

Penile Reconstruction in Carcinoma Penis

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ABSTRACT

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Introduction: Surgical management for penile carcinoma is mutilating and affects significantly the quality of life. Penile reconstruction restores the quality but poses a difficult challenge for the surgeon.

Aim: To report outcomes of patients with penile cancer treated surgically in a tertiary centre.

Materials and Methods: We reviewed data on all patients undergoing surgical management of penile cancer at a tertiary referral centre; Medical College Hospital Trivandrum, Kerala; between 2012 and 2016. Patients underwent surgical procedures like glanssectomy, partial or total penectomy with different types of reconstruction depending upon the clinical stage of the disease.

Results: Between 2012 and 2016, a total of 36 patients presenting with penile cancer underwent surgical treatment. Seven patients with a mean age of 52 (27–69) underwent penile preserving surgery with glanssectomy and skin grafting for small glanular lesions. Of the remaining 29 patients who underwent surgery, 21 had partial while 7 had total penectomy with perineal urethrostomy and one patient was managed by circumcision alone, who was having verrucous carcinoma. Mean followup for patients was 24 months (range 10–46). There were no graft failures in our series. Four patients developed meatal stenosis requiring dilatation.

Conclusion: Efforts to preserve penile length and function in the surgical treatment of penile cancer should be made in all suitable patients. Penile preserving surgery with glanssectomy and skin grafting is a successful technique with minimal complications for local control of penile carcinoma arising on the glans. Further reconstructive procedures should be offered to the suitable patients at a tertiary centre like ours.

Keywords: Penile Reconstruction, Glanssectomy, Penectomy, Penile Carcinoma

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INTRODUCTION

Penile cancer is an uncommon malignancy in the industrialized world, while it is common in some Asian, African, and South American countries. Historically, the surgical management of the primary lesion in penile carcinoma has meant either partial or radical penectomy. These operations are however often mutilating and associated with urinary and sexual dysfunction as well as significant psychological morbidity.¹ Although over the past decades, reconstructive surgery of the penis has steadily continued to evolve, repairing and reconstructing the penis remains anatomically, functionally and aesthetically a great challenge. This is because the primary goal of penile reconstruction surgery is the achievement of a cosmetically acceptable phallus with incorporated neo-urethra, which allows the patient to void while standing from the tip of the phallus in a male urinal, and enough bulk to house the cylinder(s) of an inflatable penile prosthesis to guarantee enough rigidity for penetrative sexual intercourse.

A non-structured review of the most recent English literature on glans, penile and scrotal reconstruction, and total phallic reconstruction in case of amputation, aphallia or gender dysphoria has been carried out, along with the retrospective analysis of data of penile cancer patients at our centre.

MATERIALS AND METHODS

We reviewed data on all patients undergoing surgical management of penile cancer at a tertiary referral centre; Medical College Hospital Trivandrum, Kerala; between 2012 and 2016. Majority of patients had biopsy proven squamous cell carcinoma, while one patient had melanoma, another came as verrucous carcinoma. All had their primary tumour clinically staged. Later, the majority of the patients underwent radiological staging with CT or MRI scan.

Patients underwent surgical procedures like glanssectomy, partial or total penectomy with different types of

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Table 1. Clinical Data obtained			
No. of Patients	Mean Age (in years)	Histopathology	Procedure
7	52	Squamous cell carcinoma	Glansectomy and skin grafting
20	62	Squamous cell carcinoma	Partial penectomy
7	67	Squamous cell carcinoma	Total penectomy with perineal urethrostomy
1	65	Melanoma	Partial penectomy
1	32	Verrucous carcinoma	Circumcision

reconstruction depending upon the clinical stage of the disease. The regional nodes were managed dependent on the clinical and pathological staging of the primary tumour. Patients were followed up with regular review and clinical examination.

RESULTS

Between 2012 and 2016, a total of 36 patients presenting with penile cancer underwent surgical treatment. Seven patients with a mean age of 52 (27–69) underwent penile preserving surgery with glansectomy and skin grafting for small glanular lesions. All had squamous carcinoma with two of them having moderate differentiation on histology, the rest were well differentiated lesions. Of the remaining 29 patients who underwent surgery, 21 had partial while 7 had total penectomy with 1 managed by circumcision alone, who was having verrucous carcinoma (table 1). Histology was squamous cell carcinoma in all but two patients who had melanoma and verrucous carcinoma each. Ten of the 36 patients who were treated by surgery underwent bilateral modified groin node dissection of which two demonstrated positive nodes. Of the 7 total penectomy patients all underwent perineal urethrostomy following total penectomy. Mean followup for patients was 24 months (range 10–46). There were no graft failures in our series. Four patients developed

meatal stenosis requiring dilatation; otherwise no other complications were noted.

