Chondroblastoma-like Chondroma of the Temporomandibular Joint –Case Report with CT and MRI Findings

Yong Li Chin[1]*, Xiu Fen Chen[2], Melissa Shuhui Lee[1]

[1]*Department of Neuroradiology, Singapore General Hospital, Singapore*

[2]*Department of Anatomical Pathology, Singapore General Hospital, Singapore*

***Correspondence:** Yong Li Chin, Singapore General Hospital, Outram Road, 169608, Singapore,
yongli.chin@mohh.com.sg

Radiology Case. 2024 September; 18(9):8-14 :: DOI: 10.3941/jrcr.5404

ABSTRACT

We present a case of a 58-year-old man with a gradually enlarging right cheek mass. Computed tomography (CT) and magnetic resonance imaging (MRI) revealed a tumour with a chondroid matrix closely related to the temporomandibular joint. Subsequent surgical resection revealed a chondroblastoma-like chondroma. Identification of the the typical features of a chondroid matrix may aid in narrowing the differential diagnoses. Nonetheless, surgical resection is usually required to establish the definitive diagnosis.

CASE REPORT

CASE REPORT

A 58-year-old man with no significant history of past medical illness presented with right cheek mass which has gradually enlarged over the part 3 years. No antecedent history of trauma to the region of interest was noted. Examination revealed a hard and non-mobile mass over the pre-auricular region which was mildly tender on palpation. No overlying skin changes, extension into the oral cavity or trismus was observed. The right mandible was palpable below the mass, however the right zygoma was unable to be felt. There were no signs of facial nerve palsy on the affected side.

Imaging Findings

Contrast-enhanced CT of the parotid glands showed a 5.4 x 3.4 x 5.4 cm heterogeneously enhancing lesion in the right masticator space, centered in the right masseter muscle and protruding between the coronoid and condylar processes of the right mandible. Peripheral and internal calcifications are present within the lesion, some of the latter appearing ring or arc-like in configuration. Of note, the mass is joined to the right temporal bone by a short bony pedicle.

Further evaluation with an MRI of the neck showed a T1w-isointense and T2w-hyperintense mass with heterogeneous contrast enhancement within the right masseter muscle; the mass is seen to be insinuating into the joint capsule of the right temporomandibular joint. No restricted diffusion was observed within the mass. No significant cervical lymphadenopathy was detected.

Management and Follow-up

Ultrasound-guided biopsy of the right masseter mass showed a cartilaginous tumour consistent with a soft tissue chondroma with no evidence of sarcoma. The patient subsequently underwent open resection of the right masseteric tumour. Intra-operatively, there was a 7 cm tumour encased within the right masseter muscle; the tumour was seen to originate from a small stalk arising from the capsule of the right temporomandibular joint, which was also resected.

Pathological examination of the resected specimen showed fragments of pale brown tissue with punctate areas of haemorrhage. Sections showed a cartilaginous neoplasm with populations of epithelioid chondrocytes set within a chondromyxoid stroma with stippled calcification. Occasional binucleation and mild to moderate nuclear atypia were observed. No mitotic figures, necrosis or significant ossification were present. The final histological diagnosis was that of a cartilaginous neoplasm, favouring a chondroblastoma-like chondroma.

Post-operatively, the patient had transient right facial nerve palsy and post-operative trismus which resolved on follow-up following rehabilitative exercises. Subsequent CT imaging performed at 6- and 12-month post-surgery showed no evidence of tumour recurrence.

DISCUSSION

Etiology and Demographics

Soft tissue chondromas are relatively uncommon benign, slow growing cartilaginous tumours arising from the tenosynovial sheaths or soft tissues adjacent to tendons [1, 2] seen mainly in middle-aged adults with no significant sex predilection [2,3].

These tumours comprise 1.5% of total soft tissue tumours, with more than 50% occuring in the phalanges [4]; these

are relatively less common within the head and neck region. The most frequent locations within the head and neck are the nasal cavity, paranasal sinuses and larynx [2]; a soft tissue chondroma of the masticatory space was also previously described [5]. A rare variant of soft tissue chondroma has been termed "chondroblastoma-like" chondroma owing to its histological appearances comprising of foci of hypercellularity, enlarged chondrocytes within lacunae, osteoclast-like multinucleated giant cells and "lace-like" or "chicken-wire pattern" of calcifications outlining the lacunae, reminiscent of chondroblastoma of bone [2,6].

