

ONCOLOGY/RECONSTRUCTION  
POINT OF TECHNIQUE

# Neo-glans reconstruction for penile cancer: Description of the primary technique using autologous testicular tunica vaginalis graft

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## KEYWORDS

Penile cancer;  
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Neo-glans reconstruction;  
Tunica vaginalis testis;  
Split-thickness skin  
graft

## ABBREVIATIONS

BM, buccal mucosa;  
CC, corpora cavernosa;

**Abstract** Partial penectomy (glansectomy with/or without distal corporectomy) is an acceptable alternative for smaller distal pT3 penile carcinoma lesions in highly motivated and compliant patients. The authors describe a novel technique of neo-glans reconstruction using a tunica vaginalis (TV) testis allograft. However, due to an unclear resection margin on final histology, the patient underwent re-do surgery with a neo-glans revision using the well-established mesh split-thickness skin graft (STSG) technique. The penile length was preserved and the penile and bulbar part of the urethra was additionally mobilised in order to obtain a natural and aesthetic result for the meatus.

Neo-glans reconstruction with TV coverage may be another promising alternative, which certainly requires further evaluation. We believe that the donor-site associated morbidity is minimal when compared to other harvesting sites. However, this is just an assumption, because direct comparison data on grafting techniques and neo-glans reconstruction are not available. Nevertheless, we think that for re-do procedures a

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NVB, neurovascular bundle;  
STSG, split-thickness skin graft;  
TV, tunica vaginalis;  
TVTG, tunica vaginalis testis graft

standardised approach using a STSG technique should be the treatment method of choice.

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## Introduction

Traditional total/partial penectomy is the ‘gold standard’ for the treatment of invasive penile carcinoma. However, poor aesthetic, functional, and psychological outcomes have been reported in patients who undergo this procedure [1]. The reconstruction of penile anatomy and formation of the neo-glans, in an attempt to restore the primary appearance and functional improvement after this mutilating surgery has been the matter of intensive investigation over the last decade. The primary goal is to optimise postoperative voiding and potentially sexual functioning. The early results of organ-sparing techniques without glans reconstruction have demonstrated mixed and unsatisfactory results, as expected [2].

More recently, enhanced penile-sparing techniques, such as reconstructive glanduloplasty using split-thickness skin grafts (STSGs), buccal mucosa (BM) or scrotal flaps exhibit more favourable outcomes, because they have the ability to restore the anatomy and aesthetic appearance of the penis [3–5]. The authors present a novel technique for neo-glans reconstruction using an autologous tunica vaginalis (TV) testis free graft (TVTG) in the context of penile-preserving surgery for penile carcinoma.

## Patient’s presentation and surgical technique

The authors report a case of a 56-year-old patient with biopsy confirmed high-grade penile squamous cell carcinoma (20 mm), arising from the glans penis with invasion of the glandular urethra. The patient was managed with an intention-to-treat and spare the organ, followed by neo-glans reconstruction (from corpora cavernosa [CC]) using TVTG.

After general anaesthesia induction, the patient was placed supine and a tourniquet secured at the base of the penis. A circumferential skin incision was made ~5 mm proximal to the coronary sulcus, followed by penis degloving to its base. The deep dorsal vein was isolated and secured with 3–0 polyglactin 910 suture (Vicryl®; Ethicon Inc., Somerville, NJ, USA) at the level of the primary incision. Then the meticulous dissection of the neurovascular bundle (NVB) was performed with full exposure of the tunica albuginea. After suturing the NVB, the transverse incision separated the NVB from the distal tips of the CC and the glans. Partial penectomy was completed and the specimen sent for

frozen-section analysis. The resection margin of the CC, tunica albuginea, as well as the proximal margin of the urethra was negative.

