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Clinicopathological Profile and Surgical Management of Marjolin Ulcer: A Case Series from Eastern India

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Abstract: ***Background: Marjolin ulcer represents malignant transformation arising in chronic wounds and scars. This study analyzed the incidence, clinicopathological profile and management outcomes of a tertiary private medical college in Eastern India. Methods: This study was conducted between December 2023 and November 2025. All surgically managed histopathologically confirmed Marjolin ulcer patients were included in the study. Demographic data, etiology, duration of scatring, anatomical site, histopathology, treatment and outcomes were analyzed. Results: Most of the patients were males with long-standing post-traumatic or post-burn scars. The lower limb was the most common site. Wide local excision with reconstruction formed the mainstay treatment. Histopathological examination revealed a predominantly well-differentiated squamous cell carcinoma. Conclusion: Early suspicion, biopsy of chronic ulcers and aggressive surgical management remain essential.***

Keywords: Marjolin ulcer, Squamous cell carcinoma, Chronic wounds, Scar malignancy, Reconstruction

1. Introduction

Marjolin ulcer (MU) is a rare and aggressive cutaneous malignancy that arises in scar tissue secondary to chronic injury or long-standing inflammation. The entity was first described in 1828 by French surgeon Jean-Nicolas Marjolin, who reported malignant transformation of burn scar ulcers. The majority of cases occur in post-burn scars, with an estimated incidence of 0.77-2%, particularly following deep second-and third-degree burns that heal by secondary intention. In addition to burn scars, several chronic inflammatory and non-healing conditions have been implicated as predisposing factors, including chronic osteomyelitis, hidradenitis suppurativa, venous and diabetic ulcers, and anal fistulas.

Marjolin ulcer most commonly presents in the fifth decade of life and demonstrates a male predominance, with a male-to-female ratio of approximately 2:1. The latency period between initial injury and malignant transformation is typically prolonged, averaging 30-35 years. The lower extremities represent the most frequent anatomical site of involvement, while lesions arising on the scalp carry the highest risk of underlying bone invasion.

Clinically, Marjolin ulcer is frequently misdiagnosed as a chronic infection or a non-healing ulcer, often resulting in delayed diagnosis and treatment. Compared to ultraviolet-related cutaneous malignancies, scar-associated carcinomas have a higher propensity for regional metastasis, poorer prognosis, and increased mortality. Surgical excision remains the cornerstone of management.

We report five cases of Marjolin ulcer arising in both burn and non-burn scars. This series highlights the importance of maintaining a high index of suspicion for malignant transformation in chronic, non-healing wounds. Early biopsy of suspicious lesions and prompt definitive management remain essential for achieving optimal outcomes.

The aim of this study was to analyze the clinicopathological characteristics and surgical management of Marjolin ulcer in a tertiary care center in Eastern India.

This case series has been reported in line with the SCARE 2023 guidelines.

2. Materials and Methods

Study Design and Methodology

This study was conducted as a prospective case series over a period of two years, from December 2023 to November 2025.

Inclusion Criteria

All patients with histopathologically confirmed Marjolin ulcer presenting during the study period were included. Only non-diabetic and immunocompetent individuals were enrolled in order to minimise confounding factors that could influence wound healing and disease progression.

Parameters Analysed

The following variables were systematically recorded and analysed: patient age, sex, aetiology of the primary insult, anatomical site of involvement, duration of lesion prior to presentation, treatment modality undertaken, and histopathological characteristics of the tumour.

