Skin necrosis of scrotum due to endovascular embolisation: a case report

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The aim of our case report was to analyse the results obtained with the Matriderm® system and autologous skin grafting for the surgical treatment of skin necrosis of scrotum as a result of endovascular embolisation. We recruited one patient with scrotum skin necrosis as a result of endovascular embolisation admitted at the department of Plastic and Reconstructive Surgery, University of Rome ‘Tor Vergata’. The patient underwent Matriderm® system and autologous skin grafting for skin necrosis treatment. After a single treatment, reduction of the skin necrosis was obtained, after 30 days from the surgical treatment. Patient experienced a reduction in pain and a complete restoration of the loss in volume and quality of skin was noticed. Matriderm® system and autologous skin grafting is a simple, safe and feasible technique. When comparing this treatment with others, Matriderm® is a simpler, more economic and less time-consuming method, and does not require sophisticated laboratory facilities.

Key words: Autologous skin grafting • Dermal substitute • Matriderm® system • Skin necrosis

INTRODUCTION

The treatment of scrotum wounds is a multidimensional approach: diagnostic medicine, urological, micro-vascular and finally plastic surgery. The gold standard coverage for these wounds is a bioengineering substitute, free flaps and autologous skin grafting. A cell-based wound coverage with keratinocytes and fibroblasts on the basis of a commercially available dermal substitute (Matriderm®, collagen/elastin matrix) was generated, in order to treat wide wounds. The scaffold has already proven to be suitable for a single-stage grafting procedure without the disadvantage of a skin grafting rejection. However, poor skin quality and scar contracture occur frequently and are well-known problems in split grafted areas. Dermal substitute is an appropriate way to minimise scar contraction and to optimise the quality of the grafted area in strained regions with loss of function and with high requirements of elasticity, pliability and stability.

A cell-based wound coverage with keratinocytes and fibroblasts on the basis of a commercially available dermal substitute (Matriderm®, Dr. Suwelack Skin & Health Care AG, Josef-Suwelack-Strasse, 48727 Billerbeck Germany, collagen/elastin matrix) was generated, in order to treat wide wounds.

MATERIALS AND METHODS

Patient anonymity was respected and an informed consent was obtained before the...
surgical procedure and digital image production. The protocol of the study was approved by the research ethics board of our institution. The patient, 42 years old, already subjected to left testicle angioma excision (December 2005), was admitted on 06 July 2009 in our division of vascular surgery with ultrasound diagnosis of arteriovenous scrotal malformation. His medical history showed no medical or surgical treatments.

During hospitalisation, the patient underwent ECG and RX thorax that resulted within the limits of the norm. Angio-CT of lower limbs documented the presence of coarse knotting ectasia of vessels that were manifested in the left scrotum which determines lateral dislocation of the right testicle. Scans performed at contrast arteriography documenting four afferents from the superficial femoral artery and the hypogastric through the penile arteries bilaterally. Furthermore, an early opacification of the scrotal venous system which appeared as varicose veins and femoral bilaterally – most likely an arteriovenous shunt was noticed. Concomitantly, a fluid portion in the scrotum, probably in tunica vaginalis, always on the left. In view of the clinical and instrumental evaluation, after cardiac and anaesthesiologic valuation, the patient underwent an endovascular embolisation procedure of trans-scrotal mass approached through the right femoral artery catheterisation via elective afferents of the above lesion (branches from the left femoral artery and hypogastric bilaterally) and subsequent embolisation. The angiographic control after the procedure presented partial devascularisation of that formation. For this reason, 2 days after, the patient underwent new angiography with the same technique and subsequent embolisation with Glubram2. This time, the angiographic control showed complete devascularisation of formation.

The postprocedure was characterised by presence of scrotum skin necrosis (Figure 1). For these reasons, the patient was treated initially for 30 days twice a week with advanced dressing consisted in the use of fibrinolytic creams, culture tests, antibiotic therapy based on susceptibility testing and ambulatory surgical curettage. The surgical step included the curettage of damaged areas and the dermal substitute application in combination with a split thickness autograft in a one-step procedure (Figures 3 and 4).

Postoperative follow-up consisted of four visits during the first month – one for each week – and two additional visits at the third and sixth month. During these visits, to test the effectiveness of the dermal substitute and to compare it with the current gold standard, skin grafting, we evaluated as primary endpoints of the study the time for complete epithelisation (both treated area and biopsy site), aesthetic and functional quality of the epithelisation (colour, joint contractures).