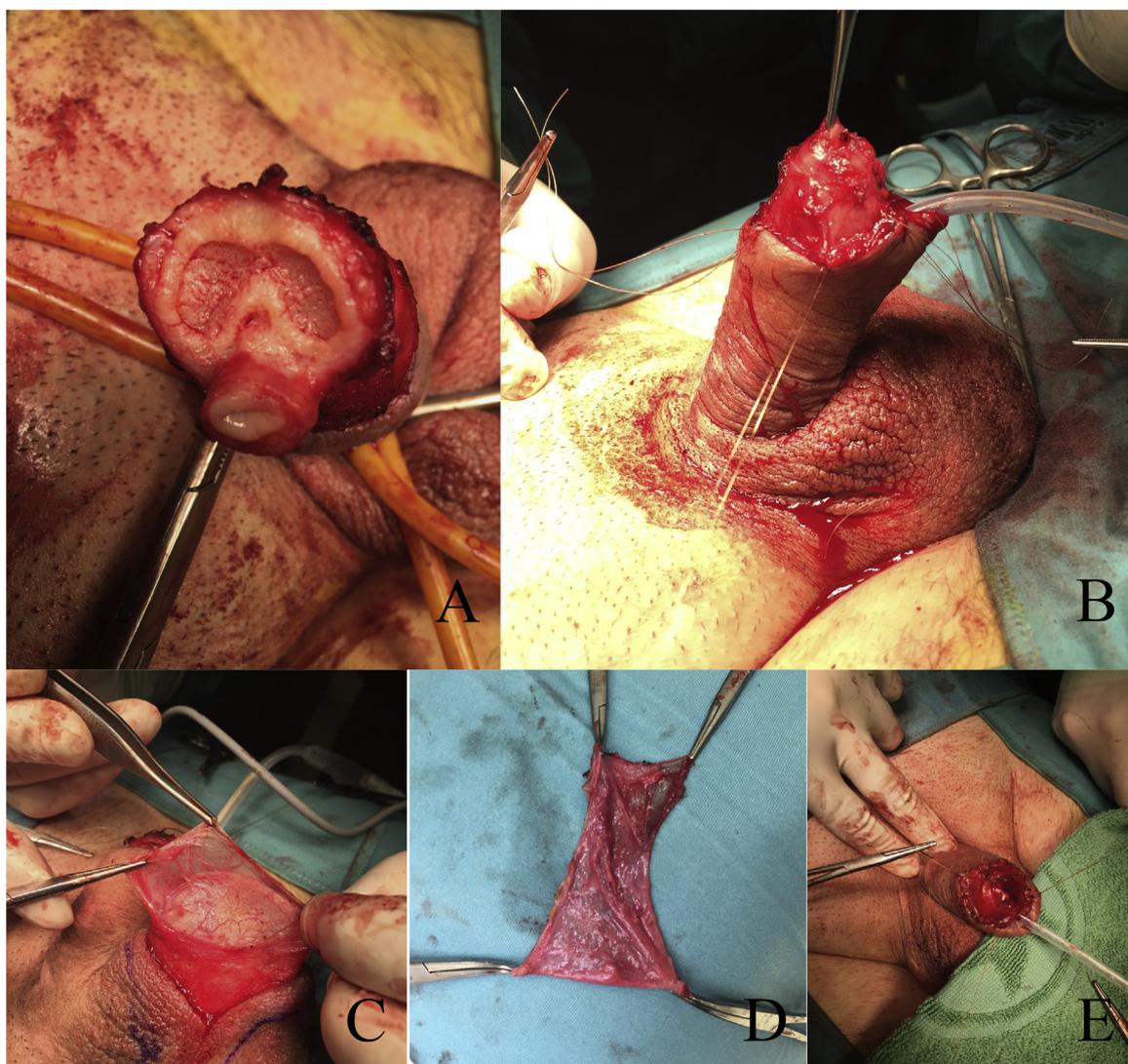
The neo-glans was recreated from CC using an inverted 3–0 polyglactin 910 running suture ‘fish-mouth’ closure. The urethra was slightly spatulated from the ventral aspect. About 1 cm distal from the tip of the CC, the penis shaft skin was sutured to the Buck’s fascia with 4–0 polyglactin 910 to create the neo-sulcus coronarius (Fig. 1). At this stage the tourniquet was released.

A 3-cm transverse incision was made at the anterior wall of the right hemiscrotum. The parietal wall of the TV was exposed (Fig. 1). To obtain an optimally sized graft, a rectangle-shaped TV was harvested along the epididymal area, after precise measuring of the newly formed neo-glans area to be grafted. Following careful adaption, the graft was approximated with absorbable 5–0 polyglactin sutures at the external meatus and 4–0 polyglactin 910 sutures at the newly formed neo-sulcus. We did not apply quilting sutures.

Finally, a gentle compressive bandage was applied to the penis shaft and neo-glans (the graft was covered with baneocin [neomycin and bacitracin] and a paraffin-gauze tie-over dressing). At the end of the procedure, we placed a 14-F catheter, no drainage was necessary. A penile local anaesthetic block was used to enhance postoperative analgesia. The patient was advised to restrain from any physical activity for 48 h. The catheter was removed on the postoperative day 7. The patient was instructed on how to wash the graft site with saline solution. A successful complete graft take was considered when the graft did not show any signs of necrosis or desquamation (Fig. 2).

