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Orthopaedic Oncology Surgery: Surgical Management of Bone and Soft Tissue Tumor, Limb Salvage Techniques, and Reconstruction Options

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Abstract

Background: Orthopaedic oncology is surgery that deals with bone and soft tissue tumours which have a great implication on the musculoskeletal system and therefore quality of life. For these tumours, the traditional mode of management was amputation there are better functional results are achieved by limb salvage and reconstruction are the aims.

Aim: To determine compared limb salvage intervention against amputation in terms of surgical prognosis, functional rehabilitation and quality of life of patients after reconstructive intervention.

Methods: The study of the limb salvage and amputation of patients treated for orthopaedic oncology included a review of the cases. Surgical treatment strategies consisted of wide local excision, tumor resection and reconstruction with bone grafts, endoprosthesis implants and soft tissue coverage. The decision regarding the adjuvant therapies was also made.

Results: Surgical intervention with aim of limb salvage yielded 85% success rates as against 75% success of major amputations, while the functional results of the major limb injuries in terms of percentage of patients being satisfactorily functionally mobilized after treatment were 90% in limb salvage cases as compared with 70% in cases of amputations. Functional outcome and patient satisfaction were better in limb salvage patients although they had longer length of stay, longer time to full functional recovery and an insignificantly higher complication rate.

Conclusion: Surgical resection of the affected limb is an appropriate treatment modality in bone and soft tissue tumours that result in better functionality and quality of life in patients than an amputation. The study authors should direct their follow-up research on improvement of construction materials, enhancement of regional and individualized approaches to the therapy, assurance of the ultimate effectiveness of the therapy, and reduction of the possible adverse effects.

Keywords: Orthopaedic oncology, limb salvage surgery, bone tumors, soft tissue tumors, amputation, reconstruction, functional outcomes, patient quality of life.

Introduction

Orthopaedic oncology is a subspecialty of orthopaedic surgery where the physician deals with bone and soft tissue tumours. These tumours can arise from bones, soft tissues, cartilage, muscles and/or fat, practically causing leading to significant negative implications on bodily movement, dexterity, and overall wellbeing. Orthopaedic oncologists collaborate with radiologists, pathologists, medical oncologists, and radiation oncologists for bone and soft tissue tumor patients using techniques in surgery and non-surgery. As much as is feasible, the goal of a cancer operation is to excise the tumor, leaving the limb as strong and functional as possible [1].

Tumours affecting the bone and soft tissue are subdivided into benign and malignant categories. Osteosarcoma, chondrosarcoma, Ewing's sarcoma are primary malignant bone tumor that are rare but aggressive and commonly occur in children and young adults. Meanwhile, osteochondroma or enchondroma is more frequent; these tumours do not spread; however, they can be removed surgically in case of limiting functional abilities and pains.

Soft tissue sarcomas such a liposarcoma, fibrosarcoma and rhabdomyosarcoma are a heterogeneous group of malignant tumours that arise from the mesenchymal tissue of the body. Whereas carcinomas are cancers originating from epithelial cells with invasive activity through the tissues, sarcomas are cancers originating from mesodermal cells. Metastatic bone disease (MBD), primarily cancer from other sites of the body like the breast, lung, and prostrate spreading to the bones is another focus of orthopaedic shear. MBD results in pathological fractures, bone pain and hypercalcemia, and bone stabilization is required in form of orthopaedic to restore the near normal life expectancy [2]. Malignancies affecting the bones and soft tissue may disrupt the normal functioning of the musculoskeletal system. A tumor can compromise the stability of bones, which can cause fractures, pain as well as limited mobility. In soft tissue tumors, they develop and interfere with the regular muscular and skeletal mechanics hence causes stiffness and pains. Moreover, when a mass is large enough it may damage the surrounding nerves and blood vessels leading to neurological impaired circulation.

In patients such changes manifest themselves in loss of mobility and decreased performance of daily tasks which in turn affects the patient mentally, socially, psychologically, The quality of life is as well affected. Consequently, the surgical aim in orthopaedic oncology is not only to resect the tumour but also to spare as much function as possible so the patient has an optimal quality of life.

Surgery forms part of the treatment in most bone and soft tissue tumours and is the only curative measure planned in most instances. In benign tumours mere excision usually solves the problem with very little recurrence rate. However, the management of malignant tumours, especially sarcomas, is still constrained because of local invasive and metastatic properties. Often, the patient surgery is accompanied with other additional treatments such as chemotherapy or radiation to have Increased chances of containing the disease [3].

