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Comparison between Meatal Advancement and Glanuloplasty with Urethral Advancement and Glanuloplasty in Treatment of Distal Hypospadias

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Abstracts

Background: Hypospadias is the second most common congenital malformation and may be classified according to the anatomical site of urethral meatus into distal, which accounts for about 70-80% of all hypospadias cases, and proximal, which is rare. There are multiple surgical options for the management of hypospadias. This study covers cases of distal hypospadias with two surgical options, which are urethral advancement and Glanuloplasty, and meatal advancement glanuloplasty.
Objectives: To compare the surgical outcomes and complications of urethral advancement and meatal advancement with glanuloplasty for the treatment of distal hypospadias.
Methods: Forty-three patients, 20 of whom underwent meatal advancement and glanuloplasty and 23 underwent urethral advancement glanuloplasty, were followed up for 6 months after the operation at Ghazi Al-Hariri Hospital, Medical City Complex, Baghdad, Iraq, for the surgical speciality during the period from April 2017 to March 2020.
Results: The mean age of the meatal advancement and glanuloplasty group at surgery was (35.5+17.31 months) which was comparable to that of the urethral advancement glanuloplasty group (37.5+14.27 months) with no significant difference. There were no significant differences between the groups in operative time, which was 35.16+2.9 min in urethral advancement glanuloplasty and 30.72+3.2 min in meatal advancement and glanuloplasty. Six complications were reported in this study, four of which (two meatal stenosis
and 2 wound dehiscence) occurred in the meatal advancement and glanuloplasty group, while two complications (one meatal stenosis and one meatal retraction) occurred in the urethral advancement glanuloplasty group.
Conclusions: Urethral advancement glanuloplasty is a safe and effective alternative surgical option for the treatment of patients with distal hypospadias, especially those with a non-mobile meatus, with the same rate of complications.
Keywords: Congenital malformation; Complications; Hypospadias; Glanuloplasty; meatal advancement, urethral advancement.

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Introduction

Hypospadias is a congenital anomaly derived from (hypo- or dysplasia) affects the penis ventrally. These deformities deform the urethral meatus through an abnormal ventral opening. The penis shaft has an abnormal ventral curvature and/or an abnormal distribution of the foreskin. The extent of malformation varies greatly between cases (1).

Most hypospadias cases are distal-anterior (70–80%), while midshaft hypospadias comprises 15–20% of cases. However, posterior or proximal forms are rare (2).

Hypospadias is a congenital disorder in males with the highest prevalence (3).

Reconstructive surgery is the first-line treatment for hypospadias. The main aim of the reconstruction using a vertically split orthotropic meatus is to straighten the penis if there is a curvature and create satisfactory aesthetic outcomes of a coined-like shape glans. Other important aspects of reconstruction are avoiding shortening of the penis and optimizing coverage of the penis by skin coverage, avoiding the use of skin from the scrotum (4). Moreover, 300 procedures have been used to rectify various forms of hypospadias. This indicates that no single method can be applied to all conditions. If the presentations are complicated, the bladder or buccal mucosa are used to perform complex grafts (5).

In this study, we used meatal advancement and glanuloplasty (MAGPI) and urethral advancement and glanuloplasty (URAGPI). The MAGPI technique was first described by Duckett in 1981. It may be useful in more distal types of hypospadias without chordee that present good skin quality (6).

The urethral mobilization and advancement technique developed by Belman for hypospadias repair and anterior urethral advancement as a one-stage technique for the repair of hypospadias and urethral fistula is an excellent idea that was introduced by Chang in 1984. He realized that the extent of urethral advancement after mobilization (in children up to 1.8–2 cm and in adults 4.5- 5.0 cm) was sufficient to repair the penile variety of congenital hypospadias (7).

In 1994, Snodgrass first reported the use of a tabularized incised plate (TIP) for repairing distal hypospadias. TIP has become the mainstream international surgical option (1).

This study aimed to compare the surgical outcomes and complications of urethral advancement and meatal advancement with glanuloplasty for the treatment of distal hypospadias.

Patients and Methods

This comparative cohort study was conducted on 46 Iraqi boys aged 1-5 years with distal hypospadias at the Department of Urology in Ghazi Al-Hariri Hospital, Medical City Complex, Baghdad, Iraq, from April 2017 to March 2020.

