

Mesenchymal Chondrosarcoma of Cervical Vertebrae: Clinical Experience with Review of Literature

Sufian Zaheer^{1*} Navpreet Kaur² and Sunil Ranga³

¹Pathology, Professor, VMMC and Safdarjang, Hospital, Delhi, India

²Pathology, Senior resident, VMMC and Safdarjang Hospital, Delhi, India

³Pathology, Professor, VMMC and Safdarjang, Hospital, Delhi, India

***Corresponding Author:** Sufian Zaheer, Pathology, Professor, VMMC and Safdarjang, Hospital, Delhi, India.

Received: December 11, 2020; **Published:** December 30, 2020

Abstract

Mesenchymal chondrosarcoma (MCS) is a rare but aggressive variant of conventional chondrosarcoma, which carries a poor prognosis. Only a few cases of such tumors originating from the spinal vertebrae have been described in the literature. It usually occurs in teenagers and young adults, but the peak is seen in the second and third decade. Jaw bones especially the mandible is commonly involved. We report here a case of a 17-year boy who presented with pain and swelling in the left side of the neck, along with weakness of the left upper limb. On CECT left side of the arch of the atlas, bone showed osteolytic destruction. There was involvement of C2, C3, and C4 vertebrae. MRI showed a large paravertebral mass with areas of focal calcification. On aspiration plump oval to spindle cells were seen. Histopathological examination of the biopsy material revealed the characteristic biphasic pattern of MCS. We suggest the differential diagnosis of every primary vertebral tumor to include the tumors of mesenchymal origin.

Keywords: *Mesenchymal Chondrosarcoma; Cervical Vertebrae; Clinical Experience; Review of Literature*

Introduction

Lichtenstein and Bernstein [1] in 1959 described mesenchymal tumor with areas of chondroid differentiation and named this rare variant of chondrosarcoma as mesenchymal chondrosarcoma (MCS). There is a slight predilection for females [2]. Pain and swelling are the main presenting features. MCS is most commonly seen in jaw bones, in the second or third decade of life. It is much more aggressive than its conventional counterpart; presenting sometimes with the features of metastasis, and the prognosis is very poor in MCS. There is no difference in radiology of both conventional as well as MCS. Histopathologic ally, the tumor has a characteristic biphasic appearance composed of small undifferentiated cells and islands of well-differentiated cartilage [3]. Differential diagnosis includes Ewing's sarcoma, lymphoma, or small cell osteogenic sarcoma. Sometimes, the arrangement of these small undifferentiated cells is around the blood vessels giving a hemangiopericytomas pattern. Only a few cases of such tumors originating from the spinal vertebrae have been described in the literature.

Methods

A 17-year male presented to the orthopedics department with pain in the neck region for 5 months, swelling in the left upper side of the neck, and weakness in the left upper limb for 3 months. On examination tenderness was elicited and a lump of 3×3 cms was found. The temperature over the swelling was raised with unremarkable overlying skin. Plain radiograph of the region did not show any abnormality. CECT showed (Figure 1) gross destruction of the lateral mass of C2 vertebrae and associated hypodense lesion on the left side show-

ing heterogeneous enhancement on contrast. There was involvement at C3 and C4 levels. Juglar vein on the left side was not visualized properly. There was an extension of soft tissue in the spinal canal, which was showing heterogeneous enhancement. Although, no gross evidence regarding mass effect on the cord was visualized.



Figure 1: Contrast-Enhanced CT Showing Gross Destruction of the Lateral Mass of C2 Vertebrae and Associated Hypodense Lesion on the Left Side Showing Heterogeneous Enhancement on Contrast.

MR imaging confirmed the involvement of the underlying cord at the affected vertebral regions and it showed abnormal signal intensity in the upper cervical region. Fine needle aspirate (FNA) was done under image guidance, which showed plump oval to spindle cells with a dirty background suggesting spindle cell lesion.

Histopathological examination of the biopsy showed small, undifferentiated round to oval cells which were spindly at places, arranged around the vascular structures giving a hemangiopericytoma-like pattern. Islands of well-differentiated cartilage juxtaposed to the undifferentiated cellular areas along with focal calcification were noted (Figure 2 to 4). A diagnosis of mesenchymal chondrosarcoma was given.

