

Snodgrass repair for distal hypospadias: a review of 75 cases

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Background/aim In 1994, Warren Snodgrass described his technique of tubularized incised plate urethroplasty, which is a relatively straightforward one-stage procedure. It has become the standard technique used by many urologists for distal hypospadias correction. We review our cases to find out whether there was any difference in the rate of urethrocutaneous fistula after the use of single-versus double-layer tubularization, the use of thick versus thin dorsal prepuce subcutaneous flap (DPF), the use of DPF versus the ventral dartos flap for repair cover, and also to find out whether the extension of the urethral plate incision till the neomeatus was associated with an increased rate of meatal stenosis.

Patients and methods We reviewed the operative notes and the out-patient files of all patients who underwent Snodgrass repair for distal hypospadias, over a period of 8 years. Follow-up extended from 2 to 24 months postoperatively. The variables addressed were as follows: the age during repair, the type of hypospadias, the tubularization technique, whether it was a single layer or with an additional reinforcing, second layer, the cover flap (dorsal prepuce subcutaneous vs. ventral local dartos fascia), the thickness of the dorsal flap when used (thin vs. thick), and the distal limit of the plate incision, whether including the site of the neomeatus or not. The complications addressed were the occurrence of urethrocutaneous fistula and meatal stenosis.

Results The study included 75 cases. Twenty-one (28%) boys operated were below 6 months, 17 (23%) between 6 and 12 months, and 37 (49%) above 1-year of age. A single

suture-line tubularization was used in 17 (23%) and a reinforcing second layer was added in 58 (77%) patients [urethrocutaneous fistulae occurred in two (11.8%) and five (8.8%) patients, respectively]. The second layer flap was the dorsal subcutaneous prepuce in 63 (84%), thin in 16 (25%), and thick in 47 (75%) patients [urethrocutaneous fistulae occurred in two (12.5%) and four (8.5%) patients, respectively]. The ventral local dartos flap was used in 12 (16%) cases (all were already circumcised) [the fistula occurred in one (8%) patient]. The neomeatus site was included in the urethral plate incision in 45 patients, and not included in 30 [meatal stenosis occurred in eight (18%) and two (7%) patients, respectively].

Conclusions In Snodgrass repair of distal hypospadias, tubularization in two layers, together with proper harvesting of the thick DPF, decrease the fistula rate. Extending the plate incision to the neomeatus site is a predisposing factor for meatal stenosis. *Ann Pediatr Surg* 8:12–14 © 2012 Annals of Pediatric Surgery.

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Introduction

In 1994, Warren T Snodgrass described his technique of tubularized incised plate urethroplasty, which is a relatively straightforward one-stage procedure [1]. It has become the standard technique used by many urologists for distal hypospadias correction [2,3]. We review our cases to find out whether there was any difference in the rate of urethrocutaneous fistula after the use of single-versus double-layer tubularization, the use of thick versus thin dorsal prepuce subcutaneous flap (DPF), the use of DPF versus the ventral local dartos flap for repair cover, and also to find out whether the extension of the urethral plate incision till the neomeatus was associated with an increased rate of meatal stenosis.

Patients and methods

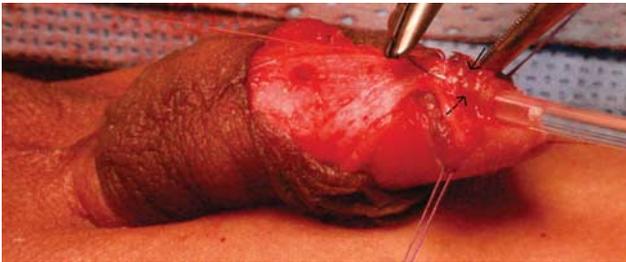
We reviewed all patients who underwent Snodgrass [1,2,4] repair for distal hypospadias, over a period of 8 years. To unify the results, the study included the cases performed by one surgeon. Operative notes and out-patient files were reviewed. Follow-up extended from

2 to 24 months postoperatively. The routine was to stent all the cases with a silicone catheter, Fr 6–8 (depending on age and size), and to leave it draining in a double diaper. The patients were discharged home on the same day or the next morning. The catheter was removed 5–7 days postoperatively. The variables addressed were as follows: the age at the repair, the type of hypospadias, the tubularization technique, whether a single layer or with an additional reinforcing second layer (Fig. 1), the cover flap (dorsal prepuce subcutaneous [1,4–7] vs. ventral local dartos fascia [8]), the thickness of the dorsal flap when used (thin vs. thick), and the distal limit of the plate incision, whether including the site of the neomeatus or not. The ventral local dartos layer was used in the circumcised boys. We define a thick (vs. thin) dorsal prepuce flap as when the urethral plate suture line could not be seen through it (Fig. 2a and b). The complications addressed were the occurrence of urethrocutaneous fistula and meatal stenosis. Data were analyzed using contingency tables and χ^2 -test, with *P*-values less than 0.05 considered significant.