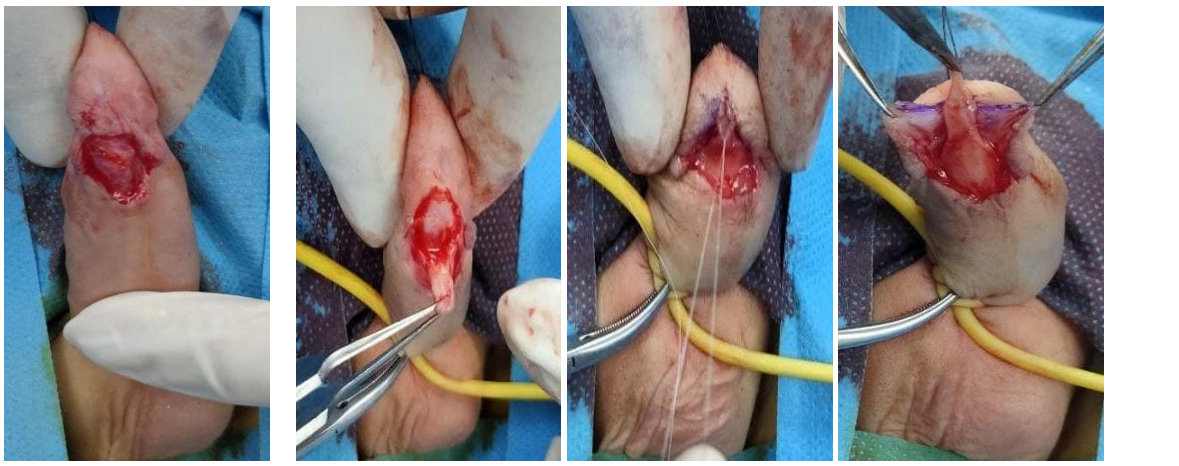
Inclusion Criteria

All patients presented with primary distal penile hypospadias (glanular, coronal, and subcoronal up to 3–4 mm proximal to the coronal sulcus).

Exclusion Criteria

- Patients with mid-penile and proximal types of hypospadias,
- Micro-penis.
- Hypogonadism.
- Mega-Meatus.
- Recurrent cases.
- Those with chordae,

According to the surgical procedure, patients were randomly divided into two groups according to the surgeon's preference: those treated with URAGPI (24 patients) (Figure 1) and those treated with MAGPI (22 patients) (Figure 2). The age at surgery and type of hypospadias were recorded at the time of surgery.



Sub-meatal incision | Mobilization of urethra | Completion of glanuloplasty

Early post-operative

Figure 1: Urethral advancement surgery

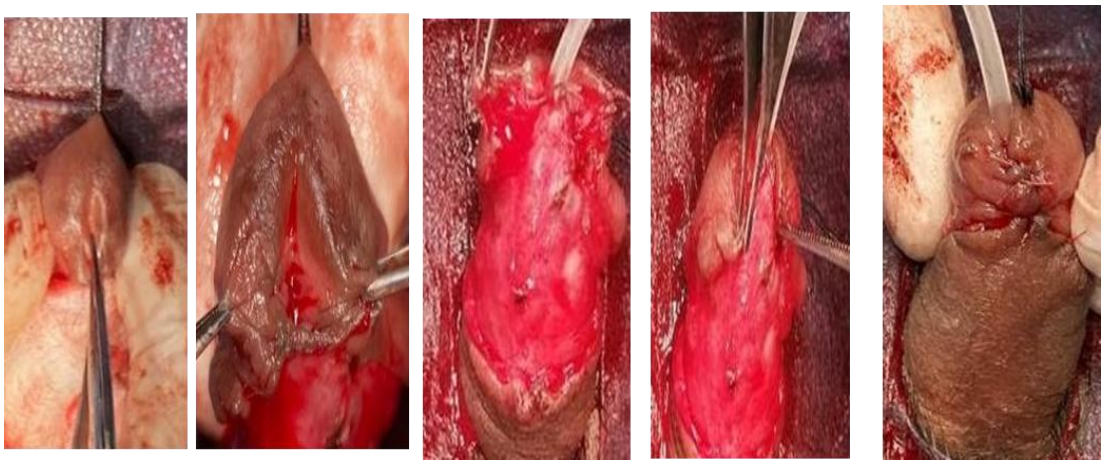


Figure 2: meatal advancement

In all patients, we inserted a uretheral stent (NG tube) of 6 Fr. A compressing dressing with paraffin gauze was used, which was removed along with the stent after five days.

