Imaging characteristics of slow-growing soft tissue chondroma of the tongue
A case report
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Abstract
Introduction: Extraskeletal soft tissue chondroma (STC) is a rare benign tumor. Soft-tissue chondromas rarely occur in the oral cavity. In this study, we aimed to confirm a slow-growing tongue mass using magnetic resonance imaging.

Patient concerns: A 60-year-old woman presented with a painful, slow-growing tongue mass that had persisted for 17 years. Intraoral examination revealed a pedunculated mass covered with mucosa on the right side of her tongue.

Diagnosis: CT and MRI revealed a lobulated heterogeneously enhancing mass without calcification. Compared with previous images obtained 17 years prior, the mass presented slow growth, more prominent enhancement, and lobulated contour. Histopathological examination confirmed the presence of STC.

Interventions: Excision of the mass surrounding normal tissue was performed under general anesthesia.

Outcomes: During 1-year follow-up period, no recurrence was observed.

Conclusions: In this study, STC lesions were slow-growing, and changed from weakly homogeneous enhancement and clean margins to markedly heterogeneous enhancement and lobulated margins over time.

Abbreviations: CT = computed tomography, LGC = low-grade chondrosarcoma, MRI = magnetic resonance imaging, STC = soft tissue chondroma.

Keywords: CT, MRI, slow-growing tongue mass, soft tissue chondroma

1. Introduction

Soft tissue chondromas (STCs) are rare, benign tumors that occur in extraosseous and extrasynovial locations.\textsuperscript{[1]} STCs usually occur in the soft tissues of the hands and feet, and fingers are frequently affected.\textsuperscript{[2]} Other locations include the dura, larynx, skin, and fallopian tubes.\textsuperscript{[3]} STCs rarely occur in the oral cavity.\textsuperscript{[1]} The subsites where these tumors have been reported include the tongue, cheek, hard and soft palate, masseter muscle, and masticatory space.\textsuperscript{[4]}

STCs usually present as asymptomatic, slow-growing, well-defined nodules that expand into surrounding tissues. They are predominantly composed of adult-type hyaline cartilage, devoid of other differentiated elements, except for osseous, fibrous, and/or myxoid stroma.\textsuperscript{[3]}

The tongue is the most common site of occurrence of oral STCs. Oral STC presents as an elastic semicircular nodule with a diameter of approximately 5 mm on the dorsum of the tongue. Forty-five cases of fibrochondroma of the tongue have been reported in literature.\textsuperscript{[1]}

However, there have been few studies on the imaging findings of chondromas in the oral cavity. Therefore, in this study, slow-growing chondrocytes were identified using computed tomography (CT) and magnetic resonance imaging (MRI), and the changes in radiological findings as they grew were investigated.
2. Case presentation

A 60-year-old woman presented with complaints of a slightly painful, slow-growing, 17-year standing lesion. Intraoral examination revealed a pedunculated multilobulated mass covered with mucosa on the right side of the tongue.

Radiologically, pre-contrast CT revealed a well-delineated homogeneous soft-tissue mass. Contrast-enhanced CT showed a peripheral enhancing mass with an internal heterogeneous enhancing portion, and the size was measured to be approximately 3.0 cm × 2.0 cm × 1.6 cm. The soft tissue mass was separated from the bone, but there was no chondroid matrix calcification (Fig. 1). On contrast-enhanced oropharyngeal MRI, the oval-shaped lobulated mass showed heterogeneously high signal intensity on T2-weighted images and intermediate signal intensity on T1-weighted images. The lobulated mass showed heterogeneous enhancement, crossing the midline (Fig. 2). These imaging characteristics should be considered when differentiating minor salivary gland benign tumors, STCs, and low-grade chondrosarcomas (LGC).

The previous image of 17 years prior showed a soft tissue mass measuring approximately 1.0 cm × 0.8 cm × 0.8 cm appeared with high signal intensity on T2-weighted images and homogeneously weak enhancement. In the same case, at present, the slow-growing lesion showed markedly heterogeneous enhancement and lobulation measuring about 3.0 cm × 2.0 cm × 1.6 cm (Fig. 3).