3. Case Details

Sr No	Age/ Sex	Place	Etiology	Parts of body involved	Time since insult	Histopathology type	Procedure done
1	59/M	Puri	Chronic NHU	Base of 3rd & 4th toes of the right foot	4-5 years	SCC	WLE with V-Y Flap
2	55/M	Nabarangapur	Chronic NHU	Ankle, heel and dorsum of left foot	1 year	SCC	WLE with LD Free Flap
3	45/M	Puri	Thermal burn	Chest and bilateral axilla	40 years	SCC	WLE with Rotational Flap over chest & jumping man flaps over right axilla
4	69/M	Jagatsinghpur	Chronic NHU	Heel of right foot	1 year	SCC	WLE with Reverse Sural Flap
5	48/M	Mancheswar	Scald Injury	Heel of right foot	42 years	SCC	WLE with Reverse Sural Flap
6	56/F	Dhenkanal	Chronic NHU	Heel of left foot	3 Year	SCC	WLE with Reverse Sural Flap
7	60/M	Bhubaneswar	Thermal burn	Left leg and left foot	8 Years	SCC	WLE with Reverse Sural Flap
8	74/M	Kalahandi	Chronic NHU	Ankle & lateral aspect of left foot	10 Years	SCC	WLE with STSG
9	65/M	Khordha	Chronic NHU	Base of 4th and 5th toes of right foot	2 Years	SCC	WLE with V-Y Flap
10	48/M	Cuttack	Thermal burn	Plantar aspect of left foot	23 Years	SCC	WLE with ALT Flap

Case illustration

During the course of managing wounds involving different anatomical regions of the body, we encountered a variety of clinical presentations. Depending on the nature and location of the defect, four different surgical procedures were employed to achieve adequate coverage of the postoperative raw areas. These four clinical scenarios and the surgical techniques utilized in each case are described below.

Case Scenario 1: Wide Local Examination with V-Y Flap

A 59-year-old male farmer presented with a history of recurrent ulceration at the base of the third and fourth toes of the right foot for the past 4-5 years. The lesion initially measured approximately $0.^{5} \times 0.^{5}$ cm.

Over the subsequent years, the patient experienced multiple episodes of partial healing followed by recurrence. During this period, he underwent repeated debridement procedures and regular wound dressings at various local healthcare centres. Despite these interventions, the ulcer persisted.

At presentation, the lesion was malodorous, painful, and prone to bleeding on minimal manipulation. On clinical examination, there were no palpable regional lymph nodes.

Histopathological examination of the lesion demonstrated acanthosis, irregular proliferation of squamous epithelium, keratin pearl formation, increased mitotic activity, infiltrative margins, and horn pearl formation. These findings were consistent with well-differentiated squamous cell carcinoma.




Surgery Performed
We performed a WLE of the tumor with 3cm margin and covered the wound by a V-Y advancement flap. We followed up with the patient for 6 months post-operatively and the patient was relatively symptom free.

Case Scenario 2: Wide Local Examination with Latissimus Dorsi Free Flap

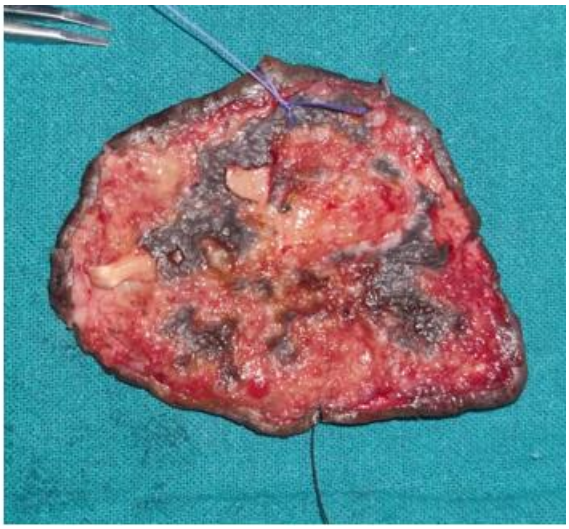
A 55-year-old male goat herder presented with recurrent ulceration involving the left ankle, heel and dorsum of the left foot for the past one year.

The condition began following a history of fall and trauma to the left ankle. Subsequently, the patient developed progressive swelling over the dorsum and ankle region of the left foot. The swelling did not resolve with conservative medical management. Over time, multiple blisters developed over the swollen areas, which were tender and painful.

The patient underwent incision and drainage of a presumed abscess at the nearest Primary Health Centre, followed by multiple periodic debridements. Despite these interventions, the wound progressively increased in size and gradually assumed a fungating appearance. It was associated with severe pain, pruritus, and foul-smelling discharge.

On examination, no palpable regional lymphadenopathy was noted.

Histopathological evaluation revealed features consistent with well-differentiated squamous cell carcinoma.