Clinical and Imaging Findings

Most chondroid tumours of the head and neck region present as a gradually enlarging painless mass [5]. Other clinical manifestations depend on the tumour location and its relation to the different neck structures, e.g. upper airway obstruction, cranial neuropathies from skull base involvement, jaw pain and trismus from temporomandibular joint involvement [7].

Radiologically, benign chondroid tumours appear as well-defined expansile masses with variable quantities of chondroid matrix. Typical calcifications of the chondroid matrix, best visualized on radiography and CT, are ring-and-arc or popcorn-like in configuration. MRI is less sensitive in detecting the chondroid calcifications, however it is superior in visualizing the extent of the tumour, and demonstrating the typical intermediate T1W signal and hyperintense T2W signal of the hyaline cartilage component. These lesions may demonstrate enhancement with variable intensity [7]. Superimposed secondary changes are not uncommon, such as extensive mineralization, enchondral ossification or myxoid degeneration which may cause confusion with other disease entities [2].

Treatment and Prognosis

Chondroblastoma-like chondromas demonstrate behavior similar to conventional chondromas with a low recurrence rate and lack of distant metastasis [5, 6]. These may be resected surgically, both to establish the diagnosis especially in the presence of confounding secondary changes, as well as to treat any associated clinical symptoms [6, 7].

Differential Diagnoses

Chondroblastoma

Benign but locally aggressive bone tumour commonly seen in the long bone epiphyses. Craniofacial chondroblastomas are uncommon but when present, are most commonly located in the skull base with predilection for the squamous temporal bone adjacent to the temporomandibular joint. Imaging appearances are typical of that of a well-defined expansile chondroid tumour with variable amounts of chondroid matrix. Up to one third of these tumours may demonstrate cystic degeneration or secondary aneurysmal bone cysts. Locally aggressive features may be observed with invasion of the surrounding structures. Distant metastasis is rare.

Osteochondroma

Common benign bone lesion usually arising from the metaphyseal regions of long bones. These are rare in the head and neck region, with the most common location being the mandible, particularly the condyle and coronoid process. These appear on imaging as exophytic osseous lesions with contiguous marrow spaces arising from the parent bone, as well as an overlying cartilage cap. The cartilaginous cap may be abnormally thickened in the setting of malignant degeneration into chondrosarcoma.

Synovial chondromatosis

Benign but locally aggressive disease secondary to chondroid metaplasia of the synovium with resultant intra-articular loose bodies and joint destruction. The temporomandibular joint is the most frequently involved joint in the head and neck. Synovial chondromatosis may be divided into primary or secondary subtypes depending on the presence of underlying joint disease. Imaging-wise, features may include joint effusions, synovitis, pressure erosions of the adjacent bony structures, as well as intra-articular loose bodies. CT and MRI appearance of these loose bodies are variable depending on the degree of calcification, with non-calcified loose bodies potentially obscured by the surrounding joint effusion.

Chondrosarcoma

Third most common primary malignant bone tumour, with head and neck chondrosarcomas accounting for 1-12% of all chondrosarcomas. Head and neck chondrosarcomas tend to be lower grade with slow growth and an indolent course, and may be difficult to differentiate from a benign chondroma. The skull base is the most common location in the head and neck for chondrosarcomas, typically located off the midline with predilection for the petroclival fissure. Imaging appearances of chondrosarcoma may show an expansive soft tissue mass with associated bony erosion and local invasion. The presence of intratumoral ring-and-arc or popcorn calcifications may be helpful in alluding to the chondroid origin of the tumour. MRI signal characteristics are typical of a chondroid tumour with intermediate T1W signal and hyperintense T2W signal. Contrast enhancement is variable. Presence of non-enhancing areas may be due to cartilage, cystic degeneration or tumoral necrosis.

TEACHING POINT

The head and neck region is a relatively rare site for soft tissue chondromas; with the "chondroblastoma-like" variant being described owing to histological appearances reminiscent of bone osteoblastoma. The presence of typical ring-and-arc or popcorn calcifications may allude to an underlying chondroid lesion which will aid in narrowing the differential diagnoses. Surgical resection is usually required to establish the histological diagnosis.

QUESTIONS

Question 1: Which of the following statements are false?

