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## Interventional Radiology

## Cone beam computed tomography-guided transpterygoidal aspiration of a carotid space abscess in Lemierre's syndrome

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## ABSTRACT

Lemierre's syndrome results from anaerobic bacterial thrombophlebitis of the cervical venous vasculature, occasionally complicated by deep neck space abscesses, sepsis, septic emboli, vascular occlusions, or mycotic aneurysms. Fastidious organisms, such as *Fusobacterium necrophorum*, may be slow to respond to intravenous antibiotic therapy, prompting a need for more aggressive source control. Concomitant vascular occlusions and mycotic aneurysms present difficult decisions regarding anticoagulation, and the anatomy involved implies important technical considerations for intervention. A case of Lemierre's syndrome complicated by a carotid space abscess and mycotic internal carotid artery pseudoaneurysm progressed despite intravenous antibiotics. Transpterygoidal aspiration using cone beam computed tomography guidance provided both technical and clinical success.

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## Introduction

Classic Lemierre's syndrome is due to oropharyngeal infection by *Fusobacterium necrophorum* followed by metastatic spread and suppurative thrombophlebitis of the head and neck with septic embolization to the lungs [1,2]. Intravenous antibiotics is the mainstay of treatment, and anticoagulation in some cases. Although retropharyngitis with or without abscess commonly accompanies the presentation, the condition may be further complicated by dural venous thrombosis and cerebral arteritis, which introduce risk of venous and arterial ischemia. The case herein presented the full complement of diagnostic and

therapeutic challenges: dural venous and cavernous sinus thrombosis, carotid space abscess, and mycotic degeneration of the internal carotid artery.

## Case

A 17-year-old male patient presented following a 1-month history cough and sore throat later accompanied by headaches, fatigue, weight loss, fevers, and neck pain. Computed tomography (CT) confirmed septic emboli to the lungs, kidneys, and spleen; left jugular and dural venous sinus thrombosis; and a carotid space abscess. Echocardiogram failed to identify vegetations or

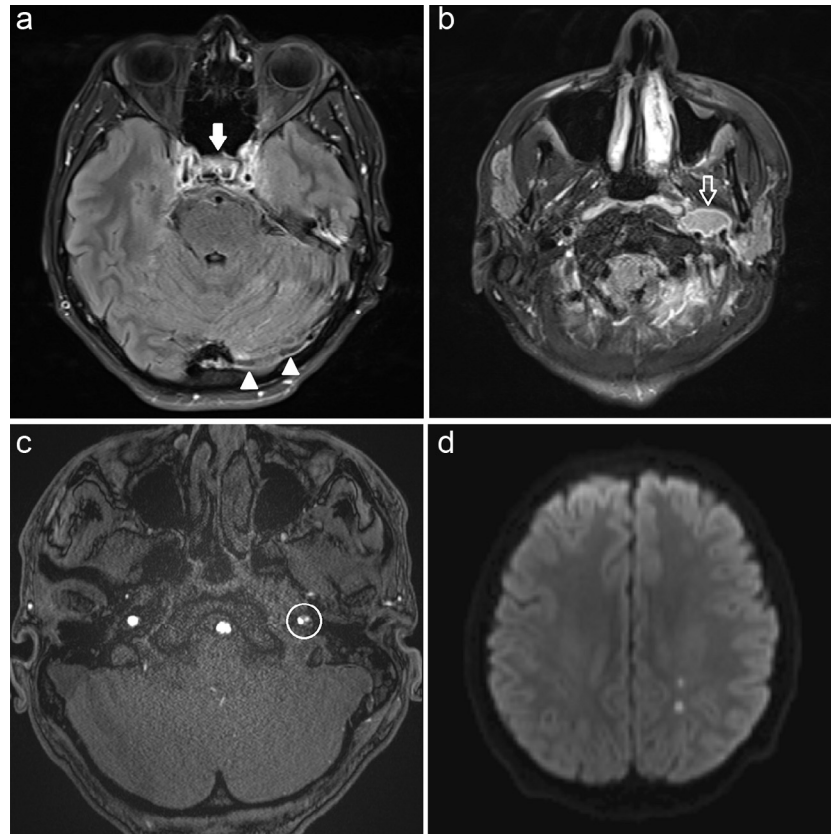
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**Fig. 1 – Axial postcontrast fluid attenuation inversion recovery (FLAIR) MR images (A, B) demonstrate enhancement and thrombosis of the left transverse sinus (white arrowheads) and cavernous sinus (white arrow) as well as a left carotid space abscess (open arrow). Axial 3-dimensional time of flight MR angiogram image (C) demonstrates narrowing of the extracranial left internal carotid artery with mycotic pseudoaneurysm formation (white circle). Axial diffusion weighted image (D) demonstrates 2 punctate infarcts in the left parietal lobe. MR, magnetic resonance.**