We performed a WLE of the tumor with 2 cm margin and covered the wound by a LD Free Flap. Postoperatively the patient was doing fine. Unfortunately the patient was lost to follow up.

Case Scenario 3: Wide Local Examination with Rotational Flap over chest & jumping man flaps over right axilla
A 45-year-old male farmer presented with a long-standing post-burn scar over the anterior chest wall associated with bilateral axillary contractures, more pronounced on the right side (R > L). He reported recurrent ulceration over the anterior chest and both axillary regions for the past six months.

The patient had sustained a thermal burn injury involving the chest and bilateral axillae approximately 40 years earlier. Over the preceding six months, he experienced repeated episodes of ulceration followed by partial healing with conservative management.

On clinical examination, no palpable regional lymphadenopathy was detected.

Histopathological examination of the ulcerative lesion revealed features consistent with well-differentiated squamous cell carcinoma.

Surgery Performed

We performed a WLE of the tumor with 3 cm margin. We covered the raw area with local fascio-cutaneous rotational transposition flap. We also released the contracture of right axilla with a double opposing z-plasty with central v-y advancement i.e. by 5-flap plasty or the jumping man flap technique. The patient was given post op skin care and physiotherapy. We followed up with the patient for 6 months post-operatively and the patient was relatively symptom free.

Case Scenario 4: Wide Local Examination with Reverse Sural Artery Flap

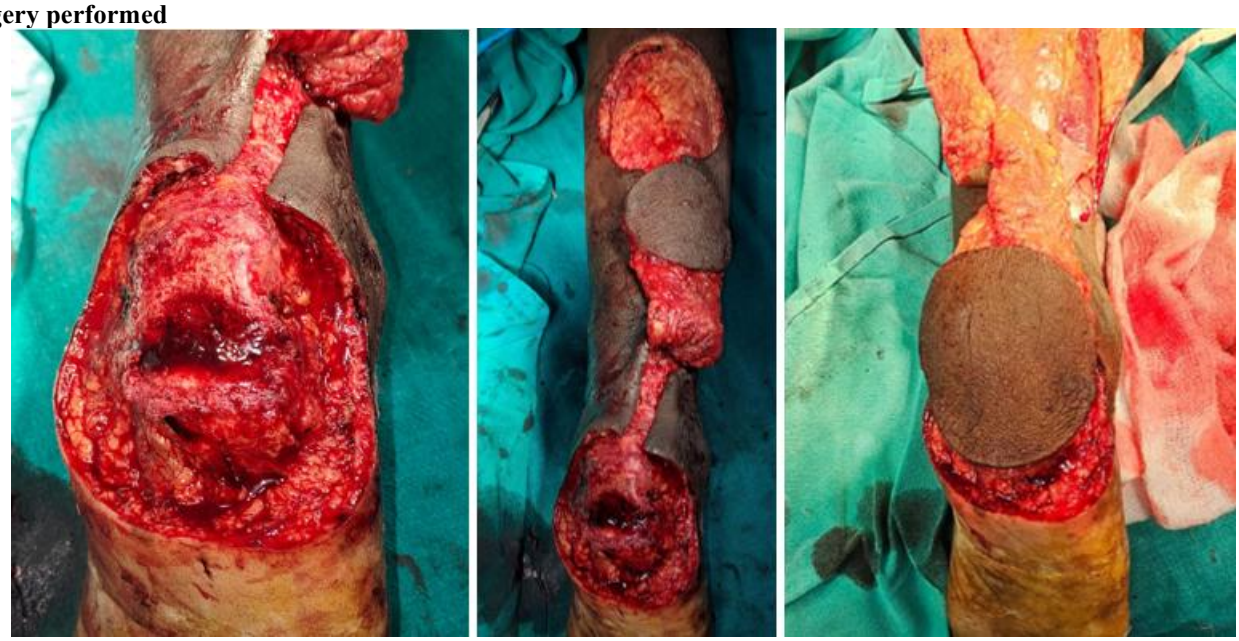
A 69-year-old male farmer presented with a history of recurrent ulceration over the heel of the right foot for the past one year. The patient reported sustaining a minor injury to the same site while working in the field approximately one year earlier.

