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SPECIAL TOPIC
Breast

Successful Treatment of Pyoderma Gangrenosum after Augmentation Mastopexy Using Vacuum Therapy

Julio Alberto Soncini, MD
Alessandra Grassi Salles, MD, PhD
Juvenal Antonio Frizzo Neto, MD
Rolf Gemperli, MD, PhD

Background: Pyoderma gangrenosum (PG) is a rare, severe, destructive neutrophilic dermatosis characterized by a progressive, necrotizing process after skin injury. Its cause is still unknown, and diagnosis represents a challenge when ulcers are seen after surgery. Bacterial infection is not found in the wounds. Patients exhibit "pathergy" with the appearance of new lesions after local trauma such as surgical procedures, debridements, and wound care, suggesting altered inflammatory response. The objective of this study was to review the literature and report a case of PG that was satisfactorily treated with vacuum therapy (vacuum-assisted closure [VAC]).

Case Report: A 19-year-old healthy patient presented with skin ulceration 4 days after augmentation mastopexy, progressing to extensive necrosis. On the eighth day, she underwent debridement and implant removal. Two days later, the necrotic process was again evident and progressed, resulting in a significant increase in wound size, with each wound reaching 20 × 25 cm. Intense and diffuse neutrophilic exudate and areas of necrosis were present. Systemic corticosteroids and VAC under general anesthesia were initiated 5 days after the second surgery. From the fourth VAC session, some adherence between the mammary gland and pectoral muscles was visible, so deep sutures avoiding the dermis were placed to direct wound closure.

Conclusions: PG is a life-threatening complication with devastating outcomes. Early diagnosis is critical. Although some reported cases needed up to 2 years for wound closure, in this case, VAC therapy allowed the patient to be discharged after only 42 days and permitted wound closure without the need for skin grafts. *(Plast Reconstr Surg Glob Open 2016;4:e1072; doi: 10.1097/GOX.0000000000001072; Published online 9 November 2016.)*

Pyoderma gangrenosum (PG) was first described in 1916 by Broq. It was better characterized by Brunsting[1] in 1930, who believed it to be a streptococcal infection causing skin gangrene.[2–4] Its pathogenesis remains unknown, but we do know that PG is not directly caused by bacteria, so it is not an infectious pathology but instead a rare neutrophilic dermatosis with high levels of recurrent skin destruction.[2,5]

From the Plastic Surgery Division, Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil.

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Early diagnosis is difficult, and in the postoperative context, it may result in inadequate treatment.[3] Incidence of the disease is estimated at 3 to 10 cases per million people per year; it may present at any age, although it is more frequent in young adults between ages 25 and 54 and in females.[2,5,6] PG may be associated with systemic diseases such as inflammatory bowel disease, rheumatic illnesses, and rheumatoid arthritis, which have known autoimmune mechanisms. It may occur after surgical trauma, in a phenomenon called pathergy,[7] that is, the appearance of new

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lesions after local trauma (debridement and bandaging), suggesting an altered, excessive, and uncontrollable inflammatory response to nonspecific stimuli.[2,3] The diagnosis must be confirmed through histopathology, because there are no pathognomonic signs of this disease. Among differential diagnoses are Sweet's syndrome, Behcet's disease, and neutrophilic urticaria.[2,3]

The objective of this study was to review the literature and report a case of PG after mastopexy with silicone implant placement that was satisfactorily treated with vacuum-assisted closure (VAC) therapy.

LITERATURE REVIEW

Pathogenesis

The initial lesion appears a few days after dermoepidermal trauma such as venal puncture or any surgery. It is characterized by the appearance of potentially hemorrhagic nodules or papular–pustular lesions and rapid progression to ulceration with variable length, depth, and pain. The ulcer may present a necrotic center, irregular and inflamed margins, and significant size. Growth of the lesions is fast and devastating. The ulcers may extend into the adipose tissue down to the underlying fascia, especially in the lower limbs, buttocks, and abdomen.[2,3] As described by some authors, the presence of the phenomenon known as pathergy (development of new lesions after local trauma) suggests an altered inflammatory response to nonspecific stimuli.[2,3,8]