## Results and revision surgery

The graft take was acceptable (on the 20th postoperative day); however, because of the Rx margin, we had to perform additional resection of the urethra in case of high-grade pT3 penile carcinoma. After careful preparation, an additional 10-mm length of the urethra was excised. The frozen-section analysis of the urethral margins and tunica albuginea area of the neo-glans close to the urethral meatus were negative. Therefore, we decided to reconstruct the neo-glans again. We did not compromise the overall length of the penis (Fig. 2). Although, this time we had to mobilise the penile and the distal



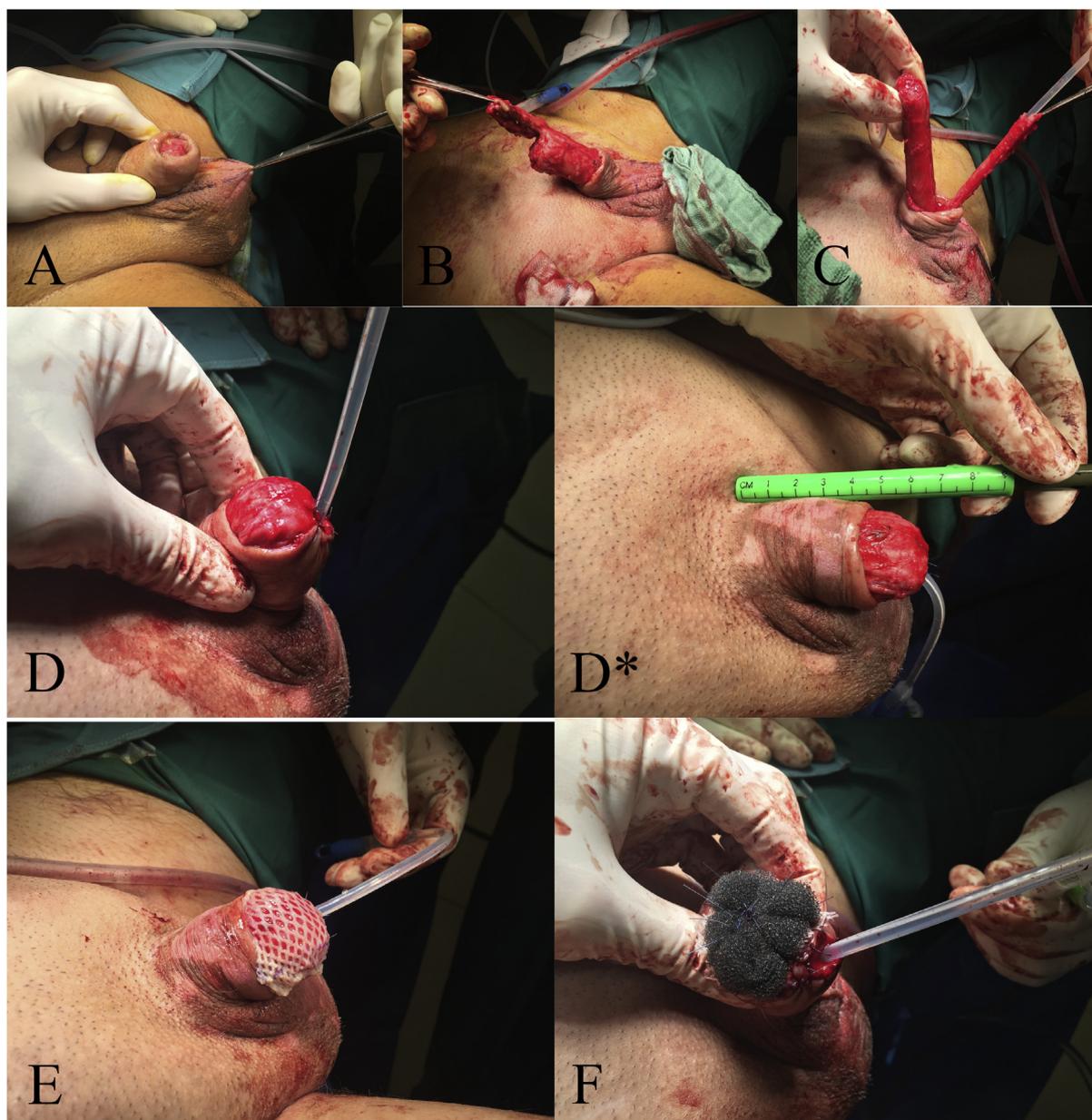
**Fig. 1** Partial penectomy–glansectomy with excision of the tips of the CC (A); neo-glans reconstruction – ‘fish-mouth’ shape (B); harvesting of the TV parietalis testis (C); free-TV graft (D); and subsequent grafting (E).

part of the bulbar urethra in order to gain sufficient length. To regain the new aesthetic appearance of the former neo-glans, we performed debridement of the remaining TV tissue. A redo-surgery was performed according to the well-established standardised technique of meshed STSG [3]. A week after we observed good graft take, and 7 days thereafter the neo-glans was almost completely epithelialized (Fig. 3). At 4 weeks after re-do surgery (Fig. 3), the patient was much more satisfied with the final cosmesis when compared to the TVTG. We have to note, that this direct comparison was subjective and based on patient’s perception only. Final histology of the specimen confirmed malignancy only on the distal resection margin in terms of lympho-vascular invasion, the remaining tissue (8 mm of the urethral length) was negative. The patient underwent laparoscopic modified inguinal lymphadenectomy 7 weeks later, without any signs of malignant spread.

