Case Report

Imaging of Nasopharyngeal Carcinoma with Intracranial Extension

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Abstract

Nasopharyngeal carcinoma (NPC) is unique in its clinical behavior, epidemiology and histopathology from that of other squamous cell carcinomas of the head and neck. Most NPC originates in the lateral pharyngeal recess, also known as the fossa of Rosenmuller. Magnetic resonance imaging is the imaging modality of choice. However, computed tomography (CT) has a major role in the assessment of bony skull base involvement and for radiotherapy planning. Positron emission tomography-CT using 18F-FDG is used primarily for the detection of distant metastasis. An understanding of its patterns of spread is important to relay the relevant information to the referring clinician so that appropriate management may be made.

Keywords: Base of skull, Cavernous sinus, Intracranial, Multislice computed tomography, Nasopharyngeal cancer

INTRODUCTION

The clinical behavior, epidemiology, and histopathology of nasopharyngeal carcinoma (NPC) are unique and different from other squamous cell carcinomas of the head and neck. NPC is common in southern Chinese population. The male-to-female ratio is 3:1 and is commonly seen in 40-60 year age group.[1-5] NPC is caused by the interaction of environmental factors (e.g., exposure to chemical carcinogens), genetic susceptibility and infection with Epstein-Barr virus.[2-5]

Management of NPC patients, from diagnosis to treatment and follow-up, involves imaging. In a minority of patients (6%) with NPC, the disease is submucosal and cannot been seen on endoscopy.[6] Hence, cross-sectional imaging studies, such as magnetic resonance imaging (MRI) and computed tomography (CT), are required for diagnosis and accurate assessment of the tumor extent- including pharyngeal wall involvement and invasion into adjacent structures. MRI is currently the imaging modality of choice for NPC; however, CT has a major role in the assessment of skull base involvement for sclerotic and lytic lesions.[7,8] Positron emission tomography (PET)-CT using 18F-FDG is primarily used for the detection of distant metastasis and NPC recurrence.[9]

We report two case studies of NPC with skull base invasion and intracranial extension and the role of imaging in making a positive diagnosis and pre-treatment assessment of tumor extent.

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CASE REPORTS

Case 1

A 60-year-old male came with complains of headache and nasal block for 1 month. On examination, mass noted in right nasal cavity, middle meatus and nasopharynx that bleeds on touch. Contrast-enhanced computed tomography (CECT) for neck showed an ill-defined heterogeneously enhancing soft tissue lesion centered in the nasopharynx with anterior extension into the nasal cavity and posterior extension to involve the long us muscle (Figure 1a). The lesion is seen extending superiorly with destruction of the petrous apex, right medial pterygoid, greater wing of sphenoid and basisphenoid with invasion into the sphenoid sinus

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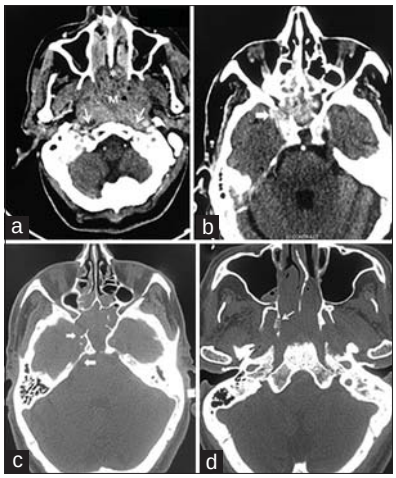

Figure 1: (a) Axial contrast-enhanced computed tomography image shows heterogenous nasopharyngeal mass lesion (m) with anterior extension into the nasal cavity (*) and posterior extension to the longus muscle (arrows). (b) Axial contrast-enhanced computed tomography image shows heterogenous mass with Superior extension and invasion of the sphenoid sinus (straight arrow). (c) Axial computed tomography window shows erosion of the basisphenoid and petrous apex of temporal bone (arrow) (d) Axial computed tomography window shows erosion of right medial pterygoid plate (arrow)

(Figures 1b-d). Bilateral heterogeneously enhancing retropharyngeal and cervical lymph nodes with central necrosis are seen. (Biopsy taken from the mass lesion showed a picture of squamous cell carcinoma and awaited follow-up)

Case 2

A 55-year-old male came with complaints of right ear discharge, hard of hearing and right-sided facial pain for 1 month. On examination, tender swelling seen in the right side of the neck.

