

## Distal Penile and Mid-Shaft Hypospadias Repair: Tubularized Incised Plate (SNODGRASS) Urethroplasty Versus Tubularized Plate (THIERSCH-DUPLAY) Urethroplasty.

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### Abstract

**Background:** Hypospadias is one of the most common congenital anomalies of male external genitalia, in which the external urethral meatus exits ventrally any where from the glans to the perineum. There are many surgical modalities for reconstruction but with different rates of success. **Aim:** Is to compare between Tubularized Incised Plate urethroplasty (Snodgrass technique) and Tubularized Plate urethroplasty (Thiersch-Duplay technique) in reconstructing distal penile and mid-shaft hypospadias regarding success rates, types and incidence of complications and advantages of each technique. **Patients and Methods:** Patients were blindly assigned into two random groups. Group A (20 patients) were repaired by Snodgrass technique and group B (20 patients) were repaired by Thiersch-Duplay technique. All patients were followed up for one year. **Results:** 40 patients with distal penile and mid-shaft hypospadias were studied. The majority were between 2-4 years of age. Meatal stenosis and urethrocuteaneous fistulae were the most frequently encountered complications. **Conclusions:** Snodgrass technique is more superior than Thiersch-Duplay technique in terms of final aesthetic and functional results.

**Key words:** Snodgrass, Thiersch-Duplay, hypospadias repair.

### Introduction

The term hypospadias is derived from the Greek word (hypos) meaning under and (spadon) meaning rent or fissure [1]. It is one of the most common anomalies of male external genitalia in which the penis is similar to the normal one except on the ventral aspect where the foreskin, the urethra and urethral spongiosum are deficient [2].

The ectopic external urethral meatus exits ventrally any where from the glans to the perineum and according to this abnormal meatal location, hypospadias is classified into: Anterior (50%); involving the glanular, coronal and the subcoronal regions. Middle (30%); involving the distal penile, mid-shaft and proximal penile regions. Posterior (20%); involving the penoscrotal, scrotal and perineal regions [3].

Chordee describes the abnormal ventral curvature of the penis. This results from hypoplasia and longitudinal shortening of ventral tissues. In most patients, mesenchymal tissue that would normally forms the corpus spongiosum and fascial layers in the normal penis manifests as fibrous tissue. However, curvature of the penis may also be due to ventral shortage of the skin, the urethra, the fascial layers, or the corpora themselves [4]. The aim of surgery in hypospadias is to achieve a functional penis with a normal cosmetic appearance [5].

Histological analysis has shown that the urethral plate in hypospadias is well vascularized, with sinusoids of abortive urethral spongiosum, and without scary tissue [6]. These features may explain the successful use of incorporating the urethral



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plate or abortive spongiosum into hypospadias reconstruction[7,8].

Primary tubularization of urethral plate (Thiersch- Duplay procedure) can be applied to patients with a deep glandular groove and wide urethral plate for both distal and proximal penile shaft hypospadias[9]. Recently, the concept of incising the urethral plate with subsequent tubularization and secondary healing introduced by Snodgrass has revolutionized hypospadias surgery[7], and this procedure is enjoying extensive popularity[10].

The present study was designated to determine wheather primary tubularized plate urethroplasty (Thiersch-Duplay technique) or tubularized incised plate urethroplasty (Snodgrass technique) is the more appropriate surgical treatment for distal penile and mid-shaft hypospadias, assessing the cosmetic and functional results in addition to the associated coplications.

### Patients and methods

A prospective study involving 40 boys with distal penile and mid-shaft hypospadias was conducted between september 2007 to september 2010. The diagnosis was made on clinical basis. Inclusion and exclusion criteria were adopted in selecting the patients.

Inclusion Criteria:

- 1- The patient is operated for the first time.
- 2- Uncircumcised patients.
- 3- Patients with minimal or no chordee.

