



"RETROSPECTIVE STUDY ABOUT "PRECISION SURGICAL MANAGEMENT OF ACRAL LENTIGINOUS MELANOMA"

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Abstract:

Background: Acral Lentiginous Melanoma (ALM), a rare but aggressive form of cutaneous melanoma, affects about 2-3% of melanoma patients in Western populations. It primarily targets acral areas like palms, soles, and subungual regions, and is more common in individuals with darker skin tones. ALM's unique biological and molecular properties, coupled with delayed diagnosis and lack of awareness, contribute to its aggressive nature and poorer prognosis compared to other melanoma types. Our goal was to explore the surgical management of ALM by analyzing patient demographics, tumor locations, and surgical outcomes.

Methods: We conducted a retrospective study on 50 ALM patients treated at the 1st Affiliated Hospital of Xinjiang Medical University from September 2017 to January 2022.

Results: The study's primary surgical method, wide local excision proved highly effective with no local recurrence in 50 treated cases, emphasizing its significance in managing Acral Lentiginous Melanoma (ALM). Tumor analysis revealed a predominant occurrence (66%) in acral areas, particularly the sole (36%) and heel (30%), emphasizing the need for precise surgical interventions in these locations. Demographically, ALM primarily affected individuals aged 41 to 70 (72% of cases), with a slight female preponderance (31 females, 19 males). Most cases were in the Chinese population (78%), providing comprehensive insights into the diverse patient characteristics associated with ALM.

Conclusion: This study enhances our knowledge of ALM management by highlighting the significance of precision medicine and customized surgical strategies for improved patient outcomes. By focusing on the surgical aspects of ALM management, we aim to optimize oncological results and enhance patient well-being.

Keywords: Acral Lentiginous Melanoma (ALM), Surgical outcomes, Wide local excision, Aggressive nature, Poor prognosis

Introduction:

Acral lentiginous melanoma (ALM) is an uncommon and especially aggressive form of cutaneous melanoma, accounting for around 2-3% of all melanoma cases in the United States and other Western countries.^{1,2,3} Unlike other types of melanoma, ALM is largely associated with acral parts of the skin, such as the palms, soles, and subungual regions, and particularly harms

those with darker skin pigmentation.^{4,5} The specific characteristics of ALM pose different obstacles for both diagnosis and management, demanding a specialist approach to its treatment.⁶ Historically, ALM has been associated with poor clinical outcomes and survival rates when compared to other melanoma subtypes.^{7,8} These differences can be linked to numerous factors, including a delayed diagnosis due to the unusual anatomical location of these lesions and a lack of public awareness.^{9,10} Additionally, the biochemical and molecular pathways underlying ALM may differ from those of other melanoma subtypes, contributing to its aggressiveness and resistance to treatment.¹¹

Over the past few decades, advancements in the understanding of ALM's pathogenesis and the development of novel therapeutic approaches have provided hope for improved patient outcomes.⁶ However, the optimal management of ALM remains a subject of ongoing research and debate, and it is essential to continue investigating the most effective strategies for diagnosis, surgical intervention, and adjuvant therapies to ensure better prospects for patients facing this challenging malignancy.¹²

In this context, our study presents valuable insights into the surgical management of ALM, addressing the need for comprehensive data on outcomes and the long-term impact of surgical approaches. We analyzed a descriptive of 50 patients who were diagnosed with acral lentiginous melanoma and subsequently treated at the 1st Affiliated Hospital of Xinjiang Medical University between September 2017 and January 2022. This diverse patient allowed for a comprehensive analysis of the surgical approaches and outcomes for this rare melanoma subtype.

Our investigation explored various surgical approaches, analyzed their respective outcomes, and assessed their impact on patient prognosis. Among the surgical techniques examined, wide local excision,¹³ a standard surgical approach for ALM, was the primary method employed, with no instances of local recurrence observed among the 48 patients who underwent successful wide local excision.

Our research provides a comprehensive dataset, including demographic and clinical characteristics of patients, tumor locations, and surgical outcomes, offering valuable insights into the management of ALM. This study is timely and relevant, given the growing emphasis on personalized medicine in cancer care, and it contributes to the ongoing dialogue on precision medicine and how it can be applied to ALM treatment, optimizing both oncological outcomes and patients' overall well-being.⁶

Methods:

This retrospective study was performed, after obtaining Institutional Review Board approval. We analyzed a descriptive of 50 patients who were diagnosed with acral lentiginous melanoma and subsequently treated at the First Affiliated Hospital of Xinjiang Medical University between September 2017 and January 2022.