Following the initial trauma, the wound gradually increased in size over time, eventually reaching approximately 5 × 5 cm. At presentation, the lesion exhibited a cauliflower-like (fungating) appearance and was associated with severe pain, pruritus, and foul-smelling discharge.

On clinical examination, there was no palpable regional lymphadenopathy.

Histopathological examination of the lesion revealed features consistent with well-differentiated squamous cell carcinoma.

Surgery performed



We performed a WLE of the tumor with 2 cm margin and covered the wound by an islanded fasciocutanous pedicled flap. Postoperatively the patient was doing fine. Unfortunately the patient was lost to follow up.

Few other images of our operated cases

1) WLE with Antero Lateral Thigh Flap

2) WLE with Reverse Sural Artery Flap

4. Results

This section presents graphical representations of the demographic characteristics, duration of illness, and surgical management modalities observed in the case series of ten patients with histopathologically confirmed Marjolin ulcer treated at Hi-Tech Medical College and Hospital, Bhubaneswar between December 2023 and November 2025 with ongoing long-term follow-up.

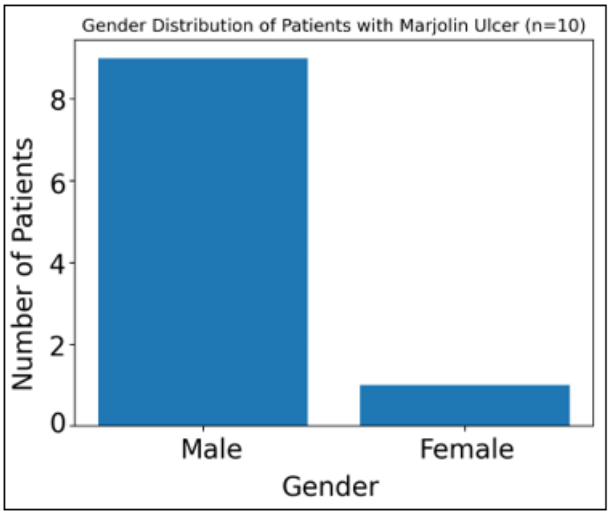


Figure 1: Gender Distribution

Figure 1 shows the gender distribution of patients included in the study. Out of the total 10 patients, 9 were male and 1 was female, giving a male-to-female ratio of 9:1. The marked male predominance may be attributed to increased exposure to trauma, burns, and occupational hazards among males in rural settings.

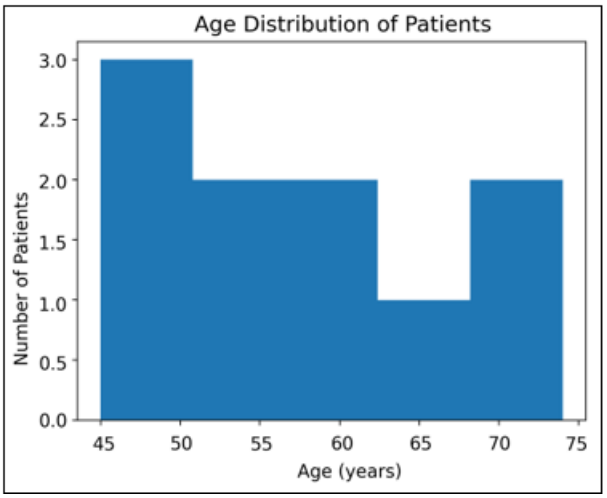


Figure 2: Age Distribution

Figure 2 illustrates the age distribution of the patients. The age of the patients ranged from 45 to 74 years, with the majority presenting in the fifth to seventh decades of life. This age distribution corresponds with the long latency period typically associated with malignant transformation in chronic scars.

