

Various Treatment Options in Osteosarcoma

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ABSTRACT

The surgical treatment of osteosarcoma has historically been amputation/disarticulation. While there has been improvement in survival from inclusion of chemotherapy on the one hand, it has been paralleled by a shift of surgical treatment from amputation toward limb salvage surgery. Limb salvage should be considered in a patient only if the surgeon is reasonably confident that surgical excision of the tumor with wide margins is feasible, and that the expected function of the limb after limb salvage surgery will be better than ablative surgery in the form of amputation/disarticulation. Aim of this study is study the various treatment options in patients of osteosarcoma.

Keywords: OS- osteosarcoma, CT-chemotherapy, RT-radiotherapy

INTRODUCTION

Osteosarcoma is a high grade primary skeletal malignancy characterised by spindle cells of mesenchymal origin depositing immature osteoid matrix. With an annual incidence rate of 3.1 cases per million in the US, Osteosarcoma accounts for less than 1% of all newly diagnosed cancer in adults and 3-5% of those in children, but it is the most common malignancy in adolescents outside of leukemia and lymphoma.¹⁻³ Osteosarcoma is the most common primary malignant bone tumor in children and adolescents, accounting for 4% of all childhood cancers worldwide. In India, the incidence varies from 4.7% to 11.6%, where this malignancy is associated with significant morbidity and mortality.⁴

According to a review conducted by the National Cancer Institute of America, the age adjusted incidence rate for all bone and joint cancers for all ages and races is 0.9/100,000 individuals per year, and the mortality rate is 0.4/100,000 individuals.⁵ The surgical treatment of osteosarcoma has historically been amputation/disarticulation. While there has been improvement in survival from inclusion of chemotherapy on the one hand, it has been paralleled by a shift of surgical treatment from amputation toward limb salvage surgery. Aim of this study to determine the various factors that contribute to the type of surgery and following treatment done in patients of osteosarcoma.

MATERIALS & METHODS

This article reviews the current status of treatment options of osteosarcoma. Aim of this study to determine the various factors that contribute to the type of surgery and following treatment done in patients of osteosarcoma.

DISCUSSION

It is imperative that patients with proven or suspected osteosarcoma have an initial evaluation by an orthopaedics oncologist familiar with the surgical management of this disease. Imaging studies should be done before the initial biopsy, because an inappropriately performed biopsy may jeopardize a limb-sparing procedure. Additionally, protective weight bearing is recommended for patients with tumors of

weight-bearing bones to prevent pathological fractures that could preclude limb-preserving surgery.

Successful treatment generally requires the combination of effective systemic chemotherapy and complete resection of all clinically detectable disease.

Randomized clinical trials have established that both neoadjuvant and adjuvant chemotherapy are effective in preventing relapse in patients with clinically nonmetastatic tumors.

The treatment of osteosarcoma also depends on the histologic grade, as follows:

Low-grade OS Patients with low-grade osteosarcoma can be treated successfully by wide surgical resection alone, regardless of site of origin.

Intermediate-grade OS When a tumor biopsy suggests an intermediate-grade osteosarcoma, an option is to proceed with wide resection. The availability of the entire tumor allows the pathologist to examine more tissue and evaluate soft tissue and lymphovascular invasion, which can often clarify the nature of the lesion.

If the lesion proves to have high-grade elements, systemic chemotherapy is indicated, just as it would be for any high-grade osteosarcoma. Although the strategy of initial chemotherapy followed by definitive surgery has become an almost universally applied approach for osteosarcoma, some studies suggest that there is no increased risk of treatment failure if definitive surgery is done before chemotherapy begins; this can help to clarify equivocal diagnoses of intermediate-grade osteosarcoma.

High-grade OS Patients with high-grade osteosarcoma require surgery and systemic chemotherapy whether the tumor arises in the conventional central location or on a bone surface.

Recognition of intraosseous well-differentiated osteosarcoma and periosteal osteosarcoma is important because patients with these tumor types have the most favorable prognosis and can be treated successfully with wide excision of the

primary tumor alone.^{6,7} Patients with periosteal osteosarcoma have a generally good prognosis and treatment is guided by histologic grade.^{8,9}

Treatment of Localized Osteosarcoma

Complete surgical resection is crucial for patients with localized osteosarcoma; however, at least 80% of patients treated with surgery alone will develop metastatic disease. Randomized clinical trials have established that adjuvant chemotherapy is effective in preventing relapse or recurrence in patients with localized resectable primary tumors.

