group ii) patients were treated by two stage repair with buccal mucosal graft in the 1st stage.

The age of patients in group i ranged from 6.5 to 15 months with mean age 9.5 ± 2.21months.in group ii the age of patients ranged from 6 to 13 months with mean age 8.7 ± 2.71months. The external urethral meatus was perineal in 7, scrotal in 11 and penoscrotal in 7 patients in group i while it was perineal in 10, scrotal in 8, penoscrotal in 6 and proximal penile in 1 patient in group ii.

Congenital penile curvature was severe (>30 degree) in all patients after complete degloving and extended bulbar dissection. This curvature was corrected completely after urethral plate transection in only 3 patients in group i and in 2 patients in group ii.

Single transverse ventral corporotomy opposing the area of maximum bent was needed in 8 cases in group i and in 7 patients in group ii after complete penile degloving and transection of the urethral plate.

Multiple transverse ventral corporotomies was done to correct the ventral curvature of 10 patients in group i and in 11 patients in group ii. Combination of multiple ventral corporotomies and dorsal midline plication was used to correct the ventral curvature (VC) in 4 patients in group i and in 5 patients in group ii.

Graft necrosis occurred in one patient in group i and in two patients in group ii. Mild fibrosis with no need for graft redo was found in 4 patients in group i and in 6 patients in group ii. Severe graft fibrosis occurred equally in only one patient in each group. Overall, the graft was taken successfully in 92% of patients and 88% of patients in group i and group ii respectively. Only 5 cases needed graft redo and revision of the 1st stage (2 in group i and 3 in group ii).

All patients (100%) in group ii suffered from oral manifestations related to the buccal mucosal graft site in the form of lower lip edema, oral pain. All these manifestations were mild and were treated medically by analgesics and anti-edematous drugs and improved gradually with follow up. Mouth tightness or numbness or permanent scar didn't happen in any patient.

Second-stage repair was completed in 43 patients after exclusion of the 5 patients that needed regrafting after failure of the 1st stage and 2 patients that missed the follow-up and did not come to our center for the 2nd stage, 22 patients in group i and 21 patients in group ii.

The overall complications rates were comparable in both groups, with total number of complications 10(45.5%) in group i and 8(38%) in group ii with initial success rate (54.5 %) in the preputial group and (62%) in the buccal group ii. Simple surgical intervention in the form of meatotomy, simple fistulectomy or visual internal urethrotomy was done in the remaining 6 complications raising the success rate to (69.2%) in group i and (76.2%) in group ii.

Complications were encountered in the form of fistula that occurred in totally 9 cases, 4 patients in group i and 5 cases in group ii, glans dehiscence was found in two patients in group i and in one patient in group ii. Partial wound dehiscence was noticed in one patient in group i and another case in group ii while complete wound dehiscence occurred in only one patient in in group i with no cases found in group ii. Meatal stenosis was occurred in 3 patients in group i and in 2 patients in group ii.

Urethral stricture was also reported in 5 patients, 2 in group i and 3 in group ii. Two cases of stricture urethra managed successfully by endoscopic dilatation (VIU) and the other 3 cases was obliterated urethral stricture and redo urethroplasty was planned for the treatment of these patients. Diverticulation of the urethra was found only in one patient in group i and was treated by diverticulectomy. No cases of urethral diverticulum occurred in group ii.

Functional assessment of patients was done by measurement the amount of post voiding residual (PVR) of urine by ultrasound at the outpatient clinic 6 months after the 2nd stage. The mean amount of PVR ranged from 0 to 33 ml with mean 9.5 ± 7.3 ml in group i and ranged from 0 to 22 ml with mean8.5 ± 6.1ml in group ii. The mean (SD) over all PPPS was 6.9 ± 1.73 in preputial group and 7.1 ± 2.21in buccal group.

3. Discussion

From 2019 to 2022, we operated on 50 boys presenting with severe proximal hypospadias. The staged repair technique was applied in all cases and two surgeons operated on all children following the same surgical steps and assisted by the pediatric urology team in Tanta university hospital.

Erin r. Mcnamara and his colleagues in their retrospective study over 20 years on 134 patients underwent staged repair of sever hypospadias, reported median age of 8.8 months [IQR 6.3– 11.7] at the time of the 1st stage. (9)the median age of cases at the 1st stage was 12 months with Badawy H et al, 2020. (10)

In our study the mean (SD) age of patients was 9.5 ± 2.21 months with preputial graft group and 8.7 ± 2.71months with buccal mucosal graft group at the time of the first stage as advised for the ideal age for repair in the literature.

Snodgrass et al (11) reported in his study on total 70 boys with proximal hypospadias that no VC after degloving in 13 (19%), VC was less than 30 degrees and corrected by dorsal plication in 22 cases (31%), and 35 (50%) had VC more than 30-degree were repaired by transection of the urethral plate.

Al-Adl et al (12) found that after penile degloving and transecting the up, straightening was achieved in 25 out of 38 cases (65.8%), while in 13 cases, transverse ventral corporotomies were needed in 10 cases (26.3%) while in three cases (7.9%) additional DP was done.

