

A Case of Fracture Blisters: A Major Bullae in the Road to Definitive Care

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Background

Fracture blisters are a rare complication of high-energy trauma [1]. Most commonly, these bullae develop 6 to 72 hours after inciting injury and overlie an acute elbow or ankle fracture where less soft tissue surrounds the bones [1, 2]. Their formation is attributed to separation at the dermal-epidermal junction, and the bullae fluid may be either serous, hemorrhagic, or mixed [3]. Blood-filled blisters typically represent a more severe injury, as there is complete separation of the dermal-epidermal junction, while serous-filled blisters indicate only partial separation of the dermal-epidermal junction [4]. The accumulation of fracture blister fluid is attributed to the opening of the paracellular pathway due to a significant reduction in tight junction expression [5].

Most blisters demonstrate a sterile aspirate, but a small percentage are colonized with bacteria before rupture [4]. However, no specific predicting factors for positive aspirate or evidence that positive aspirate increases risk for infection have been identified [4]. Nonetheless, fracture blisters are known to be associated with increased infection rates and wound breakdown [5].

Case Description

A 55-year-old female presented to the emergency department (ED) with left ankle pain following a traumatic fall. She denied any additional symptoms. Her medical history included deep vein thrombosis and insulin-dependent diabetes mellitus. Vital signs were blood pressure, 158/87 mmHg; heart rate, 113 beats per minute; respiratory rate, 18 breaths per minute; temperature, 97 °F; and SpO₂, 94% on room air. Physical examination revealed left ankle tenderness and deformity.

Plain radiographs of the left ankle displayed a closed trimalleolar fracture with tibiotalar dislocation. ED treatment included closed reduction, splinting, and pain management. Upon discharge, instructions for follow-up with orthopedics for definitive treatment were provided.

However, two days later the patient presented with an inability to ambulate, increased left ankle swelling, and the development of three golf-ball-sized fracture blisters of the serous and serosanguinous type. She was admitted for further management, which included strict bed rest, left lower leg elevation, and left ankle stabilization in an orthopedic boot. The bullae were kept intact, cleansed daily with Vashe, and dressed with Hydrofera Blue for protection.

Given the extent of the bullae, the orthopedic team deferred surgery to avoid any additional complications. Ultimately, surgery was completed once the blisters were mostly resolved, a total of three weeks after their initial presentation.