Results

From January 2003 to December 2010, 181 cases of hypospadias were repaired by the author. Seventy-five cases had Snodgrass repair for distal hypospadias. The age ranged from 2 months to 18 years (mean 30.5 months). Six (8%) had glanular, 13 (17%) subcoronal, 45 (60%) distal penile, and 11 (15%) mid-penile meatus. Twenty-one (28%) boys operated were below 6 months, 17 (23%) between 6 and 12 months, and 37 (49%) above 1-year of age. Single suture-line tubularization was used in 17 (23%) and a reinforcing layer was added in 58 (77%) patients [urethrocuteaneous fistulae occurred in two (11.8%) and five (8.8%) patients, respectively; $\chi^2 = 0.143$, *P*-value non significant]. The second layer flap was the dorsal subcutaneous prepuce in 63 (84%), thin in 16 (25%), and thick in 47 (75%) patients, [urethrocuteaneous fistulae occurred in two (12.5%) and four (8.5%) patients, respectively; $\chi^2 = 0.2$, *P*-value non significant]. The ventral local dartos was used in 12 (16%) cases (all were already

Fig. 1



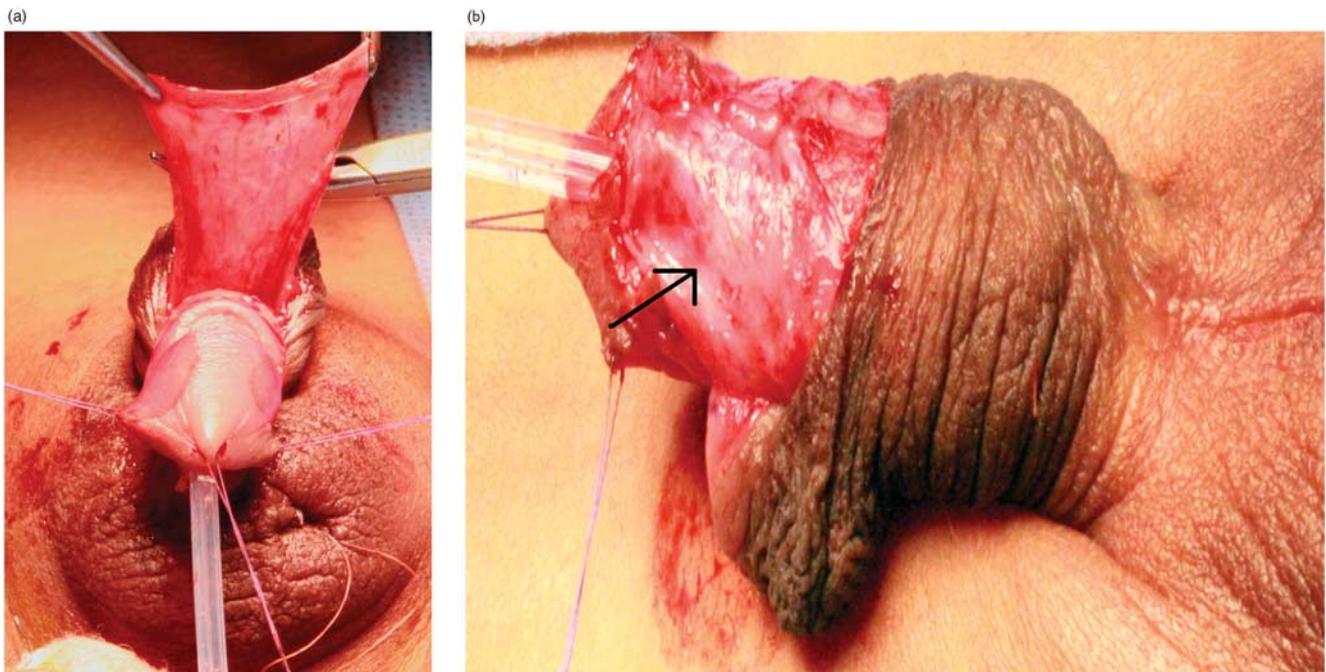
Double-suture-line tubularization. The second suture line (dotted arrow) starts a few millimeters from the first (solid arrow), on both sides.

circumcised) [the fistula occurred in one (8%) patient]. The neomeatus site was included into the urethral plate incision in 45 patients, and not included in 30 [meatal stenosis occurred in eight (18%) and two (7%) patients, respectively; $\chi^2 = 1.9$, *P*-value non significant]. Overall, urethrocuteaneous fistulae occurred in seven (9.5%) and meatal stenosis in 10 (13%) cases. Tables 1–2 summarize the results.

