Received: 12 February 2024 | Revised: 15 May 2024 | Accepted: 31 May 2024

DOI: 10.1002/lio2.1293

ORIGINAL RESEARCH

Laryngoscope Investigative Otolaryngology

Nonendemic rhinoscleroma: An unusual manifestation of the trachea

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Abstract

Objectives: Rhinoscleroma is classically described as a chronic granulomatous disease caused by *Klebsiella rhinoscleromatis* which primarily affects the nose and nasopharynx. When present, tracheal manifestations will be seen late in the disease course rather than on initial presentation. We describe a rare case of nonendemic rhinoscleroma that presented with tracheal lesions as an initial manifestation of disease.

Methods: Case report and literature review.

Results: An 88-year-old male presented with longstanding dysphonia. Flexible laryngoscopy demonstrated a septal perforation and diffuse glottic lesions. CT neck demonstrated a nonobstructive polypoid tracheal lesion and mucosal thickening of the paranasal sinuses. Biopsy confirmed an atypical lympho-histiocytic proliferation and microorganisms within macrophages on Grocott methenamine silver and Steiner stains consistent with rhinoscleroma. He was referred for rheumatology and pulmonology consultation.

Conclusion: Systemic diseases rarely affect the trachea, and even less frequently is a tracheal lesion identified as the initial manifestation of disease. The most common systemic diseases that affect the trachea include relapsing polychondritis, granulomatosis with polyangiitis, amyloidosis, and inflammatory bowel disease. The literature surrounding nasolaryngotracheal rhinoscleroma is limited, especially in nonendemic areas. It is necessary to include unusual etiologies of airway lesions in the differential diagnosis, which warrants comprehensive airway evaluation including biopsy.

Level of Evidence: 4.

KEYWORDS

Klebsiella, rhinoscleroma, rhinoscleromatis, tracheal stenosis

1 | INTRODUCTION

Tracheal diseases present as an insidious onset of pulmonary symptoms often secondary to tracheobronchial stenosis. The reduction in upper airway diameter can lead to reduced clearance of respiratory secretions resulting in infection.[1] Rhinoscleroma (RS) is an infectious granulomatosis thought to be caused by the Gram-negative bacillus *Klebsiella rhinoscleromatis*. It is endemic in the Middle East, North

Africa, Indonesia, Central and South America, and Eastern Europe.[2] Tracheal RS can present with symptoms including hoarseness, dyspnea, inspiratory wheezing, stridor, and nonproductive cough. Tracheal stenosis has also been demonstrated in these cases.[3] Diagnosis of tracheal RS is made according to histological and microbiological review.[4] It is critical to recognize RS as potential underlying causes of tracheal lesions to prevent delays in appropriate treatment and progression of disease. We report a case of nonendemic RS that initially presented with tracheal manifestations.

2 | CASE REPORT

An 88-year-old male with no known past medical history presented to the clinic for dysphonia for over 15 years. A previous biopsy in 2019 taken from the right vocal fold revealed pathology reported as pyogenic granuloma. Initial fiberoptic flexible laryngoscopy demonstrated anterior septal perforation with crusting, erythematous, friable, polypoid lesions from the epiglottis to the subglottis heavily involving the false vocal folds. CT neck revealed nonspecific tracheal thickening with a non-obstructing polypoid tracheal lesion and mucosal thickening of the nasal cavity and paranasal sinuses (Figures 1 and 2). CT chest revealed multiple calcified granulomas in the lungs and liver with a calcified pretracheal lymph node suggestive of a history of remote granulomatous disease.

He subsequently underwent nasal endoscopy, direct laryngoscopy and bronchoscopy with false vocal fold cordectomy, biopsy of the left inferior turbinate lesion, and tracheal biopsies. Findings included anterior septal perforation, diffuse mucosal nasal lesions, pedunculated supraglottic lesions extending from the false vocal cords bilaterally to the left laryngeal ventricle, no true vocal fold lesions, diffuse tracheal mucosal lesions, and tracheomalacia (Figures 3 and 4). Final pathology was reported as pyogenic granuloma, revealing reactive changes with increased histiocytes admixed with acute and chronic inflammation, negative Congo red staining, and no evidence of carcinoma or dysplasia.

