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Circumferential upper extremities burn, bilateral Dupuytren's disease and COVID-19 disease – an unfavorable triad: a case report

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ABSTRACT

Upper extremities are frequently involved in fire burns due to the natural protective reflexes. The presence of bilateral Dupuytren's disease and COVID-19 disease in patients with circumferential upper extremity burns can negatively impact the outcome, through severe contracture and a tendency to hypoxia or infections, which affects normal wound healing. Enzymatic debridement with a concentrate of proteolytic enzymes enriched in bromelain prevents compartment syndrome development in such patients, reduces blood loss, surgery duration, and appears to favor a more rapid recovery.

Keywords: upper extremity, circumferential burns, Dupuytren's disease, COVID-19 disease, enzymatic debridement

BACKGROUND

Hand and face are the commonest involved sites in burns, being the most exposed to fire [1,2]. Even though a hand represents 3% of the total body area [3], hands are affected in 90% of burn cases [1,2]. This is associated with a low mortality rate in isolated cases, but the morbidity is high, with normal functioning being never fully recoverable [2]. Epidemiological studies show that men are often involved, with hypertension, dyslipidemia, and type II diabetes being the most encountered comorbidities [4].

Dupuytren's disease is a prevalent chronic condition that affects the palmar fascia, leading to nodules and cord formation, with subsequent flexion contractures of the fingers [5]. This progressive idiopathic fibrosis that involves palmar aponeuroses affects around 8% of the worldwide population [6,7]. The prevalence is higher in patients with a history of alcoholism and diabetes [6], with genetic factors accounting for 80% of factors, along with hepatic disease, epilepsy, smoking, hand traumas, and occupational activity [7,8]. Bilateral involvement is around 36% [9].

Coronavirus disease 2019 (COVID-19) typically manifests through fever, cough, dyspnoea, and myalgia. In moderate-to-severe forms, hypoxia develops, requiring hospitalization and mechanical ventilation. The management of this disease is mostly supportive [10]. There are some reports about impaired wound healing in patients with COVID-19, like reconstructive procedures [11]. At the same time, these patients were predisposed to wound dehiscence [12] and surgical site infections [13].

Bromelain-based enzymatic debridement may be used not only in small areas but also in larger

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burns. It has demonstrated superiority over traditional methods in significantly reducing blood loss, improving dermal preservation, reducing the need for autografting, and the number of reinterventions [14]. The current guideline states that bromelain-based enzymatic debridement is recommended and can be safely used in hand burns [15].

We present the case of circumferential upper arm burns in a patient with bilateral Dupuytren's disease and concomitant COVID-19 disease, to whom enzymatic debridement with a concentrate of proteolytic enzymes enriched in bromelain was applied, obtaining optimum surgical results.

CASE REPORT

A 65-year-old man, with a history of previous myocardial infarction, a severe form of bilateral Dupuytren's disease, active smoking, and chronic alcoholism, without any home medication, was referred to our Burn Unit from another hospital, after an explosion in a closed space, with burns affecting 15% TBSA, type IIA-IIB, on the face and upper extremities (circumferential burns on the left forearm) (Figure 1), and high suspicion of inhalation injury. He arrived intubated and mechanically ventilated, presenting moderate respiratory dysfunction. The reverse transcription polymerase chain reaction (RT-PCR) for severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) was positive. Bronchoscopy revealed no inhalation lesion of the respiratory tract, but the presence of purulent tracheal and bronchial secretions. A five days therapy with remdesivir was initiated, along with systemic corticosteroid medication. Full microbiological screening, according to local protocols, presented negative results. After 24 hours, considering the important contracture of both hands due to severe Dupuytren's disease and the risk of compartment syndrome development on the left forearm, debridement with a concentrate of proteolytic enzymes enriched in bromelain was used on both hands and left forearm (Figure 2), instead of classical tangential burns excision. The next step was autologous skin grafting of the abovementioned areas (Figure 2), and upper arms splinting was used for the following few days. The face burns were cleaned, the devitalized (necrotic) epidermis was removed, and the absorbent dressing was used. An episode of upper gastrointestinal bleeding appeared after 48 hours, and after gastroenterologist evaluation, intravenous proton pump inhibitors were initiated. Subsequently, three days after admission, the respiratory dysfunction was under control, facial oedema was remitted, and the patient was stable enough to tolerate a spontaneous breathing trial (SBT). Physical therapy was started within 48 hours after the surgery. The RT-PCR-SARS-CoV-2 was negative on the 7th day of hospitalization. Postoperative wounds evolution was favorable (Figure 3), and there were no signs of gastrointestinal bleeding. He was discharged from the post-critical ward after two weeks.

FIGURE 1. Type IIA-IIB burns affecting upper extremities (circumferential burn on the left forearm)

FIGURE 2. Burns lesions after bromelain-based enzymatic debridement

FIGURE 3. Postoperative burn wound evolution

DISCUSSION

Fire, electricity, and hot liquids are the main causes of hand burns, and most o accidents happen outside the workplace [9]. In our case, the epidemiologic pattern was respected, being an explosion caused by a malfunctioning of a heating device, at home, with fire being responsible for the burn appearance.

Normally, the hand heals 8-10 days after a surgical intervention, when the rehabilitation phase starts [2]. In our case, despite the high probability of abnormal wound healing, due to respiratory dysfunction in face of COVID-19, with subsequent prone to hypoxia and infections, a tendency to dehydration and electrolyte imbalance due to C. difficile infection and the tension put on the skin graft due to severe hand contractures, the postoperative evolution was favorable, allowing quick recovery after surgery.

