

Duncan Wilcox · Warren Snodgrass

## Long-term outcome following hypospadias repair

Received: 4 January 2006 / Accepted: 6 February 2006 / Published online: 8 March 2006  
© Springer-Verlag 2006

**Abstract** Hypospadias is a common problem affecting approximately one boy in 300; it is usually corrected in the first few years of life. While early outcome data is widely available, little has been reported on the long-term problems that these men suffer. Data suggest that the majority of men have no lasting effects, but up to 40% with severe hypospadias can have some degree of voiding problems. In addition, sexual problems affecting erection, ejaculation and sexual sensation have now been reported in more than 20% of men, although these studies are few and contain only a small number of patients. This limited available data support the need for further long-term studies especially focusing on the more modern techniques.

**Keywords** Hypospadias · Sexual outcome · Long-term outcome · Voiding

### Introduction

The impact of hypospadias repair continues throughout life; despite this, few reports address micturation problems, sexual function or satisfaction with cosmesis in adults following their childhood operations. In addition the surgical techniques are always evolving making it easy to ignore past failures, as new techniques are always reported as being better!

In this review we plan to outline the broad classifications of techniques that are commonly, or have been, in use. Wherever possible, data are given according to the initial type of operation performed. We will concentrate on the long-term data that is available specifi-

cally looking at voiding abnormalities, cosmesis and sexual function outcome.

### Micturation

Problems with voiding can broadly be divided into three areas: Poor urinary stream, which has been associated with meatal or more proximal stenosis, and diverticulae of the neourethra resulting in poor peristalsis; late presenting fistulae and finally an unacceptable position of the meatus resulting in downward deflecting urinary stream.

Duckett has reported his experience with the MAGPI procedure; in his series of over 1,000 patients, only 1.2% required a secondary procedure. The problems encountered were fistulae (0.5%), meatal retraction (0.6%) and persistent chordee (0.1%). These results are excellent and have not been bettered in the literature [8]. Other groups have also published acceptable results, in general with a reoperation rate below 10%. The major problem reported is meatal retraction, and Duckett in this paper stresses the importance of glans-to-glans approximation in performing the glanuloplasty to minimise this complication [4]. A criticism of this paper is that the mean follow-up was only 2.3 months with a range of 2 weeks–2 years. This is a recurring theme in hypospadias surgery and, therefore, it is unlikely that all the complications should be identified.

Studies with a longer-term follow-up have had significantly more complications. In 1989 a study following up 45 boys after a MAGPI showed that in 26/28 patients assessed, the meatus had partially regressed towards its original position; however, in 27/28 the cosmetic and functional results were reported as satisfactory [12]. This was confirmed in 1991, a study with a mean follow-up of 23 months composed of 41 patients, 22% had partial and 15% had complete regression of the meatus [27]. In these patients the majority of the complications occurred in those with a coronal or subcoronal hypospadias. This data, and the widespread use of the tubularised incised

D. Wilcox (✉) · W. Snodgrass  
Department of Pediatric Urology, The University of Texas  
Southwestern Medical Center, 6300 Harry Hines Boulevard,  
Suite 1401, Dallas, TX, 75235, USA  
E-mail: duncan.wilcox@childrens.com  
Tel.: +1-214-4564299

plate (TIP) repair account for the decline in popularity of the MAGPI procedure.

The TIP repair was described recently in 1994 [24], consequently there is little long-term data published. In a multicenter experience with the TIP hypospadias repair 148 boys were operated from 6 paediatric urology centres [25]. The complications included fistulae 5%, meatal stenosis 2% and partial glans dehiscence 5%. These results were confirmed in later studies investigating the role of TIP in both proximal and distal hypospadias, in which approximately 10% of patients required reoperation [23]. In a recent analysis of reports 26 articles comprising 2,035 patients revealed an average complication rate of 9%. This technique has raised concerns about the long-term impact of incising the urethral plate on later voiding problems. In a follow-up study, nearly 4 years after surgery, all 17 patients were reported as having normal flow rates [26]. Recently, Khoury et al. described longer-term follow-up and showed that 2/48 (4%) developed fistulae and a further 5 required dilatation. With this 33/48 had normal peak flow rates when corrected for age and 46/48 patients had a postvoid residual of less than 10% [11]. Others support this intermediate follow-up data, in a study with a mean follow up of 3.1 years 18/19 patients had a normal peak urinary flow rate and the one remaining patient required a meatotomy. However, in this series only 19 of the original 70 patients were available for evaluation, which raises doubts and is commonly seen in long-term reviews [10]. Limited long-term follow-up is available from Orkiszewski who reviewed 9 patients in whom he had performed TIP with proximal hypospadias. In these patients more than 9 years postoperatively 5/9 patients had a normal peak flow rate and he concluded that this may be due to the disproportional low resistance of the urethral wall, compared to the meatus [20]. This data suggest that there is not a significant incidence of late urethral stenoses following the TIP repair, and the majority of patients can be discharged from care 6 months after surgery following a single calibration of the meatus or a normal uroflowmetry reading.