DISCUSSION

Traditionally, the mainstay of treatment of penile cancer were either surgical amputation of part or all of the penis or radical radiotherapy. Surgical removal of a patient’s penis often results in devastating anatomical, functional loss and a major psychological impact on the patient’s life. Majority of penile carcinomas occur distally, involving the glans and/or prepuce and are potentially amenable to organ-preserving surgery. Innovative surgical techniques have focused on penile preservation in selected patients to minimize physical disfigurement and improve quality of life for these patients. The main factor that perhaps has contributed to the move toward organ preserving surgery is the realization that traditional surgical margins of 2 cm are unnecessary to achieve good oncological results. The main types of penile preserving surgery that are currently in widespread use are discussed below as review of various articles.

SURGICAL TECHNIQUES

Glans Reconstruction

Reconstruction of the glans in isolation is required



Figure 1. Total glans resurfacing. (a) Complete involvement of the glans penis with partial meatal stenosis. (b) The glans and the coronal sulcus are completely denuded. The involved mucosa is excised preserving completely the underlying spongy tissue. (c) The denuded glans and corona are covered with a STSG that is quilted to recreate the coronal groove. (d) The final result after full glans resurfacing. STSG, split-thickness skin graft.

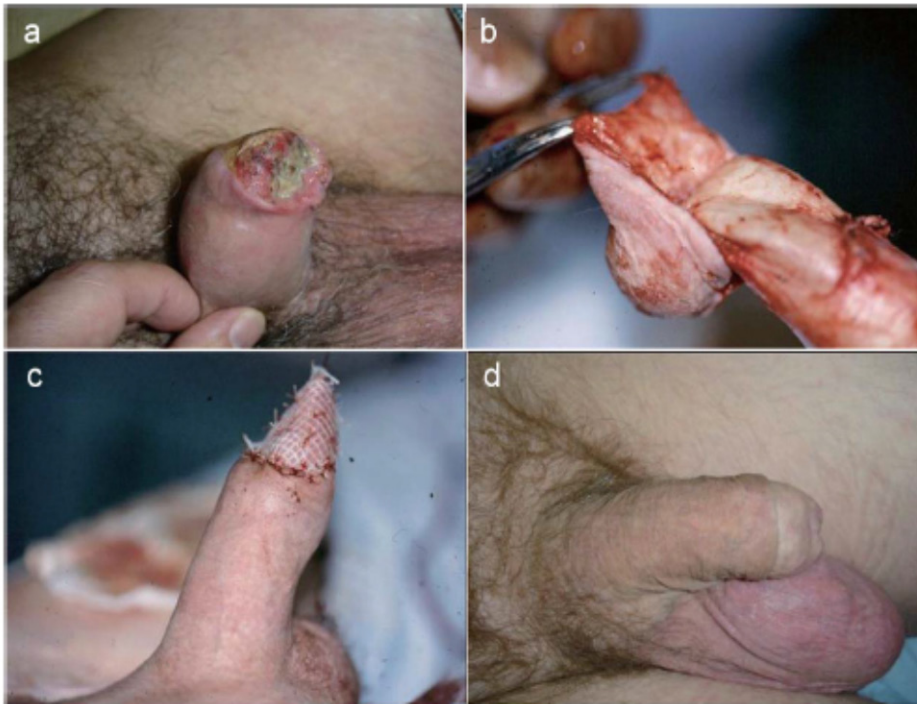


Figure 2. Technique of glansectomy for squamous cell carcinoma of the penis. (a) Diffuse glans involvement by squamous cell carcinoma. (b) The glans is dissected off the tunica albuginea of the tip of the corpora cavernosa. (c) The denuded corporal tips are covered with a STSG harvested from the inner thigh to fashion a pseudo glans. (d) Final results 6 months postoperatively. STSG, split thickness skin graft.

Partial glansectomy instead is indicated if only a small portion of the glans is affected by squamous cell carcinoma of the penis. In these patients, a wedge including the affected aspect of the glans is excised down to the tunica albuginea in order to achieve adequate clearance and reconstruction is achieved by primary closure of the defect.