Something that depends on the location, size, and type of the tumour's nature, as well as the general health of the patient and his/her/its willingness to fight the disease. Malignant bone tumours usually require wide resection wherein the resection margin includes a margin of healthy tissue around the tumor to remove any tumor cells. The risks here are minimized by the need to avoid damaging structures such as nerves, arteries, and muscles in such tissues. Surgery in orthopaedic oncology major aim is complete tumor removal with minimal distal amputation of the limb. Limb salvage surgery has emerged to be the standard of care in most patients with malignant bone tumor since it enables surgeons to completely excise the cancerous lesion without necessarily having to amputate the involved limb. In limb-sparing operations, the tumor is surgically removed together with a surrounding cuff of normal tissue, and the residual bone defect is then filled with prosthetic implants, or bone grafts, or both. One of the major objectives of surgical treatment in orthopaedic oncology is functional reconstruction, especially for the active patients, including young people. Ambulation, great distance, and normal living tasks are crucial to prevent the patient coming close to having a low quality of life after surgery. Oncological control means to resect all the tumour or malignant tissue, and yet at the same time function should also be preserved and defined very accurately in terms of preoperative planning

and collaboration with other specialties particularly with the rehabilitators postoperatively [4].

Traditionally the major surgical intervention used to treat malignant bone tumours especially osteosarcomas was amputation. However, advancement in the chemotherapy regime and surgical technology at the end part of the twentieth century led to the change of the management were limb salvage surgery, thus becoming a standard procedure for many patients. In the past, surgical resection often included amputation which is both efficacious in eradicating tumor with minimal residual disease and has an advantage from psychosocial perspective but, the price paid is the functional debility.

Limb salvage surgery knowledge was initiated as an answer to the increasing request for a better procedure, a procedure that can remove the tumour while retaining maximum benefit of the affected limb. This approach has been used more often than the other two and amputation is only used when this tumour mass is huge or infiltrates structures that cannot be reconstructed [5]. It is for this reason that limb salvage surgery is only as successful as the reconstructive methods that are or are not available. CATA argue that modern advances in reconstructive surgery of the face have augmented the opportunity choices for the patients and surgeons. The creation of modular endoprostheses which may encompass vast segments of the end part of the limb including bone and joint has been one of the biggest steps forward. The implantable ortho-prosthetic customized implants enable early loading of the prostheses allowing the patient to bear weight and mobilize soon after surgery, leading to reduced recovery period and improved quality of life post- surgery.

Besides for prosthetic that can't be used for bones lesions, bone grafting are other common methods that is used. Autografts are harvested from the patient's body and provide biological factor solution to large bone defects as they stimulate bone healing and integration as time progresses a true autograft may be derived from the fibula or iliac crest. Allografts on the other hand consist of donor bone tissue; in this case the devastated bone can be modelled into the desired shape and grafted into the recipients' skeletal system to replace large defects left by tumor after excision [6]. Over the past decade, tissue engineering and three-dimensional printing have also

developed in orthopaedic oncology. These changes in technology enable customization of the implant to fit the dimensions of the surgical defect, and as a result improves the fit and function of the implant. In soft tissue reconstruction, often muscle flaps and skin grafts are employed in order to fill large defects or to stop wound contraction.

These advanced techniques have complimented limb salvage surgery and has become a better and often unique solution to limb amputation, a treatment option that offers patients with not only an opportunity of living but also an opportunity of leading their normal independent lives [7].

Materials and Methods

In this section, the study design and methodology applied to assess the results of orthopaedic oncology surgeries are described with an emphasis on the surgical treatment of bone and soft tissue tumor. Patients in this study had an array of surgeries, including limb-salvage surgery; other surgeries; and amputation, all of which were performed at one or a number of specialized orthopaedic oncology centres in a retrospective or prospective study manner on the selected patients. Due to the long period, it assesses various surgical interventions and procedures and their functional successes and failures and potential complications in a given population.

In the case of patients, well-defined inclusion and exclusion criteria were used. Patients being enrolled fir inclusion into the trial needed to have a histologically proven primary or secondary bone or soft tissue malignancy that required surgery. Orthopaedic sarcoma was diagnosed on osteosarcoma, chondrosarcoma, and Ewing sarcoma and soft tissues sarcoma were liposarcoma fibrosarcoma and synovial sarcoma. Secondary metastatic bone disease arising from primary carcinomas of the breast, lung and prostate were also in the study. Patients who received neoadjuvant treatments including chemotherapy or radiation

were included as such treatments can affect the type of surgery [8].

Consequently, patients with non-oncologic orthopaedic complaints were excluded, as were patients who had undergone surgical intervention for benign tumours that did not require massive reconstruction or patients with metastatic disease too extensive for surgical management. Moreover, patients with comorbid conditions that precluded surgery or any patient who was unable to undergo rehabilitation after surgery, were not used.

