

Coverage of Penoscrotal Defects using Local Flaps

Youssif Khachaba, Tarek Ashour, Laila Aboul Nasr, Sherif Zamer
Department of General Surgery, Faculty of Medicine, Cairo University

ABSTRACT

Penile/scrotal skin reconstruction is a challenging topic, in which a careful treatment plan is needed. It is important for anatomic and aesthetic restoration, and for functional and psychological reasons as well. The use of local flaps (from scrotum, abdomen, thigh and/or groin) is among the available options. They are easy to perform, has short operative time, and provide like tissues, compared to perforator flaps, myocutaneous flaps and free flaps. The aim of the study was to evaluate the use of local flaps in the management of various penile/scrotal skin defects. Patients included in the study were those suffering from penile-scrotal skin defects, caused by various etiologies, who were treated solely by local flaps from neighboring tissues. Extensive debridement was done initially in the infected cases. Closure was attempted after resolution of tissue edema. Scrotal flaps, advancement or rotational abdominal, groin & V-Y flaps were performed in all cases according to injury complexity and intra-operative availability. The study was conducted on 15 patients. Eight post-infective, four acute traumatic injuries, two post-trauma scarring, and one post burn scarring. Wound infection was superficial in four cases, and responded well to repeated dressings. Gaping occurred in one case following deeper infection, and in another due to unexpected erection; Treated by secondary sutures, antibiotics and sedatives for 3 weeks. Patient satisfaction was excellent in 10 cases, acceptable in 4 cases, and poor in one case. The study showed that reconstruction of peno-scrotal defects using local flaps yielded good results, with good patient satisfaction, and few complications. In properly selected patients, local flaps can be the surgeons first choice, and provide an important means of reconstruction for peno-scrotal defects.

Key words: *Penile skin defects, scrotal skin defects, local flaps, penile trauma, Fournier's gangrene.*

INTRODUCTION

Penoscrotal reconstruction has always been a plastic surgical challenge. Such defects have physical health impact, as well as psychological impact on the patient.^[1] The aim is the restoration of the scrotal and penile anatomy, with the best possible aesthetic appearance, in a way that enables an effective functional recovery.^[2]

Different etiologies may cause soft tissue defects of the penoscrotal region. Fournier's gangrene is an acute necrotizing infection of the skin and fascia of the scrotum, penis and perineum.^[3, 4] Insult to the penoscrotal area may also be traumatic in road traffic accidents, entrapment in mechanical machinery, shot gun injuries, or animal attacks, or may be thermal in burns.^[1]

The choice of the method of reconstruction usually depends on the magnitude and complexity of the injury, and the availability of viable reconstructive options. Possible methods of penoscrotal-scrotal soft tissue defect reconstruction includes the remodeling of scrotal

skin remnants, burying the testes under medial thigh skin^[5], split thickness skin grafting, various cutaneous or fasciocutaneous local flaps^[6, 7], various pedicled muscle flaps^[8-10], perforator flaps, omental flap, and in more demanding cases, free tissue transfer.^[11, 12]

The use of local flaps from neighboring tissues for peno-scrotal reconstruction may provide a quick and easy to perform option, with acceptable donor site morbidity^[1]. The aim of the study is to assess the use of various local flaps from the abdomen, thigh, scrotum and/or groin areas, designed with advancement, rotational or V-Y patterns, to reconstruct the penoscrotal skin.

Aim of the study

To evaluate the use of local flaps in the management of various penile/scrotal skin defects.

PATIENTS AND METHODS

A prospective study was carried out on patients that presented to Cairo University hospital (Kasr Al-Aini) Emergency department or

outpatient clinic, over the period of 3 years, from June 2013, to May 2016.

Patients suffering from various penile-scrotal skin defects, which were caused by various etiologies, and were totally reconstructed using local flaps from neighboring tissues (Abdomen, scrotum, thigh, groin) were enrolled in the study.

Patients with septicemia/multi-organ system failure were excluded from the study. Also patients whose reconstruction required muscle flaps, axial fascio-cutaneous flaps from the thigh, or free flaps were excluded. All included patients had intact urethrae.

For all the patients we recorded demographic data, etiology of the peno-scrotal defect, reconstructive method used, complications acquired and patient satisfaction concerning both function and form.

