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(CASE REPORT)

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Chondrosarcoma of the larynx: Case report and brief literature review

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Abstract

Laryngeal Chondrosarcoma is a rare malignancy that poses a diagnostic and therapeutic challenge due to its indolent course and the need to balance oncologic control with preservation of laryngeal function. We report a 58-year-old man who presented with progressive dysphonia, mild dyspnea, and dysphagia over six months. Endoscopy evaluation revealed a submucosal cricoid mass, and the cross-sectional imaging showed a well-circumscribed lesion with characteristic chondroid matrix calcifications, favoring a low-grade cartilaginous neoplasm. Given the classic radiology findings, the multidisciplinary tumor board recommended definitive surgical management. The patient underwent organ-preserving partial cricoidectomy with reconstruction. Histopathology confirmed grade I conventional chondrosarcoma with well-differentiated hyaline cartilage, absence of mitotic activity, and a negative margin. No adjuvant therapy was administered. The postoperative course was favorable, with restoration of a near-normal voice and preserved swallowing function. At 3-year follow-up, the patient remained disease-free, with no evidence of recurrence or metastasis.

This case discusses the importance of integrating characteristic imaging with multidisciplinary decision-making to facilitate organ-preserving strategies, demonstrating that carefully selected low-grade laryngeal chondrosarcomas can achieve excellent oncologic and functional outcomes without radical resection.

Keywords: Laryngeal chondrosarcoma; Cricoid cartilage; Low-Grade; MDM2; organ-preserving partial cricoidectomy

1. Introduction

Laryngeal chondrosarcoma is an uncommon malignant neoplasm of mesenchymal origin and represents only a very small proportion of laryngeal tumors and laryngeal malignancies. [1] Most lesions arise from the cricoid cartilage, typically follow an indolent course, and therefore present with slowly progressive symptoms such as hoarseness, dyspnea, globus sensation, or dysphagia rather than dramatic airway compromise. [1,2] This biologic behavior, although generally favorable from an oncologic standpoint, often delays diagnosis and creates a difficult distinction from benign cartilaginous lesions such as chondroma or chondrometaplasia. [1,4,5] Imaging and histopathology are therefore central to diagnosis, grading, and operative planning, particularly when the lesion is submucosal and laryngoscopic findings are nonspecific. [2,3]

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The typical treatment for localized low-grade laryngeal chondrosarcoma is conservative, function-preserving surgery, such as local excision, partial laryngectomy, or cricoidectomy, aimed at complete removal while preserving laryngeal function. [6,7]

We report this case to illustrate several clinically important features of this rare tumor. In addition, the case highlights the value of multidisciplinary decision-making, the selective avoidance of preoperative biopsy in a radiographically classic lesion, and the feasibility of organ-preserving surgery with excellent functional and oncologic outcome at three years. [1,3]

2. Case Presentation

2.1. Clinical Presentation, Physical Examination, History, Family History, Initial Lab Studies & Clinical Impression

A 58-year-old man was referred to the otolaryngology clinic following a six-month history of gradually progressive dysphonia and mild exertional dyspnea. He described his voice as increasingly hoarse and low-pitched, with no sudden changes or episodic stridor at rest. He reported a subtle sensation of throat fullness and mild dysphagia to solid foods, though weight remained stable. There was no hemoptysis, otalgia, or neck swelling. His past medical history was significant for well-controlled hypertension and type 2 diabetes mellitus. He was a former smoker with a 15-pack-year history, having quit 18 years prior, and denied significant alcohol use or occupational exposure to radiation or inhaled carcinogens. Family history was entirely noncontributory, with no reported malignancies of the head and neck, musculoskeletal system, or hereditary cancer syndromes among first-degree relatives.

On physical examination, the patient appeared well and was not in respiratory distress at rest. Flexible fiberoptic laryngoscopy demonstrated a smooth, firm, submucosal mass arising from the posterior lamina of the cricoid cartilage, causing symmetric subglottic narrowing without mucosal ulceration or surface irregularity. Bilateral vocal fold mobility was preserved, though mildly restricted on the left. No cervical lymphadenopathy was identified.

