

Original Research Article

Compare the role of positron emission tomography scan to conventional imaging in the evaluation of advanced head and neck cancers

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ABSTRACT

Background: Advanced stages of head and neck cancers need careful evaluation by imaging to rule out multiple nodal and distant metastasis which might influence management and prognosis. The aim of the study was to compare the role of PETCT scan to MRI in the initial evaluation in advanced cancers of head and neck.

Methods: The study included 46 patients having advanced stages of head and neck squamous cancers. The patients underwent clinical examination, endoscopy, an initial CT/MRI of the disease site and conventional metastatic workup with an X-ray Chest and USG abdomen. The patients then underwent PET/CT. Tumor restaging was done after the PETCT and the results of CT/ MRI to PETCT were compared.

Results: There was upstaging of disease in patients with identification of multiple/ bilateral nodes and distant metastasis following PETCT.

Conclusions: PETCT scan has an impact on the initial upstaging staging of disease compared to conventional imaging.

Keywords: Head and neck cancer, Positron emission tomography scan, Imaging

INTRODUCTION

Head and neck cancer is the most common cancer in India. The most common site involved is oral cavity. The other common sites are larynx, hypopharynx and nasopharynx. Radiology in form of CT/MRI is the mainstay of assessing and staging advanced head and neck malignancy. Magnetic resonance imaging is the preferred tool for investigating the primary tumour in all head and neck sites, particularly for assessing cartilage, bone, perineural, and perivascular invasion. Imaging is crucial to know the site, extent and infiltration to the adjacent structures of a histologically proven primary tumour and to detect the presence of enlarged lymph nodes. After imaging, the staging of the tumour or node is upgraded in at least 30% of cases.¹

The incidence of distant metastasis in advanced head and neck malignances is influenced by various factors like location and size of primary tumour (T), lymph node stage and local control of disease above the clavicle. Lung metastases are most common in squamous cell carcinoma accounting for around 66% other being bone. Hence it is imperative to diagnose distant metastasis at initial presentation.² Whole body PET-CT helps in the detection of distant metastasis especially in high risk and advanced head and neck squamous cell carcinoma.

The aim of the study to the compare the role of PETCT scans to MRI in the initial evaluation in advanced cancers of head and neck.

METHODS

A prospective study was conducted at a tertiary care oncology centre for a period of two years from 2014-2016. The study included 46 patients having histologically confirmed stage advanced squamous cancers of head and neck (stage 3 and 4) at Command Hospital Air Force Bangalore. Written informed consent from the patients and Institute Ethical Committee clearance was taken.

Inclusion criteria

Inclusion criteria was histologically confirmed stage III/IV squamous cell cancers

Exclusion criteria

Exclusion criteria were no previous treatment.

Initial staging with conventional investigations was done based on clinical examination, neck palpation, endoscopy, initial CECT scan/MRI of the disease site, X-ray Chest and USG abdomen, biochemical evaluation renal and hepatic function followed by fine needle aspiration cytology (FNAC) of suspected neck metastases and biopsy of the primary lesion was carried out. The patients then underwent contrast whole body PET-CT as an initial investigation and the incidence of distant metastases and second primary cancers were noted. A comparison was done between MRI and PETCT findings. Distant metastasis if any was histologically confirmed.

The data obtained was analysed at the end of the study and the role of doing PET-CT as preliminary investigation in high risk advanced stage HNSCC patients was evaluated and statistically analysed.

RESULTS

The mean age of the patients is 59.4 years. The minimum age of patient studied was 37 and the maximum age of the patient is 79. Of all the patients (n=46) enrolled to the study 38 patients were males and 8 patients were female. Of all the patients, 12 patients had oral cavity cancer, 13 patients had oropharynx and 16 patients had hypopharynx cancer and 5 patients cancer of the larynx.

This table depicts the change in the staging of the disease following PET-CT. PET-CT changed the staging by upstaging the nodal disease and detecting the distant metastasis (Table 1).

Among the study population (n=30), distant metastasis was seen in 3 patients, 2 patient had lung metastasis, 1 patient had liver metastasis (Table 2).

Majority of the patients were of T3 and T4a stage and there was no change in the T staging between the MRI/CT and PET-CT.

Table 1 CT/MRI findings in study population and after PETCT.

No. of patients	Clinical examination (n=46) CT/MRI	After PETCT
T stage		
T1	5	5
T2	6	6
T3	12	11
T4a	20	21
T4b	3	3
N stage		
N0	7	4
N1	8	4
N2a	5	4
N2b	10	9
N2c	12	21
N3	4	4

Table 2: Distribution of patients with distant metastasis.

Distant metastasis	No. of patients	%
Absent	43	93.4
Present	3	6.6
Total	46	100.0

Table 3: Crosstab analysis site vs cancer analysis.

Site	Change in staging	No change in staging	Total
Oral	6	6	12
Oropharynx	11	2	13
Hypopharynx	8	8	16
Larynx	1	4	5
Total	26	20	46

Fischers exact test was used to study the relationship between site versus change in cancer staging p=0.0573.

Of the 46 patients in the study change in TNM stage after PET-CT was seen in 26 patients which was statistically significant (p<0.5) as per Fischer Exact test.