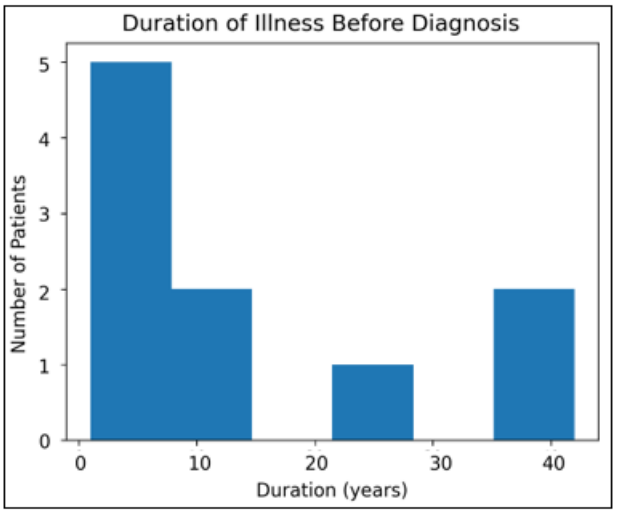


Figure 3: Duration of Illness

Figure 3 depicts the duration between the initial injury and diagnosis of Marjolin ulcer. The duration ranged from 1 year to 42 years, demonstrating the variable latency period characteristic of this malignancy. Several patients presented decades after the initial insult.

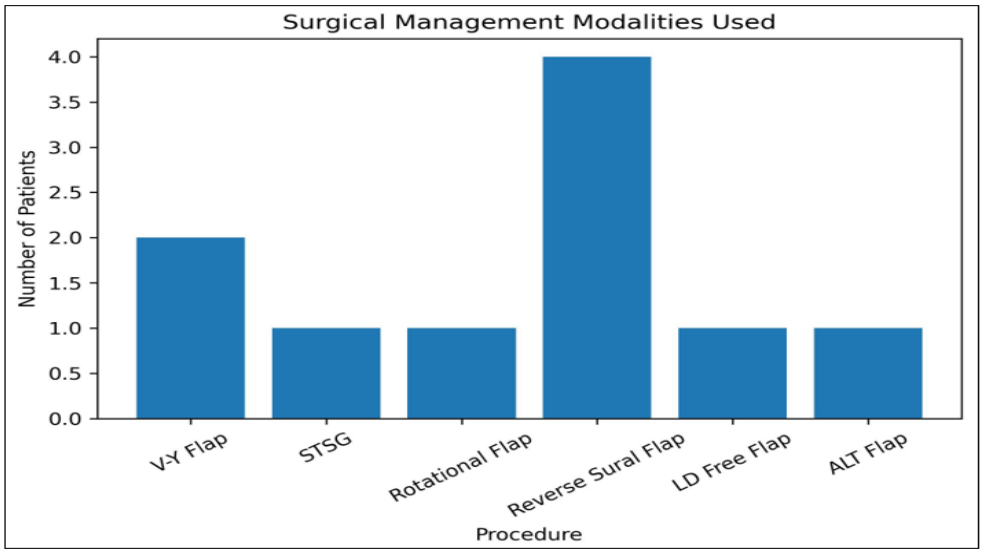


Figure 4: Surgical Management Modalities

Figure 4 shows the various surgical reconstruction techniques used following wide local excision with a 2-3 cm oncological margin. Reverse sural artery flap was the most frequently used modality. V-Y advancement flaps and rotational flaps were used for selected defects depending on anatomical location and tissue requirements.

- The mean age of patients was 57.[9] years (range 45-74).
- The mean latency period between initial insult and malignant transformation was 13.[6] years.
- The most common etiological factor was chronic non-healing ulcer (60%), followed by thermal burn scars (30%) and scald injury (10%).
- The lower limb was involved in 80% of cases, with the heel and dorsum of the foot being the most frequent sites.
- All cases were histopathologically confirmed as well-differentiated squamous cell carcinoma.

Variable	Result
Number of Patients	10
Mean Age	57.9 years
Male: Female	9:1
Most Common Site	Foot
Most Common Etiology	Chronic non- healing Ulcers
Histology	SCC (100%)
Most Common Reconstruction	Reverse Sural Flap

5. Discussion

Marjolin's ulcer is a well-recognized but relatively uncommon malignant transformation that develops in chronic wounds, scars, and previously injured skin. It most commonly manifests as squamous cell carcinoma (SCC) arising from long-standing inflammatory or traumatic lesions. The condition is characterized by a prolonged latency period and often demonstrates aggressive biological behaviour with a higher tendency for local invasion and metastasis compared with conventional cutaneous squamous cell carcinoma.

