Surgical management of chondrosarcomas of Head and Neck

Govind Jindal[1,*], Simarpreet Singh Batra[2], Jaspreet Singh Badwal[3], Shaina Uppal[4], Shivani Bhandari[5]

[1]Professor & HOD, [2]PG Student, [5]Junior Lecturer, Dept. of Oral & Maxillofacial Surgery, Gian Sagar Dental College & Hospital, Rajpura, Punjab, [3,4]Dentist

***Corresponding Author:**
Email: drgovindjindal@gmail.com

Abstract

Chondrosarcomas are uncommon malignant mesenchymal neoplasms that are rare in the head and neck region. They affect mainly the maxilla, while relatively few arise from the mandible, nasal cavity, larynx, skull and cervical vertebrae. Radical surgical resection with a wide margin of normal tissue is the treatment of choice, while radiotherapy and chemotherapy are reserved as adjunctive therapies for tumours where enbloc resection is not feasible.

Introduction

Chondrosarcomas are uncommon malignant mesenchymal neoplasms that are characterized by formation of cartilage derived from chondroid precursors.[1,2] They account for 11-20% of all primary malignant tumors afflicting the human body. The sites which get affected at relatively high incidences, include – the long bones, the pelvis and the ribs.[1-4]Approximately 1% to 3% of chondrosarcomas occur in head and neck region, affecting mainly the maxilla, while relatively few arise from the mandible, nasal cavity, larynx, skull and cervical vertebrae.[4,5] Chondrosarcomas constitute only 4% of non-epithelial tumours of the nasal cavity, paranasal sinuses and nasopharynx.[6-8] The usual age of incidence is from fifth to seventh decades of life with slight predominance in males.[5,7,9] Unlike other locations, laryngeal chondrosarcomas appear around the age of 60 years with a clear predominance in males.[6]

Chondrosarcomas can be divided into primary, when they arise from healthy tissue, or secondary, when they arise from previously existing chondromas or cartilaginous exostosis.[10,11] Diseases such as Mafucci syndrome or Ollie disease are associated with chondrosarcoma in up to 15% of cases. It has been suggested that, the locations of head and neck that lack cartilage, such as the base of the skull or the upper maxillary region, are afflicted by chondrosarcomas, at the origin of the head and neck chondrosarcomas depends on the persistence of embryonic cartilage remnants.[10-12]

Chondrosarcomas, whether Mesenchymal or undifferentiated or clear cell chondrosarcomas being rare have a worse prognosis as their course is characterized by rapid recurrence and a tendency to metastasize.[7] Incidence of lymph node involvement is 5% and distant metastases occur between 7-18% of cases, while high-grade chondrosarcomas present with metastases in up to 71% of cases. Low grade head and neck chondrosarcomas are slow-growing tumours with little tendency to metastasize.[7,8] However, their lethality derives from their tendency towards local recurrence, intra-axial invasion and the inherent nature to occur after many years of latency. Histologically, Evans classified chondrosarcomas into three grades according to their cellularity, number of mitosis per field and size of cell nuclei. This classification implies critical prognostic implications.[5,7,8]

Radical surgical resection with a wide margin of normal tissue is the treatment of choice as chondrosarcoma is a highly radio-resistant tumor.[9,10] Radiotherapy, hence, should be avoided as it may itself aggravate malignant potential of an otherwise low grade tumor or else should be reserved as a palliative measure, in case complete surgical excision is not possible. Although traditionally considered as radio-resistant tumours, in more recent times, there have been conflicting reports on this subject.[10-12] Positive responses to radiotherapy have been published in studies of head and neck chondrosarcomas, since new radiation modalities have proven useful in those lesions where resection with free margins could not be obtained.[12,13] Adjunctive radiotherapy is accepted in cases of high-grade tumours, those with lymph node involvement, incomplete resection and recurrence.[12,14] Chemotherapy is reserved for tumours with a high risk of metastasis, such as mesenchymal, undifferentiated or high-grade tumours. Anecdotal partial responses have been published. The combination of chemotherapy and radiotherapy has not obtained cures.[14-16]

