

Reconstruction of a Marjolin's Ulcer Arising in a Chronic Diabetic Foot Ulcer Using an Anterolateral Thigh Flap: A Case Report

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ABSTRACT

Marjolin's ulcer is known as the malignant transformation of long-standing chronic wounds, which usually develops into a well-differentiated Squamous Cell Carcinoma (SCC). These lesions are frequently seen over non-healing ulcers of the foot. Management of such cases of malignancy poses a great challenge due to the limited reconstructive options available, particularly in resource-constrained and rural healthcare settings. Consequently, below-knee amputation also remains the most adopted treatment approach, resulting in considerable morbidity and loss of function. However, with the availability of reconstructive techniques as well as microsurgical expertise, limb salvage is increasingly feasible and a better option in patient care. Microvascular free flap reconstruction allows adequate excision of the malignancy, coverage of exposed bone, and restoration of ambulation, thereby reducing morbidity and improving the patient's quality of life. The present case report highlights a case of an elderly 76-year-old male with diabetes and a history of Hansen's disease, having a non-healing ulcer over right foot for the past two years. Biopsy in the present case suggested well-differentiated SCC. The lesion was treated by wide local excision followed by Anterolateral Thigh (ALT) free flap reconstruction for achieving oncologic clearance as well as functional restoration. The current case highlights the role and effectiveness of ALT flap reconstruction for accomplishing durable as well as functional limb salvage.

Keywords: Biopsy, Chronic ulcer, Limb salvage, Microvascular surgery, Plastic surgery, Squamous cell carcinoma

CASE REPORT

A 76-year-old Indian male presented to the Outpatient Department of Surgery with the complaint of a chronic non-healing ulcer over the right foot for the past two years. The ulcer was insidious in its onset and was gradually progressive in nature with no aggravating or relieving factors. However, over the last four months, the patient noticed a cauliflower-like growth over the chronic ulcer, which progressively increased in size, accompanied by a weight loss of approximately 8 kg.

The patient also reported polyuria, but not any fever, trauma, cough, breathlessness, abdominal pain, nausea, or vomiting. The patient had a significant history of treated Hansen's disease (leprosy) 30 years ago and split-thickness skin grafting for a chronic right foot ulcer one year ago. He was a known case of diabetes mellitus for the past two years and was on oral hypoglycaemic therapy (metformin 500 mg once daily). At presentation, his random blood glucose was 280 mg/dL and HbA1c was 9.2% which was consistent with poorly controlled diabetes mellitus. He did not have a history of hypertension, tuberculosis, asthma, or Human Immunodeficiency Virus (HIV) infection. Upon inspection, the right foot had an ulcer of about 6×5 cm in the plantar aspect as shown in [Table/Fig-1].

The ulcer had rolled-out edges, with raised and inflamed margins, floor having hypergranulation tissue with slough and heavy bleeding on touch. The ulcer was absolutely painless, and its base was fixed. The foot had a local increase of temperature, no tenderness or pitting oedema. Peripheral pulses were bilaterally palpable; there were no signs and symptoms suggestive of peripheral vascular disease. A detailed vascular assessment was done for operative planning. Dorsalis pedis as well as posterior tibial pulses were palpable bilaterally. Handheld doppler assessment showed normal triphasic flow in both dorsalis pedis, posterior tibial arteries with no evidence of thrombus or atherosclerotic plaque. Multiple cutaneous perforators were also identified around defect margins. Routine haematological and biochemical investigations were unremarkable. The tumour was staged as pT3NXMX (American Joint Committee on Cancer (AJCC) Stage III). Sections

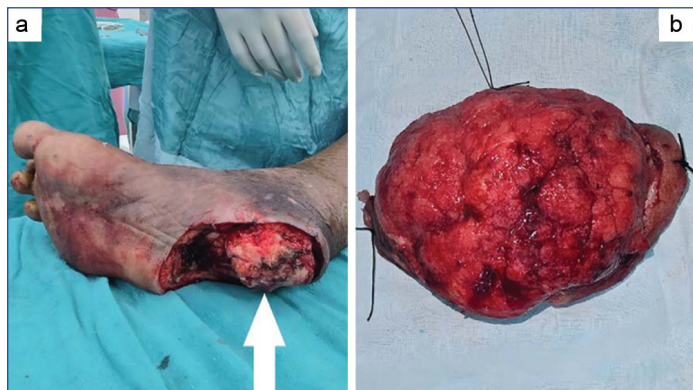


[Table/Fig-1]: Chronic non-healing ulcer having cauliflower-like growth over the right foot plantar aspect.

from all the margins confirmed complete oncologic clearance. A histopathological findings of the diagnosis of Marjolin's ulcer was established.

