

Research Article

Malignant Tumors of Foot and Our Experience: A Case Series

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Abstract

Background: Tumors involving foot are rare to encounter, challenging to manage, and not adequately addressed in the literature. Many institutes are lacking behind in handling such cases. Our study highlighted the issues faced and elaborated on the steps involved in the management of foot tumors.

Objective: To share our experience regarding presentation, management, and functional outcome of foot tumors.

Methodology: This was a retrospective case series done at Jinnah Burn and Reconstructive Surgery Centre, Lahore, from January 2017 to April 2020. Eleven patients with foot tumors were retrospectively identified. We reviewed the following details from each patient's record: Duration of presentation, prior treatments, histological type, grade/stage of the tumor, surgical management, oncological and functional outcome using MSTs (Musculoskeletal tumor society 1987).

Results: Out of eleven patients, five (45.4%) were males and six (54.5%) were females, with a mean age of 48 + 11.8 years. The mean duration of postoperative follow-up was 24.3 + 7.8 months. Histological diagnosis was Squamous Cell Carcinoma (SCC) (n=4), SCC (Marjolin) (n=2), Melanoma (n=3) and Sarcoma (n=2). All tumors were treated with excision under frozen section control and immediately reconstructed with Split thickness skin graft (STSG) in 5 (45.4%) patients, pedicled medial planter in 2 (18.1%), and free Anterolateral thigh flaps (ALTF) in 2 (18.1%). Limb salvaged in all patients except 2(18.1%) who need a trans-metatarsal amputation. The MSTs 1987 scores averaged 24.5 + 8.6. out of a possible 35 points.

Conclusion: Tumors of the foot are rare to encounter but timely referral to specialized center for appropriate treatment results in good functional outcomes.

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Introduction

Soft tissue tumors may occur all over the body, however, due to relative proportions of the tissue from which it originates, most occur in the trunk and proximal extremities. Although not always the case, most soft tissue neoplasms may also arise in the deep and superficial soft tissue of foot.¹ Data from various studies have shown that musculoskeletal tumors arising at the foot account for about 5-10%.²

Squamous cell carcinoma (SCC) rarely occurs in the

foot.^{3,4} It arises in keratinocytes or from precursor lesions and may also originate as de novo.⁴ Literature reports that 13% show up in lower extremities. Among the soft tissue tumors of the foot, SCC is most common, with a slightly greater incidence than melanoma and synovial sarcoma.⁵ Marjolin ulcers are tumors (usually SCC) that arise in pre-existing scars and at the site of chronic inflammation, which reflects the malignant degeneration of tissues. They appear on the plantar side of the foot more frequently and rarely in the toes.⁶

Another challenge for the clinician is the management of foot melanoma which account for 3–5% of all melanoma. Prognostic variables guiding melanoma management of foot have not been adequately evaluated by the literature, as the guidelines are based upon the melanoma arising from trunk and extremities.⁷

Sarcoma of foot involving soft tissue and bone is also a rare entity.⁸ Data from Mayo Clinic revealed a total number of 5124 bone sarcomas out of which foot region accounted for only 1.2%.⁹ Due to the rarity of this condition, a limited number of articles reviewed the prognostic value regarding the clinical outcome of patients with bone and STS of foot.⁹

Although, on this subject, there are enough publications in the literature, many health care providers are still unfamiliar with it, hence the delay in diagnosis and treatment.⁶ Therefore, there is inadequate reporting on disease process and lack of optimization of treatment strategies. The purpose of our study was to share our experience of dealing with tumors of the foot, with emphasis on presentation, surgical management, and functional outcome of this relatively rare condition.

Methods

This study was performed at Jinnah Burn and Reconstructive Surgery Center, Lahore, over a period of 3 years and 3 months (January 2017 to April 2020). After approval of the Institutional Review Board, a retrospective review of all patients (regardless of age and gender) with tumors involving the foot was performed, who were treated surgically by the lower limb team at our center. Demographics such as gender and age were recorded. Data included symptom duration, size of the lesion, tumor type (SCC, sarcoma, melanoma), unplanned excisions or biopsies, and surgical and adjuvant treatment (chemotherapy and radiation). Complications following surgery, the outcome of oncological treatment (local recurrence or metastasis, and death from disease), and functional outcomes as evaluated by Musculoskeletal Tumor Society scores were reviewed.¹²

All patients were subjected to routine physical examination and staging of disease. X-rays and MRI of foot was done to see the extent of local involvement. A CT scan of the chest and abdomen was done to check the metastasis. The diagnosis was confirmed by an Incisional biopsy. After the MDT meeting, surgical treatment was carried out accordingly.

