Osteoid producing primary lesion at morphologic and biologic interface

Reena Radhikaprasad Sarkar

Department of Oral and Maxillofacial Pathology, National Dental College Derabassi, Mohali, Punjab, India

Address for correspondence:
Reena Radhikaprasad Sarkar, MD
Professor and Head Department of Oral and Maxillofacial Pathology
National Dental College Derabassi
773, sector 25, Panchkula - 134109 Mohali, Punjab, India
Phone: 09988222449; 08558058355
E-mail: reenasarkar@rediffmail.com

Summary

Fibroosseous gnathic lesions comprise a wide spectrum of diseases. Many of the entities have overlapping features. A pediatric case is encountered with a complex clinicopathologic profile. Although radiographically the lesion appears benign but on histopathological examination it possesses features of osteoid producing aggressive neoplasm. This paper highlights the unusual histologic features existing within the spectrum of fibroosseous lesions and discusses relevant clinicopathologic correlations.

KEY WORDS: anaplasia; fibroosseous; neoplasm; osteosarcoma; osteoid; pediatric.

Introduction

Head and neck osteosarcomas (OS) have an incidence rate of 1.7-5% amongst all tumors affecting the region. 4-9% of OS are in the maxillofacial region. On considering the pediatric age group, OS constitute less than 1% of all head and neck malignancy. Also head and neck OS constitute 2.7% of all OS of the human body in children. Favored site for OS in children is mandible (64-86%). Predominantly osteoblastic OS are on the higher side other variants being chondroblastic, fibroblastic, parosteal, round cell type. Usually the low grade OS are more rampant. Gnathic OS have an overall better prognosis (1). Presented here is case study in which the neoplasm had features of osteoblastoma like osteosarcoma which encompasses the spectrum of fibroosseous borderline lesions.

Case report

An 8-year-old girl was referred to the Department of Oral and Maxillofacial Pathology for a localized swelling in left posteri- or mandibular region. The clinical examination revealed an expansile lesion over the outer cortical layer of the posterior mandible. The swelling was slightly hard, painless, firm in consistency. Anteriorly it began 2 cm beyond angle of mouth and extended up to angle of mandible. Intraorally, the lesion measured about 6.5 X 3.2 cm extending from left permanent mandibular first molar (19) to ramus area (Figure 1). Radiographic findings were of well corticated radiolucency where the internal structure was varying from totally radiolucent in 19 region to mixed lesion with presence of internal straight septa creating internal compartments. Thinning of the lower border of mandible was seen (Figure 2). Chest radiographs were taken to rule out metastatic lesions.

A provisional verdict of ameloblastoma, odontogenic myxoma and aneurysmal bone cyst was given. The lesion was in close association with roots of 36 but was not fused to teeth. Histopathological findings belied the clinical diagnosis due to the following observations.

- Tumor tissue could be described as cellular as large vacuolated cells with plasmacytoid nuclear arrangement were distributed around delicate thin lace like amorphous osteoid matrix. In certain areas there were sheets of osteoblasts bridging two osteoid islands while in other areas, there existed osteoid islands showing prominent osteoblastic lining. No reversal lines or entrapped osteocytes were seen in the osteoid matrix (Figures 3, 4) (450x).
- The tumor cells were round to polyhedral in shape, plasmacytoid, vacuolated and pleomorphic. Nuclei exhibited hyperchromatism, anisonucleosis, vesiculation, prominent nucleoli and atypical mitotic activity (Figures 5, 6) (450x).
- The presence of osteoblasts directly apposed over thin rims of osteoid was a uniform finding throughout the lesion.

Figure 1 - Intraoral view of left sided intraosseous swelling.
Gnathic primary osteosarcoma in child

Discussion

Maxillofacial fibrosseous lesions usually present a diagnostic dilemma for clinicians and pathologists (2). Gnathic osteosarcomas should always be considered in the differential diagnosis of expansile jaw lesions. These show slight male predilection. Definitive diagnosis of expansile lesions of jaw is arrived upon considering clinical, radiographic and pathologic features of each lesion. It may be a reactive or neoplastic lesion, ossifying fibroma, fibrous dysplasia, giant cell granuloma, cyst, benign and malignant neoplasms, and odontogenic tumours. In early GO classic sunburst appearance may be absent. Radiographic appearance is progressive and depends upon when the lesion is intercepted. For example an advanced lesion is radiopaque. Second opinion is required due to atypical presentations. Early diagnosis increases chance of successful treatment. Treatment outcomes is generally more favorable than other anatomic sites and other sarcomas of the gnathic region (3).

