Case Report

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Massive de-gloving thigh injury treated by vacuum therapy, dermal regeneration matrix and lipografting

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ABSTRACT

Frequently lower limb injuries are caused by road and work accidents. The young age of those affected coupled with the anatomical and functional peculiarities of this part of the body with regards to social life during adolescence make the treatment of the leg wound complex and challenging. We present two cases of young girls, victims of serious road accidents who were treated initially with frequent wound washings, vacuum therapy to stimulate granulation tissue, then dermal regeneration matrix (INTEGRA®) and split-thickness skin grafts. After one year, both patients treated with lipofilling have shown improved cosmetic results allowing a new social life.

Key words: Dermal regeneration matrix, skin graft, thigh wound, vacuum therapy

INTRODUCTION

Lower limbs injuries frequently occur in various accidents, especially road accidents involving young people. The treatment of the lower limb wounds is complex because of the anatomical and functional role of this area. The legs give support and the thighs have a social role in particular for young ladies.

De-gloving injury is a type of avulsion in which an extensive portion of the skin is torn off the underlying tissue, thus severing its blood supply, with devastating effects on the limb involved. Restoration of skin coverage is extremely important to protect the body from external environment and ensure trophic supply fundamental to reparation. This is essential for the deeper viable tissue to re-vascularise and reduce the risk of wound sepsis. Recently, the use of fat grafting has been described as a valuable tool to improve the function and the aesthetic result of scar tissue. In this report, we present two cases of thigh de-gloving injury, reconstructed through vacuum therapy, dermal regeneration matrix *INTEGRA®* and lipofilling and discuss the synergic effect of this new technique.

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CASE REPORTS

Case 1

The patient was a healthy 13-year-old girl who arrived at the emergency department because of a serious road accident; she wash it by a truck while cycling. She presented with a serious and extensive de-gloving injury involving the anterior, medial and lateral side of right thigh [Figure 1]. The wound appeared dirty and contaminated by debris, mud, soil and asphalt because, after the collision, she fell into a puddle. However, the deeper layers of the wound — the muscles, bones, arteries, veins and nerves — were preserved and intact.

Case 2

The second patient was a 16-year-old female, also victim of a road accident who presented with post-traumatic serious de-gloving thigh injury [Figure 2]. She was hit by a truck, and at the time of admission to the emergency room she had associated pelvic fracture with symphysis pubis diastase, perivescical haematoma, serious de-gloving thigh injury and genitals contused lacerated wound. First, all the patient was subjected to an orthopaedic treatment to reduce and stabilise the fractures, before the treatment of the soft tissues.

Treatment procedures

Both patients were immediately brought to the operating room to have wound irrigation and necrotic tissue debridement; this was repeated on three occasions to obtain clean wounds. Subsequently, we applied vacuum-

assisted closure therapy (VAC therapy) on the wounds to stimulate granulation tissue [Figure 3]. During this period, wound swabs microscopy and cultures were performed for both the patients, these yielded Gram-negative organisms. Then, after an infectious diseases specialist' consultation, a specified antibiotic therapy was established and continued until wound swabs resulted negative. After 10 days, we removed the VAC therapy and applied a dermal regeneration matrix (INTEGRA®) [Figure 4]. Then we applied Split-thickness skin grafts (STSG) [Figure 5] taken from the opposite-lateral thigh, until complete coverage. For patient 2, we also had to reconstruct vulvar labium majus trough local advancement flaps. We used this technique in order to create a sort of a tie over dressing with vac sponge and to drain the essudate very common in a retinated graft.

After a year of follow-up, both patients treated with lipofilling achieved better cosmetic results of the scar tissue and their soft tissue deficit restored. We strongly believe that the synergic effect of the artificial dermal substitute, together with the lipografting can gave a good reconstruction, making the scar tissue more pliable, and breaking the adherence of the new skin with the fascia. The amount of the lipografting in three sections was 70, 80 and 150cc for the first patient and 80, 75 and 125 cc for the second. Six months later we were able to observe good cosmetic improvement and the scars resulted more pliable, moreover there are no adherence between the fascia and the new skin [Figure 6].

