Trauma Case Reports 48 (2023) 100949

Contents lists available at ScienceDirect

Trauma Case Reports

journal homepage: www.elsevier.com/locate/tcr

Case Report

Postoperative pyoderma gangrenosum after gunshot wound: A case report

Laura A. Valaas [a,*], Cassidy Johnston [b], Timothy Bax [c]

[a] Division of Dermatology, University of Washington, Seattle, WA, United States of America
[b] Spokane Teaching Health Clinic, Spokane, WA, United States of America
[c] Columbia Surgical Specialists, Spokane, WA, United States of America

ARTICLE INFO

Keywords:
Pyoderma gangreosum
Pyoderma
Surgical site infection
Postoperative pyoderma gangrenosum
Posttraumatic pyoderma gangrenosum
Surgical pyoderma gangrenosum

ABSTRACT

Pyoderma gangrenosum (PG) is a rare neutrophilic dermatosis of unclear etiology that exhibits pathergy and can develop post-operatively in surgical incisions. To the best of our knowledge, this is the first case report of PG developing after a gunshot wound (GSW) injury or in a contaminated surgical wound. We further propose umbilical sparing as a key clinical finding differentiating the diagnosis of PG from more common infectious etiologies.

Introduction

Pyoderma gangrenosum (PG) is a rare neutrophilic dermatosis characterized by painful, neutrophil-rich, rapidly expanding ulcers. Though there are several variants to PG, the classic clinical presentation is an ulcer with violaceous borders, undermined edges, and copious purulent exudate [1]. About 25–59% of patients with PG have an associated systemic disease including inflammatory bowel disease, hematological, or rheumatologic diseases. About 20–30% of PGs occur after mild trauma due to pathergy [2]. Other factors that make this condition difficult include its underrepresentation in medical texts [3] and nonspecific histopathology [1]. Immunosuppression is considered the gold standard therapy for resolution of PG. [4] We present the interesting case of a trauma patient who developed postoperative pyoderma gangrenosum (PPG) through pathergy after an abdominal gunshot wound (GSW).

Case report

We report the case of a 30 year old male with a past medical history of substance use disorder. He presented to our trauma center after an accidental GSW to the abdomen. CT scan on arrival showed bullet entrance at the suprapubic level to the left of midline, through the left S4 transverse process, with the bullet positioned in the subcutaneous tissue posterior to the sacrococcygeal junction. Bowel perforation was suspected on CT with presence of intraperitoneal air and blood. The patient was stabilized in the emergency department and started on IV antibiotics for bowel perforation. He was taken to the operating room and a laparotomy was performed. Surgical findings included injury to the rectosigmoid colon with large rectal hematoma formation, mid-sigmoid colon injury, and one

* Corresponding author at: Division of Dermatology, University of Washington, 1959 NE Pacific St BB-1332, Seattle, WA 98195, United States of America.
E-mail addresses: valaasla@uw.edu (L.A. Valaas), Cassidy.johnston@frontierdermpartners.com (C. Johnston), tbax@spokanesurgery.com (T. Bax).

https://doi.org/10.1016/j.tcr.2023.100949
Accepted 23 September 2023
Available online 25 September 2023

