Comparison of MRI, CT and $^{18}$F-FDG-PET/CT for the detection of intracranial disease extension in nasopharyngeal carcinoma

TC Lim$^{1,4}$, ML Chua$^2$, GS Chia$^5$, DC Ng$^6$, SC Ong$^6$, JT Wee$^{2,3}$, JB Khoo$^1$

Abstract

Introduction

It is essential to determine local tumour extent in patients with nasopharyngeal carcinoma as it affects prognosis and accuracy of primary target delineation during radiotherapy treatment planning. This study aims to evaluate the efficacy of three imaging modalities (magnetic resonance imaging, computed tomography and fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography integrated with computed tomography) in detecting intracranial extension of nasopharyngeal carcinoma.

Materials and methods

The study population comprised 78 patients with histologically proven nasopharyngeal carcinoma. Cancer staging was performed with magnetic resonance imaging of the neck, fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography integrated with computed tomography of the whole body and contrast-enhanced computed tomography of the neck, thorax, abdomen and pelvis.

Results

Magnetic resonance imaging detected intracranial extension of disease in 14 of 78 patients (detection rate of 17.9%). Computed tomography identified 5 of 78 patients (detection rate of 6.4%) while fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography integrated with computed tomography identified 6 of 78 patients (detection rate of 7.7%). When magnetic resonance imaging was used as the reference imaging modality, the sensitivity and specificity of computed tomography were 35.7% and 100% while the sensitivity and specificity of fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography integrated with computed tomography were 42.9% and 100%.

Conclusion

Magnetic resonance imaging remains the modality of choice for detecting intracranial disease extension in nasopharyngeal carcinoma.

Introduction

Nasopharyngeal carcinoma (NPC) is common in patients of southern Chinese descent. The five-year survival rate for patients with NPC is significantly affected by the stage of disease at the point of diagnosis, ranging from 60.6% to 34.1% for stage 1 and stage 4 disease, respectively. In addition to nodal and distant metastases, the extent of local tumour also affects the clinical staging of NPC. The anatomical location of the nasopharynx facilitates the extension of local disease to the adjacent skull base and cranium, thus making locally advanced disease a common clinical presentation at diagnosis. Based on the American Joint Committee on Cancer (AJCC) classification guidelines for nasopharyngeal tumours, the presence of intracranial extension of disease denotes a locally advanced T4 tumour. There is evidence linking primary tumour extent to treatment failure, and accurate evaluation of local disease involvement is paramount in ensuring treatment success. In NPC, primary tumour extent can be evaluated using various imaging modalities such as computed tomography (CT), magnetic resonance imaging (MRI) and fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography integrated with computed tomography ($^{18}$F-FDG-PET/CT), with MRI being the current modality of choice. $^{18}$F-FDG-PET/CT has been found to be superior to chest radiograph, abdominal ultrasound, skeletal scintigraphy and CT in detecting distant metastasis. However, for the assessment of primary tumour in NPC, a comparative study to evaluate MRI, CT and $^{18}$F-FDG-PET/CT is yet to be reported. In this study, we aim to compare these three imaging modalities (MRI, CT and $^{18}$F-FDG-PET/CT) with regard to detection of intracranial extension of NPC at diagnosis.

Materials and methods

Patient selection

Seventy-eight consecutive patients with NPC seen over a nine-month period were recruited to the study. Approval was granted by the institutional review board, and informed consent was obtained from all patients. The diagnosis of nasopharyngeal carcinoma (NPC) seen over a nine-month period were recruited to the study. Approval was granted by the institutional review board, and informed consent was obtained from all patients. The diagnosis of nasopharyngeal carcinoma (NPC) was confirmed histologically.
Materials and methods (Cont.)

NPC was histologically proven in all patients. All patients underwent CT, MRI and $^{18}$F-FDG-PET/CT for the evaluation of local tumour extent as part of the initial staging work-up.

**Computed Tomography**

CT scan of the skull base, neck, thorax, abdomen and pelvis was performed after intravenous administration of 100 mL iohexol (Omnipaque 300; GE Healthcare, Shanghai, China), using a single-slice CT scanner that is part of the Siemens Biograph PET/CT scanner (Siemens, Erlangen, Bavaria, Germany). Section thickness for the axial images was 5 mm.

