

Third Time's a Charm: How to spot a Marjolin's Ulcer

Tyler Mulkey, Robert Burdi, Luc Bibeau, Eric Chen, Shruti Dosi, Stephanie C. Wu, D.P.M.

Dr. William M. Scholl College of Podiatric Medicine at Rosalind Franklin University of Medicine and Science

Statement of Purpose

Historically, Marjolin's ulcer was associated with burn scars. Today however, Marjolin's ulcer is understood as a malignant transformation which may occur in many types of chronic inflammatory wounds. Malignant transformation may arise after several years and is known to be more life-threatening. This case study report demonstrates the importance of remaining vigilant when treating atypical, non-healing wounds due to the Marjolin's ulcer's high potential threat to life and limb.

Literature Review

The association between malignant changes and burn scars dates back to the observations made by the Roman encyclopaedist Aurelius Cornelius Celsus from the 1st century.^{1,3,4,6,9,10,11} Currently, this association has broadened to include inflammatory skin lesions such as snake bites, pilonidal abscesses, spinal cord injury, dermatitis artefacta, urinary fistula, leprosy ulcer, osteomyelitis, decubitus ulcer, venous stasis ulcer, and trauma induced injuries. The pathologic eponym is derived from French surgeon, Jean-Nicholas Marjolin, who is credited with the description of the ulcer in the 19th century.^{1,2,4,5,6,8} The development of Marjolin's ulcer can be classified as either an acute or chronic variant in which the onset of the acute variant is defined as developing within 12 months, while the chronic variant develops beyond the span of a year.^{1,3,6} Although the pathogenicity of this disease process is still unclear, most researchers agree that multiple etiological factors including toxin exposure, lymphatic obliteration, increased susceptibility to carcinogens, immunologic factors, genetic predisposition and prolonged healing play a role in its development.^{1,4,5,6,7,10,11}

Marjolin's ulcer typically develops over a latent period of approximately 30 years until malignancy.^{1,3,5,6,8} Clinical identification of the malignancy usually occurs around the fifth decade of life.^{3,5,8} Interestingly, there is a 2:1 male to female incidence ratio.^{3,11} Although, Marjolin's ulcer can technically appear in any anatomic location, the lower extremity is the most common area of incidence.^{1,5,6,10,11} Furthermore, squamous cell carcinomas (SCC) are the most common histopathologic finding with a reported incidence of 71%. Basal cell carcinoma is the next most common, occurring in 12% of reported cases and a wide range of malignancies including melanoma make up the rest.³ SCCs derived from Marjolin's ulcer have been reported to be a more aggressive form of skin carcinoma.^{5,6,8,11} Research suggests that SCCs have a metastatic rate of 27.5% when associated with Marjolin's ulcer and a rate of 61% when associated with a pressure sore.^{1,2,5,6,11} In contrast to Marjolin's ulcer, most SCCs have metastatic rates of 0.5-3.0%.⁶ Recurrence is seen in 16% of cases, which is another complication of Marjolin's ulcer that makes proper management so critical.^{3,5}

Case Study

This case study involves a 65 year-old male with a past medical history of prostate cancer, a 10 pack-year smoking history and no history of diabetes mellitus. The patient presented initially to his primary care physician after home-care of a plantar

hyperkeratosis resulted in bleeding, at which point the patient was referred to an orthopedic surgeon. The orthopedic surgeon reported that the lesion was secondary to prominent metatarsal heads and recommended reconstructive surgery. The patient was then prescribed a removable cast walker and worked up for diabetes, believing this to be the underlying etiology of the foot ulcer. Seeking a second opinion before surgery the patient visited a podiatrist who concurred with the original diagnosis.