Extensive debridement and drainage were done initially in the infected cases, together with antibiotic therapy according to culture and sensitivity, allowing time before reconstruction until resolution of tissue edema. In traumatic cases minimal debridement was done, only for devitalized tissues, to reach a bleeding edge. Two cases with post trauma scarring, and one patient with post burn scarring had their old scars excised and fibrous bands severed to eliminate contractures.

Local scrotal, abdominal, groin or thigh flaps were employed, using advancement, rotational, or V-Y patterns. The choice was according to individual pattern of tissue loss, injury complexity and donor site availability.

In all patients a urinary catheter was inserted, to be removed 7-10 days after reconstruction. A temporary sigmoid loop colostomy was done if the patient's defect extend and location necessitated the diversion of the stools, to be closed three weeks later. Supra pubic urinary diversion was not needed in any patient.

RESULTS

Fifteen patients in total were included in this study. Age of the patients ranged from 27 to 59 years, mean age = 39.6 years.

The etiology in eight of the cases was Fournier's gangrene (53%). Four cases were due to acute traumatic injuries (27%), two patients suffered from post-trauma scarring (13%), and one patient suffered from post burn scarring (7%).

Five of the patients had Diabetes Mellitus (33%), three of the patients were hypertensive (20%), and three were hepatitis C virus positive (20%),

Sites and patterns of injury for each patient, as well as the reconstruction technique used for each are listed in table 1.

In all patients, healing of the defects was complete. Four of the patients were complicated by superficial wound infection; they were managed with repeated dressing and antibiotics according to culture and sensitivity, and responded well to treatment. One patient suffered wound gapping, following deeper infection. Another patient also had wound gapping, but due to unexpected erection; Secondary sutures, antibiotics and sedatives for 3 weeks resolved the problem. Total cases of infection = 5 (33%). Total cases of wound dehiscence = 2 (13%).

In two of the patients (13%), one with Fournier's gangrene and one traumatic, the extend and location of the defects necessitated the diversion of the stools via a sigmoid loop colostomy.

Patient satisfaction, regarding both the shape and the function after reconstruction, was excellent in 9 cases (60%), acceptable in 4 cases (27%), and poor in two cases (13%).

Table 1: Details of the patients included in the study

	Etiology	Age	Site	Time of reconstruction	Comorbidity	Reconstructive Procedure	Follow up / Satisfaction	Complications / Comments
1	Fournier's	49	Scrotal, prox. penile	26 days	-	Scrotal adv., thigh adv.,	5 months, highly satisfied	-
2*	Fournier's	39	Complete penile-scrotal	30 days	HCV, DM	Abd. adv, bil. groin V-Y, scrotal adv.	5 months, unsatisfied	Wound Infection
3*	Fournier's	42	Scrotal	16 days	-	Scrotal adv.	3 months, highly satisfied	-
4	Fournier's	38	Rt side scrotal & inguinal	39 days	DM	Rot. adv. abd., adv. thigh	5 months, satisfied	Wound infection
5	Fournier's	41	Peno-scrotal	18 days	-	V-Y rt groin, scrotal adv.	4 months, highly satisfied	-
6	Fournier's	59	Pubic, penile, scrotal, perineal	25 days	DM	Abd adv, bill thigh adv.	4 months, satisfied	Wound dehiscence, infection
7	Fournier's	53	Peno-scrotal, perineal	41 days	DM, HT	Abd adv, bil groin V-Y, bil thigh adv	6 months, unsatisfied	Wound infection, Temporary colostomy
8	Fournier's	36	Penile, scrotal	17 days	HCV, DM	Abd V-Y adv.	4 months, highly satisfied	-
9*	Trauma	32	Almost complete peno-scrotal, perineal	3 days	HT	Abd. adv., bil groin and thigh adv.	5 months, satisfied	Wound infection, Temporary colostomy
10*	Trauma	35	Penile, rt scrotal	1 day	-	Abd V-Y, scrotal adv.	3 months, satisfied	N.B. One testis lost to trauma.
11	Trauma	29	Scrotal	Immediate	-	Scrotal adv.	2 months, highly satisfied	Wound dehiscence
12	Trauma (gun-shot)	40	Scrotum transfixied, bil thighs.	1 day	-	Scrotal flaps.	4 months, highly satisfied	N.B. One testis lost to trauma.
13*	Post trauma scarring	27	Supra pubic, dorsal penile	5 months	-	Z-plasty	2 months, highly satisfied	-
14	Post trauma scarring	33	Peno-scrotal	7 months	HCV	Z-plasty, V-Y	45 days, highly satisfied	-
15	Post burn scarring	41	Dorsal penile	3 months	-	Z-plasty, groin adv.	35 days, highly satisfied	-