Most common fibrosseous lesions are osteosarcoma and ewing’s sarcoma (4).

Craniofacial osteosarcoma located in mandible or maxilla accounts for 5-13% of all osteosarcomas and 1% of all head and neck malignancies (5).
Only a few head and neck osteosarcomas in children are atypical and invasive grade lesions in the mandible. The pathological features of osteosarcoma include production of noncalcified eosinophilic osseous matrix by atypical neoplastic osteoblasts, tumor necrosis, loss of intramedullary architecture and destruction of cancellous bone. Cytological atypia includes increased nuclear to cytoplasmic ratio, nuclear chromatin irregularities and increase in mitotic figures (1). Some investigators think that the aggressive osteoblastomas are in fact well differentiated osteosarcomas resembling osteoblastomas. The diagnostic evaluation is entirely based on histology and clinical behavior (6). Six patterns or subtypes of craniofacial osteosarcomas exist: parosteal type, fibrous dysplasia like, desmoplastic fibroma like, nonossifying fibroma like, osteoblastoma like, chondromyxoid fibroma like. Histologic hallmark of all these subtypes is the direct production of osteoid by tumor cells (5). Osteoid is the organic non-mineralised matrix of bone and composed of type 1 collagen fibers, appearing uniformly eosinophilic and keloid like. Only a specific few are associated with primary pathological process as osteoid/bone matrix formation. This matrix is associated with osteoblasts within clear spaces or halo.

In lamellar bone, the bone collagen fibers are arranged in tight packed stacks that are parallel to one another so that the bone appears to be layered. Osteoblasts within the lamellar bone are arranged parallel to the collagen fibres. In contrast to lamellar bone, woven bone is characterized by the random distribution of its collagen fibers and the irregular distribution of osteoblasts within it. Neoplastic osteoid has a lace like or sheet like distribution and there is no orderly maturation (7).

The clinicopathologic profile of our case was best described as diverse. The patient was female and belonged to the pediatric age group. The radiograph display of seemingly benign multilocular lesion was contradicted by the histopathologic findings. The tumor cells were moderately anaplastic, arranged in sheets around thin spicules of osteoid matrix. Tumor tissue was densely populated with typical osteoblasts demonstrating pleomorphism and mitotic figures supported by a vascular loosely arranged stroma. No osteoclasts were seen. Osteoblastic rimming was seen but only occasionally. To rule out reactive bone formation serial sections of the lesion was performed but the picture remained uniform without change (8, 9). Reactive bone formation tends to be focal, peripherally located and mixed with other reactive elements such as hemorrhage and osteoclast giant cells (7). Also ruled out was the osteoblastoma like peripheral tissue reaction associated with aneurysmal bone cyst (8, 9).

Padilla and Murrah state that the bone matrix in gnathic osteosarcomas can be seen in very minimal amounts, discovered after many serial sections. If the predominant matrix is osteoid, the neoplasm is osteoblastic osteosarcoma. If its cartilaginous, the tumor is referred to as chondroblastic. No prognostic significance is attributed to any type or amount of matrix produced (3).

