# High-grade Compression of the Internal Carotid Artery in a 4-Year-Old Child with a Retropharyngeal Abscess. Case Report

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## Abstract
For pediatricians and otolaryngologists, retropharyngeal abscesses in children are not uncommon. Most pediatric patients make a complete recovery without complications with the use of broad-spectrum antibiotics, often supplemented by surgical incision and drainage.

We report an unusual complication of retropharyngeal abscess in a 4-year-old girl, namely high-grade compression of the internal carotid artery and compression of the internal jugular vein. The patient was treated conservatively with intravenous broad-spectrum antibiotics. No vascular or neurological complications occurred. A review of current knowledge and treatment approaches will be discussed.

## Introduction

A retropharyngeal abscess is a collection of pus in the space behind the pharynx and in front of the prevertebral fascia. It primarily affects children, often after an upper respiratory tract infection. Most children make a full recovery with the use of broad-spectrum antibiotics, often supplemented by surgical drainage. However, complications can occur, including airway compromise, jugular vein thrombosis, mediastinitis, sepsis, esophageal perforation, and carotid aneurysm or rupture. Major vascular complications are rare.

We report a high-grade external compression of the internal carotid artery by a retropharyngeal abscess in a 4-year-old child. A review of current knowledge and management approaches is provided.

## Case

A 4-year-old girl presented to the emergency department with a 3-day history of high fever, neck pain and anorexia. She had a pronounced adenopathy in the left cervical region with reduced neck mobility. Furthermore she had a hyperemic pharynx, a strawberry tongue and a scarlatiniform rash on the thorax. Laboratory analysis revealed a bacterial blood count with leukocytosis 18.58x10³/µL (5.00-10.60x10³/µL), C-reactive protein (CRP) 230.0 mg/L (<10 mg/L) and sedimentation rate 120 mm/h (<11 mm/h). Ultrasound revealed bilateral reactive lymphadenopathy.

She was admitted to the hospital and started on intravenous (IV) ceftriaxone (105 mg/kg/day in 1 dose). Figure 1 presents a timeline detailing the treatment and key steps during the admission.

**FIGURE 1:** Timeline detailing the treatment and key steps during the admission.

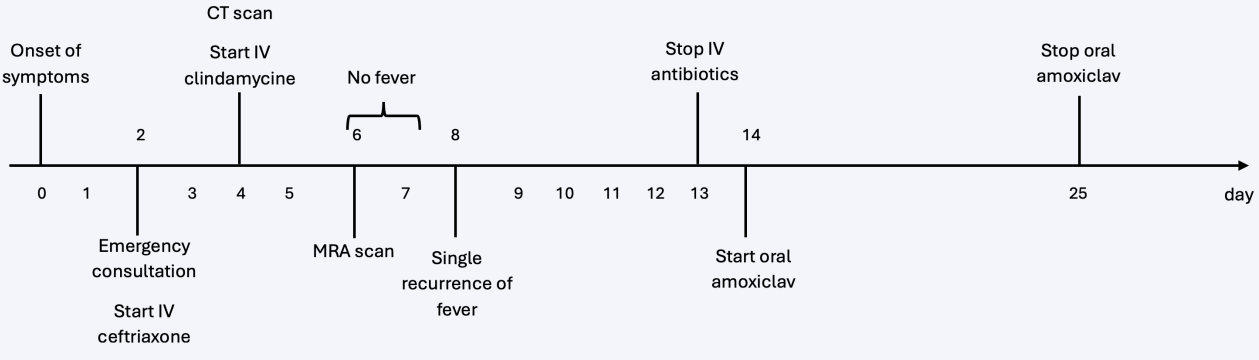


**FIGURE 2:**
CT scan revealed a hypodense, irregularly marginated abscess collection in the left retropharyngeal space at the level of the nasopharynx. The abscess compresses both the ICA and the IJV (orange arrows).during the admission.