**Magnetic Resonance Imaging**

MRI scan of the skull base and neck was performed with a 1.5 Tesla scanner (GE Signa Echospeed; GE Medical Systems, Milwaukee, USA), as per institutional protocol. Axial T2-weighted fast spin echo sequence (TR/TE: 5800/80 ms), axial T1-weighted fat spin echo sequence (TR/TE: 920/9 ms) and coronal T2-weighted fast spin echo sequence with frequency selected fat suppression were acquired. Contrast-enhanced fat-suppressed T1-weighted spin echo sequences in axial and coronal planes were also acquired following intravenous administration of gadopentetate dimeglumine (Magnavist; Schering Diagnostics AG, Berlin, Germany) at 0.1 mmol/kg of body weight. The section thickness for axial and coronal images was 5 mm with a slice interval of 6.2 mm. The imaging matrix was 256 × 256 in all the imaging planes, as well as in all the sequences.

**Fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography integrated with computed tomography**

Whole-body positron emission tomography (PET) was performed with a dedicated PET/CT scanner. All patients fasted for at least 6 h prior to intravenous injection of 370 MBq ± 10% $^{18}$F-FDG. The prerequisite serum glucose level was less than 120 mg/dL prior to injection. Scanning was performed at 3 min per bed position after an interval of at least 60 min following the injection.

**Image interpretation**

For MRI of the neck and CT of the neck, thorax, abdomen and pelvis, a designated radiologist with more than 10 years of experience in head and neck imaging was exclusively assigned to each modality for interpretation and stratification of the findings.

For $^{18}$F-FDG-PET/CT, a designated nuclear medicine physician with more than 10 years of experience in nuclear medicine was assigned exclusively to interpret and stratify the findings. Visual analysis was based on detecting areas of increased tracer uptake and anatomical localization of $^{18}$F-FDG-avid lesions on integrated PET/CT images. CT images were also separately interpreted without integrating the $^{18}$F-FDG uptake pattern to sieve out additional abnormality. All physicians involved in radiological assessments were blinded to findings of the patients’ initial endoscopic assessment.

The outcome of interpretation for each modality was stratified into either ‘positive’ or ‘negative’ for intracranial spread of NPC. MRI was chosen as the reference method, and CT and $^{18}$F-FDG-PET/CT findings were compared against the MRI findings.

**Determination of intracranial spread**

As it is unfeasible to confirm the presence of intracranial extension of disease through histology in NPC patients, we applied the following criteria for disease confirmation: (1) unequivocal extension of intracranial tumour extension based on imaging findings and (2) equivocal evidence of intracranial spread of NPC in the imaging studies, with a concordant clinical course six months from diagnosis. Intracranial tumour extension was defined as either dural thickening or enhancement that is contiguous with the primary nasopharyngeal mass or a mass in the cavernous sinus (see Figures 1–4).

**Figure 1:** Patient with dural thickening and enhancement detected by MRI (a and b; red arrow) indicative of intracranial extension of NPC. However, these findings were not observed in $^{18}$F-FDG-PET/CT (c and d) and CT (e).

**Figure 2:** Patient with intracranial extension of NPC seen in MRI (a), CT (b) and $^{18}$F-FDG-PET/CT (c and d).

**Figure 3:** Patient with dural thickening and enhancement detected by MRI (a and b) and CT (e) but not seen in $^{18}$F-FDG-PET/CT (c and d).
Materials and methods (Cont.)

Figure 4: Patient with dural thickening and enhancement detected by MRI (a and b) and 18F-FDG-PET/CT (c and d), but not seen in CT (e).

Patient management

The patients with early-stage disease (T1-2N0-1) underwent radical radiotherapy (RT) alone. Patients with intracranial extension of disease were considered to have locally advanced disease and underwent concurrent chemoradiotherapy, with subsequent three cycles of adjuvant chemotherapy. The chemotherapy drug used in the concurrent setting was cisplatinum, given at 100 mg/m² on days 1, 22 and 43. Cisplatinum (80 mg/m²) was given in combination with 5-fluorouracil (1000 mg/m²) in the adjuvant setting for four continuous days in divided doses, once monthly, and initiated a month upon completion of radical treatment. Radical RT was given using either 3-dimensional conformal radiotherapy (3-D-CRT) or intensity-modulated radiotherapy (IMRT). RT was prescribed at 69.96–70 Gy in 33–35 fractions over 6–7 weeks for gross disease with a margin and 50–60 Gy in 30–33 fractions over 6–7 weeks for high-risk sub-clinical disease. Patients with distant metastasis at the time of diagnosis were started on palliative chemotherapy. Local RT was delivered only for patients with complete and near-complete response to chemotherapy. Palliative RT was given to symptomatic areas with disease involvement upon progression following chemotherapy.