Patients with widespread pT1 and pT2 squamous cell carcinoma of the glans penis are instead better served with a glansectomy (figure 2), which involves the complete excision of the spongiosum of the glans penis that is dissected off the tip of the corpora cavernosa just above the tunica albuginea.⁴ Glans

reconstruction is then achieved either with the use of an STG, which is applied on the denuded corporeal heads, or with a urethral flap, which is spatulated, inverted and reshaped in a ‘pseudo-glans’ fashion.^{5,6} Alternatively, following traumatic amputation or surgical excision of benign and malignant conditions. Glans resurfacing is indicated in patients with lichen sclerosus or carcinoma in situ of the glans penis and involves the partial or complete excision of the glans mucosa followed by repair with the use of a split thickness graft (STG) usually harvested from the inner thigh.^{2,3} If only a small portion of the mucosa of the glans is affected by lichen sclerosus or carcinoma in situ, patients can be offered a partial glans resurfacing with excision only of the involved mucosa followed by repair with the use of STG (figure 1). STGs tend to take better than their full thickness counterpart on the denuded spongy tissue and excellent cosmetic and functional results have been reported in almost all cases.³

reconstruction is then achieved either with the use of an STG, which is applied on the denuded corporeal heads, or with a urethral flap, which is spatulated, inverted and reshaped in a ‘pseudo-glans’ fashion.^{5,6} Alternatively,



Figure 3. Surgical management of extensive penoscrotal lymphoedema. (a) Extensive penoscrotal lymphoedema. (b) After the isolation of cords and shaft, all the lymphoedematous tissue is excised. (c) The shaft is covered using the inverted inner preputial layer, which is not affected by the lymphoedema, and a FTSG harvested from a non-hair bearing area. (d) The final result after 6 months. FTSG, full-thickness skin graft.

glans and coronal reconstruction can be also achieved with the use of urethral, rectus abdominis or palmaris longus flaps.^{7,8} Glans reconstruction following glansectomy and distal corporectomy is a simple and reproducible procedure. Complications include poor graft take requiring regrafting in around 6% of patients and inadequate final cosmetic or functional outcome in 1% of cases in patients who have undergone reconstruction with the use of skin grafts.⁴

Scrotal Reconstruction

Loss of scrotal skin may be consequence of necrotizing fasciitis, trauma or following excision of bulky penile tumours. When primary closure is not feasible, reconstruction of the scrotum can be achieved using either STG or local myocutaneous and fasciocutaneous flaps (**figure 3**).

Usually scrotal reconstruction is performed with the use of meshed STG; however, an adequate graft take is possible only if tunica vaginalis and granulation tissue are present at the time of grafting. Meshed STGs are a good solution for scrotal repair, since they allow the drainage of exudate through the fenestrations, thus improving the success of graft take to nearly 100%. Moreover, when healed, they mimic the rugae that normally characterize the scrotal skin. However, STGs are insensate, demand a long and time-consuming period of wound care, and play no role in the thermoregulation of the scrotal content; therefore, local pedicled flaps are the preferred option for providing testicular coverage, when the remnant scrotal tissue is insufficient for primary closure. Classically, the vertical rectus abdominis myocutaneous flap yields the best cosmetic and functional results, but is also associated with significant donor site morbidity. Other myocutaneous and fasciocutaneous flaps based on tissue from the perineum, groin and lower limbs have been described. Among these, the medial circumflex femoral artery perforator flap, the gracilis myofasciocutaneous flap, the neurovascular pedicled pudendal thigh flap and the Singapore flap are the most commonly used.⁹

Penile Shaft Reconstruction

Partial or subtotal penectomy, traumatic amputations of the penis, micropenis, exstrophy, aphallia or penile agenesis represent the main indications for penile shaft reconstruction. Preservation of as much viable tissue as possible is paramount in all cases, and patients who have had a partial amputation of the penis should be initially offered conservative management, such as division of the suspensory ligament of the penis or excision of the suprapubic adiposity, to maximise the

length of the residual penile stump.

Total phallic reconstruction should be offered only if all conservative measures fail and the patient is not capable to resume penetrative sexual intercourse and to void while standing, or in presence of severe psychological distress.

The choice of the reconstructive technique should be tailored on patients' expectations, body habitus and previous surgical procedures, since thigh and forearm free flaps are associated with poorer cosmetic result in obese patients due to the excessive thickness of the adipose layer and transverse lower abdominal scars may contraindicate the use of infraumbilical flaps. Also patients' comorbidities must be taken into account, since diabetes, hypertension, dyslipidaemia, obesity and cigarette smoke are associated with high risk of vascular complications and therefore, represent relative contraindication to the use of free flaps.

