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Surgery Illustrated – Surgical Atlas
Two-stage hypospadias repair with inner preputial layer Wolfe graft (Aivar Bracka repair)

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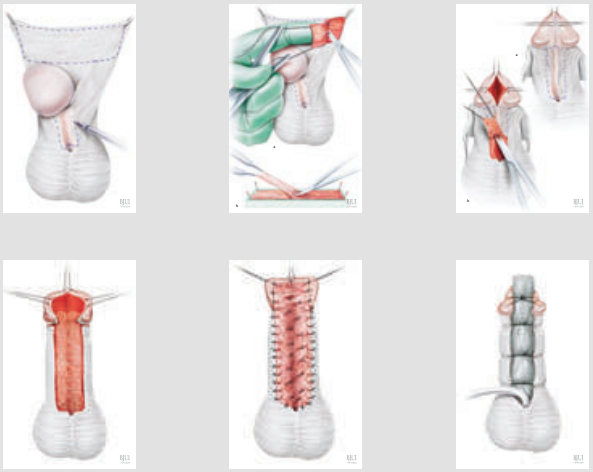
ILLUSTRATIONS by STEPHAN SPITZER, www.spitzer-illustration.com

INTRODUCTION

As is well known, >300 methods and modifications have been described for the repair of hypospadias and none of those is universally accepted. Modern hypospadias operations are mostly single-stage procedures whenever possible, with the goal of creating a penis with normal appearance and function. Nevertheless, for selected indications, many still regard Bracka's two-stage procedure, (introduced in the mid-1980s and first published in 1995), as the hypospadias repair of choice. It is appropriate in proximal primary cases with severe chordee and an inadequate urethral plate, or distal cases with a conical glans configuration, and also for many re-operative cases. This two-stage approach has several advantages:

- it can, if wished, be used in almost all types of hypospadias
- it gives excellent cosmetic results
- it has low complications rates, and it is relatively easy to learn if the surgeon is familiar with the basic principles of hypospadias repair.

The first stage is to create a new and adequate urethral plate. The existing plate is excised, the glans clefted, chordee released, and the resulting defect is covered with a Wolfe graft (full-thickness skin graft), usually from the inner layer of the prepuce. The versatility of this operation lies in that if there is insufficient preputial skin to cover a very long defect, or if the patient is already circumcised because of previous surgery, buccal mucosa or posterior auricular Wolfe grafts can be used either in addition, or as an alternative. Note that in patients with balanitis xerotica obliterans



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(BXO, lichen sclerosus), the new urethra must be made entirely from mucosa, and therefore in this situation skin should never be used.

The second stage consists of tubularising the reconstructed urethral plate to form a neourethra. In essence it is like a tubularised incised-plate (TIP) repair but without a dorsal releasing incision.

Today's surgeon no longer has to master a range of technically diverse and unrelated repairs. Almost any hypospadias can now be corrected to optimum standard using a simple protocol consisting only of the popular one-stage TIP ('Snodgrass'), the graft-augmented TIP ('Snod-graft') and the Bracka two-stage repair. These three methods form a natural progression. Furthermore, the TIP and graft-augmented TIP repairs pose few challenges for the surgeon who is already adept with the two-stage repair, because these derivatives share similar procedural steps.

This two-stage technique is therefore particularly useful for surgeons who perform a modest number of hypospadias repairs annually, because with mastery of one relatively easy-to-learn and versatile technique, results can be achieved that are comparable to those of larger centres. This is of importance even in countries with large tertiary centres because recent surveys have shown that almost half of surgeons who perform hypospadias repair in the UK are low-volume operators [1,2].

PLANNING AND PREPARATION

PATIENT SELECTION

Two-stage repair with free grafts is a method of choice in both children and adults when:

1) The primary urethral plate is of poor quality and needs to be excised, thereby necessitating a full circumference urethral reconstruction.
2) In 're-do' hypospadias surgery to deal with severe ventral curvature, or to replace the entire circumference of a hairy, severely strictured, or BXO diseased urethra.

EQUIPMENT AND MATERIALS

Description is for elective childhood repair. Sutures, catheters and dimensions should be modified accordingly for older patients.

- Optical loupes (×2.5–5.5)
- Marking pen
- Tourniquet
- Microsurgical instruments (forceps, needle driver, scissors)
- 6–8 F silicone Foley catheter
- 4–0 and 5–0 polypropylene monofilament sutures (Prolene®, Ethicon, USA)
- 6–0 and 7–0 polyglactin 910 braided sutures (Vicryl®, and Vicryl Rapide® Ethicon)
- Non-adhesive wound dressing, fixation bandage
- Needle and syringe for the saline erection test

PATIENT PREPARATION

In rare cases of very small glans/penis, a couple of months of androgen stimulation can be used before surgery, as it has been shown to increase penis size [3]. This may be achieved with monthly injections of long-acting testosterone or with topical testosterone cream.

The first stage is usually timed when boys are aged 9–12 months, and the second stage 5–6 months later. This avoids surgery during the difficult period from 18 months to 3 years. Alternatively, surgery can be delayed until the second window of opportunity, soon after the age of 3 years [4,5]. Antibiotic prophylaxis with co-amoxiclav is given preoperatively before both stages and continued until the catheter is removed.

PATIENT POSITIONING

The patient is placed supine. In children, surgery is performed under general anaesthesia. A caudal block is administered before commencing surgery, although a penile block can be used as an alternative for mid-shaft and distal hypospadias.

SURGICAL STEPS

FIRST STAGE

Figure 1

If adhesions between the glans and the prepuce are present, complete manual adhesiolysis should be done as a preliminary procedure. A 4-0 polypropylene monofilament suture is placed through the tip of the glans as a traction suture. Another two traction sutures can be placed at the corners of the preputial hood to facilitate harvesting of the graft. Incision lines are drawn with a marking pen, and a tourniquet is applied.