Several months later, he returned for repeat biopsy and balloon dilation of the subglottis due to ongoing symptoms. A midline anterior subglottic scar band, possibly from the patient's prior biopsy, was identified and lysed with a CO_2 laser and balloon dilated. There was recurrence of lesions in the subglottis, but this was overall fewer than seen previously. Steroids were not injected at this time. Flow cytometry was negative for lymphoproliferative disorder. Hematoxylin and eosin staining demonstrated pathognomonic Mikulicz cells (Figure 5). Repeat pathological analysis revealed atypical lymphohistiocytic proliferation consistent with RS as the Grocott methenamine silver stain and Steiner stains demonstrated microorganisms within foamy macrophages and numerous Russell bodies (Figures 6 and 7). He was referred for rheumatology and pulmonology consultation and was ordered for 12 weeks of sulfamethoxazole–trimethoprim (800–160 mg). The patient had a largely unremarkable rheumatologic work up, including negative ANA, ACE, c-ANCA, p-ANCA, anti-SSA/SSB, anti-dsDNA, and RF, as well as normal CRP, slightly elevated ESR, and normal serum protein electrophoresis. The patient was then subsequently lost to follow up at our institution.

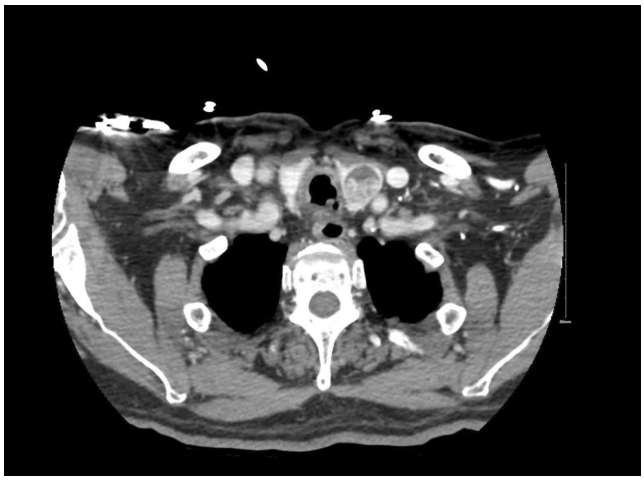

FIGURE 1 Axial CT neck demonstrating a 4 mm polypoid tracheal lesion. An incidental left thyroid mass is seen as well.

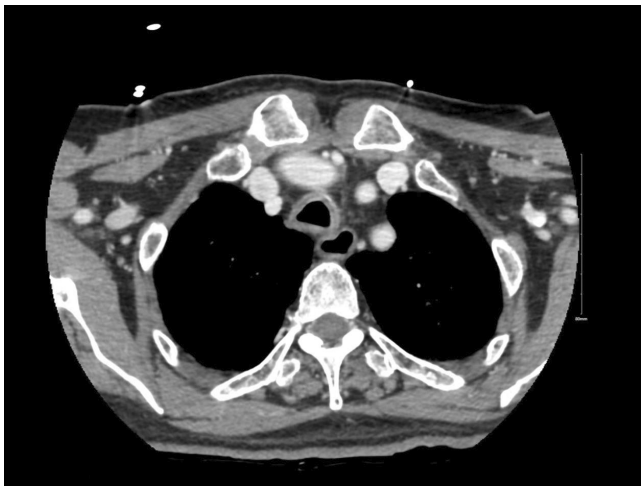

FIGURE 2 Axial CT neck demonstrating nonspecific tracheal thickening.