Imaging

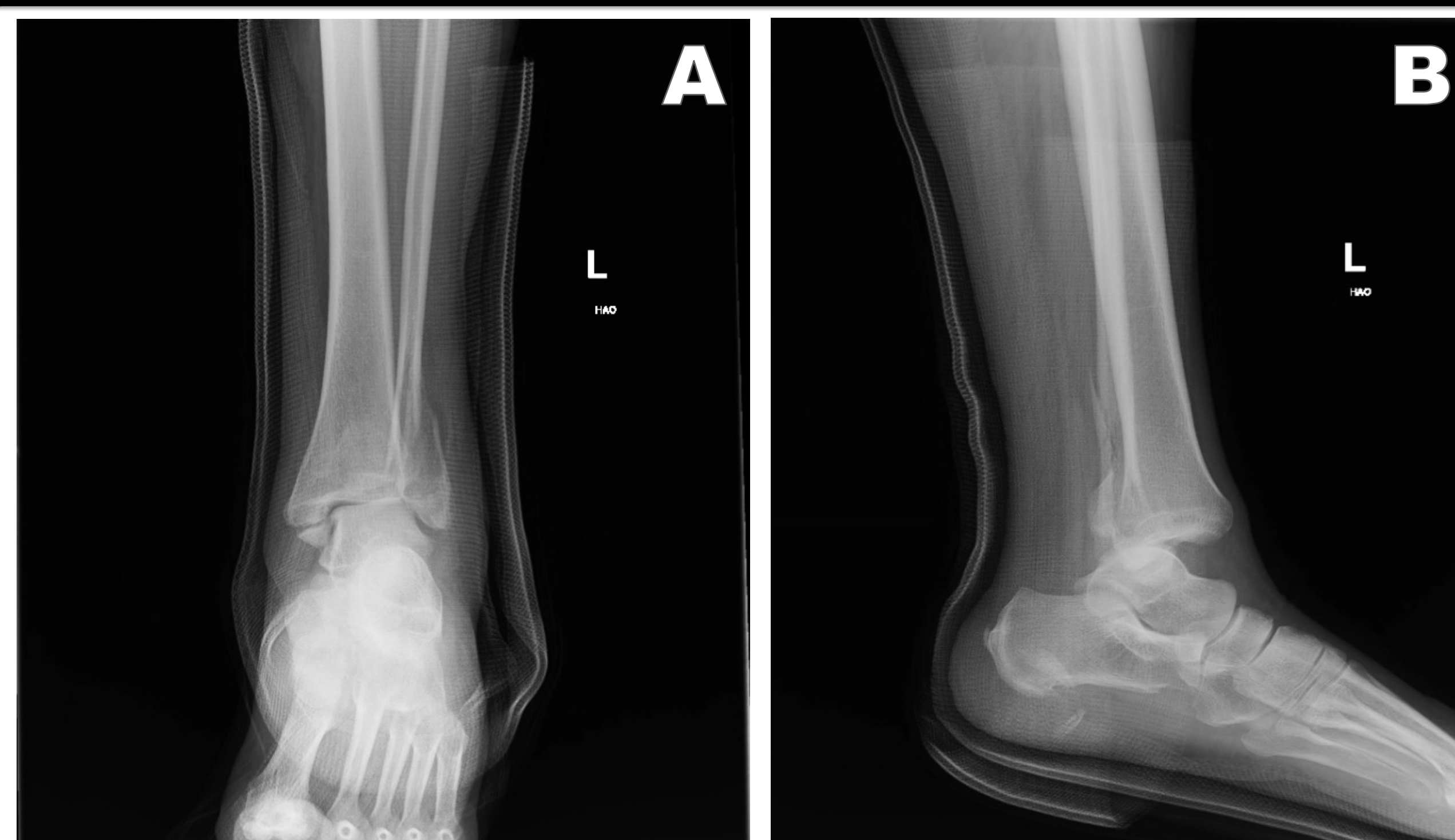


Figure 1. Plain radiographs of the patient's left ankle prior to closed reduction. **A**, Anteriorposterior view. **B**, Lateral view.

