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## Original article

# The Use of Autologous Platelet Rich Fibrin Membrane as a Second Layer in Snodgrass Repair of Distal Hypospadias

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## ABSTRACT

**Background:** Hypospadias is a common pediatric health problem. Snodgrass [Tubularized Incised Plate Urethroplasty] surgical repair was adopted as the standard technique, although different techniques had been described. However, higher complication rate continues to be a problem.

**The aim of the work:** To evaluate the use of platelet rich fibrin membrane as an intermediate layer in the Snodgrass repair of distal hypospadias.

**Patients and Methods:** Thirty children were included. All were evaluated preoperatively by full history taking, clinical examination and laboratory investigations. Then all were treated by Tubularized Incised Plate Urethroplasty with the use of platelet rich fibrin membrane as an intermediate layer. They then followed up and any early or late complications were registered.

**Results:** Hypospadias was recurrent among 83.3%. Patient age ranged between one and six years and the mean operative time was  $67 \pm 5.4$  minutes; the mean hospital stay duration was  $7.0 \pm 1.2$  days. The success rate was 93.3% and complication rate was 6.7%. Complications were edema in 6.7%, urethro-cutaneous fistula [UCF] in 6.7% and skin infection among 3.3%.

**Conclusion:** The use of a platelet rich fibrin membrane is a feasible and safe intermediate layer for hypospadias surgery in Tubularized Incised Plate Urethroplasty. The procedure is quick and straightforward and has a low postoperative complication.

**Keywords:** Hypospadias; Tubularized Incised Plate Urethroplasty; Platelet-Rich Fibrin; Autologous; Intermediate.

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\* Main subject and any subcategories have been classified according to the research topic.

## INTRODUCTION

Hypospadias is a congenital abnormality of the male urethra, leading to irregular ventral positioning of the urethral opening and is associated with abnormal foreskin development and penile curvature [1].

Hypospadias is a common congenital anomaly, with an incidence from 0.3 to 0.7 percent in live male births [2]. Hypospadias is usually classified into distal hypospadias, middle shaft [penile] hypospadias, and proximal [penoscrotal, scrotal, or perineal] hypospadias [3-4].

The proposed mechanism for the pathogenesis of hypospadias is disruption of the androgenic stimulation which is essential for the normal development of the male external genitalia. Both genetic and environmental factors have been linked to hypospadias, suggesting multifactorial etiology [5,6].

The objective of surgical correction is to restore normal function and appearance of a penis. Surgical urethroplasty should result in a properly directed urinary stream and a straightened erected penis [7].

The most common postoperative complication after hypospadias repair is urethral-cutaneous fistula [UCF] with a reported incidence from 4 to 28% [8].

Using an intermediate layer between the foreskin and the neourethra is an important intervention used to reduce fistula formation [9].

Several coverage techniques have been described including local subcutaneous penile tissue, tunica vaginalis, dartos, and extragenital tissues. In addition, fibrin sealants were introduced to prevent fistula formation [10].

Platelet-rich fibrin membrane [PRF] is an autologous source of growth factors. It is prepared from the sera of the patient. Transforming growth factor- $\beta$ , vascular endothelial growth factor, and endothelial growth factor are the most common growth factors detected in the PRF sample [11].

PRF enhances collagen synthesis and tissue repair and improves wound healing and angiogenesis; therefore, this autologous fibrin membrane could be used as an intermediate layer between the neourethra and the skin to reduce the incidence of fistula formation [12].

## AIM OF THE WORK

The aim of the study is to evaluate the use of autologous platelet rich fibrin membrane as interpositional layer in Snodgrass repair of distal hypospadias, its outcome and postoperative complications.

## PATIENTS AND METHODS

All patients signed an informed consent, and the study protocol had been approved by the local ethical committee. The study included 30 patients with distal hypospadias were treated by Snodgrass technique with autologous platelet-rich fibrin [PRF] membrane as a second interposition layer in distal hypospadias repair at Al-Azhar University Hospital [New Damietta].

The inclusion criteria were: distal hypospadias with wide and supple urethral plate either fresh or recurrent, no or minimal Chordae, circumcised child, and age ranged between one and 14 year.