After biopsy, the predominant cells found in lesions are neutrophils (polymorphonuclear leukocytes) with chemotaxis dysfunction and hyperresponsiveness.[2,3,9] There is an association between PG and systemic diseases with known autoimmune mechanisms. The presence of autoantibodies against skin antigens was also demonstrated, but it was not possible to prove that these antibodies were related to the cause of the cutaneous lesions. Alterations in the immune cells are also present but are not sufficient to explain the pathogenesis of PG.[2,3]

Clinical Manifestations

There are 4 clinical forms of PG[2,10]:

1. *Vegetative* (12.5%): This form is more localized and nonaggressive, consisting of superficial verrucose lesions with a nonpurulent base, which differentiate this form from the ulcerative form. It is known as superficial granulomatous pyoderma and is predominantly found on the torso, head, and neck. Many patients do not have associated systemic diseases. Differential diagnoses include mycobacterial infections, sporotrichosis, and malignant cutaneous neoplasia.
2. *Bullous* (6.25%): Known to be associated with leukemia, this form has acute onset; it is more superficial and characterized by papules and purple and blue bullae that hemorrhage. Differential diagnoses are acute febrile neutrophilic dermatosis (Sweet's syndrome), cellulite, bullous dermatoses, and spider bites.
3. *Ulcerative* (81.52%): This form begins with a small pustule surrounded by an inflamed, painful, and rapidly evolving halo. Malignant PG is an aggressive and potentially lethal variation of this disease; it generally occurs in the head and neck regions and may be associated with systemic vasculitis. Differential diagnoses include vasculitis (Wegener's granulomatosis, cryoglobulinemia, polyarteritis nodosa, and antiphospholipid antibody syndrome), infections such as sporotrichosis, amebiasis, syphilitic ulcer, ecthyma gangrenosum and malignant neoplasms, ischemic ulcers, and insect bites.
4. *Pustular*: This rare form is associated with fever and arthralgias and is often related to inflammatory bowel diseases. Pustules are present, which may or may not develop into ulcerative lesions that primarily affect the external surface of the extremities. Control of inflammatory bowel disease can cause the skin disease to regress without leaving a scar. The lesions may simultaneously coexist with the ulcerative form. Differential diagnoses are pustular vasculitis, folliculitis, and pustular eruption resulting from drugs and infections.

In addition to the above classification, there are other variations of PG:

Periostomal: the disease occurs after an ostomy.
Pyostomatitis vegetans: a pustular rash affecting the oral mucosa. It can also be associated with inflammatory intestinal diseases.
Atypical: bullous lesions, most frequently in the lower extremities and related to hematological and/or malignant diseases.

The cutaneous lesions most commonly appear on the lower extremities. Extracutaneous manifestations appear in the lungs, joints, digestive tract, eyes, liver, spleen, and bone marrow. Pulmonary involvement can cause pleural effusion, nodules, cavitations, bronchiolar pneumonitis, and abscesses.

Postsurgical PG (PSPG) can be considered a specific subtype of PG, in which the phenomenon of pathergy is critical.[3] In PSPG, after a period of normal appearance lasting from 4 days to 6 weeks, the surgical wound exhibits small dehiscences, which coalesce into large areas of ulceration in a process that extends beyond the surgical wound. Granulation tissue is virtually nonexistent.[2] When the breast is affected, the nipple is spared. Local treatment and the use of antibiotics do not result in improvement.[11,12]

Laboratory Examinations

There are no specific examinations for diagnosis. Testing can reveal elevated results for blood sedimentation rate, C-reactive protein, and leukocytosis. Anemia and reduced serum iron may be present, and also hyper- and hypoglobulinemia. Specific autoantibodies and circulating immune complexes are not commonly observed.[2,6]

Histopathology

Histopathological findings are nonspecific. Initially there is a neutrophilic infiltration (with or without participation of lymphocytes), small and medium caliber thrombosis of the blood vessels, necrosis, and hemorrhage.[2,5,9]

Infiltration of polymorphonuclear leukocytes is typically dense, determining the formation of microabscesses with liquefaction necrosis associated with secondary thrombosis of venules. Neutrophils are considered markers of PG.[3]

The occurrence of necrotizing vasculitis is controversial; some authors describe only the presence of fibrinoid necrosis, whereas others describe lymphocytic vasculitis.[7,8]

