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## Case Report

# CT and MRI presentation of nasopharyngeal tuberculosis (with a case report) ☆

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## ABSTRACT

Nasopharyngeal tuberculosis is a rare extrapulmonary tuberculosis caused by *Mycobacterium tuberculosis* invading the nasopharynx. Early clinical symptoms are atypical, making the condition easy to overlook and misdiagnosed. We retrospectively reviewed the case of a 37-year-old man who visited the clinic in March 2023, presenting with enlarged cervical lymph nodes persisting for over a year. Computed tomography and magnetic resonance imaging showed the nasopharynx wall was thickened, and cervical multiple enlarged lymph nodes were visible, presenting bead-like appearance. The enhanced scan revealed the lesion uneven enhancement. He was diagnosed with nasopharyngeal carcinoma with lymph node metastasis based on the images. However, the histopathological examination finally confirmed that the nasopharyngeal and neck mass were tuberculous granulomas. Nasopharyngeal tuberculosis is easily misdiagnosed and mistreated, and it is especially difficult to differentiate from nasopharyngeal carcinoma. When diagnosing and treating neck masses, clinicians should consider the possibility of nasopharyngeal tuberculosis in patients with chronic nasopharyngeal symptoms. Nasopharyngoscopy biopsy and histopathological examination have great value in the diagnosis of nasopharyngeal tuberculosis.

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## Introduction

The primary site for tuberculosis is typically the lungs, and the nasopharynx is the least frequent site of tuberculosis infection within the upper respiratory tract [1]. The incidence of tuberculosis in the nasopharynx has been reported inconsistently. For example, Chopra et al. [2] reported that pri-

mary nasopharyngeal tuberculosis, representing a mere 0.12% of tuberculosis, often eludes early detection due to its non-specific clinical symptoms and signs, coupled with the relatively concealed location of the nasopharyngeal site, which further complicates the identification of lesions in their initial stages. This situation can easily lead to misdiagnosis and underdiagnosis of this disease, consequently delaying treatment. In this paper, we present a case study of nasopharyngeal

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tuberculosis confirmed by pathology examination and supported by CT and MRI imaging. Additionally, we conduct a comprehensive review of the relevant literature to improve the understanding and diagnosis of this disease. This is clinically significant for ensuring precise diagnosis and selection of strategies for nasopharyngeal tuberculosis.

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## Case report

A 37-year-old man suffering from HIV noticed multiple swellings in his neck 1 year ago, which arose spontaneously. After self-administering cephalosporins, these swellings initially subsided slightly, but then gradually increased in size, so he went to the otorhinolaryngology department. The nasal endoscope showed that the nasal mucosa was swollen and congested; bilateral inferior turbinate hypertrophy, thickening and roughness of the mucosa in the nasopharynx, and the mucosal surface was not smooth. After the patient was admitted to the hospital, CT (including chest) and MRI examination were performed. MRI examination showed thickening of the peripheral wall of the nasopharynx, the left wall was more significant, and it appeared that a soft-tissue nodule had formed locally, measuring approximately  $1.1 \times 0.8$  cm. Imaging results showed that the signal exhibited an equal signal on T1-weighted imaging (T1WI) and a slightly higher signal on T2-weighted imaging (T2WI). The enhanced scan revealed the lesion uneven intensification, bilateral pharyngeal crypts, and pharyngopharyngeal orifices disappeared, and cervical multiple enlarged lymph nodes were visible, partially fused, presenting bead-like changes, with uneven signals within them, and marked uneven enhancement on the enhancement scan. The CT scan reveals that the nasopharyngeal wall is thickened, causing the bilateral pharyngeal recess to disappear. The enhanced scan demonstrates mildly uneven enhancement, and multiple enlarged lymph nodes are visible in the neck with notable uneven enhancement. Additionally, there was no evident bone resorption or destruction. Chest CT scan showed scattered cornified hyperdense shadows in both lungs. Under general anesthesia, the patient underwent nasal endoscopic mass biopsy. During the procedure, a reddish mass was observed in the right pharynx. Intraoperative cytopathology indicated chronic granulomatous inflammation, and molecular pathology testing suggested a positive result for tuberculosis DNA (TB-DNA +). Another ultrasound-guided cervical lymph node aspiration was performed under local anesthesia, and the pathology examination showed tuberculous granulomatosis, with molecular pathology suggestive of TB-DNA (+).