Clinical Features

The Chondrosarcoma is a neoplasm that may arise in any bone but shows a predilection for the pelvic girdle, chest wall, and scapula.[17] In contrast to osteosarcoma, chondrosarcoma is uncommon in the first two decades of life, with utmost prevalence in the fourth to sixth decades.[18] In cases involving the head and neck, mean patient ages range from 35 to 45 years, although patients younger than 20 years of age have been reported.[19] Chondrosarcomas of the jaws do not show a sex predilection. Patients with Maffucci syndrome and Ollier disease have a 25-30% risk of developing chondrosarcoma, these patients being generally younger

than those with primary chondrosarcoma.[20] Chondrosarcomas in the head and neck region have shown involvement of virtually every site. The most common locations include the maxilla, base of the skull, cervical vertebrae, nasal cavity, and the nasal septum. In the mandible, the most common location is the premolar molar area, although the symphysis, coronoid process and condylar process may be involved.[20] The anterior part of the maxilla and the posterior region of the mandible are more common sites of occurrence, the origin being accounted to remnants of embryonic cartilage precursors of nasal and septal development in the anterior part of the maxilla and Meckel's cartilage precursors in the posterior aspect of the mandible.[21]

The signs and symptoms of head and neck chondrosarcomas vary from pain, swelling, headacheand hearing loss with neurological problems depending on the tumor location. Jaw lesions may be associated with limited mouth opening, separation or loosening of teeth, expansion of cortical plates, and premature exfoliation of teeth.[17,22]

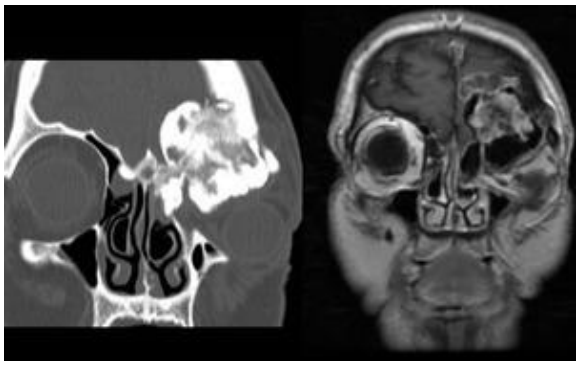

Fig. 1: Chondrosarcoma of left or bit

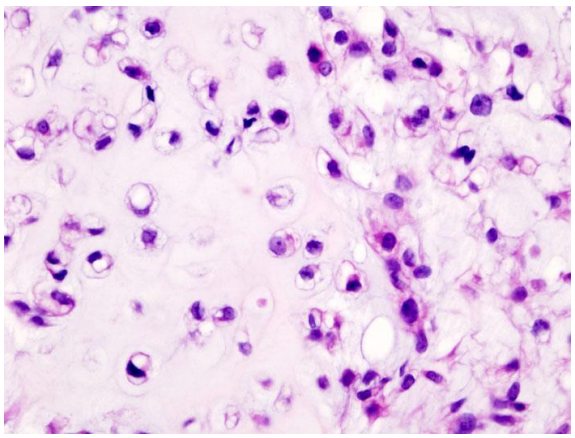

Fig. 2: High power microscopic view of chondrosarcoma

Radiologic Features

Radiographically, the tumor presents as an irregular intramedullary radiolucency causing cortical expansion and destruction. Punctate radiopacities may be present because of dystrophic calcifications or focal ossifications of cartilage. In some cases, the tumor may grow in a lobular pattern with minimal or no foci of calcification. In such instances, the lesion can appear as a multilocular radiolucency and mimic a benign process.[22] Calcification is seen in 45-80% of cases.[19] Chondrosarcomas with an extreme myxoid component frequently lack calcification. These tumors in the base of the skull cannot be radiologically distinguished from chordomas.[20] In tooth bearing areas, a widening of the periodontal ligament space (Garrington sign) may be seen as an early sign of chondrosarcoma.[21] In general, slow growing tumors cause reactive thickening of the cortex, whereas a more aggressive high grade neoplasm destroys the cortex and forms a soft tissue mass. The more radiolucent the tumor, the greater the likelihood that it is high grade.[23] The differential diagnosis for radiolucency with displacement of teeth might include lateral periodontal cyst, the early stages of cemento-osseous dysplasia, central giant cell granuloma, cemento-ossifying fibroma, odontogenic cysts (e.g., radicular or odontogenic keratocyst), odontogenic tumours and other nonodontogenic tumours (e.g. fibrosarcoma). Painful lesions with similar radiological findings include osteomyelitis, periapical lesions, osteosarcoma and Langerhan's cell disease.[24]