Immunofluorescence can be positive for various markers, especially in the nearby dermal vessels.[2,9] Histopathological findings vary according to the location of the biopsy (edge, center, or necrotic area of the ulcer), the evolutionary stage of the lesion, and the form of presentation (vegetative, bullous, pustular, or ulcerative).[3,7]

Association with Systemic Diseases

In approximately 50% to 70% of cases, PG can occur in association with systemic diseases such as ulcerative rectocolitis, Crohn's disease, rheumatoid arthritis, paraproteinemia, multiple myeloma, leukemia, chronic active hepatitis, Behcet's disease, malignant neoplasms, HIV, and after immunosuppression in posttransplant patients. In the remainder of cases, PG presents as a primary lesion restricted to the skin and is referred to as idiopathic.[3,8]

In some cases, skin lesions are the first symptom of PG that occurs in the patient, who may continue for long periods without symptoms of intestinal disease.

Diagnosis

Diagnosis of PG depends exclusively on observation of its clinical characteristics and its evolution. Suspicious factors include pain in the ulcerated lesions, rapid progression, and the presence of pathergy. Cultures of the ulcers usually do not exhibit bacterial growth. Potential association with systemic diseases and also rapid response to corticoids can aid in diagnosis.[2,3,9,13] Histopathological examination of the material at the wound edges can help exclude other etiologies for cutaneous ulcers.[7,9]

Ferrándiz-Pulido and Briones established a routine for diagnosing ulcerated lesions[8]:

1. Clinical history
2. Physical examination
3. Skin biopsy for Gram staining and culture
4. Skin biopsy with histopathology
5. Laboratory blood tests: complete blood count, biochemistry, sedimentation rate, protein electrophoresis, coagulation, anticardiolipin antibodies, antiphospholipid antibodies, antineutrophil cytoplasmic antibodies to neutrophil hematoxylin and eosin, periodic acid–Schiff stain, and cryoglobulins.
6. Chest x-ray
7. Abdominal ultrasound
8. If digestive symptoms are present: upper gastrointestinal endoscopy and colonoscopy
9. If complete blood count presents alterations: aspiration and biopsy of bone marrow.

Treatment

The goal of treatment is to limit tissue destruction and promote wound healing. There is no universally accepted therapeutic regime. The treatment with the most scientific evidence is the use of high-dose systemic corticosteroids and a hyperbaric chamber and requires monitoring by a multidisciplinary team including a dermatologist, immunologist, infectious disease specialist, and plastic surgeon.[2,3,6,12] Surgical debridement, manipulations, and skin grafts should be avoided because there is a risk of pathergy with aggravation of the lesions or a return to the initial condition.[2,7] Procedures to disinfect the wound should be performed without trauma and without use of caustic medications.

CASE REPORT

A 19-year-old nulliparous woman with mammary ptosis and asymmetry, history of surgery for appendicitis, and 5 tattoos without complications underwent mastopexy with placement of 240-mL silicone implants and was discharged from hospital on the same day.

After 4 days, the patient returned to the clinic with ulceration and necrosis at the incision, without secretions or fever, tachycardic with arterial hypotension. Initial test results showed hemoglobin 7.5 g/dL, hematocrit 23%, leukocytes 64,500/mm, C-reactive protein >270 mg/L, and low levels of total proteins and fractions (4.10 g/dL), serum albumin (2.0 g/dL), and globulins (2.1 g/dL). Patient was transferred to the intensive care unit with suspected infection of the surgical site and sepsis and received systemic vancomycin and meronem for 20 days and daptomycin (Cubicin) after these antibiotics (Fig. 1).

For local wound care, we used saline solution and chlorhexidine antiseptic and alternated between rifampicin and silver sulfadiazine, twice daily.