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## Overview

Nasopharyngeal tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis* and is characterized pathologically by tuberculous nodule formation and caseous necrosis. It can be classified into 2 categories: primary and secondary.

Primary nasopharyngeal tuberculosis is caused by *M tuberculosis* staying on the mucosa of the nasopharynx when it enters the respiratory tract with the air and develops due to the decrease in the body's resistance or specific localization characteristics of the infection. Secondary nasopharyngeal tuberculosis is mostly secondary to primary tuberculosis foci, such as pulmonary tuberculosis. *Mycobacterium tuberculosis* usually spreads to the nasopharynx by the blood or lymphatic route. After invading the nasopharynx, it can lead to enlargement of cervical lymph nodes via lymphatic spread. Nasopharyngeal tuberculosis is prone to being overlooked or misdiagnosed due to the nonspecificity nature of its clinical symptoms, signs, and pathology findings.

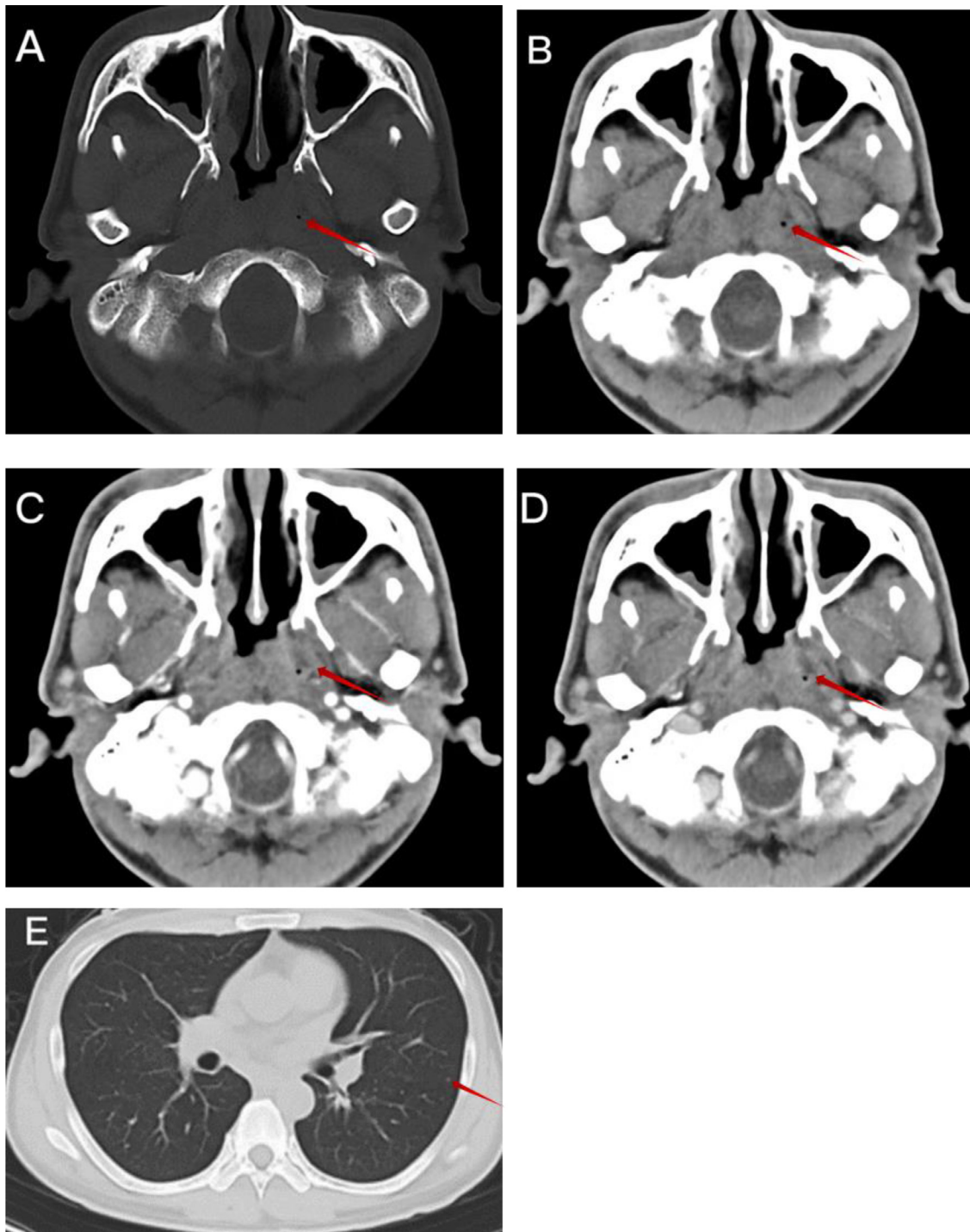
Nasopharyngeal tuberculosis has a relatively short course, and the most relevant clinical symptom is the presence of a neck mass, which accounts for approximately 82.5% of cases [3]. Nasopharyngeal tuberculosis with enlarged cervical lymph nodes is mostly located in the upper third of the anterior edge of the sternocleidomastoid muscle posterior to the angle of the mandible. The enlarged lymph nodes can be unilateral or bilateral, and the lymph nodes are often multiple, or can be fused into a mass, soft, and movable.