The exclusion criteria were: patients with proximal hypospadias, uncircumcised child, and unsuitable urethral plate for Snodgrass repair. All patients were subjected to detailed history taking, full clinical examination [general and local]. Local examination was carried to check out penile size, shape and size of the glans, width of urethral plate, degree of chordae, and characters of urethral orifice [position, shape, width of urethral orifice]. In addition, preoperative laboratory investigations include complete blood count, coagulation profile, and urine analysis.

All procedures were conducted by a single surgeon, under general anesthesia and the third-generation cephalosporin was injected with induction of anesthesia in a dose of 50mg/kg body weight and continued for 72 hours post operatively. Then, replaced with oral antibiotic till removal of urinary stent [5-7] days.

**Surgical technique:** Under general anesthesia, the meal location was noted. Then, a polyglactin stay suture 4/0 [on round needle] was placed in the dorsal glans for traction of the penis, and a 6-10Fr urethral catheter was inserted. To maintain a bloodless field, a tourniquet was applied at the base of the penis. An artificial erection was induced to ensure a straight penis [Figure 1].

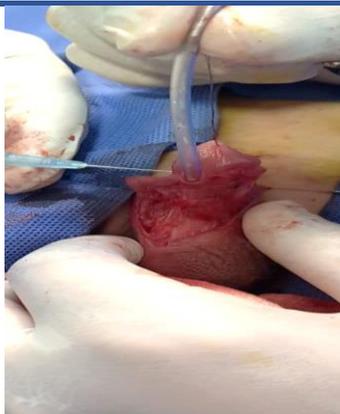


Figure [1]: An artificial erection was induced to ensure a straight penis.

A U-shaped incision was made extending beyond the edges of the urethral plate and 2 mm proximal to the original meatus. The shaft skin is degloved to the penoscrotal junction [Figure 2].



Figure [2]: Degloving to the penoscrotal junction

The glanular wings were created after making parallel longitudinal incisions to define the urethral plate and were dissected laterally for subsequent tension-free closure [Figure 3].



Figure [3]: The glanular wings were created after making parallel longitudinal incisions

The edges of the urethral plate were gently elevated and retracted laterally with fine forceps. The urethral plate was then widened by a deep relaxing

midline incision along its entire length from the meatus to the glans tip [Figure 4].



Figure [4]: Deep relaxing midline incision along its entire length from the meatus to the glans tip

The incision was carried deeply through the mucosal and submucosal tissue dividing all transverse webs and exposing the underlying corporal bodies [Figure 5].

Incised plate was then tabularized over the urethral catheter by Continuous subcuticular 6–0 polyglactin sutures. Spongioplasty may be done to reinforce the neo-urethra with interrupted 6-0 polyglactin sutures.

Preparation of Platelet-rich Fibrin Membrane: Ten milliliter blood samples were obtained intraoperatively. Blood was collected without anticoagulant into a sterile tube and directly centrifuged at 3000 rpm for 10 minutes. As a result, there was a formation of a fibrin clot in the middle of the tube. The clot was extracted from the tube, separated and gently compressed between two surgical swabs to obtain PRF membrane. The who procedure was done under strict asepsis. This PRF membrane was secured over the urethroplasty using a few 6–0 interrupted polyglactin sutures [Figure 6].

The glanular wings were symmetrically closed ventrally over the neourethra with 6–0 polyglactin sutures in two layers. The skin was sutured over the patch using interrupted 6–0 polyglactin sutures [Figure 7]. The transurethral catheter was left in place for 5–7 days with a compressive dressing for a mean of 3 days. We used a simple dressing with Vaseline paper and gauze & gentle pressure. We used a simple wrap dressing around the shaft of the penis with fixation of dressing to the penis and suprapubic region to prevent slipping of dressing.