Initial laboratory studies, including complete blood count, comprehensive metabolic panel, lactate dehydrogenase, and serum alkaline phosphatase, were all within normal limits. The clinical impression at this juncture strongly favored a benign or low-grade cartilaginous neoplasm of the larynx, with laryngeal chondrosarcoma considered the leading diagnosis.

2.2. Radiographic Studies, Additional Testing & Differential Diagnosis

Computed tomography (CT) of the neck and chest with contrast was obtained and demonstrated an expansile, lobulated, well-circumscribed mass arising from the posterior cricoid lamina, measuring 3.1 × 2.7 × 2.4 cm. The lesion displayed the hallmark chondroid matrix mineralization pattern of laryngeal chondrosarcoma, punctate, curvilinear, and ring-and-arc calcifications distributed uniformly throughout the lesion, with smooth endosteal scalloping and cortical expansion of the cricoid cartilage. No cortical destruction, extralaryngeal soft-tissue extension, thyroid cartilage involvement, or pathological cervical lymphadenopathy was identified. The chest CT showed no pulmonary nodules or distant metastatic disease. Magnetic resonance imaging (MRI) of the neck confirmed a T2-hyperintense, lobulated lesion with a homogeneous hyaline cartilage signal throughout, without discrete zones of T2 hypointensity, internal necrosis, or areas raising concern for higher-grade transformation. Contrast enhancement was minimal and peripheral, consistent with a low-grade cartilaginous neoplasm.

Given the uniformly low-risk imaging characteristics, PET-CT was not performed at this stage. Direct laryngoscopy under general anesthesia confirmed the submucosal, firm nature of the mass without mucosal breach. The differential diagnosis was grade I chondrosarcoma (most likely), chondroma, cricoid chondrometaplasia, and synovial chondromatosis. High-grade chondrosarcoma, dedifferentiated chondrosarcoma, and osteosarcoma were considered unlikely given the homogeneous imaging appearance, intact cortex, and absence of metabolic hyperactivity.

2.3. Multidisciplinary Tumor Board Discussion, Biopsy & Diagnosis

The case was presented at the head and neck multidisciplinary tumor board, with representation from otolaryngology–head and neck surgery, medical oncology, radiation oncology, pathology, and radiology. The central discussion revolved around several key issues: 1. whether preoperative biopsy was necessary given the classic and uniform imaging appearance, or whether the risk of seeding and sampling error outweighed its benefit; 2. the extent of surgery, specifically, whether organ-preserving resection (partial cricoidectomy) was oncologically appropriate versus total laryngectomy; and 3. the role of adjuvant therapy in a confirmed low-grade lesion.

The board reached consensus that the imaging findings were sufficiently characteristic to proceed with planned surgical excision without a mandatory preoperative biopsy, with intraoperative frozen section to guide margin assessment. No neoadjuvant chemotherapy or radiation was recommended, given the low-grade, localized nature of the lesion. Intraoperative pathology confirmed low-grade chondrosarcoma, and the planned organ-preserving resection proceeded.

2.4. Management, Pathology, IHC, Molecular Studies, Final Diagnosis & Follow-Up

The patient underwent partial cricoidectomy with reconstruction via a pericondrial flap, preserving laryngeal framework integrity and airway patency. A temporary tracheostomy was placed intraoperatively and successfully decannulated on postoperative day eight. No neck dissection was performed, given the absence of clinical or radiographic lymphadenopathy.

Gross pathologic examination of the resected specimen revealed a glistening, lobulated, blue-white cartilaginous mass with a well-defined fibrous pseudocapsule, measuring 3.0 × 2.6 × 2.3 cm. Cut sections showed uniform hyaline cartilage matrix without necrosis, hemorrhage, or grossly identifiable high-grade zones. Histologically, the tumor demonstrated well-differentiated hyaline cartilage with mild nuclear enlargement, occasional binucleation, and an open chromatin pattern confined predominantly to a single cell per lacuna, consistent with grade I chondrosarcoma. Mitotic figures were absent. No myxoid change, spindle cell component, or high-grade dedifferentiation was identified. (Figure 1 A, B, C) Immunohistochemistry (IHC) demonstrated diffuse positivity for S100 protein and SOX9, confirming chondrocytic differentiation. IDH1/IDH2 mutation analysis was negative. MDM2 immunostaining and FISH for MDM2 amplification were performed to exclude low-grade central osteosarcoma and returned negative, solidifying the diagnosis.