Nasopharyngeal tuberculosis is prevalent in the posterior wall of the nasopharyngeal parietal, on CT scan shows equal density or slight hyperdensity, on an MRI scan, shows an equal signal on T1WI and a slightly higher signal on T2WI. The surface can be smooth or rough, a few nasopharyngeal tuberculosis can also be accompanied by cystic lesions, accompanied by the involvement of the adjacent muscles but without bone destruction [4]. The diameter of most of the enlarged lymph nodes is less than 2 cm. Enhanced scan showed an irregular ring-enhancement, and the center part is not enhanced. The sign is different from the metastatic lymph node enlargement, most of the latter is a solid mass, which is homogeneous and mildly-moderate enhancement, and the larger ones can have centralized Necrosis. Nasopharyngoscopy may reveal polypoid masses, ulcers, plaques, or diffuse mucosal thickening in the nasopharynx [5]. CT and MRI scans are valuable in diagnosing head and neck tuberculosis. They can provide information regarding the site, distribution, and extent. MRI allows better detection of lesions and facilitates differentiation from other nasopharyngeal diseases. The treatment of nasopharyngeal tuberculosis adheres to the principles of tuberculosis treatment, primarily relying on the systemic combination of drugs. Generally, patients with nasopharyngeal tuberculosis have a favorable prognosis when treated with this approach.

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## Etiology

Nasopharyngeal tuberculosis is categorized into 2 types: primary and secondary. Primary nasopharyngeal tuberculosis occurs when *Mycobacterium tuberculosis* stays on the mucous membrane of the nasopharynx when it enters the respiratory tract with the air and develops due to the lowering of the body or local resistance. Secondary nasopharyngeal tuberculosis is secondary to a primary tuberculosis lesion (eg, pulmonary tuberculosis, etc). *Mycobacterium tuberculosis* is usually transmitted to the nasopharynx by the blood or lymphatic route.

