Original Research

Assessment of prognostic factors in osteosarcoma

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ABSTRACT

Background: Rapid growth, high local aggressiveness, and early metastasis to the lungs and other distant bones are characteristics of osteosarcoma, a highly malignant bone tumor. The present study was conducted to assess prognostic factors in osteosarcoma.

Materials &Methods:47 cases of osteosarcoma of both genders were selected. Parameters such as clinical characteristics (location of tumour, largest dimension of tumour, staging, maximal alkaline phosphatase [ALP] level, calcium and phosphate levels before the start of treatment, and presence of pathological fracture), treatment-related characteristics etc. were recorded.

Results: Out of 47 patients, 27 were males and 20 were females. The mean time from symptom onset to presentation was 8.1 months, follow-up interval was 54.3 months, alkaline phosphatase before diagnosis was 214.5 IU/L, serum calcium before diagnosis was 2.6 mmol/L, pathological fracture was seen in 5, time from diagnosis to start of chemotherapy was 9.2 days. The prognostic factors identified for OS included local aggressiveness, the presence of metastasis at diagnosis and throughout, and a larger tumour dimension contributed to OS. The difference was significant ($P< 0.05$).

Conclusion: There are significant correlations between age at the time of diagnosis, tumor size, tumor location, and surgery and overall survival of patients with osteosarcoma. Male gender, larger tumor sizewere potentially responsible for poor prognosis in patients with osteosarcoma.

Keywords: osteosarcoma, tumour, Prognosis

Introduction

Rapid growth, high local aggressiveness, and early metastasis to the lungs and other distant bones are characteristics of osteosarcoma, a highly malignant bone tumor. It is more commonly diagnosed in men and is more common in teens and young adults between the ages of 15 and 25. Osteosarcoma is the most prevalent primary malignant bone cancer with a low overall survival (OS) rate, while being a rare illness with an annual incidence of between 1–5 cases per million population. More than 60% of patients survived for five years after resection, adjuvant chemotherapy, and neoadjuvant chemotherapy were introduced. However, a significant number of patients continue to have a catastrophic outcome because to local relapse, tumor metastasis, and treatment resistance. In order to forecast high-risk patients and administer early treatments to increase the survival rate of patients with osteosarcoma, it is imperative to identify useful prognostic indicators.

Tumor size, metastatic disease at diagnosis, histological grade, histologic response to neoadjuvant treatment, and appropriate surgical margins are among the potential prognostic markers that have continuously demonstrated a high link with survival in patients with osteosarcoma. Nevertheless, some of the aforementioned indicators require an invasive procedure, which makes them difficult to detect and less than ideal. More accessible and affordable osteosarcoma prognostic indicators are required to maximize therapy effectiveness and enhance OS. In general, the tumor site, age at diagnosis, and tumor histological subtypes are favorable prognostic markers for osteosarcoma survival, with features that are simple to use and reasonably priced.The present study was conducted to assess prognostic factors in osteosarcoma.

Materials & Methods

The study was carried outon 47 cases of osteosarcoma of both genders.All gave their written

consent to participate in the study.

Data such as name, age, gender etc. was recorded. Parameters such as clinical characteristics (location of tumour, largest dimension of tumour, staging, maximal alkaline phosphatase [ALP] level, calcium and phosphate levels before the start of treatment, and presence of pathological fracture), treatment-related characteristics (time from diagnosis to start of chemotherapy, surgical treatment approach, and histological results of the resected tumour [including tumour chemonecrosis and surgical margin]), and details of metastasis (timing, location, size, and treatment) etc. were recorded. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table: IDistribution of patients

Total- 47		
Gender	**Male**	**Female**
Number	27	20

Table I shows that out of 47 patients, 27 were males and 20 were females.

Table: II Assessment of parameters

Parameters	Mean	SD
Time from symptom onset to presentation, months	8.1	1.2
Follow-up interval, months	54.3	3.5
alkaline phosphatase before diagnosis, IU/L	214.5	54.2
serum calcium before diagnosis, mmol/L	2.6	0.7
pathological fracture	5	1.2
Time from diagnosis to start of chemotherapy, days	9.2	1.1

Table II, graph I shows that mean time from symptom onset to presentation was 8.1months, follow-up interval was 54.3months, alkaline phosphatase before diagnosis was 214.5IU/L, serum calcium before diagnosis was 2.6mmol/L, pathological fracture was seen in 5, time from diagnosis to start of chemotherapy was 9.2 days.