3 | DISCUSSION

RS has been a topic of interest largely due to its peculiar epidemiology. Characterization of geographic patterns and individual patient characteristics may lead to a better understanding of the factors contributing to development of RS. There is a need for further data to investigate potential explanations for the epidemiology of RS, and this need is most pronounced in nonendemic regions where the disease is scarce which makes diagnosis difficult due to low index of suspicion. Indeed, significant delay in diagnosis of RS has been reported in nonendemic regions,[5] whereas in endemic areas RS is more readily diagnosed despite early nonspecific symptoms that often mimic more

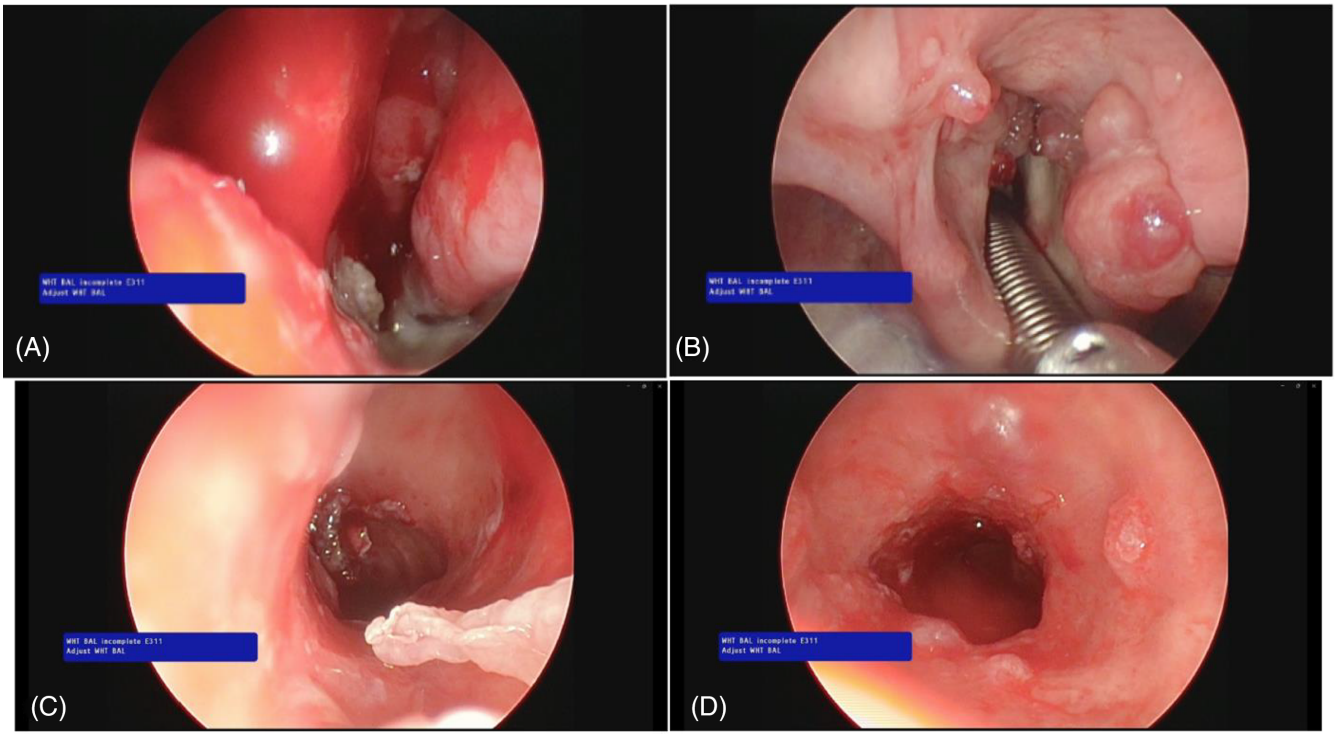

FIGURE 3 (A) Rhinoscleroma lesions on the septum and left inferior turbinate prior to excision. (B) Rhinoscleroma lesions of the larynx prior to excision. (C) Rhinoscleroma lesions of the proximal trachea prior to excision. (D) Rhinoscleroma lesions of the distal trachea prior to excision.