The present mini case series was conducted at Hi-Tech Medical College and Hospital, Bhubaneswar, over a period of two years (December 2023 to November 2025). A total of 10 patients with histopathologically confirmed squamous cell carcinoma arising from chronic wounds or burn scars were included in this study. The patients were referred from various districts of Odisha, highlighting the persistent burden of neglected chronic wounds and burn scar complications in the region.

Demographic Characteristics

In our study, 9 patients were male and 1 patient was female, resulting in a male-to-female ratio of 9:1. This marked male predominance has been consistently reported in previous studies and may be attributed to greater occupational exposure to trauma, burns, and chronic wounds among males, particularly in rural and labour-intensive occupations.

The age of patients ranged from 45 to 74 years, with most patients presenting in the fifth to seventh decades of life. This observation aligns with the typical epidemiological pattern described in literature, where Marjolin's ulcer commonly manifests decades after the initial injury. The delayed presentation may reflect both the prolonged latency period of malignant transformation and delayed healthcare access in rural populations.

Etiopathogenesis and Duration of Illness

Marjolin's ulcer (MU) is an uncommon but well-recognised malignant transformation arising in chronic wounds, burn scars, or long-standing inflammatory lesions. Although its exact incidence remains unclear, it is considered a rare complication, with variation depending on the population studied and predisposing conditions. Since the first description by Jean-Nicolas Marjolin in 1828 and later detailed by Da Costa in 1903, several hundred cases have been reported in the literature. Fei Xiang et al. reported one of the largest contemporary series in 2019, documenting 140 cases. The cervicofacial region represents the second most frequently involved anatomical site, accounting for approximately 34.5% of cases.

Historically, the term "Marjolin's ulcer" referred specifically to squamous cell carcinoma (SCC) arising in post-burn scars. However, the modern definition encompasses any malignant tumour developing within chronic wounds or scar tissue. Squamous cell carcinoma remains the predominant histological subtype, particularly affecting the lower limbs and head and neck region. Basal cell carcinoma and melanoma are less commonly reported.

The pathogenesis of MU is complex and multifactorial. Chronic inflammation is believed to play a central role in carcinogenesis. Persistent inflammatory stimuli in non-healing wounds generate oxidative stress and sustained release of pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1β, promoting cellular proliferation and mutagenesis. This pro-inflammatory microenvironment contributes to genomic instability and epigenetic modifications, including tumour suppressor gene inactivation and oncogenic pathway activation-particularly involving p^{53} and EGFR.

The prolonged latency period-often spanning decades-suggests a gradual accumulation of molecular alterations. In our series, a latency period of up to 40 years was observed which supports this slow carcinogenic evolution, potentially influenced by immune surveillance decline, vascular insufficiency within scar tissue, repeated trauma, or environmental exposures.

Several theories have been proposed to explain MU development, including:

- Chronic inflammatory irritation theory
- Foreign body reaction to implanted epithelial elements
- Toxin release secondary to poor vascularisation and scar autolysis
- Reduced immune response within scar tissue

Recent molecular studies reinforce the genetic basis of malignant transformation. Harland et al. identified homozygous deletion of the p^{53} gene in burn-related carcinomas, while Lee et al. reported Fas gene mutations affecting apoptotic pathways in burn scar-associated SCC. These findings support the role of genetic and epigenetic dysregulation in MU pathogenesis.

In our study the etiological factors identified in this series included:

- Chronic non-healing ulcers
- Thermal burn scars
- Scald injury scars

Among these, chronic non-healing ulcers constituted the most common underlying pathology, followed by thermal burn scars. These findings are consistent with previously reported literature, which identifies chronic burn scars as one of the most common precursors of Marjolin's ulcer.

The duration between the initial injury and malignant transformation varied widely, ranging from 1 year to 42 years. Several patients demonstrated an extremely prolonged latency period exceeding 20 years, which is characteristic of the classical form of Marjolin's ulcer. However, a few cases in our series developed malignancy within 1-3 years, representing a relatively shorter latency period that has also been described in aggressive variants of the disease.