In the early post-operative period, vital signs and urine output were monitored. Follow-up was conducted at 2 weeks, 1 month, 3 months, and 6 months postoperatively. The study included observation of the meatus and glans regarding meatal retraction, meatal stenosis, wound dehiscence, wound infection or hematoma, urine stream, and the final cosmetic outcome. The duration of surgery and hospital stay were recorded for each patient.

Statistical analysis:
The data were analyzed using the Statistical Package for Social Sciences(SPSS) version 22 and are presented as mean ± standard deviation. A paired t-test was used to compare the means of continuous variables. A *P*-value of less significance was set at $P < 0.05$.

Results

Demographic and Clinical Characteristics

A total of 46 patients were initially included in this study; 3 of them three were lost to follow-up. Therefore, 43 patients completed the study evaluation and were included in the final analysis (MAGPI group, n = 20; URAGPI group, n = 23).

The demographic and clinical characteristics of the study population are summarized in Table 1.

The mean age at surgery was 35.4 ±17.31 months for the MAGPI group and 37.5 ±14.27 months for the URAGPI group, with no statistically significant difference ($P = 0.758$). Likewise, no significant difference was observed between the two groups in terms of weight at the time of surgery ($P = 0.669$). A family history of hypospadias was reported in two boys in the MAGPI group (10%) and two boys in the URAGPI group (8.7%), dem onstrating no significant difference ($P = 0.641$). Consanguinity was reported in four families (20%) in the MAGPI group and three families (13.04%) in the URAGPI group ($P = 0.538$). Two associated anomalies were reported in this study: congenital inguinal hernia and undescended testes. Congenital inguinal hernia accounted for one case (5%) in the MAGPI group and one case (4.35%) in the URAGPI group ($P = 0.892$). Undescended testes were noted only in the URAGPI group (n = 2, 8.7%), with no statistically significant difference between the cohorts ($P = 0.350$) (Table 1).

Table 1: Demographic and clinical characteristics of the study population

Variable	MAGPI N=20	URAGPI N=23	*P*-value
Age at surgery, months			
Mean±SD	35.4±17.31	37.5±14.27	0.758
Range	18-60	18-60	
Weight at surgery, kg			
Mean±SD	16.22± 4.18	17.3± 5.11	0.669
Range	14.5-19.2	14.8- 20.5	
Family history			
No	18(90%)	21(91.3%)	0.641
Yes	2(10%)	2(8.7%)	
Consanguinity			
No	16(80%)	20(86.96%)	0.538
Yes	4(20%)	3(13.04%)	
Associated anomalies			
Congenital inguinal hernia	1(5%)	1(4.35%)	0.892
Undescended testis	0(0%)	2(8.7%)	0.350

Anatomical Subtypes of Hypospadias

Three anatomical types of hypospadias were encountered in this study: glandular, coronal, and subcoronal. In the MAGPI group, glandular hypospadias accounted for 10 cases (50%), coronal for 8 (40%), and subcoronal for 2 (10%) cases. In the URAGPI group, the glandular, coronal, and subcoronal locations accounted for 8 (34.78%), 11 (47.83%), and 4 (17.39%) cases, respectively. No statistically significant differences were observed between the two groups in terms of the distribution of hypospadias subtypes ($P = 0.560$) (Figure 3).