Inclusion criteria:

1. Patients with confirmed acral lentiginous melanoma (ALM) according to clinical and histopathological characteristic
2. Patients treated at the 1st Affiliated Hospital of Xinjiang Medical University from September 2017 to January 2022.

Exclusion Criteria:

1. Patients without a diagnosis of ALM
2. Patients whose data or medical records were incomplete or unavailable for analysis.

Preoperative Procedures and Pathology: Patients underwent preoperative skin biopsies to obtain a pathological diagnosis, after which they were informed about their condition and scheduled for surgery.

Surgical Procedure: Upon admission, all patients underwent Mohs surgery, with the extent of excision determined by tumor thickness:

Melanoma in situ: 0.5 cm surgical margin.

Tumor thickness $\leq 1\text{mm}$: 1 cm surgical margin.

Tumor thickness 1-2mm: 1-2 cm surgical margin.

Tumor thickness $\geq 2\text{mm}$ and $\geq 4\text{mm}$: 2 cm surgical margin.

In exceptional cases of tumors with a thickness exceeding 4mm, the surgical margin distance from the tumor remained at 2 cm.

Following excision, the surgical site was covered with sterile gauze. The excised specimen underwent staining and was sent again for pathological examination. Repair and reconstruction proceeded if the tumor was entirely removed.

Surgical Approaches: Wide local excision was the primary surgical approach. Particular attention was given to two scenarios.

Secondary Healing (Toe and Thumb): Surgical sites were allowed to heal naturally without intervention.

Skin Grafting (Sole, Heel): Skin grafting from healthy areas promotes faster healing and reduces complications for specific anatomical sites.

Management of Lymph Nodes: Enlarged lymph nodes led to lymph node clearance in the respective regions. For patients with negative clinical examination of lymph nodes but melanoma thickness exceeding 1mm, a sentinel lymph node biopsy was performed.

Lymph Node Examination and Clearance:

Examination and clearance of groin lymph nodes involve both superficial and deep lymph node procedures. Superficial clearance addresses the nodes under the inguinal ligament, while deep clearance extends to the nodes near the pubic bone, the obturator muscle, and the retroperitoneum. Deep clearance is indicated for pelvic or lymph node-positive cases. Sentinel lymph node biopsy is now part of melanoma treatment guidelines. It is recommended for patients with clinically negative lymph nodes and melanoma thickness over 1mm. For melanomas with 0.76-1mm thickness, biopsy criteria include ulcers, invasion into the Clark IV layer, and mitotic figures. A negative biopsy eliminates the need for further clearance, reducing complications. Decision-making should be multidisciplinary, considering patient characteristics and disease parameters for optimal outcomes and reduced morbidity.

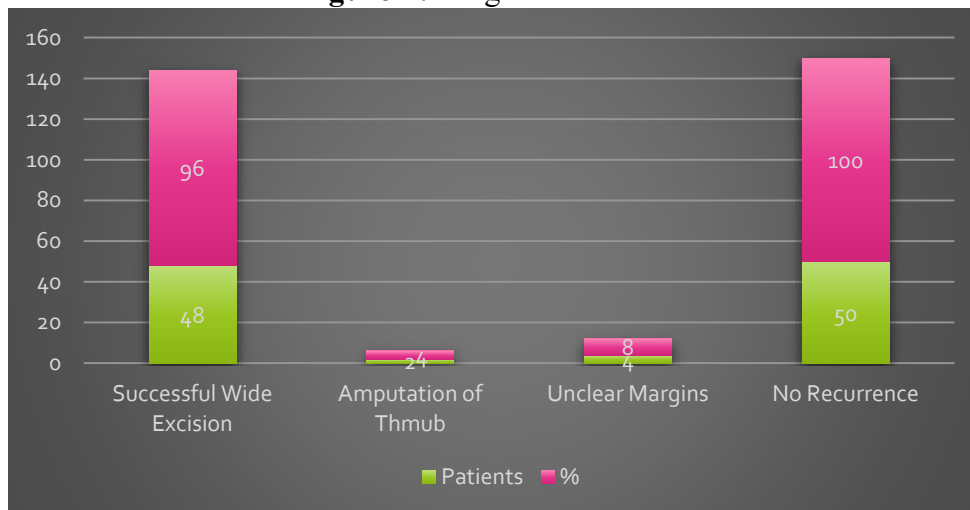
Postoperative Follow-Up & Outcome: Among the 50 patients with successful wide local excision, no local recurrence was observed. The two patients who underwent thumb amputation also did not experience local recurrence (Fig. 1).