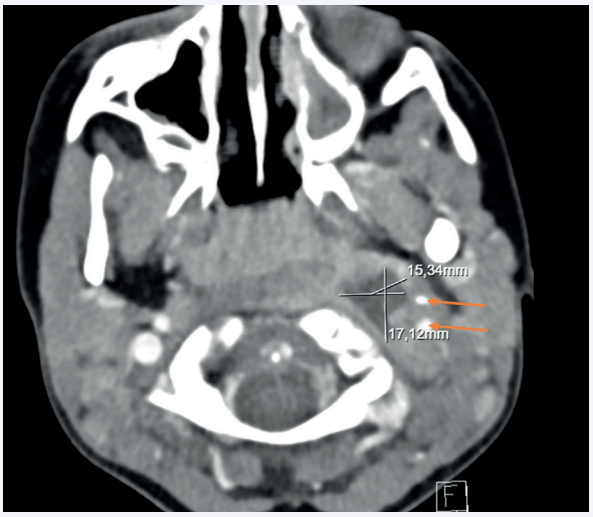



**FIGURE 3:**
CT scan shows a high-grade collapse of the left ICA (orange arrow) secondary to the mass effect of a RPA (green arrow).

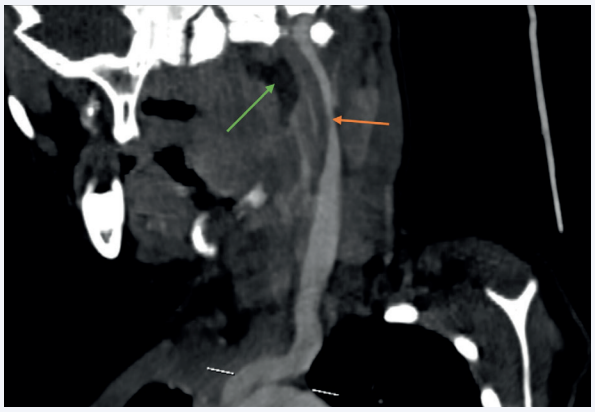
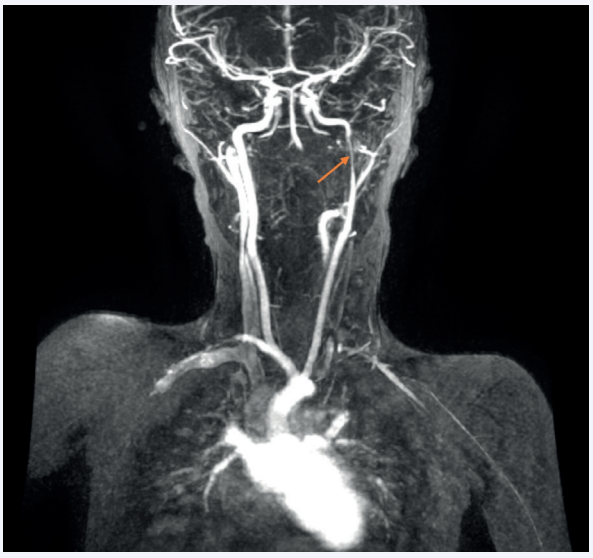


**FIGURE 4:**
MRA, conducted 2 days post-CT-scan, shows the ICA compression (orange arrow). Additionally, the normal morphology and patency of other blood vessels is visualized.



Two days after starting IV ceftriaxone, a computed tomography (CT) scan with contrast was performed because of persistent pyrexia, which revealed a hypodense, irregularly marginated abscess collection in the left retropharyngeal space at the level of the nasopharynx, exerting a moderate mass effect. The abscess measured approximately 15 x 17 x 27 mm and extended to the base of the skull (Figure 2). Imaging also showed high-grade compression of the left internal carotid artery (ICA) and compression of the left internal jugular vein (IJV), with no evidence of an intraluminal thrombus (Figure 3). Given the diagnosis of an abscess and the presence of a bacterial blood count, IV clindamycin (50 mg/kg/day in 4 doses) was associated 2 days after starting IV ceftriaxone to cover the patient against bacterial toxins. Coagulation screening showed no abnormalities. Clinically, the patient had no neurological deficits or additional complaints. Given the anatomically challenging location of the abscess, the absence of neurological impairment, the decrease in inflammatory markers, and the patient's stable clinical condition, the decision was made to continue IV antibiotic therapy (ceftriaxone + clindamycin) without proceeding with surgical drainage. Due to the arterial nature of the compressed blood vessel, anticoagulant therapy was not administered.

