



Malignant Transformation of a Digit's Burn Scar: Case Report and Literature Review

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Authors' contributions

This work was carried out in collaboration among all authors. Authors RM and RA designed the study and wrote the first draft of the manuscript. Authors WB and WS managed the analyses of the study. Authors MAS, MT and RM managed the literature searches. All authors read and approved the final manuscript.

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Case Study

ABSTRACT

Marjolin's ulcer is a situation describing the malignant transformation of chronic unstable scars, especially in chronic burn scars. From all burn scar malignancies, carcinomas are the most common reported cases with an invasive majority of squamous cell carcinomas (SCC). As surgeons, we should recognize this long-term complication of severe burns, its occurrence, its clinicopathologic aspect, its prognosis and for sure its adequate management. We describe an unusual presentation of post-burn sequelae of a middle finger revealing a squamous-cell carcinoma degeneration and present a review of the literature to clarify Marjolin's ulcers characteristics.

Keywords: *Burn scar; Marjolin's ulcer; hand; finger; squamous-cell carcinoma.*

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1. INTRODUCTION

Burn accidents have always been a real public health problem in Tunisia because of its prevalence, especially in the pediatric population. Because of the frequent brazier accident and "the hand and face syndrome" _ which is an unconscious protective reflex from the flames by putting the hands in front of the face_, the hand is frequently affected. Contradictorily, cancer transformation of burns in this location remains rare to our knowledge.

Marjolin's ulcer is nowadays a well-known situation describing the malignant transformation of chronically unstable scars, typically in burn sequelae, but also reported in many types of non-healing wounds [1,2]. It has been stated that the incidence of burn scar tumours is 0,1-2,5%. [3] From all burn scar malignancies, carcinomas are the most commonly reported cases with an invasive majority of squamous cell carcinomas (SCC) [4,5].

The purpose of this paper, through a case report and a review of literature, is to reconsider mechanisms of injury, incidence, clinicopathologic aspect and behavior and finally summarize adequate management of this rare disease.

In fact, the effective approach can be controversial and these lesions can often be neglected and inadequately treated.

2. PRESENTATION OF CASE

A 54-year-old left-handed male presented with a 3 cm budding and ulcerative lesion, which was rapidly enlarging for the recent 3 months and localized in the amputation stump extremity of his middle right finger (Fig. 1).

Physical examination (Fig. 1) and X-ray (Fig. 2) revealed complex burn sequelae of all long fingers explaining the severity of the flame accident that happened when he was 3-year-old; he put his hand accidentally into a brazier. The patient reported that he did not undergo any surgical treatment. His initial lesions were left to heal by secondary intention and then he was lost of sight after complete cicatrization.

As X-ray showed a doubtful osteolytic lesion of the head of P2 bone (Fig. 2), amputation was the

safest excision to do with 2 cm of macroscopic clear margins with direct wound closure (Fig. 3). The decision was well-accepted by the patient.

Histological findings showed a well-differentiated squamous cell carcinoma. Despite of bone infiltration, radical excision was confirmed with 1.5 cm of clear margins.

No pulmonary, liver or bone metastases were found on Computed Tomography scans. He didn't undergo regional lymphadenectomy as no palpable lymph nodes were found. Chemotherapy and radiotherapy were found to be unnecessary based on these findings.

A close follow-up is conducted. At his latest examination, the patient remains free of disease six months from surgery (Fig. 4).

3. DISCUSSION

Marjolin's ulcer always constitutes a current matter of concern for all countries regardless of their level of development. It remains a rare and aggressive skin malignancy that develops in chronic nonhealing wounds [6,7]. Kerr-valentic et al. [2] found that 76% of Marjolin's ulcers wound type were predominantly burn scars followed by traumatic lesions for only 8%.

This condition was named after the French surgeon Jean Nicolas Marjolin who was the first to demonstrate in-depth the cellular changes of ulcerated scar tissue in 1828 and then approved and developed by many other authors such as Dupuytren in 1839, De Costa in 1903, Nancarrow in 1983, Steffen in 1984, Fishman and Parker in 1991 [4,5].

Historically, skin cancer is known to arise in cultures where occurs chronic fire exposure such as the Kangri burn cancer in India, the Kairo in Japan and the Kang cancer in China; all cases revealed a squamous cell carcinoma in chronic burn scars [5,6].

Many authors tried to explain the physiopathology of this disease. But it remains, up-today, an unsolved problem and none of these suggestions was confirmed. Several theories have been postulated such as Virchow's theory of chronic irritation, Ribbet's theory of misplaced epithelial cell groups and Treves and Pack's theory of the release of toxins by the autolysis and heterolysis of burn scar [8].