CECT neck showed an ill-defined heterogeneously enhancing soft tissue mass lesion in the region of right fossa of Rosenmuller, extending laterally to involve the para-pharyngeal space (Figure 2). The mass extends superiorly, causing destruction of the petrous apex and basisphenoid (Figure 3). Note made of intracranial extra-dural tumor extension into the right cavernous sinus. The mass is seen to encase the right internal carotid artery with mass effect on the right temporal lobe (Figures 4 and 5). Multiple heterogeneously enhancing necrotic right retropharyngeal and bilateral cervical lymph nodes seen (Figure 6). Note also made of right middle ear effusion and mastoiditis with intact ossicular chain (Figure 3). Apical sections of the thorax show a spiculated mass lesion in the left side (Figure 7). Histopathology report of the right cervical lymph node showed a picture of metastatic undifferentiated NPC.

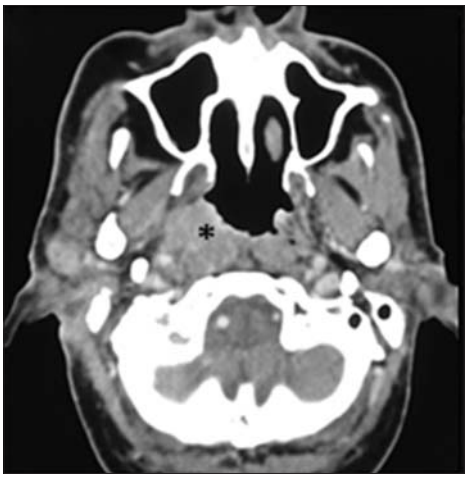

Figure 2: Axial contrast-enhanced computed tomography image shows a heterogeneously enhancing mass filling the right fossa of rosenmuller (*) with parapharyngeal involvement on the right side

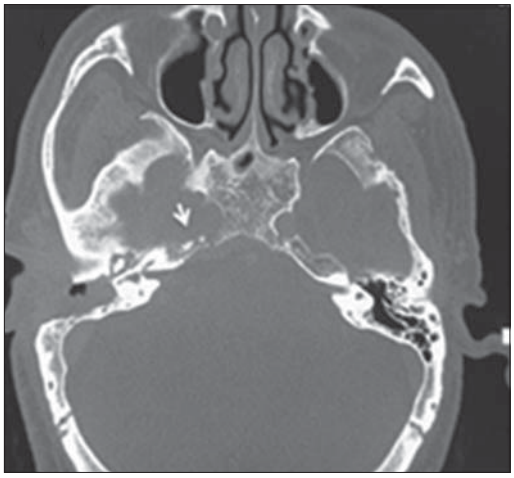

Figure 3: Axial computed tomography bone window shows erosion of the basisphenoid and petrous apex of temporal bone (arrow)

DISCUSSION

Most NPCs originate in the lateral pharyngeal recess, also known as the fossa of Rosenmuller. They tend to spread sub-mucosally with early infiltration into deeper neck spaces. The mass shows a preference for superior spread to the skull base, rather than inferior spread to the oropharynx.[10]

Patients present with clinical symptoms, such as pain, trismus, otitis media due to eustachian tube dysfunction, hearing loss, nasal block and nasal regurgitation due to paresis of the soft palate. The nasopharynx is a relatively clinically silent area, and the most common presentation may be with cervical nodal or distant metastasis.[1-5] Depending

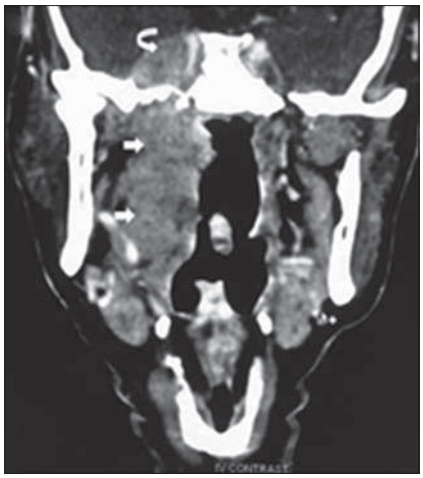

Figure 4: Coronal contrast-enhanced computed tomography image shows heterogenous mass (straight arrows) with skull base invasion and extension into right cavernous sinus (curved arrow). Note encasement of internal carotid artery

Figure 5: Axial contrast-enhanced computed tomography image shows cephalad extension of the mass lesion with skull base invasion and extension into middle cranial foss (straight arrow)

