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Previously-treated nasopharyngeal carcinoma with cystic lesions in the temporal lobe

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ABSTRACT

Nasopharyngeal carcinoma is a common malignancy in the Asian Chinese population. First-line treatment consists primarily of radiotherapy and chemotherapy, with salvage surgery if recurrence occurs. Patients with this tumours frequently present years after radiotherapy with symptomatic temporal lobe cystic lesions and a diagnostic problem arises. The possible differential diagnoses include radionecrosis, pyogenic abscesses or tumour recurrence. A series of three cases of cystic temporal lobe lesions, with emphasis on their clinical, radiological and histopathological diagnostic aspects, are presented. The three cases presented consist of radiation necrosis, pyogenic abscess, and a case with both infection with tumour recurrence. The methodology of both clinical and radiological diagnosis are presented.

Keywords: brain abscess, nasopharyngeal carcinoma, radiation necrosis, temporal lobe cyst

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INTRODUCTION

Nasopharyngeal carcinoma (NPC) is a common malignancy in the Chinese population, with treatment consisting primarily of radiotherapy, chemotherapy, with surgery for recurrence. NPC patients are commonly seen years later with symptomatic temporal lobe cysts which often present a diagnostic and treatment difficulty. We describe a series of patients with emphasis on the diagnostic aspects.

CASE ONE

A 36-year-old Chinese man had NPC that was treated with radiotherapy in January 1997. He developed a recurrence and was treated again with radiotherapy in July 1998. In April 2001, he presented with seizures. There was no fever/meningism and he was clinically not septic. Neurological examination was normal except for a left XII cranial nerve palsy. Magnetic resonance (MR) imaging showed a large right temporal lobe cystic lesion with surrounding vasogenic oedema (Fig. 1). MR diffusion- weighted imaging (DWI) showed bilateral temporal lobe hypointense signals that were suggestive of radiation necrosis (Fig. 2). He was diagnosed with temporal lobe necrosis and managed conservatively. He has been asymptomatic since then, with no evidence of tumour recurrence.

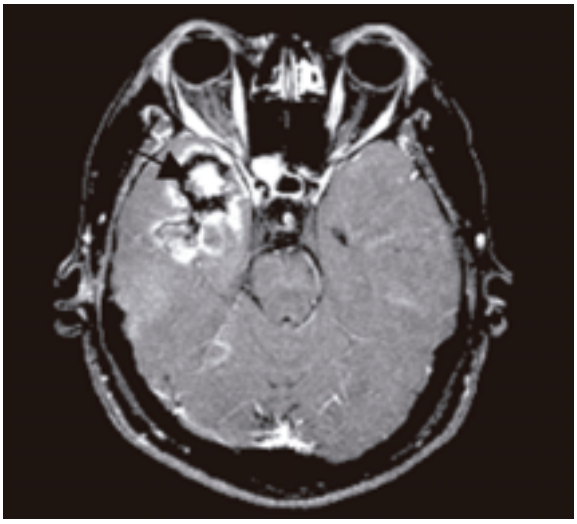

Fig. 1a Enhanced axial T1-w MR image shows a enhancing right temporal lobe cyst (arrow).

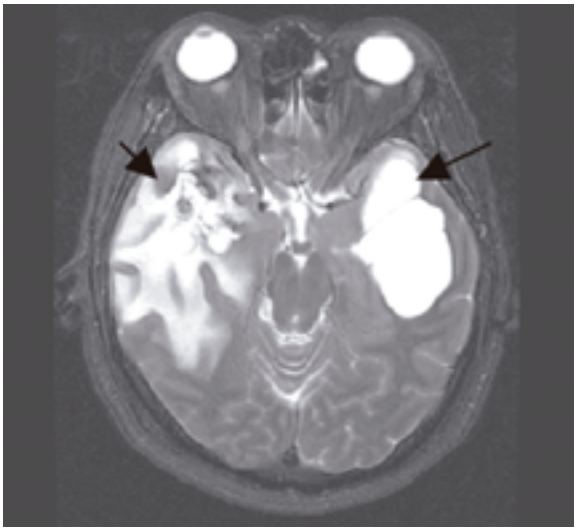

Fig. 1b Axial T2-w MR image shows bilateral temporal lobe hyperintensity due to vasogenic oedema (arrows).