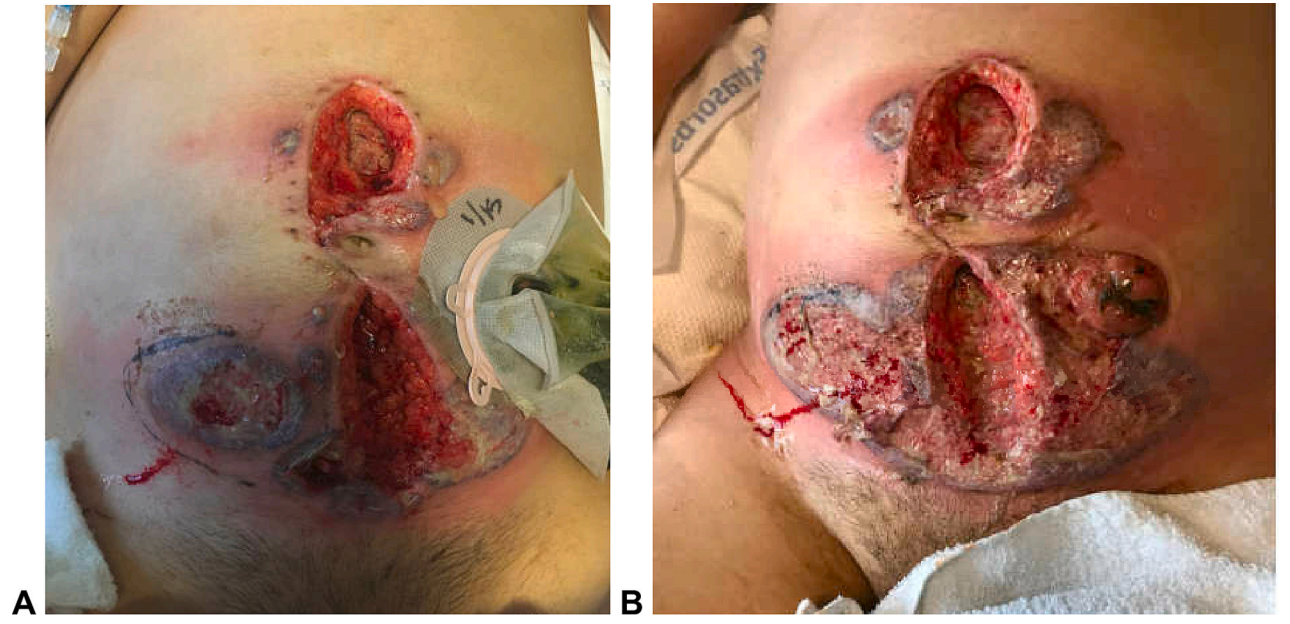

Fig. 1. Rapid expansion of ulcers from post-op day 9 (**A**) to post-op day 11 (**B**) with purulent, violaceous borders and relative sparing of the umbilicus.

small bowel injury to the distal jejunum. During this first surgery, the patient required sigmoidectomy, small bowel resection, and a descending end colostomy creation.

The patient initially did well after his operations with no concerns for localized or systemic infections. He had full return of bowel function in a reasonable time frame. On post-op day 5, the patient began fevering and he was noted to have an exquisitely painful purulent ulcer forming at his midline abdominal incision near his initial entry point from the GSW which had been integrated into his laparotomy incision. This was initially concerning for wound dehiscence versus infection and the superficial and dermal sutures were removed at bedside and a short term wound vac was placed. The patient was promptly started on IV Levofloxacin. About 24 h after this ulcer was first noted, it began to dramatically enlarge hence blood cultures were drawn and antibiotics were escalated to IV Ertepenem and Vancomycin and wound care was transitioned to wet to dry dressings. Despite these measures, the abdominal ulcer continued to expand and worsen.

The diagnosis of PPG was first considered on post-op day 10, however, given the mechanism of injury and contaminated nature of his surgery, it was determined that extensive infectious workup should be completed prior to considering PPG. Unfortunately, dermatology consultation was unavailable. Infectious workup included bacterial blood cultures, fungal blood cultures, MRSA NAAT, and bacterial and fungal wound tissue cultures which were all negative for growth.

Clinical exam was notable for a rapidly expanding, exquisitely painful ulcer starting near his GSW entry point with heaped up, undermined, violaceous borders, and copious purulent exudate (Fig. 1). As the ulcer expanded it enveloped, but did not involve his umbilicus or his stoma. His deep fascial closure remained intact.

On post-op day 13 he was taken to the operating room for debridement and tissue biopsy. Given the concern for PPG, conservative debridement was taken from one quadrant of the wound and additional tissue was sent for pathologic review. While awaiting biopsy results, the wound continued to worsen (Fig. 2). The biopsy demonstrated dense neutrophilic inflammation with no organisms. He was started on high-dose steroids on post-op day 17 and continued on broad spectrum antimicrobials. After 3 days of high-dose steroids, the ulcer ceased expanding. Steroid responsiveness was seen as confirmation of the diagnosis of PPG and antimicrobial treatment was promptly deescalated at that time. Topical treatments included 0.05% clobetasol solution. He was treated with wound-vac until discharge.