In a large review 374 boys were assessed whom had an onlay island flap repair; this represented 33% of all primary repairs carried out between 1987 and 1992 [2]. The mean follow-up was 2.7 years. The main complication was fistulae in 6%, others included urethral diverticulum 0.5%, epithelial inclusion cyst 0.5% and meatal stenosis in 1%, and their overall reoperation rate was 9%. Others have reported similar results with Mouriquand reporting a 15% fistula rate [15].

Occasionally it is necessary to divide the urethral plate in order to correct the chordee. In these rare cases the preputial flap can be tubularised to create the neourethra alone. This method of repair is often reserved for the more complex cases of hypospadias; consequently the rate of complications is higher. Dewan reported an 11-year experience with the tubularised preputial flap [7]. This retrospective series reviewed 189 patients, with a mean follow-up of 25 months. Complications were

common; fistulae occurred in 34%, urethral strictures in 12%, 18% developed meatal stenoses, with an overall reoperation rate of 50%.

In a study with a mean follow-up of more than 14 years, Snyder and colleagues evaluated 30 patients out of an original cohort of 125 patients. In this series 1/14 patients were corrected using an island tube developed stenosis and 2/16 following an onlay. In addition two were found to have fistulae and two had torsion of the penis, presumably from the rotation of the island flap, which required surgical repair. All the patients, who had urine flow rates, were normal [21].

Two-staged skin flap urethroplasty has been another option for repair, especially when ventral curvature leads to urethral plate transaction. Bracka has reviewed his series of 600 patients who underwent a two-stage repair [3]. The majority had an inner preputial free skin flap. The first stage of the operation needed to be revised in 4% of patients as this was for persistent chordee and/or increasing the meatal skin. The complications of the second stage were fistulae in 6%; the redo patients had a higher fistula rate of 10% compared with 3% for primary. The fistulae tended to occur in the early part of the series before a vascularised dartos flap was placed between the neourethra and the skin. The importance of this layer in preventing fistulae was also stressed by Snodgrass [25]. Urethral stenoses occurred in 7% of patients, which was unexpected. The author concluded that this may be attributed to balanitis xerotica obliterans and suggested that if this was present in the genital skin, then a postauricular skin flap or a buccal graft should be used instead [3].

Long-term urinary outcome in patients following a free flap repair has recently been reported by a number of centres. In a review from Buffalo, New York 27 of an original cohort of 44 were evaluated. In those patients 10 (40%) described urinary spraying and 10 patients felt they had to milk the penis following micturition to avoid postmicturition dribbling [13]. This was also shown in a group of patients following oral mucosal grafts, 43 adult patients were assessed; 7/43 had urinary symptoms and 2/43 had severe urinary symptoms with a total of 26% describing problems with urinary spraying [17]. Interestingly, Fichtner and colleagues have shown that complications continue to appear with time, of the 49 patients (original number 132) followed for more than 5 years, 12 developed complications. Although 9 were in the first year, 2 developed after the first year including both urethral and meatal stenosis and one in the third year [9, 19].

---

### Cosmesis

An objective assessment of the cosmetic appearance following hypospadias is difficult; in general patients do not have much to compare with and the surgeons have an inherent interest in the results. In addition, when Mureau et al. [16] asked what factors influenced patient

opinion, they found only some were potentially under the control of the surgeons (meatal position and scar), whereas others (penile size, appearance of testes and scrotum) might not reflect technical issues. Consequently there have been few well-orchestrated trials. In a recent study 32 boys had their penis photographed following three different types of hypospadias repair: TIP, Mathieu and Onlay. In this study five health care professionals evaluated the photographs. In an evaluation of the meatus, glans and overall appearance, the TIP repair was felt to have the most cosmetically appealing result [28]. The main problem with the Mathieu repair has been the crescentic meatus; this has been addressed by using a "V" incision, which the authors have stated that it improves the result of the meatus [4].