The development of total phallic construction techniques has paralleled the development of flaps in plastic surgery, and at present more than 20 different types of flaps is available for phallic construction.

The classical method of penile reconstruction involves the use of abdominal flaps. The first total phallic reconstruction (TPR) was attempted in 1936 by Bogoras,¹⁰ who used a random pedicled oblique abdominal singular tube with no incorporated neourethra. Phallic rigidity was obtained by inserting a rib cartilage inside the flap.

Maltz¹¹ and Gillies and Harrison¹² subsequently improved the Bogoras technique by creating a phallus which incorporated a urethra using the 'tube within a tube' concept. These procedures were multistaged, resulted in extensive scarring and disfigurement of the donor area, and produced a phallus with no sensation.

With the advent of microsurgical techniques, a new era has started for TPR. Originally described in 1982 by Song et al.,¹³ the use of the radial-artery free flap (RAFF) phalloplasty was first published in 1984 by Chang and Hwang,¹⁴ who used this technique successfully for TPR in seven patients that had previously had a penile amputation. The reconstructive procedure involved the creation of 'a tube within a tube' using forearm skin with the urethra fashioned from the non-hair-bearing area and the whole flap base on the radial artery. This technique allowed the creation of a cosmetically acceptable phallus. Sensation was also maintained due to the coaptation of the antebrachial nerves to the dorsal nerve of the penis or to the iliohypogastric and ilioin-

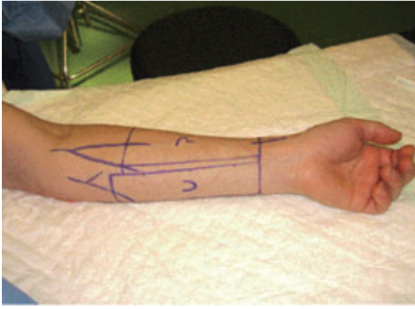


Figure 4 (a): Flap dimensions; 416 cm for urethra (U) and 12x13 cm for phallus (P).

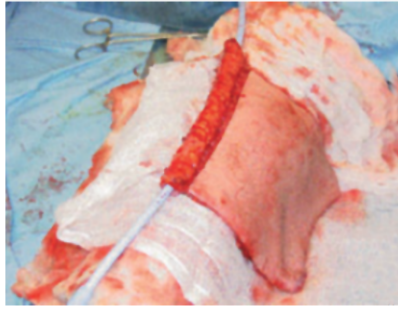


Figure 4 (b): The urethra tubularized over a 16 F catheter



Figure 4 (c): The phallus portion wrapped over urethra to form 'tube within a tube' concept.

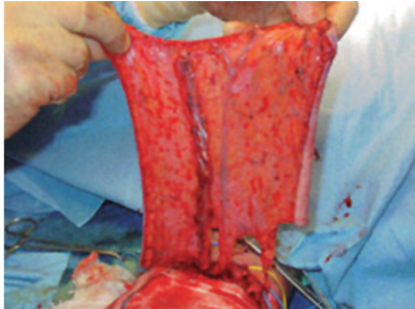


Figure 4 (d): The flap raised on the radial artery with its comitantes, the cephalic and lateral flap veins, and cutaneous nerves

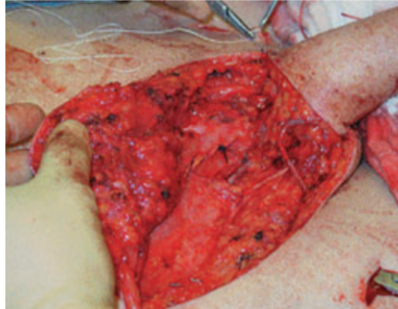


Figure 4 (e): The vascular anastomoses in the recipient area.

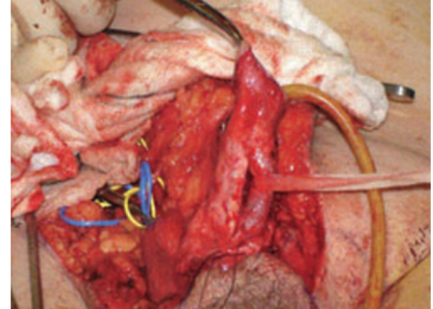


Figure 4 (f): Separation of the penile urethra from the corporal stump



Figure 4 (g): Full-thickness skin graft placed on the arm defect.



Figure 4 (h): Glans sculpture with the full-thickness graft.