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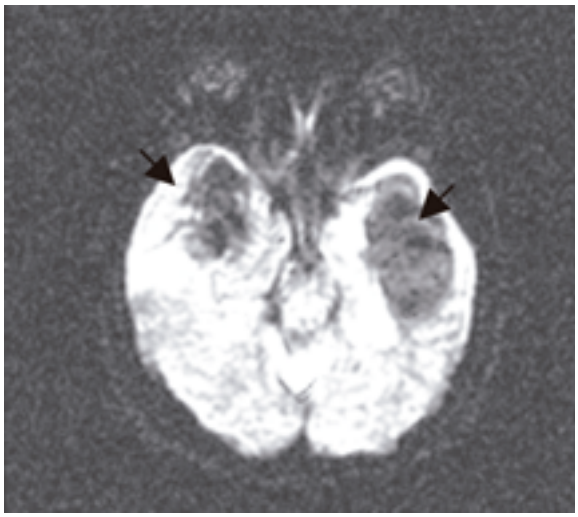

Fig. 2 MR DWI shows bilateral hypointense signals in the temporal lobe (arrows), suggestive of temporal lobe radiation necrosis.

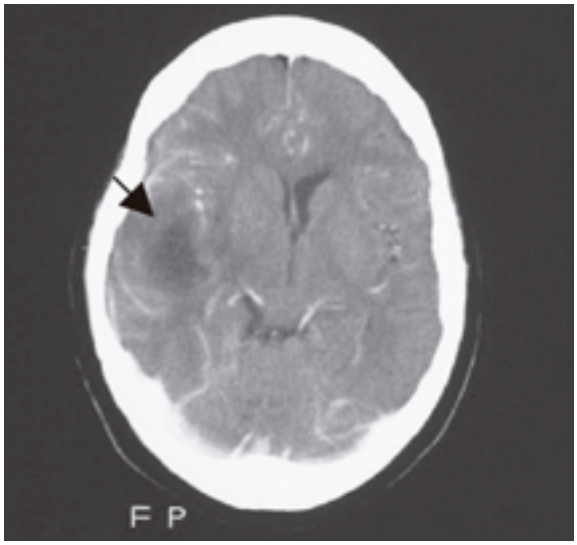

Fig. 3 Enhanced axial CT image of the brain shows a large right temporal lobe rim-enhancing abscess (arrow) with mass effect.

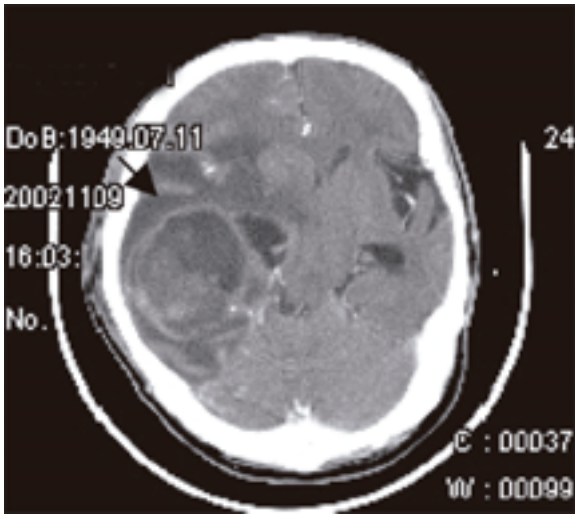

Fig.4 Enhanced axial CT image shows a large multiloculated rim- enhancing right temporal lobe cyst (arrow) with adjacent mass effect.

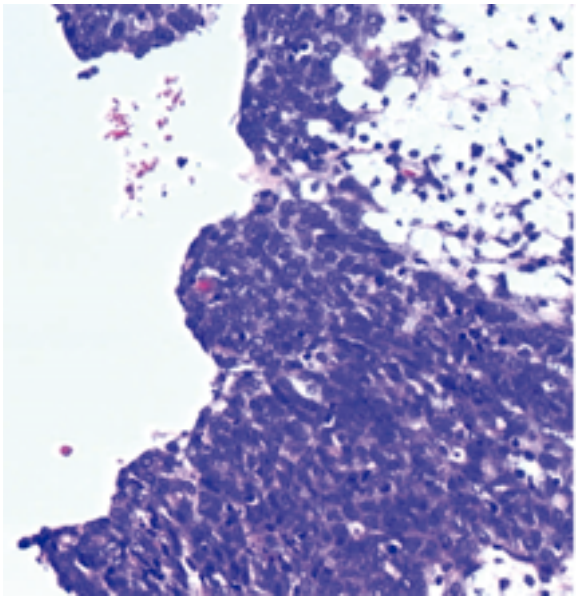

Fig. 5a Photomicrograph shows poorly- differentiated NPC cells invading into brain parenchyma. (Haematoxylin & eosin, x 40)