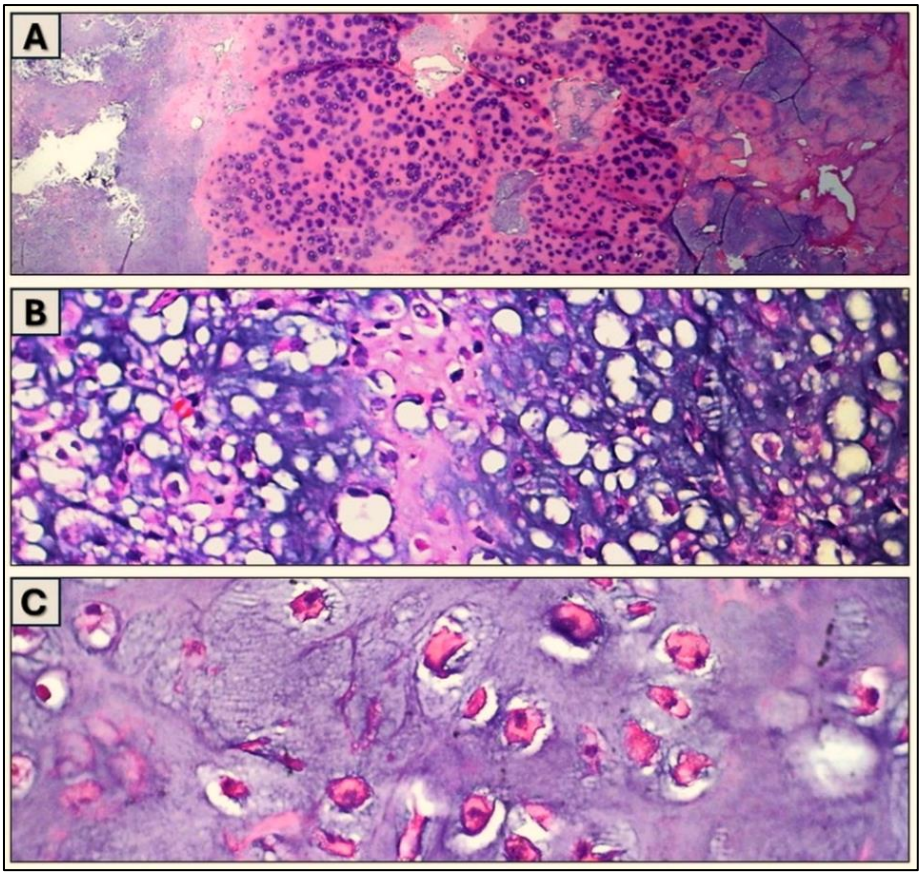
Final diagnosis: Laryngeal chondrosarcoma, grade I (conventional hyaline type), arising from the posterior cricoid lamina, with negative surgical margins. No adjuvant chemotherapy or radiation therapy was administered. The patient was enrolled in a structured surveillance program.

2.5. Outcome, Follow-Up & Patient Status at Three Years

The patient recovered uneventfully from organ-preserving surgery. Voice rehabilitation was initiated at 4 weeks postoperatively, and by 3 months, the patient had regained near-normal voice quality with only mild residual roughness. The swallowing function was fully preserved. The tracheostomy site healed without complication, and the patient resumed his preoperative activities of daily living without restriction.

Surveillance imaging with CT of the neck and chest was performed at three-month intervals for the first year and every six months thereafter, consistent with institutional sarcoma surveillance protocols. At the three-year follow-up, the patient remained free of locoregional recurrence and distant metastatic disease. No new pulmonary nodules or regional lymphadenopathy were identified on imaging. Laboratory studies, including alkaline phosphatase, remained within normal limits throughout the follow-up period.

The patient was considered to be in sustained remission at three years, reflecting the favorable natural history of the respective low-grade laryngeal chondrosarcoma. This outcome will serve as a meaningful baseline for the audience when the second, far more complex case is introduced.