The patient then presented to clinic for his third consultation. A moderate hyperkeratotic lesion sub 3rd and 4th metatarsal heads of the right foot was noted. (Figure 1) The lesion was friable, lobulated, measuring 2cm x 3cm, with a macerated center and pinpoint bleeding upon debridement. Prior radiographs were then reviewed. (Figure 2) Two punch biopsies were taken and sent for histopathologic examination due to the suspicious nature of the lesion: one from the necrotic center and another from the lateral border of the lesion. The biopsies yielded a pathologic diagnosis of well-differentiated squamous cell carcinoma extensively involving the base of each biopsy. Due to the patient's past medical history of prostate cancer, oncology was consulted. Magnetic resonance imaging (MRI) was ordered to determine the size and invasiveness of the lesion. (Figure 3) After the MRI revealed that the carcinoma extended to, but, did not involve bone, a wide excision of the lesion with bilobed flap closure was determined to be the treatment of choice. The patient was then gait trained prior to surgery in preparation for non-weight bearing (NWB) status in the postoperative period.



Figure 1: Hyperkeratotic lesion noted plantar aspect of the third to fourth metatarsal heads area of the right foot. Lesion is friable, lobulated, measuring 2cm x 3cm with macerated center and pinpoint bleeding noted on debridement

Figure 6: Patient healed at 8 weeks post wide excision of squamous cell carcinoma with biopsy right foot with primary closure using bi-lobed flap right foot

During the operation, the lesion was excised to the depth of the subcutaneous tissue. A 3mm circumferential margin of clinically uninvolved skin and subcutaneous tissue, as well as additional subcutaneous tissue at the deep margin, was excised. The margins of excision were tagged, labeled and sent to pathology for stat frozen section analysis. Pathology confirmed tumor cells along the deep margin. The remaining subcutaneous tissue at the deep margin was then resected. After pathology was able to determine clear margins throughout, the wound site was irrigated and closed using a bi-lobed flap. (Figures 4 & 5)

Following the procedure the patient was placed on strict NWB

status in a below knee cast for 4 weeks. The patient was then transferred to protected weight bearing status in a removable cast walker for an additional 4 weeks. The patient's progress was monitored closely until complete healing of the surgical wound site. (Figure 6) Once healing was complete, the patient was prescribed accommodative orthotics to off-load pressure at the surgical wound site. He is now 15 months postoperative and ambulating without pain.

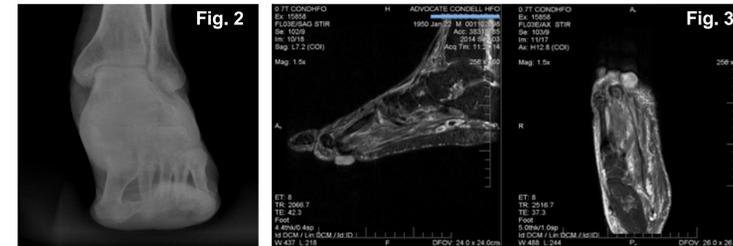


Figure 3: (Above) MRI demonstrating a well circumscribed lesion that extends to bone but does not invade bone

Figure 2: (Left) Axial-sesamoid view of patient's right foot demonstrating metatarsal head level

Analysis and Discussion

It is estimated that 9.3% or 29.1 million Americans suffer from diabetes mellitus with 1.7 million new cases annually.¹³ The growing epidemic of type II diabetes in America has made pedal complications relating to this disease process commonplace in clinical practice. However, as this case demonstrates, Marjolin's ulcer presents a unique challenge for clinicians to be aware of. In a situation where a suspected diabetic foot ulceration with adequate vascularity does not respond reasonably to established treatment protocols such as: off-loading, debridement and bioburden control; it is imperative to have a high suspicion.

Currently, there is no universal consensus regarding the treatment and diagnosis of Marjolin's ulcer. When suspicious of Marjolin's ulcer, multiple punch biopsies from multiple locations within the lesion are indicated in order to improve diagnostic accuracy. It has been suggested that at least one biopsy from each: the border and center of the lesion are advisable.^{8,10,11} The use of MRI has proven to be beneficial in demonstrating the margins and invasiveness of the soft-tissue tumors that define Marjolin's ulcer.^{5,8,11,12} Of note, location has been proposed as the key prognostic indicator influencing metastases with lesions in the lower extremities being most likely to metastasize.¹¹ Regional lymph nodes should also be evaluated to determine the probability of metastases and proper course of treatment.^{5,8} Although there is no established treatment protocol, wide local excision with definitive wound coverage using skin grafts or flaps appears to be the standard of care.^{5,6,8,11} The functional requirements and anatomical limitations of the plantar aspect of the foot make successful wound coverage a challenge: a bilobed flap, such as the one utilized in this case, can be advantageous in wound closure at the plantar surface when simple excisional techniques cannot be performed.^{14,15} Alternatively, in extreme cases with neurovascular invasion or inadequate margins, amputation may be indicated.^{4,11} Following surgical treatment, monitoring is warranted

