ORIGINAL ARTICLE

Ortho-Oncoplastic reconstruction of lower limb sarcomas

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Abstract:
Objective: The aim of this study is to share our experience with using free tissue reconstruction in lower limb sarcomas and to assess functional outcomes after reconstruction.
Study design: Descriptive cross sectional study.
Setting: Burns and Plastic Surgery Center, Peshawar.
Material and Methods: This is a descriptive cross sectional study. Patients with biopsy proved sarcomas were included in the study after informed consent and IREB approval. Patients underwent tumor excision and free tissue transfer. Functional outcome was measured by assessing independent mobility of the patient after recovery.
Results: A total of 10 patients presenting with sarcoma of the lower limb were operated. Mean age of the patients was 25.80±9.72. 9-patients (90%) were male and 1(10%) was female patient. Success rate for free micro vascular tissue transfer was 90%. 9(90%) patients could embolized autonomously 6-months post-operatively.
Discussion: Several treatment modalities are available in patients with lower limb sarcomas. Although most of the patients still unfortunately end up with amputation in a low resource setting, the reconstruction options available are implants, and allografts. Autografts along with free vascularized tissue is also a reliable method and is easy to do in a low resource setting.
Conclusion: By employing the use of vascularized tissue transfer along with bone autografts, limb salvage can be achieved in majority of the patients. It is more economical and natural. The only issue with this technique is the long recovery time.

Keywords: Free tissue transfer, sarcoma, reconstruction, free fibula flap, lower limb sarcoma

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Introduction:
The incidence of sarcoma is rising as compared to other types of malignancies.[1] Lower limbs are one of the most common sites involved. Several studies have shown that soft tissue sarcomas are more prevalent compared to the bone sarcoma.[2,3] The 5-year mortality for soft tissue sarcoma is less than that for the bone sarcomas.[1] This disease can significantly decrease the quality of life of the patient. This can also incur significant health care costs for the hospitals as well.[4]

Conventional treatment option for such patients is amputation of the involved limb. This can significantly increase the disability adjusted life years (DALY) for the sarcoma patients. Reconstruction of the lower limb in such cases can help most patients achieve mobility and improve their quality of life.[5]

Reconstruction is lower limb sarcoma is a challenging task. Aggressive resection can leave the defects that are difficult to reconstruct and can severely impact on the mobility of the patient. In most cases, amputation is done and patient is fitted with a prostheses for mobility. The problem exacerbates in patients with patients who present late for treatment. Limb salvage in these cases can not only improve the quality of life of the patient, but it also increases productivity of

Figure 1: tumor involving the ankle of the patient. B. Defect after excision. C. Osseocutaneous free fibular transfer along with skin grafting

the patient. The aim of this study is to share our experience with using free tissue reconstruction in lower limb sarcomas and to assess functional outcomes after reconstruction.

Material and Methods:

Study design: Descriptive cross sectional study.

Duration: January 2018 to December 2021.

Setting: Burns and Plastic surgery Center, Peshawar.

Surgical technique: Patients who had undergone work-up on Orthopedic Department and presenting with biopsy proven soft tissue sarcoma to the plastic surgery out-patient clinic were included in the study. The extent of the disease was determined and resection margins were decided upon in the MDT meeting. First, tumor was resected by the ortho-oncology team. Resection was done up to one layer below the tumor. This was followed by identification of the recipient vessels and their preparation for microvascular anastomosis.

Once the resection was complete, reconstruction of the defect was started by harvesting the free fibula. Head of the fibula and lateral malleolus are marked and a line is drawn between them. Incision begins on the lateral surface of the leg on the dotted line a few centimeters below the head of fibula, in a lazy S shape. Only concern here was to preserve the common peroneal nerve. Muscle of the lateral compartment are dissected away from the fibula leaving a 2mm cuff of muscle tissue over the fibula. Muscles of anterior and posterior compartment were also dissected away leaving a cuff of 2mm muscle on the fibula, while preserving the neurovascular structures.

Osteotomies are made according to the length of the bone needed and according to the pedicle length needed. Distal bone is harvested if a long pedicle is needed. An autoclaved devascularized autograft was used as a scaffold for housing the vascularized free fibula transfer.[6-8]

Data collection: Data was collected after getting approval from ethical committee. Data was collected using patient records. Data regarding patient age, gender, type of sarcoma and stage of the disease was collected from the patient records. Data regarding flap re-exploration and post-operative complications was also collected. Data regarding functional mobility was also collected.

Data analysis: Data was analyzed using open source software GNU PSPP 1.6.2. Univariate analysis was done to calculate the frequencies and percentage for gender, stage of the disease. Mean and standard deviation was calculated for patient age. Percentage was calculated for the number of patients that achieved independent mobility.

