ALK+ Histiocytic Subglottic Lesion: An Unusual Presentation of Biphasic Stridor

Richard J. Lu, MD MBA MSc[1], David Liao, MD[1], Madeleine Drusin, MD FACS[1]

[1]Department of Otolaryngology – Head & Neck Surgery, Weill Cornell Medical Center, New York, NY

Abstract

Background/Objective:
ALK-histiocytic lesions are rare neoplastic disorders characterized by abnormal histiocytes with anaplastic lymphoma kinase (ALK) gene rearrangements, typically presenting with systemic or localized tissue infiltration in young children. We report the case of a 3-year-old boy with progressively worsening biphasic stridor, found to have an isolated ALK+ histiocytic lesion in the subglottis. This case represents the first reported instance of an isolated ALK+ histiocytic subglottic lesion managed with endoscopic debulking.

Methods:
Case report

Results:
The patient initially presented with three months of biphasic stridor and cough with modest improvement on asthma therapy. In-office flexible laryngoscopy revealed an asymmetric, narrowed subglottis, and urgent direct bronchoscopy was recommended. This revealed a firm, round, submucosal mass originating from the right cricoid and obstructing approximately 80% of the lumen. Biopsy yielded no significant bleeding, lowering the concern for a vascular lesion. Histopathology confirmed an ALK+ histiocytic lesion, with immunohistochemistry negative for desmin, myogenin, and S100. PET/CT showed no other disease sites. Following confirmation of the pathology, the patient was managed with endoscopic resection and monitoring via serial endoscopy.

Conclusions:
This is only the second reported case of isolated ALK+ histiocytic lesions in the airway and the only report of endoscopic management of this lesion.

Pediatric Airway Lesions – Diagnosis & Management

Consider airway subsite and age

Benign Lesions: vascular tumors (e.g., subglottic hemangioma), Infectious (e.g., RRP), granulation tissue, subglottic cysts

Malignant: Rhabdomyosarcoma, Carcinoid tumor, Mucoepidermoid carcinoma, Other rare tumors: (e.g., Inflammatory myofibroblastic tumor, histiocytic lesions)

Management of Pediatric Airway Lesions

Triage: Secure airway and stabilize patient

Diagnosis: Endoscopy – flexible fiberoptic or direct laryngoscopy with bronchoscopy

Surgical techniques
(1) Endoscopic approaches (microdebrider, laser resection) – benign lesions, localized
- Cold steel – debulking exophytic, non-vascular tissue, low risk of airway fire
- Laser – precision cutting and coagulation, especially vascular lesions

(2) Open surgical (e.g., cricotracheal resection, laryngotracheoplasty) – infiltrative tumors

ALK Histiocytosis – Epidemiology & Pathophysiology

Histiocytic neoplasms are rare lesions driven by rearrangements in anaplastic lymphoma kinase (ALK) gene. Phenotypes include Langerhans cell histiocytosis, juvenile xanthogranuloma, Erdheim-Chester disease, and Rosai-Dorfman disease. Incidence is 1 per 200,000 to 1 million children.[1]

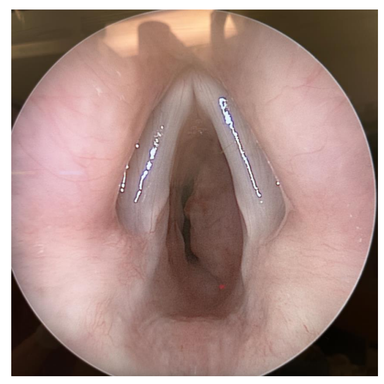
Airway involvement is exceedingly rare. There is only one known case report, [2] where the patient presented with croup-like stridor, thought to be hemangioma. The localized disease was excised via open tracheofissure.

Type	Disease Presentation	Treatment
Systemic disease	Infiltration by atypical hystiocytes (typically liver, spleen, marrow) leading to hepatosplenomegaly and cytopenias	Chemotherapy if no spontaneous resolution
Localized lesions	Focal lesions (e.g., skin, breast, extremities, CNS)	Surgical resection often curative

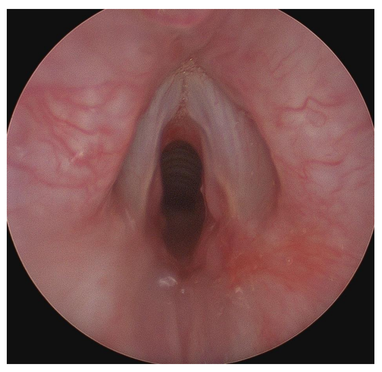
Case Report – Clinical Course

Initial Presentation: 3-year-old ex-full term boy with unremarkable PMH present with cough and biphasic stridor for several months, refractory to asthma medications. No reported cyanotic event, no voice changes, and no difficulty with PO intake. Flexible fiberoptic laryngoscopy revealed a narrow, asymmetric subglottis with otherwise no lesions.