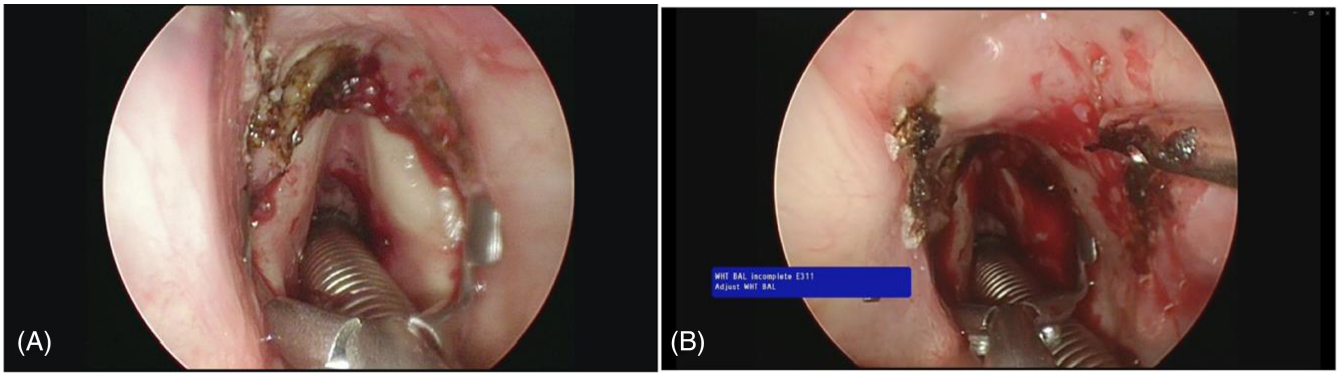

FIGURE 4 (A) Excision of glottic rhinoscleroma lesions. (B) Excision of supraglottic rhinoscleroma lesions.

common conditions such as atrophic rhinitis. It is therefore crucial to continue reporting nonendemic RS to allow for improved recognition of the disease, especially when unusual anatomic areas such as the trachea are involved.

Cases of RS have been reported throughout the upper and lower airway with cutaneous, nasal, laryngeal, maxillary, temporomandibular joint, palate, upper lip, anterior cranial fossa, and tracheal involvement across case reports and series.[6] Of these sites, the nasopharynx is most common, with the larynx and trachea being less common sites.[7] A review of the literature found 27 cases of RS with involvement of the larynx, trachea, and/or bronchi reported in the United States.[8–10] Increased travel from endemic areas is a proposed explanation for nonendemic RS. With modern day travel modalities increasing globalization, it is imperative for physicians to recognize potential signs of RS, even when presenting in an unusual manner in nonendemic regions, as symptoms of RS can be severe and even fatal.

The clinical presentation of RS typically progresses through three stages. The catarrhal (atrophic or rhinitic) phase occurs first, presenting with nonspecific rhinitis with subsequent chronic, foul-smelling purulent discharge. Epistaxis, crusting and nasal obstruction have also been reported in this phase. In the second phase, granulomatous (proliferative or nodular), patients develop a granulomatous mass that can lead to obstruction. Finally, the sclerotic (cicatricial or fibrotic) phase occurs in untreated cases. This is characterized by permanent complications including nasal deformity, anosmia, oral anesthesia, dysphonia, dysphasia, and stridor.[11]