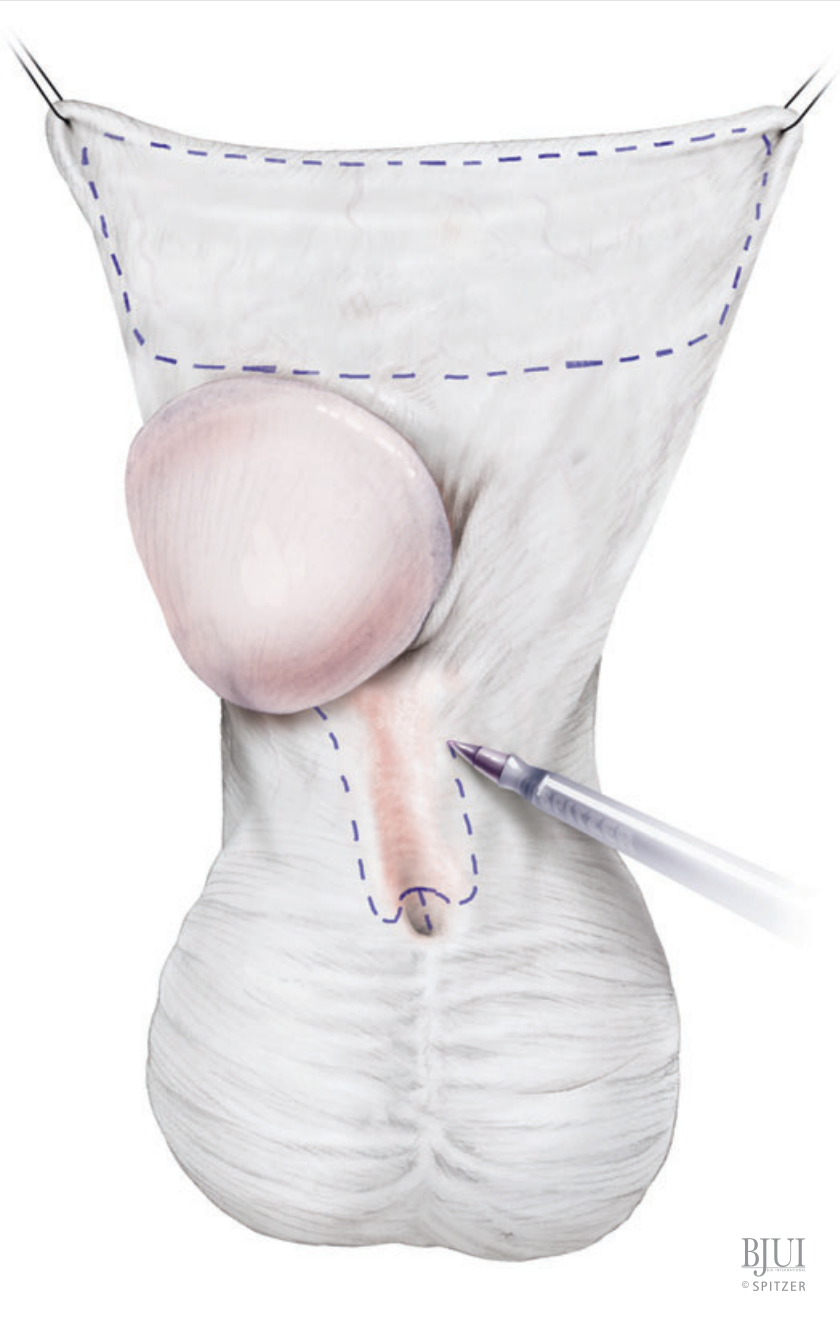

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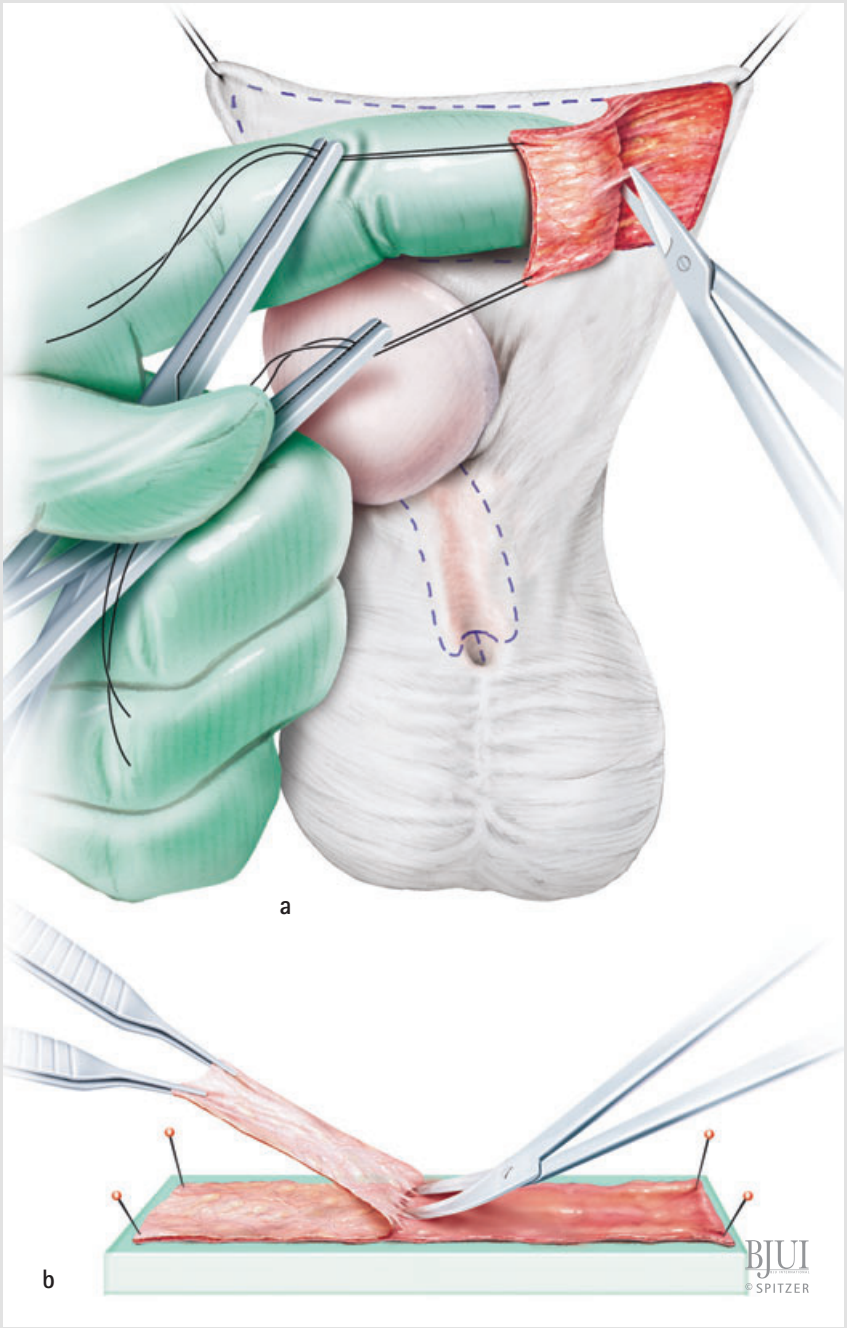
Figure 2