Figure 1: Pre and Postoperative Follow-up



The above images depict the progression from pre-operation to post-operation stages. The skin grafts depicted in pictures "C" and "D" show the progress of recovery at corresponding intervals of 3 months and 1.3 years following surgery. Similarly, secondary healing is illustrated in images 'G' and 'H' at 6 months and 1.8 years post-surgery. In particular, the absence of recurrence throughout the follow-up period underscores the success and enduring efficacy of the surgical intervention. These visual representations provide valuable information on the sustained positive outcomes and long-term effectiveness of the procedures performed (Fig. 2).

Figure 2: Surgical Outcomes



Statistical Analysis: Descriptive statistical analysis provided an overview of patient demographics, tumor characteristics, surgical approaches, and clinical outcomes.

Results: The demographic and clinical characteristics provided valuable insights into the patient population under investigation. The age distribution highlighted the predominance of ALM cases in middle-aged to elderly individuals

Demographic and Clinical Characteristics:

The demographic data revealed a diverse age distribution among the patients, with the majority falling within the age range of 41 to 70 years, comprising 72%. Gender distribution indicated that 31 patients were female, while 19 were male. The racial composition included 39 Chinese patients, 6 Uyghur patients, 2 Kazakh patients, and 3 Mongolian patients. The anatomical locations of the tumors varied, with the sole and heel being the most common sites, accounting for 66% of cases (see Table 1).

Table 1: Demographic and Clinical Characteristics of Patients

Characteristic	Number of Patients (%)
Age (years)	
- 21-30	1 (2%)
- 31-40	3 (6%)
- 41-50	10 (20%)
- 51-60	10 (20%)
- 61-70	14 (28%)
- 71-80	9 (18%)
- 81-90	3 (6%)
Gender	
- Female	31 (62%)
- Male	19 (38%)
Race	

- Chinese	39 (78%)
- Uyghur	6 (12%)
- Kazakh	2 (4%)
- Mongolian	3 (6%)
Tumor Location	
- Sole	18 (36%)
- Heel	15 (30%)
- Toe	7 (14%)
- Thumb	10 (20%)

Age Distribution:

The age distribution of the patients encompassed a broad range, spanning from 21 to 90 years. Notably, the majority of patients comprising 72%, were within the age range of 41 to 70 years. This distribution highlighted the predominance of acral lentiginous melanoma cases in middle-aged and elderly individuals. Table 1 demonstrates the age distribution in a clear, quantitative manner.

Table 2: Age Distribution of Patients

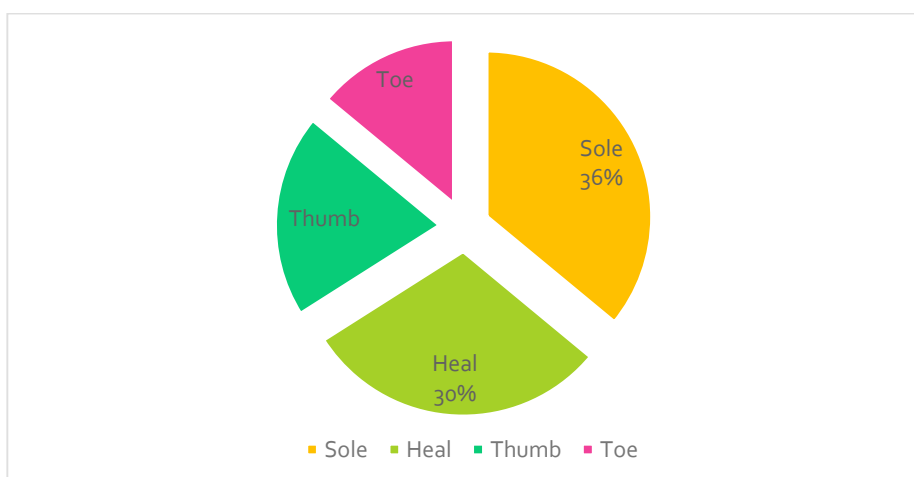
Age Group	Number of Patients	Percentage
21-30	1	2%
31-40	3	6%
41-50	10	20%
51-60	10	20%
61-70	14	28%
71-80	9	18%
81-90	3	6%

The significant representation of patients in the 41-70 age range (see Table 2), further emphasizes the prevalence of acral lentiginous melanoma in this age group

Tumor Location:

The anatomical distribution of tumors across various locations provided essential clinical insights. The sole and heel were identified as the primary sites of tumor occurrence, accounting for 66% of cases. Specifically, the sole was the most common location, with 36% of cases, while the heel accounted for 30% of cases (Fig. 3).