Results:

A total of 10 patients presenting with sarcoma of the lower limb were operated. Mean age of the patients was 25.80±9.72. 9-patients (90%) were male and 1(10%) was female patient. 1-patient had chronic hepatitis B and C infection. There were no comorbidities in other patients. 6-patients had sarcoma involving the femur while 4-patients presented with sarcoma involving the tibia as shown in figure 1. A total of 12 fibula flaps were done. In 2-cases, the pedicled fibular flap was also done along with the free fibula as shown in figure 2 and 3. We anastomosed one artery and two veins in each case for the free fibula tissue transfer.

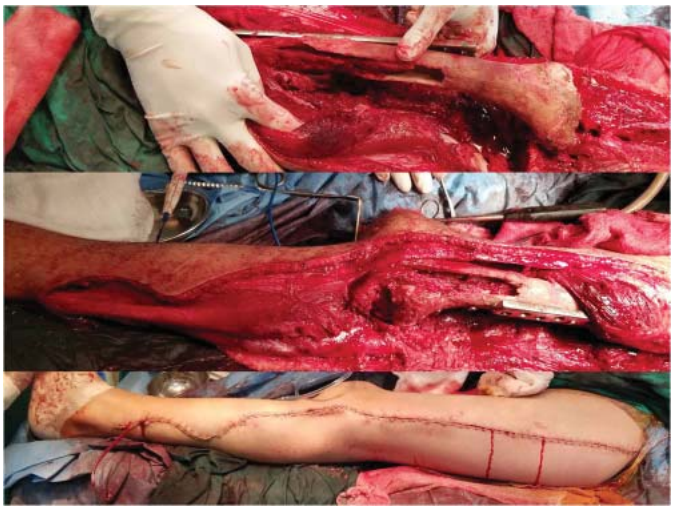

Figure 2: Devitalized femur containing the tumor was autoclaved extracorporeally. A. Medial view; Femur inset into the thigh showing a window made for inserting a free vascularized fibula harvested from the contralateral limb. B. Lateral view showing a second window in the femur distally, padicaled fibular flap flipped into the defect to cover the lower extend of the defect. C. Wound site after closure.

Figure 3: Shows radiographs of the same patient in figure 2. A. Shows the bony lesion on the radiograph. B. Shows the free fibula transfer to the proximal femur medullar cavity. C. Showing both the proximal free fibula and the distally padicaled flipped fibula in the medullary cavity.

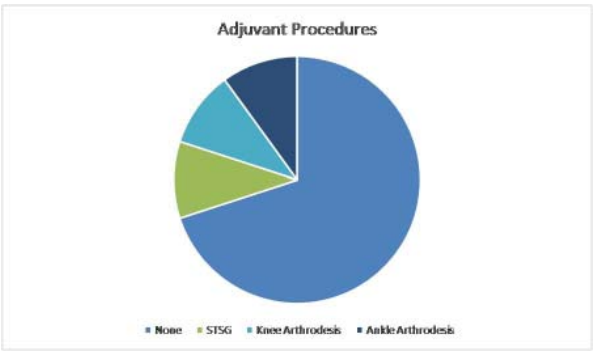

Figure 4: Adjuvant procedures done along with vascularized free fibular transfer

Early complications were observed in 3-patients Figure 4. 1-patient with venous congestion was re-explored and microvascular anastomosis was revised but the flap did not survive and lead to flap failure. Success rate for free micro vascular tissue transfer was 90%. 9(90%) patients could walk autonomously six months post-operatively.

Discussion:

In this study most of the patients were adult males. Studies show that sarcomas can occur in any age group, but the incidence is highest in young adults.[9,10] A population based study conducted on predominantly caucasian population in Europe reported the male to female ratio of 0.8, however, this can slightly vary for other populations owing to the complex multifactorial pathophysiology and incidence of viral infections in the population.[11]

As all our patients had bony and soft tissue defects after the excision, fibula flaps were done to cover the defects. In some cases with large defects of the femur, two fibular flaps were done. The two flaps accelerate the bone healing and help attain the required bone width to achieve mobility. A single bone transfer to the femur defect results in a weak link in the bone and the patient can take a substantially long time to attain mobility. In such cases, free fibula was harvested from the contralateral side and the ipsilateral fibula was islanded on the pedicle and flipped in place. In leg defects, a single free fibula was harvested for the recipient defect.

Allografts have been traditionally used for a massive lower limb defects for limb salvage. However it is mired with increasing periods of immobilizations, bony non-union, fractures and infection.[12] Capanna et al observed that bone take is much better when allografts are used along with vascularized tissue transfer like free or pedicled fibular flap.[8] This improves the recovery time of the patient.[13,14] In places where there is limited access to allografts, it is much easier to use autografts for the purpose. The tumor containing bone is irradiated or autoclaved extracorporeally and then used to house the vascularized free fibula. The patient is able to

ambulate relatively quickly and assume his daily activities of living.