Intraoperatively, a soft tissue mass was observed attached to the right side of the tongue, crossing the midline. The mass surrounding the normal tissue was excised under general anesthesia.

Histopathologically, the lesion exhibited a multinodular pattern with slightly well-defined edges. This appearance corresponded to a cartilaginous tumor with multiple nodules composed of mature chondrocytes in an abundant chondroid matrix. The background of this multinodular pattern was intensely sclerotic with some fibroblasts. No signs of infiltration or ulceration of the overlying

![Figure 1](image1.png)
(A) Axial pre-contrast computed tomography (CT) showed a well-delineated homogeneous mass without chondroid matrix calcification. (B–D) Contrast-enhanced CT showing showed a peripheral enhancing mass with internal heterogeneous enhancing portion and the size was measured to be approximately 3.0 cm × 2.0 cm × 1.6 cm. The soft tissue mass was separated from the bone.

![Figure 2](image2.png)
On contrast-enhanced oropharyngeal magnetic resonance imaging (MRI): (A) the oval-shaped lobulated mass with intermediate signal intensity on T1-weighted images, and (B) heterogeneous high signal intensity on T2-weighted images. (C, D) The lobulated mass showed a heterogeneously enhancement crossing the midline.

![Figure 3](image3.png)
Comparison of previous and present oropharyngeal MRI: (A) the oval-shaped homogeneous mass measuring approximately 1.0 cm × 0.8 cm × 0.8 cm appeared with high signal intensity on a previous T2-weighted image, and (B) the present axial T2-weighted image showing slow-growing 17-year standing lesion with heterogeneous high signal intensity on the right side of the tongue. (C) Previous coronal contrast-enhanced T1-weighted MR image showing homogenously weak enhancement of the mass, and (D) the present MR image showing markedly heterogenious enhancement of the slow-growing mass.
Many patients diagnosed with STC are middle-aged, with ages ranging between 26 and 60 years. A slightly higher incidence of female patients has been reported, although a male preponderance has also been reported. Many patients diagnosed with STC are middle-aged, with ages ranging between 26 and 60 years. A slightly higher incidence of female patients has been reported, although a male preponderance has also been reported. The radiological appearance of oral STCs is non-specific. On CT, STCs appear as circumscribed heterogeneously enhancing masses. They frequently demonstrate chondroid calcifications (in 33–70% of cases), which are typically punctate, curvilinear, or ring-like. On MRI, tumors usually have a multilobulated appearance with low-to-intermediate signal intensity on T1-weighted images, high signal intensity on T2-weighted images, and peripheral or septal contrast enhancement. Chondroid matrix calcifications may be evident on MRI as areas of low signal intensity, but these types of calcifications are easily recognized on CT. Our case also showed similar findings with a lobulated heterogeneous enhancing mass but no chondroid calcification.

Distinguishing between chondromas and LGC is a common challenge, as the lesions are both histologically and radiographically very similar. Diagnosis is difficult because cartilaginous neoplasms have different histological patterns, ranging from benign chondroid tumors to malignant undifferentiated neoplasms. The MRI features of mesenchymal chondrosarcoma are variable, but the tumor often appears as a lobulated soft tissue mass with low signal intensity on T1-weighted images, variable and heterogeneous signal intensity on T2-weighted images, and complex heterogeneous enhancement after intravenous administration of gadolinium-based contrast material. Chondroid matrix calcifications may be evident on MRI as curvilinear or stippled areas with low signal intensity. Plain radiography and CT are particularly helpful in identifying these calcifications. Compared to the MRI image taken 17 years prior, as the size of the lesion increased, there was a change from weakly homogeneous enhancement and clean margins to markedly heterogeneous enhancement and lobulated margins. When we correlated the change in heterogeneous enhancement with pathological findings, it was considered that the sclerotic and fibrotic areas, which are the backgrounds of these nodules, were enhanced, not the multiple nodular areas composed of mature chondrocytes. The distinction between these areas became clear as the size of the lesions increased over time, resulting in markedly heterogeneous enhancement. And the long diameter of the lesion has increased in size from 1 cm to 3 cm over 17 years, and it is thought that it is a slow growing mass, which is considered to have shown as a lobulated margin. Low-grade chondrosarcomas may present variable enhancement patterns and margins, but soft tissue masses with heterogeneous enhancement and lobulated margins are common imaging features in many cases. It can be seen that as the size of tumors increases, low-grade chondrosarcomas have radiologic characteristics.

