

## FOREQUARTER AMPUTATIONS AT THE MOI TEACHING AND REFERRAL HOSPITAL

**E.N. Muteti**, MMed, FCS (Ortho), Department of Orthopaedics and Rehabilitation, School of Medicine, Moi University/Moi Teaching and Referral Hospital, Eldoret, Kenya, **N. Busakhala**, MBChB, MMed (Intern Med), Department of Medicine, School of Medicine, Moi University/ Moi Teaching and Referral Hospital, Eldoret, Kenya, **H. Vagdama**, MD, MMed (Ortho), Consultant Orthopaedic Surgeon, Moi Teaching and Referral Hospital, Eldoret, Kenya and **D. Lagat**, BSc (Nurs), Department of Surgery and Anesthesiology, School of Medicine, Moi University, Eldoret, Kenya

**Correspondence to:** Dr. Elijah N. Muteti, P. O. Box 1998-30100, Eldoret, Kenya. Email: enmuteti@gmail.com

### ABSTRACT

**Background:** Forequarter amputation is an uncommon procedure. It is performed for high grade sarcomas of the proximal humerus, scapula and axillary region; that are not responding to induction chemotherapy or tumour progression with vascular invasion.

**Objective:** To document the indications and results of forequarter amputations done at the Moi Teaching and Referral Hospital.

**Methods:** Records of patients that had received a forequarter amputation in Moi Teaching and Referral Hospital between February 2012 and February 2017 were retrieved. The patient's demographics, indication for surgery, complications and duration of survival post-operatively were noted and further analyzed.

**Results:** A total of twelve patients were found that had a forequarter amputation done on their upper extremity. Eight were male while four were female. Ten patients (83.3%) were operated on for sarcomas including: synovial sarcoma, neurofibrosarcoma, Ewing's sarcoma, Kaposi's sarcoma, rhabdomyosarcoma, enchondroma, osteosarcoma and poorly differentiated sarcoma. Two patients (15.4%) were operated for squamous cell carcinoma. All the amputations were primary surgeries. Survival was 77.7% at six months and 44.4% after one year.

**Conclusion:** The most common indication for forequarter amputation was a limb sarcoma. A one-year survival rate of 44.4% was found following forequarter amputation of a limb.

### INTRODUCTION

Forequarter amputation entails surgical removal of the entire upper extremity, including the scapula and clavicle (1). Forequarter amputations traditionally were performed for high grade sarcomas of the proximal humerus, scapula and axillary region with neurovascular involvement (2-4). Currently, the most frequent indication for amputation in these tumours is failure to respond to induction chemotherapy and/or tumour progression with vascular or brachial plexus invasion. Forequarter amputations are thus performed as a last resort in those cases with excessive fungating tumour growth, ulceration, impending vascular disruption, paralysis, sensory disorders and lymphatic edema (5). Despite the disfiguring experienced by the patients, forequarter amputation is an effective procedure to cure and palliate tumours of the upper extremities (6). The cosmetic and functional deficit is usually well tolerated in carefully selected patients who

are suffering intractable pain from a dysfunctional limb.

Forequarter amputation surgeries per se may not necessarily prolong life. Because of this, this type of surgery has been on the decrease in developed world; in favour of limb salvage surgery. In our experience, we have noted that patients delay in seeking medical assistance, making limb salvage less appealing. Therefore, 2-3 patients every year receive this procedure in Moi Teaching and Referral Hospital. This study thus seeks to determine and document the indications for this uncommon surgery performed in MTRH as well as patient survival following forequarter amputations done between February 2012 and February 2017.

### MATERIALS AND METHODS

Between February 2012 and February 2017, twelve patients were treated by forequarter amputation at the Moi Teaching and Referral Hospital and were all included in this retrospective study.

Approval to conduct this study was obtained from Institutional Research and Ethics Committee of Moi University/ Moi Teaching and Referral Hospital. Patients' data concerning their medical history and hospitalization was obtained from their files. Follow up data regarding clinical course, outcome and survival was collected from patients' records and telephone interviews of their next of kin.

## RESULTS

At the time of treatment, the patients' age averaged 28.8 years (mode 26; range 11-57 years). Four were female while eight were male. Ten (83.3%) were operated on for sarcomas including one synovial sarcoma, one neurofibrosarcoma, one Ewing's sarcoma, one Kaposi's sarcoma, one rhabdomyosarcoma, one enchondroma, three osteosarcomas and one poorly differentiated sarcoma. Two (15.4%) were operated for squamous cell carcinoma. The tumour was located in the

proximal humerus in nine patients, the shoulder in one patient, the arm in one patient and the elbow in one patient.