Bromelain-based enzymatic debridement has many advantages over traditional tangential eschar excision, among which are reduction of blood loss, dermal preservation, lower surgical interventions, and reinterventions. It shows superiority in cases with circumferential extremity burns predisposed to compartment syndrome development [14], like our case. Enzymatic debridement is properly prepared on anatomically challenging hands with severe contractures for skin grafting, with no need for further surgical excisions.

Studies have shown that remdesivir improves the clinical evolution of patients presenting moderate-to-severe COVID-19, even though its role in this disease is not well established worldwide. Others showed that association with systemic corticoid therapy may be the best option [15,16]. Regarding the burn population, the information is scarce, and every institution used national protocols and recommendations for treatment. This was also our case, and we have obtained an improvement in the respiratory status, with a shorter intubation period, therefore preventing further complications.

CONCLUSION

Bromelain-based enzymatic debridement appears to have superior surgical results in patients presenting upper extremities burns, especially in those having severe hand contracture due to bilateral Dupuytren's disease and predisposed to infection and abnormal wound healing in face of COVID-19 disease.

Ethical approval and informed consent

All the procedures of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008 [5], as well as the national law. Written informed consent was obtained from the patient for publication of this case report and accompanying images. Case reports are exempt from ethical approval at our institution.

Declaration of competing interest

The authors declare no conflict of interest regarding this article.

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REFERENCES

1. Stritar A, Mikša M. Reconstructive surgery of upper extremity after thermal burns: guidelines or experience? *Ann Burns Fire Disasters*. 2020 Mar 31;33(1):47-52.
2. Pan BS, Vu AT, Yakuboff KP. Management of the Acutely Burned Hand. *J Hand Surg Am*. 2015 Jul;40(7):1477-84; quiz 1485.
3. Richards WT, Vergara E, Dalaly DG, Coady-Fariborzian L, Mozingo DW. Acute surgical management of hand burns. *J Hand Surg Am*. 2014 Oct;39(10):2075-2085.e2.
4. Mata-Ribeiro L, Vieira L, Vilela M. Epidemiology And Outcome Assessment Of Hand Burns: A 3-Year Retrospective Analysis In A Burn Unit. *Ann Burns Fire Disasters*. 2022 Mar 31;35(1):18-25.
5. Karbowiak M, Holme T, Khan K, Mohan A. Dupuytren's disease. *BMJ*. 2021 Jun 4;373:n1308.
6. Salari N, Heydari M, Hassanabadi M, Kazeminia M, Farshchian N, Niaparast M et al. The worldwide prevalence of the Dupuytren disease: a comprehensive systematic review and meta-analysis. *J Orthop Surg Res*. 2020 Oct 28;15(1):495
7. Ruettermann M, Hermann RM, Khatib-Chahidi K, Werker PMN. Dupuytren's Disease-Etiology and Treatment. *Dtsch Arztebl Int*. 2021 Nov 19;118(46):781-788.
8. Picardo NE, Khan WS. Advances in the understanding of the aetiology of Dupuytren's disease. *Surgeon*. 2012 Jun;10(3):151-8.
9. Mansur HG, Oliveira ER, Gonçalves CB. Epidemiological analysis of patients with Dupuytren's disease. *Rev Bras Ortop*. 2017 Dec 14;53(1):10-14.
10. Ochani R, Asad A, Yasmin F, Shaikh S, Khalid H, Batra S et al. COVID-19 pandemic: from origins to outcomes. A comprehensive review of viral pathogenesis, clinical manifestations, diagnostic evaluation, and management. *Infez Med*. 2021 Mar 1;29(1):20-36.
11. Inouye D, Zhou S, Clark B, Swanson M, Chambers T. Two Cases of Impaired Wound Healing Among Patients With Major Head and Neck Free-Flap Reconstruction in the Setting of COVID-19 Infection. *Cureus*. 2021 Dec 1;13(12):e20088.
12. Kiełbowski K, Wojtyś M, Kostopanagiotou K, Janowski H, Wójcik J. Association of major postoperative wound and anastomotic

complications in thoracic surgery with COVID-19 infection. *Surg Open Sci*. 2022 Oct;10:208-215.
13. Pitak-Arnnop P, Tangmanee C, Muangchan C, Meningaud JP, Neff A. Asymptomatic or mildly symptomatic COVID-19 patients with craniomaxillofacial injuries have an increased risk of surgical site infection. *Br J Oral Maxillofac Surg*. 2022 Oct;60(8):1118-1124.
14. Bowers C, Randawa A, Sloan B, Anwar U, Phipps A, Muthayya P. Enzymatic debridement in critically injured burn patients - Our experience in the intensive care setting and during burn resuscitation. *Burns*. 2022 Jun;48(4):846-859.
15. Rosenberg L, Krieger Y, Bogdanov-Berezovski A, Silberstein E, Shoham Y, Singer AJ. A novel rapid and selective enzymatic debridement agent for burn wound management: a multi-center RCT. *Burns*. 2014 May;40(3):466-74.
16. Liu M, Zhu H, Yan R, Yang J, Zhan R, Yu X et al. Epidemiology and Outcome Analysis of 470 Patients with Hand Burns: A Five-Year Retrospective Study in a Major Burn Center in Southwest China. *Med Sci Monit*. 2020 May 6;26:e918881.
17. Rochwerg B, Agarwal A, Zeng L, Leo YS, Appiah JA, Agoritsas T et al. Remdesivir for severe covid-19: a clinical practice guideline. *BMJ*. 2020 Jul 30;370:m2924.
18. Lee TC, McDonald EG, Butler-Laporte G, Harrison LB, Cheng MP, Brophy JM. Remdesivir and systemic corticosteroids for the treatment of COVID-19: A Bayesian re-analysis. *Int J Infect Dis*. 2021 Mar;104:671-676.