As the local situation worsened, 9 days after the initial surgery, the patient underwent surgical removal of the silicone implants (Figs. 2, 3). Each site was rinsed with 2 L of saline, garamycin 80 mg, and kefazol 1 g, and the breasts were reconstructed using mononylon sutures. Various samples were taken and cultured, but there was no bacterial growth in samples from the breast region or other areas of the body, blood culture, or surgical instruments, autoclave, etc. Biopsies of the edges of the surgical wound

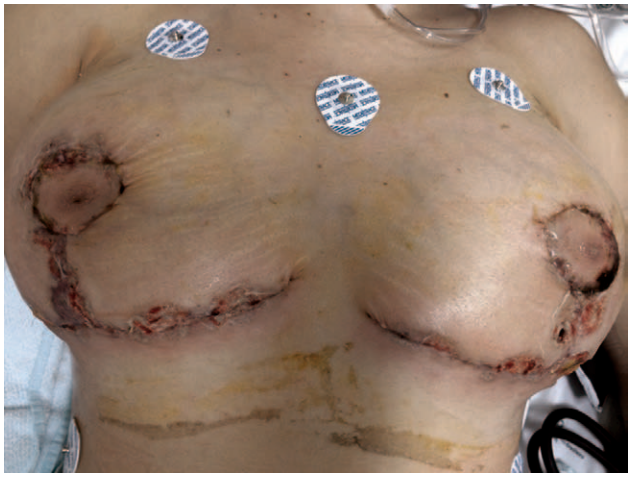

Fig. 1. Seven days after mastopexy with silicone implant.

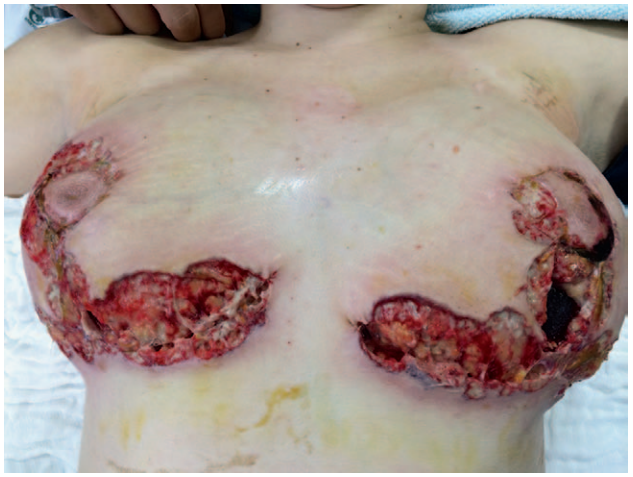

Fig. 2. Eight days postoperatively. Increased area of necrosis with exposure of implants.

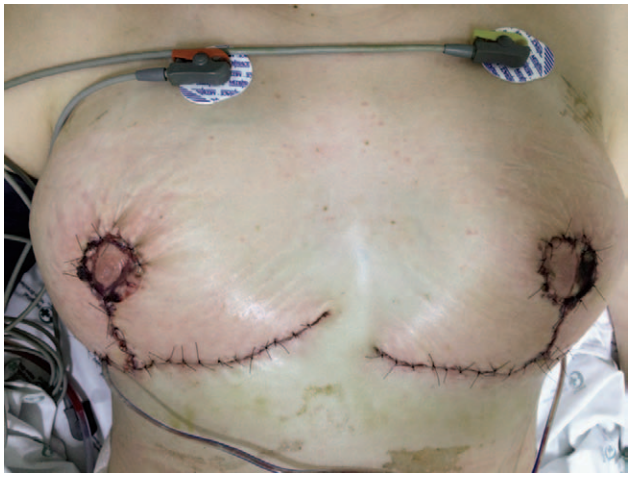

Fig. 3. Nine days after initial procedure. One day after breast reconstruction with implant removal.

were sent to 2 different laboratories so that results could be compared, and showed dermatitis and diffuse neutrophilic panniculitis and necrosis.

Three days after the new procedure, there was new dehiscence of the entire surgical wound, with a large area of necrosis with no secretion (Fig. 4). There was rapid and progressive aggravation of the lesion and worsening of the general clinical condition. Under analgesia, dressings were changed until delimitation of the necrotic area was achieved, with each wound reaching 20×25 cm. Wound care using negative pressure VAC (Acelity; San Antonio, Tex.) and hydrophobic polyurethane foam sponges with silver was introduced at this time; 4 changes were done at 2- to 4-day intervals (Figs. 5, 6). Notable at this stage was the large amount (up to 1 L/d) of purplish secretion aspirated by the VAC machine, along with worsening of the patient's clinical condition and anasarca.