Exclusion Criteria:

- 1- If the patient was operated upon previously.
- 2- Circumcised patients.
- 3- Patients with severe chordee.

The patients were blindly assigned into two random groups. Group A (20 patients) was repaired by tubularized incised plate urethroplasty(Snodgrass technique) and group B (20 patients) was repaired by tubularized plate urethroplasty(Thiersch-Duplay technique).

All the patients were operated upon under general anaesthesia. For those patients treated by tubulariced incised plate urethroplasty(Snodgrass technique); A silk

3/0 stay suture was placed in the dorsal glans to aid in the traction of the penis and fixation of the silastic urinary tube. Two Parallel longitudinal incisions approximately 8-10 mm apart alongside the urethral plate were done extending from the area near the tip of glans to the ectopic meatus and then joined each other about 2-3 mm proximal to the meatus forming a "U" shaped incision. The skin was degloved to the penoscrotal junction. For those patients with minimal chordee, dorsal tunical plication was performed using 4/0 polydioxanone suture. The glanular wings are dissected laterally to facilitate subsequent glans closure without tension and urethral plate was incised in the midline from the ectopic meatus to about the tip of the glans exposing the underlying corporeal bodies(fig.1A). Then the urethral plate was tubularized over an 8-10Fr silicon catheter (fig.1B), using a running subepithelial 6/0 polydioxanone suture. The epithelium of the urethral plate is inverted toward the lumen to avoid fistula formation. In all cases, a vascularized dartos fascial flap harvested either from the prepuce or the penile shaft was used to cover the urethroplasty as a second barrier layer and sutured with periurethral tissue using few 5/0 interrupted polydioxanone sutures. Care must be taken to avoid rotation of the penile shaft. The lateral glans wings were reapproximated over the neourethra using vertical mattress 5/0 polydioxanone sutures. Then skin closure was completed utilizing preputial flaps using 5/0 or 4/0 absorbable sutures. A small drain was left in place for 24 hours and a lightly compressive dressing was applied. The catheter was left for 7-10 days. Prophylactic intravenous antibiotic (3rd generation cephalosporin) started 30 minutes before induction of anesthesia and continued for 5-7 days postoperatively.

The same surgical steps were followed in those patients who were operated upon by tubularized plate alone(Thiersch-Duplay technique), fig.2A & 2B, except three points:

- 1- The urethral plate was not incised.



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2-The "U" shaped incision is slightly wider (the width between the two parallel incisions is 10-15 mm).

3-Dartos fascial flap was not used as an interposing barrier layer.

All patients were scheduled back for follow up for one year (once weekly for the first post-operative month, then monthly for five months and then every 3 months for the next six months). In each visit:

1-The parents were asked about the stream of urine on micturition (whether straight, splashed or weak), also they were asked about any leak of urine from the site of repair, and any pain or retention of urine.

2-A clinical examination of the external genitalia was performed to assess the progress of healing and detect any stenosis of the external meatus or any fistula or other complications at the site of repair.

### Results

Forty boys with distal penile and mid shaft hypospadias underwent primary repair. 20 of them were allocated for tubularized plate urethroplasty (Thiersch-Duplay technique) while tubularized incised plate urethroplasty (Snodgrass technique) was carried out for the other 20 boys. Their ages at the time of operation ranged between 2-8 years, and the majority were between 2-4 years as shown in **table (1)**. 3 boys had positive family history of hypospadias.

There were 30 patients (75 %) with distal penile and 10 patients (25 %) with mid shaft hypospadias. 20 patients (50%) had chordee, 18 of them (45%) had minimal skin chordee that was released by degloving of penile shaft skin and only 2 patients (5%) had minimal fibrous chordee to whom dorsal tunical plication was done.

5 patients (12.5%) were associated with undescended testes and inguinal hernia found in 3 (7.5%) patients.

