

Marjolin Ulcers of the Scalp Post Trauma and of the Neck Post Radiation, Diagnosis, and Reconstruction

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FIGURE 1. (A) Nonhealing scalp traumatic wound with malignant transformation to SCC involving the bone. (B) Increased wound size despite aggressive wound care. (C) Wide excision with frozen section; craniectomy with titanium mesh placement, pericranial flap coverage, and Integra placement. (D) Healing full-thickness skin graft applied 4 weeks later.

Questions

1. What are potential causes of Marjolin ulcer and how do they present?
2. How are MU diagnosed?
3. What are differential diagnoses for MU, and what can help differentiate them?
4. What are the appropriate treatments for MU?

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wound clinic for a nonhealing parietal scalp traumatic wound that was sustained by hitting his head against the kitchen cabinet 2 months prior (**Figure 1A**). After 6 weeks of wound care, which included cleansing with normal saline then packing with Iodoform strip, the wound had enlarged (**Figure 1B**). Tissue biopsies were performed and remained negative for malignancy. Due to deterioration of the wound despite continued aggressive wound care, the patient was taken to the operating room (OR) for aggressive debridement and exploration. It was noted that the outer table of the cranium was involved, and the deep tissue biopsies obtained were positive for invasive squamous cell carcinoma (SCC). Postoperatively, computed tomography scan showed invasion of the outer table only. A second OR trip was planned with the participation of the neurosurgeon, and full thickness craniectomy, titanium mesh placement, pericranial flap coverage, and Integra (Integra LifeSciences) placement was performed (**Figure 1C**). The Integra was incorporated into the wound bed 1 month later. At that time, the patient was taken to the OR for the next stage, and a groin full-thickness skin graft was applied to the groin (**Figure 1D**). Radiation therapy was administered 1 month post healing, and at 6 months post-healing positron emission tomography (PET) scan showed no metastasis.

Case Descriptions

Case 1 Description

A 72-year-old generally healthy male patient was referred to the

Case 2 Description

A 74-year-old male patient presented with nonhealing ulcers

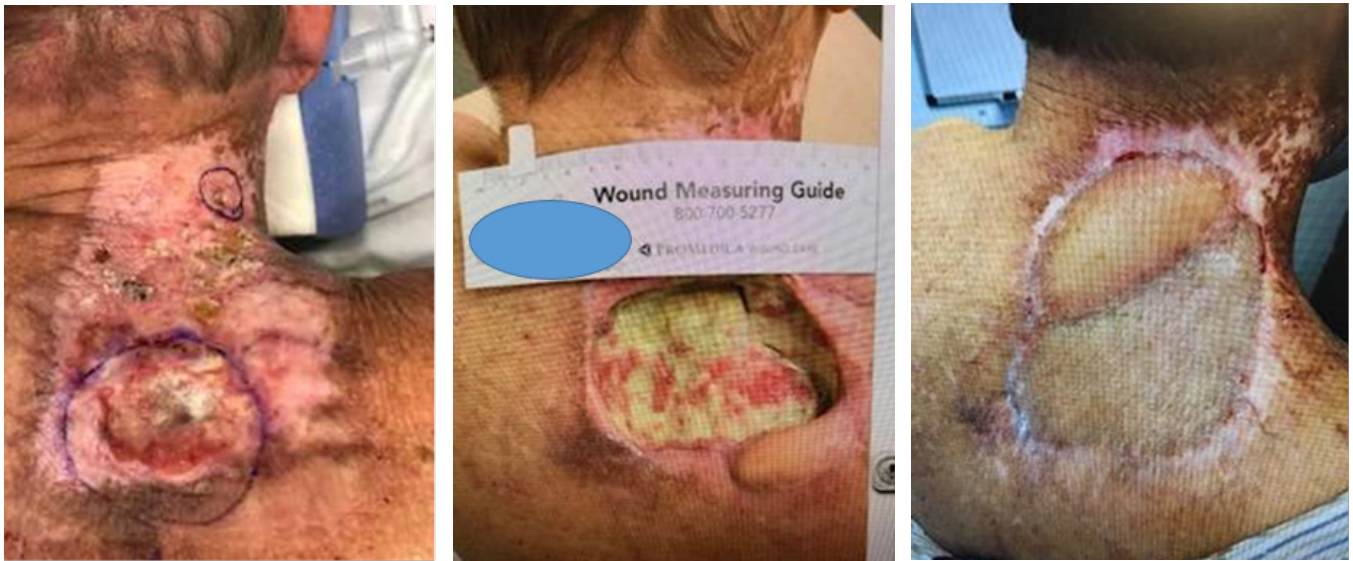


FIGURE 2. (A) Nonhealing wound due to SCC in previously radiated area for cutaneous lymphoma. (B) Failed pedicle LD flap. (C) Status post free LD flap with split-thickness skin graft coverage.

that developed 8 weeks prior in an area previously radiated 20 years ago on the right posterior neck for cutaneous lymphoma. Biopsies proved the diagnosis of invasive SCC (**Figure 2A**). The patient was taken to the OR and underwent excision of the lesions with frozen section. Negative pressure wound therapy (NPWT) was applied to the wound with periodic debridement. Metastatic workup remained negative. The patient was then taken to the OR, and right latissimus dorsi (LD) pedicle flap was attempted to cover the defect. Unfortunately, the flap failed and contracted due to lack of inosculation (**Figure 2B**). The wound was treated with NPWT as well as frequent debridement and received 30 treatments of hyperbaric oxygen therapy. A high-protein diet and multivitamin supplement were given. Spine magnetic resonance imaging remained negative for any involvement. Upon wound improvement with increased granulation tissue and no slough, the patient was taken to the OR and had left free LD flap connected to the right LD pedicle. The inferior muscular part of the flap was covered with split-thickness skin graft (**Figure 2C**). The flap adhered nicely and healed in 1 month. The flap remained in place, and the metastatic workup with PET scan remained negative 1 year later.