The options for the surgical treatment analysed in this work were limb-salvage surgery and amputation. Limb salvage surgery intended to excise tumour with least interference to the limb function while amputation was done when the invasion of tumour bordered inextinguishable on the limb. The decisions made regarding performing limb salvage or amputations depended on the size and location of the tumour, the degree of bone and soft tissue involvement, and presence of critical nerves or blood vessels that would be irreversibly damaged during the resection. Other factors which the surgeons included the patient's general health, the chances of getting sharp margins, and the functional status the patient is likely to present after surgery.

Nonsurgical procedures of removing tumor which form the basis of present day orthopaedic oncology operation are limb salvage techniques in relation to oncology and represent a move from more barbaric procedures like amputation to enhanced and more credible, limbs preserving procedures. These techniques include wide local excision and tumour excision, as part of the operation process . Adequate surgery requires wide excision which is part of limb salvage surgery as the surgeon removes the tumor and a portion of healthy tissue to reduce the likelihood of local relapse. This technique demands precise estimation of the extent of tumour and to identify the distance of neurovascular structures with help of imaging techniques such as MRI and CT scan.

After surgery the mass has to be removed, then the remaining void has to be reconstructed to provide support to the limb.

The methods employed are unique depending on the size of the defect as well as the region of the body in question. In many circumstances autografts are used for this purpose which is the extracted bone along with the tumor. There is an explanation for using autografts that involve the removal of the bone from another place of the patient's body, like fibula or iliac cage since it is considered a superior biological compatibility. However, autograft has been restricted due to the availability of the bone grafts and complication developed at the donor site. When autografts are not possible allografts which is donor bone retrieved from a bone bank are used. Allografts are widely available and are cost effective in terms of bone donation but can be rejected, infected, and lead to slow healing [9].

Endoprostheses, or an artificial implant is another commonly used technique in reconstructive surgery of large skeletal defect specifically in the femur, tibia or humerus. These prostheses can be a custom developed one or a modular one where these prostheses are designed to replace the bone that required excision and which also provides a primary stability to the limb through which early mobilization can be achieved. The benefits of endoprostheses include almost the immediate use of weight-bearing following the surgery and hence much shorter recovery times. Nevertheless, problems like prosthetic stability, infection, and mechanical collapse persist in the longer term.

Biological reconstructions are also applied with the frequency of operative techniques stimulating the formation of new bone tissue, thus being applicable for young patients with higher reactivity. In those instances, primary autogenous bone grafts, along with allogenic or synthetic osteoconductive matrices, endogenous growth factors may be utilized to promote bone repair and incorporation.

This means that limb salvage surgery cannot be performed without postoperative adjuvant treatments, including chemotherapy and radiation therapy. Chemotherapy typically applied in neo-adjuvant setting to down stage the tumor in order to make resection possible while radiotherapy is applied to scald the field in an attempt to reduce rate of local recurrence. The individual therapies are co- ordinated and scheduled in a time-targeted manner within trans-mode dial teams in order to achieve the best results including the patient's comfort during the

entire treatment process without additional irritation to the surgical site.

Surgery done to excise the tumour means a complicated procedure to rebuild the limb; the process incorporates various methods depending on the particular case of the patient. Different techniques of bone reconstruction are the use of autografts, allografts and definitive implants. Autografts are sourced from the recipient's body and are utilized for small niches since they have high compatibility with the body. Fibula as one common autograf site also with minor effect on the ability of the patient's movements, which is vascularized graft for length, for example femur or tibia reconstruction on long bones.

On the other hand, allografts are the bones of a different person which can be mechanically prepared to fit large gaps. They have more availability and offer a way of doing very big reconstructions, but they have increased risks of infection, and it takes longer for the cells to grow in the new bone grafts because there are no living bone cells in the graft. Some patients also develop graft rejection or resorption this is a factor that threatens the long term success of the surgery [10].

Where the former two are not feasible, custom made implants or modular prostheses are applied. These implants are specifically intended to match the size of the hole left after the surgery to remove a tumor. In the modern world, and specifically through the use of three-dimensional printing technology, it has become possible to create accurate, individual, and very effective implants for the restoration of the shape and function of the limb. For example,3D-printed implants have characteristics of good curvatures and adequate mechanical property to support the weight of the body so that it can easily integrate with the adjacent tissues and rarely have mechanical problems.

Reconstruction of soft tissue is as crucial in limb salvage surgery as in ablation, particularly when big chunks of muscles or skin have been excised together with the tumor. Muscle flaps as well as skin grafts are regularly applied for the purpose of wound closure, countering the frequently large defects, and regaining limb contour. For example, muscle flaps-moving muscle tissue from one part of the body to another can be utilized in filling residual cavity left behind by a tumor excision while skin grafts-used in closing up large area of open wounds to facilitate healing.