Radiologically, minor salivary gland tumors, STCs, and LGC were considered differential diagnoses. In our case, it was difficult to make a diagnosis because ring and arc calcifications, which are characteristic findings of chondromas, are not visible. Since the size of a well-defined lesion is less than five–six centimeters and surrounding bone destruction is not clear, it was considered benign rather than malignancy. Surgical excision is the treatment of choice for this condition. Ten to fifteen percent of tumors may recur locally after surgical excision.

4. Conclusion
STC is a benign cartilage-forming tumor that occurs in the extraarticular soft tissues. Clinically, these tumors present as slow-growing, non-tender masses that are sometimes painful and not attached to the bone. Radiologically, these tumors show well-defined, heterogeneously enhancing masses. Similar to our case, as the size of the tumor increased, it showed LGC characteristics. As the diagnosis of oral STCs may be difficult, radiologists should always keep a differential diagnosis in mind.

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Author contributions
Conceptualization: Yoonsoo Park.
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References

[1] Sera H, Shimoda T, Oteki S, Honda T. A case of chondroma of the tongue. Int J Oral Maxillofac Surg 2005;34:99–100.
[2] Papagelopoulos PJ, Savvidou OD, Mavrogenis AF, Chloros GD, Papaparaskeva KT, Soucacos PN. Extraskeletal chondroma of the foot. Joint Bone Spine 2007;74:285–8.
[3] Nayler S, Heim S, Fletcher DM, Unni KK, Mertens F. Soft tissue chondroma. Tumors of soft tissue and bone. WHO Classification of Tumors (Chondro-Osseous Tumours) Lyon, France: WHO; 2002;180–1.
[4] Vescovi P, Meleti M, Merigo E, et al. Soft tissue chondroma of the oral cavity: an extremely rare tumour localized on the hard palate. Case Rep Med 2014;2014:414861.
[5] Kamysz JW, Zawin JK, Gonzalez-Crussi F. Soft tissue chondroma of the neck: a case report and review of the literature. Pediatr Radiol 1996;26:145–7.
[6] Dahlin DC, Salvador AH. Cartilaginous tumors of the soft tissues of the hands and feet. Mayo Clin Proc 1974;49:721–6.
[7] Krolls SO, Jacoway JR, Alexander WN. Osseous choristomas (Osteomas) of intraoral soft tissues. Oral Surg Oral Med Oral Pathol 1971;32:588–95.
[8] Osodera K, Xu H, Kimizuka S, Echigo S, Ooya K. Chondroma of the cheek: a case report. Int J Oral Maxillofac Surg 2005;34:924–6.
[9] van Vliet M, Kliffen M, Krestin GP, van Dijke CF. Soft tissue sarcomas at a glance: clinical, histological, and MR imaging features of malignant extremity soft tissue tumors. Eur Radiol 2009;19:1499–511.
[10] Vilanova JC, Woertler K, Narváez JA, et al. Soft-tissue tumors update: MR imaging features according to the WHO classification. Eur Radiol 2007;17:125–38.
[11] Fletcher CDM, Unni KK, Mertens F, Kleihues P, Sobin LH. Pathology and genetics of tumours of soft tissue and bone. World Health Organization Classification of Tumours Lyon, France: IARC; 2002.
[12] Ly JQ. Mesenchymal chondrosarcoma of the maxilla. AJR Am J Roentgenol 2002;179:1077–8.
[13] Murphey MD, Walker EA, Wilson AJ, Kransdorf MJ, Thomas Temple H, Gannon FH. Imaging of primary chondrosarcoma: radiologic-pathologic correlation. Radiographics 2003;23:1245–78.