shunting to explain paradoxical emboli. Blood cultures revealed *F. necrophorum* bacteremia, confirming Lemierre's syndrome. Due to altered mental status, a magnetic resonance angiogram (MRA) of the brain was acquired which confirmed the previous findings and revealed multifocal infarcts in the left parietal lobe. Broad-spectrum intravenous antibiotic coverage had been initiated empirically and was subsequently tailored following identification of organism and sensitivities.

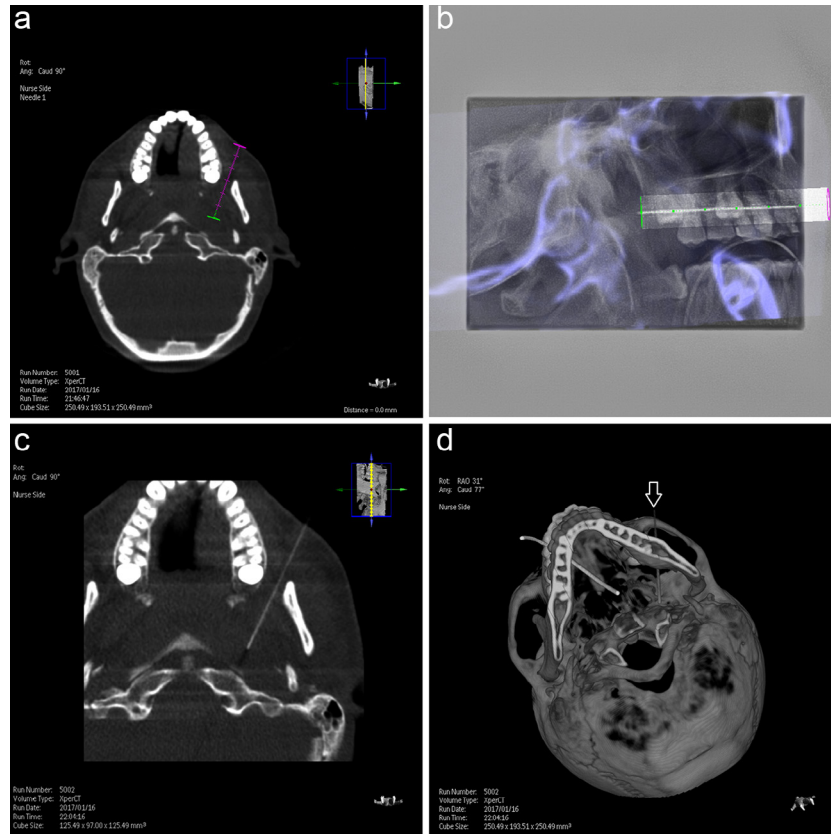
The patient remained clinically stable. However, MRA in the week following his diagnosis showed enlargement of the carotid space abscess, worsening and now severe left cervical carotid stenosis, and development of a mycotic pseudoaneurysm of the carotid artery (Fig. 1). No new cerebral infarcts were noted. Multiple subspecialty surgical services were consulted for operative decompression, but open drainage was believed to introduce unacceptable risk.

Interventional radiology was then consulted for image-guided drainage. Under general anesthesia, a cone beam computed tomography (CBCT) of the face and upper cervical spine was acquired and a transpterygoidal approach was identified. Under intermittent fluoroscopic guidance with CT navigational overlay (XperGuide navigation; Philips, Eindhoven, the Netherlands), a 20-gauge needle was advanced into the abscess cavity (Fig. 2). Three milliliters nonbloody purulent fluid was evacuated and sent for analysis.