Standard treatment protocol was followed, and all

tumors were excised under frozen section control. SCC was excised with 2cm margin, Marjolin with 4cm, melanoma was excised according to Breslow thickness, and sarcoma with wide local excision (3 cm margin). All the wounds were covered with split-thickness skin graft and flaps accordingly. Later on, all were advised to follow-up with the radiation and medical oncologist with the biopsy report.

We assessed functional outcome by using the musculoskeletal society score (MSTS 1987). It consists of 7 components which include pain, motion, stability, strength, deformity, functional activity, and emotional acceptance. The total score ranges from 0-35 with each component scored from 0-5. A higher score is attributed to good functional outcomes.

The data was analyzed using SPSS version 20. Quantitative variables like age, duration, size of the lesion, and follow-up months were evaluated in terms of mean and standard deviation. Frequency and percentage were evaluated for qualitative variables. The potential relationship between prior treatment and symptoms duration with local recurrence was evaluated by using the Pearson Chi-square test.

Results

Total 11 patients were identified, among them 5 (45.4%) were males and 6 (54.5%) females. Mean age of patients was 48+11.8 years. Duration of postoperative follow up was 24.3 + 7.8 months. Unplanned excision prior to referral were 7 (63.6%) while 4 (36.3%) patients received were not treated before. Out of 11 patients, 3(27.2%) had regional metastasis at time of presentation. The histological diagnosis of tumors were SCC (n = 4), SCC (marjolin) (n=2), invasive melanoma (n=3), and sarcoma (clear cell and spindle cell lesion)(n=2). The location of tumor was hind foot (n = 5) midfoot (n= 3) and fore-foot (n=3). Regarding size of lesions, 3 were <5 cms, 6 were between 5 – 10cms, and 2 were > 10 cm. The average duration of symptoms was 29.5+7.8 months.

Surgical management consisted of excision of the tumor followed by immediate reconstruction. This was in the form of split-thickness skin graft in 5(45.4%) patients, local flaps (medialplanter) in 2 patients (18.1%), while 2 (18.1%) patients required free flap (ALTf)(figure 1). Limb salvage was achieved in all patients except in 2 (18.1%) who needed amputation (trans metatarsal amputation and choparts amputation).

Neoadjuvant chemotherapy was not offered in any

patient.⁴ patients received post operative chemo and radiotherapy. A total of four patients experienced post-operative complications: three (27.2%) patients had a small patchy loss of split-thickness graft that was managed with topical antibiotics cream; one (9.0%) patient had a small necrotic patch over the stump that was managed successfully with debridement and allowed

to heal secondarily. The average MSTS 1987 scores of all patients was 24.5 + 8.6(out of a total of 35).

Demographic data including presentation, diagnosis, management, and functional outcome of all 11 patients are presented in Table 1. Figure 1 and 2 show representative cases.

Table 1: Clinical Characteristics and Treatment Details of all Patients

S. No	Age/ gender	Tumor type	Size (cm)	Symptom duration (months)	location	Prior treatment	Operative treatment	Chemo/ radiation therapy	Local recurrence	Follow-up (months)	MSTS
1	37/F	SCC	13	36	Hindfoot	Inadequate excision	WLE (2cm)/ STSG	Yes	yes	6	died
2	26/M	scc	4	19	Forefoot	None	WLE (2cm)/ STSG	No	No	31	30
3	60/F	scc	5	26	Hindfoot	Biopsy	WLE (2cm)/ STSG	No	No	26	28
4	41/M	STS	5	15	midfoot	None	WLE (2cm)/ STSG	No	No	23	30
5	57/F	scc	8	24	midfoot	None	WLE (2cm)/ STSG	No	No	30	30
6	45/M	STS	8	34	midfoot	Biopsy	WLE (3cm)/ ALTF	Yes	No	14	26
7	55/M	melanoma	6	38	Hindfoot	Inadequate excision	Choparts amputation	No	No	27	25
8	38/F	melanoma	2	35	Hindfoot	None	WLE (2 cm)/ medial plantar flap + RLN	Yes	No	25	28
9	52/M	melanoma	5	26	Hindfoot	Debridement	WLE (2 cm)/ medial plantar flap + RLN	Yes	No	30	27
10	55/F	SCC (marjolin)	7	35	Forefoot	Biopsy	WLE (4 cm)/ALTF	No	No	26	25
11	65/F	SCC (marjolin)	15	37	Forefoot	Debridement	Trans-metatarsal amputation	No	No	30	21

M=male, **F=**female, **SCC=** squamous cell carcinoma, **STS=**soft tissue tumor, **WLE=**wide local excision, **ALTF=**antero-lateral thigh flap, **RLN=**regional lymph node



Figure 1. (a): Melanoma Heel, (b): Medial Planter Artery Flap After Tumor Excision And Donor Site Covered With Stsg, (c): Sentinel Lymph Node Dissection