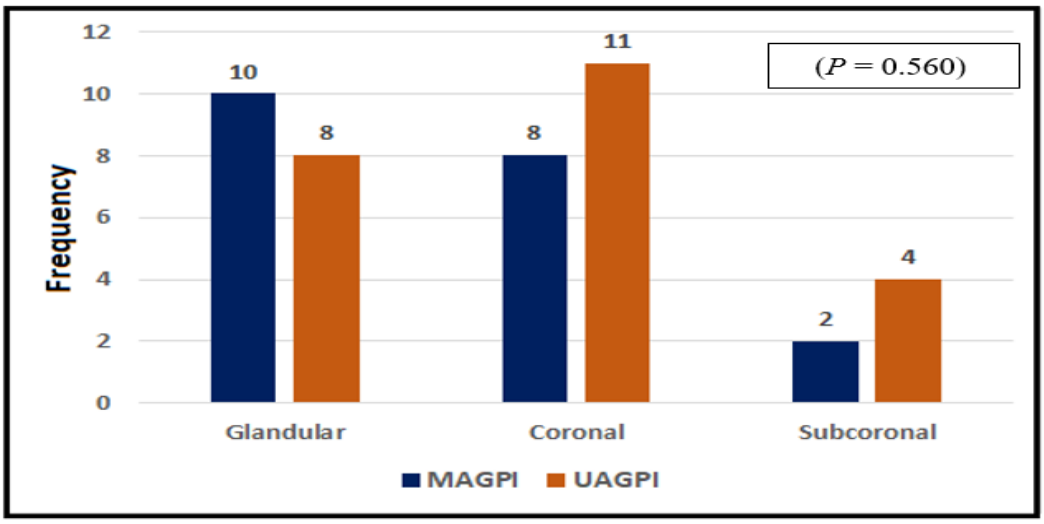


Figure 3: Types of hypospadias in MAGPI and URAGPI groups.

Intraoperative Parameters and Postoperative Complications

The mean operative time in the URAGPI group was 35.16 ±2.9 min, which was comparable to that of the MAGPI group (30.72±3.2 min) with no statistically significant difference (*P*=0.790).

The total number of postoperative complications in the study population was 6. In the MAGPI group, four complications occurred, consisting of 2 cases of meatal stenosis (10%) and two cases of wound dehiscence (10%). In contrast, two complications occurred in the URAGPI group, consisting of one case of meatal stenosis (4.35%) and one case of meatal retraction (4.35%). Statistically, there was no significant difference in the overall complication rates between the two surgical groups (*P* = 0.566) (Table 2).

Meatal stenosis was diagnosed objectively by calibration of the meatus to less than 6 Fr and successfully treated with outpatient meatotomy. Wound dehiscence was treated with a secondary Snodgrass tubularized incised plate (TIP) repair. None of the patients in either group developed urethrocutaneous fistulas. Ultimately, all patients achieved excellent cosmetic and functional results, characterized by a slit-like meatus, normal urethral calibre, and normal urinary stream.

Table 2: Complications in MAGPI and URAGPI groups

Complication	MAGPI N=20	URAGPI N=23	*P*-value
No complication	16(80%)	21(91.3%)	0.566
Meatal stenosis	2(10%)	1(4.35%)	
Meatal retraction	0(0%)	1(4.35%)	
Wound dehiscence	2(10%)	0(0%)	

Postoperative Hospital Stay

In all patients, the surgical dressing and urethral stent were routinely removed on the fifth postoperative day. Boys in the MAGPI group stayed in the hospital for a mean of 1.12 ±0.5 days postoperatively (range: 1–2 days), while those in the URAGPI group stayed for a mean of 1.41 ±0.7 days (range: 1–2 days). Statistically, there was no significant difference in the postoperative hospital stay between the two groups (*P* = 0.412) (Figure 5).

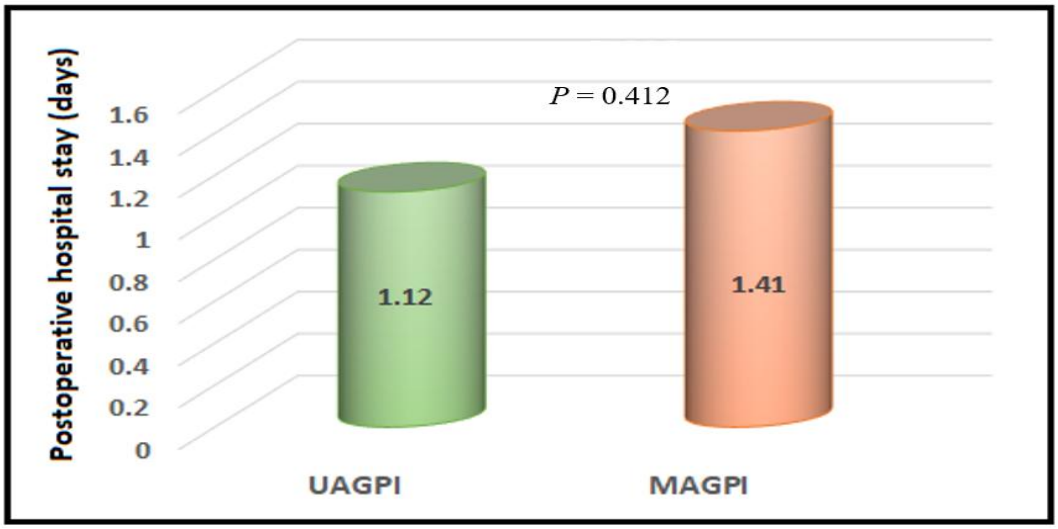


Figure 5: Postoperative hospital stay in MAGPI and URAGPI groups.