The patient was scheduled for a wide local excision of the lesion along with ALT free flap reconstruction, as both oncologic and functional restoration was to be achieved. In view of poorly controlled diabetes mellitus, perioperative glycaemic optimisation was undertaken. Oral hypoglycaemic agents were withheld, and the patient was shifted to short-acting human regular insulin under a sliding-scale protocol along with close capillary blood glucose monitoring. However, perioperative glycaemic levels were stable and no additional insulin requirement was noted during immediate perioperative period. The

patient was given the supine position under combined spinal and epidural anaesthesia. Preoperative markings of the margins of the lesions and recipient vessels (posterior tibial and dorsalis pedis arteries) were made. The ulcer and underlying indurated and scarred tissue were excised en bloc with a margin of about 2 cm of healthy skin all around. The incision continued to the deep fascia, and all the abnormal tissue was removed completely. The base was further inspected properly for involvement of deeper structures; there was no involvement of the bone or tendon. The specimen was oriented and sent for histopathology for confirmation of the status of the margin. Meticulous haemostasis was also achieved using bipolar cautery. The intraoperative procedure and excised specimen of the right foot ulcer is depicted in [Table/Fig-2 a,b].



[Table/Fig-2]: The intraoperative procedure and excised specimen of the right foot ulcer: a) Intraoperative procedure during excision of ulcer pointed by white arrow; b) Excised specimen of right foot ulcer.

At the same time, a second surgical team excised the ALT free flap from the contralateral thigh. Using a handheld doppler, suitable perforators of the descending branch of the lateral circumflex femoral artery were identified preoperatively. A fasciocutaneous flap, which measured approximately 11×9 cm, was raised, including one musculocutaneous perforator. The vascular pedicle, consisting of the artery and its accompanying veins, was approximately 10 cm in length, providing a sufficient reach for end-to-side microvascular anastomosis. The closure of the donor site was then done after ensuring that adequate haemostasis was done after harvesting the flap. The harvested ALT flap on the right foot of patient is shown in [Table/Fig-3].

The flap was then transferred to the recipient site. The posterior tibial artery and its venae comitantes were prepared, and an end-to-side microvascular anastomosis was thus performed using 9-0 nylon sutures, which was done under an operating microscope for preservation of distal perfusion. Immediate and late flap perfusion was thereby also confirmed by colour, capillary refill, and using handheld doppler signals. The flap was inset carefully to cover the defect without tension, and a suction drain was also placed.



[Table/Fig-3]: The harvested Anterolateral Thigh (ALT) flap on the right foot of patient.

A structured flap monitoring protocol was implemented postoperatively in patient. On postoperative day 1, flap perfusion was assessed every four hours with the help of clinical parameters and dermal bleeding on prick testing. On postoperative day 2, monitoring was performed every eight hours; on postoperative day 3, he was monitored every 12 hours. Thereafter, daily monitoring was continued until postoperative day 5. Parameters assessed were inclusive of colour, temperature, capillary refill, turgor, Doppler signals, as well as bleeding response to prick test. The postoperative period of the patient was uneventful. The flap was also viable with good perfusion range during all the time it was monitored. On the fifth day of the postoperative period, the drain was removed, and on day 12, the sutures were removed. The donor-site healed without any complications. After three weeks, the patient was started on partial weight-bearing before being able to ambulate gradually. After one year of follow-up, it showed a healthy flap, with stable coverage, and there were no early signs of local recurrence and ulceration, as shown in [Table/Fig-4]. His functional assessment at one-year follow-up showed satisfactory plantar weight-bearing capacity, preserved ankle mobility, along with independent ambulation without assistive devices. The patient also reported no pain or functional limitation in daily activities.



[Table/Fig-4]: One-year postoperative follow-up showing well-healed ALT flap reconstruction with stable soft-tissue coverage and no evidence of recurrence.