Ventral curvature in our included patients was sever more than 30 degrees in all cases after complete degloving and extended bulbar dissection. Degloving and urethral plate transection were sufficient to correct the curvature in 5(10%) of patients, 3 patients in preputial group and 2 boys in buccal mucosal graft group, VC was corrected by single ventral corporotomy with urethral plate transection in 15(30%), 8 cases in group i and in 7 patients in group ii, multiple ventral corporotomies were needed with the plate transection in 21(42%), 10 cases in from group i and in 11 cases in group ii and a combination of multiple ventral corporotomies and dorsal midline plication was used to correct the ventral curvature in 9(18%) of patients, 4 cases in group i and in 5 patients in group ii.

The graft take was successful in 23(92%) of cases in preputial graft group and 22(88%) of cases with buccal mucosal graft. Collectively only five patients needed redo 1st stage (3 graft necrosis and 2 graft severe fibrosis). Our results were like the reported data of Badawy H et al (10), they found 39(90.7%) patients with graft take, and 4(9.3%) cases required revision of the first stage. Also graft take was successful in 90% of proximal hypospadias

cases underwent primary repair using BMG in the first stage as described by Shandilya and his colleagues. (13)

Alice Faure et al (14) in their report on forty-four boys who underwent two-stage repair for proximal primary hypospadias. Free grafts of inner preputial skin were used in 41 patients (93%), and buccal mucosa grafts were used in three (6.8%). The grafts took successfully after the first stage in 41 (93.8%) patients. Three graft contractures (6%) were noted: all were inner preputial graft, and all required a second grafting procedure before tubularization.

Jan Fichtner et al (15) described the use of buccal mucosa as only graft in a total of 132 patients who underwent staged hypospadias repair, successful graft take was present in nearly all cases with only 2 graft contractures were found in need for regrafting.

Snodgrass and Elmore (16) reported graft contracture in 12% of hypospadias staged repair cases. Modified Bracka procedure was performed by Barroso Jr et al (17) in 9 children with previous failed hypospadias repair and one primary scrotal hypospadias. Significant contraction of the graft was not seen in any patient.

Zhao et al (18) and Manasherova d et **al** (8) performed two-stage repair of hypospadias using a buccal mucosa graft with no reported complications related to the buccal mucosa harvest site. The donor site was closed primarily with interrupted sutures in all cases with Zhao m et al (18) and was left open for re-epithelialization with Manasherova d et al (8) .

Regarding the oral complications in our study, we found only minor complications like lower lip edema and oral pain in all patients (100%) with buccal mucosal graft group that resolved gradually 2 weeks postoperative. No mouth tightness or scar was reported in any patient. The buccal mucosal harvesting site was left open for gradual healing and epithelialization as described by Manasherova d et al (8)

The overall success rate was comparable to the published results of staged repair by about 54.5% of cases of preputial graft group and 62% of patients in buccal mucosal graft group. The surgical outcomes were satisfactory both cosmetic and functionally and the mean (SD) over all PPPS was 6.9 ± 1.73 in preputial group and 7.1 ± 2.21in buccal group.

Associated complications in our study after the second stage urethroplasty was found in 45.5% in preputial group and 38% in buccal mucosal group. Our reported complications rate was high as we included all occurred minor and major complications but, some of our reported early complications were expected to improve and were managed conservatively or simple surgical intervention like meatotomy or fistulectomy and serial dilatation of the stenotic urethral meatus with no need for reoperations.

So, our complications rate was lowered after repair of the reported minor complications during the follow up duration in our study mean 11.2 ± 3.07 months with preputial graft group and 11.4 ± 3.00 months in buccal mucosal group to become 31.8% with preputial group and 23.8% with the buccal mucosal graft patients that in need for a major surgical repair in the form of redo single or multiple stages urethroplasty during longer follow up periods.

Our outcomes are similar to those in the existing literature with Snodgrass et al (19), Faure et al (14) and Badawy H et al (10) by 38%,38.4% and 43.2% respectively, which was considerably higher than that reported by Bracka (6), Manasherova d et al **(8)** and Zheng D et al (20) by 23.5%,28% and 33% respectively.

There are many factors that may influence the outcome of hypospadias repair, including the type of hypospadias, age at repair, duration of time between first and second stage, repair technique and personal experience. These varying factors produce cumulative success rates ranging from 37% to 77%, with the rate rising to higher than 95% after the addition of a third repair stage.(21)

4. Conclusions

Two-stage repair with Bracka's technique using preputial or buccal mucosal graft is safe and feasible for repair of primary cases of sever proximal hypospadias with good surgical outcomes.

Since no significant difference between buccal and preputial grafts, we recommend use of preputial graft in the first stage when available in primary cases of two stage repair.

Our limitations in this study are the low number of patients in each group and short term follow up, so we are planning to extend our study to include large number patients with long term follow up for better evaluation of the functional and cosmetic outcomes.

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