Statistical analysis

Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated for each modality. The detection rate of intracranial spread of NPC generated for each staging modality was compared, and the Z-test was used to decide if differences between these detection rates were significant.

Results

Patient characteristics

Seventy-eight patients, newly diagnosed with NPC, were enrolled on the study from August 2005 to May 2006. The median age was 50 years (ranging from 19 to 78 years). Sixty-nine (88.5%) of these patients had World Health Organization (WHO) type III histology, while 9 (11.5%) patients had WHO type II histology. The median time of follow-up was nine months (ranging from 6 to 22 months). The patient characteristics are provided in Table 1.

Intracranial extension of NPC

Of the 78 patients in the study population, 14 (17.9%) had intracranial extension of NPC, detected by at least one of the three modalities.

MRI detected intracranial disease in 14 patients (detection rate of 17.9%) and excluded intracranial disease in the remaining 64 patients of the study population. CT identified 5 patients (detection rate of 6.4%) ‘positive’ for intracranial disease and excluded intracranial disease in the remaining 73 patients. Nine of 14 patients detected by MRI to have intracranial extension of disease were not identified by CT.

18F-FDG-PET/CT identified 6 patients (detection rate of 7.7%) ‘positive’ for intracranial disease and excluded intracranial disease in the remaining 72 patients. 18F-FDG-PET/CT failed to pick up 8 of 14 patients detected by MRI to have intracranial extension of disease. Table 2 summarizes the detection rates for the three modalities and the statistical significance of their differences.

Seven patients (9.0%) had intracranial spread of NPC detected by MRI while the corresponding CT and 18F-FDG-PET/CT yielded no significant intracranial disease (Figure 1). Four (5.1%) of 78 patients had intracranial disease detected by all the three modalities (Figure 2). One (1.3%) patient had intracranial spread of NPC diagnosed by MRI and CT, with ‘negative’ 18F-FDG-PET/CT findings (Figure 3). Two patients (2.6%) had intracranial disease diagnosed by MRI and 18F-FDG-PET/CT, with ‘negative’ CT findings (Figure 4). There was no patient in whom intracranial disease was detected by CT and 18F-FDG-PET/CT, but not by MRI. These results are summarized in Figure 5.

Table 1

<table>
<thead>
<tr>
<th>Clinical characteristics of study population</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>78</td>
<td>100</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>60</td>
<td>76.9</td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>23.1</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35</td>
<td>6</td>
<td>7.7</td>
</tr>
<tr>
<td>35–49</td>
<td>31</td>
<td>39.7</td>
</tr>
<tr>
<td>50–64</td>
<td>31</td>
<td>39.7</td>
</tr>
<tr>
<td>65 and above</td>
<td>10</td>
<td>12.9</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>72</td>
<td>92.3</td>
</tr>
<tr>
<td>Malay</td>
<td>6</td>
<td>7.7</td>
</tr>
<tr>
<td>WHO pathological type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type II</td>
<td>9</td>
<td>11.5</td>
</tr>
<tr>
<td>Type III</td>
<td>69</td>
<td>88.5</td>
</tr>
</tbody>
</table>

Copyright © 2012 OA Publishing London

For citation purposes: Lim TC, Chua ML, Chia GS, Ng DC, Ong SC, Wee JT, Khoo JB. Comparison of MRI, CT and 18F-FDG-PET/CT for the detection of intracranial disease extension in nasopharyngeal carcinoma. Head Neck Oncol. 2012 Sept 9;4(2):49.
Results (Cont.)

