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Osteosarcoma Profile in Dr. Soetomo General Academic Hospital Surabaya: A 5-year Retrospective

Khafidhotul Ilmiah[1,2*], Heriyawati[1,2]

[1]Department of Anatomical Pathology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia

[2]Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

*Corresponding author details: Khafidhotul Ilmiah; khafidhotulilmiah@gmail.com

ABSTRACT

Background: Osteosarcoma is the most common primary malignant bone tumor in adolescents and young adults. Pathological assessment plays a pivotal role in confirming the diagnosis and evaluating treatment response. However, comprehensive data describing the clinicopathological profile of osteosarcoma based on the type of surgical specimen remains limited. ***Objective:*** This study aims to characterize the clinicopathological features, histologic subtypes, and distribution of osteosarcoma from various surgical specimens and their pre-operative chemotherapy response. ***Method:*** This is a descriptive study with a retrospective design. Data were collected from the histopathological diagnosis of osteosarcoma from various surgical procedures at the Laboratory of Anatomical Pathology in Dr. Soetomo General Academic Hospital, Surabaya, from January 2020 to May 2025. ***Result:*** A total of 89 osteosarcoma cases were analyzed, comprising 61 males (68.5%) and 28 females (31.5%), with the majority occurring in the 11–20-year age group. The femur and tibia were the most frequently involved sites. Amputation was the predominant surgical procedure (52.8%). Conventional osteosarcoma accounted for 92.1% of all histologic subtypes. Only 32.2% of patients received preoperative chemotherapy, and most exhibited low Huvos grades (I–II), reflecting limited histologic response to treatment. ***Discussion:*** Osteosarcoma predominantly affects young males and commonly arises in the metaphyseal regions of long bones, particularly the femur and tibia, in this study. Low Huvos grade observed in most cases suggests suboptimal response to preoperative chemotherapy, underscoring the urgent need for earlier diagnosis and improved multimodal management. ***Conclusion:*** comprehensive histopathological evaluation remains pivotal for prognostic assessment.

Keywords: cancer; bone tumor; resection; amputation; limb ablation.

INTRODUCTION

Osteosarcoma is the most common primary malignant bone tumor [1], predominantly affecting adolescents and young adults. Its peak also occurs in older adults [2,3,4,5]. It is characterized by the production of osteoid matrix by malignant osteoblastic cells [6]. Although sarcoma incidence is relatively low compared to other malignancies, with approximately less than 1% in adult malignancies [7], osteosarcoma exhibits highly aggressive behavior and remains associated with considerable morbidity and mortality [8]. Diagnosis often requires a careful correlation of histomorphology features with clinical and radiological findings due to its broad morphological spectrum and overlap with other bone neoplasms from a pathological perspective [9].

Advances in surgical techniques and neoadjuvant chemotherapy have significantly transformed the management of osteosarcoma from radical amputations to limb-sparing resections with reconstructive procedures [10]. Nevertheless, in cases with advanced presentation, amputation remains a necessary option [11].

The examination of osteosarcoma specimens obtained from surgical procedures, for pathologists, is not limited to establishing a histologic diagnosis. It also involves assessing post-therapy necrosis, evaluating surgical margins, and tumor invasion into adjacent tissues [12, 13]. These parameters are crucial for determining prognosis and for assessing the response to neoadjuvant chemotherapy [6].

Therefore, this study aims to describe the clinicopathological characteristics of osteosarcoma derived from resection, amputation, and limb ablation specimens. The findings are expected to provide an updated overview of the morphological spectrum of osteosarcoma and contribute to the enhancement of diagnostic and prognostic assessment in bone tumor pathology.

METHOD

This was a descriptive study with a retrospective approach. Data were collected from histopathological examination results with diagnosis of osteosarcoma from various surgical procedures, i.e., resection, wide resection, amputation, limb ablation, hip disarticulation, and hemipelvectomy at the Laboratory of Anatomical Pathology in Dr. Soetomo General Academic Hospital Surabaya for the period January 2020 to May 2025. Any tumors other than osteosarcoma in bone and any samples obtained from biopsies are excluded. The data was then compiled and classified according to gender, age, location, procedure, histological subtype, pre-operative chemotherapy, and Huvos grade.

RESULT

A total of 89 osteosarcoma cases were included in this study. The patients consisted of 61 males (68.5%) and 28 females (31.5%), with a male-to-female ratio of approximately 2.2:1. Most patients (60.67%) were in the 11–20-year age group, the adolescent period. Only a few cases occurred beyond the fourth decade of life.

The most common tumor sites were the femur with 40 cases (44.95%), followed by the cruris with 37 cases (41.58%), which consisted of tibia with 26 cases (29.21%). Nine other cases can't be identified whether the primary site is from the Tibia or Fibula, and we classified them as 'other'. Rare locations such as the pelvis, mandible, and shoulder are also found in this study.

In terms of surgical management, amputation was the most frequently performed procedure with 47 cases (52.8%), followed by resection with 21 cases (23.6%), wide resection with 15 cases (16.9%), limb ablation with 2 cases (2.25%), hip disarticulation with 2 cases (2.25%), and hemipelvectomy with 2 cases (2.25%) (Table 1).