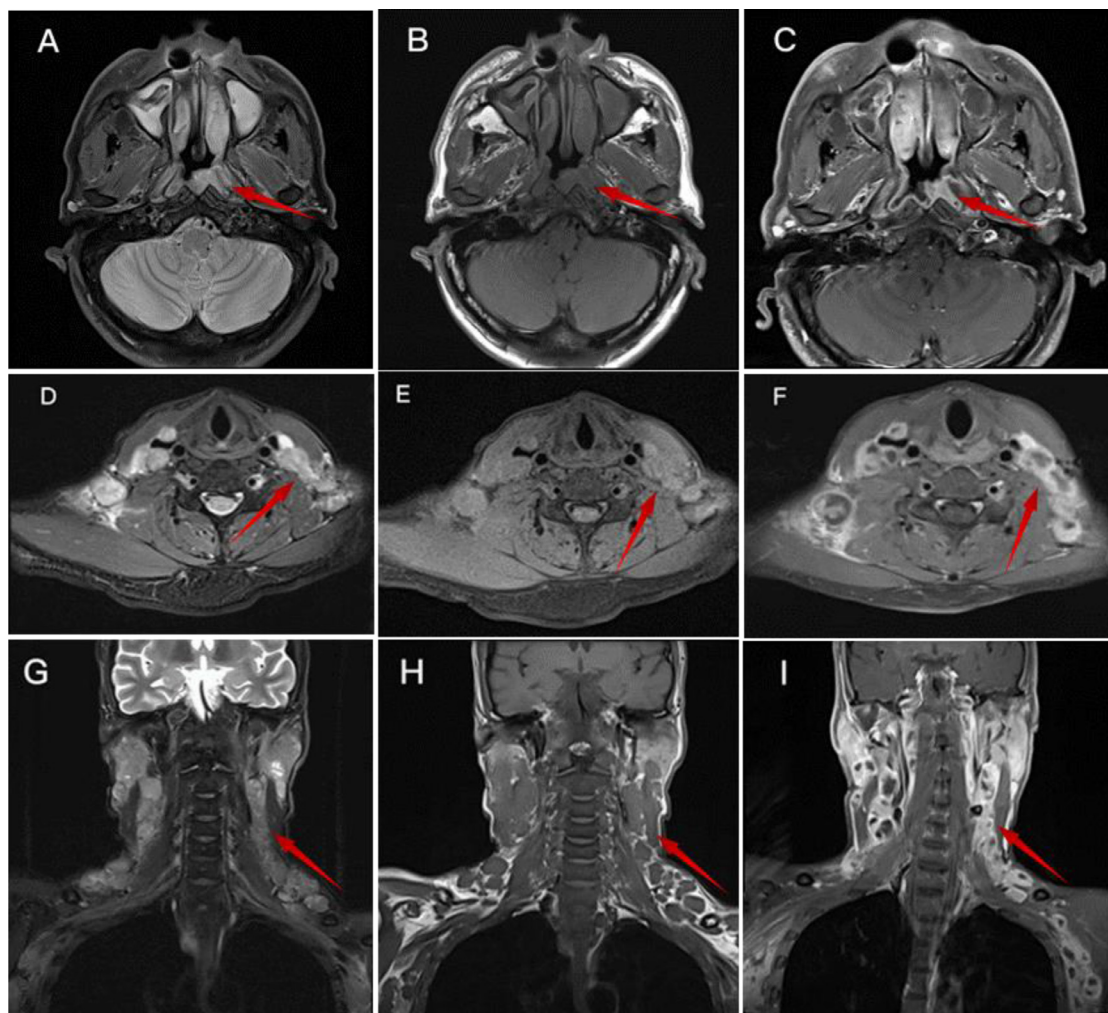


**Fig. 1** – Axial images of CT scan of nasopharynx with bone window (A) and mediastinal window on plain scan and enhancement (B–D). These images show thickening of the nasopharyngeal wall with soft tissue mass formation (red arrow), uneven enhancement on enhancement scan, and no destruction of the surrounding bone. Scattered cornified hyperdense shadows are seen on the chest CT scan (E).