Meatal stenosis was the most frequent complication involved those boys repaired by (Snodgrass technique) while those repaired by (Thiersch-Duplay technique) were mostly complicated by

urethrocutaneous fistula. **Table (2)** demonstrates the details of the complications encountered in both techniques. The final aesthetic and functional results of both techniques are demonstrated by **table (3)**.

### Discussion

Hypospadias is one of the most common congenital anomalies occurring in approximately 1 of 200 to 1 of 300 live births [14]. It is unique among the common congenital anomalies in having different techniques for the correction of a single condition [15].

The goals of primary hypospadias repair include straightening the curvature of the penis, extending the meatus to the glans tip, and revising the abnormal prepuce by circumcision to allow satisfactory cosmetic and functional results regarding urination and sexual function [7].

There are various surgical procedures to correct such defects, and each procedure is determined by a number of factors including the configuration of the glans, the site of meatus, and the degree of penile curvature [16].

Chordee was found in 50% of our patients, 45% of them had minimal skin chordee that was corrected just by degloving of penile shaft skin. Only 5% had minimal fibrous chordee that was corrected by dorsal tunical plication using polydioxanone 4/0 suture. These results are closely related to that of

El Mageed et al, as 50% of their patients had skin chordee and 10% of them had fibrous chordee [12]. Hence, it can be stated that skin chordee that is corrected just by degloving of penile shaft skin represents a high percentage of ventral penile curvature in distal and mid shaft hypospadias patients.

Regarding the Thiersch-Duplay technique, our overall complication rate was 40%. Urethrocutaneous fistula developed in 25% of the patients and 15% of them were complicated by glans disruption. Van Horn and Kass stated that: simple tubularization of urethral plate is attractive in its simplicity, however, the urethral plate is



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rarely wide enough to create an adequate urethral caliber. This may be compensated for by moving the longitudinal incisions more lateral away from the midline, but the resultant compromise in skin closure accounts for the significant fistula rate [13]. This concept may explain this high fistula rate. In most of the cases, the ventral glans does not have a deep groove [7]; hence, simple tubularization of the urethral plate would not provide an adequate diameter for the neourethra leading to glans disruption in 15% of our cases.

Regarding the results of Snodgrass technique, meatal stenosis and poor urinary stream were the most frequent complications; they were seen in 20% of the patients. In 2002 Lorenzo and Snodgrass concluded that failure to deeply incise the plate and/or tubularization of urethral plate too far distally can play an important role in developing stenosis [17]. Gordan and Schlossberg, Stated that (during the healing process of urethral plate, if it is not incised deeply, there will be epithelial apposition and hence healing by primary intention rather than by secondary intention resulting in meatal stenosis [18], therefore, it can be stated that meatal stenosis and its associated poor urinary stream is mainly due to technical error. To minimize this, we adopted two technical issues:

First: Deeply incising the urethral plate and avoiding too far distal tubularization (not exceeding the mid-glanular point).  
Second: A longterm daily urethral dilatation: started after removing the silastic urinary catheter after 10-14 days and continues for 3 months, this dilatation prevents or at least minimizes epithelial apposition enhancing the secondary rather than primary wound healing. These two steps significantly improved the results of the next repair procedures.

The other complications encountered by Snodgrass technique were urethrocutaneous fistula (5%) and diverticulum (5%). These complications were observed just in those patients with meatal stenosis suggesting that the impaired normal flow of urine due to stenosis produced back pressure which

adversely affected the suture line that is considered as a weak point, enhancing the development of a fistula or diverticulum. We think that preventing meatal stenosis in Snodgrass technique significantly minimizes these complications.

Khuri *et al* found an incidence of 9.3% of undescended testes and 9.1% of inguinal hernia in patients with hypospadias [11]. In our study we found a comparable results 12.5% with undescended testes and 7.5% with inguinal hernia; therefore, any patient with hypospadias should be examined thoroughly so as not to miss these associated anomalies.