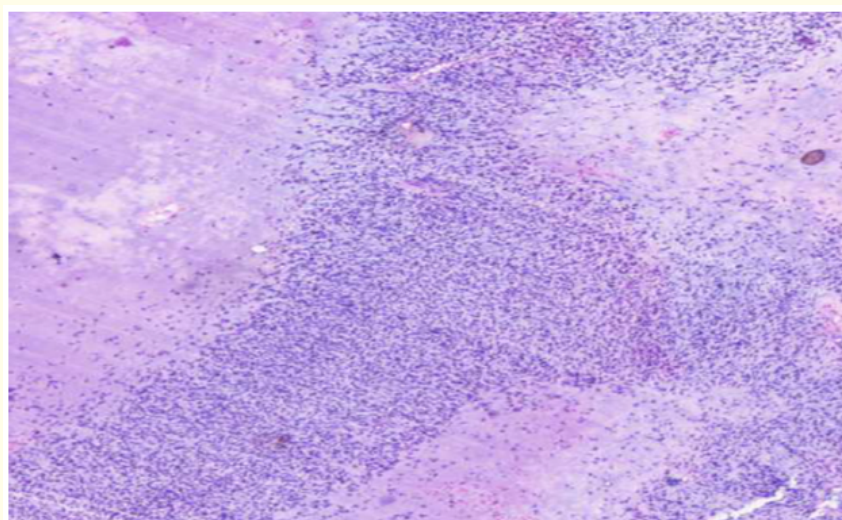


Figure 2: Microphotograph Showing Characteristic Biphasic Appearance Composed of Small Undifferentiated Cells and Islands of Well-Differentiated Cartilage (Haematoxylin and Eosin, X40).

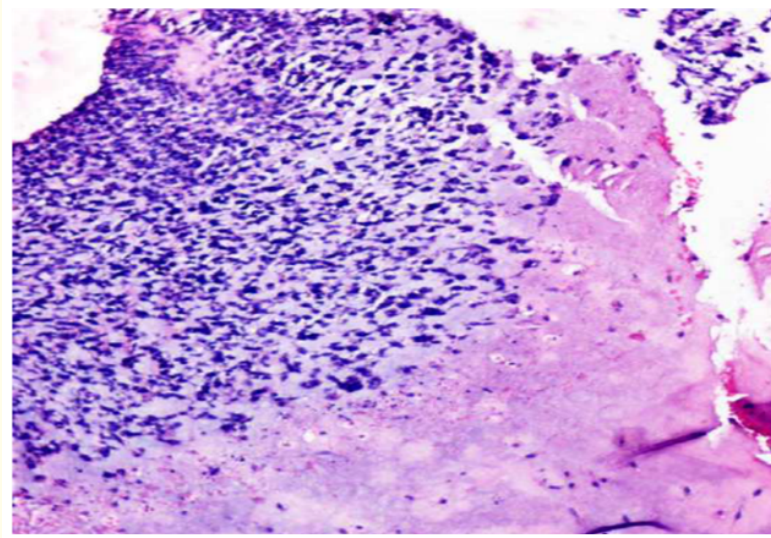


Figure 3: Microphotograph Depicting Small, Undifferentiated Round to Oval Cells Which are Even Spindly at Places Along with Islands of Well-Differentiated Cartilage Juxtaposed to the Undifferentiated Cellular Areas. Haematoxylin and Eosin, X100.

