Necrotizing fasciitis (NF) is a devastating, potentially life-threatening disease of the skin and soft tissue that produces rapidly extensive tissue necrosis[1]. It affects the extremities, the abdominal wall, but also the perineal area[2]. The main cause is the inoculation of the microorganisms into the subcutaneous layer of the skin. Trauma is considered to be the main reason in patients with history of lesions of the epithelial or mucosal surface[3]. The mortality rate is high [2], up to 36% [4], taking in the consideration the fact that the patients can develop septic shock. It is correlated with numerous comorbidities such as diabetes mellitus, immunosuppression, peripheral vascular disease, chronic renal failure and liver cirrhosis [2].

It is considered to be a flesh-eating disease, which was first named necrotizing fasciitis in the 1950s by BL Wilson. He was describing the rapid destruction of tissue with extensive necrosis of fascia and subcutaneous tissue (fig. 1). Excision of the infected and necrotic tissue was realised until healthy tissue was revealed. Aggressive debridement was performed revealing extensive necrosis of fascia and subcutaneous tissue (fig. 1). Wound cultures were performed and empirical antibiotic therapy was started. On day 7 of admission, the patient presented skin necrosis with purulent bullae and crepitus all over the lower right leg. An antiseptic dressing was applied all over the thigh. The antiseptic dressing was changed every day in aseptic conditions. Antibiotics were adjusted according to the positive results of wound swab cultures, our patient having Escherichia coli.

On day 7 of admission, the patient presented skin necrosis with purulent bullae and crepitus all over the lower right leg. He underwent further surgical exploration. An aggressive debridement was performed revealing extensive necrosis of fascia and subcutaneous tissue (fig. 1). Excision of the infected and necrotic tissue was realised until healthy tissue was revealed.
Post-operatively, the patient was carefully monitored. Supportive therapies, which include preservation of fluid and electrolyte balance, blood product transfusion and nutritional support, were provided as needed. His laboratory parameters subsequently normalized. Negative pressure wound therapy with polyurethane foam was applied all over the right calf. (fig 2). The foam was changed every 2 days in aseptic conditions for checking the evolution of the wounds. The status of the lesions was advantageous after 7 days under continuous pressure level of 125mmHg. The defect was covered with skin graft after 7 days. It was decided to use vacuum therapy also after the grafting (fig 3). The foam was changed every 5 days. In the first 3 days, continuous negative pressure was applied and after intermittent subatmospheric pressure (125mmHg/75mmHg). The skin grafts were totally integrated after 15 days.

Fig 2. The fourth day post-debridement. Vacuum assisted therapy with polyurethane foam

Fig 3. The right lower leg immediately after skin grafting. The fifth day postoperative -the skin grafts cover with silver dressing and polyurethane foam

The evolution was favourable. The patient fully recovered after 30 days of hospitalization and left the plastic surgery department in a good clinical condition.

Results and discussions

Early diagnosis of NF is important. The proper management consists in antibiotic therapy, aggressive surgical treatment and supportive therapy [5]. After surgical debridement, negative pressure wound therapy is recommended [4]. For our patient, we used negative pressure wound therapy with polyurethane foam after the second intervention, but also 2 weeks after the skin grafting.

Negative pressure wound therapy is used more and more in the last two decades for wound healing. The principal indications for using NPWT are acute and traumatic lesions, dehisced incisions, stasis, diabetic or pressure ulcers, flaps and meshed grafts [7]. In NF application of NPWT is a vital step after the removal of the septic fascia together with the unhealthy tissue [8]. There are different types of foam dressing, but in our case, we used the polyurethane foam.

NPWT produces wound healing via four mechanisms: macrodeformation, microdeformation, fluid removal and alteration of the wound environment. The wound shrinkage is called the macrodeformation and appears when suction is applied to the foam [9]. In our case, the polyurethane foam was used circumferentially on the right thigh creating compressive forces, part of the macrodeformation mechanism.

Microdeformation is the process that becomes noticeable due to the interaction of the mechanical forces, such as the compression and the tension from the polyurethane foam, with the hydrostatic forces from the extracellular fluid. The forces differ considerably across the wound producing changes in the cytoskeleton and activating the granulation tissue formation [9, 10]. The fluid removal is essential for permitting the compression forces to influence the microvessels to increase blood flow and perfusion of the tissue [11]. The structure of the foam is like a three-dimensional net allowing a better fluid drainage [9]. We remove 800mL per day of fluid in the first 7 days and after that 800 mL every 2 days. The proper moist sterile wound environment is maintained by the foam [12]. After the skin grafting, to our patients, silver dressing was added beneath the polyurethane foam in order to prevent bacterial contamination.

The chemical process of the formation of the polyurethane foam is described by the reaction of polyols, isocyanates and water [13] and the final characteristics of the polyurethanes rest on the chemical structure of the elements [14]. The water produces bubbles and foam creating an enlarging structure. Due to the open pored structure the pressure is easily spread over the sponge and encourages an effective therapy [13]. The flexibility of the foam permits to adapt it to all the irregular wound edges. Another material with a good flexibility used in plastic surgery for breast reconstruction is the acellular dermal matrix that offers stability of the lower pole [15]. The polyurethane foam is considered also to be an optimal wound dressing being able to control exudates, to block external contamination, to provide a moist environment and to permit a safely removal with no dressing remained in the wounds [16].

Conclusions

Necrotizing fasciitis is a life-threatening condition and a public health issue. Rapid diagnosis of the disease and surgical debridement are the most important steps in the management of treatment of these patients. Even if there are not sufficient studies regarding the effects of vacuum assisted therapy with polyurethane foam in necrotizing fasciitis, it is clear that the treatment should be started after debridement. In our patient, the evolution was favourable; the polyurethane foam created a proper environment of wound healing. Further research into the negative pressure wound therapy with polyurethane foam in necrotizing fasciitis is needed.
References
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