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Reconstruction of massive skin avulsion of the scrota and penis by combined application of dermal regeneration template (Pelnac) and split-thickness skin graft with vacuum-assisted closure: A case report

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Abstract

BACKGROUND

Although skin avulsions to male external genitalia are rare, they can be both physically and psychologically traumatic. Thus, the necessity for judicious management poses significant challenges to surgeons in order to avoid potential permanent disabilities. We report a case of massive penoscrotal skin avulsion and a composite graft was creatively applied to cover the defect which achieved good results. We believe that this case is of great reference value for fellow surgeons.

CASE SUMMARY

A 52-year-old male presented with massive traumatic avulsion of the penile and scrotal skin following mishandling of an electric drill. The avulsed skin was missing. The patient was diagnosed with massive skin avulsion of external genitalia. Following initial complete debridement of devitalized or infected tissues, Pelnac dermal substitute was secured to the defect with the assistance of negative-pressure wound closure. In the final step, the silicone layer of Pelnac was removed and a split-thickness skin graft was applied. The defect had healed at the two-month follow-up. The patient now has normal erections and satisfactory sexual function.

CONCLUSION

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Our experience with this wound repair demonstrated that the combination of a dermal regeneration template and a split-thickness skin graft with vacuum-assisted closure is a safe, well-tolerated and efficient solution for the reconstruction of massive penoscrotal skin defects.

Key words: Artificial dermis; Dermal regeneration template; Massive skin defect; Penoscrotal defect; Split-thickness skin graft; Case report

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Core tip: Skin avulsions of the scrotum and penis are rarely seen, especially massive avulsions. However, when they do occur, it is vital for surgeons to take prompt and judicious measures to repair the defects to avoid possible disabilities which could be both physically and psychologically traumatic. We report a case with massive skin avulsion of the scrota and penis, where we customized treatment by combining a dermal regeneration template (Pelnac) and a split-thickness skin graft to cover the defect with vacuum-assisted closure using three steps. Our experience with this wound repair proved that this combination is a safe, well-tolerated and efficient solution for the reconstruction of massive penoscrotal skin defects.

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INTRODUCTION

Due to their intrinsic characteristics^[1], skin avulsions in the genital area are rare and poorly reported^[2]. However, lifelong sequelae which are both physically and psychologically traumatic are possible if the defects are not immediately and appropriately treated. Therefore, the necessity for judicious management poses significant challenges for surgeons in order to avoid potential permanent disabilities, such as retraction of grafted skin, erectile dysfunction, *etc*^[3,4].

We report a case with massive penoscrotal skin avulsion. The patient was successfully treated with the combination of a dermal regeneration template (Pelnac) and a split-thickness skin graft with vacuum-assisted closure. This treatment technique is analyzed and discussed for further promotion.

CASE PRESENTATION

Chief complaints

A 52-year-old male patient presented in our emergency room with massive traumatic avulsion of the penile and scrotal skin following mishandling of an electric drill during work 9 h earlier. The missing skin was not retrievable.

History of present illness

The patient was taken to the local hospital immediately after the accident. The wound was quickly dressed and the patient was referred to the Emergency Department of our hospital.

History of past illness

The patient was healthy prior to the accident with no history of chronic disease.

Physical examination

Physical examination showed full-thickness skin of both scrota and the proximal part of the penis was denuded with active bleeding (Figure 1). Urinary catheterization was successfully performed which indicated that there was no damage to the urethra.



Figure 1 Massive skin defect of both scrota and the proximal part of the penis before surgery.

Laboratory examinations

Laboratory studies revealed a white blood cell count of $12.3 \times 10^9/L$ (neutrophil percentage, 74.5%) which was higher than the normal level and was believed to be caused by the open trauma. Other results were normal.

Imaging examinations

A pelvic computed tomography scan revealed that the perineum skin had multiple spots of dense shadows, and the subcutaneous fat gap was slightly blurred.

FINAL DIAGNOSIS

The final diagnosis was massive penoscrotal skin avulsion.

TREATMENT

Following discussion, we repaired the skin defect using three steps. First, excision of the necrotic and inflammatory tissues was carefully performed and hemostasis was meticulously achieved to prevent infection, seroma and hematoma. Polyurethane foam was then applied to the wound and sealed with a transparent dressing to avoid air leak. The tube which was previously attached to the dressing was connected to a vacuum setting which was set at a constant negative pressure (125 mmHg) and supplied to the region.

One week later when the graft bed had been appropriately prepared, the Pelnac dermal regeneration template was grafted onto the defect region according to the wound size (Figure 2), and with the assistance of negative pressure therapy described above, the artificial dermis was firmly secured and incorporated into the wound.

Finally, after confirmation that Pelnac was clinically incorporated into the defect, the silicone layer was removed and a split-thickness skin graft, which was harvested from the left inner thigh, was applied over the artificial dermis one week later (Figure 3). The vacuum setting was again utilized and maintained at a continuous negative pressure to assist grafting. The device was dismantled seven days later and the skin graft was found to have completely survived.

OUTCOME AND FOLLOW-UP

The combined grafting achieved a good cosmetic appearance and stable coverage of the defect which was elastic and of good quality and texture at the three-month follow-up. Furthermore, urination and sexual function in this patient were not greatly affected by his injuries or treatment. He is satisfied with his erectile length and sexual function (Figure 4).