A. The incision is made at one side of the marked preputial skin strip and two stay sutures are placed at the corners of the skin strip. The graft is then dissected by applying counter pressure with the finger while holding the stay sutures. **B**. After the graft has been harvested it is spread over a finger or a cork plate and residual subcutaneous tissue is removed with fine scissors, so that a thin translucent skin strip is created. The graft is stored in saline-soaked gauze until required.



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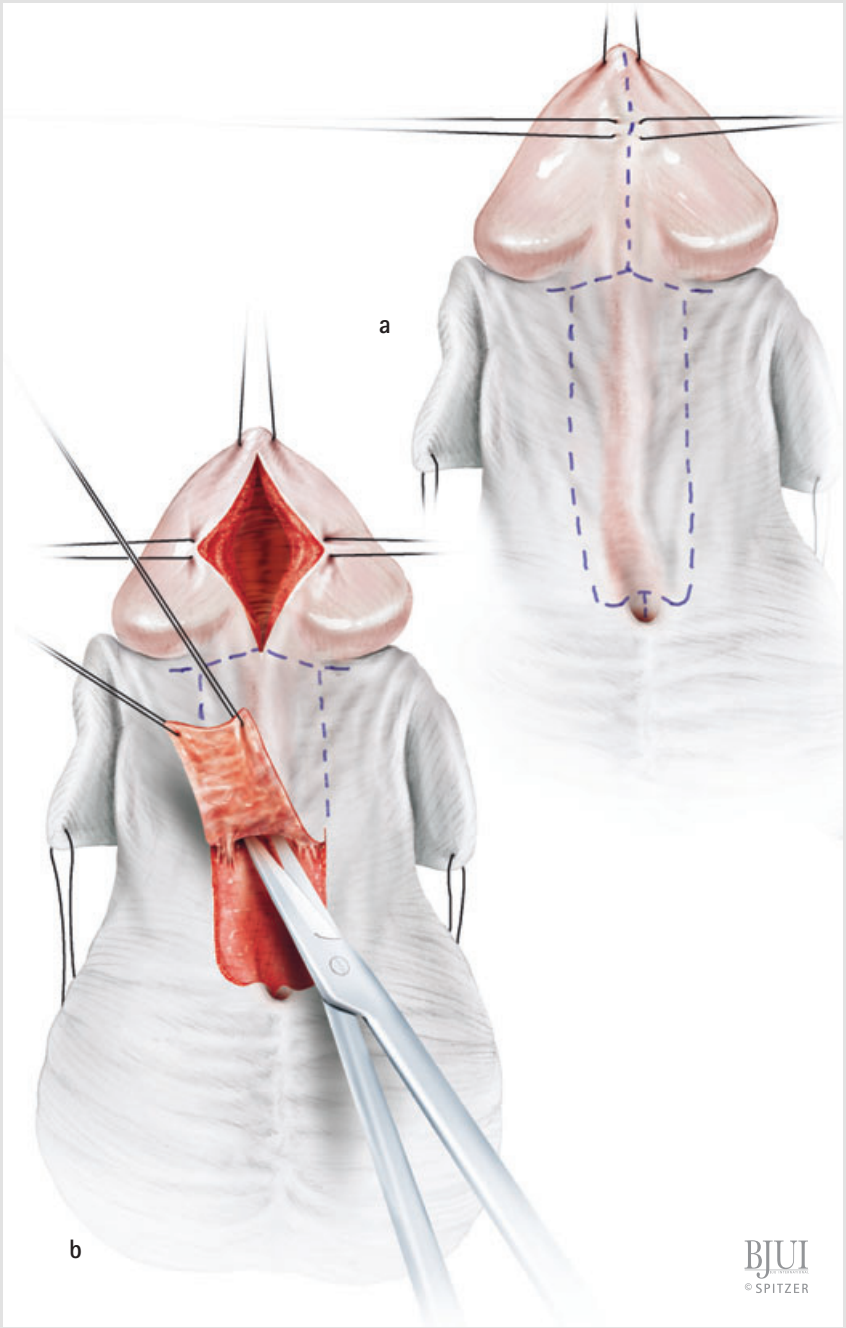
Figures 3 and 4

4-0 polypropylene monofilament stay sutures are placed on each side of the glans margin, at the 6 o'clock position of the proposed new meatus site. They are used as traction sutures to facilitate dissection of the glans wings and then subsequently as the first 'tie-over' suture. The incision is made in the glans and penis, and glans wings are formed. The glans incision should be deep enough to visualise the tips of the corpora cavernosa. The urethral plate is excised and fibrous bands of the Buck's fascia and aberrant corpus spongiosum that contribute to chordee are dissected off the corpora cavernosa.

A saline erection test is performed. If despite thorough dissection, minor residual curvature remains, this will be dealt with in the second stage. But if the curvature is still significant, the penis can be fully degloved and a dorsal tunica shortening procedure performed. Depending on preference this may be simple Baskin type midline plications, which work well in young children, or alternatively in older patients, a formal mobilisation of the neurovascular bundles and dorsal Yachia modification of the Nesbit procedure may be more reliable (for a detailed description of the technique see [6]).