In order to obtain a better visualization of the cervical and intracranial vasculature, magnetic resonance angiography (MRA) was performed. The scan, performed two days after the CT scan, demonstrated an external compression of the ICA (Figure 4). In addition, the scan showed further reduction of the abscess (12 x 11 x 22 mm), normal morphology and patency of other blood vessels, and no evidence of ischemia. Intravenous antibiotic therapy was continued.

The fever resolved after six days, 3 days after the start of IV ceftriaxone. Clinically, she appeared generally well, although cervical adenopathy and reduced neck mobility persisted. Her white blood cell count and CRP also decreased.

On day five of treatment, eight days after the onset of the symptoms, there was a recurrence of fever. No significant clinical changes were noted and there was no indication of an intercurrent viral infection. Serial blood counts showed a continued decrease in inflammatory markers. The treatment regimen remained unchanged, and no subsequent febrile episodes were recorded.

After completing a 12-day course of IV ceftriaxone and a 10-day course of clindamycin, the patient was discharged with mild persistent cervical adenopathy. Amoxiclav (50/6,25 mg/kg/day in 3 doses) was administered orally for an additional twelve days.

At the end-of-treatment follow-up, the swelling and cervical adenopathy had completely resolved. After 2.5 months, a repeat MRA of the cervical vessels showed complete re-expansion of the ICA and complete resolution of the abscess

Written informed consent for the use of this case in this report was obtained from the patient's parents.

## Discussion

Retropharyngeal abscesses (RPAs) are not uncommon in pediatric patients. In most cases, abscess formation follows an upper respiratory tract infection, leading to suppurative adenitis of the retropharyngeal lymph nodes and subsequent abscess formation. This process occurs mainly in children under the age of five years due to the involution of these lymph nodes starting at four to five years of age (1,2). Although abscess formation is often preceded by an upper respiratory tract infection, trauma involving inoculation at the level of the posterior pharynx or dental disease can also serve as an entry point for retropharyngeal infection leading to abscess formation (1). Timely diagnosis and treatment is important, but can be difficult in children, especially in nonverbal children, because of insidious onset. RPA should be included in the differential diagnosis of a child

presenting with fever, with or without torticollis and decreased oral intake. Complications are more common when there is a delay in diagnosis and treatment. Two separate studies found that, among deep neck abscesses, the risk of complications was highest for RPAs (3,4). Several complications have been described, including airway compromise, jugular vein thrombosis, mediastinitis, sepsis, esophageal perforation, and carotid aneurysm or rupture (1,4).

Serious vascular complications secondary to RPA are uncommon. Arterial complications, which were more common before the advent of antibiotics, are even less common than venous complications (5). To our knowledge, only a single case report about an ICA occlusion has been published, defined radiologically defined loss of signal in the ICA, secondary to a RPA (6). In contrast, several studies have demonstrated that vascular narrowing with partial patency (which is unambiguously defined) is a prevalent radiographic finding associated with RPAs (5,7,8). Its significance is controversial. Hudgins et al. found ICA narrowing (range 1-5mm) in 13 children with RPA, without complications, or neurological symptoms (8). Caroll et al. identified carotid or jugular narrowing in 93 of 208 patients with deep neck abscess, without neurological complications. Three patients had jugular vein thrombosis, one possibly an artifact (5). Derinkuyu et al. observed ICA narrowing in 5 children with parapharyngeal-lateral RPA. One patient had mild lower extremity weakness that resolved with heparin treatment; otherwise, there were no complications (7). Hudgins and Caroll consider ICA narrowing to be benign and not requiring intervention due to its common and usually uneventful course (5,8). Derinkuyu emphasizes the importance of recognizing this common finding to prevent progression and fatal complications (7).

As with the significance of ICA narrowing, the treatment of RPA is controversial, especially concerning the role and timing of surgical intervention. To our knowledge, there are no established guidelines for the treatment of RPA. Most studies advocate an initial trial of intravenous antibiotics alone, while others argue that surgical drainage should be included as part of the treatment (2). Increasing attention is being given to the role of corticosteroids in treatment as they may reduce the need for surgical drainage, shorten hospital stays, and decrease hospitalization costs (9).