Q1. What are potential causes of Marjolin ulcer and how do they present?

Marjolin ulcer (MU) is a skin malignancy frequently presenting as SCC in burn wounds and scars. MU is rare, presenting in 1 to 2% of all burn scars and 0.7 to 2% for deep burns.¹⁻³ Although rare, they are more aggressive compared with other skin cancers, predominantly due to their long latency period averaging 25 to 30 years.^{1,4,5} The cases reported here demonstrate the diverse locations that MU can present; however, they are predominantly

located on the extremities and less commonly the torso and face.^{1,4,5} Research conducted on MU of the scalp found an average latency period of 42.9 years, attributing to malignant transformation. Case 1 was a difficult oncology case found on the scalp only 2 months post injury; however, due to its nonhealing nature after aggressive treatments, MU had to be considered and was confirmed on deep operating room samples. High vascularization of the scalp is thought to be the reason for the slim amount of MU cases found in that area.⁶ Case 2 presented as an unusual case of MU found on the posterior neck and due to postradiation therapy of cutaneous lymphoma. Radiation results in DNA damage and is a predisposition to neoplastic changes but is not a primary cause of MU, and there are sparse data on radiation as an exacerbating factor.^{4,5} In both cases, although unusual, MU should always be on the differential for nonhealing wounds that are not responding to treatment.

Q2. How are MU diagnosed?

MU is found to be more aggressive than other skin cancers with a metastatic rate of 27%, making a prompt diagnosis essential.^{1,4,5} Diagnosis of MU involves wound assessment, biopsies, and gathering a thorough patient history. Any nonhealing wound with a prolonged latent phase should raise high suspicion for SCC.⁵ A biopsy is the gold standard and should be at varying depths of the ulcer and surrounding area approximately 2 cm into the normal adjacent tissue.^{1,5,7} Case 1 experienced a short latent period, but the wound did not respond to treatment after 6 weeks and worsened, warranting aggressive exploration. Early superficial tissue biopsies remained negative; however, wound features, including the wound appearance seen in **Figure 1**, required further aggressive debridement with deep tissue analysis

and successfully found SCC. Obtaining a computed tomography scan showed the invasion was localized to the outer table of the cranium. Malignancy in case 2 was highly suspected, with the classic long latency period of 20 years and the lesion being in a previously radiated area. Diagnosis of MU for this patient was therefore confirmed by biopsy.

Q3. What are differential diagnoses for MU, and what can help differentiate them?

MU is commonly overlooked due to its rarity and similarity with many other skin conditions. Differential diagnoses include pressure ulcers, diabetic wounds, necrotic abscesses, arterial insufficiency, venous insufficiency, and vasculitis.^{3,8} Biopsies are not suggested for several of the differentials and may not require aggressive treatments like MU does.⁸ Wound appearance and MU etiology help rule out differentials. As mentioned previously, wounds that present after a long latency period arising from previous scars or areas of trauma with impaired healing indicate MU. Many of the differentials are commonly present on the extremities, like in MU, but the location rules most of them out in these 2 cases. Wound behavior in case 1 imitated malignancy with continued deterioration after weeks of treatment, and proper surgical investigation led to the corresponding MU diagnosis. Post radiation therapy-induced nonmelanoma skin cancer is well documented in the literature. It tends to occur in 10% of patients who received the treatment in the facial, head, and neck regions.⁹ In case 2, the patient history of previous radiation therapy along with the wound characteristics prompted the need for biopsies and confirmed the finding of SCC. After a supportive patient history and wound evaluation, biopsies are the most effective method for identifying MU and differentiating between the other causes of ulceration. In addition, MRI or PET scan may be used as a tool to exclude metastatic processes.⁵

Q4. What are the appropriate treatments for MU?

The most common surgeries performed for MU are amputation, when necessary, lesion resection >2 cm from ulcer tissue, and the use of skin grafting.^{5,7} MU of the scalp requires radical excision. Therefore, the patient in case 1 underwent surgical debridement and exploration of deep tissue with histological analysis, which enabled proper diagnosis. This was followed by a full-thickness craniectomy, titanium mesh placement, pericranial flap coverage with Integra placement, and later full-thickness skin graft with postoperative radiation therapy. PET scan was promising at 6

months post healing, showing no recurrence or metastasis. As seen in case 2, treating a previously radiated area has proven to be complex, but free flap surgery is the most effective method for treating these patients.¹⁰ Negative pressure wound therapy and hyperbaric oxygen therapies were initiated after the first pedicle myocutaneous flap failed to promote healing and keep the wound clean before attempting a more complex free flap procedure. The second flap coverage was successful, and the wound healed within a month. PET scan was negative for metastasis at 1-year follow-up.

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