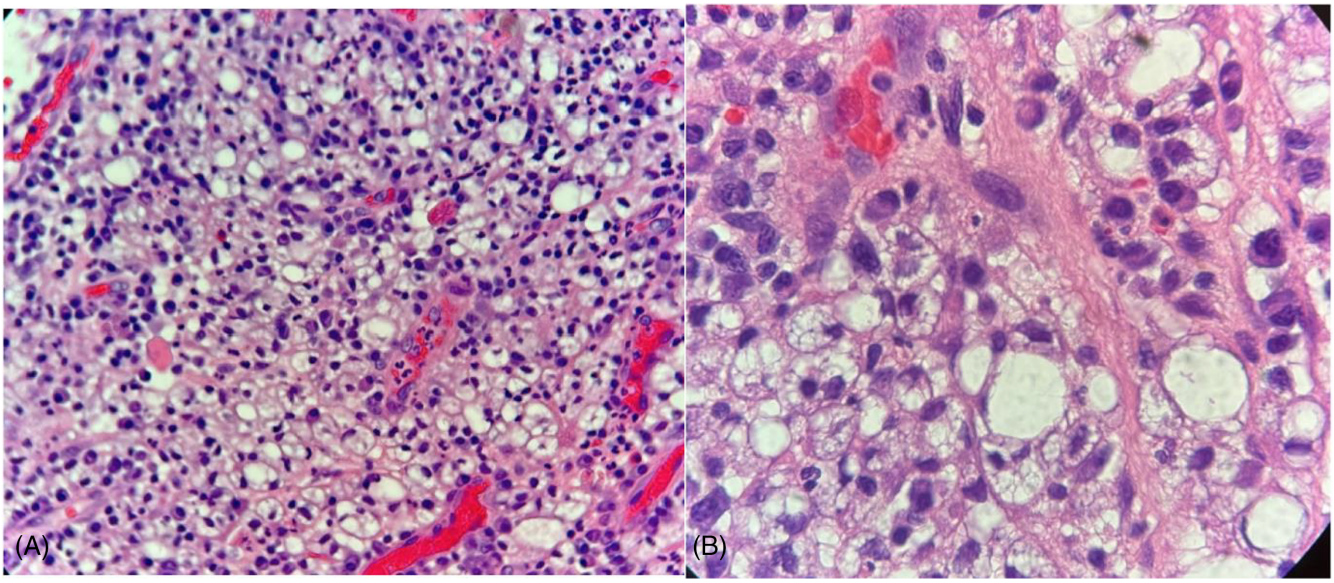

FIGURE 5 (A) Hematoxylin and eosin (H&E) staining of biopsy specimen from trachea which demonstrates Mikulicz cells in a background of plasma cells and inflammatory cells. (B) H&E staining demonstrating Mikulicz cells (foamy macrophages) containing bacteria.

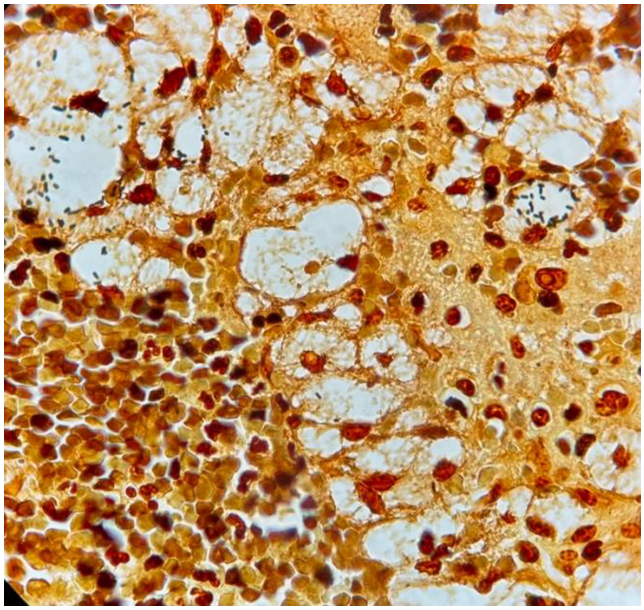

FIGURE 6 Warthin–Starry stain demonstrating rod shaped bacilli within cells.