Table 2 Detection rates of intracranial tumour extension in pre-treatment NPC patients for MRI, CT and \(^{18}\)F-FDG-PET/CTB

<table>
<thead>
<tr>
<th>Detection rate</th>
<th>MRI (1)</th>
<th>CT (2)</th>
<th>(^{18})F-FDG-PET/CT (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>95% Cl %</td>
<td>95% Cl p value</td>
<td>95% Cl p value</td>
</tr>
<tr>
<td>17.9 (14/78)</td>
<td>9.4–26.4</td>
<td>5/78</td>
<td>0.0279</td>
</tr>
<tr>
<td></td>
<td>6.4</td>
<td>11.8</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>1.0–13.6</td>
<td>6/78</td>
<td>0.0566</td>
</tr>
</tbody>
</table>

CI, confidence interval; CT, computed tomography; \(^{18}\)F-FDG-PET/CT, fluorine-18-2-fluoro-2-deoxy-\(\beta\)-glucose positron emission tomography combined with computed tomography; MRI, magnetic resonance imaging

Figure 5: Venn diagram illustrating the cases with intracranial extension of NPC (n = 14).

As mentioned earlier, intracranial disease in the study population cannot be confirmed by histology due to practical constraints. Hence, all 14 patients with ‘positive’ MRI were considered to have intracranial extension of NPC. One of these 14 patients had hepatic metastases (T4-N2-1) and received palliative chemotherapy. This patient had intracranial disease diagnosed by all the three imaging modalities. The remaining 13 patients received chemoradiotherapy. Subsequent clinical follow-up showed that intracranial spread of NPC was correctly diagnosed in this group of 14 patients. There was no evidence to suggest significant intracranial spread of NPC in the remaining 64 patients of the study cohort.

Using MRI as the reference imaging modality, the overall sensitivity of CT and \(^{18}\)F-FDG-PET/CT for detection of intracranial extension of NPC was 35.7% and 42.9%, respectively. Both CT and \(^{18}\)F-FDG-PET/CT registered 100% specificity and PPV. The NPVs of CT and \(^{18}\)F-FDG-PET/CT were 87.7% and 88.9%, respectively. The accuracy of CT and \(^{18}\)F-FDG-PET/CT was 88.5% and 89.7%, respectively. The sensitivity, specificity, PPV, NPV and accuracy of CT and \(^{18}\)F-FDG-PET/CT are provided in Table 3.

Discussion

Epidemiology of NPC

In 1901, Dr Chevalier Jackson, an American laryngologist, first reported on ‘primary carcinoma of the nasopharynx’\(^{11}\). More than a century later, NPC remains a rare condition in most countries, with an age-adjusted incidence of less than 1 per 100 000 population\(^{12}\). However, this disease occurs more frequently in parts of southern China, Hong Kong, northern Africa and Alaska\(^{2,13}\). For example, in Hong Kong, the reported incidence is 15–20 per 100 000 women and 20–30 per 100 000 men\(^{12}\). Earlier studies have described the role of environmental, ethnic and genetic factors as well as the Epstein–Barr virus in the pathogenesis of NPC\(^{14–16}\).

Histology, prognosis and staging of NPC

NPCs can be histologically grouped based on a classification system proposed by WHO in 1978\(^{17}\):

- WHO type I comprising keratinizing squamous cell carcinoma,
- WHO type II comprising non-keratinizing squamous cell carcinoma,
- WHO type III comprising undifferentiated carcinoma.

Our study population comprises patients with WHO type II and III histology. This reflects the histological distribution of NPC seen in southern Chinese patients as reported by Nicholls in 1997\(^{18}\). Tumours of WHO type II and III histology demonstrate a better primary tumour control rate with treatment, although distant metastasis is more common compared to WHO type I tumours. The five-year survival rates for non-keratinizing and undifferentiated carcinomas (WHO type II and III) are higher compared to WHO type I carcinomas\(^{19}\). Apart from the histology of the primary tumour, the other adverse prognostic factors affecting the survival of NPC patients include presence of paraganglionic hyperplasia extension\(^{3}\), quantity of circulating Epstein–Barr virus DNA\(^{20}\) and the patients being male\(^{21}\). To date, the most important prognostic factor for NPC is the extent or volume of the tumour\(^{2–5}\). Sze et al. reported that for every 1 cm\(^3\) increase in primary tumour volume, the estimated increase in the risk of local failure is about 1%\(^{6}\).

Prior to 1997, there were significant differences between Ho's staging system for NPC, which was frequently used in Asia, and the AJCC classification, which was widely accepted in America and Europe. The revised AJCC staging system incorporates the most predictive factors from both staging systems, thus providing a better
Discussion (Cont.)