DISCUSSION

Marjolin's ulcer is the malignant transformation, usually into well-differentiated SCC of long-standing scars, chronic ulcers or persistently inflamed wounds [1]. The definition of the term Marjolin's ulcer has been extended to include carcinoma (usually SCC) in any long-term non-healing ulcer, such as Diabetic Foot Ulcers (DFUs) [2]. DFU malignancy is very uncommon; however, in specialised units has been estimated at about 0.6% (6 per 1,000 patients) [2]. On the same note, patients with Hansen's diseases (leprosy) are known to develop chronic ulcers because of the impaired sensibility, especially loss of protective sensations in the feet [3]. This causes a high prevalence of plantar ulcers (up to ~34% among those with anaesthetic feet), which could remain chronic and, in some very uncommon cases, become malignant, as Marjolin's ulcers [3].

In patients having Hansen's disease, the loss of protective sensation has important implications for postoperative care [3]. Sensory impairment limits the patient's ability to perceive pain, pressure, as well as early signs of wound complications, thereby increasing the risk of delayed detection of flap compromise, infection, or dehiscence [3]. Neuropathic feet in cases of leprosy are highly prone to recurrent ulceration due to persistent mechanical stress, autonomic dysfunction, causing dry skin, along with altered weight distribution [4].

The ALT flap has become a cornerstone of reconstruction surgery, especially when dealing with lower extremity defects of a complex nature like Marjolin's ulcers [5,6]. One of the major aspects of reconstructive surgery is functional preservation, and this is where

the ALT flap plays a very crucial role [6]. Its design further enables the incorporation of muscle components, such as the vastus lateralis, where necessary to provide support and an extra bulk [5]. This adaptability also makes sure that the reconstructed area is strong enough to resist the mechanical stresses of ambulation along with weight-bearing activities [5]. The ALT flap also shows durability in weight-bearing foot reconstruction cases because of its resilience to shear stress along with mechanical load [7]. Functional outcomes were promising as addressed in a study assessing extensive plantar reconstructions with ALT free flaps, patients achieved a very good Foot Function Index (FFI) score, with a mean of about 8.9% over a follow-up of 47 months, without any signs of late cutaneous fistulas [7]. Furthermore, in heel reconstruction cases performed with Free Tissue Transfer (FTT), flap success rates were approximately over 95%, with 90%+ of patients ambulatory at long-term follow-up [8].

In a case reported by Larijani B et al., a 69-year-old Iranian man with a 10-year history of type 2 diabetes developed a chronic DFU on the mid-plantar surface of the right foot, along the first metatarsal, which persisted for four years. Since the lesion was chronic and persistent, it was subjected to local surgical excision, leading to complete wound closure within 12 weeks. The histopathological examination revealed invasive moderately differentiated SCC without a vascular and perineural invasion, which confirmed a Marjolin's ulcer [9].

In a case reported by Xu S et al., a Singaporean patient who was a 68-year-old Chinese male initially presented with a superficial ulcer on the sole of his right forefoot, present for approximately one year [10]. A few months later he presented again, with an enlarging lesion [10]. Excision biopsy revealed well-differentiated SCC, and a right forefoot amputation was thus done. Final histopathology also showed well-differentiated SCC [10].

Chronic limb-threatening lower extremity wounds, such as neuropathic-ischemic ulcers, are preferably managed with a limb-salvage approach involving multidisciplinary care, including revascularisation, aggressive debridement, and infection control [11]. Advanced reconstructive techniques are considered when adequate blood supply, controlled infection, and the potential for durable wound healing are present, as they can achieve satisfactory healing and reduce major amputation rates [11]. Conversely, amputation may be indicated when salvage fails, in cases of extensive ischaemia or unreconstructable tissue necrosis, or when reconstruction is unlikely to restore functional ambulation, as these situations are associated with poor healing and increased morbidity [12]. Therefore, objective assessment of ulcer severity, vascular status, and co-morbidities should guide decision-making, ensuring a patient-centred approach that integrates functional expectations

and risk profiles when choosing between limb salvage and amputation [13].

CONCLUSION(S)

The present case highlights the occurrence of Marjolin's ulcer which was secondary to a chronic DFU in a survivor of Hansen's disease. Early clinical suspicion, timely biopsy and surgical intervention are paramount in the diagnosis and treatment measures. Wide local excision and sufficient margins is the mainstay of therapy and ALT flap reconstruction is an ideal functional and aesthetic restoration, while preserving limb viability. The present case highlights that close follow-up is crucial in chronic ulcers, as it allows early detection of malignant transformation, timely intervention, along with improved disease-free and long-term survival of patients.

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