The final aesthetic and functional results were achieved in the majority of those patients treated by Snodgrass technique. All the patients had a conical shaped glans. The meatus was vertically oriented and expanded to the apex of the glans with straight voiding stream in 80% of them. This is in an agreement with the results of Smail Acimi: the tubularized incised plate gave an excellent cosmetic result with fewer fistulae [19] and that of KM O'Connor and EA Kiely: the urinary stream was straight in 94% of their patients, and 97% reported a good or satisfactory final cosmetic outcome [20]. The same authors found a rounded or tranverse external urethral meatus in Mathieu and Thiersch-Duplay technique [20]. Abnormal meatal shape (rounded or tranverse) was seen in 85% of our patients repaired by Thiersch-Duplay technique beside bifid or splashed stream in 60% of them.

**Conclusions:**

Snodgrass repair is a simple technique and offers satisfactory cosmetic and functional results in distal penile and mid-shaft hypospadias repair; however, meatal stenosis initially encountered but modified meatoplasty and regular meatal dilatation dramatically improved this complication. Thiersch-Duplay technique offers less satisfactory results and urethrocutaneous fistulae are more frequently encountered mainly due to the tension in closure

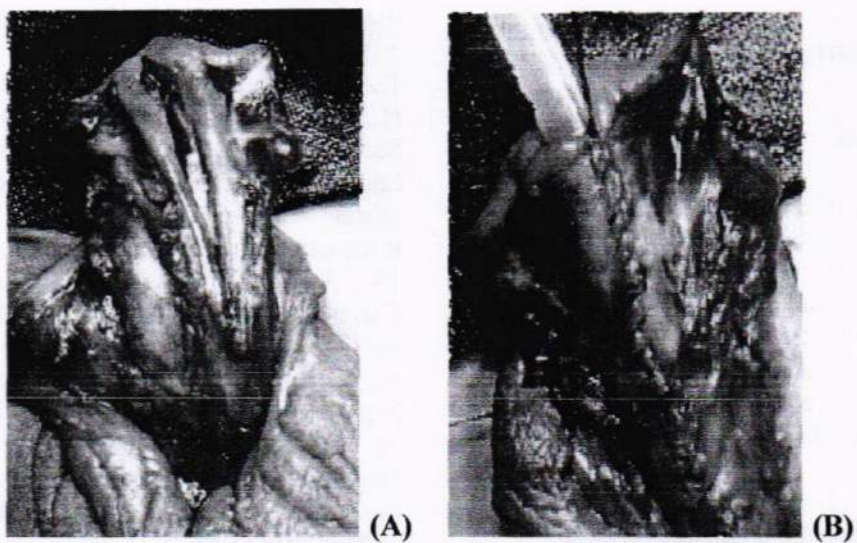


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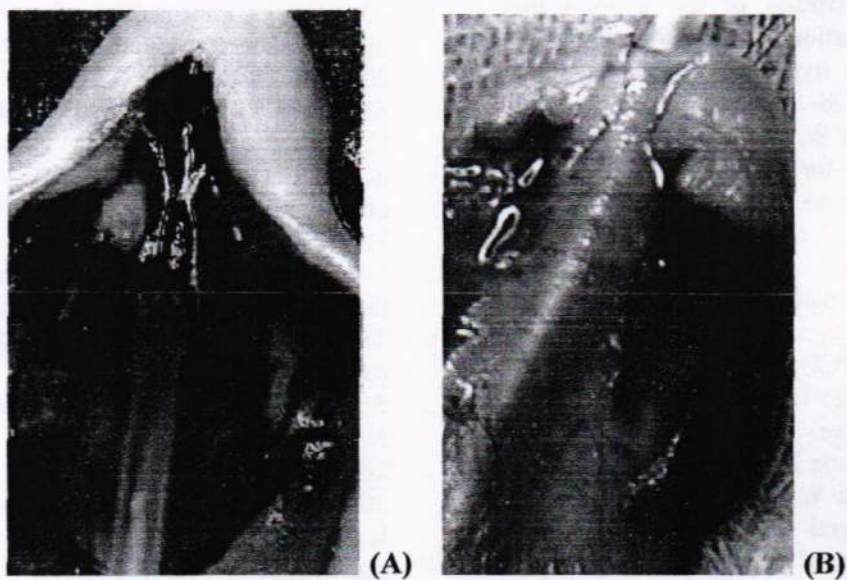
and the absence of the dartos fascia as an interposing barrier flap.