Discussion

This study aimed to compare the outcomes and complications of MAGPI and URAGPI in the treatment of distal hypospadias. In this study, the age of boys at the time of surgery was approximately 3 years. Different studies worldwide have reported different ages at surgery. However, most of these studies reported older ages than those in our study. In a previous study (9); study, the mean age at surgery was 5.9 years, which reflects the late presentation of these patients for consultation asking to solve the problem. In a Turkish study that included 171 boys, Ekinci et al. (10) reported a mean age at surgery of 4.5 years. In an American study (11), the age range was 4 months to 12 years. In Egypt, Hassan et al. reported an age range of 9 months to 7 years (12). In contrast, in another Turkish study, Elemen et al. (13) reported a slightly younger age than the present study (32.76±23.65 months). The variation in age at surgery mainly reflects the cultural attitudes toward each surgery. The age at the time of surgery in this study was consistent with the standard timing of primary hypospadias repair (14). "The advantages of early surgery include easier aftercare, which includes better restraint for hygienic purposes, less separation anxiety, less need for analgesia, less postoperative emotional disturbance, and better parent-infant bonding"(15).

According to our study, there was no significant difference between MAGPI and URAGPI in the type of hypospadias. Glandular and coronal hypospadias

were the most common types in both groups. This was in accordance with many previous reports, which reported that glandular and coronal hypospadias were the most common types of hypospadias (14,15).

In the present study, the mean operative time in the URAGPI group was 32.16±2.9 min, which was comparable to that of the MAGPI group (30.72±3.2 min) with no significant difference. Compared with other studies, this time period is relatively short. For the MAGPI procedure, Elemen et al. (13) reported a mean operation time of 58.82±22.87 min, and Jawad (15) reported a mean operative time ranging from 30 to 50 min, with an average of 45 min.

The hospital stays in this study in both groups ranged from 1-2 days with no significant difference between MAGPI and URAGPI. This is in accordance with a Saudi study in which the overall average hospital stay was 1.2 days (15). A slightly longer stay (2-3 days) was reported by Hadidi (14). The length of hospital stay depends mainly on the presence of immediate complications, such as bleeding or hematoma, which were completely absent in the present study.

The most interesting finding of our study was that there were six complications, four of which (two meatal stenosis and two wound dehiscence) occurred in the MAGPI group, while two complications (one meatal stenosis and one meatal retraction) occurred in the URAGPI group, with no significant difference. These are considered within the acceptable rate of long-term complications, both in terms of the type of complications and their frequencies, compared with other studies worldwide. This result is in accordance with a study from Saudi Arabia, in which theauthors treated 153 boys with distal hy*p*ospadias (URAGPI for 51 patients and MAGPI for the other 102 patients). The overall complication rate was 4% in URAGPI compared to 3.8% in MAGPI. The study concluded that URAGPI can be used effectively in patients with coronal and subcoronal hypospadias, particularly in the presence of fibrotic immobile urethral meatus or MAGPI limitations. URAGP could also be a useful alternative to MAGPI, where tension-free urethral advancement and glanular wrapping can be achieved (15).

Moreover, in a study that treated 20 patients with distal hypospadias with URAGPI and followed them for one year, three patients developed meatal stenosis and five patients had meatal retraction (9).

Among twenty-six patients, complications were observed in 15% had postoperative patients, with one patient requiring a second operation to stop the bleeding (16). However, (11) found a single case of postoperative hematoma (1.3%) among 73 patients. The study described a surgical procedure among 30 patients, one-third of whom developed meatal stenosis; two (6%) responded to repeated dilatation twice weekly for two weeks, and one (3%) requiredmeatoplasty (17). Another study (10) reported that among 171 patients, four (2%) had meatal stenosis, four (2%) had a fistula, four (2%) had meatal regression, and four (2%) had granular dehiscence.

Since the innovation of meatal advancement and glanuloplasty (MAGPI) (18), this procedure has been successfully used by many surgeons (19). However, many reports have indicated complications and unsatisfactory results with the MAGPI procedure, particularly in the long term (20). The primary criticisms of the MAGPI procedure are meatal regression and meatal stenosis. To prevent these complications, many authors have reported modifications to the procedure (21).

This led to the need for other single-stage procedures with fewer or comparable complications. Therefore, urethral advancement and glanuloplasty (URAGPI), a single-stage procedure that is a modification of MAGPI, was found to be a good alternative to MAGPI.