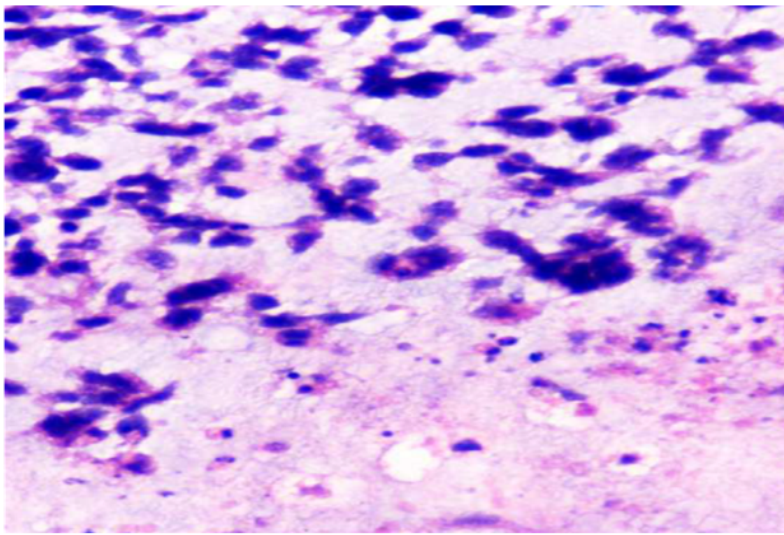


Figure 4: Microphotograph Depicting Small, Undifferentiated Round to Oval Cells. Hematoxylin and Eosin, X400.

Surgical excision was done, but a wide resection could not be performed because of the location of the tumor. Histopathological examination of the resected material was consistent with the diagnosis of MCS. The patient was sent for radiotherapy. Unfortunately, the patient succumbed to the disease within 3 months of diagnosis.

Discussion

Hutter, *et al.* [4] suggested the term “Primitive Multipotent Sarcoma of bone” to designate a group of tumors that have histological features of more than one type of sarcoma. In their review, they found different types of differentiation including Ewing’s Sarcoma, osteoid matrix, chondroid matrix, vascular areas, squamous areas, plasmacytoid differentiation, and adenocarcinoma. Similarly, Jacobson, *et al.* [5] proposed the term “polyhistioma” to designate a neoplasm of small round cells that may differentiate into one or a variety of mesenchymal tissue including osteoid, chondroid, vascular tissue, lipid elements, and plasmacytoid cells, but not into epithelial cells. He proposed that the term mesenchymal chondrosarcoma (MCS) is unsuitable and should be dropped as it disguised the relationship of these tumors to the other forms that polyhistioma can take. However, Sim., *et al.* [6] proposed that the term “mesenchymal chondrosarcoma” be retained and refer to small round cell tumors producing chondroid but no osteoid, and that the designation of “small cell osteosarcoma” be applied to those that produce osteoid, or chondroid matrix.

Dabaska, *et al.* [7] proposed MCS as a neoplastic caricature of embryonal enchondral osteogenesis. WHO book on the classification of tumors, defines MCS as a rare malignant tumor characterized histopathologically by a biphasic pattern composed of highly undifferentiated small round cells and islands of well-differentiated hyaline cartilage [3]. It is a very rare tumor that accounts for 1 - 9% of all chondrosarcoma [8,9]. It can occur both in skeletal and extra-skeletal sites in a ratio of 2:1 [10]. MCS is more aggressive than conventional chondrosarcoma and carries a poor prognosis. This highly aggressive cartilage producing sarcoma was first described in bone by Lichtenstein and Bernstein in 1959 [1] and soft tissue by Dowling in 1964 [11], they conclude that MCS showed a higher rate of recurrence and metastasis.

The tumor can occur at any age with a peak incidence in the second and third decade. Females are slightly more commonly affected than males, with the female to male ratio being 1.4:1 [2]. Cranio-facial bones especially the jaw bones are most frequently affected [12]. Other commonly involved sites include vertebrae, rib, pelvis, and humerus [10]. Common extra-skeletal sites include lower extremities, orbit, meninges, nasal and paranasal mucosa, and parapharyngeal space. MCS of rare sites like heart, lungs, labia major, retroperitoneum, pancreas etc. has been reported [13-17].

The present case discusses MCS of cervical vertebrae which is a rare skeletal site for the tumor. Common symptoms are pain and swelling ranging from days to several years, frequently for more than one year. Similar complaints were noted in our case. Oncogenic osteomalacia (tumor-induced osteomalacia) has also been reported with this entity [18]. Conventional radiography, CT, and MRI demonstrate several overlapping features with those of conventional chondrosarcoma. The lesions are primarily lytic and destructive with poor margins and not significantly different from conventional chondrosarcoma in most of the cases. MRI features are variable and can include a heterogeneous, low attenuation on T1 weighted image and high signal intensity on T2 weighted image [19,20].