Even if a formal degloving is not necessary for curvature correction, it may often be necessary to extend the subcoronal incision around to join the graft donor site, so that dorsal skin can then be advanced around to lengthen any ventral skin shortage.



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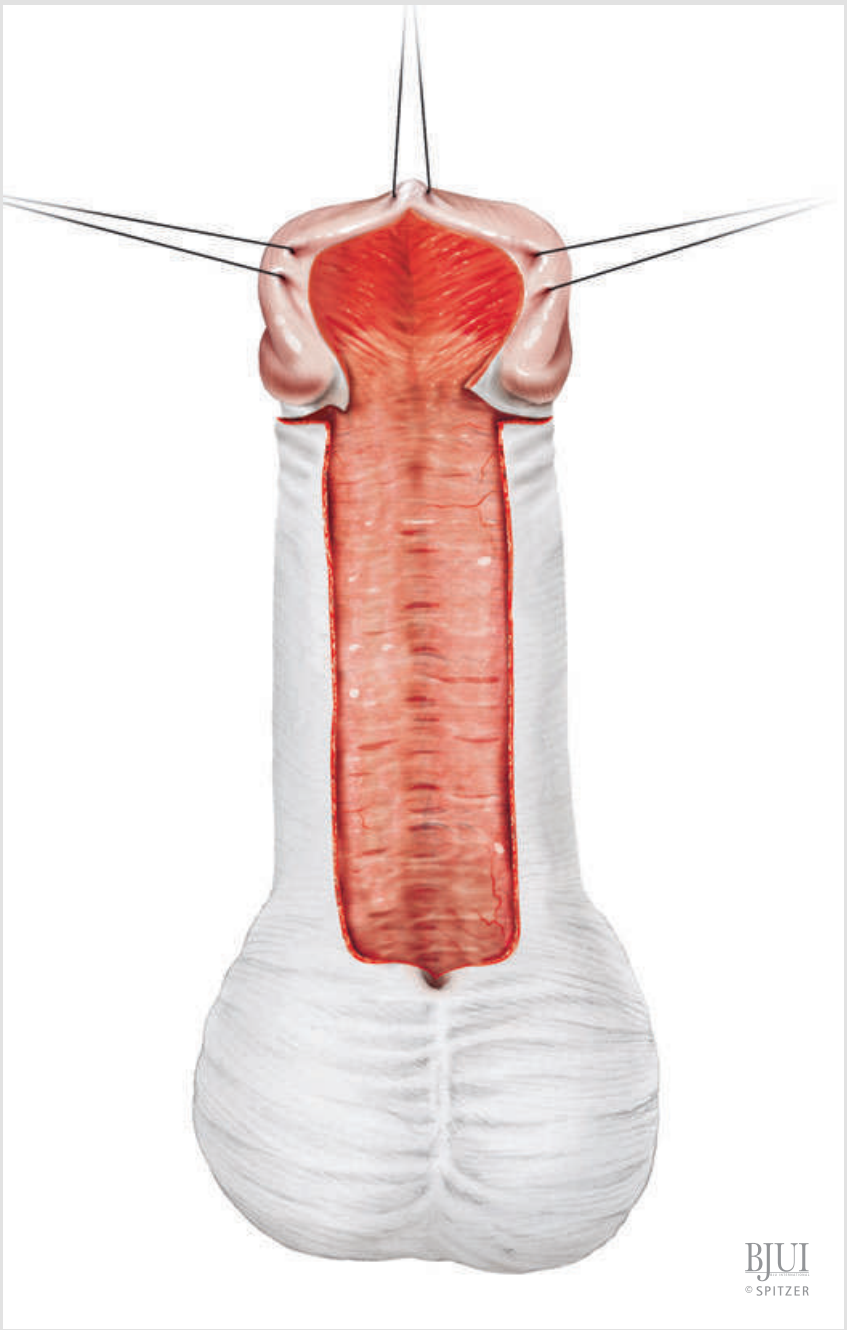

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Figure 5

Next, the graft is quilted onto the defect with 7-0 polyglactin 910 braided sutures (Vicryl Rapide). It should fit correctly, so that there is neither tension nor wrinkling of the graft. On the glans margin, one skin suture is placed at the 12 o'clock midline position. However, to avoid suture marks in the new meatus, no peripheral approximating sutures are placed within the area that will form the meatus. The graft should be quilted in the midline to demarcate the glans cleft, and quilted to the corpora at regular intervals to stabilise the graft on the wound bed and to avoid any possibility of large haematoma or seroma formation.

To facilitate mobilisation of the graft edges at the second stage, it can be helpful to incorporate a little areolar tissue under the junction with the shaft skin and not to fix the graft firmly onto the tunica albuginea right up to its very periphery.

Colour

Figure 6

The lateral glans stay sutures are now tied over a non-adherent bolus dressing. Additional looped 4-0 polypropylene monofilament (Prolene) tie-over sutures are then added on either side and tied snugly with the knots in the midline.

This protective tie-over dressing further reduces the chance of haematoma collecting under the graft.

An 8-F catheter is passed, tourniquet released, and after any requisite haemostasis, the donor site is closed with 6-0 or 7-0 polyglactin 910 braided sutures (Vicryl Rapide). The catheter and penis are taped upwards to the abdominal wall.

Colour

Second stage

Once the graft has matured to become a stable, well vascularised new urethral plate, it can be tubed to form the neourethra. Again check that the coronal margin is not compromised by residual or reformed adhesions, and separate these if need be.

Figure 7

A 4-0 polypropylene monofilament (Prolene) suture is placed through the tip of the glans as a traction suture. Incision lines are marked, designing a 1.5-cm wide strip that extends from the ectopic meatus up to the 6 o'clock points of the proposed new meatus. Scar junctions and any surplus graft width are excised.