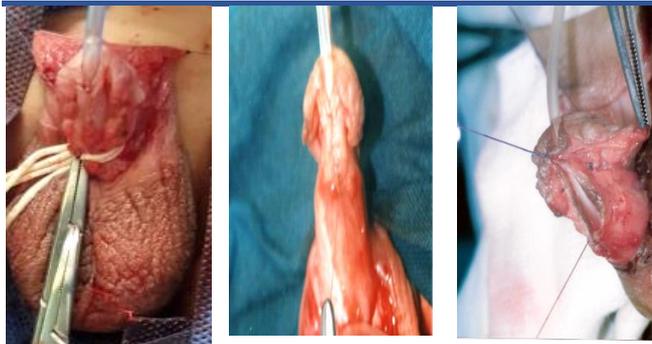


Figure [5]: Tubularized over an 8 Fr silicone urethral catheter



Figure [6]: Platelet rich fibrin [PRF] membrane sutured over urethroplasty



Figure [7]: The glanular wings were symmetrically closed

The tip of the glans must be exposed for close observation and follow up of the vascularity of the glans. The transurethral catheter was left in place for 5–7 days with a compressive dressing for a mean of 3 days. We used a simple dressing with Vaseline paper and gauze & gentle pressure. We used a simple wrap dressing around the shaft of the penis with fixation of dressing to the penis and suprapubic region to prevent slipping of dressing. The tip of the glans must be exposed for close observation and follow up of the vascularity of the glans.

**Post-operative follow up:**

All patients were followed in the post-operative period regarding dressing, catheter care, analgesics and antibiotics. For the regular check of catheter patency, we flush the catheter with 10-20 ml saline with garamycin ampule if needed. The parents were instructed to apply an antibiotic ointment to the tip of the glans penis. Postoperatively if the child suffers from pain he was treated by simple analgesics. One intravenous dose of abroad- spectrum antibiotic indicated preoperatively and for at least two days postoperative, then we shifted to oral antibiotics until patient was discharged from hospital. First dressing was done 5 days postoperative. The catheter was removed after 7-10 days. The discharge of patient from hospital done after removal of urinary catheter. The protocol of follow-up was done every week during

the first postoperative month then every two months for the next six months.

The postoperative evaluation included the following: duration of hospital stay, time of stent "urethral catheter" withdrawal, the incidence of fistula occurrence, the incidence of meatal stenosis, incidence of hematoma and infection, and incidence of total disruption.

**RESULTS**

The type of hypospadias was recurrent among 83.3% of studied children and new among 16.7%; the patient age ranged between 1 to 6 years; the mean age was 3.7±1.2 years; the operative time ranged between 45 and 75 minutes and mean operative time was 67±5.4 minutes; the hospital stay duration ranged between 5 and 10 days with a mean duration of 7.0±1.2 days; Stent withdrawal was done at the fifth or tenth postoperative, the mean time for stent removal was 6.63±1.21 days [Table 1].

In the current work, the success rate was 93.3% and complications were reported in just 2 patients [6.7%], complications were in the form of edema 6.7%, urethro-cutaneous fistula [UCF] among 6.7% and skin infections among 3.3%. Otherwise, no patients had disruption, urethral stenosis or hematoma [Table 2].

Table [1]: Type of case, patient age, operative time, hospital stay duration and time of stent withdrawal among studied cases.

Variable		Statistics
Type of case	Recurrent	25 [83.3%]
	New Case	5 [16.7%]
Age [years]		3.7±1.2; 1-6
Operative time		67±5.4 [45-75]
Hospital stay		7.0±1.20 [5-10]
Stent withdrawal		6.63±1.21 [5-10]

Table [2]: Success rate and complications among the studied groups

		n.	%
Succeeded cases		28	93.3%
Complicated cases needed surgery		2	6.70%
Complications	Edema	2	6.70%
	UCF	2	6.70%
	Disruption	0	0.0%
	Urethral stenosis	0	0.0%
	Hematoma	0	0.0%
	Skin infection	1	3.3%

## DISCUSSION

For hypospadias repair to be considered successful, it should fulfill the following criteria: a vertical slit-like meatus, a conical glans, a straight erected penis, good skin coverage, and a normal scrotal position in relation to the penis<sup>[13]</sup>. In nineties, Snodgrass described a technique of urethral plate incision and tubularization<sup>[14]</sup>. Many techniques are reported in literature, describing the second layer coverage [e.g., spongioplasty and separation of the corpora cavernosa] for surgical repair of the hypospadias. It is essential to introduce a layer of healthy tissues between urethroplasty and the skin. However, there is no consensus between pediatric urologists on the standard technique<sup>[15]</sup>. PRF is as a concentrated preparation that increases the basal platelet number up to four- and nine-folds<sup>[16]</sup>. Autologous platelets will confer a local increase of cytokines and growth factors that recruit cells and stimulate the healing process<sup>[17]</sup>. The PRF preparation is a simple process than fibrin glue. The patch can be prepared during the surgical procedure and used immediately. Otherwise, it can be preserved for a few minutes between swabs soaked in a saline serum<sup>[18]</sup>. Guinot *et al.*<sup>[9]</sup> found that the PRF appears to be an effective and safe covering technique. It is a supplementary method to coverage for hypospadias repair surgery.