On gross examination, the tumor was firm, well-circumscribed, grey to white measuring approximately 10 cm in diameter. Most of the tissue showed mineralized deposits that varied from dispersed foci to prominent areas [3]. Bone expansion with cortical thinning was seen along with bone destruction and invasion of soft tissue.

Histopathologically, the tumor is characterized by a biphasic pattern composed of small, round, undifferentiated cells admixed with an island of well-differentiated hyaline cartilage. Small round cells that form the undifferentiated part of the tumor may be confused with malignant lymphoma or Ewing’s sarcoma. They can even be spindly at times. Sometimes they are arranged around a hemangiopericytoma-like vascular pattern [3]. Despite the undifferentiated nature of this small cell component, pleomorphism, and mitotic activity was inconspicuous [12]. There is the presence of osteoclastic giant cells. Cartilaginous Island forms the well-differentiated portion of the tumor. It may be distinct from the undifferentiated part. Earlier it was thought that the cartilaginous portion has to be benign, but with experience, it was realized that chondroid island may have the appearance of low grade chondrosarcoma [21].

Round undifferentiated cells of MCS can simulate Ewing's sarcoma (ES), lymphoma, or small cell osteosarcoma (OS) in the biopsy specimen. Recognition of this tumor from other entities is important because of the potential differences in the response to therapy. presence of chondroid element ruled out lymphoma or Ewing's sarcoma. Well-differentiated cartilage is unusual in Osteosarcoma [21]. Differentiation from conventional CHS is difficult radiologically because of several overlapping features. Thus histopathological diagnosis becomes very important in separating this tumor from conventional chondrosarcoma which varies significantly in the course of the disease, treatment, and prognosis.²² Immunohistochemistry shows positivity for Leu 7, vimentin, and CD 99 making the differentiation from ES again difficult. Chondroid areas are S-100 and Vimentin positive. It is proposed that immunohistochemical positivity for collagen II and IIA, which are considered as a marker for chondro-progenitor cells, could be used to differentiate MCS from other small round cell tumors [23-25]. Another study by Wherli, *et al.* [24] have shown that transcription factor SOX 9, a master regulator of chondrogenesis, can be demonstrated in mesenchymal chondrosarcoma to differentiate this tumor from other small round cell tumors [26].

Treatment often involves wide margin excision. The benefits of chemotherapy and radiotherapy are not clear [16]. But for areas like the spine, as in our case where the wide surgical margin excision is not possible, chemotherapy and radiotherapy can play an important role [27]. MCS are aggressive lesions with a high propensity to metastasis; however, some patients can have a protracted clinical course, so the behavior can be unpredictable [11]. However, the overall prognosis is poor, because tumors tend to have late recurrences, either locally or as a metastasis.

Metastasis of chondrosarcoma is hematogenous and the most common site is the lung. In the review of 111 cases, Nakashima, *et al.* [3] reported a five-year survival rate of 54% and a 10-year survival rate of 27%. They also found that 43 out of 71 patients (61%) developed metastasis after an average of 4.3 years. Unfortunately, we lost the patient within 3 months of diagnosis. This again attests to the grave outcome of this disease.

Conclusion

We have reported this case because of the importance of histopathological examination in the diagnosis of MCS and its differentiation from other round cell tumors and conventional chondrosarcoma, with which it shares several radiological features making its differentiation difficult. This is important so that timely and proper intervention can be done for this more aggressive tumor with relatively poor outcomes when compared to the conventional variant.

Bibliography

1. Lichtenstein L and Bernstein D. "Unusual benign and malignant chondroid tumors of bone". *Cancer* 12 (1959): 1142-1157.
2. Williams HK, *et al.* "Mesenchymal Chondrosarcoma". *International Journal of Oral and Maxillofacial Surgery* 16 (1995): 119-124.
3. Nakashima Y, *et al.* "Mesenchymal Chondrosarcoma". In WHO classification of tumors". Pathology and genetics of tumors of soft tissue and bones. 2002. IARC Press. Lyon (2002): 255-256.
4. Hutter RVP, *et al.* "Primitive multipotent primary sarcoma of bone". *Cancer* 19 (1966): 1-25.
5. Jacobson SA. "Polyhistioma: a malignant tumor of bone and extraskeletal tissue". *Cancer* 40 (1977): 2116-2130.
6. Sim FH, *et al.* "Osteosarcoma with small cell simulating Ewings tumor". *Journal of Bone and Joint Surgery* 61-A (1979): 207-215.
7. Dabaska M and Huvos AG. "Mesenchymal Chondrosarcoma in the young. A clinicopathological study of 19 patients with explanation of histogenesis". *Virchows Arch* 399 (1983): 89-104.