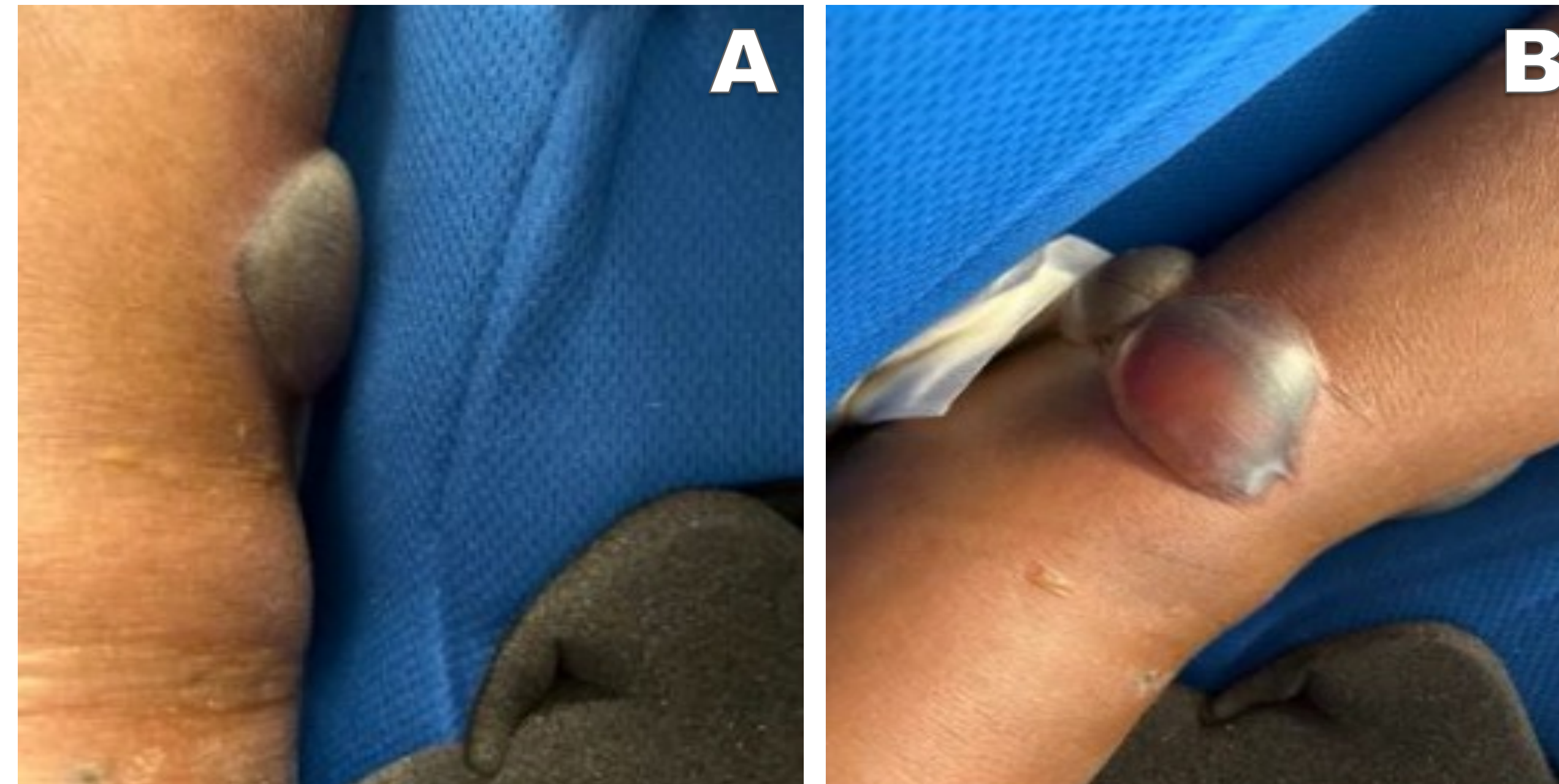


Figure 2. Fracture bullae appearance on the patient's left ankle 9 days status post traumatic fall. **A**, Left lateral ankle. **B**, Left medial ankle.