* Denotes patients whose pictures are included below



Fig. 1: Patient (2), post Fornier's gangrene complete penoscrotal defect. A-B: Pre-operative, debrided and ready for reconstruction. C-D: Immediate post-operative, reconstructed with abdominal advancement flap, bilateral groin V-Y flaps, and scrotal advancement flaps. E: 3 weeks post-operative. F: 6 weeks post-operative.



Fig. 2: Patient (3), post Fornier's gangrene scrotal defect. A: pre-operative. B: 3 weeks post-reconstruction with scrotal advancement flaps.



Fig. 3: Patient (9), post traumatic almost complete penoscrotal defect (distal penile skin spared), with perineal involvement. A: Pre-operative, debrided and ready for reconstruction. B: Immediate post-operative, reconstructed with abdominal advancement flap, bilateral groin V-Y flaps, and thigh advancement flaps. C-D: 4 weeks post-operative.



Fig. 4: Patient (10), Traumatic injury with scrotal, penile and pubic involvement. A-B: Intra-operative, debrided and ready for reconstruction. C: Immediate post-operative, reconstructed with abdominal V-Y advancement flap. N.B. Right testis lost. D: 3 weeks post-operative.



Fig. 5: Patient (13), post traumatic scarring of the dorsal penis and supra-pubic area with skin contracture. A: pre-operative. B: Immediate post-reconstruction with multiple z-plasties

DISCUSSION

Insult to the peno-scrotal area has always been distressing to the patient, as it has been challenging to the surgeon. These injuries have a marked physical and psychological impact on the patient, and they are a source of significant discomfort and inconvenience as well. The surgical restoration of the scrotal and penile anatomy, with an acceptable aesthetic appearance, and an effective functional recovery is a quite difficult task.^[2, 13]

Acquired soft tissue defects of the penoscrotal region can be caused by variable etiologies.

Acute necrotizing infection of the skin and fascia of the scrotum, penis and perineum (Fornier's gangrene) is an infrequent condition, usually attributed to multi-organism infection in the environment of a weak host immunity. Most incriminated organism in Fornier's gangrene is group A streptococci. Diabetes mellitus is reported in 20-70% of patients with Fornier's gangrene. Preceding injury or surgery to the perinioscrotal area may be a recognized factor for the introduction of bacteria that initiates the process. Other factors include low socio-economic status, alcohol/drug abuse, and cancers.^[3, 14]

Trauma to the penoscrotal area is encountered in road traffic accidents, especially those involving motorcycles, and in industrial machine accidents. Entrapment of the scrotal skin in moving mechanical parts or moving belts of machines may lead to degloving of the whole

scrotal and penile skin. Shot gun injuries, animal attacks (bites or kicks), surgical excision for cancers or lymphoedema, and burns are other possible causes of peno-scrotal soft tissue defects.^[2]

The reconstruction procedure may be further complicated by the poor general condition of the patient, especially in patients with Fornier's gangrene, most of whom suffer multiple comorbidities and immune deficiency. The possibility of continuous wound soiling by excretory product may further complicate the reconstruction procedure, necessitating the temporary diversion of urine and stools until the completion of the reconstructive procedure.^[14, 15]

The wide array of surgical techniques that have been employed for peno-scrotal soft tissue reconstruction reflects the challenging nature of the problem. The choice of the method of reconstruction usually depends on the magnitude of the injury, whether total or partial skin loss, and whether simple or complex including other accompanying injuries. The method choice also depends on the availability of viable reconstructive options.

