Volume 6 | Issue 1 | 2026

ISSN | 2771-019X

Journal of
Clinical & Medical Images
Case Reports

Open Access | Case Report

Critical airway obstruction by subglottic submucosal haemangioma and segmental tracheobronchial pinhead lesions, rapidly responding to propranolol

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Abstract

Previously, critical airway haemangiomas were treated by surgery, kryo- or laser-therapies. These invasive procedures were prone for critical complications, including bleeding, scaring and development of strictures. Surprisingly, conservative therapies with ß-blockers like oral propranolol reveal to substantially improve even critical haemangiomas in the airways. We report on a case of life-threatening submucosal obstruction diagnosed as laryngeal haemangioma for the rapid and sustained improvement with propranolol.

Case description: A two-month-old primarily asymptomatic girl developed incrementing symptoms of the upper respiratory tract with a cough, tachypnoea and intermittent predominantly inspiratory stridor. Additionally, she revealed small pinhead-sized haemangiomas on the lower lip. During the inpatient stay, a biphasic stridor became apparent and we performed a bronchoscopy. The upper airway tract was occluded for about 60% with a subglottic dorsolateral tumour with surfaces not differing from the surrounding airway mucosa. Additionally, we found small, pinhead-sized erythematous efflorescences distributed segmentally in the lower bronchial tree. Supposing haemangioma as the occlusions´ cause and as oxygen saturation went down to 88-90%, propranolol treatment was initiated, leading to entire vanishing of the stridor after two days, so that the mother requested home monitoring, as she did not hear her daughter breathing any more.

Comments: In unclear cases of dyspnea and stridor a segmental haemangioma of the airway should be considered causative, especially when occurring with other cutaneous haemangiomas in the facial area, and particularly when located in the mandibular region. In our case, the diagnosis of a subglottic haemangioma could thus be confirmed retrospectively.

Received: Mar 12, 2026

Accepted: May 08, 2026

Published Online: May 15, 2026

Cite this article: Döhmen A, Sadrieh P, Ribeiro JD, Kössel H, Mainz JG. Critical airway obstruction by subglottic submucosal haemangioma and segmental tracheobronchial pinhead lesions, rapidly responding to propranolol. J Clin Med Images Case Rep. 2026; 6(1): 1824.

Keywords: Subglottic stenosis; Infantile haemangioma; Propranolol.

Introduction

Infantile haemangiomas are the most common type of vascular tumours in children [1]. Characteristically, they reveal a dynamic clinical development, usually with the appearance of efflorescences at the age of 8-12 weeks and with progression over approximately the first 4 months of life. While the most common presentation of haemangiomas in infants is the focal or multifocal form with more than 5 efflorescences, the rare segmental haemangiomas occur alongside of anatomical segments and a usually involve a larger surface of the skin (>5 cm).

While cutaneous haemangiomas are quite common and usually have a good prognosis, manifestations in the respiratory tract occurring solitary or in association with cutaneous haemangiomas can be life-threatening. Haggstrom et al. found the highest associated risk of simultaneous Upper Airway Haemangiomas (UAIH) in cutaneous haemangioma of the facial area, especially in the mandibular region [2]. Segmental haemangiomas happen to be associated with malformation syndromes, such as the PHACES syndrome, which includes anomalies of the posterior fossa, arteries, the eyes and/or the sternum (Table 1). About 30% of children with large haemangiomas of the face meet the criteria for incomplete or complete PHACES syndrome [3,4].

Historically, critically located haemangiomas prompted recurrent interventions prone to critical side effects and complications, including surgical, thermal or laser therapies, as well as systemic therapy with corticosteroids or oral vincristine. In the past decades, oral propranolol has become first-line treatment of critical haemangiomas in children [5]. Particularly in the case of upper airway haemangiomas, propranolol has shown to be a more effective option with rapid onset causing fewer severe side effects than laser-treatment, surgery, or systemic steroids and vincristine. The comparatively low rate of potential side effects of oral propranolol usually seen in dosages >2 mg/kg/d, include bradycardia, hypoglycaemia, hypotension, and bronchospasm [5].

Case report

A two-month-old female patient initially presented to the emergency department with acute symptoms of the upper respiratory tract including tachypnoea and a barking cough supposing to the frequent croup-syndrome. On examination, the tachypnoeic patient showed pulmonal rales while measuring moderate oxygen saturations. Additionally, the girl had a small haemangioma on the right lower lip (Figure 1). In the outpatient clinic, adrenaline inhalations and systemic corticosteroids were administered and the patient was admitted to the pediatric ward. Blood tests revealed unremarkable results, particularly in regard to the inflammation parameters. After an initial improvement, a biphasic stridor became apparent, but the patient stabilized by symptoms including oxygen saturation in the normal range and so that she could be discharged.