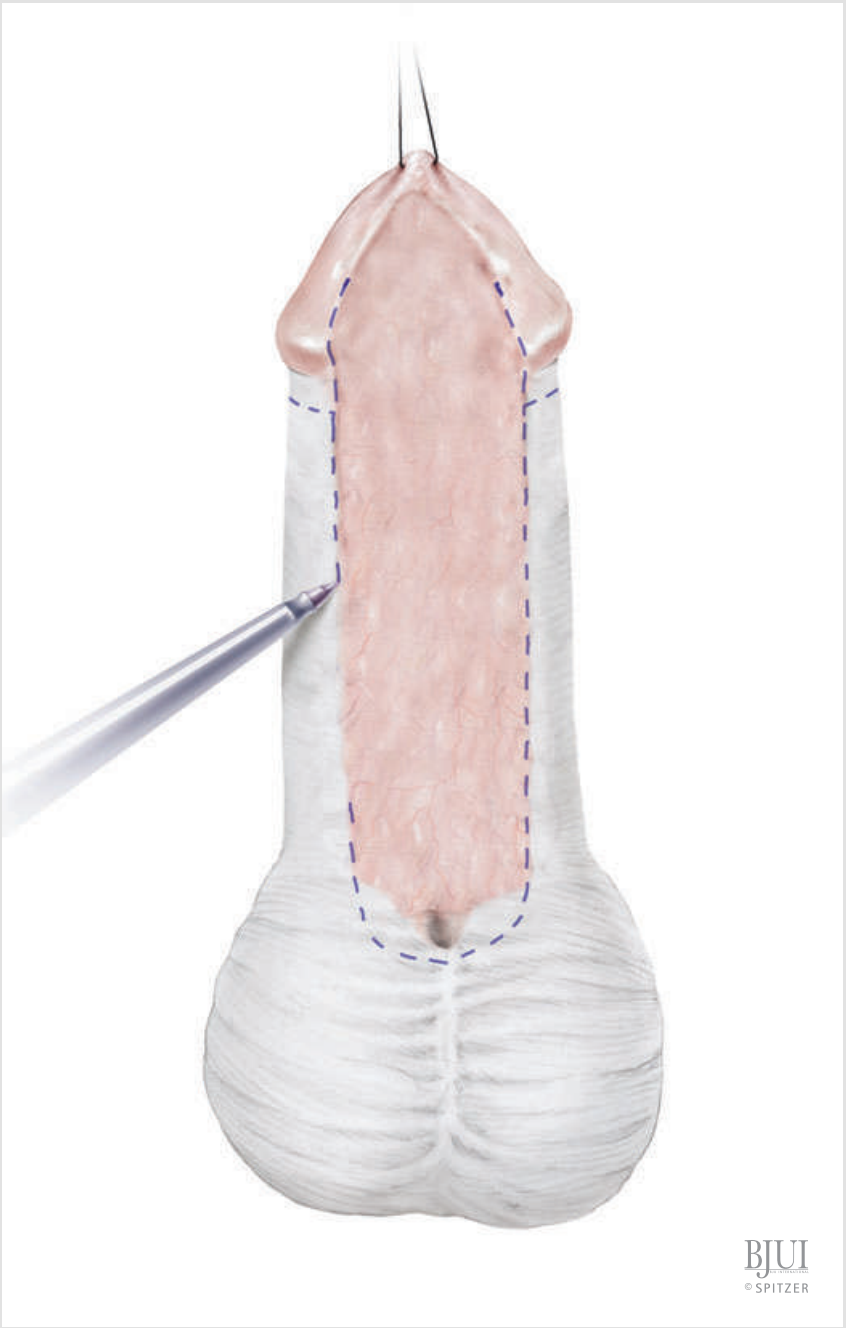

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Figure 8

The penis is degloved at the level of Buck's fascia. This will, in most cases, correct any minor residual curvature. The saline erection test is performed and if any residual curvature is noted, it is likely intrinsic curvature of the corpora cavernosa, and should be corrected by an appropriate dorsal tunica shortening procedure (see above).