The perpetual innovation in modes of RT delivery is driven by the obvious need to suppress radiation dose to surrounding organs at risk. RT delivery techniques have transformed from conventional RT, a few decades ago, to 3-D-CRT, IMRT and image-guided radiotherapy (IGRT). IMRT allows escalation of dose to areas affected by the tumour while sparing irradiation of the adjacent normal tissues. This offers excellent local control rates while preserving normal function of the surrounding organs. A study on patients with early NPC reported that sparing of the parotid glands during IMRT leads to a reduction in the severity of delayed xerostomia as compared to conventional RT. Dosimetric sparing of the swallowing structures also allows for preservation of the swallowing function in patients post-IMRT. However, due to the sharp dose gradient encountered in IMRT, there is a potential of overdose to the surrounding normal tissues or inadequate irradiation of the tumour if the diseased area is not accurately delineated during treatment planning. Therefore, precise image guidance is imperative for effective IMRT. Changes to the tumour volume often occur during treatment as a result of the swallowing structures also.

Table 3

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
<th>95% CI</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>35.7%</td>
<td>100%</td>
<td>100%</td>
<td>87.7%</td>
<td>88.5%</td>
<td>81.4–95.6</td>
<td>95% CI</td>
</tr>
<tr>
<td>18F-FDG-PET/CT</td>
<td>42.9%</td>
<td>92.9–100.0</td>
<td>100%</td>
<td>88.9%</td>
<td>89.7%</td>
<td>81.4–95.6</td>
<td>95% CI</td>
</tr>
</tbody>
</table>

CI, confidence interval; CT, computed tomography; 18F-FDG-PET/CT, fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography combined with computed tomography; NPV, negative predictive value; PPV, positive predictive value.

patients (70.5%) had stage 3 and stage 4 disease.

Image guidance in treatment of NPC

The evaluation of intracranial extension of NPC revolves around detection of a mass in the cavernous sinus or dural thickening that is contiguous with the nasopharyngeal tumour. This is less contentious compared with the evaluation of skull base involvement, as signal changes and contrast enhancement seen in the bones of the skull base do not always imply tumour involvement. Indeed, a study conducted on mandibulectomy specimens demonstrated that MRI is less specific in detecting bone involvement compared with 18F-FDG-PET/CT. There is a mix of opinion regarding the effectiveness of MRI in assessing skull base involvement compared with CT. While one study found that MRI has limitations in assessing bone details compared with CT, another study recommended MRI to be the preferred technique in the evaluation of intracranial extension of NPC. With the advent of IMRT and IGRT, there is greater emphasis on the ability to accurately delineate local disease involvement through imaging. This is crucial during the planning stage of targeted RT. Further, neoadjuvant chemotherapy administered to patients with T4 tumours can potentially downsize the primary lesion, thus reducing the extent of intracranial irradiation. Hence, it is important to detect intracranial extension of NPC at the onset of diagnosis, and knowing the efficacy of each imaging modality in assessing the local extent as well as intracranial spread allows us to choose the most appropriate imaging tool for initial staging. This forms the basis of our research.

Intracranial spread of NPC

Local spread of NPC can be in the form of skull base involvement or intracranial extension of tumour. In our study, intracranial extension of NPC was studied instead of skull base involvement. This is because...
Discussion (Cont.)

skull base involvement. MRI has been reported to be better than CT for the detection of intracranial invasion in NPC patients. In terms of detecting distant metastasis, 18F-FDG-PET/CT is superior to conventional work-up (chest radiograph, abdominal ultrasound and skeletal scintigraphy), CT and 18F-FDG-PET. Furthermore, the accuracy of MRI and 18F-FDG-PET/CT in detecting nodal metastasis in NPC patients is not significantly different. It appears that there is no general consensus with regard to which imaging modality is the best for NPC staging. However, reported evidence seems to support that MRI is the standard imaging modality for assessment of local disease. Hence, we used MRI as the reference imaging modality in our study. In addition, there is further clinical evidence derived from our study cohort to support MRI as the standard imaging modality for assessment of intracranial spread of NPC.