CT and magnetic resonance imaging are quite valuable in determining the nature and extent of the lesion, but a definitive diagnosis needs to be made histologically. CT imaging may show the exact extent of the lesion to be much more extensive than that visualized on conventional radiographs.[23]

Histopathology

The histology of chondrosarcoma was first described by Lichtenstein and Jaffe.[20] It usually contains an abundant amount of hyaline type cartilage, a lobulated growth pattern with round and oval cells in lacunae, with enlarged nuclei and is hypercellular. Tumor cells with large, single or multiple nuclei may be found. Numerous binucleated cells are seen with greater frequency in chondrosarcoma than chondroma, especially in poorly differentiated tumors. Features such as foci of atypical spindle cells, myxoid degeneration of the matrix, and calcification or ossification of the matrix may be seen. Evans and coworkers have further classified chondrosarcomas into grades I, II, and III on the basis of mitotic rate, cellularity, and nuclear size. Most chondrosarcomas in the head and neck region are well-differentiated (Grade I). Mitotic activity in acartilaginous tumor is an excellent indication of malignancy, although some high grade chondrosarcomas may lack this feature. The finding of individual cell necrosis within areas not marred by calcification or degeneration is an important clue to the diagnosis of chondrosarcoma. Chondrosarcomas infiltrate between existing bone trabaculae, causing endosteal erosion, invade the cortex filling the Haversian canals and extend into the soft tissues.[20,23] The absence of osteoid and

neoplastic bone helps to rule out chondroblastic variant of osteosarcoma.

Differential Diagnosis

The diagnosis of chondrosarcoma is among the most difficult problems in bone tumor pathology. The diagnosis of a low-grade, well differentiated chondrosarcoma from an enchondroma, based on histology alone, is often difficult if not impossible, especially in small biopsy specimens. Indicators of malignancy include occurrence of chondrocytes with enlarged atypical nuclei having a distinct chromatin pattern and individual cell necrosis. Islands of cartilage remain separated from the trabecular bone in enchondroma, unlike chondrosarcoma where bone is infiltrated. It is imperative to assess clinical features, location, and radiographic appearance to determine whether the lesion is malignant or not. Further, the incidence of chondromas of the jaw is extremely low andtherefore any symptomatic cartilage lesion in this area is best considered malignant.[19] The differential diagnosis of a chondrosarcoma from an osteosarcoma is also a difficult distinction to make, since chondroid differentiation in osteosarcoma of jaw is more common than in other sites. In chondroblastic osteosarcomas, there is spindling of tumor cells towards the periphery of the lobules and the tumor cells surrounding the lobules are cytologically malignant with the presence of lace-like osteoid between the spindle cells. In chondrosarcoma, bone formation takes place on the framework of a preexisting cartilage matrix; whereas in osteosarcoma, bone isproduced directly by the malignant stromal cells.[20]

In Ollier's and Maffucci's syndromes, the cartilage may be hypercellular with a haphazard distribution of cells and may exhibit nuclear atypia similar to chondrosarcoma. In suchcases, a careful review of the clinical features and radiology will help to arrive at a correct diagnosis.[16]

Treatment and Prognosis

Surgical resection is the most effective therapy. The resection margins should be determined in relation to the grade of differentiation of the tumor. Wide bloc excision is recommended for all types of chondrosarcomas. Because of the low percentage of dividing cells, poor vascularization and the production of extracellular matrix, chondrosarcomas are relatively resistant to radiotherapy and chemotherapy. Radiotherapy is feasible after incomplete resection or where enbloc resection is not possible, to achieve local control.[15,25]