1. Soft tissue chondromas are more commonly seen in the extremities than in the head and neck.

2. Presence of ring-and-arc calcifications are typical of an osteoid matrix. (applies)

3. Surgical resection is the treatment of choice.

4. Recurrence rates of soft tissue chondromas are low after resection.

5. Soft tissue chondromas cannot be definitively differentiated from chondrosarcoma on imaging alone.

Explanation

1. Soft tissue chondromas are more commonly seen in the extremities than in the head and neck. [Soft tissue chondromas are more commonly seen in the hands and feet with >50% seen in the phalanges]

2. Presence of ring-and-arc calcifications are typical of an osteoid matrix. (applies) [Ring-and-arc and popcorn calcifications are more typical of a chondroid matrix]

3. Surgical resection is the treatment of choice. [These lesions are typically resected surgically]

4. Recurrence rates of soft tissue chondromas are low after resection. [These lesions have a low recurrence rate and short interval follow-up is usually performed.]

5. Soft tissue chondromas cannot be definitively differentiated from chondrosarcoma on imaging alone. [Chondrosarcoma cannot be definitively excluded based on imaging, especially in the presence of secondary changes and surgical resection is required for definitive diagnosis.]

AUTHORS' CONTRIBUTIONS

YLC prepared the manuscript, selected the relevant images and prepared the figures for inclusion into the manuscript.

XFC reviewed the histopathological findings and prepared the representative histological figures.

SML reviewed the case details and images for suitability for inclusion and supervised the preparation of the manuscript.

ACKNOWLEDGEMENTS

Acknowledgement given to Dr Timothy Tay Kwang Yong and Dr Kesavan S/O Sittampalam from the Department of Anatomical Pathology, Singapore General Hospital for the specimen excision and histopathological report, with expert opinion from Prof. Andrew E. Rosenberg from the Miller School of Medicine, University of Miami.

CONSENT

Did the author obtain written informed consent from the patient for submission of this manuscript for publication? Yes

REFERENCES

1. Zlatkin MB, Lander PH, Begin LR, Hadjipavlou A. Soft-Tissue Chondromas. *AJR Am J Roentgenol.* 1985; 144(6): 1263-7126. PMID: 3873809.
2. Raparia K, Lin JW, Donovan D, et al. Chondroblastoma-like chondroma of soft tissue: report of the first case in the base of skull. *Ann Diagn Pathol.* 2013; 17(3): 298-301. PMID: 22743240.
3. Alaseirlis D, Tsifountoudis I, Konstantinidis G, Miliaras D, Malliaropoulos N, Givissis P. Para-articular extraskeletal chondroma mimicking first metatarsophalangeal synovitis. *Radiol Case Rep*. 2017; 12(3): 564-570. PMID: 28828128.
4. AlYami AH. Chondroblastoma-Like Soft-Tissue Chondroma of the Hand: A Case Report. *Cureus*. 2021; 13(11): e19467. PMID: 34912609.
5. De Riu G, Meloni SM, Gobbi R, Contini M, Tullio A. Soft-tissue chondroma of the masticatory space. *Int J Oral Maxillofac Surg.* 2007; 36(2): 174–176. PMID: 17008056.
6. Cates JM, Rosenberg AE, O'Connell JX, Nielsen GP. Chondroblastoma-like chondroma of soft tissue: an underrecognized variant and its differential diagnosis. *Am J Surg Pathol.* 2001; 25(5): 661-666. PMID: 11342780.
7. Wangaryattawanich P, Agarwal M, Rath T. Imaging features of cartilaginous tumors of the head and neck. *J Clin Imaging Sci*. 2021; 11: 66. PMID: 34992942.

