The Efficacy of Limb Preservation Surgeries after Osteosarcoma Removal Compared to Amputations

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Abstract

Osteosarcoma is the most common primary bone malignancy and the third most common cancer in adolescents. A majority of osteosarcoma cases were treated with amputations in the past in order to prevent recurrence; however, as surgical techniques and specifically diagnosis and treatment of osteosarcomas have advanced in the 21st century, limb preservation or limb salvage surgeries have become the standard. These advances have made it possible for osteosarcoma patients to keep their limbs while preventing recurrence. Techniques for limb preservation surgery in osteosarcoma removal, such as tumor endoprosthesis, allograft reconstruction, and expandable prostheses are not well researched in their current early stages and must be evaluated further to better understand the disease and make optimal treatment decisions. This review will evaluate existing literature for these various techniques in regard to post-surgical outcomes including metastasis/recurrence, mortality, and infection to elucidate which techniques may provide optimal treatment outcomes. Tumor endoprostheses, allograft reconstruction, and expandable prostheses were found to be equally effective if not more so at treating osteosarcomas in terms of preventing recurrence and metastasis. While limb preservation surgeries only require maintenance such as correction surgeries and outgrowth implants, they allowed patients the physical and psychological benefits of keeping their limbs. Additionally, the survival time for limb preservation surgeries was greater than that of amputations as the 5-year survival rate was 70.7% compared to the 55.3% rate for amputations. Further studying the efficacy of these techniques is necessary to improve outcomes after osteosarcoma treatment and make optimal treatment decisions.

Introduction

Osteosarcoma is an incredibly aggressive cancer of the bone. Receiving an osteosarcoma diagnosis in the past was nearly always fatal; however, advances in neoadjuvant chemotherapy have increased the survival rates of these cancer patients. As a result, many doctors believe amputations are no longer necessary to contain this incredibly deadly and fast-spreading disease. The National Institute of Health even stated that limb-salvage surgeries were equally as effective as amputations.

While amputations have high rates of success in helping prevent osteosarcoma recurrence, metastasis, and mortality, they have many negative consequences. Complications that occur after amputation include heart problems, deep vein thrombosis, infections in the wound, slow wound healing, pruritus, and pain that seems to be coming from the amputated limb, which is known as phantom limb pain. Additionally, losing a limb is detrimental to many patient’s mental health as it can cause body image issues and loss of function. In order to avoid the many complications with amputations, limb salvage surgeries are utilized. Only the tumor and the areas surrounding the tumor are removed in tumor salvage surgeries compared to the entire limb in amputations.

Three common examples of limb salvage surgeries include...

- Tumor Endoprostheses
- Allograft Reconstruction
- Expandable Prosthesis

Results

In a study with 3363 osteosarcoma patients, 2447 received limb salvage surgeries while the remaining 916 underwent amputations. The 5-year survival rate for limb salvage surgeries was 78.9% and the 5-year rate for amputations, the 3-year was 64.5% and the 5-year was 55.8%. Limb salvage patients had significantly higher survival rates in comparison with amputees. The Efficacy of Limb Preservation Surgeries after Osteosarcoma Removal

Conclusion

In terms of mortality, limb preservation surgeries showed promise as they provided significantly longer survival times. Additionally, both amputations and limb salvage surgeries were successful in preventing recurrence of the former malignancy and metastasis. Further research on perioperative complications is needed, though current findings may suggest that tumor endoprostheses shows lower infection rates compared to expandable prostheses. In conclusion, limb preservation surgeries are efficacious techniques for treatment of osteosarcoma and lead to longer survival times than amputations, though further research is needed to compare complication rates.

Future Directions

One possible confounder in this study was the demographics of amputation patients tends to be in lower economic classes and in worse living conditions compared to limb salvage surgery patients potentially contributing to the worse outcomes for amputees. Research on the socioeconomic status of osteosarcoma patients may help elucidate obstacles they may have and how they relate to treatment outcomes.

Further research into other limb preservation surgeries and other factors such as cost, maintenance, complications, and patient demographics would provide valuable insight in understanding osteosarcomas.

References


Images

In the early stages of the disease, the patient is treated with an expandable endoprosthesis. The local recurrence occurs when the tumor is treated with an expandable prosthesis that is inserted into the patient’s limb. The patient will have a total of 30 complications. The local recurrence rate is that of tumor endoprosthesis patients, 25% had local recurrence. The expandable prosthesis device uses the tumor to elongate the body of the device. The device is able to elongate without additional surgery making the procedure perfect for growing children.

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References


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