Conclusions

Urethral advancement and glanuloplasty (URAGPI) is a good surgical option with comparable outcomes and complications to those of meatal advancement and glanuloplasty (MAGPI) in the treatment of patients with distal hypospadias, and the use of each one of them depends on the surgeon's preference and experience.

Authors Declarations

We confirm that all the Figures and Tables in the manuscript belong to the current study. Besides, the Figures and images, which do not belong to the current study, have been given permission for re-publication attached to the manuscript. Authors sign on ethical consideration's Approval-Ethical Clearance: The project was approved by the local ethical committee in (Department of Surgery, College of Medicine, University of Baghdad**)** according to the code number (1145) on (11.08.2024)

Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this paper.

Funding: No financial support or grant was received for conducting this study.

Data availability

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Authors' Contribution

Study conception & design: (M. B. I). Literature search: (H. F. H.). Data acquisition: (M.B.I). Data analysis & interpretation: (M.B.I & H.F.H). Manuscript preparation: (A.B.M.). Manuscript editing & review: (M.B.I &M.N.H.).

AI Declarations

No artificial intelligence tools were used in the design, analysis, or writing of this manuscript.

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المقارنة بين تقدم مجرى البول ورأب الحشفه و تقدم الإحليل و رأب الحشفه في معالجة المبال التحتاني

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الخلاصة

الخلفية العلمية : الاحليل التحتي هو التشوهات التي تنطوي على الجانب البطني للقضيب وفتحة بطنية غير طبيعية من الصماخ، وانحناء بطني غير طبيعي للقضيب (الحبلي) و / أو القلفة المغطاة بشكل غير طبيعي. المبال التحتي هو ثاني أكثر التشوهات الخلقية شيوعًا ويمكن تصنيفها وفقًا للموقع التشريحي لصماخ مجرى البول إلى القاصي والذي يمثل حوالي 70-80 ٪ من جميع حالات المبال التحتاني والقريب وهو نادر. هناك العديد من الخيارات الجراحية لمعالجة الإحليل التحتي. تغطي هذه الدراسة حالات المبال التحتاني البعيدة مع خيارين جراحيين هما تقديم مجرى البول و رأب الحشفه و تقديم اللحمه و رأب الحشفه.
الهدف من الدراسة: لمقارنة النتائج والمضاعفات الجراحية بين تقدم مجرى البول رأب الحشفه و تقدم اللحمه و رأب الحشفه
المرضى وطرق العمل: أُدرج في هذه الدراسة ثلاثة وأربعون مريضًا يعانون من الإحليل التحتاني البعيد ، 20 منهم تم إجراء عملية جراحية لها باستخدام تقديم اللحمه و رأب الحشفه و 23 مريضًا تقديم مجرى البول و رأب الحشفه في مستشفى غازي الحريري للتخصصات الجراحيه خلال الفترة من أبريل 2017 إلى مارس 2020
النتائج: ستة وأربعون مريضا 20 منهم خضعوا لـ تقديم اللحمه و رأب الحشفه و 23 تقديم مجرى البول و رأب الحشفه ، توبعوا لمدة 6 أشهر بعد العملية ، كان متوسط عمر مجموعة تقديم اللحمه و رأب الحشفه. في الجراحة (35.5 + 17.31 شهرًا) مقارنة بمجموعة تقديم مجرى البول و رأب الحشفه (37.5 + 14.27 شهرًا)) مع عدم وجود فرق كبير. تم الإبلاغ عن ثلاثة أنواع من المبال التحتاني في هذه الدراسة: هذه هي الحبيبي ، والإكليلي وتحت التاجي والتي تمثل 10 (50٪) ، 8 (40٪) و 2(10٪) على التوالي من مجموعة تقديم اللحمه و رأب الحشفه، و 8 (34.78٪) ، 11 (47.83٪) و 4 (17.39٪) على التوالي في تقديم مجرى البول و رأب الحشفه مع عدم وجود فرق كبير. كما لا توجد فروق ذات دلالة إحصائية بين المجموعتين في وقت العملية الذي كان 35.16 + 2.9 دقيقة في تقديم مجرى البول و رأب الحشفه و 30.72 + 3.2 دقيقة في تقديم اللحمه و رأب الحشفه.
الكلمات المفتاحية: تشوهات الخلقية، مضاعفات المبال التحتاني، رأب الحشفة، تقديم قناة اللحمة، تقديم الاحليل