Figure 2. (a): Sarcoma Foot, (b): Tumor Excised, (c):free Alt Flap

Discussion

Our study exclusively highlighted the presentation, surgical management, and outcomes of soft-tissue tumors involving the foot. Generally, the number of musculoskeletal tumors are very less, the total number of true neoplasia of the foot and ankle is small. Although the compact anatomy should facilitate early detection of tumors of the foot and ankle, the correct diagnosis is often missed due to a lack of awareness of these entities. Additionally, the malignant potential of a tumor on the foot is often underestimated.¹⁰

In our study, 7 (63.6%) patients were received in OPD after prior unplanned excision. Many tumors show indolent potential, which makes the clinician perceive a false impression of benignity that ultimately prompts inappropriate surgical management.¹¹ Giuliano and Eilber¹² created the phrase “unplanned total excision” regarding the attempted entire excision of STS without suitable imaging or biopsy and without taking care of recommended surgical margins which resulted in positive residual disease in almost one-half of excised tumors. Thacker and colleagues extracted similarly high rates (67% and 56%) in patients who underwent unplanned excisions, ensuing greater reconstructive and radiotherapy needs and probably increased chances of local recurrence despite aggressive definitive management.¹³ With respect to oncologic outcomes, patients presenting after unplanned excisions fared worse than those who present early, with more than half of such patients reporting local progression.¹³ In our study, we found an insignificant ($P=0.62$) relationship between unplanned excision of tumors with local recurrence of the disease.

Patients mostly belong to rural areas of the country and clinicians are unaware of these rare entities, therefore presenting to tertiary care facility very late. The meantime of presentation to lower limb OPD was 29.5 ± 7.9 months. The late presentation resulted in progression and worsening of disease ($p=1.92$). Despite vast literature, and years of education regarding the importance of timely assessment of soft-tissue masses, there is still an obvious need to educate health workers who manage these patients primarily.

Limb salvage has evolved as a standard of care for most STS of the limbs. Habib, et al.¹⁴ in their study advocated 80% of tumor surgeries being done with the principle of limb salvage. It has now emerged as the norm in the management of musculoskeletal tumors

without compromising the survival and recurrence of the tumor. We also tried to spare the limb in 9(81.8%) patients out of 11. The key points of optimal management of soft tissue tumors are appropriate biopsy, correct diagnosis, accurate staging of the tumor, effective planning and execution of surgery, rational usage of adjuvant therapies, and surveillance after resection. These can be carried out effectively by a multidisciplinary team (MDT) at a tertiary care center, which along with the plastic surgery team, specializes in the care of tumor patients, with the aim of limb salvage, using complex techniques of flap reconstruction. We did a free ALT flap in 2 patients and pedicle medial plantar flap in 2 patients. We did amputation in 2(18.1%) patients where tumor involved underlying bony structures.

Regarding the management of all tumors of the foot, we always did resection of the tumor under frozen section control with recommended margins. We excised SCC with 2cm margins, marjolin with 4cm, melanoma according to Breslow thickness of the tumor, and sarcoma with 3 cm margins.^{6,15,16,17} Frozen section provides a rapid assessment of the extent of disease, and allows achievement of negative margins.¹⁸ We believe that once the primary tumor with microscopic free margins is excised, the chances of local recurrence of disease are minimum. Although the follow-up period was short (minimum 6 months), our study only had one patient with local recurrence. Most localized soft tissue sarcomas of extremity are best treated surgically with or without radiation therapy. Chemotherapy is usually reserved for patients with metastatic disease or less commonly for local tumor down-staging for very extensive lesions which might not otherwise be amenable to limb-sparing surgery.¹⁹ For SCC, radiotherapy is indicated only for local control of disease, while the efficacy of chemotherapy is still debatable. Generally for melanoma, Shaikh et al¹⁹ reported 4.98% sentinel lymph node positivity, and another research has reported 20.6% to 23.6% positive lymph node involvement.²⁰ We noted a significantly high rate of 66.6% (2 out of 3 patients) of positive sentinel lymph nodes in our study of foot melanoma.

The limitation of this study is that it has a small sample size. Further studies can be conducted on a larger scale. Moreover, different types of tumors can be separately addressed.

Conclusion

Tumors of the foot are frequently subject to inappro-

appropriate initial treatment, delaying both diagnosis and definitive procedure, and potentially compromising outcomes. Most patients are candidates for complete or partial limb salvage, with generally good oncologic and functional outcomes. If such patients are referred early to a specialized center, a good prognosis would be achieved by following the basic oncoplastic reconstructive principles to treat tumors of the foot.

Conflict of Interest

None

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