The patient was discharged to a rehab facility and subsequently returned home with outpatient wound care and an oral steroid taper (Fig. 3). The patient later saw outpatient dermatology and continued on daily prednisone until his PPG healed about 12 months after initial injury (Fig. 4). His course of healing was lengthy, but uncomplicated. He did have another accidental GSW while his PPG was healing but did not develop PG at this new GSW site. Of note, no other autoimmune conditions were identified in this patient. His ostomy was successfully reversed 18 months after its creation.

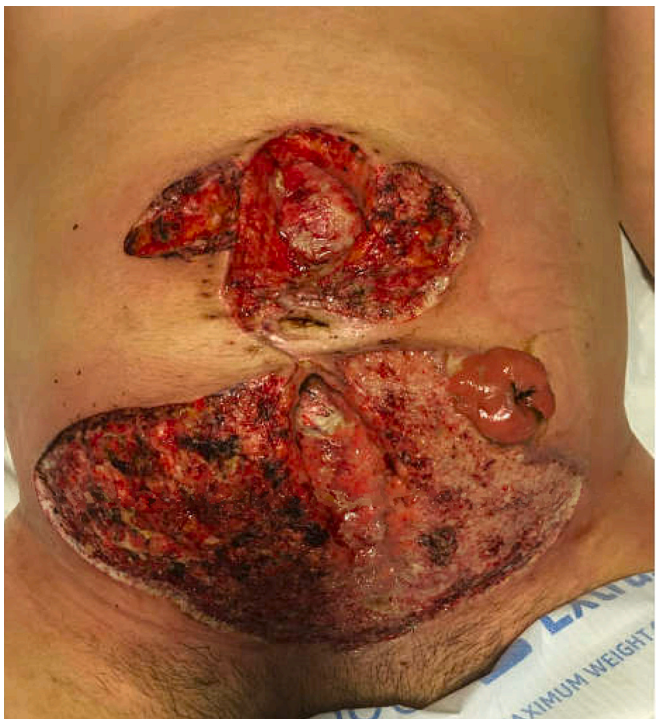

Fig. 2. Post-op day 18 after sharp debridement and one day after initiating high dose steroids with ongoing purulent exudate at borders, some violaceous undermined borders, and peripheral erythema.

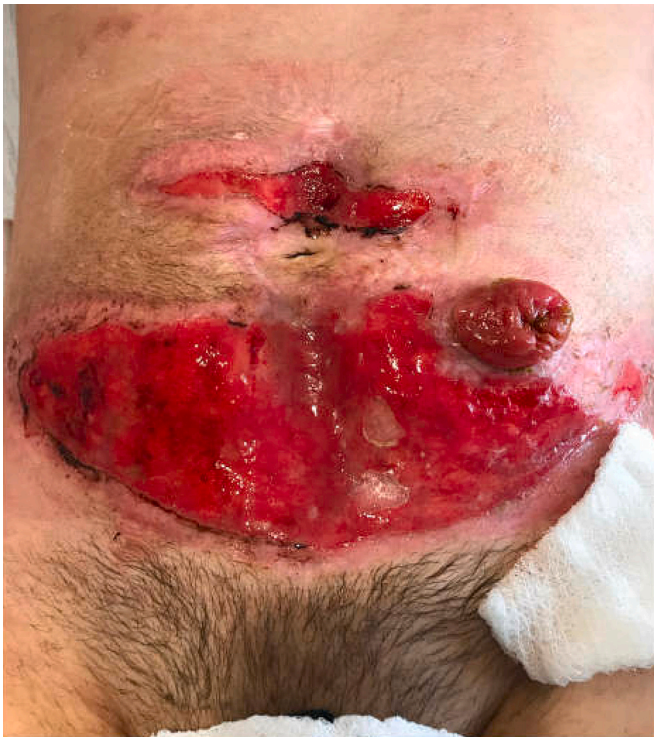

Fig. 3. Post-op day 83 and after 66 days on systemic steroids with re-epithelialization of the ulcer borders, minimal surrounding erythema, and ulcer bases with healthy granulation tissue.