FIGURES

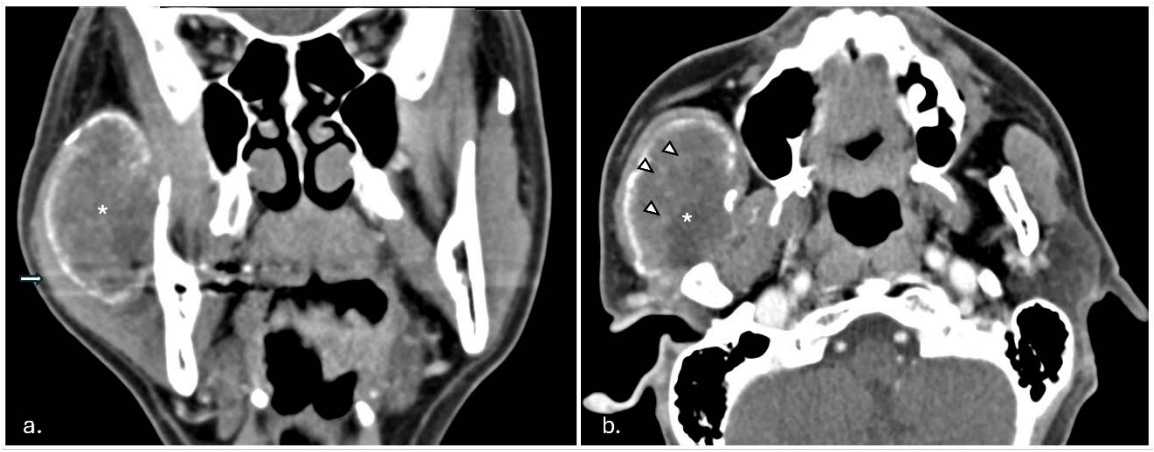

Figure 1: Contrast-enhanced CT (venous phase, soft tissue window) of a 58 year-old man with a right cheek mass; a) A mass (*) with internal and peripheral calcifications is seen within the right masticator space with lateral displacement of the right masseter muscle (arrow); b) The internal calcified matrix of the mass (*) shows configurations reminiscent of ring and arc calcifications (arrowheads).

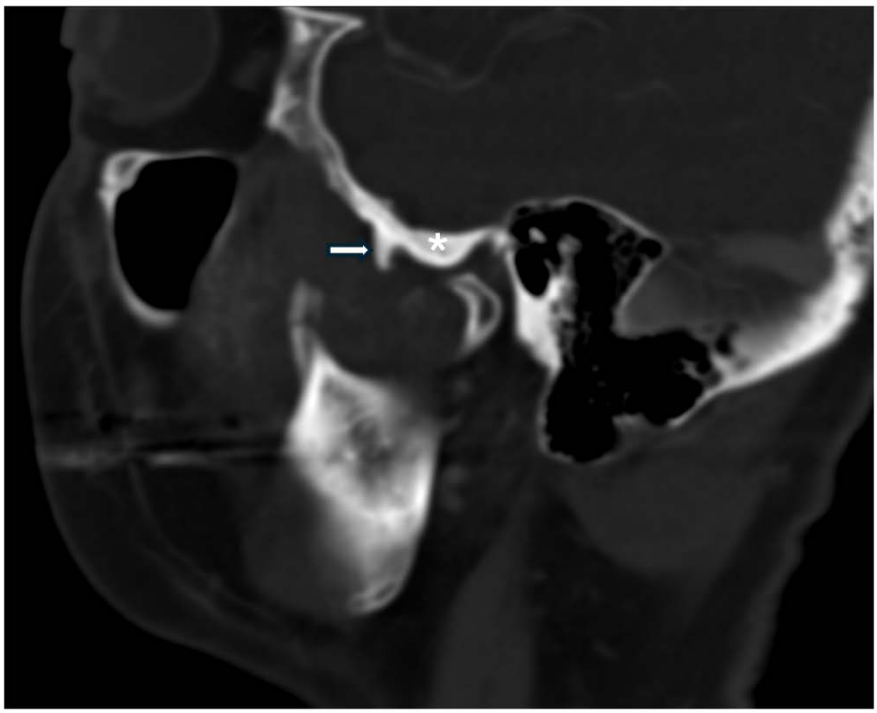

Figure 2: Contrast-enhanced CT (venous phase, bone window) shows a connection between the mass and the right temporal bone via a small bony stalk (arrow) anterior to the articular tubercle of the right temporomandibular joint (*).