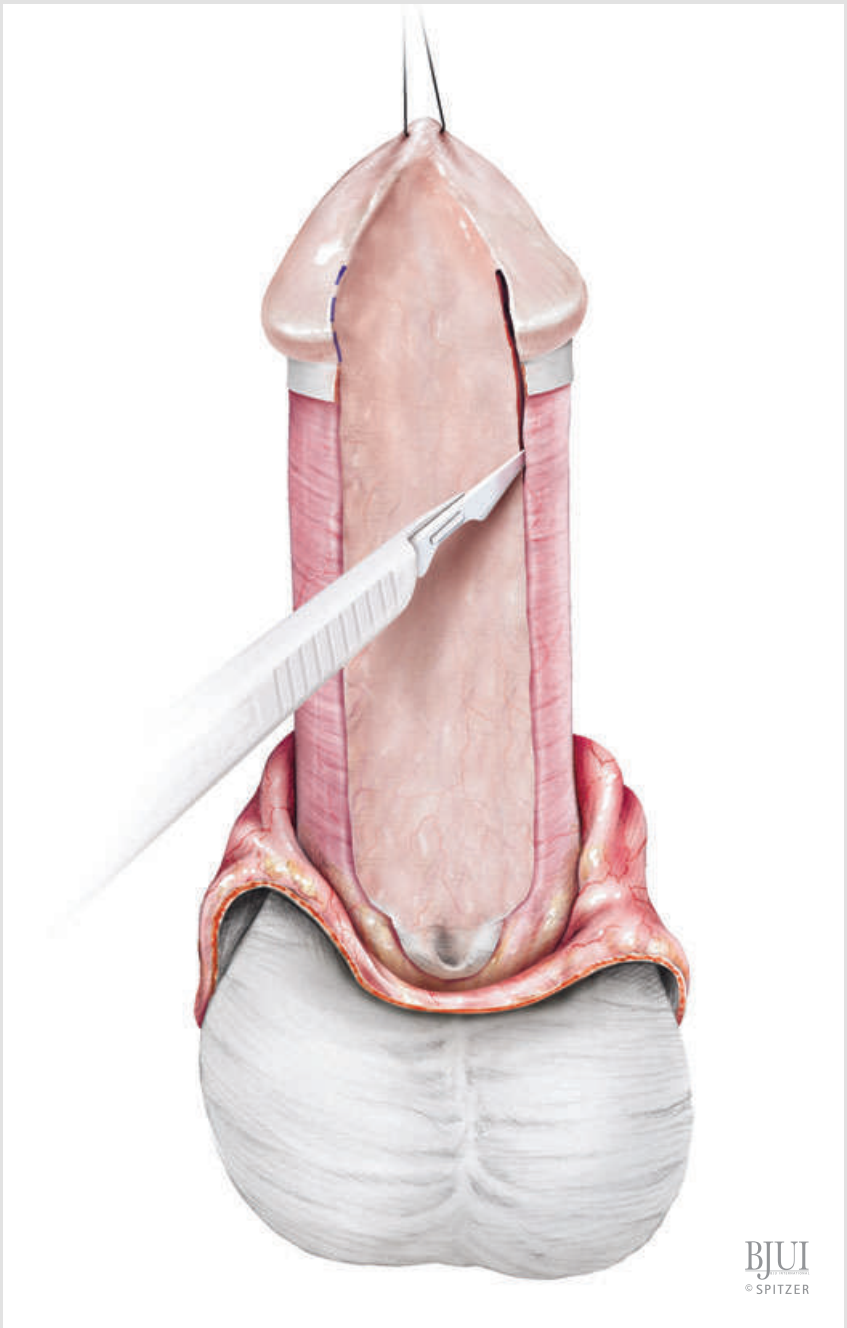

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Figure 9

A. After the penis has been straightened, an 8-F catheter is placed. The edges of the urethral plate strip should tube easily around the catheter without any need for undermining and mobilising the edges. If mobilisation proves necessary it should be kept to a minimum. The neourethral plate is then tubularised by using an extraluminal inverting continuous 7-0 polyglactin 910 braided (Vicryl) suture, reinforced with a few interrupted sutures. **B**. On cross-section, the neourethra should be oval or triangular rather than round because the latter requires extensive mobilisation of the edges, which can compromise the blood supply of the suture line (**C**).

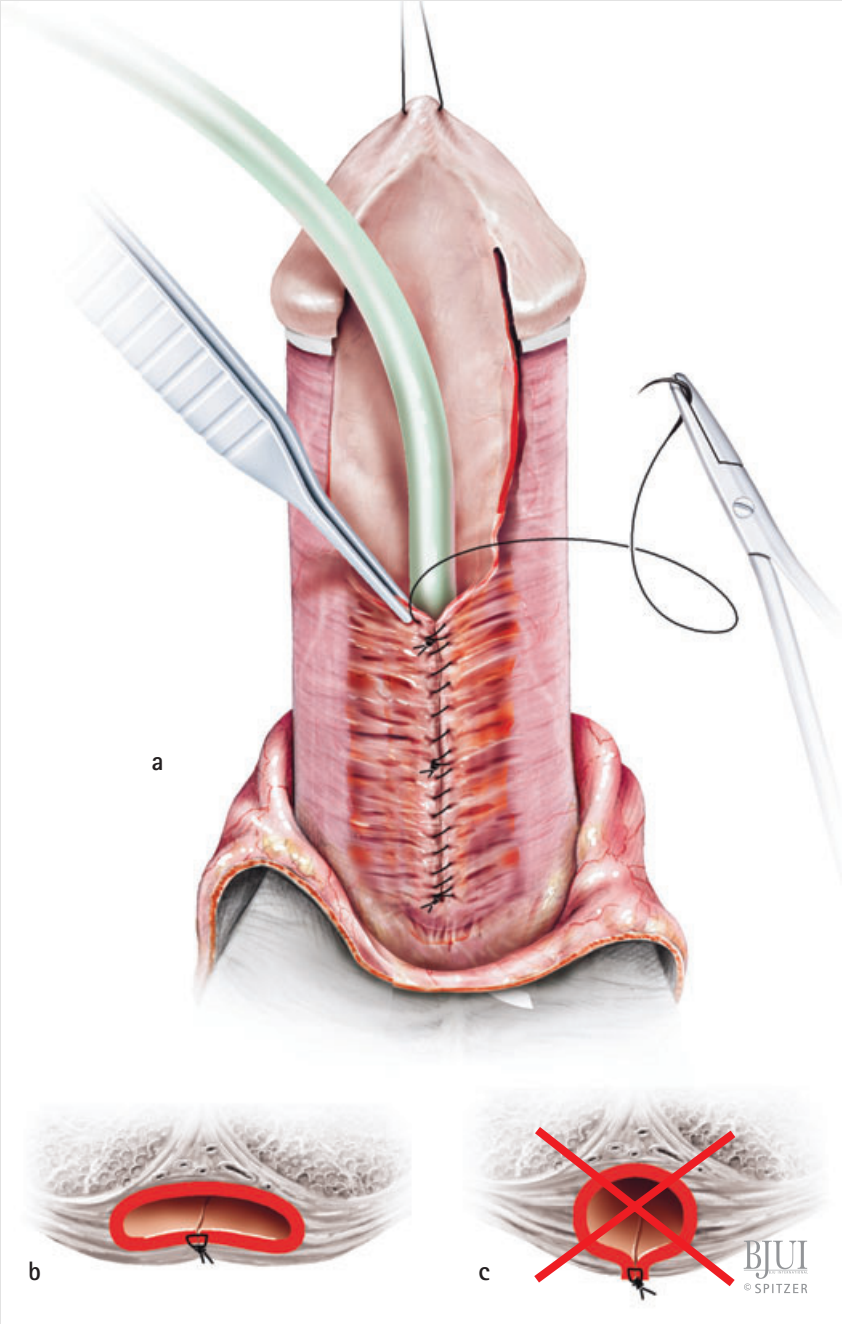


Figure 10

After the formation of the neourethra, a protective dartos fascia flap is placed over the entire suture line as a 'waterproofing' layer. The dartos flaps are taken from the dorsal penile skin and rotated around ventrally, maintaining a base of ≈1 cm in width. Waterproofing flaps should be of adequate length and mobility not to create torsion or ventral tethering. In very proximal hypospadias or in re-operative cases there may be insufficient penile dartos available for waterproofing. If so, additional or alternative sources of waterproofing flaps are tunica vaginalis from a testicle or dartos from the scrotum. The waterproofing flap is secured under the glans and to the tunica albuginea using 7-0 polyglactin 910 braided sutures (Vicryl).