DISCUSSION

Skin avulsions of the scrotum and penis have been poorly reported^[2], especially massive avulsions, due to intrinsic factors such as unique location and anatomy^[1].



Figure 2 Dermal regeneration template (PelnaC) was grafted onto the defect region.

They are generally seen in industrial or agricultural accidents when unprotected rotary gears catch the pants of the workers and draw the scrotum and penis into the machinery^[5], which is exactly what our patient experienced. Prompt and judicious treatment should be undertaken to prevent possible disabilities which could be both physically and psychologically traumatic following delayed or inappropriate management^[3,4]. Therefore, it is vital for surgeons to make suitable and customized decisions regarding certain defects.

We performed a literature search of skin avulsions of the scrotum and penis, and the results are shown in [Table 1](#)^[6-16]. In our case, the patient suffered massive skin avulsion of both scrota and the proximal part of the penis. Furthermore, the torn skin was lost during the accident. In addition, according to the experience of Sheridan *et al*^[17], the penoscrotal region is among the poorest areas for graft survival. Therefore, the characteristics of the graft needed for the defect were as follows: easy to survive, abundant quantity and good quality and texture after transplantation for sexual function. The most appropriate option was a split-thickness or full-thickness skin graft. It is known that split-thickness skin graft survive easily and can be obtained easily, but can later retract and be of poor quality and texture^[18]. In contrast, the survival of a full-thickness skin graft is relatively difficult and not easily obtained, but would not retract and would be of good quality and texture^[19]. In order to adopt the advantages of a split-thickness skin graft in terms of survival and quantity, we decided to introduce artificial dermis^[20,21] to prevent retraction and improve the quality and texture after transplantation.

However, the disadvantage of this treatment is a second-stage operation and a potentially higher rate of complications. The main complications include infection, hematoma, seroma and improper mobilization. In the hope of reducing these unfavorable factors, we adopted vacuum-assisted closure which has been confirmed to be effective^[12,21] throughout the whole repair procedure. Considering the dirty environment in which the accident occurred, we decided to reconstruct the defect in three steps which proved to be a practical and successful strategy.

This treatment of combining artificial dermis and a split-thickness skin graft allowed successful reconstruction and shows promising clinical application. These types of injuries, which once could only be treated with flaps, for example, exposed bone, tendons and other vital yet poorly vascularized structures^[21], can now be successfully covered by this composite graft which is not limited to specific locations. Commonly encountered complications such as infection, hematoma or improper mobilization, can now be reduced due to the introduction of vacuum-assisted closure. This technique is not only reliable in terms of coverage of the defect, but can also reduce complications. Our patient was thankful and satisfied with his care during hospitalization. We highly recommend this method for the repair of various massive and troublesome defects.

CONCLUSION

The combination of a dermal regeneration template and split-thickness skin graft with vacuum-assisted closure is a safe, well-tolerated and efficient solution for the reconstruction of massive penoscrotal skin defects.

Table 1 The characteristics of patients with skin avulsions of the scrotum and penis

Date of publication	Ref.	Age	Cause of defect	Size	Infection	Treatment
1948	Davis <i>et al</i> ^[5]	60	Trauma	Scrota, penis, spermatic cords, tunica vaginalis and cremaster muscles	No	Thick split-thickness skin graft
1948	Davis <i>et al</i> ^[5]	51	Trauma	Left testicle, spermatic cord, penile shaft and scrotum	No	Thick split-thickness skin graft
1966	Cullen TH <i>et al</i> ^[6]	16	Trauma	Left scrotum, penis shaft	No	Subcutaneous tunnel and split-skin graft
2001	Liu <i>et al</i> ^[7]	37	Trauma	Scrota, penis shaft	No	Replantation of avulsed skin
2002	Ribuffo <i>et al</i> ^[8]	75	Basal cell carcinoma	Scrota, penis, pubic and inguinal area	No	Split-thickness skin graft
2007	Jena <i>et al</i> ^[9]	28	Trauma	Scrota, penis	No	Scrotal skin flap
2010	Selvan <i>et al</i> ^[10]	27	Trauma	Scrota, penis	No	Hypogastric flap and split
2012	Asimakopoulos <i>et al</i> ^[11]	-	Radical circumcision	Penis	No	Split-thickness skin graft
2013	Zhao <i>et al</i> ^[12]	39	Trauma	Scrota, penis	Necrosis	Split-thickness skin graft
2014	Pieptu <i>et al</i> ^[13]	31	Trauma	Anterior perineal skin, penis and both testicles	No	Split-thickness skin graft for testicles; Integra and ultra-thin split-thickness skin graft for penis
2014	Wong <i>et al</i> ^[14]	-	Paraffinoma, burn, circumcision, trauma	Penis	No	Bipedicled scrotal flap
2015	Djedovic <i>et al</i> ^[15]	-	-	Penis	No	Acellular dermal template and split-thickness skin graft
2016	Judge <i>et al</i> ^[16]	32	Elephantiasis	Scrota, penis, perineal area	No	Full-thickness skin graft



Figure 3 Split-thickness skin grafts were applied over the artificial dermis.



Figure 4 Follow-up after removal of stitches.

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