Fig. 1. Budding and ulcerative mass of the middle finger



Fig. 2. Doubtful osteolytic lesion of the head of P2 bone



Fig. 3. Amputation of the affected finger



Fig. 4. Recurrence-free and stable aspect 6 months after surgery
(A: dorsal view, B: palmar view)

Giblin et al. [9] stated that contractures and tension of scars are more likely to cause ulcerations; in such conditions, epithelium is abraded by relatively slight injuries because of lack of skin normal elasticity. Therefore, persistent stimulation of the marginal epithelium may result in neoplastic changes. The relatively avascular scar tissue and no lymphatic channels in scars may then act as an immunologically privileged site that allows the tumour to resist the body's usual defenses. Aron and Tajuri [10] Recent molecular studies have shown that burn scar squamous-cell carcinoma cases have Fas gene mutations in the apoptosis function region. Lee et al. [11] Heredity has also been involved as some authors evidenced relation with HLA DR4 and abnormalities in p53 gene [5].

Several studies have considered demographic characteristics of Marjolin's ulcers. All agreed that it occurs in adults mostly aged from 40 to 60 years old with higher rates in males (sex-ratio M/F:2/1 to 3/1). (2,4,5,7) The possible reason for male preponderance is that men are more susceptible to trauma and lack consciousness of close surveillance [7].

Diagnosis may be challenging because of the clinical presentation especially in the hand where it can mimic other more common benign conditions. The ulcerative appearance is the predominant form followed by exophytic appearance. Both forms are suspicious when showing malignant characteristics, such as irregular margin, pink color, enlarging circumference, bloody drainage, discharging pus, foul smell, pain and itching [3,7]. Our patient had

an ulcerative and exophytic combined form enlarging on burn sequelae of his middle finger which made it more suspicious.

Even though, correct diagnosis of Marjolin's ulcer can only be confirmed using pathologic interpretation. In most reported cases, squamous cell carcinoma (SCC) is the most common type averaging 71-82% of Marjolin's ulcers [5,12]. However, it is worth noting that burn scar carcinomas account for only 2% of all skin-SCCs. [5] Solid epidemiologic studies proved that the tendency for malignant degeneration of burn scars did not increase the risk of squamous cell carcinomas or other types of skin cancer above the level seen in the general population [1,13].

Statistically, it is followed by basal-cell carcinoma (BCC) and less frequently melanoma [1,6,7]. BCC usually occurs in lesions where the sweat glands and hair follicles have not been destroyed explaining that BCC should not originate from deep burn scar ulceration [8,13].

A recent review conducted in 2008 by Kerr-Valentic et al. [2] analyzed, among other statements, the anatomical variability of 443 Marjolin's ulcers. Fifty-three percent of Marjolin's ulcers were located predominantly in the lower extremity. Upper extremities are in the second place averaging 19 % in frequency. This fact can be explained by the preponderance of burn and traumatic injuries that affect arms and legs. Kowal-Vern and Criswell [5] reported as well that the lower extremities were most frequently affected (33%), followed by the head (30%) and upper extremities (19%).

However, it is rarely reported in the hands and fingers [14,15]. Thus, clear epidemiologic data have not been established specifically for this location to estimate its prevalence. An analysis of data from case series and literature review, in a recent study including 49 SCCs affecting the hand and forearm, revealed that only one case was related to burn scars [16].

Latency period, which is defined by the period that separates skin injury and the onset of the malignancy, is typically slow in Marjolin's ulcer. (2) Acute form, which is rare, occurs within 12 months, while chronic form averages 30 years [2,4,5].

Kowal-Vern and Criswell [5] stated that genetics and environmental factors may play a role in patients with acute burn scar neoplasm. In our case report, the latency period was about 50 years which is consistent with other reports in literature.

Despite this lengthy progression, Marjolin's ulcers are recognized to be more aggressive than all typical skin malignancies with a wider tendency to develop regional et distant metastasis [2,6].

Bostwick et al. [17] reported that lymphatics in scar tissue environment were obliterated; therefore, tumor cells must penetrate the thick barrier of scar fibrosis before functional lymphatic vessels were accessible to them. When tumor cells do reach them, metastatic growth within the regional nodes usually can be quite rapid.

There is also a predilection for poor patients coming from developing countries, with limited access to health care and the history of wounds left to heal by secondary intention, who considered chronic and ulcerative lesions over burn scar a normal fact. This leads to delayed presentation and aggressive form [7].