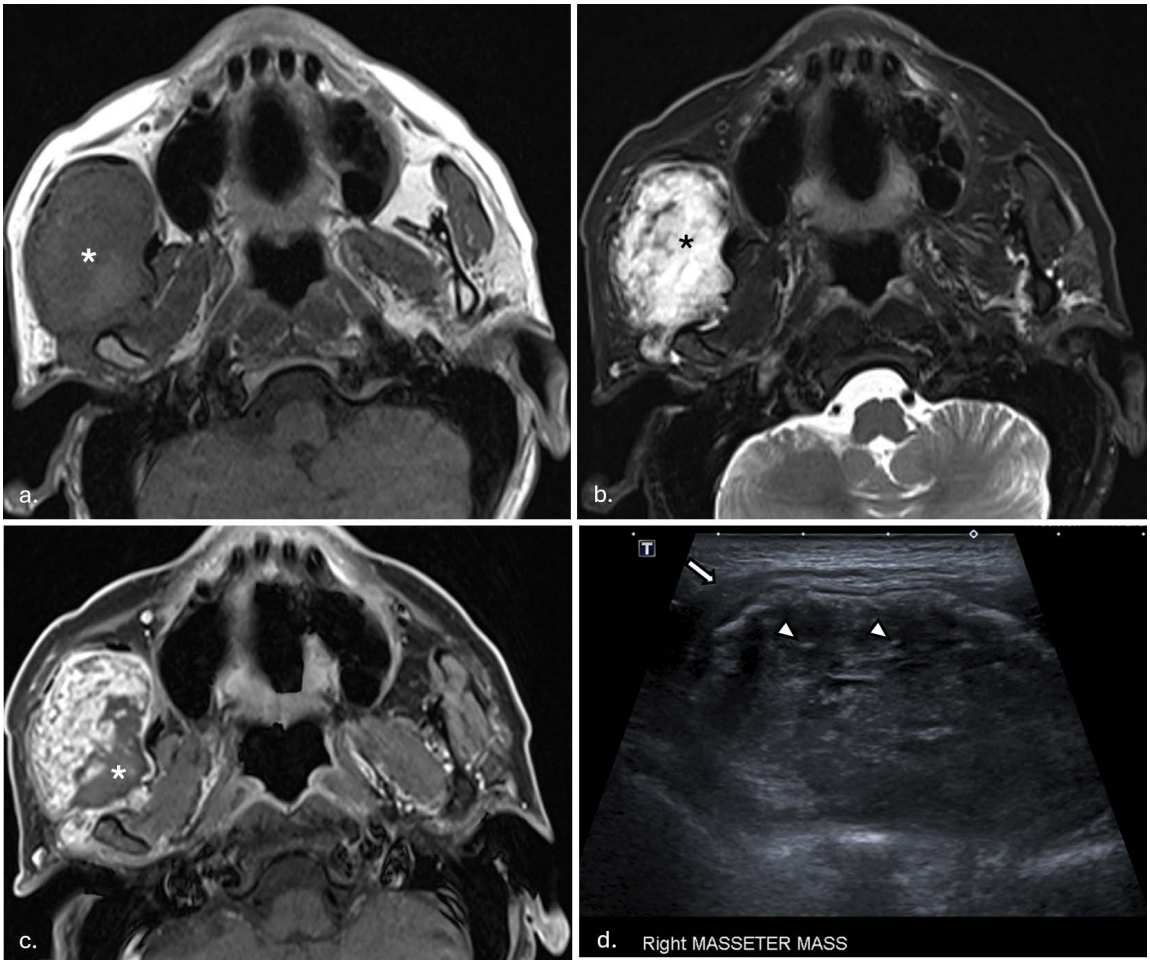

Figure 3: 1.5T MRI and sonographic appearances of the mass; Unenhanced axial T1w image (a) [TR 680ms TE 12ms] shows a right masticator space mass (*) which is isointense to muscle; Axial fat-saturated T2w image (b) [TR 4190ms TE 79ms] shows marked T2w-hyperintensity of the mass (*) and the close relation between the posterior aspect of the mass with the temporomandibular joint capsule; Contrast-enhanced axial T1w fat suppressed (c) [TR 680ms TE 12ms] images show heterogeneous enhancement within the mass with areas of non-enhancement (*); images obtained during ultrasound-guided biopsy of the mass (d) show a hypoechoic mass with peripheral and internal (arrowheads) calcifications deep to the masseter muscle (arrow).