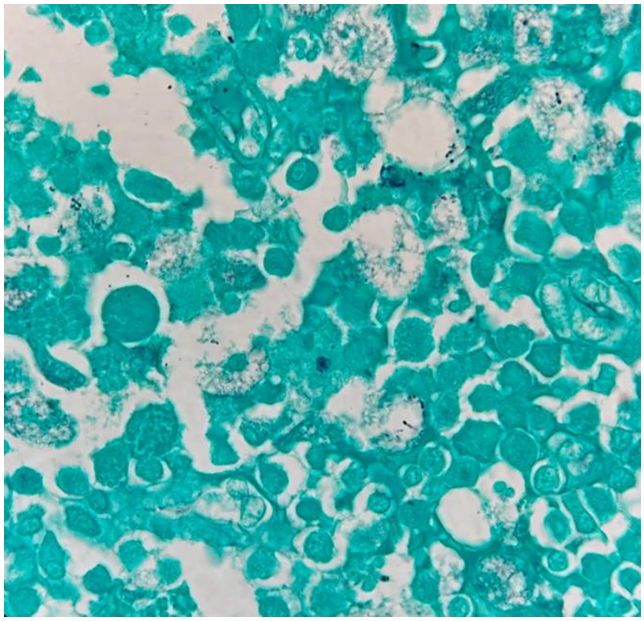

FIGURE 7 Grocott's methenamine silver (GMS) staining demonstrates intracellular coccobacilli.

Histopathology is the mainstay in diagnosis of RS, with classic findings including Mikulicz cells, Russell bodies, and positive Warthin–Starry stain.[12] Biopsy and tissue culture of tracheal lesions can also be used for diagnosis. *K. rhinoscleromatis* is the most commonly identified organism, however, *Klebsiella ozaenae* and *Klebsiella pneumoniae* have also been identified.[13–15] Negative cultures cannot rule out *K. rhinoscleromatis*, as positive cultures are only seen in about 60% of patients.[4] In our patient, initial biopsy results were consistent with pyogenic granuloma; however, cultures were not obtained at that time, which may have expedited the diagnosis of RS.

Our patient was noted to have granulomatous lesions of the lungs and liver. Systemic granulomatous involvement including the lungs and liver is atypical of RS, and to the best of our knowledge this has not been previously reported. However, *K. pneumoniae* has been documented to manifest in these sites, and as previously mentioned, this organism has been identified in RS.[13–16] Our patient was diagnosed based on histopathology and was subsequently lost to follow up and as such, culture results were not obtained to confirm the specific organism involved in this case. While systemic involvement is an

unusual finding in RS, it is reasonable to suspect granulomatous involvement of the trachea in patients with airway obstruction and evidence of prior systemic granulomatous disease.

The mainstay of treatment for RS is combination antibiotic therapy due to variation in bacterial susceptibility. Treatment regimens vary, but include rifampin and trimethoprim, ciprofloxacin and doxycycline, ciprofloxacin and cotrimoxazole, and ciprofloxacin and sulfamethoxazole.[6,17] Antibiotic selection is often adjusted according to resistances and sensitivities to available agents. Surgical correction of tracheal lesions with endoscopic laser therapy can be used for symptomatic relief of obstruction. For severe obstruction causing respiratory compromise, there are reports of tracheal implants being used in cases of stenosis, and tracheotomy performed in emergencies.[4]

4 | CONCLUSION

RS is typically endemic to regions including West Russia, North Africa, Indonesia, Central America, South America, and some regions of the Middle East, making this case at our institution in the United States a rare diagnosis. Although an uncommon cause of upper airway obstruction, RS should be kept in the differential and, if clinically suspected, be appropriately evaluated with both histopathologic and microbiologic analysis. Treatment should be aimed at management of patient symptomatology as well as combination antibiotic therapy and possible surgical management to achieve these goals.

ACKNOWLEDGMENTS

We would like to thank the Newark Beth Israel Department of Pathology for their assistance in obtaining and reviewing slides.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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How to cite this article: Celidonio J, Bahethi R, Malhotra R, Sangappa S, Kaye R. Nonendemic rhinoscleroma: An unusual manifestation of the trachea. *Laryngoscope Investigative Otolaryngology*. 2024;9(4):e1293. doi:10.1002/lio2.1293