Study	Country	Patients	Latency	SCC %
Xiang 2019	China	140	28 yrs	92
Luo 2025	China	126	31 yrs	90
Liu 2016	China	187	25 yrs	95
Present Study	India	10	13 yrs	100

Clinical Features

Marjolin's ulcer should be suspected in any chronic wound or scar that demonstrates delayed healing, induration, increased exudation, foul odour, bleeding, or rapid growth. The age of onset ranges from 15 to 85 years, with a male predominance (approximately 3:1).

The latency period between initial injury and malignant transformation typically exceeds 10 years. However, cases with shorter latency have been described. In our series, the duration was consistent with established literature.

Diagnosis is confirmed histologically. Multiple deep biopsies from both the central and peripheral margins of the lesion are recommended to avoid sampling error.

Imaging Evaluation

Radiological assessment is essential for staging. Common imaging features include:

- Bone destruction
- Periosteal reaction
- Soft tissue mass
- Irregular lesion margins

CT scanning is useful for evaluating bony involvement, while MRI provides superior delineation of soft tissue extension and perineural invasion. PET-CT is considered valuable for detecting regional or distant metastases.

Differentiating inflammatory bone changes from tumour invasion can be challenging. Suspicion of osseous involvement may necessitate en bloc excision to prevent recurrence. Xiang et al. reported bone invasion in 46 patients, including 25 cases involving the skull, highlighting the aggressiveness of scalp lesions.

Marjolin's ulcer demonstrates a strong lymphophilic tendency. Regional lymph nodes are the most common site of metastasis. Sentinel lymph node biopsy offers a minimally invasive method for nodal evaluation in SCC-type MU. Imaging findings suggestive of nodal involvement should ideally be confirmed with ultrasound-guided biopsy.

In our case, CT was performed as first-line imaging. MRI and PET-CT were not obtained due to financial constraints and limited availability.

Anatomical Distribution

In the present study, the lower extremity was the most commonly affected site, particularly the foot, heel, ankle, and dorsum of the foot. This predominance of lower limb involvement has been widely documented in previous studies and may be attributed to the higher incidence of trauma, burns, and chronic ulceration in these regions.

One case in our series involved the chest wall and axillary region, arising from a long-standing burn scar of approximately 40 years duration. Such extensive burn scar malignancies often require complex reconstructive procedures following excision.

Surgical Management

The cornerstone of treatment for Marjolin's ulcer remains wide local excision (WLE) with adequate oncological margins. All authors agree that extensive tumour resection with adequate safety margins is essential. Recommended margins exceed 2 cm, often ranging between 2.5-5 cm depending on tumour size and location. The depth of excision depends on tumour invasion and may include deep fascia, muscle, or bone.

In cases of confirmed nodal involvement, therapeutic lymph node dissection is indicated. The role of prophylactic lymphadenectomy remains controversial. Some authors advocate systematic dissection due to high metastatic rates, whereas others report lower nodal incidence, questioning its routine use. Therefore, management should be individualised based on tumour size, differentiation, invasion depth, and nodal status.

Given the aggressive nature of MU and its higher propensity for lymphatic spread compared to conventional SCC, a lower threshold for lymph node evaluation and wider excision margins is justified.

In the present study, all patients underwent wide local excision with a 2-3 cm margin, followed by appropriate reconstructive procedures depending on the size and location of the defect.

Various reconstructive modalities were employed in our series, including:

- Split thickness skin graft (STSG)
- Reverse sural artery flap
- LD Free flap
- Anterolateral thigh flap
- V-Y advancement flap
- Rotational flaps

Among these, Reverse sural artery flap was the most commonly used reconstructive method. Flap reconstruction was preferred in cases involving exposed bone, tendon, or weight-bearing areas of the foot where grafting alone would have been inadequate.

The reverse sural flap proved to be particularly useful for coverage of defects involving the heel and distal leg, owing to its reliable vascularity and relative technical simplicity. Similarly, V-Y advancement flaps were used for smaller defects in the toe and forefoot region.

Adjuvant Therapy

Chemotherapy has not demonstrated consistent benefit as adjuvant therapy. The efficacy of intra-arterial methotrexate remains inconclusive.