DISCUSSION

The vacuum therapy[1] has been introduced in clinical practice for treating wounds, even in massive wounds, in the past 20 years and the advantages are well documented. This is a non-invasive system highly effective in open wound healing. The pump exerts a negative pressure of about 125 mmHg, thus sucking up the substances (e.g. fluid, serum) from the wound into containers. This system facilitates wound cleansing and contraction and stimulates granulation tissue growth.[2,3]



Figure 1: Pre-opertative situation of patient 1

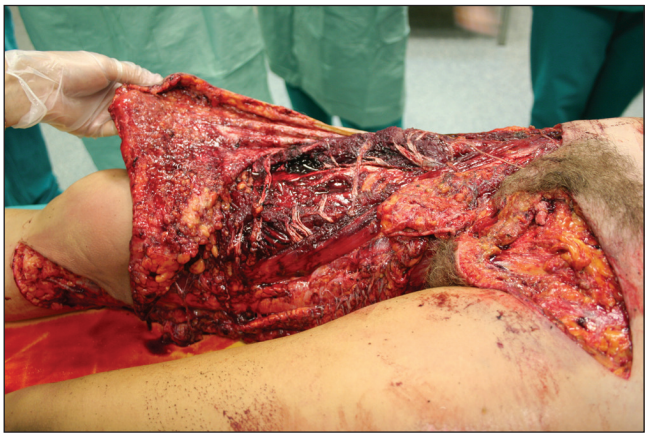


Figure 2: Pre-operative situation of patient 2

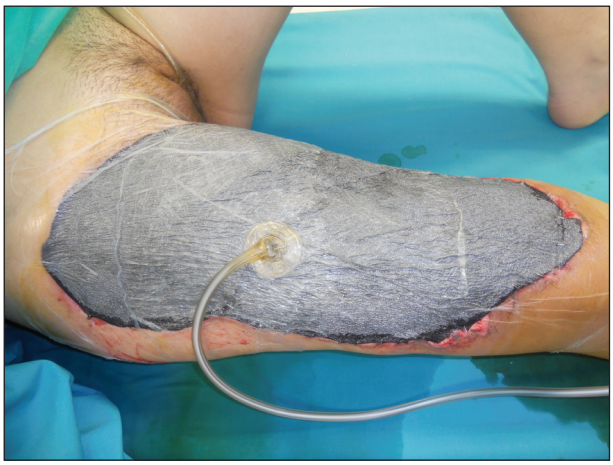


Figure 3: Application of vacuum therapy case 1



Figure 4: Application of INTEGRA® dermal matrix case 1



Figure 5: Results after split thickness skin graft case 2



Figure 6: Result after lipofilling case 1

Where the wounds appeared contaminated, we managed them with a delayed coverage using the VAC therapy as a temporary cover, and a series of debridement every 2–3 days. After clean wounds were obtained, we used INTEGRA to reconstruct the soft tissue defect, thus improving the elasticity of the thigh. Only after a good take of the dermal substitute, both cases after 21 days, we finally grafted a STSG to obtain the closure of the wounds.

INTEGRA is a bio-engineered tissue consisting of cells functionally integrated with a biomaterial. It is formed by artificial dermal foil covered with a silicon foil. INTEGRA has demonstrated to have the ability to reconstruct the elasticity of the dermal reticular layer. The first layer is the one which stimulates granulation tissue growth while the second has a protective role and must be removed after about 21 days. Upon the silicon foil removal, the optimal results made it now possible to cover the wound with a skin graft.[4] It is broadly used for lower, upper extremities defects but also genital trauma.[5]

The management of a massive de-gloving thigh injury can be complicated and hard to achieve good cosmetic results with skin grafts surgery.[6] The main problems are the risks of infection, poor aesthetic result, as well as inadequate elasticity obtained with a split-thickness skin graft. Flaps are often considered better than grafts, but the possibility of reconstructing the thigh with flaps[7] instead of grafts is limited because of its small dimension. To reduce the risks of sepsis, an early coverage needs to be achieved as soon as possible, but grafting the defect too early, could lead to an incomplete debridement risking the development of infection to the graft of the graft with a partial or complete loss of it and the acute wound could become a chronic wound.

The VAC system again provided good stabilisation of the skin graft, which prevented sheering forces and improved graft success. Though we believe that this is possible only for the first 5 days post-surgery, otherwise the granulation tissue stimulated by the VAC in the holes of the STSG will be a mechanical obstacle to re-epitelisation.[8] Once healing was complete, both patients developed a good elasticity of the new tissue, although adherences between the new skin and the muscular fascia were still present.

At this point we decided to reconstruct the missing soft tissue and to break down the scar tissue through the principles of the Rigottomies with the lipofilling.[9] The rigottomies allow a tri-dimensional web as receiving bed for the lipograft. This gives an improvement of graft taking and consequential reconstructed tissue pliability. The surgery was repeated three times to allow a better take of the small volume of lipograft, but already after the first surgery a good improvement of the thigh was observed, with a final liberation of all adherences.

CONCLUSIONS

We strongly believe that an accurate debridement, the use of the vacuum therapy, dermal substitute combined can give a functional and good result that are more acceptable compared with use of STSG alone. In addition, lipofilling can be safely applied with other techniques, and also permits management of the adherence and scar tissue formed between the new skin and muscular fascia, improving the aesthetic result the pliability and softness of the new skin.

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