Differential diagnosis includes osteoblastomas (OB) which constitutes 1% of primary bone tumors. The lesion had multiple appearances from radiolucency in one area to multilocularity in another. Osteoblastomas on the other hand demonstrate mottled radiopaque picture surrounded by radiolucent halo. Intratumoral calcifications can be seen. The osteoblastoma may share overlapping histopathological features with other osteoid producing tumors of bone, including low grade osteosarcoma or osteoblastoma like osteosarcoma (8). OB is composed of interanastomosing trabeculae of woven bone set within loose edematous fibrovascular stroma. A spectrum of bony maturational changes ranging from cords and clusters of activated osteoblasts associated with minimal osteoid to lacelike wispy osteoid to anastomosing trabeculae of woven bone to sheets of woven bone. OB undergoes continuous remodeling therefore giant cells are usually in abundance (4, 8, 10). Some variants of osteoblastomas exist. Those exhibiting degenerative cytologic atypia are termed as pseudomalignant osteoblastoma. Multifocal or multinodular epithelioid osteoblastoma (aggressive osteoblastoma) are also described. Epithelioid osteoblastoma in multiple nidus has a predilection for the jaws. This lesion is difficult to distinguish from OS (11). Careful consideration of cyto morphologic and nuclear features aids in differentiating from osteosarcoma because osteosarcomas are generally more atypical. Atypical features include the presence of larger neoplastic cells than seen in osteoblastoma, greater nuclear to cytoplasmic ratio, vesiculated nucleus with prominent nucleolus, very little volume of osteoid, atypical mitosis and tumor invasion into host bone. Osteoblasts do not fill in the inter trabecular stromal spaces in osteoblastoma (10). Based on these subtle findings along with the absence of giant cells, reversal lines in osteoid, presence of woven bone and mismatched radiographic finding led us away from the diagnosis of gnathic osteoblastoma.

Bilodeau et al. in their case report have described a bizarre occurrence of cementoblastoma with histologic and radiographic features of an osteoblastoma and osteosarcoma in pediatric patient. An intimate association was seen between the tooth apices and the tumor. Rare atypical mitotic figures were seen within the osteoblasts. No star burst appearance was seen. This tumor presented as a diagnostic dilemma clinicopathologically (11). Borderline neoplasms have been often described presenting histologic continuums especially in the case of gnathic fibrousseous lesion.

Another differential kept in mind was ossifying fibroma. They are completely radiolucent or mixed, depending on amount of calcification; surrounded by a radiolucent rim. Multilocularity is rare. The histologic test of aggressive ossifying fibroma is dense cellular proliferation of polyhedral and spindle shaped cells arranged in a whorled pattern. Osteoclasts, osteoid are also seen rapidly expanding central jaw lesions of children and adolescents (2, 12). Ossifying fibroma appearing as fast growing mass between 5 and 15 yrs of age, radiologically well bordered and consistent with ossifying fibroma histologically are referred to as juvenile ossifying fibroma. In 79% of cases it occurs before 15 yrs of age. Fibroblastic spindle cells constituted stroma with anastomosing areas of cellular condensation, garland like bony strands lined by plump osteoblasts and cement particles are usually present (13, 14). Not much atypia or mitotic activity is seen (15).

Diagnosis of juvenile ossifying fibroma could be ruled out because no spindle shaped fibroblasts or whorling pattern of cells or trabecular/psammomatomoid osteoid matrix was seen. In our case, the cells were polyhedral and vacuolated, no whorling pattern was observed. Osteoid matrix demonstrated wispy like pattern of formation. No giant cells could be seen. Lesion was well vascularised and highly cellular. Sanerkin and Mott described their case as solid Aneurysmal bone cyst in which the atypical islands of osteoid as in osteoblastoma or osteosarcoma. A fibroblastic, fibrohistiocytic proliferation, osteoclast rich areas, foci of osteoblastic prolif-
Gnathic primary osteosarcoma in child

eration, aneurysmal sinusoids, and fibromyxoid stroma was present in four cases. The signs and symptoms were described as compatible with malignancy (16).

Solid form of ABC represents 5% of all cases of ABC and is a noncystic variant. The cyst has multilocular soap bubble like appearance (17).

Lastly to exclude fibrous dysplasia. Radiographically the demarcation of fibrous dysplasia from the surrounding bone is ill defined and it has picture of mixed radiopaque radiolucent (18). Also the fibrous dysplasia has y or c shaped trabeculae with blander stroma and absence of bony destruction.

To conclude, we have discussed a pediatric case of gnathic osteoblastoma like osteosarcoma. This lesion is rare and represents an area where osteoblastoma and osteosarcoma overlap. Gnathic fibroosseous lesions often present with diagnostic dilemma as in our case.

Disclosure
Conflict of interest none declared. Source of funding nil.

References