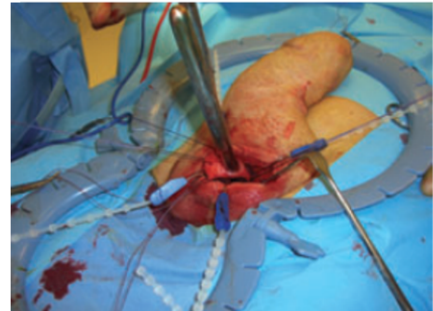


Figure 4 (i): The crura are isolated and dilated for implant



Figure 4 (j): The prosthesis is inserted into the phallus within an incorporated Dacron sheath to form a pseudo-corpus insertion



Figure 4 (k): The end results in patient

Figure 4. Radial-artery free flap (RAFF) phalloplasty

guinalis nerves. The main drawback of this technique is donor site morbidity. Although associated with a more severe donor site morbidity the RAFF currently yields the best cosmetic and functional results, according to various reports.

This procedure involves two or three stages, usually carried out 3 months apart over a period of at least a year (**figure 4**). The first stage consists of creating the phallus, which is transposed to the recipient site with a microsurgical free tissue-transfer technique. The

arterial blood supply to the flap is guaranteed by the inferior epigastric artery or the femoral artery. Venous drainage is through the branches of the long saphenous vein, the dorsal penile vein or the pampiniform plexus. Cutaneous and erogenous sensation is instead guaranteed by the anastomosis of the cutaneous antebrachial nerves to the dorsal nerve of the penis, the iliohypogastric and ilioinguinal nerves. The phallic urethra is then anastomosed to the proximal urethral stump, to allow the patient to void and ejaculate from the tip of the phallus. The cosmesis of the phallus is then improved during the second stage with the formation of a pseudoglans using the Norfolk technique, which involves the use of a full-thickness skin graft harvested from a nonhair-bearing area, to create the glans ridge and groove. A penile prosthesis is implanted at 1 year after phallus construction, to give enough time to allow cutaneous sensation to develop. This procedure is necessary to guarantee the rigidity required for penetrative sexual intercourse.

Total phallic reconstruction using the RAFF is a reproducible technique. The most feared complication is acute venous thrombosis of the microsurgical anastomosis, which occurs in 3% of patients and becomes obvious at 2 to 3 days after surgery, when the phallus appears 'oozy' and discoloured, and the pulse becomes progressively weaker and then disappears. Due to its subtle onset, it is invariably recognised too late, when irreversible endothelial changes have already occurred, and therefore leads to the complete loss of the phallus.

On the contrary, acute thrombosis of the arterial anastomosis is immediate and easily identifiable. Re-exploration can therefore be immediate and this allows the preservation of the phallus in most cases.

The most common complications after using a RAFF are neourethral stricture and fistulae, which occur, respectively, in 10% and 20% of cases. However, surgical correction is almost always successful, and up to 99% of patients are able to void while standing, from the tip of the phallus, after revisional surgery.¹⁵

Inserting a penile prosthesis in a phalloplasty is associated with a high risk of complications like infection, erosion and mechanical failure.

Overall patients' satisfaction with this technique can be as high as 97% with phallic sensation present in up to



Figure 5. Circumcision for Verrucous Carcinoma

86% of cases.¹⁶

In our series, we have described 7 patients who underwent glansectomy and skin grafting with good cosmetic results and local control. The remaining 28 patients were managed with either partial or total penectomy with perineal urethrostomy while one underwent circumcision for verrucous carcinoma (Figure 5). The retrospective nature of our study is a recognised weakness. Recent reconstructive surgical techniques are underutilized and should be offered to the suitable patients at our centre.

CONCLUSIONS

Efforts to preserve penile length and function in the surgical treatment of penile cancer should be made in all suitable patients. Skin grafts still represent the solution of choice for repair of skin defects on the glans and shaft penis. STGs tend to be easier to harvest and to take better than their full thickness counterpart; however, they are associated with a higher degree of contracture and therefore, are ideal only for glans reconstruction. Full thickness grafts are the solution of choice on the shaft as they heal maintaining the elasticity necessary to achieve adequate erections.

In scrotal skin defects, when primary closure is not feasible, local flaps are the solution of choice, as they tend to heal better than skin grafts and can play a role in thermoregulation of the testicles.

With regards to penile reconstruction, phalloplasty should be offered only when conservative measures have failed. Although none of the techniques of total phallic reconstruction is universally recognized as the gold standard, RAFF and its modifications yield the best cosmetic and functional results. Further recent reconstructive procedures should be offered to the suitable patients at a tertiary centre like ours.

END NOTE

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