Table: III Factors associated with poor event-free survival and poor overall survival

Variables	Hazard ratio (95% confidence interval)	P value
Female sex	1.16	0.82
Time from symptom onset to presentation (weeks)	1.04	0.74
Largest dimension of tumour (mm)	1.07	0.03
Maximal ALP ≥1000 IU/L before treatment	1.35	0.51
Local aggressiveness	4.2	0.01
Presence of metastasis throughout	157.2	0.02

Table III shows that the prognostic factors identified for OS included local aggressiveness, the presence of metastasis at diagnosis and throughout, and a larger tumour dimension contributed to OS. The difference was significant (P< 0.05).

Discussion

Osteosarcoma arises from primitive bone-forming mesenchymal cells.1 It is the most common primary malignant bone tumour worldwide, with an annual incidence of 4.8 per million population in the US. Moreover, it was one of the most common types of childhood malignancy in Hong Kong in 2017 to 2019. The present study was conducted to assess prognostic factors in osteosarcoma.

We found that out of 47 patients, 27 were males and 20 were females. Xin et al in their a total of 18,126 patients from 40 studies were eventually included. Results indicated that gender (male vs. female: 1.21, 95% CI, 1.11–1.32; female vs. male: 0.85, 95% CI, 0.75–0.98), age (12–20 vs. ≤12: 1.37, 95% CI, 1.13–1.65; ≥20 vs. 8 vs. ≤8: 1.55, 95% CI, 1.07–2.24; >9 vs. ≤9: 1.44, 95% CI, 1.05–1.96), chemotherapy response (poor vs. good: 2.45, 95% CI, 2.02–2.97; good vs. poor: 0.41, 95% CI, 0.34–0.48), and surgery (yes vs. no: 0.45, 95% CI, 0.36–0.57; amputation vs. salvage: 2.34, 95% CI, 1.47–3.74) were significantly associated with overall survival in osteosarcoma patients.

We observed that mean time from symptom onset to presentation was 8.1 months, follow-up interval was 54.3 months, alkaline phosphatase before diagnosis was 214.5 IU/L, serum calcium before diagnosis was 2.6 mmol/L, pathological fracture was seen in 5, time from diagnosis to start of chemotherapy was 9.2 days. Theyobserved that the prognostic factors identified for OS included local aggressiveness, the presence of metastasis at diagnosis and throughout, and a larger tumour dimension contributed to OS. Tong et al[14]identified the characteristics of paediatric high-grade osteosarcoma and define its prognostic factors. Most patients (n=40, 80%) underwent limb-salvage

surgery. The event-free survival and overall survival rates were 55.8% and 71.2%, respectively. Prognostic factors independently associated with poor eventfree survival and poor overall survival were the presence of metastasis at diagnosis, poor tumour chemonecrosis, and the need for amputation.

Zamzam et al[15]assessed the impact of several patient-related and treatment-related prognostic factors in patients with localized osteosarcoma of the extremities treated at a single institution with the same chemotherapy protocol over a three-year period. With a median follow-up of 23 months, the three-year Event-Free Survival (EFS) and overall survival rates were 70.5% and 77.8 %, respectively. In univariate analysis, EFS was significantly related to the age of patients, serum level of alkaline phosphatase, and tumor volume but not to histologic subtype or histologic response to preoperative treatment. In multivariate analysis, only gender and serum alkaline phosphatase were statistically significant. Local and systemic recurrences occurred in 12 patients (21%) (10 developed pulmonary metastasis, one patient developed both bone and pulmonary metastases, and one patient had local recurrence). Median time to recurrence was 9.2 months, and recurrence correlated with the histologic response to preoperative treatment, tumor volume and serum alkaline phosphatase.

The shortcoming of the study is small sample size.

Conclusion

Authors found that there are significant correlations between age at the time of diagnosis, tumor size, tumor location, and surgery and overall survival of patients with osteosarcoma. Male gender, larger tumor sizewere potentially responsible for poor prognosis in patients with osteosarcoma.

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