Five weeks later, with incrementing symptoms and respiratory distress at a follow-up examination, together with a progression of the haemangioma of the lower lip and a few new pinhead-sized haemangiomas on the chin we performed flexible bronchoscopy. A right dorsolateral subglottic mass occluding approximately 60% of the subglottic area with an inconspicuous mucosal surface was identified (Figure 1). In addition, there were a narrowing of the proximal middle trachea from the left and pinhead-sized erythematous efflorescences distributed mainly in the area of the left bronchial tree and the distal dorsal trachea. A complementary Magnet Resonance Imaging (MRI) could not provide any further information on the aetiology of the mass. For increasingly critical symptoms of dyspnoea and biphasic stridor three days later, we started a trial therapy with oral propranolol with titration over six days to 2 mg/kg/day. Impressively, already after two days of therapy stridor at rest entirely disappeared.

The symptoms steadily improved during the ongoing therapy. At the follow-up presentation after three months, no stridor was audible, even during activity, and the child thrived well, without revealing side effects of systemic therapy with beta-blockers. Follow-up bronchoscopy showed a substantial decline of the mass descripted (Figure 1). At the same time, the haemangioma of the lower lip decreased and fewer erythematous lesions were detectible in the bronchial tree. The diagnosis of a subglottic subcutaneous haemangioma could thus be confirmed ex juvantibus, together with segmental pinhead-sized haemangioma at the lower lip and in segments of the tracheobronchial tree similarly affected. Oral propranolol treatment is going to be continued for two years.

Discussion

As previously described, upper airway infant haemangioma is an important differential diagnosis to be considered in the case of secondary incrementing, stridoric breath sounds in infants [6]. In most cases, diagnostic bronchoscopy and/or sectional imaging can provide a reliable diagnosis.

In our case, respiratory symptoms of airway obstruction, not responding to inhalative therapies, which incremented and finally became life threatening over time prompted to perform flexible bronchoscopy. The identified subglottic mass obstructing more than 60% of the lumen by itself was not identifiable as haemangioma, having a surface identical to the surrounding mucosa. It resulted to be located below airway mucosa.

With increasing and life threatening upper airway obstruction including intermittent mild hypoxaemia, the small haemangioma on our patient´s lower lip as well as bronchoscopic detection of clustered segmental the pinhead-sized erythematous lesions in the bronchial tree prompted decision to tentative treatment with oral propranolol. The considerably fast relieve of respiratory distress, which after only 2-3 days of therapy, confirmed the diagnose of a critical submucosal upper airway haemangioma, and at discharge, prompted the mother to request a monitoring device, as she did not hear her daughter´s sounds of breathing any more.

As described by Uthurriague in an observatory study including 38 children with upper airway haemangioma, the classic mandibular localisation of cutaneous haemangiomas is associated highly with the presence of an airway haemangioma but especially the lower lip localisation has been shown to be a quite suggestive area for an airway haemangioma and should therefore alert physicians [3].

It is to be discussed whether an earlier start of treatment with oral propranolol would have been justifiable given that the lower lip haemangioma represents a high-risk skin region for associated simultaneous upper airway haemangioma [1,2]. As MRI imaging could not help to identify the source of the stenosing tracheal structure, we were dependent on