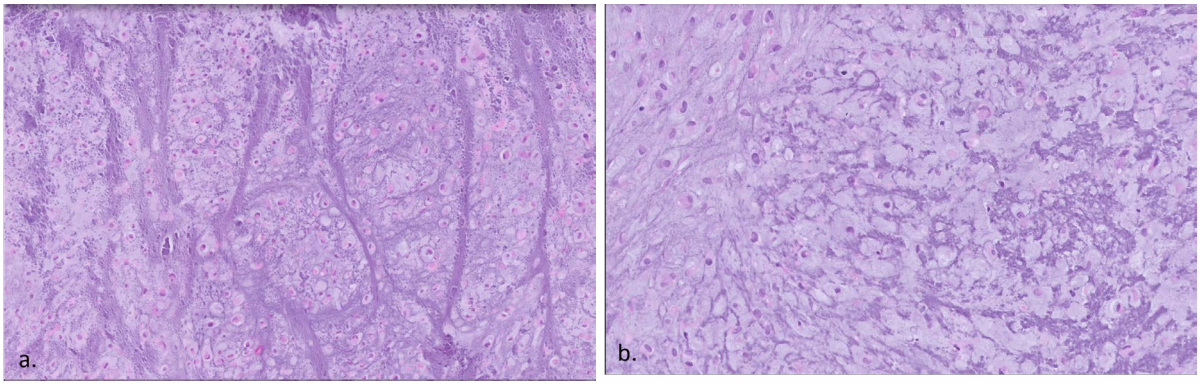

Figure 4: Haematoxylin and eosin staining of the resected mass seen at (a) 100X and (b) 200X magnification showed proliferation of chondroblast-like cells within a chondromyxoid stroma with areas of stippled and pericellular lace-like calcifications. A few scattered binucleated cells are observed. No evidence of mitotic figures or necrosis.

SUMMARY TABLE:

Table 1: Summary table of skull base chondroblastoma-like chondroma

Aetiology	Benign extraskeletal cartilaginous tumour with histological features reminiscent of bone chondroblastoma
Incidence	Chondromas of the head and neck are rare with no incidence established for the chondroblastoma-like variant
Gender ratio	No known sex predilection
Age predilection	No age predilection; typically seen in middle age
Risk factors	No known risk factors
Treatment	Surgical resection
Prognosis	Low risk of recurrence. Not known to metastasize.
Findings on imaging	CT: Well-defined expansile hypodense lesions with typical chondroid matrix demonstrating ring-and-arc and popcorn calcifications. MRI: Intermediate T1W signal and hyperintense T2W signal. Lesions may enhance with variable intensity.

DIFFERENTIAL TABLE:

Table 2: Differential diagnosis table of extraskeletal chondroma in the skull base

Diagnosis	Aetiology	Imaging
Soft tissue/extraskeletal chondroma	Benign, slow growing extraskeletal cartilaginous tumour arising from cartilaginous tissues of the head and neck, most commonly in the larynx	CT: Well-defined expansile hypodense lesions with typical chondroid matrix demonstrating ring-and-arc and popcorn calcifications. MRI: Intermediate T1W signal and hyperintense T2W signal. Lesions may enhance with variable intensity.
Chondroblastoma	Benign but locally aggressive bone tumours characterized by presence of chondroblasts on histology, uncommon in the head and neck. When seen in the head and neck, the skull base and squamous temporal bone are the most common locations.	CT: Non-specific well-defined expansile osseous lesion with chondroid matrix and invasion of surrounding structures MRI: Up to one third may have intratumoral cystic degeneration or secondary aneurysmal bone cysts
Osteochondroma	Benign and typically exophytic bone lesions with bone marrow contiguity with the parent bone and a thin cartilage cap. In the head and neck, the mandible is the most common location.	MRI: Thin cartilage cap shows low to intermediate T1W signal and hyperintense T2W signal. Abnormal thickening of the cartilage cap is suspicious for malignant degeneration.
Synovial chondromatosis	Benign but locally aggressive disease secondary to chondroid metaplasia of the synovium with resultant intra-articular loose bodies and joint destruction.	CT: May show calcified intra-articular loose bodies and joint erosions MRI: Joint effusion and synovitis may be present. Non-calcified loose bodies may be obscured by joint effusion.
Chondrosarcoma	Primary malignant bone tumour with slow growth and indolent course. May be associated with multiple enchondroma syndromes e.g. Ollier's disease or Mafucci syndrome	MRI: Typically located off midline with predilection for the petroclival fissure. Intermediate T1W signal and hyperintense T2W signal. Contrast enhancement is variable. Presence of non-enhancing areas may be due to cartilage, cystic degeneration or tumoral necrosis.

KEYWORDS

Extraskeletal Chondroma; Soft Tissue Chondroma; Skull Base; Chondroblastoma-Like; Cartilaginous Tumour

ABBREVIATIONS

CT = Computed Tomography
MRI =Magnetic Resonance Imaging