PRF sheets as a coverage layer might help in reduction of postoperative complications. This method might be an alternative coverage layer for hypospadias in repair surgery, especially when a healthy layer for coverage was absent, such as in circumcised patients, distorted cases or in patients undergone previous surgeries<sup>[18]</sup>.

In our study, incidence of success in the

management of hypospadias repaired by Snodgrass with PRF is 93.30%. Complicated cases needed surgery are reported in 6.7%, with urethero-cutaneous fistula and edema in two patients [6.7%] and wound infection in 3.3%. In their study, Mahmoud *et al.*<sup>[11]</sup> reported overall success rate 85.6%, which is lower than the current study, and could be attributed to the small number of patients in the current work and reported a complications rate of 13.3% in group treated by the fibrin rich plasma sheets. The urethrocutaneous fistula [UCF] was the most common early complication reported in 10.0% of the fibrin group. However, no patients reported a superficial wound infection in their study. However, Hassouna *et al.*<sup>[19]</sup> reported a complication rate of 20.0% in management of hypospadias either by Mathieu or Snodgrass techniques. The wound breakdown reported in 5.0%, fistula in 10.0% and meatal stenosis in 5.0%; with a fistula as the most common complication. The possible explanation of increased rate of complications in their study when compared to the current one may be due to different ages [they included patients up to 15 years] and no use of the second intermediate layer. Kajbafzadeh *et al.*<sup>[20]</sup> reported that, UCF remains a common complication after hypospadias surgery with a rate of 3 and 10%. The rate in the current work lies within this reported incidence.

In an attempt to decrease post-urethroplasty complications especially UCF, different maneuvers for the second layer coverage have been reported in the literature [e.g., spongioplasty and separation of the corpora cavernosa for hypospadias repair]<sup>[21]</sup>. Appignani *et al.*<sup>[22]</sup> described the de-epithelialized foreskin flap, Churchill *et al.*<sup>[23]</sup> described the dartos flap as a second adjunct layer to prevent UCFs in repeated hypospadias repair. In addition, Snow *et al.*<sup>[24]</sup> described the use of tunica vaginalis as a blanket

wrap for prevention of UCF, and Gopal *et al.* [25] described the use of fibrin glue.

The idea of the use of a double protective [second layer of dorsal prepuce and penile skin] had been supported by the study of Kamal [26] with the reduction of UCFs. Savanelli *et al.* [27] reported a reduced rate of complications [fistula recurrence] by the use of ventral dartos coverage after TIPU repair. Cimador *et al.* [28] reported similar results. Fahmy *et al.* [29] recommended double dartos flap [DDF] during TIPU for distal hypospadias. However, Thomas *et al.* [30] reported that, use of dartos flaps in hypospadias repair offers no statistically significant benefit over flapless repair for reduction of complication rates.

In the current study, the incidence of edema was reported in 6.7% and was managed by anti-edematous and anti-inflammatory medications with no need for other surgery. Comparable results reported by Bhat *et al.* [31]. The current rate of superficial wound infection was 3.3%, that managed by frequent dressing and intravenous [IV] antibiotic injection. Tavakkoli Tabassi and Mohammadi [32] reported an incidence of infection [13.79%] after dartos flap with Snodgrass repair, and 5.71 after the tunica vaginalis flap [33].

Limiting steps of the current work is the small sample of included patients and the absence of the control group. However, the study retains its importance as one of the unique trials evaluated the fibrin flaps as an intermediate second layer in hypospadias repair.

In conclusion, the results of the current study indicated that the use of fibrin layer is a feasible and safe intermediate layer for hypospadias surgery. It seems to be a promising coverage technique especially in recurrent cases [with absent healthy dartos tissues for flap or with no-availability of tunica vaginalis due to previous testicular operation]. The technique is rapid and straightforward a low risk of postoperative complications.

#### Financial and Non-financial Relationships and Activities of Interest

None

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