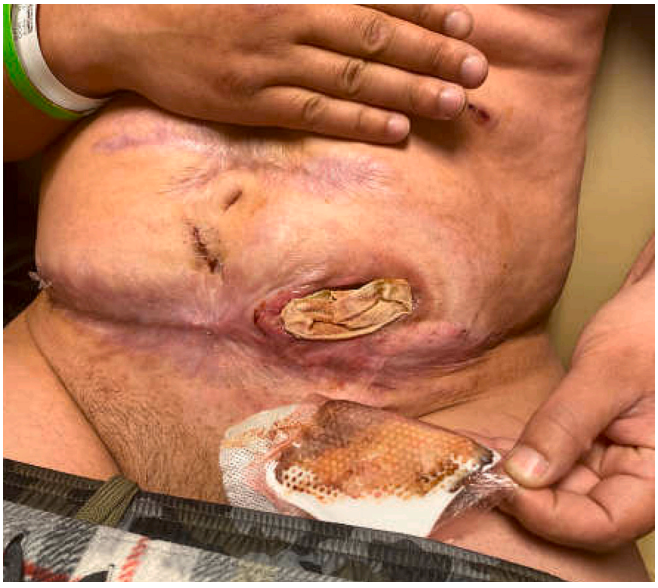

Fig. 4. Well healed PG ulcers at 16 months after initial injury with some cribriform scarring and persistent peristomal wound.

Discussion

PPG has been reported after breast, chest, cardiothoracic, and orthopedic surgery [5]. To the best of our knowledge, this is the first reported case of PPG following a GSW. Although up to 60% of patients have associated systemic disorders, postoperative PG has a much lower association with systemic disease [6,7].

PPG is a diagnostic quandary because it mimics other postoperative complications and is a diagnosis of exclusion. Furthermore, it is

a diagnosis that is under-represented in non-dermatology textbooks [3]. The overwhelming majority of post op wound complications in abdominal trauma are due to surgical site infections [8]. On initial presentation PPG ulcers warrant a thorough infectious workup, however, we recommend including PPG on the initial differential of post-op wound complications to reduce the risk of diagnostic inertia and fixation on infectious etiologies if the ulcer continues to rapidly expand despite negative infectious workup and appropriate antimicrobials. Repeat debridements followed by rapid ulcer expansion should in particular raise clinical suspicion of PPG [1].

Delayed diagnosis of PPG can have significant consequences. One case series looked at 14 cases of PPG that were misdiagnosed and considered for amputation, 6 of these cases were erroneously treated with amputation and amputation sites included fingers, toes, lower leg, and distal penis [9]. In another case series, 73% of patients later definitively diagnosed with PPG had undergone wound debridement in the early periods of their ulcer development [7]. These unnecessary debridements further mutilate the skin, trigger expansion of PPG due to pathergy, prolong healing time, and worsen cosmetic and medical outcomes for these patients. Additionally, these patients are unnecessarily exposed to surgeries, prolonged systemic antibiotics, pathergy-inducing wound care, and as a result experience expanding ulcers and greater morbidity. Instead, treatment of PPG requires high dose topical and systemic steroids often in conjunction with or preceding other immunosuppressants such as cyclosporine, tacrolimus, azathioprine, and tacrolimus [1].

PPG of the breast is uncommon but more widely reported, most commonly after mastectomy or mammoplasty due to pathergy. Sparing of the nipple-areola complex has been identified as a diagnostic characteristic of postoperative PG of the breast [10]. We propose that sparing of the umbilicus may represent a characteristic feature of PPG of the abdomen. This has been noted in the plastic surgery literature as a clinical feature of PPG [11,12]. This may be an indicator of PPG on the abdomen and an early differentiator from soft tissue infection.

Conclusion

PPG is a challenging diagnosis to make but should be included in the differential of postoperative complications when soft tissue infections are considered. While initial treatment of postoperative ulcers for likely surgical site infection is appropriate, in this case, and in many others, fixation on infectious etiologies delayed diagnosis of PPG. This is the first case report of PPG in a contaminated surgical incision following a GSW. We propose that umbilical sparing may be a key clinical finding in early differentiation between PPG and surgical site infection. PPG is often misdiagnosed, leading to increased morbidity. This patient had an adequate outcome after initiation of systemic steroids and required 12 months of diligent local wound care and systemic immunosuppression to heal his PPG.

Declaration of competing interest

The authors report no conflict of interest. The authors received no funding for this work. We confirm that this work is original and has not been presented or published elsewhere, nor is it currently under consideration for publication elsewhere.