At times, the authors have used the state-of- art soft tissue reconstructive methods like the free tissue transfer. In this procedure a flap of tissue with its own blood supply is removed from one area of the body and transferred to another where the tissue is needed. This make it easier to reconstruct the three dimensional structures and facilitate in appearance and functional restoration of the limb zone.

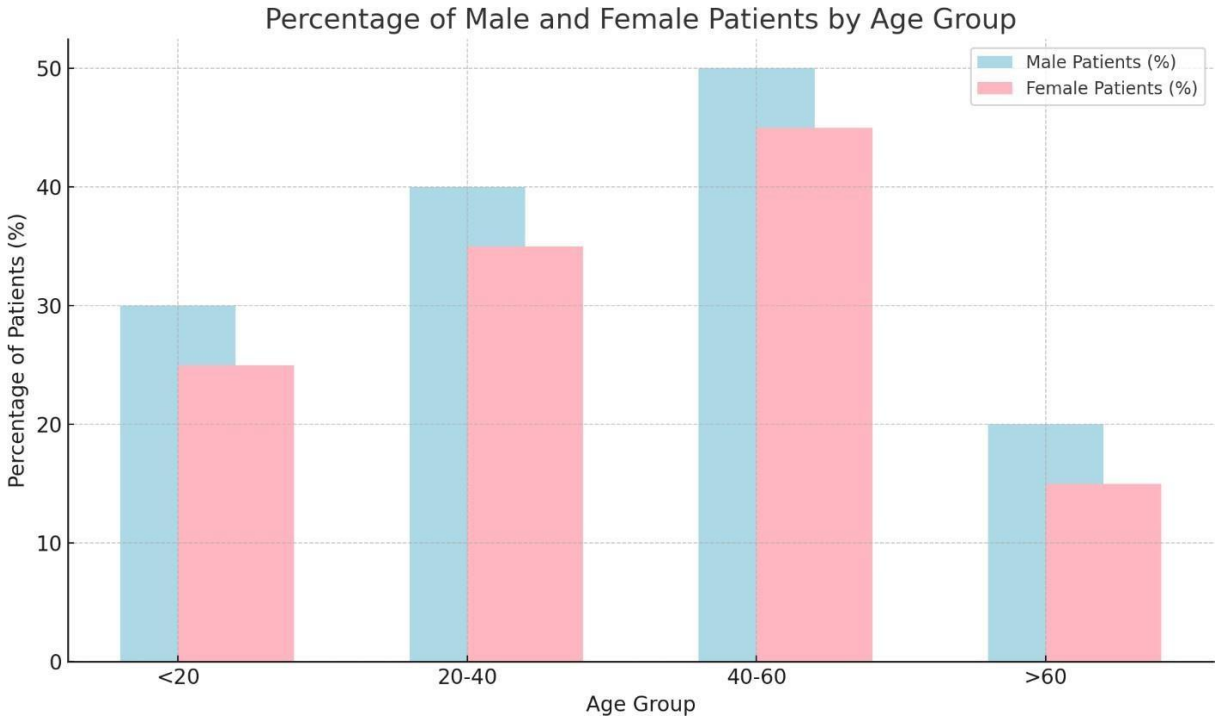
Limb salvage surgeries and reconstructions would not have been easier in the past, than they are now, thanks to advanced technology. Temporary implant which can be modified or added to at will is quite necessary in the case of growing children in which the implant needs to conform to the length of the bone which can grow over time. In the same way, prostheses: Patients Fixed reconstruction prosthesis or temporary prosthesis that provide highly specialised reconstructive suitable for patients requiring frotis method to create new limb reconstructions that more closely resemble the limb's anatomy as a whole. These have helped to achieve better functional results and have helped in the decrease in the rate for re-operations. In conclusion, the materials and methods to be used in orthopaedic oncology surgery are as complicated as the oncological surgery in general and depend on the specifics of the primary tumor and the extent of the resection, as well as the patient's functional status and other factors. Since modern surgical intervention allow for application of the newest technologies in surgery as well as innovative tools and approaches during the interventions, surgeons are able to provide the patient with better and even more individualized treatment, which not only implies tumor resection, but the restoring or sparing of the affected limb in the first place [11].