Key Points

- the patient, 42 years old, already subjected to left testicle angioma excision (December 2005), was admitted on 06 July 2009 in our division of vascular surgery with ultrasound diagnosis of arteriovenous scrotal malformation
- his medical history showed no medical or surgical treatments
- angio-CT of lower limbs documented the presence of coarse knotting ectasia of vessels that were manifested in the left scrotum which determines lateral dislocation of the right testicle
- scans performed at contrast arteriography documenting four afferents from the superficial femoral artery and the hypogastric through the penile arteries bilaterally
- in view of the clinical and instrumental evaluation, after cardiac and anaesthesiologic valuation, the patient underwent an endovascular embolisation procedure of trans-scrotal mass
- the post procedure was characterised by presence of scrotum skin necrosis
- after a urological, plastic and reconstructive surgery evaluation the patient underwent surgery for surgical curettage and debridement of necrotic skin tissue
- we evaluated as primary endpoints of the study, the time for complete epithelisation (both treated area and biopsy site), and the aesthetic and functional quality of the epithelisation (colour, joint contractures)
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Matriderm®

Matriderm® is a single-use three-dimensional matrix composed of native structurally intact collagen fibrils and elastin for supporting dermal regeneration. The collagen is obtained from bovine dermis and contains the dermal collagen types I, III and V. The elastin is obtained from bovine nuchal ligament by hydrolysis. Matriderm® serves as a scaffold in the skin reconstitution and modulates scar tissue formation. Moreover, Matriderm® has an excellent haemostatic property and thus reduces the risk of split skin sub graft haematoma. The non use of chemical cross-linking of the collagen results in a matrix, which is especially biocompatible (5). Matriderm®, applied using a single-stage, is immediately covered with split skin through the 1-mm thick matrix by diffusion. Matriderm® is supplied in sterile double-bagged packs and these may only be opened under sterile conditions. Before the use, Matriderm® must be rehydrated in ample physiological saline or Ringer’s solution to avoid trapped pockets of air (air pockets can hinder the diffusion and thus jeopardise the attached graft). Matriderm® should be laid on the surface of the water and not immerse. The matrix is ready for use as soon as the appearance of the entire surface has changed from white to translucent (5).

Skin grafting

Classic skin grafting was performed with a dermatome using a thin split thickness depth and it was fixed to the wounds by 3/0 nylon sutures. A moulage compressive dressing with hyaluronic acid gauze was used to cover the surgical wound.

To apply Matriderm®, it should be cut to the exact size of the wound. We applied the matrix by hand and it is crucial that Matriderm® is in complete contact with the whole area of the wound bed and adheres to it. Air bubbles between the wound bed and the matrix should therefore be carefully removed by smoothing them out from the margins of the matrix. A split thickness cutaneous was harvested from an uninvolved area (the inguinal region) using a Zimmer dermatome (Zimmer, 1800 West Center Street, Warsaw, IN). The split skin is grafted into the wound area directly on the top of Matriderm®; an additional attachment of Matriderm® with the split skin is achieved by sutures. A slight pricking is recommended to avoid the formation of seromas (5). The patient was subjected to appropriate antibiotic therapy to prevent introduction of skin flora into the wound area and the risk of infection.

RESULTS

The patient underwent a single treatment of skin necrosis of scrotum caused by endovascular embolisation. Thirty days after surgery, the skin necrosis reduction was obtained (Figure 5). The days before the in-growth the skin graft seemed compromised, but as we noted in other patients with other types of wounds, from the second week epithelial islands and buttons appear from the centre and the periphery of the area.

A marked improvement was observed: both aesthetical and functional in the area surrounding the wound, with an increase of...
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Figure 5. Post-operative view at 30 days, the new skin is renewed, refreshed in the volume and texture, even the colour looks good compared to the baseline.

blood supply, a restored trophism and the pain reduction had been a great relief for the patient, as well as the decline of wound secretion. The wound infection had been tested with negative tampon confirmation performed at 2 weeks interval for four times.

The skin was renewed, regenerated in volume and texture and the patient appeared to have a good healing of the skin colour pigmentation and texture compared to the baseline.

DISCUSSION

Vascular lesions of the scrotum are uncommon. They occur in 0.3–0.5% of the general population. In 1982, Mulliken and Glowacki described a classification of vascular anomalies according to their endothelial cell characteristics. This classification differentiates vascular tumours (haemangiomas) from vascular malformations (arterial, venous, lymphatic channels, capillaries or their combinations) (6). The most common are varicocele lesions. We can also describe haemangiomas, phlebangioma, lymphangiomas and arteriovenous malformations, the least common.