1A: Low power view showing cricoid cartilage (center) infiltrated from both sites by chondrosarcoma (Right and Left) (H&E stain X20)

1B: Low power view showing low-grade cartilaginous proliferation with mild atypia (H&E stain X20)

1C: High power view showing nuclear details of low-grade chondrosarcoma, mild nuclear enlargement, occasional binucleation, and an open chromatin pattern confined predominantly to a single cell per lacuna. Mitotic figures are absent (H&E stain X40)

Figure 1 Microscopic findings of laryngeal chondrosarcoma-

3. Discussion

3.1. Background (History, epidemiology, risk factors, and WHO classification)

Chondrosarcoma is the term for a type of malignant mesenchymal tumor that produces a cartilaginous matrix, which is produced by the neoplastic cells of the tumor. This sarcoma was one of the first to be described in the 19th century. [8] Chondrosarcoma is the second most common primary malignant bone neoplasm, but it is relatively rare in the head and neck region. Moreover, primary chondrosarcomas of the larynx are among the rarest of these tumors and constitute less than 1% of all laryngeal neoplasms. [9] Findings of a slow-growing nature are described in the earliest descriptions of chondrosarcomas of the larynx at the beginning of the 20th century; as such, these tumors are generally accepted to be indolent. [8]

The laryngeal chondrosarcomas arise mainly from the cricoid cartilage, mainly the posterior lamina, followed by thyroid and arytenoid cartilage. [10] Chondrosarcoma is more prevalent in men and generally occurs between the fifth and seventh decades of life. [9] Well-defined causative factors of chondrosarcoma remain elusive. Potential contributors include exposure to radiation, chronic inflammation of laryngeal cartilage, ossification of cartilage, and syndromes such as Ollier's and Maffucci's syndrome. However, to date, no association has been shown between smoking and this malignancy. [7,11]

Despite being malignant, the tumors are typically low-grade and grow slowly, with limited ability to metastasize other parts of the body. [10] Tumors may cause symptoms due to compression of the vocal folds or pharynx, including hoarseness, dyspnea, and dysphagia. Histologically, the tumors present in chondrosarcomas are graded I-III based on the following features: cellularity, nuclear atypia, and mitotic activity according to the World Health Organization

(WHO) grading system. This defines grade I as lesions with well-differentiated hyaline cartilage and little atypia. [12] Laryngeal chondrosarcoma generally has a favorable prognosis, but outcomes rely on histological grade and complete surgical removal.

3.2. Pathogenesis, Pathophysiology

The pathogenesis of laryngeal chondrosarcoma remained incompletely understood. Proposed mechanisms in the literature included disordered ossification of hyaline cartilage, persistence of embryologic cartilaginous rests, and less favored hypotheses such as pluripotent mesenchymal cell transformation or ischemia-related cartilaginous change. [1,9] Because the larynx contains several cartilaginous structures, the cricoid cartilage appears particularly susceptible, which may explain why most reported tumors arise from the posterior cricoid lamina. [2] In biologic terms, most laryngeal chondrosarcomas are low-grade conventional tumors composed of well-differentiated hyaline cartilage with limited mitotic activity, mild nuclear atypia, and slow local expansion rather than aggressive early dissemination. [1,2]

This histologic composition helps explain the clinical behavior seen in the present case. The tumor enlarged gradually within the cricoid framework, producing a smooth submucosal mass, progressive airway narrowing, mild restriction of vocal fold mobility, and dysphagia from local mass effect, while preserving an intact mucosal surface and lacking radiographic features of high-grade transformation. The relative rarity of nodal and distant metastasis contrasted with the tendency for local persistence or recurrence if resection is incomplete, making tumor grade and adequacy of excision more clinically relevant than occult systemic spread in most patients. [2,4]

3.3. Comparative Analysis of Our Case with Existing Literature. (Clinical, radiology, pathology, Lab, diagnosis, management, and outcome)

The case described here of a 58-year-old man with transformation from dysphonia to dyspnea is very typical for laryngeal chondrosarcoma, and most commonly the tumor arises within cricoid cartilage, resulting in slowly progressive hoarseness, airway symptoms, and no significant systemic findings. [13,14] As noted in previous reports, the lack of cervical lymphadenopathy and the indolent progression of symptoms suggest a low-grade lesion. [14]