This study did not evaluate the two-stage procedure, which Bracca has advocated that it gives superior results, especially in the more severe cases of hypospadias [3]. Lam and colleagues in their long-term review of two-stage repairs report that 92% of patients who responded were pleased with the outcome and 88% considered their penis to be normal [13]. In contrast Nelsons study reviewing single-staged buccal urethroplasty for severe cases of hypospadias showed only 28% very satisfied and 12% dissatisfied with the appearance of the penis [17].

---

### Sexual outcome

Sexual function following successful hypospadias correction should be normal. Erection should be obtainable and fertility should not be affected unless the patient had associated undescended testicles [22]. There has been considerable concern about the psychosocial and sexual outcome of these men. A psychosocial study appears to refute this concern [16]. This study used standardised questionnaires to compare psychosocial function in 189 children and adults who had undergone hypospadias surgery. They compared it with age-matched controls that had undergone an inguinal herniotomy. This study did not demonstrate a difference in psychosocial functioning between the two groups. A more recent study suggests that the libido is the same in hypospadias compared with control men, but sexual satisfaction scores were lower in the hypospadias patients [5]. This has led to concerns about the effect of surgery on penile sensation, ejaculation and the ability to maintain a normal erection.

Baskin and Duckett reviewed their experience at correcting penile chordee associated with hypospadias [1]. In this study 13% required a plication of the dorsal tunica albuginea; this is a modification of Nesbit's procedure. Those boys who underwent a plication were reviewed, with a mean follow-up of 2.7 years. Six (4%) had residual chordee, in only one (0.6%) further surgery was recommended. Long-term studies appear to support these early good results. Nelson and colleagues, who studied patients following puberty, 5 years after surgery, showed that all 10 of their sexually active patients had

satisfactory erectile function [18]. This was also seen in a study, where control and hypospadias patients reported the same ability to have a satisfactory erection, although 40% of the patients with hypospadias, compared with 18% of controls, noted a curvature on erection [5]. Chertin and colleagues who assessed 83 patients with a mean follow-up of 6 years following dorsal plication to correct curvature concluded that this technique was effective in obtaining long-term correction of penile curvature. However, of the 28 patients who had a postoperative erection test six required further plication [6]. These data suggest that although the majority of patients continue to have straight erections, follow-up into puberty may be necessary to exclude erectile problems in a few patients.

Sexual sensation has not been well documented in the literature following hypospadias repair. Indirect evidence is mixed, with one group reporting 100% of their patients experienced the sensation of orgasm, while others describing a reduction in sexual satisfaction in hypospadias patients [5, 18]. In 19 adult patients reviewed following repair of severe hypospadias, 15 described satisfactory erection and orgasm, but only 7 had satisfactory ejaculation [14]. The inability to achieve satisfactory ejaculation is well described in most papers with approximately 20–30% of men suffering ejaculatory problems [5, 14, 18].

---

### Conclusion

As with female reconstructive surgery performed in childhood it is clear that more detailed investigation of men following hypospadias repair is required before we can fully understand the long-term impact of our surgical repairs. While many men appear to have no long-term sequelae: voiding dysfunction, late presenting urethrocutaneous fistulae and poor sexual outcome are all now described. This information does not support a widespread change in surgical repair as often technique-specific data is not available but necessitates more detailed studies into the long-term effect of hypospadias repair in adult life.

---

### References

1. Baskin L, Duckett J (1994) Dorsal tunic albuginea plication for hypospadias curvature. *J Urol* 151:1668–1671
2. Baskin L, Duckett J, Ueoka K, Seibold J, Snyder H (1994) Changing concepts of hypospadias curvature lead to more onlay island flap procedures. *J Urol* 151:191–196
3. Boddy SA, Samuel M (2000) Mathieu and 'V' incision sutured (MAVIS) results in a natural glanular meatus. *J Pediatr Surg* 35(3):494–496
4. Bracca A (1995) Hypospadias repair: the two-stage alternative. *Br J Urol* 76(Suppl 3):31–41
5. Bubanj TB, Perovic SV, Milicevic RM, Jovcic SB, Marjanovic ZO, Djordjevic MM (2004) Sexual behavior and sexual function of adults after hypospadias surgery: a comparative study. *J Urol* 171(5):1876–1879