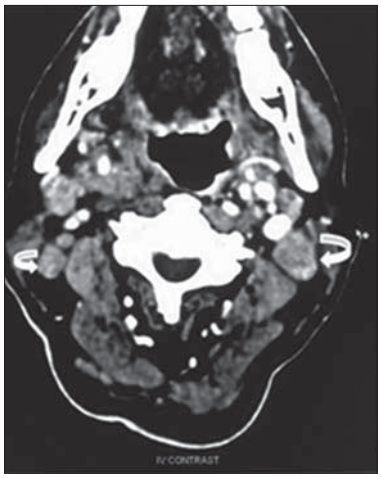

Figure 6: Axial computed tomography image shows bilateral enlarged level II lymph nodes (curved arrows)

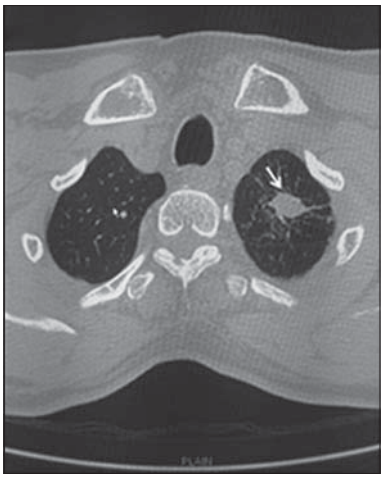

Figure 7: Axial computed tomography image-lung window, at the level of the lung apices shows a spiculated lesion on the left side (arrow)

on the degree of local infiltration, patients may also suffer from cranial nerve dysfunction and headache. Distant metastatic spread may result in organ dysfunction or bone pain. Tumor confined to the nasopharynx is only found in one-fifth of patients.[1] Invasion of the para-pharyngeal space carries an increased risk of distant metastases and tumor recurrence. It can lead to compression of the eustachian tube with middle ear and mastoid effusion.[11]

The anatomical location of the nasopharynx and early invasiveness of NPC, facilitates the adjacent skull base erosion and intracranial extension, thus making locally advanced disease a common clinical presentation at diagnosis. This means that the base of the skull is involved in 25-35% of the cases, with intracranial invasion occurring in 3-12% of the cases.[12] The pterygoid bones, clivus, body of the sphenoid and petrous temporal bones are most commonly invaded. CT reveals erosive or permeative bone changes of the skull base and spread along foraminal pathways. There is involvement of the paranasal sinus as a result of direct extension. Up to 25% of patients have tumor extension superiorly into the floor of the sphenoid sinus, and further into the sphenoid sinus cavity.[8,13]

Unchecked, NPC can extend superiorly into the cavernous sinus with extra dural involvement while direct invasion of the brain is rare at diagnosis.[1]

Features denoting intracranial extension include meningeal involvement (especially if seen as nodular enhancing masses), masses within the middle or posterior cranial fossa and peritumoral spread. Carotid artery encasement is defined as tumor tissue surrounding >270° of the vessel circumference. In these cases, the patient is deemed inoperable as the surgeon cannot remove all the tumor

tissue. Other potential issues that may result from the encasement include vessel invasion and potential carotid artery blow-outs post-radiotherapy.

Imaging studies suggest that nodal spread is seen in 60-90% of cases, in an orderly fashion beginning with the retropharyngeal nodes, and then to levels II, III and IV and are found to have a tendency for bilateral spread. Necrosis, if identified is considered 100% specific if present, can only be reliably identified in tumor foci larger than 3 mm. In CT images, necrosis is seen as a focal cental area of hypoattenuation with or without peripheral rim enhancement.

Extranodal spread carries a grave prognostic significance, in which there is an extension beyond the capsule into the adjacent soft tissues. It is recognized radiologically as loss or irregularity of the nodal margins, with or without adjacent fat stranding.

Among head and neck malignancies, NPC has the highest incidence of distant metastasis, with a rate of 11% at diagnosis.[14,15] The most common sites are skeletal(20%), thoracic (mediastinal lymph nodes and pulmonary deposits) (13%), hepatic (9%), and distant lymph nodes. PET-CT is sensitive to detect soft-tissue and bony metastatic deposits.[9]

CONCLUSION

Understanding of the unique clinical behavior of NPC, together with its pattern of spread, is important while imaging NPC. NPC most commonly arises in the lateral pharyngeal recess and has a tendency to invade widely and metastasize. Cervical lymphadenopathy is very common at presentation. Diagnosis and effective treatment of NPC requires an accurate mapping of tumor extent with imaging. MRI is the best tool for assessing tumor extent, while high-resolution CT has a definitive role in places where MR equipment is not readily available. CECT can accurately assess the extent of the tumor especially extension to the para-pharyngeal space, cortical bone erosion, and intracranial extension. PET/CT is the modality of choice for accurate assessment of distant metastases and recurrence.

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