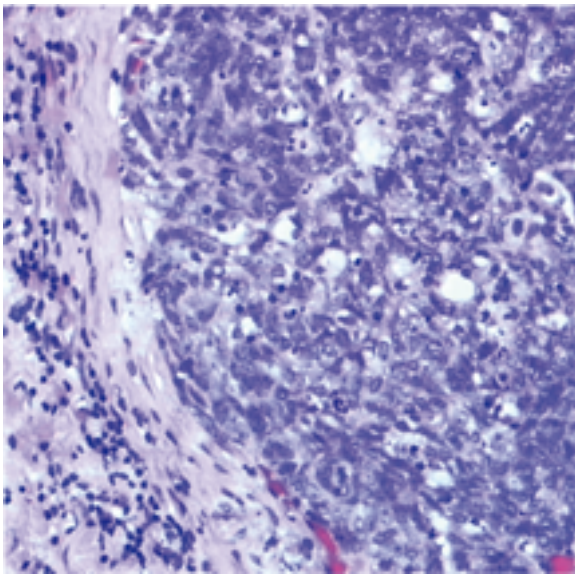

Fig. 5b Photomicrograph shows tumour cells invading into the dura. (Haematoxylin & eosin, x 40)

CASE TWO

A 67-year-old Chinese woman presented with fever, drowsiness and left limb weakness. She had NPC five years ago which was treated with radiotherapy. On physical examination, she was pyrexial at 38 degrees and had a mild left limb hemiparesis (Grade 4/5). Full blood count showed an elevated total white cell count of $16x10^9$ (Normal range, $4\text{-}10x10^9$) with increased percentage of neutrophils (85%). Computed tomography (CT) of the brain showed a large right temporal lobe ring- enhancing lesion. Thie lesion measured 5.5x3.8cm, and had a mass effect (Fig. 3). A diagnosis of right temporal lobe abscess was made. She underwent a craniotomy and

drainage of the abscess. Intra-operative findings were of a large temporal lobe abscess with frank pus. Cultures subsequently grew Klebsiella bacteria. Multiple biopsy specimens were taken of the abscess wall and adjacent dura, but no evidence of tumour recurrence was detected. She was subsequently treated with a three month course of intravenous antibiotics, and recovered well.

CASE THREE

A 53-year-old Chinese man presented with a right ear purulent discharge. He had NPC three years ago which was treated with radiotherapy. There was no fever. On physical examination, he was apyrexial, and the power in all four limbs was full. Full blood count showed a mildly- elevated total white count at $10.6x10^9$ (Normal range, $4\text{-}10x10^9$), but the differential count of neutrophils was elevated at 90.8%. The erythrocyte sedimentation rate was elevated at 87mm/hr (Normal range, 1-10mm/hr). These investigations both suggested infection. CT of the brain showed a right temporal lobe multiloculated, rim- enhancing lesion with mass effect and oedema (Fig. 4). A diagnosis of right temporal lobe brain abscess was made.

He underwent a craniotomy and drainage of the abscess. Intra-operatively, an abscess with frank pus was seen. However, tumour recurrence was also found involving the dura of the temporal fossa which was abnormally thickened and firm. Subsequent histological examination confirmed NPC recurrence. There was evidence of NPC invasion into the dura and brain parenchyma (Fig. 5). Cultures from the abscess grew *Streptococcus millieri*. He completed three months of intravenous antibiotics and was given a follow-up course of radiotherapy, with good recovery.

DISCUSSION

In the Chinese population, the incidence of NPC is high at 30 per 100,000. This is in contrast to the incidence in Europeans which is only 1 per 100,000[1]. Radiotherapy has an important role in the treatment of NPC, both as the initial treatment modality and also for subsequent recurrence. This has improved survival, but more incidents of cerebral radiation damage are being recognised. Damage to the cerebrum is classified into acute, subacute and late delayed, according to the time of occurrence. Late radiation effects occur from six months to many years after treatment. The peak period is between one to three years post- treatment[2]. There is usually a clinically silent interval between treatment and development of radionecrosis.