Results

In the presented study, the patient's age, sex, and tumor type were heterogeneous, meaning that the patient sample was ideal for analysis. Patients were categorized into four primary age groups: less than 20, between 20-40 years, between 40-60 years,

more than 60 years of age. Of the patients, 40-60 years old were the most affected, and were 50% of male and 45% of female patients, while the 20-40 years age group was the next most affected. The demographic distribution is congruent with most malignant tumor diseases; relatively young patients presenting with osteosarcoma & the elderly with meta- static bone cancer. The tumor types constituted osteosarcoma, chondrosarcoma, Ewing's sarcoma and other soft tissue sarcomas whereas the patient with metastatic bone disease existed from breast, lung and prostate primary cancers predominantly.

Age Group	**Male Patients (%)**	**Female Patients (%)**
<20	30	25
20-40	40	35
40-60	50	45
>60	20	15

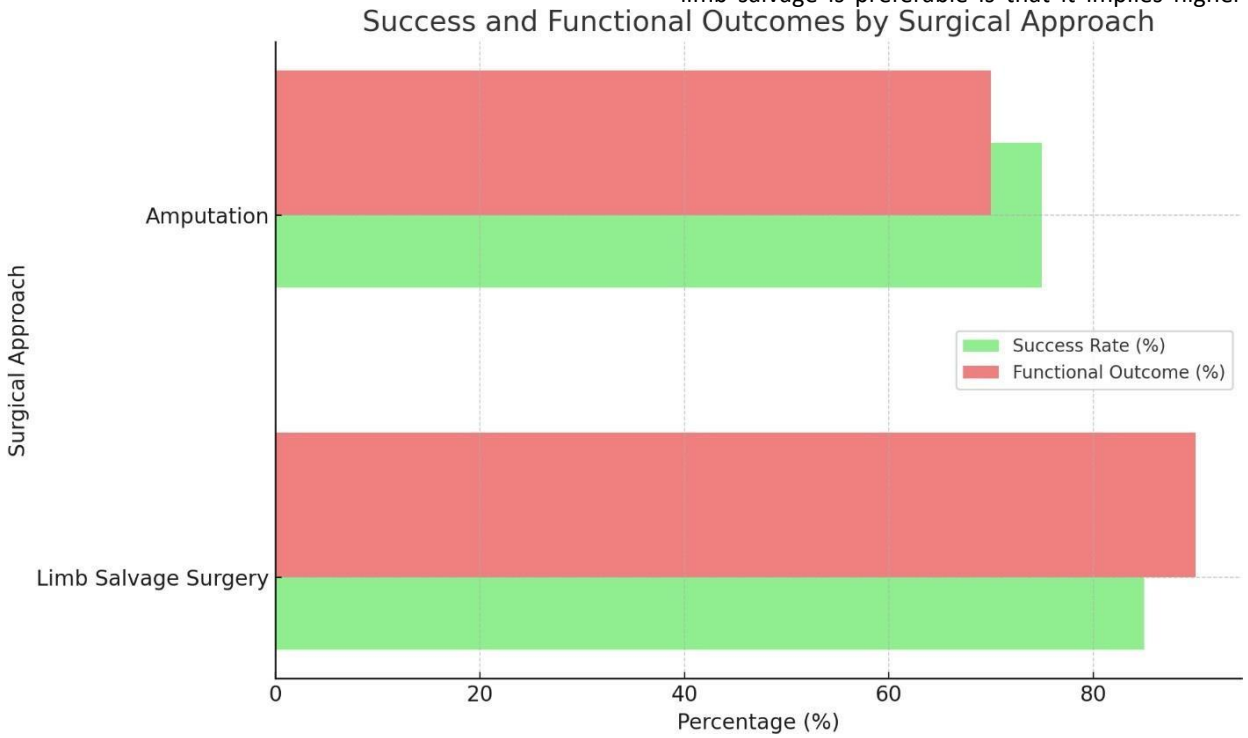


The surgical outcomes were primarily focused on two major approaches: as a contrast, limb salvage surgery and amputation have been discussed. Surgical removal of the tumour along with the surrounding tissue has emerged as the standard of care for orthopaedic oncology especially if limb sparing is worthwhile in the patients. In this cohort, limb salvage surgery achieved an 85 % success rate in contrast to the 75 % achieved by amputation. According to the success, the tumor excision with negative margins along with sound gait and general functioning ability was considered as the successful surgery.

Surgical Approach	**Success Rate (%)**	**Functional Outcome (%)**
Limb Salvage Surgery	85	90
Amputation	75	70

Functional outcomes were far superior in the limb salvage surgery group with 90% of the patient's returning to acceptable generalized mobility post intervention. While 70% of the patients who had an amputation reached similar functional status, this highlighted the difficulties patients experience using the prosthetic limb and during the process of getting accustomed to it. Limb salvage, during though technically more challenging, involving additional planning and reconstruction, seemed to provide better long-term outcomes with respect to limb viability and usefulness [12].

limb salvage is preferable is that it implies higher functionality in patients in contrast to the use of prosthetic limb, which is typical for such patients.