### Clinical symptoms

Nasopharyngeal tuberculosis is a rare form of extrapulmonary tuberculosis caused by *M tuberculosis* invading the nasophar-

ynx. Patients often have symptoms such as enlarged cervical lymph nodes, nasal congestion, runny nose, blood in the mucus, stuffy ears, and hearing loss [6–9]. Besides, they may have sore throats and sleep snoring [10,11], and a few patients may have systemic symptoms such as low-grade fever,



**Fig. 2** – Proton density-weighted imaging (PDWI) shows that the nasopharyngeal lesion is hyperintensity (A); T1WI shows that the nasopharyngeal lesion is equisignal (B); T1WI enhancement shows that the lesion is significantly strengthened (C); T2WI shows that the multiple enlarged lymph nodes in the neck are visible and hyperintensity (D and G); T1WI shows that the multiple enlarged lymph nodes in the neck are equisignal (E and H); T1WI enhancement shows that the multiple enlarged lymph nodes in the neck are ring-enhanced with a bead-like appearance (F and I).

night sweats, and fatigue. Nasopharyngeal tuberculosis often presents without obvious signs and symptoms. Additionally, atypical manifestations such as diplopia and sleep apnea have been reported [12,13].

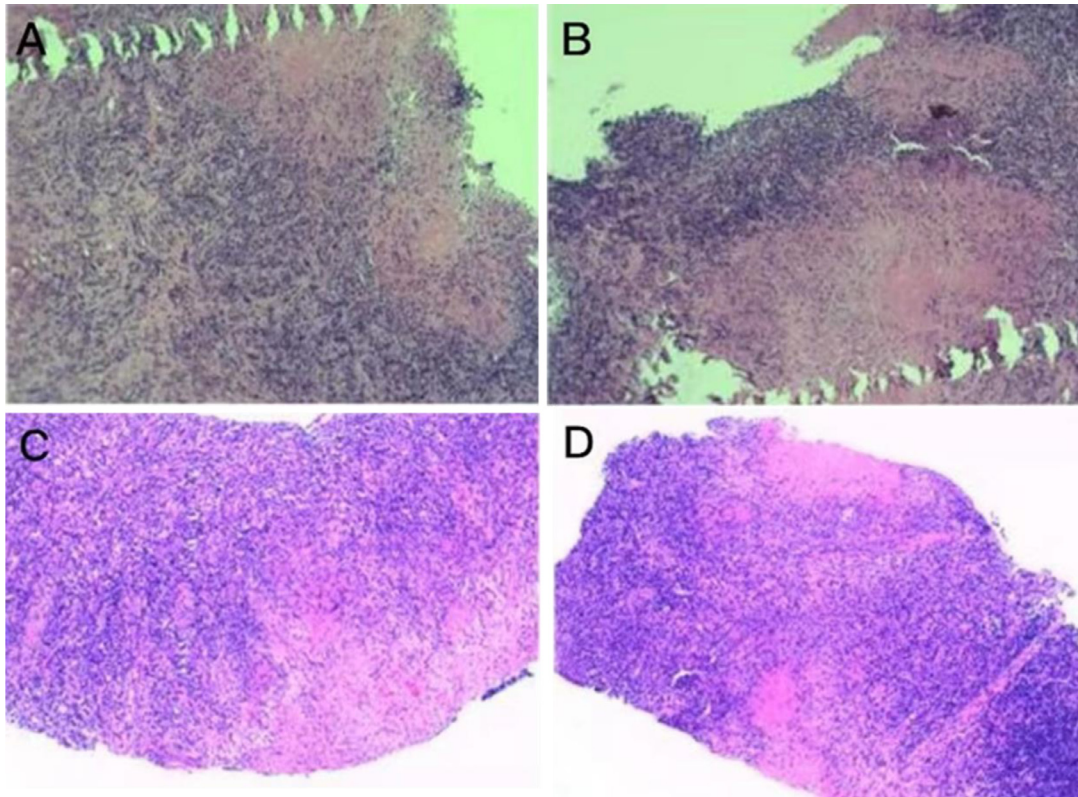
### CT and MRI findings of nasopharyngeal tuberculosis

The CT scan of nasopharyngeal tuberculosis typically shows a mass with equal or slightly high density. MRI imaging often reveals equal/slightly prolonged T1 and prolonged slightly longer T2 signals. The enhanced scan shows uneven enhancement, and there may be involvement of adjacent muscle involvement, but without bone destruction. Multiple enlarged

lymph nodes were seen in the neck, which display a bead-like appearance. These nodes show uneven internal signals and, upon enhancement scanning, demonstrate irregular marginal ring enhancement with a lack of enhancement in the center (Figs. 1 and 2).