6. Chertin B, Koulikov D, Fridmans A, Farkas A (2004) Dorsal tunica albuginea plication to correct congenital and acquired penile curvature: a long-term follow-up. *BJU Int* 93(3):379–381
7. Dewan P, Dineen M, Winkle D, Duffy P, Ransley P (1991) Hypospadias: Duckett pedicle tube urethroplasty. *Eur Urol* 20:39–42
8. Duckett J, Snyder H (1992) Meatal advancement and glanuloplasty hypospadias repair after 1,000 cases: avoidance of meatal stenosis and regression. *J Urol* 147:665–669
9. Fichtner J, Filipas D, Fisch M, Hohenfellner R, Thuroff JW (2004) Long-term followup of buccal mucosa onlay graft for hypospadias repair: analysis of complications. *J Urol* 172(5 Pt 1):1970–1972
10. Gurdal M, Tekin A, Kirecci S, Sengor F (2004) Intermediate-term functional and cosmetic results of the Snodgrass procedure in distal and midpenile hypospadias. *Pediatr Surg Int* 20(3):197–199
11. Hammouda HM, El-Ghoneimi A, Bagli DJ, McLorie GA, Khoury AE (2003) Tubularized incised plate repair: functional outcome after intermediate followup. *J Urol* 169(1):331–333
12. Hastie KJ, Deshpande SS, Moisey CU (1989) Long-term follow-up of the MAGPI operation for distal hypospadias. *Br J Urol* 63(3):320–322
13. Lam PN, Greenfield SP, Williot P (2005) 2-stage repair in infancy for severe hypospadias with chordee: long-term results after puberty. *J Urol* 174(4 Pt 2):1567–1572
14. Miller MA, Grant DB (1997) Severe hypospadias with genital ambiguity: adult outcome after staged hypospadias repair. *Br J Urol* 80(3):485–488
15. Mouriquand P, Persad R, Sharma S (1995) Hypospadias repair: current principles and procedures. *Br J Urol* 76(Suppl 3):9–22
16. Mureau M, Slijper F, Slob A, Verhulst F (1997) Psychosocial functioning of children, adolescents, and adults following hypospadias surgery: a comparative study. *J Pediatr Psychol* 22(3):371–387
17. Nelson CP, Bloom DA, Kinast R, Wei JT, Park JM (2005) Long-term patient reported outcome and satisfaction after oral mucosa graft urethroplasty for hypospadias. *J Urol* 174(3):816–817
18. Nelson CP, Bloom DA, Kinast R, Wei JT, Park JM (2005) Patient-reported sexual function after oral mucosa graft urethroplasty for hypospadias. *Urology* 66(5):1086–1089
19. Nuininga JE, DE Gier RP, Verschuren R, Feitz WF (2005) Long-term outcome of different types of 1-stage hypospadias repair. *J Urol* 174(4 Pt 2):1544–1548
20. Orkiszewski M, Leszniewski J (2004) Morphology and urodynamics after longitudinal urethral plate incision in proximal hypospadias repairs: long-term results. *Eur J Pediatr Surg* 14(1):35–38
21. Patel RP, Shukla AR, Snyder HM III (2004) The island tube and island onlay hypospadias repairs offer excellent long-term outcomes: a 14-year followup. *J Urol* 172(4 Pt 2):1717–1719
22. Rajfer J, Walsh P (1976) The incidence of intersexuality in patients with hypospadias and cryptorchidism. *J Urol* 116:769–770
23. Samuel M, Wilcox DT (2003) Tubularized incised-plate urethroplasty for distal and proximal hypospadias. *BJU Int* 92(7):783–785
24. Snodgrass W (1994) Tubularized, incised plate urethroplasty for distal hypospadias. *J Urol* 151(2):464–465
25. Snodgrass W, Koyle M, Manzoni G, Hurwitz R, Caldamone A, Ehrlich R (1996) Tubularized incised plate hypospadias repair: results of a multicenter experience. *J Urol* 156:839–841
26. Snodgrass W (1999) Does tubularized incised plate hypospadias repair create neourethral strictures? *J Urol* 162(3 Pt 2):1159–1161
27. Unluer ES, Miroglu C, Ozdiler E, Ozturk R (1991) Long-term follow-up results of the MAGPI (meatal advancement and glanuloplasty) operations in distal hypospadias. *Int Urol Nephrol* 23(6):581–587
28. Ververidis M, Dickson AP, Gough DC (2005) An objective assessment of the results of hypospadias surgery. *BJU Int* 96(1):135–139