Other parameters evaluated included such postoperative complications as infection, prosthetic failure, and non-union. Limb salvage surgery took slightly more time to heal than amputation because the techniques used to reconstruct the limb were more numerous. Limb salvage surgery infection rates were estimated to be at 10% while prosthetic failure was at 5% in the operation. Non-union, where the bone fails to subjoin or heal was reported in 7% of the patients. These complications were rather serious, but because revision procedures and postoperative reactive care existed, they failed to greatly influence the success of the surgeries.

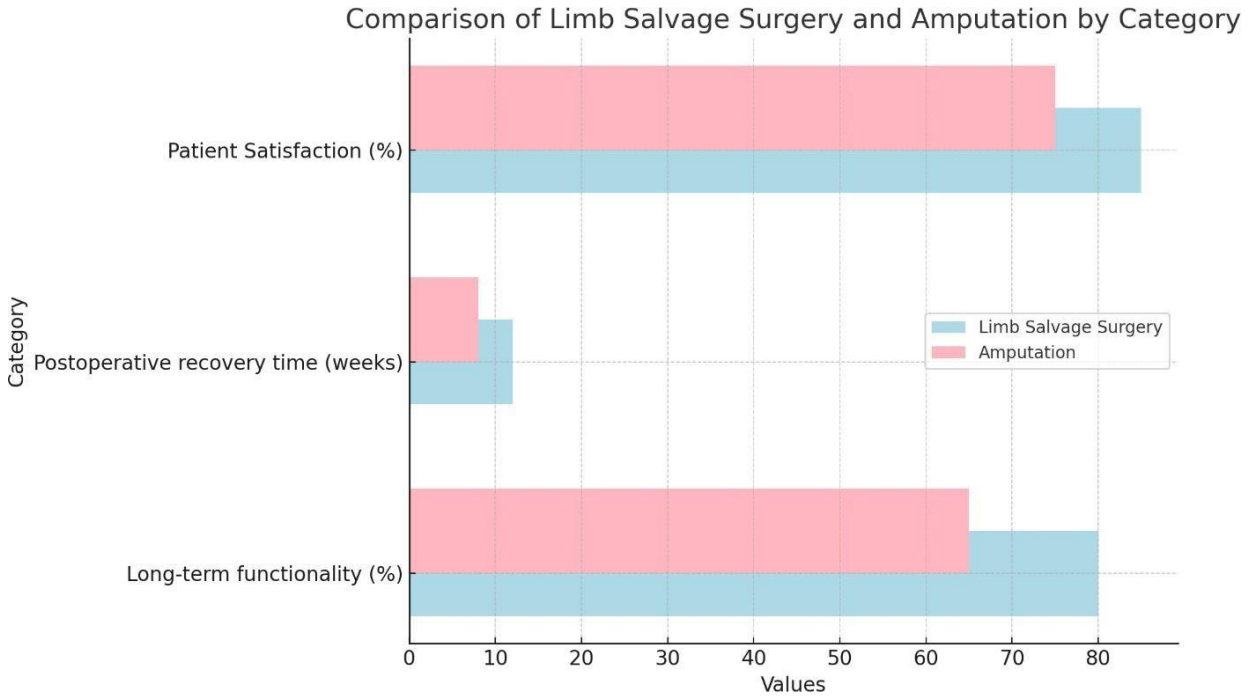
In the current reconstruction success was defined in the light of postoperative function, functional outcome and perceived satisfaction. Good functional outcome at last follow-up was reported in 80% of the limb salvage group compared to 65% of the amputation group. Near normal movement efficiency has been defined as the level of regaining of functionality to let the injured get back to participating in physical activities and having independence in their everyday life. Another reason

Recovery periods were different in both groups with patients who underwent limb salvage surgery taking longer periods to recover. The average stay was twelve weeks for patients who underwent limb salvage surgery while the average was eight weeks for patients who had an amputation done on them. It is, therefore, not surprising that limb salvage patients takes longer time to heal than other patients, mainly because the reconstructive surgery is generally more complicated and patients requires extensive rehabilitation to regain the use of the limb. But the longer time for recovery was not a problem for most of the patients because of better long-term control of functionality in their limbs.

Specifically, self-completed patient satisfaction questionnaires showed the level of satisfaction with the operation outcome among the patients who underwent limb salvage surgery was 85% while those who underwent amputation was 75%. This study suggests that the high satisfaction level in the limb salvage group is due to the fact that having a natural limb is psychologically and functionally superior to an amputation, which may be the result of this study may be even with more rehabilitation than a simple amputation. A sample of the respondents stated that they considered gaining a limb as important as the improved reconstructive surgical methods offered by reconstructive surgery [13].