Possible methods of penoscrotal-scrotal soft tissue defect reconstruction includes the remodeling of scrotal skin remnants, burying the testes under medial thigh skin, split thickness skin grafting, various cutaneous or fasciocutaneous local flaps, various pedicled muscle flaps, perforator flaps, omental flap, and in more demanding cases, free tissue transfer.^[11]

The utilization of the remnants of the scrotal skin, if available, is the easiest and fastest method,

and provides the most similar skin, with the least donor morbidity. This skin has very high stretchability. However, with more extensive injuries, or infections, this option might not be available, as the scrotal skin blood supply is hindered, if the skin and Dartos muscle are avulsed or infected.^[1]

Split thickness skin grafting can be a simple and successful means of reconstructing avulsed penile and scrotal skin, covering large areas, with minimal donor morbidity. The disadvantages include the need of proper bed (intact tunica), the lack of protective sensations, possible shape distortion and color mismatch, and difficult graft fixation and immobilization.^[16]

Various local flaps from the abdomen, thigh and/or groin areas can be used, in many cases, to reconstruct the peno-scrotal skin. Those flaps can be designed with advancement, rotational or V-Y patterns, depending on the reconstructive need for each case.^[1]

Local flaps are quick to perform, and are easy in that they do not need special training or expertise, or special instruments and setup (compared to free flaps, or even perforator flaps). Local flaps also have a very acceptable donor site morbidity, with minimal scarring and functional affection, and a better fit into the area that needs reconstruction, compared to axial fasciocutaneous flaps from the thigh^[6,7], or muscle flaps^[8-10].

This study has shown that reconstruction of peno-scrotal skin defects using local flaps yielded good results, with good patient satisfaction, and few complications.

Local flaps can provide an important means of reconstruction for peno-scrotal defects, and can be the surgeons first choice, in properly selected patients.

REFERENCES

1. Karki, D., P.K. Patel, and R.P. Narayan, Penoscrotal defect: a functional, esthetic, and psychological challenge. *Plastic and Aesthetic Research*, 2016. **3**(2): p. 64-67.
2. Mukundan, P.K., et al., Peno-scrotal soft tissue loss: a need for multidisciplinary and multimodal integration. *Plastic and Aesthetic Research*, 2016. **3**(8): p. 273-278.
3. Parry, N., Fournier gangrene. *Clin Case Rep*, 2015. **3**(3): p. 198-9.
4. Faria, S.N. and A. Helman, Deep tissue infection of the perineum: Case report and literature review of Fournier gangrene. *Can Fam Physician*, 2016. **62**(5): p. 405-7.
5. Okwudili, O.A., Temporary Relocation of the Testes in Anteromedial Thigh Pouches Facilitates Delayed Primary Scrotal Wound Closure in Fournier Gangrene With Extensive Loss of Scrotal Skin-Experience With 12 Cases. *Ann Plast Surg*, 2016. **76**(3): p. 323-6.
6. Lin, C.T., et al., Clinical applications of the pedicled anterolateral thigh flap in reconstruction. *ANZ J Surg*, 2015.
7. Rashid, M., et al., Clinical applications of the pedicled anterolateral thigh flap in penile reconstruction. *J Plast Reconstr Aesthet Surg*, 2011. **64**(8): p. 1075-81.
8. Ellabban, M.G. and P.L. Townsend, Single-stage muscle flap reconstruction of major scrotal defects: report of two cases. *Br J Plast Surg*, 2003. **56**(5): p. 489-93.
9. Katusabe, L.J., D. Balumuka, and A. Hodges, Scrotal Reconstruction with a Pedicled Gracilis Muscle Flap after Debridement of Fournier's Gangrene: A Case Report. *East Afr Med J*, 2013. **90**(11): p. 375-8.
10. Daigeler, A., et al., Bilateral pedicled gracilis flap for scrotal reconstruction. *J Plast Reconstr Aesthet Surg*, 2016. **69**(9): p. e195-6.
11. Karian, L.S., S.Y. Chung, and E.S. Lee, Reconstruction of Defects After Fournier Gangrene: A Systematic Review. *Eplasty*, 2015. **15**: p. e18.
12. Ye, X., et al., Pedicled deep inferior epigastric perforator flap for total phallic reconstruction. *Ann Plast Surg*, 2012. **69**(1): p. 64-6.
13. Di Giuseppe, P., et al., Penoscrotal skin avulsion. *European Journal of Plastic Surgery*, 1995. **18**(6): p. 305-307.
14. Mallikarjuna, M.N., et al., Fournier's Gangrene: Current Practices. *ISRN Surg*, 2012. **2012**: p. 942437.
15. Jeong, H.J., et al., Prognostic factors in Fournier gangrene. *Int J Urol*, 2005. **12**(12): p. 1041-4.
16. Fajdic, J., N. Gotovac, and Z. Hrgovic, Fournier gangrene: our approach and patients. *Urol Int*, 2011. **87**(2): p. 186-91.