Notwithstanding the lack of histological confirmation of intracranial extension of NPC, the 14 patients diagnosed with intracranial disease by MRI showed clinical response to initial therapy planned with respect to the imaging findings. With the exception of one patient with distant metastases, the remaining 13 patients received combined chemo-RT. Subsequent follow-up imaging in all 13 patients revealed either complete or partial resolution of the intracranial component of the primary tumour compared with the initial scans. The remaining patient with distant metastases also showed partial resolution of dural thickening and enhancement following palliative chemotherapy. Hence, there is indirect evidence to suggest that the initial staging MRI studies did not generate any false positive result. Five of the remaining 64 patients had distant metastases at the time of diagnosis and were given palliative chemotherapy. The remaining 59 patients underwent either 3-D-CRT or IMRT with treatment planned according to CT and MRI findings. As these patients were not initially diagnosed to have intracranial extension of NPC, there was no intended irradiation of the intracranial structures. Therefore, it is logical to assume that the absence of intracranial disease in subsequent follow-up imaging indicates that the initial staging MRI studies did not generate any false negative result.

However, it is possible for palliative chemotherapy to result in local tumour control, thus hindering detection of significant intracranial tumour extension in the follow-up imaging studies of the five patients with distant metastases. We acknowledge this to be a potential pitfall of our study. However, there was no upstaging of disease or significant impact on the clinical course in this group of patients, even if intracranial extension of NPC was indeed present on diagnosis. In our study, the detection rates for MRI, CT and 18F-FDG-PET/CT were 17.9%, 6.4% and 7.7%, respectively. The difference in detection rate between MRI and CT was found to be statistically significant while the difference in detection rate between MRI and 18F-FDG-PET/CT trended towards statistical significance (Table 2). Hence, our study found MRI to be superior to CT and 18F-FDG-PET/CT in detecting intracranial spread of NPC. CT and 18F-FDG-PET/CT did not detect any case with intracranial disease that was not picked up by MRI. Better image quality and contrast resolution derived from MRI leads to improved differentiation of soft tissue structures, which, in turn, allows diagnosis of intracranial disease to be made with less ambiguity. 18F-FDG-PET/CT is not ideal for assessment of intracranial disease due to strong background tracer uptake in the brain as well as poorer image resolution. In a study investigating the impact of 18F-FDG-PET/CT on the staging of NPC at diagnosis, King et al. reported that 18F-FDG-PET/CT did not upstage or significantly alter the clinical management of the study cohort. However, 18F-FDG-PET/CT can demonstrate obvious intracranial extension of NPC in some cases if the primary tumour is significantly more hypermetabolic compared with the surrounding brain parenchyma. At present, although 18F-FDG-PET/CT has a proven role in detecting nodal and distant metastasis, its technical limitations, availability and relatively higher cost do not warrant it replacing MRI as the modality of choice for local staging. 18F-FDG-PET/CT should be reserved for investigation or confirmation of nodal and distant metastasis as well as disease evaluation after therapy.

Conclusion

We found MRI to be superior to CT and 18F-FDG-PET/CT in detecting intracranial extension of NPC. As such, MRI is recommended as the modality of choice for local staging and exclusion of intracranial extension of tumour in NPC patients due to better delineation of anatomical structures.

Abbreviation list

AJCC, American Joint Committee on Cancer; CI, confidence interval; CT, computed tomography; 3-D-CRT, 3-dimensional conformal radiotherapy; 18F-FDG-PET/CT, fluorine-18-2-fluoro-2-deoxy-d-glucose positron emission tomography integrated with computed tomography; IGRT, image-guided radiotherapy; IMRT, intensity-modulated radiotherapy; MRI, magnetic resonance imaging; NPC, nasopharyngeal carcinoma; NPV, negative predictive value; PPV, positive predictive value; RT, radiotherapy; WHO, World Health Organization.

Copyright © 2012 OA Publishing London

For citation purposes: Lim TC, Chua ML, Chia GS, Ng DC, Ong SC, Wee JT, Khoo JB. Comparison of MRI, CT and 18F-FDG-PET/CT for the detection of intracranial disease extension in nasopharyngeal carcinoma. Head Neck Oncol. 2012 Sept 9;4(2):49.
Acknowledgement

TC participated in the study design, performed data analysis and interpretation, carried out statistical analysis as well as helped to draft, edit and review the manuscript prior to submission. ML participated in the study design, data acquisition, analysis and interpretation as well as helped to edit the manuscript prior to submission. GS performed data interpretation and carried out statistical analysis. DC ensured quality control of the data and participated in data interpretation as well as statistical analysis. SC ensured quality control of the data and participated in the study design, data acquisition, ensured quality control of the data as well as helped to edit and review the manuscript prior to submission. All authors have read and approved the final manuscript.

References