Figure 3: The distribution of tumors across different anatomical sites.



This visual representation simplifies understanding of the anatomical distribution of the malignancy, serving as a valuable tool for clinical decision-making and the planning of therapeutic strategies that acknowledge the preponderance of cases in these regions.

Discussion:

The present study delves into the intricate landscape of acral lentiginous melanoma (ALM), a rare and highly aggressive variant of cutaneous melanoma.³ Our investigation aimed to shed light on the surgical management of this challenging malignancy, focusing on 50 patients treated at the 1st Affiliated Hospital of Xinjiang Medical University between September 2017 and January 2022. This unique patient population allowed for a comprehensive analysis of surgical approaches and outcomes for ALM, with a particular emphasis on wide local excision and its impact on patient prognosis.⁶

The demographic and clinical characteristics of the patient provided valuable insights into the landscape of ALM.^{1,12,14} The age distribution of patients showcased a broad range, with a notable concentration of cases in the age group of 41 to 70 years, comprising 72%. This age distribution reflects a predilection for ALM in middle-aged and elderly individuals, which aligns with historical observations of the disease.^{15,16}

Tumor location played a crucial role in understanding the anatomical distribution of ALM.^{17,18} The sole and heel were identified as the primary sites of tumor occurrence, accounting for a significant 66% of cases. This finding underscores the importance of recognizing the preponderance of ALM in these regions for clinical decision-making and the development of tailored therapeutic strategies.^{17,18}

In terms of preoperative procedures, all patients underwent Mohs surgery, with the extent of wide local excision determined by tumor thickness., a standard surgical approach for ALM.⁶ Among the 48 patients who underwent successful wide local excision, no instances of local recurrence were observed, indicating the effectiveness of this approach in achieving complete tumor removal and clear margins.^{6,13} The success of wide local excision is paramount, given that local recurrence in ALM can significantly impact patient outcomes.

Additionally, we explored two distinct surgical scenarios within our study.¹³ For patients with ALM in the big toe and thumb, secondary healing, allowing surgical wounds to naturally heal without skin grafting, was considered.¹³ The results of this approach were assessed for its suitability in specific anatomical locations. On the other hand, patients with ALM in the sole and heel underwent skin grafting post-surgical excision, promoting faster healing and reducing complications.¹³ These two scenarios reflect the adaptability of surgical management in ALM, tailoring approaches to the unique characteristics of the tumor and its location. Lymph node management included clearance for enlarged nodes and sentinel lymph node biopsy for patients with negative clinical examinations but thicker melanomas.¹⁹

Our study not only contributes valuable insights into the surgical management of ALM but also addresses the growing emphasis on personalized medicine in cancer care.³ As we uncover melanoma's molecular and genetic aspects, tailoring treatment approaches to individual patient needs becomes increasingly significant.¹¹ Our focus on surgical techniques offers a path towards precision medicine, optimizing both oncological outcomes and overall patient well-being.

Limitation:

The limitations include the retrospective design's potential biases, limited generalizability to diverse populations, and the absence of long-term follow-up data. The study focuses on surgical aspects, with less emphasis on molecular insights, warranting cautious interpretation and highlighting the need for further research to address these aspects comprehensively.

Conclusion:

The findings of this study highlight the importance of wide local excision in achieving favorable outcomes in ALM patients, with no local recurrence observed in cases where this approach was successful. The significance of tumor location, notably the sole and heel, reinforces the need for tailored strategies that account for the prevalence of ALM in these areas. Moreover, considering secondary healing and skin grafting in specific scenarios showcases the adaptability of surgical management in ALM. This research contributes to the evolving body of knowledge regarding ALM, offering insights into the challenges and opportunities in managing this aggressive malignancy and advocating for a personalized approach to treatment.

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Conflict of Interest: None

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