References

[1] M. Skopis, A. Bag-Ozbek, Pyoderma gangrenosum: a review of updates in diagnosis, Pathophysiol. Manag. J. 4 (3) (2021) 367–375, https://doi.org/10.3390/j4030028.
[2] R. Lindberg-Larsen, K. Fogh, Traumatic pyoderma gangrenosum of the face: pathergy development after bike accident, Dermatology 218 (3) (2009) 272–274, https://doi.org/10.1159/000182266.
[3] A.M. Reese, C.K. Haag, E. Jung, A.C. Nauta, R.A. Swerlick, A.G. Ortega-Loayza, Pyoderma gangrenosum underrepresentation in non-dermatological literature, Diagnosis (Berl.) 8 (1) (2020 Jan 9) 85–90, https://doi.org/10.1515/dx-2019-0079 (PMID: 31913849).
[4] A.C. Lemos, D. Aveiro, N. Santos, V. Marques, L.F. Pinheiro, Pyoderma Gangrenosum: an uncommon case report and review of the literature, Wounds 29 (9) (2017) E61–E69.
[5] D.C. Ehrl, P.I. Heidekrueger, P.N. Broer, Pyoderma gangrenosum after breast surgery: a systematic review, J. Plast. Reconstr. Aesthet. Surg. 71 (7) (2018 Jul) 1023–1032, https://doi.org/10.1016/j.bjps.2018.03.013.)Epub 2018 Mar 28. PMID: 29748073).
[6] N. DI Meo, G. Stinco, S. Trevisini, et al., Pyoderma gangrenosum and burns: a special pathergy phenomenon, G. Ital. Dermatol. Venereol. 152 (4) (2017) 397–400, https://doi.org/10.23736/S0392-0488.16.05340-2.
[7] S.N. Tolkachjov, A.S. Fahy, F.B. Cerci, D.A. Wetter, S.S. Cha, M.J. Camilleri, Postoperative Pyoderma Gangrenosum: a clinical review of published cases, Mayo Clin. Proc. 91 (9) (2016 Sep) 1267–1279, https://doi.org/10.1016/j.mayocp.2016.05.001 (Epub 2016 Jul 31. PMID: 27489052).
[8] K. Hanna, S. Asmar, M. Ditillo, M. Chehab, M. Khurrum, L. Bible, M. Douglas, B. Joseph, Readmission with major abdominal complications after penetrating abdominal trauma, J. Surg. Res. 257 (2021 Jan) 69–78, https://doi.org/10.1016/j.jss.2020.07.060 (Epub 2020 Aug 17. PMID: 32818786).
[9] C.K. Haag, F. Nutan, J.W. Cyrus, J. Satpathy, K. Shinkai, A.G. Ortega Loayza, Pyoderma gangrenosum misdiagnosis resulting in amputation: a review, J. Trauma Acute Care Surg. 86 (2) (2019 Feb) 307–313, https://doi.org/10.1097/TA.0000000000002096 (PMID: 30358767).
[10] S.H. Tuffaha, K.A. Sarhane, G.S. Mundinger, J.M. Broyles, S.K. Reddy, S.C. Azoury, S. Seal, D.S. Cooney, S.C. Bonawitz, Pyoderma Gangrenosum after breast surgery: diagnostic pearls and treatment recommendations based on a systematic literature review, Ann. Plast. Surg. 77 (2) (2016 Aug) e39–e44, https://doi.org/10.1097/SAP.0000000000000248 (PMID: 25003456).
[11] T.H. Park, K.L. Fan, E.G. Zolper, D.H. Song, G. Del Corral, Pyoderma Gangrenosum masquerading as necrotizing infection after autologous breast reconstruction, Plast. Reconstr. Surg. Glob. Open 8 (4) (2020 Apr 10), e2596, https://doi.org/10.1097/GOX.0000000000002596 (PMID: 32440390; PMCID: PMC7209838).
[12] J.T. Zelones, J.F. Nigriny, Pyoderma Gangrenosum after deep inferior epigastric perforator breast reconstruction: systematic review and case report, Plast. Reconstr. Surg. Glob. Open 5 (4) (2017 Apr 21), e1239, https://doi.org/10.1097/GOX.0000000000001239 (PMID: 28507842; PMCID: PMC5426861).