The reported CT findings are pathognomonic, with the mass well-circumscribed and expansile, and showing "ring-and-arc" chondroid calcifications [15], all of which emphasize key features that differentiate these tumors from other laryngeal masses. The MRI features presented in this case - high T2 signal with slight peripheral enhancement, are consistent with previously described imaging features of low-grade chondrosarcomas, which are low, necrotic/aggressive in appearance. [16,17] These imaging findings frequently enable clinicians to proceed directly to surgical management without a preoperative biopsy, especially when sampling error is anticipated. [14]

From a diagnostic standpoint, histopathologic findings consistent with grade I chondrosarcoma (the most reported subtype in the literature) include well-differentiated hyaline cartilage with mild nuclear atypia in the absence of mitoses. [13] The immunohistochemistry (IHC) positivity for S100 and SOX9 strengthens evidence of chondroid differentiation, whilst also being negative for MDM2, which excludes low-grade osteosarcoma and is in accordance with the suggested diagnostic workup. [15]

Management in this case, organ-preserving partial cricoidectomy is consistent with current literature recommending conservative surgical approaches for low-grade tumors to safely conserve laryngeal function and achieve negative margins. [14,17,18] Total laryngectomy is mostly reserved for high-grade or extensive disease. This decision to omit adjuvant therapy is also consistent with evidence demonstrating the limited benefit of either radiation or chemotherapy for low-grade lesions. [13]

As a final point, this positive three-year disease-free outcome is consistent with the reported prognosis, in which low-grade laryngeal chondrosarcomas exhibit excellent long-term overall survival and low metastatic potential when adequately resected. [17] In summary, although this case provides additional insight into the clinical course of these patients, it can also reinforce existing clinical patterns and sustain the concept that imaging is key to diagnosis and organ-preserving management.

4. What Have We Learned from This Case?

This case reinforced several practical lessons for clinicians evaluating persistent laryngeal symptoms. First, slowly progressive dysphonia with exertional dyspnea, dysphagia, or a sense of throat fullness should not be dismissed as benign, particularly when laryngoscopy reveals smooth submucosal posterior laryngeal mass. In that setting, a cricoid-based cartilaginous neoplasm should be considered early. Second, the case underscored the diagnostic importance of

cross-sectional imaging. The combination of a well-circumscribed cricoid lesion with ring-and-arc or punctate chondroid calcification, cortical expansion, preserved mucosa, and T2-hyperintense cartilage signal strongly favored a low-grade cartilaginous tumor and helped narrow the differential diagnosis. [14,15,16]

A further lesson concerned management. This case supported the view that treatment should be individualized according to grade, location, symptoms, and feasibility of complete resection while preserving function. For a localized low-grade cricoid lesion, organ-preserving surgery may provide disease control without the morbidity of total laryngectomy. [15,16] At the same time, the prolonged natural history of laryngeal chondrosarcoma meant that surveillance must be structured and durable, because favorable histology does not eliminate the risk of delayed local recurrence. Thus, this case both reinforced current knowledge regarding the indolent nature of low-grade disease and emphasized the modern shift toward function-preserving management when oncologically sound. [15,16]

5. Conclusion

In summary, we presented this case because it demonstrated the classic presentation, imaging profile, histopathology, and favorable clinical course of grade I chondrosarcoma of the cricoid larynx, while also highlighting contemporary principles of care. The case added practical value by showing how a rare laryngeal malignancy could be recognized early, discussed in a multidisciplinary setting, and treated with laryngeal-preserving surgery rather than routine ablative resection. It also reminded clinicians that apparently indolent submucosal laryngeal lesions may still represent malignant cartilaginous tumors requiring definitive treatment and long-term surveillance. For the medical community, this report supported the growing literature that low-grade laryngeal chondrosarcoma often permits conservative but oncologically appropriate management with meaningful preservation of voice, swallowing, and airway function.

Compliance with ethical standards

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All relevant data are included in the paper.

Author contributions

All authors contributed equally to producing this manuscript.

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