Six days after the second surgery, we introduced prednisone 40 mg/d, which was progressively increased up to 125 mg/d. In the following days, the patient's general condition improved, and granulation tissue, contraction of

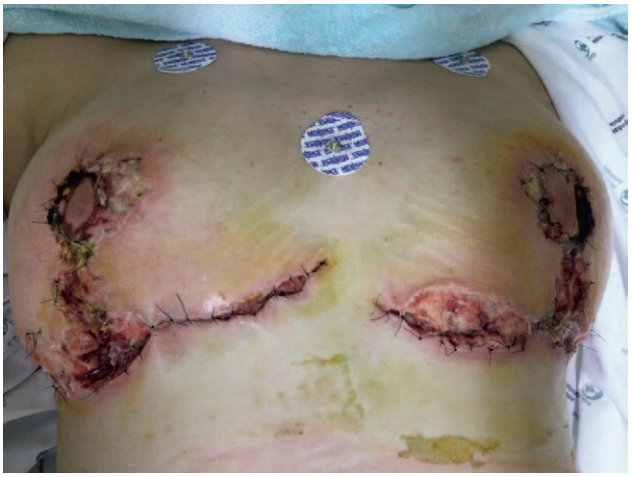

Fig. 4. Eleven days after initial procedure. Three days after breast reconstruction with relapse of necrosis.

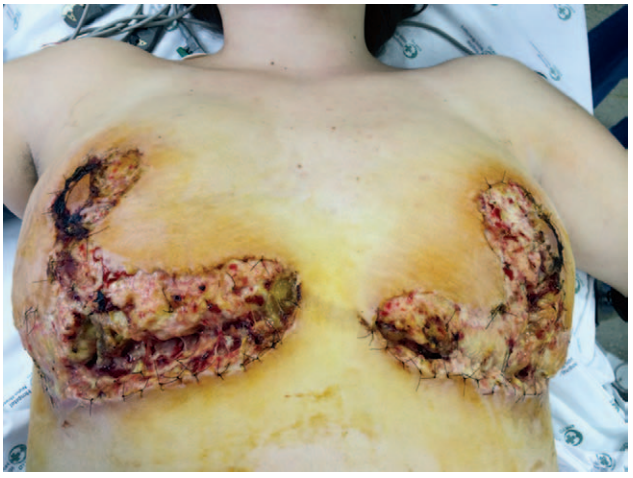

Fig. 5. Thirteen days after initial procedure. Progressive aggravation of the wound area.

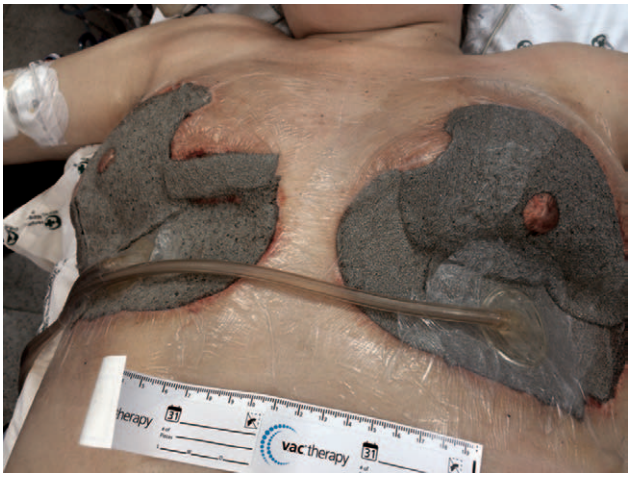

Fig. 6. Thirteen days after initial procedure. Implementation of VAC with silver foam.

the wound edges, and some adherence between the structures of the pectoralis major muscle and the glandular tissue were observed. After 4 silver foam VAC procedures, we began to use hydrophobic polyvinyl alcohol (white) foam in the next 3 VAC foam changes, also placing deep mononylon sutures to direct tissue adhesion without transfixing the dermis or the epidermis (Figs. 7–10).

After 27 days of VAC therapy, the surgical wound improved, and we were able to perform dressing changes using sodium carboxymethyl cellulose with silver (Aquacel) outside the operating room.

Patient was discharged 42 days after the original surgery with prednisone 60 mg/d. Wound care was conducted in the outpatient clinic with progressive improvement in the wound's appearance. The dose of corticosteroids was gradually reduced and eventually suspended after 4 months. Seven months after the procedure, the patient reported initial sensitivity in the areola and nipple (Fig. 11). Additional pictures can be seen as **Supplemental Digital Content 1** (**see pdf, Supplemental Digital Content**, which displays detailed pictures of the treatment of the patient since preoperatory until 13 months postoperatory, ***http://links.lww.com/PRSGO/A282***).