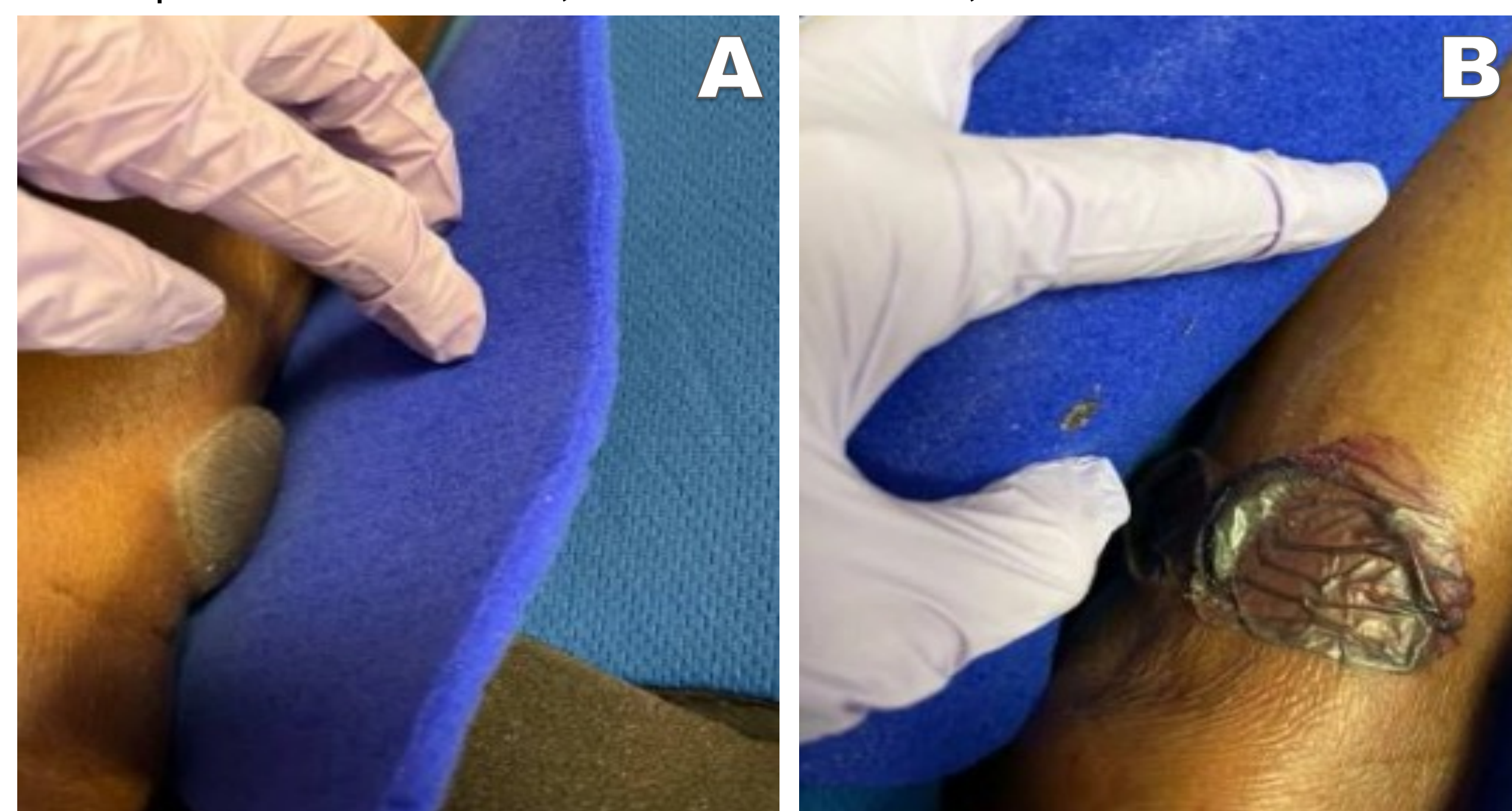


Figure 3. Fracture bullae appearance on the patient's left ankle 16 days status post traumatic fall. **A**, Left lateral ankle. **B**, Left medial ankle.

The authors received patient consent to use their data for this report.

Discussion

The most significant implication of fracture blisters is the clinical obstacle they present to the treatment of the underlying fracture [4]. Fracture blisters significantly delay the time to definitive fixation compared to patients without fracture blisters [1]. The extensive delay in this patient's definitive care represents the importance of considering the complication of fracture blisters, especially in acute fractures of the ankle, wrist, and elbow [6, 7]. Prompt consideration of this rare dermatological complication could influence swift intervention and avoid prolonged postponement of definitive treatment [8].

Despite the known obstacles that fracture blisters create, there is no clear consensus on the optimal management of fracture blisters [1, 3]. Currently, the most common treatment modalities include normal saline dressings, paraffin gauze, and betadine-based dressings [3]. In a recent study, circumferential negative pressure wound therapy with sterile saline instillation demonstrated promising results as a preoperative management option for patients with blisters overlying closed fractures [9]. Barrier repair products, such as ceramides and hyaluronic acid, represent an additional category to be considered in managing patients with fracture blisters [10]. These products create an environment optimal for healing by mimicking physiologic lipids and acting as a humectant [10].

Overall, this case represents the need for a general consensus on the acute management of fracture blisters, balancing prevalent dermatological and orthopedic considerations. This guidance would allow care teams to minimize complications and time to definitive treatment.

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