Discussion

The incidence of hypospadias is one out of 300 male births. The majority of the cases are distal [4,6]. Since it was introduced in 1994, Snodgrass urethroplasty [1] has been the adopted procedure for distal hypospadias correction by many urologists [2,9,10]. Its versatility, together with the normally appearing meatus, has made it the preferred technique. Although the technique has also been used for the repair of proximal hypospadias, our study focused on the distal cases because they are more common and reliably corrected in one stage. The most feared complications after tubularized incised plate urethroplasty procedure are the urethrocuteaneous fistula and meatal stenosis [4,5,10]. Various techniques were used to decrease the incidence of urethrocuteaneous fistula. Gentle tissue handling with precise identification of minute tissue relations and preservation of the periurethral vascular supply are essential [5,10]. We use Loup (X 2.5) as a routine. Different technical points were raised to decrease the incidence of fistula formation. The importance of the second layer cover flap was agreed as an important step [1,4,5,7,8,11]. DPF was the one used by Snodgrass himself to cover his repair [1,2,4]. Although Ross and Kay [12] raised the concern that

Fig. 2



Thick dorsal prepuce subcutaneous flap (a) harvested and rotated from the right side to cover the repair. (b) The repair sutures are not seen through the thick nontransparent flap.

Table 1 Urethrocutaneous fistula in relation to some technical points in Snodgrass repair of distal hypospadias (75 cases)

Technical point	Fistula (%)	χ^2
Tubularization		
Single layer (17)	2 (12)	0.143
Two layers (58)	5 (9)	
Flap		
DPF (63)	6 (9)	0.015
Local tissue (12)	1 (8)	
DPF thickness		
Thin (16)	2 (13)	0.2
Thick (47)	4 (9)	

DPF, dorsal prepuce subcutaneous flap.

 $\chi^2 > 3.84$ correlates to a $P < 0.05$, that is, significant.**Table 2 Meatal stenosis in relation to the distal extent of the plate incision in Snodgrass repair of distal hypospadias (75 cases)**

Technical point	Meatal stenosis (%)	χ^2
Plate incision distal limit		1.9
Neomeatus included (45)	8 (17.7)	
Neomeatus not included (30)	2 (6.6)	

 $\chi^2 > 3.84$ correlates to a $P < 0.05$, that is, significant.

mobilization of this flap may compromise the blood supply to the skin closure and predispose to torsion, this has been our main flap. We rotated the flap from one side and covered the repair (Fig. 2b) without any penile torsion or vascular compromise of the dorsal penile skin in any case. The same observation was reported by Decter and Franzoni [7], who found that the vascularized pedicle of subcutaneous tissue, covering the neourethra, resulted in a statistically significant decrease in the fistula rate over the use of the adjacent local tissue. Again, the subcutaneous flap, in their experience, had not adversely affected cosmesis or led to problems with torsion.

However, with more practice, we found that the thickness of the flap was an important factor in fistula prevention. Although statistically not significant, thin flaps with even good blood vessels running through it, were not enough to decrease our fistula rate. The flap, when thick, nontransparent, allowing good vascular tissue bulk to be laid over the repair (Fig. 2a and b), decreased the rate of fistula (12.5 vs. 8.5%).

Another important factor was the use of an additional reinforcing, second layer for the tubularization versus a single one. We believe that the urethral plate, when dissected, should be thick enough to allow for tubularization in two layers, namely the first subepithelial together with a second reinforcing one.

Our fistula rate has changed from 11.8% in the early cases to 8.8%, which is comparable to other series from other

institutions [2,10]. Our fistula rate, although initially disappointing, represents a learning curve associated with the realization of the points addressed before: the tubularization in two layers and proper harvesting of the thick dorsal flap.

Meatal stenosis generally occurs in up to 7% of patients after hypospadias repair [2,5,10]. Extending the urethral plate incision till the site of the neomeatus was considered by some as a predisposing factor [3]. This was seen in our cases. When the neomeatus site was not included into the plate incision, the meatal stenosis rate almost decreased from 18 to 7%.

Conclusion

Although statistically insignificant, our experience showed that in Snodgrass repair of distal hypospadias, two-layer tubularization, together with proper harvesting of the thick dorsal subcutaneous prepuce flap, decrease the fistula rate. Extending the plate incision to the neomeatus site is a predisposing factor for meatal stenosis. A larger prospective controlled study is required.

Acknowledgements

The work adhered to the ethical policy of the hospital.

Conflicts of interest

There are no conflicts of interest.

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