### Pathology and diagnosis

Pathologic biopsy is the "gold standard" and the most useful method to confirm the diagnosis of nasopharyngeal tuberculosis. Histology is typically characterized by a granulomatous inflammatory reaction surrounded by a large number of epithelioid cells, Langerhans, and lymphocytes, with caseous necrosis in the center [14] (Fig. 3).



**Fig. 3 – Histopathological images (special stain, x10) Epithelioid cells, multinucleated giant cells, lymphocytes, and coagulative necrosis are seen in the mucosal tissue of the nasopharynx (A and B), coagulative necrosis, granulomatous structures formed by epithelioid cells and multinucleated giant cells are seen in the lymph node tissue (C and D).**

### Differential diagnosis

Nasopharyngeal tuberculosis is mainly distinguished from nasopharyngitis, nasopharyngeal carcinoma and nasopharyngeal lymphoma. (1) Nasopharyngitis: the predominant feature is diffuse symmetric thickening. On a CT scan, its density is equal or slightly higher than its surrounding muscle. In MRI imaging, it typically presents as a prolonged T1 and slightly prolonged T2 signal. The enhancement scan for nasopharyngitis usually shows mild enhancement. There is no invasion of parapharyngeal soft tissue and skull, and lymph node swelling in the neck is rare. (2) Nasopharyngeal carcinoma is the most common malignant tumor of the nasopharynx, predominantly occurring in the pharyngeal crypt and posterior wall of the nasopharyngeal parietal. The density of the CT scan is equal to or slightly higher than the density of its surrounding muscles. MRI typically reveals long T1 and slightly long T2 signals. The enhancement scans usually show significant enhancement. This condition is often associated with metastasis to the cervical lymph nodes. The lymph node involvement is predominantly in deep upper cervical lymph nodes, which tend to be hard and fixed in texture. In the advanced stage, bone destruction of the skull base and sinus invasion can be seen. (3) Nasopharyngeal lymphoma typically presents as thickening of the nasopharyngeal wall or as an irregular soft tissue mass. On CT scans, it commonly appears

as isodense. On MRI, it exhibits slightly longer or equal T1 and slightly longer T2 signals. It can spread to the nasal cavity or invade tonsils, oropharynx, and root of the tongue. The enhancement scan usually shows mild to moderate enhancement in nasopharyngeal lymphoma. Enlargement of cervical lymph nodes is common. The density and signal of enlarged lymph nodes are mostly uniform. The enhancement scan typically demonstrates uniform enhancement, with more pronounced enhancement. In cases where necrosis is present, ring-shaped enhancement is observed. Generally, there is no destruction of the skull base and adjacent bones.

### Conclusion

In conclusion, nasopharyngeal tuberculosis is rare, cervical lymph node enlargement was the most common manifestation. The imaging findings showed nasopharyngeal mass and diffuse thickening of mucosa, with equal or slightly high density on CT scan, and slightly long T1 and long T2 signals on MRI. The adjacent muscles may be involved, but there is no bone destruction. CT and MRI scans are valuable tools in the diagnosis of head and neck tuberculosis. They provide crucial information regarding the location, distribution, and extent of the disease. MRI, in particular, is more effective in detecting the lesions, aiding significantly in differ-

entiating tuberculosis from other nasopharyngeal diseases. Nasopharyngeal carcinoma was considered in the imaging of this case before diagnosis, which reduced the vigilance of nasopharyngeal tuberculosis. Therefore, the possibility of tuberculosis should be considered for nasopharyngeal lesions, tuberculosis-related examinations should be carried out when necessary. Histopathological examination is the "gold standard" for diagnosis of tuberculosis. The prognosis is good after regular antituberculosis treatment.

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### Ethics statement

The study involving human subjects was reviewed and approved by the Medical Research Ethics Committee of Hainan General Hospital in accordance with the Helsinki Declaration. In this retrospective study, this patient's written informed consent was obtained.

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### Patient consent

Patient's written informed consent was obtained.

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