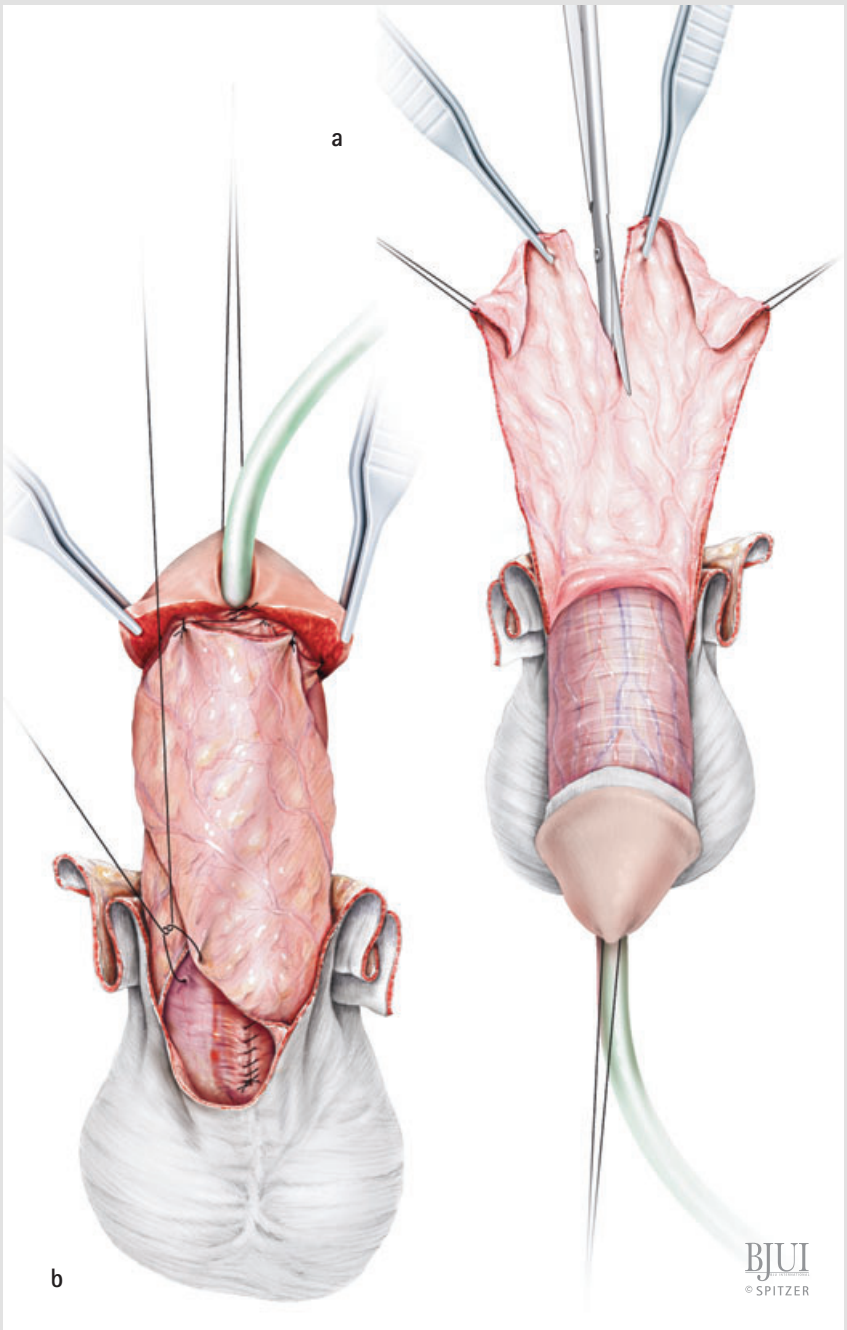
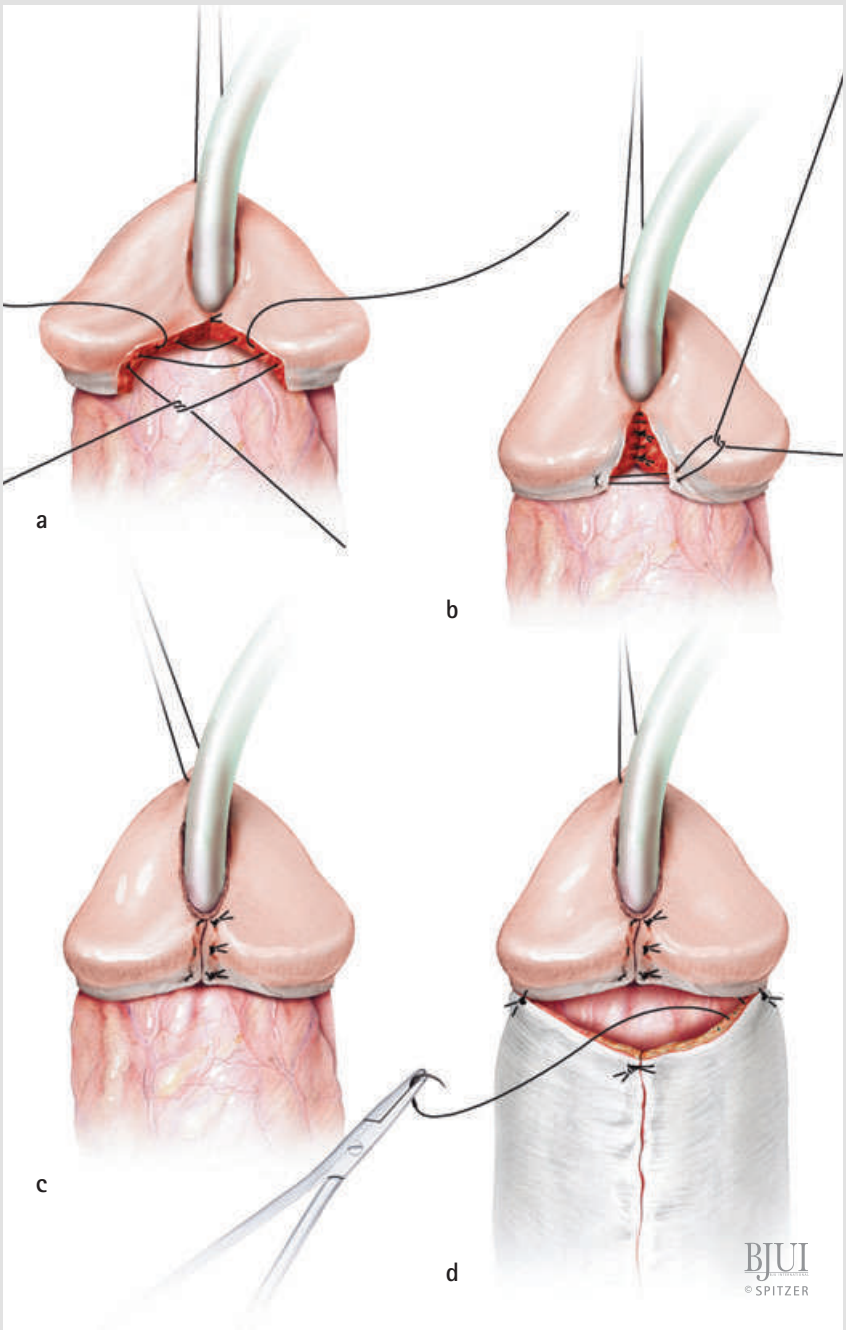