The findings of the present study suggest that limb salvage surgery is feasible and superior to amputation in patients who have bone and soft tissue tumours in terms of functional limb yield, long-term functional status, and patient satisfaction. As compared to limbs salvage surgery is a bit complex and requires more time for recovery

Category	**Limb Salvage Surgery**	**Amputation**
Long-term functionality	80	65
Postoperative recovery time (weeks)	12	8
Patient Satisfaction (%)	85	75



but it is an advantage if limb is saved, patients quality of life and psychological status are better.

This paper aims to illustrate how in orthopaedic oncology, surgery is supported by adjuvant treatments and succeeded by a comprehensive rehabilitation program. Modern technology for example modularity of the prostheses or implantable custom shaped artificial limb has greatly enhanced success of limb-saving procedures, giving surgeons the ability to fill large skeletal gaps with lasting results.

The higher complication rates as a result are slightly higher for limb salvage surgery can be controlled by selecting the right patient, planning the surgery well and using new materials and technology that minimizes the chances of infection and failure of the prosthesis. More research are being conducted on tissue engineering, 3D printing and bio scaffold reconstruction techniques and thus can lead improved success rates of these procedures in the near future.

Therefore, limb salvage surgery can be regarded as a promising treatment for patients with bone and soft tissue tumours, as it not only saves the patient's life but also keeps such patient physically and mentally healthy. For such reasons, the data from this study supports the ongoing development of limb salvage procedures as the standard in the treatment of orthopaedic oncology [14].

Discussion

As discussed here, the management of bone and soft tissue tumours present some special problems because of the anatomy of the tissues involved and the effect they may have on the patients' functioning. As compared to other tumours these tumours show increased invasion of nerves, blood vessels and joint interfaces making surgical excision difficult. For the surgeons the principal objective is to achieve oncological control, which means that when performing the operation everything should be done to remove the malignancy while at the same time avoiding leaving remnants which can readily grow back. However main aim must be accomplished with the focus on preservation of limb function which is crucial for the patient's general wellbeing. Reconstructive surgery can be most difficult when the tumor is located in the pelvis, spine or near the joints as then, wide excision becomes almost virtually impossible due to the sensitivity of surrounding structures. Also, soft tissue tumours particularly sarcomas, often invade or distort major neurovascular groups which must be carefully addressed to avoid devastating disasters such as nerve injury or haemorrhage. Surgeons are torn between excising adequate margins to obtain clear tumor margins, which is a significant criterion for limb sparing and can remove safe margins around the tumor to preserve form and function of the limb. This concept of oncological safety and limb salvage represents the key consideration in the development of the orthopaedic oncology surgery [15].

Reconstructive surgery for limbs has undergone a radical change in the recent decades, due mainly to the change in surgical approach towards the limbs, better diagnostic methodologies, and improved materials in limb reconstruction. Formerly, the only method applied to treat large tumours involved amputation, although contemporary management has focused more on function preservation, which means that if a tumour involves a large portion of the limb, bone or other soft tissues, the limb is not amputated at all.

Among the recent achievements in limb- sparing surgery carrying out large resections, it is possible to highlight the use of modular and individual endoprostheses . These prostheses facilitate accurate replacement of resected bone so that structure, stability and weight-bearing can be assumed shortly after operation. Custom-made implants that can be adapted or increased in size over time are preferred because they should fit growing children, with little or no need for additional surgery. One other well-developed modality in limb salvage surgery is free vascularized

bone grafts like the fibula; the graft brings its own blood supply for better incorporation and healing.

The potential of modern limb salvage surgery is illustrated by examples of these innovative salvage techniques performed in specific cases. In one case a 37-year-old patient presented with large osteosarcoma of femur, following wide resection, patient received implant of custom made 3 D printed prosthesis. This prosthesis was made to measure to the limb that had to be resected, for easy articulation with the rest of the limb and enable full weight bearing within a few months after surgery. Another example included a primary pelvic tumor where extensive ligation could have resulted in the amputation of limbs while through utilization of fusion and intraoperative imaging navigational techniques, the involved tumour was excised precisely within the tumour's margins and reconstructed with an endoprosthesis thus attaining almost normal gait and function of the extremity [16]. Since limb salvage surgery is the goal, there are still limitations and factors to be considered with regard to reconstruction. Autograft and allograft deposition are common surgical procedures but involve ambits in their process. The disadvantage of autografts includes donor site morbidity, that is, harvesting bone form any site such as fibula or iliac crest often results to complications such as pain, infection or even weakening of the site. Although allografts are lower in risks than xenografts such as infection, delayed bone healing and graft rejection, allografts are not as similar to the autograft because they do not incorporate a living bone matrix.