A varicocele is a dilatation of the pampiniform venous plexus and the internal spermatic vein. It is a well-recognised cause of decreased testicular function and occurs in approximately 15–20% of all males and in 40% of infertile males. It is easily distinguished by its location within the spermatic cord. It is much more common (80–90%) in the left testicle because of anatomic factors.

Haemangioma is common in childhood and only 2% of them involves genitalia (7). It contains veins and capillaries, derived by proliferation of endothelial cells. Ninety per cent of them involved without treatment and they are clinically resolved by age of 9.

Phlebangioma, usually appears sporadically but can be inherited through a dominant autosome. They appear at birth but become more prominent as the patient becomes older. The bluish colour is pathognomonic, because of the presence of ectatic venous vessels inside the dermis.

Lymphangioma is a malformation of the lymphatic system that involves the skin and subcutaneous tissues.

AVMs are vascular malformations and are more uncommon in the scrotum. They are both congenital and post-traumatic. AVMs are made up by numerous arterioles and thick-walled veins. These lesions have a progressive growth with no evidence of involution.

Vascular malformations are uncommon benign entities with a negative aesthetic effect on the patient. They may be asymptomatic or can present with pain, swelling, bleeding and enlargement of the scrotum (7). Varicoceles and haemangiomas have been shown in prior studies to cause an elevation in scrotal temperature that bring on adverse affects on spermatogenesis (8).

To evaluate scrotal vascularity, sonography with colour Doppler imaging is the initial imaging modality (9). MRI also gives us information about the extent of the lesion, the vascularity and involvement of surrounding structures. Magnetic resonance angiography can show the arterial feeders and the draining vein. However, angiography is essential to fully delineate the feeder vessels, vascular takeoffs and draining veins (10). High-quality angiographic images are a necessary prerequisite to plan further management (embolisation or surgery). This evaluation is necessary to prevent ischaemia of the testes or the lower limb cussed by angioembolisation (11).

In bleeding scrotal lesions, the first aim is a local control with conventional methods of haemostasis such as direct pressure and haemostatic agents (12). There are several options to treat these vascular lesions: surgery resection, radiology embolisation, sclerotherapy or a combination of them. The treatment consists of primary surgical excision and definitive angioembolisation, or a combined approach with pre-operative embolisation.
Angioembolisation is useful to stop bleeding in an emergency setting. When it is performed in the pre-operative step, it prevents major bleeding during surgery (13). Necrosis of skin and muscles, bladder infarction, impotence are the major complications associated with embolisation therapy. They can be avoided by superselective catheterisation and embolising the distal branches (7).

When the scrotal mass is large-sized or for patients with infertility, a surgical correction is recommended (8). Wound healing is an evolutionarily conserved complex multicellular process that aims at restoring skin barrier. This process involves coordinated efforts of several cell types including keratinocytes, fibroblasts, endothelial cells, macrophages and platelets. The migration, infiltration, proliferation and differentiation of these cells will culminate in an inflammatory response, formation of new tissue and ultimately wound closure (14, 15).

Basing on our clinical practice, we decided to use a combined treatment with Matriderm® and skin autologous graft for this case. This association has guaranteed a significant healing time reduction. Furthermore, the minimally invasive technique was well accepted by the patient with a noteworthy quality of life improvement along with cost reduction because of the fewer number of medications. The result of the scar tissue at the end of the treatment shows a net amelioration both in texture and pigmentation with absence of retraction in the scar tissue. On examination, no pain was experienced upon palpation as well as no evidence of adhesions and no restriction of movement in underlying tissues. No discomfort was experienced with garments and no alteration in functionality.

CONCLUSION

Our study demonstrates the role of Matriderm® and skin autologous graft in tissue regeneration and wound closure with a significant healing time reduction. We consider Matriderm® and skin autologous graft key-element to improve functional and aesthetic outcomes. This association guarantees a temporary barrier with multiple functions: haemostatic, reduction of contracture and wound infection, maintenance of skin elasticity and dermal architecture and a better appearance of the scar. Matriderm® can also be used to cover tendons and bone. Furthermore, the minimal invasive technique is well accepted by patients with a noteworthy quality of life improvement along with cost reduction as a result of fewer medications. In conclusion, our results show that the best treatment strategy is the integration of different but complementary disciplines such as cell therapy, bioengineering and biomaterials sciences as effective support to the surgical procedure.

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REFERENCES