DISCUSSION

The present study was carried out to compare the role of PET-CT vis avis conventional imaging in detection of nodal and distant metastasis and detection of second primaries on initial presentation in advanced HNSCC.

Of the 46 patients majority of cases studied were T3/T4 and there were no changes in T staging after WB 18F-FDG PET-CT scan. In the nodal staging after WB 18FFDG PET-CT scan, there was a statistically significant change in identification of nodal metastasis in N0 group and also identification of additional multiple/bilateral nodes (N2c). 3 patients had a change in M status

with identification of 3 distant metastasis. There were no second primaries detected.

The advantage of PET scan over conventional radiology in determining primary lesion has been low due to the functional uptake by various structures in the head and neck causing high number of false positive results. The advent of hybrid PET-CT scan has improved the visualization and delineation of structures. Various studies have indicated PET scan to have an equal sensitivity as compared to CT/MRI, whereas other studies have shown a higher sensitivity in staging primary disease.^{2,3} Laubenbacher et al did a prospective study involving 22 patients with HNSCC, compared FDG PET, MRI and endoscopy for staging (postoperative histologic tissue characterisation) head and neck carcinoma, which showed that the sensitivity and specificity for detection of individual lymph node involvement were 91% and 96% for PET and 78% and 71% MRI respectively.⁴

Branstetter et al conducted a prospective comparative study of 65 patients which compared the accuracy of PET-CT with PET or CT alone.² Overall the study showed PET-CT had a sensitivity of 98%, a specificity of 92%, and an accuracy of 94% in identification of individual lesions. The study concluded that combined PET-CT is more accurate than PET or CT alone in detection of malignancy in head and neck and also improves localization of PET abnormalities and allows better differentiation of therapeutic changes from residual disease.

Teknos et al conducted a pilot prospective study of 12 patients which studied the role of PET in the evaluation of stage III and stage IV head and neck cancer in the detection of metastatic disease.² Of 12 patients with diagnosis of mucosal squamous carcinoma of head and neck 25% showed FDG PET scan demonstrating metastatic disease.³ In their study they found that FDG PET scan detected mediastinal disease in 17% (2 patients) with advanced HNSCC that was not identified with conventional imaging.

One of the most important applications of PETCT scan due to its higher sensitivity and specificity in identifying nodal disease leading to change in initial staging, affecting survival rates. Schwartz et al conducted a prospective pilot study where they included 63 patients with squamous cell carcinoma with oral cavity, oropharynx, larynx and hypopharynx.³ Their study suggested that FDG PET-CT is superior to CT alone for geographical localization of diseased neck node levels.

However Schoder et al, carried out a prospective study with 31 patients who studied FDG PET-CT for detecting nodal metastasis with oral cavity cancer staged N0 by clinical examination and CT/MRI.⁶ In conclusion despite reasonably high overall accuracy, the clinical application of FDG-PET in N0 neck may be limited by the combination of limited sensitivity for small metastatic

deposits and relatively high number of false positive findings. However PETCT scan can identify metastatic deposit in non-enlarged nodes, nodes with no morphological change and also in nodes like retropharyngeal and supraclavicular which are difficult to evaluate in conventional studies. In our study FDGPET helped upstage 3 cases of N0 to N1.

In our study nodal staging after WB 18FDG PETCT scan, there was a statistically significant change in identification of nodal metastasis in N0 group and also identification of additional multiple and bilateral nodes (N2b and N2c) leading to upstaging of disease and the study group.

The presence of distant metastasis from a primary in HNSCC suggests advanced disease with a poor outcome. WB 18FDG PETCT is an excellent tool in identification of distant metastasis as compared with routine initial workup.⁷ Our results showed additional identification of distant metastasis in 3 patients had a change in M status with identification of distant metastasis in lungs (2 patient) and in the liver (1 patient).

We evaluated our patients by a hybrid system of PET and CT scan providing better delineation and reducing false positive, which was seen in earlier studies evaluated by PET alone.^{1,2}

Kim et al, in a prospective study to evaluate the ability of FDG PET-CT to detect distant metastasis and second primary in 349 previously untreated head and neck cancer patients found that of the 349 patients 4% (14 patients) had second primary cancer, 7.45% (26 patients) had distant metastasis at initial staging or during follow up after treatment.¹ In 39 of these 40 patients FDGPET-CT correctly picked up second cancers or distant metastasis. There was one false negative and 23 false positive result. FDGPET-CT had sensitivity of 97.5%, specificity of 92.6%, positive predictive value of 62.9% and negative predictive value of 99.7% in detecting second primary cancers or distant metastases. The study concluded that FDGPET-CT is an essential part of initial investigation for detecting second primaries and distant metastasis in HNSCC.

CONCLUSION

In our study WB FDG PET-CT had a high impact in the initial evaluation of advanced cancers HNSCC. Following WB18FDG PETCT scan, there was a statistically significant change in identification of nodal metastasis in N0 group and also identification of additional multiple/bilateral node (N2c). PETCT also helped identify distant metastasis in patients. Our study recommends that PETCT should be included as an initial investigative modality for advanced head and neck cancers.

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