Prosthesis has also been used to replace the tumor containing bone, however, they have their own set of problems. Risk of infection is very high in these patients and require meticulous aseptic technique. Muscle attachment to the implant is also not seen, as is the case with the allografts or autografts.

The limitations of our study is that it is retrospective in nature. Data was obtained from the patient records. Due to small sample size, our patient population is predominantly male. The male to female ratio would have been more representative of the prevalence in the general population in a larger sample size.

Conclusion:
By employing the use of vascularized tissue transfer along with bone autografts, limb salvage can be achieved in majority of the patients. It is more economical and natural. The only issue with this technique is the long recovery time. Further work needs to be done to improve the outcomes further. Large scale studies need to be conducted to establish the efficacy of these treatment options

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Role and contribution of authors:
Syed Asif Shah, study design, data collection, data analysis, writing, proof reading.

Waqas Hayat, study design, data collection, data analysis, writing and proof reading.

Zeeshan Khan, data collection, writing, proof reading.

Muhammad Bilal, data collection, writing, proof reading.

Irfan Ullah, data collection, proof reading.

Zeeshan Faisal, data collection, data analysis

References:

1. Memon AA, Siddique FG, Abro AH, Agha AH, Lubina Shahazadi, Memon AS. An audit of secondary peritonitis at a tertiary care university hospital of Sindh, Pakistan. World J Emerg Surg. 2012Mar;7:6.
2. Ordonez CA, Puyana JC. Management of peritonitis in thecritically illpatient. SurgClin North Am. 2006 Dec;86(6):1323-49.
3. van Ruler O, Boermeester MA. Surgical treatment of secondary peritonitis: a continuing problem. Chirurg. 2017;88(Suppl 1):1-6.
4. Wani RA, Parry FQ, Bhat NA, Wani MA, Bhat TH, Farzana F. Non-traumatic terminal ileal perforation. World J Emerh Surg. 2006;1:7.
5. Calandra T, Cohen J, International Sepsis Forum Definition of Infection in the ICU Consensus Conference. The international sepsis forum consensus conference on definitions of infectionin the intensive care unit. Crit Care Med. 2005 Jul;33(7):1538-48.
6. Vincent JL, Rello J, Marshall J, Silva E, Anzueto A, Martin CD, et al. International study of the prevalence and outcomes of infection inintensive care units. JAMA. 2009 Dec 2;302(21):2323-9.
7. Doherty GM, editor. Current diagnosis and treatment, Surgery. 13th 82edition. New York: The McGraw-Hill Companies, Inc.; 2010:464-8.
8. Hameed T, Kumar A, Sahni S, Bhatia R, Vidhyarthy AK. Emerging spectrum of perforation peritonitis in developing World. Front Surg. 2020 Sep 15;7:50.
9. Sharma S, Kaneria R, Sharma A, Khare A. Perforation peritonitis: a clinical study regarding etiology, clinical presentation andmanagementstrategies. IntSurg J. 2019 Nov 26;6(12):4455-9.
10. Ross JT, Matthay MA, Harris HW. Secondary peritonitis: principles of diagnosis and intervention. BMJ. 2018 Jun 18;361.
11. Nascimbeni R, Amato A, Cirocchi R, Serventi A, Laghi A, Bellini M, et al. Management of perforated diverticulitis withgeneralized peritonitis: a multidisciplinary review and positionpaper. Tech Coloproctol. 2020 Nov 5:1-3.
12. Bhandari TR, Poudel R, Chandra K. Effect of early surgery onoutcome in perforation peritonitis. J UniversColl Med Sci. 2017;5(1):12-6.
13. Boyer A, Vargas F, Coste F, Saubusse E, Castaing Y, Gbikpi-Benissan G, et al. Influence of surgical treatment timing onmortality from necrotizing soft tissue infections requiring intensive care management. Intensive Care Med. 2009 May;35(5):847-53.
14. Strobel O, Werner J, Büchler MW. Surgical therapy of peritonitis. Chirurg. 2011 Mar;82(3):242-8. 15.Pouli S, Kozana A, Papakitsou I, Daskalogiannaki M, Raissaki M. Gastrointestinal perforation: clinical and MDCT clues for identification of aetiology. Insights into Imaging. 2020 Dec;11(1):1-9. 96.
15. Hameed T, Kumar A, Sahni S, Bhatia R, Vidhyarthy AK. Emerging spectrum of perforation peritonitis in developing world. Frontiers in Surgery. 2020 Sep 15;7:50.
16. Afridi SP, Malik F, Ur-Rahman S, Shamim S, Samo KA. Spectrumof perforation peritonitis in Pakistan: 300 cases Eastern experience. WorldJEmerg Surg. 2008 Nov 8;3:31.