The twelve amputations were performed as initial surgeries since limb salvage was not possible. Five patients had metastatic disease at the time of forequarter amputation and were treated with palliative intention. Three out of the twelve had received preoperative chemotherapy while seven received adjuvant chemotherapy postoperatively.

No intra operative death occurred. Three patients were lost to follow-up. Mean follow up time was nine months (range 4 months -21 months). Eight patients died in the course of follow-up. One was still alive at the point of writing of this article. Survival was 77.7% at six months and 44.4% at one year. Two complications were noted: one patient had local tumour recurrence while one patient had delayed wound healing. A summary of patients' information is given in Table 1.

**Table 1**  
*Patient-related synoptical table*

SN	Sex	Age at amputation (years)	Location of tumour	Diagnosis	Metastasis	Chemotherapy	Survival (Months)	Status
1	M	27	Left elbow	Synovial sarcoma		Adjuvant	21	D
2	M	26	Left upper limb	Neurofibrosarcoma	Lungs		8	D
3	M	26	Right upper limb	Kaposi's sarcoma		Adjuvant	6	D
4	M	42	Left upper limb	Squamous cell carcinoma				LOF
5	M	28	Left proximal humerus	Chondrosarcoma		Adjuvant		LOF
6	F	11	Left proximal humerus	Osteosarcoma		Preop/ Adjuvant	19	D
7	F	17	Right humerus	Rhabdomyosarcoma		Preop/ Adjuvant	18	D
8	F	26	Left shoulder malignant tumour	Poorly differentiated sarcoma	Lungs			LOF
9	M	42	Right proximal humerus	Ewing's sarcoma	Pleura/ mediastinum	Pre op/ Adjuvant	8	D
10	M	28	Left upper limb	Metastatic osteosarcoma	Lungs		4	D
11	F	15	Right proximal humerus	Osteosarcoma		Adjuvant		Alive
12	M	57	Right upper limb	Squamous cell carcinoma	Lungs		5	D

A-Alive D-Dead LOF- Loss of follow up

**Figure 1**

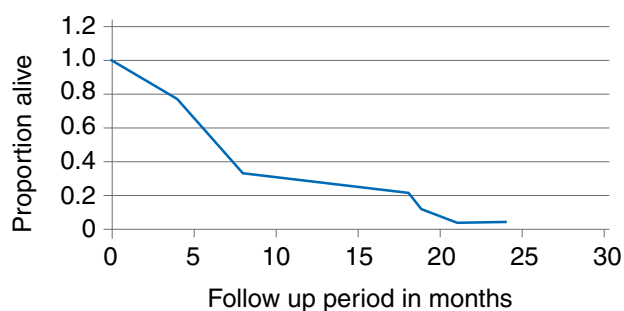
Pre-operative image

**Figure 2**

Post-operative image

**Figure 3**

Overall survival after very proximal survival

**Survival curve**

## DISCUSSION

Forequarter amputations due to malignant tumours have become rare but are still a valuable treatment option in palliation (5). The goal is to radically remove the bones and the soft tissue of the affected extremity. The procedure is currently limited to cases of advanced disease that are unmanageable by a less radical approach or in patients with recurrent tumours in whom limb salvage is not feasible anymore (7).

The mean age for the patients requiring a forequarter or hindquarter amputation in the current study represents a young adult population. This is like that reported in other parts of East Africa (8). Western literature reports a median or mean age in the fifties. The indications for the amputation were consistent with the recommendations of Malawer *et al* (9). All the cases were due to malignancies, the most common reason being a sarcoma. None of them was post-traumatic and neither was carcinoma of the breast found to be an indication for this kind of surgery in the current study. Other malignancies that have been reported as indications for major limb amputation are: bone metastasis from renal

cell carcinoma (10), squamous cell carcinoma (11), metastatic melanoma (12) and non-metastatic tumours such as desmoid tumour or aggressive fibromatosis (13). All the tumours were large (more than 10cm diameter) and the disease was extra-compartmental. Four were fungating and three of these were bleeding persistently. Pain was universal. Pathologic fracture was noted in two cases and joint destruction/involvement was seen in one case. These tumours were deemed not amenable to limb salvage.

The technique of forequarter amputation employed was the posterior approach as described by Littlewood (14). This was chosen since it is described as technically easier and has better hemostasis. Primary closure was achieved except one case that required skin grafting. Modifications to the local soft tissue flaps were made to accommodate the tumour and allow at least a two-fingerbreadth margin from the tumour. No chest wall resection was required in any of our patients.