The procedure was performed without complication, and the patient clinically improved in the following weeks. Transcranial Doppler demonstrated no ongoing embolic phenomena. Gram stain and culture revealed abundant polymorphonuclear leukocytes but no organisms. Cultures remain negative to date, attributable to ongoing antibiotic treatment and the fastidious nature of the organism. Serial MRA examinations at 2 days, 2 weeks, and 1 month post procedure demonstrated a resolving enhancement corresponding to the previous abscess cavity without a residual fluid component and improvement in the carotid stenosis and aneurysm. The patient was subsequently discharged on home intravenous antibiotics. MRA at 4 months showed thrombosis of the pseudoaneurysm and ongoing improvement in carotid narrowing (Fig. 3).

## Discussion

Abscesses infrequently complicate Lemierre's syndrome in children [1,2]. Suppurative deep neck space infections of all causes in children are generally uncommon, typically occurring in the retropharyngeal space and accompanying an upper respiratory tract infection [3]. The condition may become

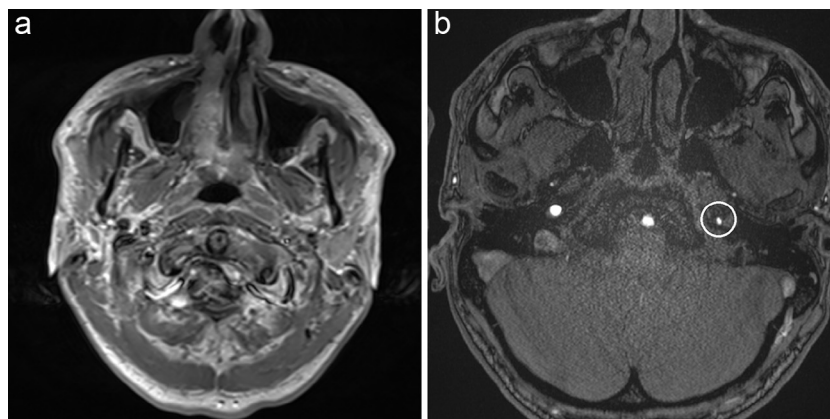


**Fig. 2 – Axial CBCT image (A) demonstrates the anticipated needle trajectory planning using XperGuide software. Orthogonal progress view image from intraprocedural fluoroscopy with navigational overlay using XperGuide software (B) demonstrates needle advancement with depth confirmation. Axial CBCT image (C) confirms needle position. Oblique inferior 3-dimensional surface rendering image (D) demonstrates the needle trajectory (arrow). CBCT, cone beam computed tomography.**

life-threatening due to sepsis or respiratory compromise, prompting a need for airway securement and surgical evacuation. Conservative treatment with supportive measures and intravenous antibiotics may be considered for stable patients. Image-guided aspiration provides both diagnostic and

therapeutic benefits, particularly when conservative methods have failed, and may avoid the need for surgery [3].

Although retromandibular approaches prevail in the literature, the abscess in the case presented was located in the medial aspect of the carotid space. This orientation placed the



**Fig. 3 – Axial postcontrast T1-weighted MR image 4 months post procedure (A) demonstrates no residual left carotid space abscess. Axial 3-dimensional time of flight MR angiogram image (B) demonstrates residual narrowing of the extracranial left internal carotid artery and interval resolution of the mycotic pseudoaneurysm (white circle). MR, magnetic resonance.**

internal carotid artery in the lateral approach trajectory and this, in addition to risk of the more superficial nontarget structures including external carotid artery branches, facial nerve, and parotid gland, was believed to introduce unacceptable morbidity. Poe et al described a CT-guided transpterygoidal (transfacial) alternative to the retromandibular approach when called for by individual anatomic considerations [4].

CBCT-guidance has proven effective for a wide range of pediatric and adult interventions [5–10], offering several advantages over traditional CT guidance including reduced radiation dose, improved procedural ergonomics, and image-fusion capabilities. The case presented represents the first published use of a CBCT-guided transpterygoidal approach. Because Poe et al's descriptions on the approach are sparse, it may be under-recognized and underutilized. Accordingly, risks of the approach are therefore not well established. A needle trajectory inferior to the course of the parotid duct minimizes risk to this structure and neurovascular structures traversing the pterygopalatine fossa.

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## Conclusion

CBCT guidance facilitates a wide range of percutaneous interventions including the nonoperative treatment of deep neck space abscesses. A transpterygoidal route should be considered when an individual's anatomy precludes retromandibular approaches.

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