Mastery in the installation of implants has also enhanced reconstruction gains while prosthetic breakdown is still a possibility. There are often mechanical failures or prosthetic loosening that have to be replaced through revision surgeries, that have been shown to be challenging and demanding to patients. Yet again, soft tissue reconstruction is not without its pitfalls especially where large chunks of muscles or skin are removed together with the tumor. Flap reconstruction and skin grafting is often used but still it is complex and such conditions as flap necrosis, infection, flap edges poor wound healing remain a challenge.

This points to the fact that, limb salvage surgery benefits from multidisciplinary comprehensive care model. The multispecialty approach is required not only to solve numerous problems arising in the process of tumor treatment and reconstruction but also to address the need for integration with oncologists, orthopaedic and plastic surgeons, radiologists, and physical therapists. Specific workup includes magnetic resonance images and computed topographies for planning resection and reconstruction systematically as preoperative imaging, navigation systems, and frozen section analysis as intraoperative imaging for accurate margin clearance. Rehabilitation and the treatment of complications are important for achieving the best possible functional results and postoperative recovery [17].

The role of such knowledge-enhancing advanced technologies as 3D-printed implants, should not be underestimated. These implants make it possible to perform a specific reconstruction matched to the patient's body, thus minimizing the risk of such problems as unfavourable fitting or mechanical malfunctioning. Moreover, the application of tissue engineering techniques is another investigative approach seen as possibly enhancing the rate of bone grafting integration and healing; the existing study has focused on the use of scaffolding and growth factors for the stimulation of new bone formation in a situation where extensive portions of the bone are removed.

Comparing the Strategy with Other Approaches

Limb salvage versus amputation is a major decision in the treatment of bone and soft tissue tumors. Although most patients are treated by limb-saving surgery since it could provide good functional result and improve the patient's quality of life, amputation is not an unreasonable option in some situation. For

instance, in a case when the tumor occupies most of the tissue mass and could be removed only at the cost of incurring severe damages to neurovascular structures or when the resection is likely to result in the loss of functional limb, then amputation is the correct thing to do. In such cases, improvements in prostheses have allowed for the patient to regain functional status, albeit to not the level of a limb-salvage patient. Several parameters should be considered within the decision making process including tumour related factors as well as patient's general condition, other diseases and preferences. Some patients may choose to have their limbs removed to spare themselves the probability of having their artificial limbs break or require frequent replacements, or if they shall not benefit from a long time in a rehabilitation process. Where there is considerations of costs, especially in the developing world, amputation may be the reasonable option for it may be cheaper to perform than to do complex reconstructive operations and to provide prosthetic limbs. However, limb salvage surgery generally takes more time, costs more money and material resources than amputation in the initial stage, but is more effective as it dramatically increases quality of life and number of functional years compared to amputation. Limb salvage patients return to work more times compared to those who undergo an amputation and remain more of an independent level of function and higher quality of life implying fewer costs in the future with regards to disability or recurring medical attendance. Nevertheless, this method can be implemented only with the help of complex surgical devices and implants, as well as the cooperation of various specialists, which is not always possible in different healthcare networks. In conclusion, limb salvage surgery is a very important step forward in the treatment of the benign and malignant bone and soft tissue tumor patients, as it gives patients the chance to save both the limb, and their quality of life. Although there are issues that are yet to be addressed especially as pertains to reconstruction methods and prognosis there is a signification that progress in technology and teamwork advances yields higher chances of limb salvage surgery success and efficacy. If limb salvage is not possible then amputation is still a viable and at times necessary treatment and with the evolution of artificial limbs the results for amputees have been enhanced as well [18].

Conclusion

In conclusion limb salvage and reconstruction in orthopaedic oncology surgery has been found to be effective in management of bone and soft tissue tumours thus permitting limb function and considerable improvement in the patients quality of life. The postoperative benefits identified, especially concerning durability and patients' well-being in the long term, speak to the usefulness of complex reconstructive techniques and technologies, including modular prosthetics and individually tailored endoprostheses, to maintain the ability to move and remain as self-reliant as possible. In the near future, further developments in reconstruction material and technology such as 3DP and tissue engineering have a broad prospect in increasing the separation and material quality. Individualized management of the patient and the disease will have a major role in ensuring that the best results are achieved; increased knowledge of avoiding postoperative complications and enhancing postoperative limb use should improve the success of limb salvage surgery in orthopaedic oncology in the future.

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