The most important aim of forequarter amputation of the extremity is to obtain local tumour control. In the current study, one patient with squamous cell carcinoma of the right proximal humerus had local recurrence after 3 months. Published rates of local recurrence range from 0 to 25% depending on the length of follow-up, treatment intent and histological diagnosis (7, 12, 13, 15). Local control of tumours especially sarcomas of the shoulder girdle after surgery alone is possible in up to 90%. Clark and Thomas (3) reported a local recurrence rate of 27.8%, and Fanous *et al* (15) reported 14% local recurrence after FQA for soft-tissue sarcoma.

Levine *et al* (13) in their series of ten patients with soft-tissue tumours reported a 100% ten-year survival rate, but they included patients with locally aggressive non-metastatic conditions such as fibromatosis. In our series, all patients had high-grade tumours and our results indicate a 44.4% overall one year survival. Patients requiring forequarter often present with a high incidence of distant metastases. Like in our study, five patients had tumour metastases which is indicative of poor prognosis. The benefit of these palliative amputations for such patients needs to be studied further since the patients die within one year. Similar observations were made in a study by Malawer *et al* (9) who reported a median survival of 13 months in patients done amputation for palliation. Despite the documented short survival, we believe the amputation was justified for pain relief, haemorrhage control and avoid/

treat fungation. The quality of life and patient independence is thus improved.

This present study was retrospective in design and enumerates a small group of patients demonstrating that this operation is uncommon even in large centers. The follow-up periods were short thus presenting the short-term outcomes of this surgery in a developing world set-up. The effect of adjuvant therapy was not evaluated.

## CONCLUSION

The most common indication for a forequarter amputation was a limb sarcoma for which limb sparing procedures were not applicable. The goal of treatment was palliative. Soft tissue healing difficulties and local recurrence were the most common complications. A one-year survival rate of 44.4% was found following a forequarter amputation.

## REFERENCES

1. Malawer, M.M. and Sugarbaker, P.H., editors. Musculoskeletal cancer surgery: treatment of sarcomas and allied diseases. Springer Science & Business Media; 2007 May 8.
2. Goodman, M.D., McIntyre, B., Shaughnessy, E.A., et al. Forequarter amputation for recurrent breast cancer: a case report and review of the literature. *J Surg Oncol.* 2005; **92** (2):134-141.
3. Clark, M.A. and Thomas, J.M. Amputation for soft-tissue sarcoma. *The Lancet Oncol.* 2003; **4** (6):335-342.
4. Lusk, M.D., Kline, D.G. and Garcia, C.A. Tumors of the brachial plexus. *Neurosurg.* 1987; **21**(4):439-453.
5. Daigeler, A., Lehnhardt, M., Khadra, A., et al. Proximal major limb amputations—a retrospective analysis of 45 oncological cases. *World J Surg Oncol.* 2009; **7**(1):15.
6. Yoak, M.B., Cocke, W.M. Jr and Carey, J.P. Interscapulothoracic amputation. *W V Med J.* 2001; **97**:148-150.
7. Bhagia, S.M., Elek, E.M., Grimer, R.J., et al., Forequarter amputation for high-grade malignant tumours of the shoulder girdle. *J Bone Joint Surg Br.* 1997; **79**:924-926.
8. Lupondo, V.M., Museru, L.M. and Mcharo, C.N. Forequarter amputation at Muhimbili Orthopaedic Institute: indications and outcome. *East Central Afr J Surg.* 2011; **16**(1): 113-118.
9. Malawer, M.M., Buch, R.G., Thompson, W.E., et al. Major amputations done with palliative intent in the treatment of local bony complications associated with advanced cancer. *J Surg Oncol.* 1991; **47**:121-130.
10. Wittig, J.C., Bickels, J., Kollender, Y., et al. Palliative forequarter amputation for metastatic carcinoma to the shoulder girdle region: indications, preoperative evaluation, surgical technique, and results. *J Surg Oncol.* 2001; **77**: 105–113.
11. Johnston, E.A., Namm, J.P. and Reeves, M.E. Major extremity amputation for nodal metastasis from squamous cell carcinoma. *J Surg Oncol.* 2006; **93**: 76–79.
12. Jaques, D.P., Coit, D.G. and Brennan, M.F. Major amputation for malignant melanoma. *Surg Gynecol Obstet.* 1989; **169**: 1–6.
13. Levine, E.A., Warso, M.A., McCoy, D.M., et al. Forequarter amputation for soft tissue tumours. *Am Surg.* 1994; **60**:367-370.
14. Littlewood, H. Amputations at the shoulder and at the hip. *Br Med J.* 1922; **1**:381.
15. Fanous, N., Didolkar, M.S., Holyoke, E.D., et al. Evaluation of forequarter amputation in malignant diseases. *Surg Gynecol Obstet.* 1976; **142**: 381–384.