due to the recurrence rate seen in Marjolin's ulcer.^{8,9}

This case study demonstrates the rare insidious nature and dangerous metastatic potential of this disease, illustrating the need for increased clinical suspicion when dealing with any non-healing wound. It has been suggested that routine biopsies at regular intervals throughout the span of any chronic non-healing wound is required for proper surveillance.^{2,12} It is our contention that patient education, proper wound management and awareness for signs suggesting a malignant transformation by clinicians and patients alike will prove to be critical in limb salvage and prevention of metastatic disease.



Figure 4: Wide excision of squamous cell carcinoma with confirmation of clean borders

Figure 5: 1 week post wide excision of squamous cell carcinoma with biopsy right foot with primary closure using bilobe flap right foot

References

- Sharma A, Schwartz RA, Swan KG. Marjolin's warty ulcer. *J Surg Oncol.* 2011;103(2):193-195.
- Fairbairn NG, Hamilton SA. Management of Marjolin's ulcer in a chronic pressure sore secondary to paraplegia: a radical surgical solution. *Int Wound J.* 2011;8(5):533-536.
- Kowal-Vern A, Criswell BK. Burn scar neoplasms: a literature review and statistical analysis. *Burns.* 2005;31(4):403-413.
- Schnell LG, Danks RR. Massive Marjolin's ulcer in a burn graft site 46 years later. *J Burn Care Res.* 2009;30(3):533-535.
- Kerr-Valentic MA, Samimi K, Rohlen BH, Agarwal JP, Rockwell WB. Marjolin's ulcer: modern analysis of an ancient problem. *Plast Reconstr Surg.* 2009;123(1):184-191.
- Copcu E. Marjolin's ulcer: a preventable complication of burns? *Plast Reconstr Surg.* 2009;124(1):156e-64e.
- Mustoe T, Upton J, Marcellino V, Tun CJ, Rossier AB, Hachend HJ. Carcinoma in chronic pressure sores: a fulminant disease process. *Plast Reconstr Surg.* 1986;77(1):116-121.
- Bozkurt M, Kapi E, Kuvat SV, Ozekinci S. Current concepts in the management of Marjolin's ulcers: outcomes from a standardized treatment protocol in 16 cases. *J Burn Care Res.* 2010;31(5):776-780.
- Fleming MD, Hunt JL, Purdue GF, Sandstad J. Marjolin's ulcer: a review and reevaluation of a difficult problem. *J Burn Care Rehabil.* 1990;11(5):460-469.
- Bloemsma GC, Lapid O. Marjolin's ulcer in an amputation stump. *J Burn Care Res.* 2008;29(6):1001-1003.
- Tobin C, Sanger JR. Marjolin's Ulcers: A Case Series and Literature Review. *Wounds.* 2014 Sep;26(8):248-54
- Smith J, Mello LF, Nogueira Neto NC, et al. Malignancy in chronic ulcers and scars of the leg (Marjolin's ulcer): a study of 21 patients. *Skeletal Radiol.* 2001;30(6):331-337.
- Centers for Disease Control and Prevention. National diabetes statistics report: Estimates of Diabetes and its Burden in the United States, Centers for Disease Control and Prevention, Atlanta, 2014.
- Bouche RT, Christensen JC, Hale DS. Unilobed and Bilobed Skin Flaps: Detailed Surgical Technique for Plantar Lesions. *J Am Podiatry.* 1995; 85(1):41-48
- Sanchez-Conejo-Mir J, Bueno Montes J, Moreno Gimenez JC, Camacho-Martinez F. The Bilobed Flap in Sole Surgery. *J Dermatol Surg Oncol.* 1985;11(9):913-917