Radiotherapy plays an important role in selected cases, particularly:
- Poorly differentiated (Grade III) tumours
- Lesions >10 cm
- Bone invasion
- Regional or distant metastases
- Inoperable disease

However, concerns exist regarding reduced effectiveness due to poor vascularity within scar tissue.

In the present study, all patients underwent wide local excision with a 2-3 cm margin and none met the criteria to receive adjuvant treatment.

6. Clinical Implications

The findings of this study emphasize the importance of maintaining a high index of suspicion in long-standing scars and chronic ulcers, especially those that demonstrate persistent ulceration, excessive granulation tissue, bleeding, or rapid growth. Early biopsy of suspicious lesions is essential for prompt diagnosis and timely surgical intervention.

In resource-limited settings, delayed presentation and neglect of chronic wounds remain significant challenges. Public awareness, early wound care, and routine surveillance of chronic scars may help reduce the incidence of malignant transformation.

7. Prognosis

Prognosis depends on tumour size, differentiation, depth of invasion, and metastatic status. The five-year survival rate ranges from 40% to 69%. Recurrence is common, with approximately 68% occurring within the first postoperative year. Therefore, close follow-up during the first year is critical, followed by long-term surveillance due to the risk of distant metastases (brain, liver, lung, kidney).

In our case, no recurrence or distant metastasis was observed during first year of follow-up.

8. Preventive Considerations

Prevention remains paramount. Early excision of unstable scars, vigilant monitoring of chronic ulcers, and prompt biopsy of suspicious lesions are essential strategies. Raising awareness among primary care physicians regarding non-healing wounds is critical to reducing delayed diagnosis and improving outcomes.

9. Strengths & Weaknesses of our Study

Strengths
The cases were reviewed in a multidisciplinary team meeting to ensure comprehensive evaluation and formulation of an optimal treatment strategy. Following detailed assessment, the patient underwent extensive surgical intervention aimed at complete oncological clearance, addressing the full extent of the disease.

Given the resultant tissue defect, appropriate reconstruction was undertaken using skin grafts and/or flap coverage, tailored to the size and location of the defect. The reconstructive approach was planned to achieve durable wound coverage, preserve function, and optimise aesthetic outcomes, reflecting the application of advanced reconstructive surgical techniques.

Limitations
This study is limited by its small sample size and single-centre design. Additionally, incomplete long-term follow-up in some patients restricts the ability to evaluate recurrence rates and survival outcomes.

10. Conclusion

Marjolin's ulcer is an aggressive malignancy associated with a high risk of local recurrence and a comparatively poor prognosis. Early recognition remains crucial. Any suspicious, non-healing, or ulcerative lesion arising within a chronic scar or long-standing wound should undergo prompt biopsy to facilitate early diagnosis and timely initiation of appropriate management.

The predominance of foot involvement in this study may reflect occupational exposure among rural populations who frequently work barefoot, leading to repeated trauma and chronic ulceration. This pattern highlights the need for improved wound surveillance programs in rural communities.

This case underscores the importance of vigilant scar surveillance, meticulous wound care, and a low threshold for histopathological evaluation in chronic lesions. Increased awareness among healthcare professionals may contribute to earlier detection and improved outcomes, while also supporting the development of clearer clinical guidelines for the prevention, diagnosis, and management of Marjolin's ulcer.

Any chronic wound persisting for more than 3 months, particularly in a scarred area, should undergo early biopsy to

exclude malignant transformation. Delayed diagnosis remains a major challenge in developing regions.

Author contribution

- The following authors were directly involved in the patient's care: Dr Debashis Nanda, Dr Chinmaya Chiranjibi Samal
- The following authors were not directly involved in the patient's care, they contributed to the manuscript by: Dr Smita Sarangi

Ethical approval

Institutional ethical approval was obtained. All participants were patients treated within the standard scope of care at our institution. No experimental interventions or deviations from established clinical protocols were undertaken. All personal identifiers have been removed to ensure complete patient confidentiality. The study complies with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments.

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The authors declared that no grants were involved in supporting this work.

Conflict of interest statement

All other authors declare no conflict of interest.

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