## Discussion

Glans reconstruction after glansectomy or partial penectomy with distal corporectomy for penile cancer lesions remains a challenging procedure. Firstly, due to the rarity of the disease and secondly, as this type of surgery is potentially associated with significant postoperative morbidity. The goal of treatment is to achieve comparable oncological outcomes with traditional partial/total penectomy and guarantee adequate cosmesis and functional results. In general, patients who are willing to undergo such a procedure should be compliant and adherent to the follow-up protocols.

Several techniques for the glans reconstruction with different grafting materials have been described in the literature. Today, STSG is the most commonly used and established approach with satisfactory results and



**Fig. 2** Final status 3 weeks after primary procedure (A); secondary resection of the urethra and prepuceum (B); mobilisation of the urethra proximal to the bulbar urethra (C); reconstruction of the neo-glans and neo-sulcus (D,D\*); mesh STSG implantation (E); application of the tie-over dressing (F).

comparable oncological outcomes to total/partial penectomy without glans/neo-glans reconstruction.

For cases with an adequate amount and length of urethral tissue, an inverted flap procedure has acceptable cosmetic and functional outcomes [6]. In our present scenario, our patient required a substantial length of the urethra, thus an inverted flap procedure was not possible. That was one of the reasons why we decided to harvest TV. Other alternatives are oral BM graft and full-skin grafts from the scrotum or lower abdomen [4,5]. One may argue that BM is commonly used in urethral reconstruction due to its robust microvascular network and enhanced microcirculation. On the other hand, BM is adapted to a wet environment like TV,

and may theoretically be susceptible to shrinkage or desquamation [3]. Harvesting of BM is more complex than TV, and can be associated with significant bothersome postoperative morbidity [7]. Last but not least, we are not advocates of full-skin grafting (foreskin/scrotum) for neo-glans reconstruction.

TV testis despite its anatomical location is relatively superficial and quite easy to harvest. Additionally, it has uniform thickness, elasticity, and therefore ideal properties to guarantee graft safety during erection. When compared to synthetic grafts, the procedural costs are reduced. Furthermore, TV is much easier to harvest than other autologous grafts, such as STSG/full-thickness skin graft or BM.



**Fig. 3** Final appearance at 1, 2 and 4 weeks after the secondary procedure. Patient obtained full morning erections 14 days postoperatively.

Because of the location of the TV, there are no visible scars and postoperative morbidity is not significant, as with other donor-harvesting sites. But direct comparative data on this topic are lacking from the literature.

TVT application is faster, and has a potential to decrease operative time, whilst specific graft preparation is not needed. However, it is unclear which form of TV exhibits better graft-take properties –meshed or standard TVTG, or TVTG transplanted as a vascularised flap. The use of the TV as a graft material has been described in urethral reconstruction and Peyronie's disease with acceptable short-term results [8,9]. On the contrary, the role of TV in penile enhancement surgery in animal models showed unsatisfactory results, because of insufficient vascularisation [10].

Glans resurfacing or neo-glans reconstruction requires high expertise in the field of reconstructive and plastic surgery. In general, the use of grafts is associated with donor-site morbidity and the risks of poor graft take. Many modifications with regard to the graft material have been published; however, none of them are as well established as the STSG [11]. For that reason, we chose a standardised STSG for the second procedure in order to minimise risk of graft take failure and unsatisfactory cosmetic appearance.

STSG may require lower metabolic demand when compared to the free TVTG, which is more suitable for the revision surgery. Potential risk of lymphoedema and haematoma is reduced as opposed to the full-thickness skin graft, due to the meshed features of the STSG.

The described surgical neo-glans reconstruction using autologous testicular TV may be a promising alternative. It is important to note, further studies are warranted to confirm the utility of this surgical principle. Certainly more patients are needed, to compare the

safety of free TV vs vascularised TV flap for penile reconstructive surgery. The use of skin grafting is now common and well established in penile surgery for various pathologies and should be the method of choice for revision-surgery cases.

### Conclusion

TVT application should be considered as another alternative in the spectrum of reconstructive surgery options for glans restoration, e.g. in those institutions where other options like expertise or specific surgical armamentarium are lacking. The surgical approach to neo-glans reconstruction is still controversial owing to a lack of direct comparisons of different operative techniques with regard to functional and cosmetic-related outcomes, as well as a partner appearance assessment. In the meantime, the STSG seems to be the most studied and established technique for glans reconstruction, which is why it should be considered as the strategy of choice for revision procedures.

### Conflict of interests

The authors declare that they have no competing interests.

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None.

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