Complete resection is the most effective treatment for conventional chondrosarcomas. Maxillary and antral tumors are more difficult to eradicate and therefore are less amenable to cure. Local recurrence leads to death by direct extension of the tumor into vital structures of the head and neck. Patients presenting with mandibular tumors and with tumors of better differentiated histologic grade enjoy a better survival time. Mesenchymal and dedifferentiated chondrosarcomas are usually treated by chemotherapy because of their aggressive clinical course.[24,26]

Chondrosarcoma, although traditionally regarded as a radio-resistant tumor, was reported by Harwood to be radiosensitive and potentially radiocurable. The reviewed literature rarely presents irradiation as a single modality treatment but is rather used most commonly as an adjunct. The primary role of radiation therapy has been for the treatment of unrespectable disease (enbloc resection not possible) and after surgical resection with positive margins.[27] Chemotherapy has a limited role in chondrosarcoma, but can be applied as an adjuvant therapy in cases with aggressive behaviour, rapid local recurrence and high grade chondrosarcomas.[27,28]

Prognosis of chondrosarcoma depends on the site, grade and respectability of the tumor. The worst prognosis has been implicated in centrally occurring chondrosarcomas of the pelvis, trunk, proximal extremity and the head and neck areas, especially the nasal cavity and nasopharynx. However, there are contradictory views regarding the behavior of this tumor. Since the grade of the tumour is an important prognostic factor, high-grade lesions should be treated aggressively.[29] Cases with positive margins, requiring further radiotherapy or chemotherapy, have a bad prognosis. Chondrosarcoma can also get implanted in an operative scar or even along the tract of a needle biopsy. The implanted cartilaginous cells survive even in the most hostile environments making it essential for a meticulous clearance of this tumor. Distant metastases in chondrosarcoma are found in 10% of grade II and 71% of grade III tumours.

Conclusion

Chondrosarcoma occurs rarely in the jaws and exhibits histological features similar to other tumours, due to which diagnosis is always a challenge for pathologists. These lesions mostly present as a hard mass that may be associated with pain and displacement of teeth. Good prognosis for the lesion is achieved with early recognition and diagnosis followed by wide surgical resection performed as soon as possible, as chondrosarcoma is a locally aggressive lesion. A long-term study of combined treatment with surgery and adjuvant radiation therapy or chemotherapy is needed to confirm the best approach in the management of these lesions.

References

1. Burkey BB, Hoffman HT, Baker SR, Thornton AF, McClatchey KD. Chondrosarcoma of the head and neck. Laryngoscope. 1990;100:1301-5.
2. Ruark DS, Schlehaider UK, Shah JP. Chondrosarcomas of the head and neck. World J Surg. 1992;16:1010-5.
3. Koch BB, Karnell LH, Hoffman HT, Apostolakis LW, Robinson RA, Zhen W, et al. National cancer database