Limb-sparing procedures

In general, more than 80% of patients with extremity OS can be treated using a limb-sparing procedure and do not require amputation. Limb-sparing procedures are planned only when the preoperative staging indicates that it would be possible to achieve wide surgical margins.

Reconstruction after limb-sparing surgery can be accomplished with many options, including metallic endoprosthesis, allograft, vascularized autologous bone graft, and rotationplasty. An additional option, osteogenesis distraction bone transport, is available for patients whose tumors do not involve the epiphysis of long bones.

Amputation

For some patients, amputation remains the optimal choice for management of the primary tumor. A pathological fracture noted at diagnosis or during preoperative chemotherapy does not preclude limb-salvage surgery if wide surgical margins can be achieved. If the pathological examination of the surgical specimen shows inadequate margins, an immediate amputation should be considered, especially if the histologic necrosis after preoperative chemotherapy was poor.

Preoperative chemotherapy

Almost all patients receive intravenous preoperative chemotherapy as initial

treatment. However, a standard CT regimen has not been determined. Current CT protocols include combinations of the following agents: high-dose methotrexate, doxorubicin, cyclophosphamide, cisplatin, ifosfamide, etoposide, and carboplatin. Regimens containing three active chemotherapy agents were superior to regimens containing two active agents.

Postoperative chemotherapy

Historically, the extent of tumor necrosis was used in some clinical trials to determine what type of postoperative CT would be given. In general, if tumor necrosis exceeded 90%, the preoperative chemotherapy regimen was continued. If tumor necrosis was less than 90%, then drugs not previously utilized in the preoperative therapy were added.

Patients with less necrosis after initial CT have a prognosis that is inferior to the prognosis for patients with more necrosis. The prognosis is still substantially better than the prognosis for patients treated with surgery alone and no adjuvant CT.

Based on the following evidence, it is inappropriate to conclude that patients with less necrosis have not responded to CT and that adjuvant chemotherapy should be withheld for these patients. Chemotherapy after definitive surgery should include the agents used in the initial phase of treatment unless there is clear and unequivocal progressive disease during the initial phase of therapy.

Radiation therapy

If complete surgical resection is not feasible or if surgical margins are inadequate, radiation therapy may improve the local control rate.¹⁰ RT should be considered in patients with osteosarcoma of the head and neck who have positive or uncertain resection margins.¹¹

RESULT

We evaluated 25 patients with osteosarcoma, who underwent tumour resection and endoprosthetic reconstruction

and limb amputation. Today, amputation is not a first choice anymore owing to advances made in chemotherapy, surgical techniques, surgical devices, and diagnostic methods. Endoprosthetic reconstruction, the most common option in limb-salvage surgeries, is an attractive alternative to other surgical options and plays a key role in keeping the patients quality of life. This surgical technique can provide early mobilization, stability, and weight-bearing for patients. Endoprosthetic reconstruction, the most common option in limb-salvage surgeries, is an attractive alternative to other surgical options and plays a key role in keeping the patient's quality of life since it provides early mobilization, stability, and weight-bearing for patients. The aim of limb-salvage surgery is to maximally preserve a limb with a satisfactory function and to avoid the psychological and cosmetic problems caused by amputations. With the addition of neoadjuvant chemotherapy to treatment protocols, five-year survival rates have dramatically increased. Today, amputation is not a first choice anymore. In our study the patients with malignant tumors received neo-adjuvant chemotherapy and post operative chemotherapy based on the histo-pathology and immuno-histochemistry of the excised specimen as per standard chemotherapy regimens and protocols. Our study group consists of 25 patients of biopsy proven osteosarcoma, 17 patients were treated using limb salvage procedures and endoprosthesis while 8 patients underwent amputation procedure.

CONCLUSION

The surgical treatment of osteosarcoma has historically been amputation/disarticulation. While there has been improvement in survival from inclusion of chemotherapy on the one hand, it has been paralleled by a shift of surgical treatment from amputation toward limb salvage surgery.

Declaration by Authors

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