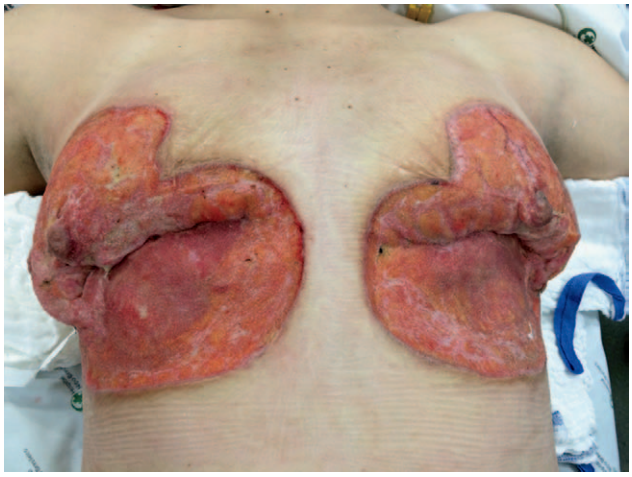

Fig. 7. Twenty-nine days after initial procedure. Improved appearance of the wound after 4 foam changes.

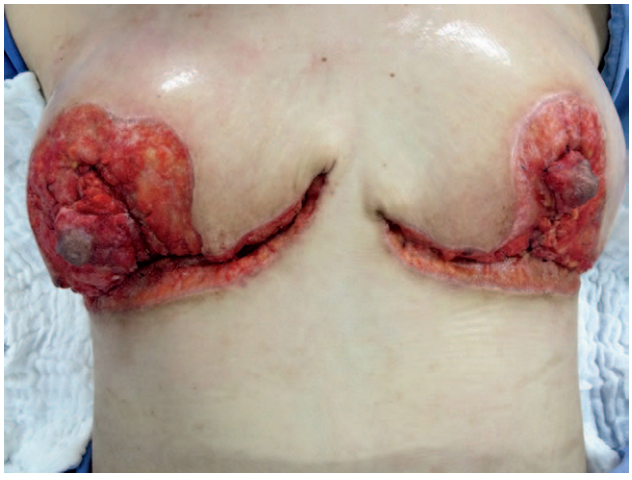

Fig. 8. Thirty-one days after initial procedure. Surgical remodeling of breast cone using deep sutures sparing dermis.

DISCUSSION

In 1997, Argenta and Moryskwas[14] developed a commercial product based on the use of negative pressure (VAC) and began to use it for wound treatment, providing an excellent environment for faster healing. Negative pressure therapy can promote approximation of the wound edges; remove exudates, infectious material, and cellular debris; reduce edema; and promote perfusion through neoangiogenesis and cellular responses such as migration and proliferation.[14,15]

The aggression and significant destruction of the skin in PG should draw the attention of surgeons. Nevertheless, there are no specific preoperative examinations. Therefore, early diagnosis and differentiation from surgical site infection are imperative to avoid rapid progression of the

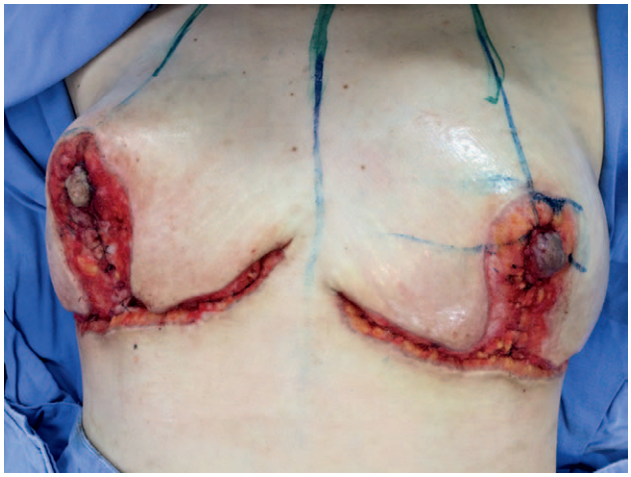

Fig. 9. Thirty-eight days after initial procedure. Creating symmetry in the nipple–areola complex.