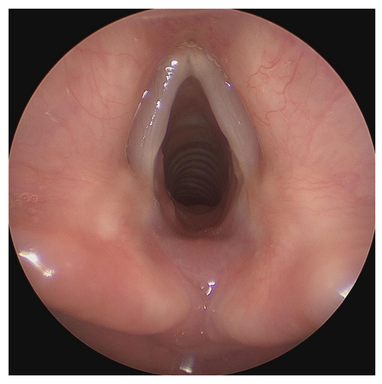
Initial Procedure – DL/Bronchoscopy with Lesion De-Bulking
- **Findings**: Firm, round, submucosal lesion in the subglottic airway arising from the right cricoid, narrowing the airway to a small crescent extending the length of the cricoid. Mass biopsies and debulked with cupped forceps microdebrider. Pathology with diffusely positive ALK, CD45, CD163
- **Airway**: Only 2.5 ETT able to fit through the crescent-shaped airway. Unable to pass 4mm camera
- **Post-op**: patient left intubated and given steroid course. Extubated on POD4 and discharged on POD5 on a regular diet with a strong voice.
- **Oncologic Course**: MR Neck and PET/CT with post-surgical changes and likely-reactive bilateral cervical lymph nodes; no other suspicious lesions. Systemic therapy (ALK inhibitor or MAPK/MEK) inhibitor discussed, but deferred due to relative low morbidity of close monitoring and resection



Initial DLB – Firm Subglottic Lesion



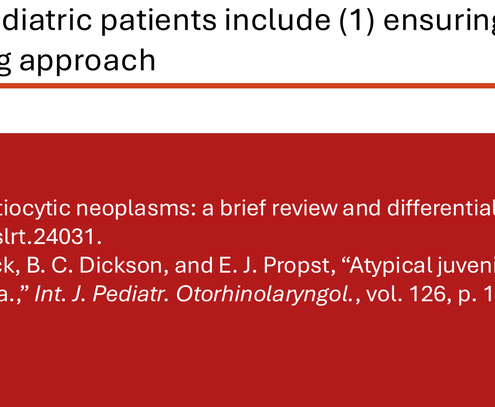
Initial DLB – After Microdebrider Debulking



6-month Surveillance DLB

Surveillance Bronchoscopy
- **2-month surveillance**: Webbed scar tissue (sharply transected) with left-sided subglottic granuloma (biopsied and resected en block with cold steel dissection). Pathology with residual ALK-positive histiocytic lesion.
- **3-month surveillance**: Several small exophytic subglottic lesions relatively stable to prior that were excised. Pathology with residual ALK-positive histiocytic lesion. Airway sized to a 5.0 ETT.
- **6-month surveillance**: No interval changes on bronchoscopy

CD45	Positive
ALK-1 (D5F3 clone)	Positive
CD163	Positive
Fascin	Positive
CD1a	Negative
Muscle markers: • MyoD1 • Desmin • SMA • Myogenin • MSA	Negative
T-cell markers	Negative
B cell and plasmablastic markers	Negative
EBV in-situ hybridization	Negative
Cytokeratin (AE1/AE3)	Negative
S100	Negative
CD34	Focal positive
INI-1	Retained



Pathology & Immunohistochemical Staining

Conclusions

This is only the second reported case of isolated ALK+ histiocytic lesions in the airway and the first report of endoscopic management of this lesion. Important considerations when addressing an obstructive airway lesion of unknown pathologic origin in pediatric patients include (1) ensuring stable airway, (2) assessing lesion characteristics, (3) tailoring the debulking approach

Contact
Richard Lu, MD MBA MSc
Department of Otolaryngology Head and Neck Surgery
New York-Presbyterian Hospital/Weill Cornell Medical Center
1305 York Avenue, 5th floor
New York, NY 10021
E-mail: ujo9003@nyp.org

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