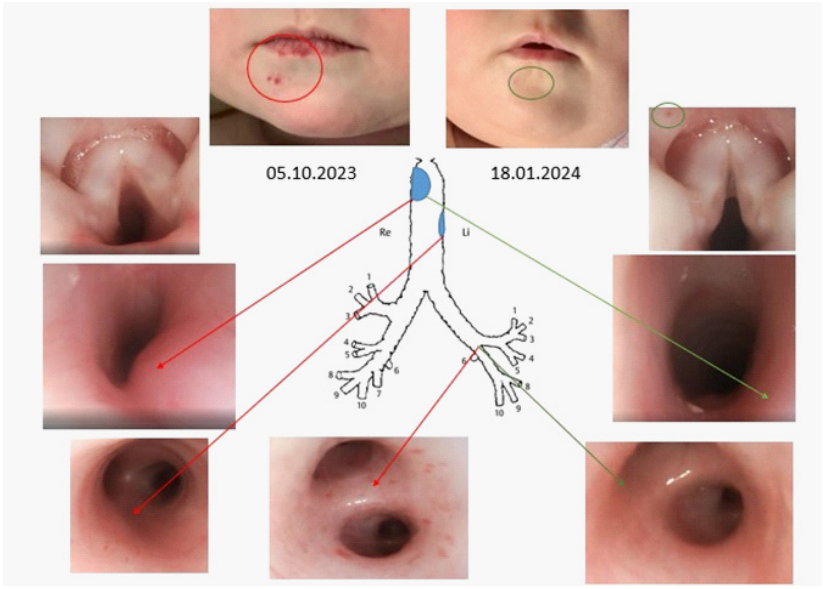

Figure 1: Comparison of cutaneus and bronchoscopic findings prior to treatment and after 3 months of oral therapy with oral propranolol.

Table 1: Diagnostic criteria revised for PHACES syndrome along Garzon et al [10].

	Major criteria	Minor criteria
Posterior fossa malformation	Posterior fossa brain anomalies Dandy-Walker malformations Other hypoplasia/dysplasia of the mid and/or hind brain	Midline brain anomalies Malformation of cortical development
Arterial anomalies	Anomaly of major cerebral of cervical arteries Dysplasia of large cerebral arteries Arterial stenosis/occlusion Persistent carotid-vertebrobasilar anastomosis	Aneurysm of cerebral arteries
Cardial Anomalies	Aortic arch anomalies Coarctation of the aorta Aneurysm Aberrant origin of the subclavian artery with or without a vascular ring	Ventricular septal defect Right aortic arch/double Aortic arch Systemic venous anomalies
Eye anomalies	Posterior segment anomalies Persistent hyperplastic primary vitreous Persistent fetal vasculature Retinal vascular anomalies Morning glory disc anomaly Optic nerve hypoplasia Peripapillary staphyloma	Anterior segment abnormalities Microophthalmia Sclerocornea Coloboma Cataracts
Sternal anomalies	Sternal defect/pit/cleft, supraumbilical raphe	Ectopic thyroid hypopituitarism Midline sternal papule/hamartoma
Definite PHACES		
Haemangioma >5cm in diameter of the head area PLUS 1 major or 2 minor criteria		Haemangioma of the neck, upper trunk or trunk and proximal upper extremity PLUS 2 major criteria
Possible PHACES		
Haemangioma >5cm in diameter of the head area PLUS 1 minor criteria	Haemangioma of the neck, upper trunk or trunk and proximal upper extremity PLUS 1 major or 2 minor criteria	No haemangioma PLUS 2 major criteria

the findings of the bronchoscopy, which led us to suspect a haemangioma due to the presence of the small erythematous lesions in the bronchial tree. We consider it an advantage of this approach that further invasive diagnostics with possible harm, such as a computertomography scan or a biopsy, could be dispensed with. Alternatively, as previously described, an ultrasound examination could have led to valuable findings as a complementary non-invasive method [7].

As addressed above, a PHACES syndrome must be considered in children with large, segmental haemangiomas in the facial area. In the patient presented, the criteria for PHACES syndrome as listed up in detail on (Table 1) were not met. Apart from the segmental haemangioma, which, however was not characterized by a large size above 5cm in diameter, other major or two minor criteria were not present according to the clinical examination and further sonographic examination [8].

The treatment with oral propranolol is expected to be continued for total of two years based on current recommendations in order to prevent a recurrence of the life threatening upper airway occlusion [9,10]. The chosen dosage of 2 mg/kg/day seemed to be sufficient for a successful treatment although further clinical follow-up assessments are going to be carried out.

Conclusion

Segmental haemangiomas are a relatively rare cause of stridorous breath sounds in infants. However, even if the bronchoscopic findings are inconclusive, an underlying submucosal segmental haemangioma should be considered in the presence of simultaneous cutaneous haemangiomas. Especially if these occur in regions of higher association to airway haemangiomas. In this case, a trial therapy can and should be considered due to the relatively low side effect spectrum of oral propranolol compared to those of an interventional diagnostic/biopsy.

Learning points

Upper airway infantile haemangiomas may occur in association with cutaneous haemangiomas, particularly in skin regions of the face (mandibular region, preauricular region).

A submucosal haemangioma can be difficult to identify as such by bronchoscopy. Further findings in the area of the bronchial system can confirm the suspicion.

Oral propranolol is the standard of care in upper airway infant haemangioma and may be considered a therapy attempt in the case of ambiguous bronchoscopy findings.

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