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Two-stage hypospadias repair with a free graft for severe primary and revision hypospadias: A single surgeon's experience with long-term follow-up

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Summary

Introduction
Repair of severe primary and revision hypospadias is a demanding procedure. Debate continues as to whether a two-stage approach or single-stage technique is superior. The two-stage procedure with a free graft involves penile straightening followed by application of a graft for the neourethral plate at stage one; with tubularization at stage two after graft maturation.

Objective
To report the outcomes of a single surgeon's experience with the two-stage repair using a free graft for both severe primary and revision hypospadias with long-term follow-up.

Materials and methods
Between July 1998 and January 2010, 301 boys underwent a two-stage reconstruction. The surgical technique is described in the manuscript.

Primary repairs ($n = 208$): indications for a two-stage approach with a free graft included meatal position, presence of corporal chordee, and poor glans development. Median follow-up from completion of the second stage was 75 months.

Revision repairs ($n = 93$): indications included urethral fistula, excessive scarring/meatal stenosis, balanitis xerotica obliterans (BXO), and residual or untreated chordee. Median follow-up from completion of the second stage was 85 months.

Results
For the primary repairs ($n = 208$), the graft took well in all but one case. Second-stage complications included fistula (7), meatal stenosis (3), partial glans dehiscence (3), and all were re-operated (13).

For the revision repairs ($n = 93$), the graft took well in all but four cases. Second-stage complications included fistula (5), meatal stenosis (3), breakdown (1) and reoperation (8).

Discussion
In a systematic review of 20 years of publications on the repair of primary severe hypospadias, the two-stage procedure with a free graft demonstrated an overall complication rate of 22%; this was a distinct overall benefit when compared with the single-stage procedures in terms of lower complication rates (Castagnetti and El-Ghoneimi, 2010). Our results for the severe primary repairs revealed significantly lower complication rates than those in the literature, with an overall re-operation rate of 6.3%, a fistula rate of 3.4%, and meatal stenosis and partial glans dehiscence at 1.4% each.

Several papers have documented outcomes following the single-stage tubularized incised plate urethroplasty for re-operative hypospadias, giving overall complication rates ranging from 15.4 to 30%. Our data show a re-operative rate of 8.6%, a fistula rate of 5.3%, breakdown in 1.1%, and meatal stenosis in 3.2%.

Conclusion
The two-stage repair with a free graft for correction of both severe primary and failed primary hypospadias is a safe, viable, and durable procedure offering low morbidity and excellent cosmetic results. The authors advocate the two-stage repair with a free graft as the technique of choice for treatment of both of these challenging groups of the deformity.

Summary Table Graft type for primary and revision repairs.

Graft type	Primary repairs ($n = 208$)	Revision repairs ($n = 93$)
Inner prepuce	199	15
Posterior auricular Wolfe graft	4	60
Buccal mucosal graft	1	9
Composite graft	4	6
Shaft skin	0	3

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Introduction

Repair of severe primary and revision hypospadias is a demanding procedure. There is ongoing debate as to whether a two-stage approach or single-stage technique is superior. Castagnetti et al. recently published a systematic review of 20 years of publications on severe primary hypospadias management; lower complication rates were shown with a staged approach [1]. Steven et al. surveyed current practice in paediatric hypospadias surgery, and showed that nearly half of all respondents opted for a staged approach with a free graft for correction of proximal hypospadias [2].

Turner-Warwick and Cloutier should be acknowledged for their initial descriptions of staged urethral reconstruction for both primary and salvage procedures [3,4]. More recently, Bracka re-popularised this technique [5]. The procedure involves penile straightening followed by application of a graft for the neourethral plate at stage one; with tubularization at stage two after graft maturation. When applied to the revision repairs, the technique allows for complete excision of scar tissue from previous procedures prior to laying a fresh graft of either harvested skin or buccal mucosa.

The present study reports the outcomes of a single surgeon's experience with the two-stage repair with a free graft for both severe primary and revision hypospadias with long-term follow-up.

Materials and methods

Between July 1998 and January 2010, 301 boys underwent a two-stage hypospadias reconstruction using a free graft: 208 were primary repairs and 93 revisions.

Primary repairs

For the primary repairs, the pre-operative meatal position is detailed in Table 1, although this was not the exclusive measure of severity or the prime indication for a two-stage approach. Other associated factors included the presence of corporal chordee (as assessed during surgery) and poor glans development. A proximal meatus was defined as sited anywhere from the proximal shaft to the perineum. No pre-operative hormonal stimulation was given to any patient. The median age at first operation was 16 months (range: 10—204). Median follow-up from completion of the second stage was 75 months (range: 12—137).

Table 1 Pre-operative meatal position.

Pre-operative meatal position	Primary repairs $n = 208$	Secondary repairs $n = 93$
Glans	4	11
Coronal	7	5
Subcoronal	0	11
Distal shaft	19	25
Mid shaft	51	15
Proximal shaft	29	10
Penoscrotal	87	16
Perineal	11	0

Revision repairs

These came from a referral practice, and the indications included urethral fistula, excessive scarring/meatal stenosis, balanitis xerotica obliterans (BXO), residual or untreated chordee, and previous breakdown. Median age at first operation was 86 months (range: 7—280). Median follow-up from completion of the second stage was 85 months (range: 12—137).

Surgical technique

At the beginning of the first stage, the penis is degloved circumferentially to the level of Buck's fascia. Ventrally, the urethral plate is divided and lifted together with the spongiosum and the proximal urethra from the ventral aspect of the penile corpora. This continues proximally to the bifurcation of the corpora and releases them completely to optimise their length. At this point, an artificial erection is performed to assess residual penile chordee, using a proximal tourniquet and normal saline (Fig. 1). If present, chordee is corrected by lifting the neurovascular bundle off the corpora and performing dorso-lateral plications of the tunica albuginea, as described by Duckett [6] (Figs. 2 and 3).

Following chordee correction, to create a deep glans groove, the glans is split in the midline. Further dissection of the glans, off the dome of the corpora, is performed to allow the glans to open out flat [3]. This allows a rectangular graft shape that will provide easy tubularisation at

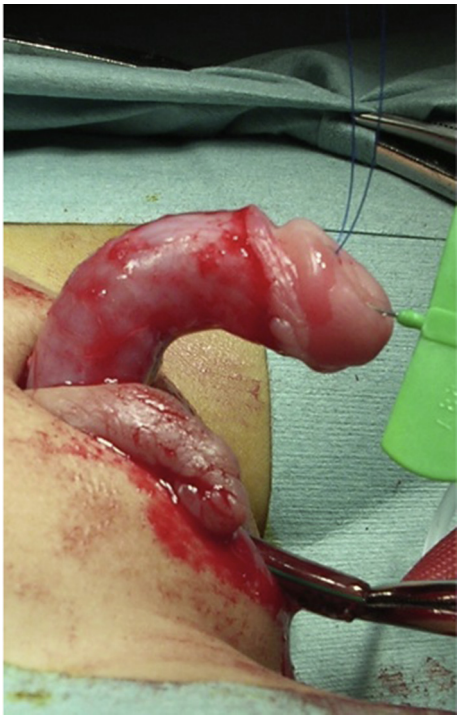

Figure 1 Artificial erection to assess residual chordee following penile degloving and urethral plate division.