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**Fig.1: Tubularized incised plate urethroplasty.**



**Fig.2: Tubularized plate urethroplasty**



**Table (1):** Ages at the time of operation.

Age in years	Thiersch-Duplay technique		Snodgrass technique	
	No.	%	No.	%
2 – 4	16	80	15	75
>4 - 6	3	15	4	20
>6 - 8	1	5	1	5
<b>Total</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>

**Table (2):**Complications of Snodgrass and Thiersch-Duplay techniques.

Complication	Thiersch-Duplay technique		Snodgrass technique	
	No.	%	No.	%
Meatal stenosis	0	0	4	20
Urethrocutaneous fistula	5	25	1	5
Glans disruption	3	15	0	0
Diverticulum	0	0	1	5

**Table (3):**The final aesthetic and functional results in Snodgrass and Thiersch- Duplay techniques.

Functional and aesthetic result	Thiersch-Duplay technique		Snodgrass technique	
	No.	%	No.	%
Conical glanular configuration	0	0	20	100
Vertical slit-like meatus	0	0	16	80
Rounded meatus	7	35	0	0
Tranverse meatus	10	50	0	0
Straight voiding stream	8	40	16	80
Bifid or splashed stream	12	60	0	0
Poor stream	0	0	4	20

## تقويم الاحليل (المبال) التحتاني الولادي القريب و المتوسط البعد من الحشفة: مقارنة طريقة سنود كراس مع طريقة ثيرش- دوبلي

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### الخلاصة

**خلفية البحث:** يعتبر الاحليل (المبال) التحتاني الولادي من اكثر التشوهات الولادية التي تصيب الاعضاء التناسلية الذكرية الخارجية شيوعا وفيه تكون فتحة الاحليل الخارجية بعيدة عن مكانها الطبيعي في مقدمة الحشفة واقعة على السطح البطني (السفلي) للحشفة او القضيب او كيس الصفن او المنطقة التي تليه. هناك عدة طرق جراحية لعلاج هذا التشوه ولكن النتائج تبقى متباينة.

**هدف الدراسة:** مقارنة طريقة سنود كراس مع طريقة ثيرش- دوبلي لعلاج الاحليل (المبال) التحتاني الولادي من حيث الوظيفة والجمالية والمضاعفات.

**المرضى و طريقة البحث:** تم تقسيم المرضى عشوائيا الى مجموعتين: المجموعة الاولى وتضم عشرين مريضا تم علاجهم بطريقة سنود كراس اما المجموعة الثانية فقد ضمت عشرين مريضا ايضا و تمت معالجتهم بطريقة ثيرش- دوبلي . ان جميع المرضى تمت متابعتهم بعد التداخل الجراحي لمدة سنة واحدة.

**النتائج:** عدد المرضى الذين اشتملت عليهم الدراسة (اربعون مريضا)، غالبية اعمارهم عند اجراء العملية الجراحية كانت بين السنة الثانية و الرابعة من العمر. تضيق فتحة الاحليل و ناسور الاحليل كانا اكثر المضاعفات التي صاحبت التداخل الجراحي.

**الاستنتاج:** ان طريقة سنود كراس لتقويم الاحليل (المبال) التحتاني الولادي كانت هي الامثل من الناحية الوظيفية و الجمالية .

**كلمات مفتاحية:** سنود كراس ، ثيرش- دوبلي ، المبال التحتاني الولادي.