Clinical presentation includes progressive focal neurological deficits, e.g. hemiparesis. The histopathology of radiation necrosis consists of coagulative necrosis of white matter and deeper areas of cortex. Vascular degenerative changes implicated in the pathogenesis of radiation necrosis include thickening, proliferation and telangectasia formation[3]. Demyelination of neurons has also been implicated in the pathogenesis of radiation necrosis, which occurs after radiation- induced death of oligodendrocytes[4]. Lastly, the autoimmune pathogenesis postulates that radiation- induced antigenic substances that are produced stimulate the accumulation of inflammatory cells[5].

Temporal lobe cystic lesions cause generalised raised intracranial pressure or focal mass effect. Headache, nausea, vomiting, and papilloedema commonly occur in patients with abscesses, tumour recurrence and radiation necrosis[6]. Features favouring an infective pathology are fever, neck stiffness and signs of clinical sepsis. In Case one, there was no evidence of sepsis and there were bilateral temporal lobe lesions on imaging, suggestive of temporal lobe necrosis. However, close clinical follow-up of the patient is needed as tumour recurrence cannot be completely excluded.

In Case two, the patient presented with the classical symptoms of a brain abscess, including fever, drowsiness and focal limb weakness. Patients with abscesses may deteriorate acutely due to intra-ventricular rupture, or haemorrhage into the abscess cavity[7]. Knowing the duration of symptoms is helpful as abscesses usually present over one to two weeks[8]. Radiation necrosis and tumour recurrence present over a longer duration, usually over several weeks. Focal neurological features such as limb hemiparesis and visual field defects may also occur, and may not help in distinguishing among the various aetiologies.

The imaging of temporal lobe lesions has advanced rapidly. On CT of the brain, radionecrosis has varying appearances. It usually appears as low density, non-enhancing regions. However, it may also enhance, with surrounding vasogenic oedema and mass effect. The temporal lobe changes may appear as a focal cystic lesion or a more diffuse area of involvement[9]. These changes are not specific for radiation necrosis only. One important distinguishing radiological finding is that radionecrosis commonly presents with bilateral temporal lobe changes. In the second patient, her CT showed a unilateral ring- enhancing lesion with a central hypointense area that was suggestive of an abscess which, coupled with the clinical presentation, made the diagnosis of a cerebral abscess likely.

MR imaging provides better diagnostic imaging quality. Radiation damage to the brain parenchyma results in an increase in tissue water content, producing

prolonged T1 and T2 relaxation times. On the T2-weighted images, increased signal intensity is seen compared to white matter. On the T1-weighted images, decreased signal intensity is seen compared to normal white matter. A diffusion- weighted sequence aids in distinguishing the different types of pathology. A hyperintense DWI signal with a diminished apparent diffusion coefficient (ADC) points more to a temporal lobe abscess rather than necrotic brain tissue[10]. Radiation necrosis or tumour are likely to be present if there is a hypointense signal on DWI. Newer imaging modalities including positron emission tomography (PET) and single photon emission computed tomography (SPECT) may also assist in diagnosis. However, these modalities may not be available widely.

Medical therapy of radionecrosis consists of corticosteroids which produce improvement of clinical and radiological abnormalities. Lee et al[11] have found that dexamethasone treatment over five months produces clinical and radiological improvement in up to 34% of patients. Surgical resection becomes necessary in patients with significant signs of raised intracranial pressure or progressive neurological deficits despite steroid treatment. Surgical results are good if the lesion is focal in the temporal lobe[12]. Other forms of treatment, including hyperbaric oxygen and warfarin anticoagulation, produce varying degrees of success[13,14].

In conclusion, temporal lobe cystic lesions are fairly common in patients with NPC. The diagnosis of radiation necrosis versus tumour recurrence may be difficult. Clinical features may distinguish between the different causes, and radiological features using MR imaging and diffusion- weighted sequences are helpful. Occasionally, the various aetiologies may co-exist with one another. Ultimately, however, histological diagnosis via a biopsy may become necessary to guide the appropriate treatment strategy.

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