Most cases were classified as conventional osteosarcoma with 82 cases (92.1%), followed by telangiectatic osteosarcoma with 5 cases (5.6%) and small-cell osteosarcoma with only 2 cases (2.2%) from histopathology examination. Four of five cases from telangiectatic osteosarcoma subtype cases in this study also show conventional osteosarcoma morphology. Only one case shows pure telangiectatic osteosarcoma morphology. All the small cell osteosarcoma subtype cases in this study also show conventional osteosarcoma morphology. Preoperative chemotherapy was given to 29 patients only (32.2%), and 8 cases (9.0%) underwent cryotherapy as part of adjuvant management.

Assessment of tumor necrosis using the Huvos grading system revealed 10 cases (11.24%) with Grade I, 14 cases (15.73%) with Grade II, and 5 cases (5.61%) with Grade III necrosis. No cases demonstrated complete necrosis (Grade IV). These findings indicate that a substantial proportion of patients exhibited limited histologic response to preoperative chemotherapy (Table 2).

DISCUSSION

The present study characterizes the clinicopathological spectrum of osteosarcoma based on various surgical specimens, providing a morphological overview that reflects both diagnostic diversity and treatment-related challenges. The predominance of male patients (68.5%) and the peak incidence in the second decade of life are in line with the established epidemiology of osteosarcoma, which is strongly associated with skeletal growth and metaphyseal bone remodeling [3,4,6].

TABLE 1: The distribution of clinical characteristics for osteosarcoma.

Characteristic	Total N (%)
Population	
Sex	
Male	61 (68.5%)
Female	28 (31.5%)
Age	
0-10	10 (11.24%)
11-20	54 (60.67%)
21-30	17 (19.10 %)
31-40	2 (2.25%)
41-50	2 (2.25%)
51-60	3 (3.37%)
61-70	1 (1.12%)
Location	
Mandible	1 (1.12 %)
Shoulder	1 (1.12 %)
Humerus	5 (5.61%)
Antebrachial	2 (2.25%)
Pelvis	2(2.25%)

Characteristic	Total N (%)
Location	
Genu	1 (1.12 %)
Femur	40 (44.95%)
Cruris	37 (41.58%)
Tibia	26 (29.21%)
Fibula	2 (2.25%)
other	9 (10.12%)
Procedure	
Resection	21 (23.6%)
Wide resection	15 (16.9%)
Amputation	47 (52.8%)
Limb ablation	2 (2.25%)
Hip Disarticulation	2 (2.25%)
Hemipelvectomy	2 (2.25%)

Conventional osteosarcoma was the most prevalent type (92.14%), followed by telangiectatic and small cell variants. This distribution mirrors global data and reinforces that conventional osteosarcoma remains the dominant entity within the WHO 2020 classification [14]. Microscopically, conventional osteosarcoma demonstrates malignant osteoid production by atypical spindles or polygonal cells, often accompanied by varying fibroblastic and chondroblastic differentiation [14]. In this study, mixed patterns frequently coexist within the same lesion. Such variability carries potential prognostic implications, as small cell osteosarcoma and telangiectatic osteosarcoma usually have a worse prognosis than conventional osteosarcoma [14, 15].

TABLE 2: The distribution of histopathological features of osteosarcoma.

Histopathology	Total N (%)
Subtype	
Conventional osteosarcoma	82 (92.14%)
Telangiectatic osteosarcoma	5 (5.61%)
Small cell osteosarcoma	2 (2.25%)
Pre-operative Chemotherapy	
Yes	29 (32.58%)
No	60 (67.42%)
Cryotherapy	8 (8.98%)
Huvos grade	
I	10 (11.24%)
II	14 (15.73%)
III	5 (5.61%)
IV	0 (0%)

The small proportion of telangiectatic osteosarcoma (5.61%) observed aligns with its reported incidence of 2.5–12% [15, 16, 17]. Histologically, this variant may mimic aneurysmal bone cysts due to its cystic and hemorrhagic spaces, yet its hallmark feature, malignant osteoid deposition along septa containing highly atypical cells, remains crucial for accurate diagnosis [14].

The rare small cell osteosarcoma, 2.25% in this study, is consistent with the other literature, with an incidence rate of 1.3% [18]. This subtype represents another diagnostic challenge, given its morphological and immunophenotypic overlap with Ewing sarcoma; thus, confirmatory testing using SATB2 and FLI1 immunostaining, or molecular analysis for EWSR1 rearrangement, is often warranted [14, 19].

Preoperative chemotherapy was administered in one-third of the cases, and histologic assessment of tumor necrosis demonstrated predominantly Huvos grades I–II responses. The absence of grade IV responses suggests limited chemotherapeutic efficacy in this study. From a pathological standpoint, quantifying post-therapy necrosis remains the gold standard for assessing treatment response and correlates strongly with patient outcome [20, 21].

The predominance of amputations (52.8 %) among our cases underscores the advanced disease stages at presentation and the limited feasibility of limb-sparing resections [22]. Careful grossing and sampling are critical, particularly in evaluating extension, soft-tissue involvement, post-therapy

response, parameters essential for both staging and prognostication [23].

CONCLUSION

Our findings reaffirm that osteosarcoma in this study retains the classical demographic and morphologic profile described globally, but the relatively poor chemotherapeutic response and high rate of amputations point to systemic challenges in early detection and multidisciplinary integration. Future research integrating histopathologic grading, molecular biomarkers, and digital morphometry may further refine diagnostic accuracy and prognostic stratification in osteosarcoma.

Conflict of Interests

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