Figure 11

The glans spongiosum is reconstructed with 6-0 polyglactin 910 braided sutures (Vicryl), thereby completing the medial derotation and closure of the glans wings below the meatus. Glans epithelium and penile skin are sutured using simple interrupted 6-0 or 7-0 polyglactin 910 braided sutures (Vicryl Rapide). The wound dressing consists of non-adhesive paraffin gauze and absorbent sponge. The penis and catheter are fixed upwards on the abdominal wall with tape.



POSTOPERATIVE CARE

After the first stage, the catheter is removed within 2 days and the child can take a short bath. The dressing gets wet from water and urine, but this does not cause problems. Depending on circumstances, the child can be discharged and return as a day case, or stay in hospital until removal of the tie-over dressing at ≈6 days postoperatively. Mupirocin (Bactroban®) ointment or a moisturising neutral cream can be applied regularly onto the graft and suture lines for the following week.

After the second stage, the child can shower and have the external dressing removed after 2 days (or whenever preferred). Again, depending on social circumstances, the child can be discharged at 2 days and return for catheter removal, usually at 6–7 days postoperatively, or remain in hospital until that time. However, the catheter can be left for up to 2 weeks in severe cases with significant swelling.

FROM SURGEON TO SURGEON

There are several important points to optimise the two-stage repair:

1. When clefting the glans in the first stage it is important not to incise the glans too far posteriorly. In hypospadias, the glans wings are typically rotated downwards and outwards, so that the true apex of the glans is more ventral than it may seem. If the glans is clefted too far back in the first stage, the meatus may be slightly epispadic after the second stage, once the glans configuration has been corrected.
2. The graft has to be trimmed to fit the defect, cleaned of all subcutaneous tissue and quilted onto the wound bed firmly but not too tightly with absorbable sutures. When suturing the graft to the penile skin, a little dartos fascia can be incorporated in the peripheral sutures so that the lateral graft edges are not fixed directly to bare tunica albuginea. This will facilitate tubularisation of the graft strip at the second stage, and avoid the need for undermining of the skin strip edges.
3. When oral mucosa or post-auricular skin is used to supplement a preputial skin graft, these bulkier alternatives should be deployed at the proximal end rather than in the glans.
4. The Foley catheters should be all silicone rather than coated latex, to ensure maximum size of drainage lumen. A urine bag with narrow bore tubing allows more reliable siphon drainage and reduces the likelihood of an airlock in the tube that could cause pseudo-obstruction and bypassing of the catheter.
5. The catheter should be inserted sufficiently far and immobilised such that the balloon of the Foley does not rest on the bladder trigone and cause pain or bladder spasms. With these precautions, antispasmodics or opiate analgesics are rarely required and adequate analgesia can normally be achieved with ibuprofen or paracetamol. Occasionally light sedation with diazepam can help an anxious child to relax.
6. Good postoperative care is a major factor in preventing complications. Thus the catheter should not be taped downwards to the leg or left hanging free, because pulling against erections may cause ventral suture line disruption. It should remain securely fixed upwards on the abdominal wall until its removal.

Whilst the patient can be moderately mobile, the wounds are vulnerable during the first 6 weeks or so and therefore high-risk physical activities should be curtailed and monitored during this timeframe.

REFERENCES

1 **Bragg TW, Ali SN, Warner R, Park AJ.** Hypospadias surgery in plastic surgery: a snapshot of today with an eye on tomorrow. *J Plast Reconstr Aesthet Surg* 2009; **62**: 365–8
2 **Timmons MJ.** The UK primary hypospadias surgery audit 2006-2007. *J Plast Reconstr Aesthet Surg* 2010; **63**: 1349–52
3 **Kaya C, Bektic J, Radmayr C, Schwentner C, Bartsch G, Oswald J.** The efficacy of dihydrotestosterone transdermal gel before primary hypospadias surgery: a prospective, controlled, randomized study. *J Urol* 2008; **179**: 684–8
4 **Manzoni G, Bracka A, Palminteri E, Marrocco G.** Hypospadias surgery when, what and by whom. *BJU Int* 2004; **94**: 1188–95
5 **Bracka A.** A versatile two-stage hypospadias repair. *Br J Plast Surg* 1995; **48**: 345–52
6 **Stein R, Schröder A, Thüroff JW.** Surgical atlas: Primary hypospadias repair with buccal mucosa. *BJU Int* 2006; **97**: 871–89

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Abbreviations: **BXO**, balanitis xerotica obliterans; **TIP**, tubularised incised-plate.