Guidelines for the treatment of ICA compression secondary to RPA are also currently lacking. Current recommendations for acute ischemic stroke in children recommend the administration of unfractionated heparin, low-molecular-weight heparin, or aspirin until dissection and cardioembolic causes are ruled out. If these causes are excluded, the guidelines recommend continuing aspirin therapy for at least two years (10). In our patient, there was no stroke, only an asymptomatic ICA compression, and no evidence of dissection or a cardioembolic source, so anticoagulation was not initiated.

In our perception, external compression of the ICA should not be considered a trivial finding. The importance of recognizing and managing ICA compression lies in the potential risk of ischemic events. These events do not always occur with ICA compression because many individuals have an intact circle of Willis or develop collateral circulation from another intracranial source or from the external carotid artery to the ICA. In children, leptomeningeal collaterals are particularly well developed (8). In this context, we do not believe that it is necessary to treat all patients with anticoagulation. However, if neurological symptoms or dysfunction are present, further evaluation of cerebral perfusion should be performed and intervention or medication may be warranted.

## Conclusion

In summary, we present a case of high-grade internal carotid artery compression secondary to a retropharyngeal abscess. The patient was treated with broad-spectrum antibiotics and had no neurological or vascular complications.

The clinical significance of internal carotid artery compression due to retropharyngeal abscess remains uncertain, and there are no established guidelines for its management. We believe that internal carotid artery compression should not be considered trivial because of to the potential risk of ischemic events.

Further research into the recognition of and therapeutic approaches to arterial compression due to retropharyngeal abscesses would be of value, although the low incidence of such cases poses a challenge to a comprehensive study.

The authors have no conflicts of interest to declare with regard to the topic discussed in this manuscript.

REFERENCES


1. Jain H, Hohman MH, Sinha V. Retropharyngeal abscess. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2024 Aug]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK441873/
2. Akhavan M. Ear, Nose, Throat: Beyond Pharyngitis: Retropharyngeal Abscess, Peritonsillar Abscess, Epiglottitis, Bacterial Tracheitis, and Postoperative Tonsillectomy. Emerg Med Clin North Am. 39(3):661–75.
3. Jain A, Singh I, Meher R, Raj A, Rajpurohit P, Prasad P. Deep neck space abscesses in children below 5 years of age and their complications. Int J Pediatr Otorhinolaryngol. 2018 Jun;109:40–3.
4. Baldassari CM, Howell R, Amorn M, Budacki R, Choi S, Pena M. Complications in pediatric deep neck space abscesses. Otolaryngol Neck Surg. 2011 Apr;144(4):592–5.
5. Carroll W, Van Beck J, Roby B. Is vessel narrowing secondary to pediatric deep neck space infections of clinical significance? Int J Pediatr Otorhinolaryngol. 2019 Oct;125:56–8.
6. Elliott M, Yong S, Beckenham T. Carotid artery occlusion in association with a retropharyngeal abscess. Int J Pediatr Otorhinolaryngol. 2006 Feb;70(2):359–63.
7. Derinkuyu BE, Boyunağa Ö, Polat M, Damar Ç, Tapısız Aktaş A, Alımlı AG, et al. Association between deep neck space abscesses and internal carotid artery narrowing in pediatric patients. Turkish J Med Sci. 2017 Dec;47(6):1842–7.
8. Hudgins PA, Dorey JH, Jacobs IN. Internal carotid artery narrowing in children with retropharyngeal lymphadenitis and abscess. AJNR Am J Neuroradiol. 1998;19(10):1841–3.
9. Wang X, Chen Y, Jia D, Teng Y, Pan H. The role of adjuvant systemic corticosteroid in pediatric retropharyngeal and parapharyngeal abscess. Am J Otolaryngol. 2024;45(2):104117.
10. Monagle P, Chan AKC, Goldenberg NA, Ichord RN, Journeycake JM, Nowak-Göttl U, et al. Antithrombotic Therapy in Neonates and Children: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest. 2012 Feb 1;141(2 Suppl):e737S-e801S.