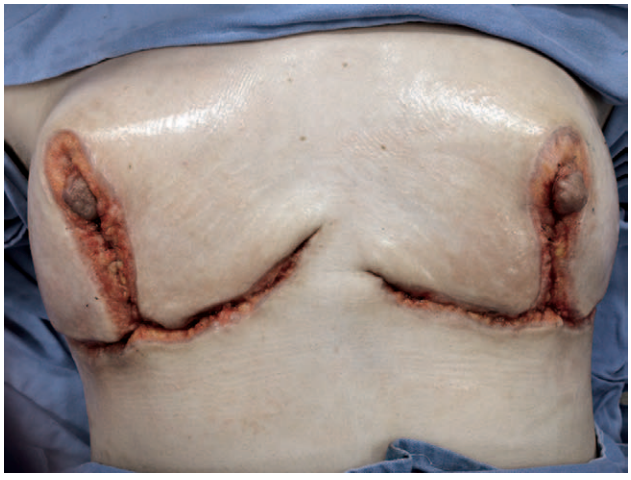

Fig. 10. Forty days after initial procedure; seventh VAC change.

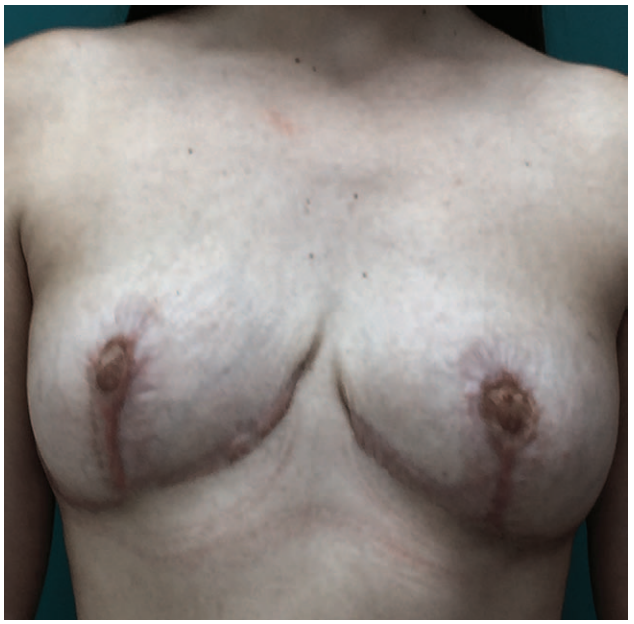

Fig. 11. Thirteen months postoperatively.

disease, because treatment involves immunosuppressants. Skin lesions may arise from 4 days to 6 weeks after any dermoepidermal aggression, from surgical procedures to punctures.[2,3] The clinical condition, with rapid progression of the lesions, worsening of general state and neutrophilia, should lead the surgeon to perform a biopsy in various areas of the surgical wound, permitting diagnosis of PG through a process of elimination.

In the literature, treatment of PSPG involves use of corticosteroids, cyclosporin, serial surgeries, and a hyperbaric chamber. A single case of treating PG in the lower limbs using VAC was described previously.[12,13,15,16]

In this present case, vacuum therapy improved wound perfusion, decreased exudate, and promoted adherence of the mammary gland to the pectoral muscle. But most importantly, it permitted faster healing of the very large ulcers presented by the patient. The time needed for complete healing after PSPG is described in the literature as ranging from 1.5 months to 1 year (average, 5 mo).[12] After the fourth VAC foam change, it was possible to place fastening sutures between these tissues using 4-0 mononylon line. It should be emphasized that the skin should never be manipulated to avoid pathergy.

These cases should be accompanied by a multidisciplinary team including an infectious disease specialist, intensivist, immunologist, dermatologist, rheumatologist, nutritionist, physiotherapist, and psychologist.

CONCLUSION

PG is a rare, devastating occurrence after surgery. Early diagnosis is fundamental. The successful, more rapid outcome for the patient in this case was obtained through use of systemic corticosteroids and VAC therapy.

Julio Alberto Soncini
Rua Josefina Mandotti 340 cj. 54
Guarulhos-SP, 07115-080 Brazil
E-mail: jasoncini@uol.com.br

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