report on chondrosarcoma of the head and neck. Head Neck. 2000;22:408-25.
4. Wanebo JE, Bristol RE, Porter RR, Coons SW, Spetzler RF. Management of cranial base chondrosarcomas. Neurosurgery. 2006;58:249-55.
5. Prado FO, Nishimoto IN, Perez DE, Kowalski LP, Lopes MA. Head and neck chondrosarcoma: analysis of 16 cases. Br J Oral Maxillofac Surg. 2009;47:555-7.
6. Thompson LD, Gannon FH. Chondrosarcoma of the larynx: a clinicopathologic study of 111 cases with a review of the literature. Am J Surg Pathol. 2002;26:836-51.
7. Finn DG, Goepfert H, Batsakis JG. Chondrosarcoma of the head and neck. Laryngoscope. 1984;94:1539-44.
8. Fu YS, Perzin KH. Non-epithelial tumors of the nasal cavity, paranasal sinuses, and nasopharynx: a clinicopathologic study. Cartilaginous tumors (chondroma, chondrosarcoma). Cancer. 1974;32:453-63.
9. Anwar R, Ruddy J, Ghosh S, Lavery KM, Wilson F. Chondrosarcoma of the maxilla. J Laryngol Otol. 1992;106:53-5.
10. Fayda M, Aksu G, Yaman Agaoglu F, Karadeniz A, Darendeliler E, Altun M, et al. The role of surgery and radiotherapy in treatment of soft tissue sarcomas of the head and neck region: review of 30 cases. J Craniomaxillofac Surg. 2009;37:42-8.
11. Gripp S, Pape H, Schmitt G. Chondrosarcoma of the larynx: the role of radiotherapy revisited−a case report and review of the literature. Cancer. 1998;82:108-15.
12. Meyer C, Hauck KW, González C. Chondrosarcoma of the facial skeleton in a child. Otolaryngol Head Neck Surgery.1989;101:591-4.
13. Mc Naney D, Lindberg RD, Ayala AG, Barkley HT Jr, Hussey DH. Fifteen year radiotherapy experience with chondrosarcoma of bone. Int J Radiat Oncol Biol Phys1982;8(2):187–90.
14. Harwood AR, Krajbich JI, Fornasier VL. Radiotherapy of chondrosarcoma of bone. Cancer 1980;45(11):2769–77.
15. Dai X, Ma W, He X, Jha RK: Review of therapeutic strategies for osteosarcoma, chondrosarcoma, and Ewing's sarcoma. Med Sci Monit 2011,17(8):RA177–RA190.
16. SteinbichlerTB[1], Kral F, Reinold S, Riechelmann H. Chondrosarcoma of the nasal cavity in patient with Maffucci syndrome: case r eport and review of the literature. World J Surg Oncol. 2014 Dec 17;12:387.
17. Hackney FL, Aragon SB, Aufdemorte TB, Holt GR, Van Sickels JE. Chondrosarcoma of the jaws: Clinical findings, histopathology and treatment. Oral Surg Oral Med Oral Pathol 1991;71:139-43.
18. Huvos AG, Marcove RC. Chondrosarcoma in the young. A clinicopathologic analysis of 79 patients younger than 21 years of age. Am J Surg Pathol 1987;11:930-42.
19. Saito K, Unni KK, Wollan PC, Lund BA. Chondrosarcoma of the jaw and facial bones. Cancer 1995;76:1550-8.
20. Gnepp DR. Diagnostic surgical pathology of the head and neck. 2nd ed. Philadelphia: Saunders Elsevier; 2009.
21. Robert EM, Diane S. In: Oral and Maxillofacial Pathology. Rationale for diagnosis and treatment. Chicago: Quintessence Publishing Co, Inc; 2003. p. 810.
22. Angela C. Chi. Bone Pathology: In: Neville, Damm, Allen, Bouquot editors. Text Book of Oral and Maxillofacial Pathology. 3rd ed. Missouri: Elsevier; 2009. p. 664-9.
23. Robbins, Kumar, Abbas, Fausto. Mitchell-Basic Pathology. 8th ed. Pennsylvania: Elsevier Inc, Saunders: 2007. p. 815.
24. Saini R,AbdRazak NH, Ab Rahman S, Samsudin AR. Chondrosarcoma of the mandible: a case report. J Can Dent Assoc. 2007 Mar;73(2):175-8.
25. Kharrat S, Sahtout S, Tababi S, Temimi S, Ben Miled M, Abid W, Zainine R, Nouira K, Menif E, Beltaief N, Besbes G: Chondrosarcoma of sinonasal cavity: a case report and brief literature review. Tunis Med 2010,88(2):122–124.
26. Simşek B, Köybaşioğlu A, Yücel E, Günhan O. Chondrosarcoma of the parapharyngeal space. A case report. Int J Oral Maxillofac Surg. 2005;34:803-5.
27. McNaney D, Lindberg RD, Ayala AG, Barkley HT Jr, Hussey DH. Fifteen year radiotherapy experience with chondrosarcoma of bone. Int J Radiat Oncol Biol Phys 1982;8(2):187–90.
28. Harwood AR, Krajbich JI, Fornasier VL. Radiotherapy of chondrosarcoma of bone. Cancer 1980;45(11):2769–77.
29. Riedel RF, Larrier N, Dodd L, Kirsch D, Martinez S, Brigman BE. The clinical management of chondrosarcoma. Curr Treat Options Oncol. 2009 Apr;10(1-2):94-106.