Moreover, it is important to notice that Marjolin's ulcer behaves differently depending on its anatomical location.

Novick et al. [18] reported a metastatic rate from lower extremity lesions that were twice as high as rates in any other part of the body, which was also reported by Gül and Kiliç [19]. In general, patients with tumors located on the head, neck and upper extremities have a far better prognosis than those on the trunk and lower extremities. [4,18,19] However, it has not been clearly stated

why localization seems to play a role in the metastatic potential; these facts have been statistically reported without being explained.

Treatment seems to be very controversial. In all cases, according to detailed clinical evaluation, histological findings and computed tomography results, radical excision and therefore adjuvant treatment must be adequately planned. As for adjuvant radiation and/or chemotherapy, it may be indicated in cases of unresectable tumors and aggressive forms or if the patient refuses surgery [4].

Excision margins should be between 2 to 4 cm, with an early skin grafting, as only an aggressive approach can prevent from recurrence along with a strict follow-up [6,7]. It constitutes the cornerstone of oncotherapy. Kadir et al. [3] believe that performing the excision with cautery would be safer as it can prevent tumor cells from seeding into the blood and the lymphatic system. Furthermore, as in our case report, amputation is recommended for lesions that have entered joint cavities and metastasized to bone tissue in the extremities without worrying about esthetic issues and functional losses [3,10].

Besides, no reconstructive surgery should be performed primarily because of possible post-operative recurrences. Novick et al. [18] have suggested a delay of at least 12 months.

Imperative lymphadenectomy is not always performed. Nevertheless, some authors have insisted that if a lymph node is positive, lymphadenectomy dissection (LND) may be recommended [6,20]. Some authors believe that sentinel lymph node (SLN) biopsy can be an investigational staging tool in clinically node-negative high-risk cutaneous squamous cell carcinoma patients [20]. To the best of our knowledge, there is no consensus to support whether prophylactic LND or SLN permits better results for prognosis or not.

Furthermore, prognosis is not well-defined. Two parameters have to be considered in group studies: recurrence rate and recurrence-free survival rate (RFS). Kerr-Valentic et al. [2] showed in their study that recurrence is found in approximately 16,7% of patients. However, this rate is variable from a study to another depending on group sample and its clinicopathologic findings such as the averaging size of primary tumor, its depth invasion and histological differentiation, the existence of lymph

nodes enlargement and distant metastasis. Logically, regional node involvement is associated with an increased risk of recurrence and decreased survival [20]. Also, it is noteworthy that depth and histological grade are found to be independent prognostic factors of RFS [7].

Huang et al. [13] considered that high histological grade, tumour location especially on the lower extremities, large tumor diameter (> 10 cm), and regional lymphadenopathy on presentation are poor prognostic factors. Based on these facts, authors proposed an interesting treatment algorithm regarding a biopsied burn scar ulcer with no regional lymphadenopathy:

- If tumour size is < 10 cm AND cancer is well-differentiated, then wide excision + skin grafting is recommended.
- If tumour size is > 10 cm OR cancer is poor-differentiated OR localized at lower limbs then wide excision and prophylactic lymph node dissection is recommended.
- If tumour size is > 10 cm OR cancer is poor-differentiated AND localized at lower limbs, then amputation is considered.

Finally, it has been stated that the major risk factor for the development of post burn neoplasm have been not-grafted deep burns left to heal by secondary intention and non-healing wounds. (3,5) Therefore, the mainstay of managing better living standards is to advocate for primary prevention. It lies on well-conducted surgical care, by excision and grafting, in the acute phase of wound healing. Awareness is very important to set the light on suggestive signs of malignant degeneration of non-healing wounds. Patients should be educated to pay attention to seek rapidly medical care and not delay appropriate treatment.

4. CONCLUSION

The majority of burn scar carcinomas occur after a lag period in deep burns that have not been grafted following injury. Therefore, large full-thickness burns should be managed surgically and not allowed to heal by secondary intention.

Patients with burn scars must be monitored closely; therefore, biopsy must be carried out early in doubtful conditions in order to prevent delayed and aggressive forms. Our patient presented with a post-burn SCC, that have

already spread to bone tissue, for which conservative treatment was impossible.

The literature does not contain any definite data related to optimal treatment. Actually, decisions differ depending on the experience of the surgeon while malignant transformation of burn scars, and Marjolin's ulcers in general, constitute a severe condition that has to be faced with a well-planned and rational attitude. This can be comforted only by a worldwide general consensus.

CONSENT

As per international standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard, ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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