8. Bertoni F, *et al.* "Mesenchymalchondrosarcoma of bone and soft tissue". *Cancer* 52 (1983): 533-241.
9. Nusrat Alkapot and Ozeyir Gok. "Mesenchymal chondrosarcoma of the mandible". *Turkish Journal of Medical sciences* 34 (2004): 209-213.
10. Nakashima Y, *et al.* "Mesenchymal chondrosarcoma of bone and soft tissue. A review of 111 cases". *Cancer* 57 (1986): 2444-2453.
11. Dowling EA. "Mesenchymal chondrosarcoma". *Journal of Bone and Joint Surgery* 46 (1964): 747-754.
12. Salvador AH, *et al.* "Mesenchymal chondrosarcoma. Observation of 30new cases". *Cancer* 28 (1971): 605-615.
13. Nesi G, *et al.* "Extraskkeletal mesenchymal chondrosarcoma involving theheart. Report of a case". *Italian Heart Journal* 1 (2000): 435-437.
14. Luppi G, *et al.* "Mesenchymal chondrosarcoma ofpleura". *European Respiratory Journal* 9 (1996): 840-843.
15. Lin J, *et al.* "Extraskkeletal mesenchymal chondrosarcoma of thelabia majus". *Gyenocological Oncology* 60 (1996): 492-493.
16. K Taori, *et al.* "Primaryretroperitoneal extraskkeletal mesenchymal chondrosarcoma: A computed tomographydiagnosis". *The British Journal of Radiology* 8 (2007): 541-544.
17. Bae-Geun O, *et al.* "Primary extraskkeletal mesenchymal chondrosarcoma arising in the pancreas". *Korean Journal of Radiology* 8 (2007): 541-544.
18. Zura RD, *et al.* "Tumor induced osteomalacia and symptomatic looserzones secondary to mesenchymal chondrosarcoma". *Journal of Surgical Oncology* 71 (1999): 58-62.
19. Shinaver CN, *et al.* "MRI of Mesenchymal Chondrosarcoma of orbit; Casereport and review of Literature". *Neuroradiology* 39 (1997): 296-301.
20. Ariyoshi Y and Shimahara D. "Mesenchymal chondrosarcoma of maxilla: report of a case". *Journal of Oral and Maxillofacial Surgery* 57 (1999): 733-737.
21. Inwards CY and Unni KK. "Bone tumors. In Sternberg's Diagnostic surgical pathology". fourth Edition. Lippincotts William Wilkins, Philadelphia USA (2004): 283.
22. Steiner GC, *et al.* "Mesenchymal chondrosarcoma: A study of theultrastructure". *Cancer* 32 (1973): 926-939.
23. Aigner T, *et al.* "Cell differentiation and matrixgene expression in mesenchymal Chondrosarcoma". *The American Journal of Pathology* 156 (2000): 1327-1335.
24. Ng LJ, *et al.* "SOX 9 bind DNA, activates transcription and coexpress 9 with type II collagen in chondrogenesis in mouse". *Developmental Biology* 183 (1997): 108-121.
25. Bi W, *et al.* "SOX 9 is required for cartilage formation". *Nature Genetics* 22 (1999): 85-89.
26. Wherli BM, *et al.* "Sox 9 a master regulatorof chondrogenesis, distinguishes mesenchymal chondrosarcomaform other small round celltumors". *Human Pathology* 34 (2003): 263-269.
27. Cesari M, *et al.* "Mesenchymal Chondrosarcoma. An analysis of patients treated at a single institution". *Tumori Journal* 93 (2007): 423-427.

Volume 4 Issue 1 January 2021

©All rights reserved by Sufian Zaheer, *et al.*