

Performance of Latest Generation PET/CT Scanner for detection of Metastatic Lymph Nodes in Head and Neck Cancer



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Problem Statement

- A gap in the literature exists on the accuracy of the newest generation PET/CT scanners in detecting cervical nodal metastasis, a tool that is essential for cancer staging.

Aim

Identify the overall sensitivity, specificity and accuracy for the newest generation PET/CT scanners and determine if the increased spatial resolution overcalls positive nodes during staging in head and neck cancer patients.

Background

- In head and neck cancer, cervical lymph node involvement is one of the most important prognostic factors.
- Staging of these cancers informs treatment decisions and patient care planning.
- In May 2019, the Dartmouth-Hitchcock Radiology department installed the Siemens Healthineers Biograph Vision Digital PET/CT.
- This newest model contains improved spatial resolution and photon detectors when compared to older models.

Methods

- 55 consecutive patients who underwent surgical neck dissection for head and neck neoplasms were identified by surgical patient logs (Paydarfar).
- All patients in this study had their surgical nodal neck dissections after the installment of the newest generation of PET/CT scanners (May 2019). Patients were excluded if their scan did not precede surgical resection.
- A retrospective chart review was conducted by two reviewers (Tocci and Butt) assessing the location and number of reported PET/CT positive metastatic lymph nodes compared to the gold standard of metastatic lymph nodes found on surgical pathology following neck dissection.
- Additional follow up assessing nodal response to treatment was also collected via chart review.

Fig. 1 Image of new PET/CT scanner with example scans showing FDG avid lymph nodes



Fig. 3 Flow chart of nodes assessed by newest PET/CT with comparison to gold standard of surgical pathology.

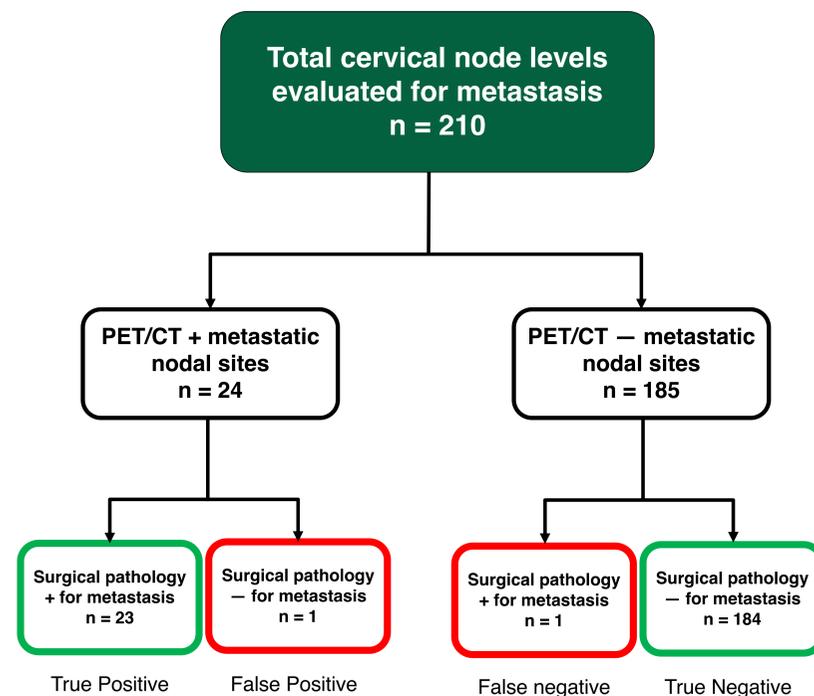
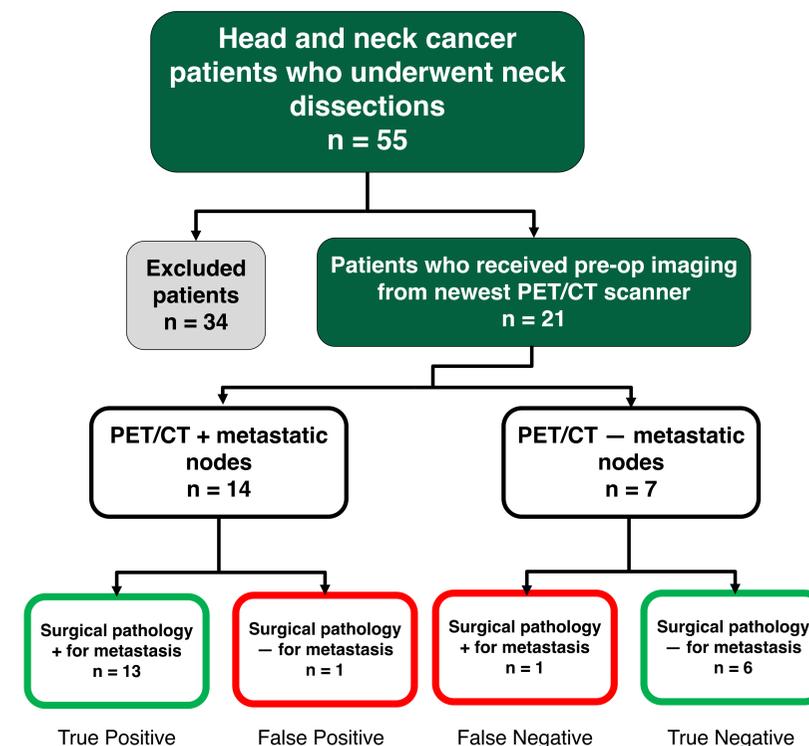


Fig. 2 Flow chart of patients assessed by newest PET/CT with comparison to gold standard of surgical pathology.



Results

- Of the 55 patients identified, 21 underwent scanning by the newest generation PET/CT machine. A total of 210 nodal levels were reviewed.
- Newest generation PET/CT scanners identified 14 patients (66%) with reports of fluorodeoxyglucose (FDG) avid nodal metastasis.
- Within these 14 patients, metastatic lymph nodes were identified in 24 cervical nodal levels.
- One metastatic lymph node was not identified via PET/CT scanners on pre-operative imaging but was identified via surgical pathology (measuring 9mm)
- Of all nodal levels evaluated (210) the newest PET/CT scanner had a sensitivity 96% and specificity of 99%.
- For patients evaluated (21) with head and neck cancer the sensitivity was 93%
- For patients evaluated (21) with head and neck cancer the specificity was 93%
- Positive likelihood ratio (6.50) and Negative likelihood ratio (0.08)
- PPV: 0.93
- NPV: 0.83

Conclusion

DHMC's newest PET/CT scanner demonstrated both a high sensitivity and specificity for the detection of head and neck cancer cervical nodal metastasis, which is comparable to other studies found in the literature.

Citations

- Goel R, Moore W, Sumer B, Khan S, Sher D, Subramaniam RM. Clinical Practice in PET/CT for the Management of Head and Neck Squamous Cell Cancer. *AJR Am J Roentgenol.* 2017 Aug;209(2):289-303. doi: 10.2214/AJR.17.18301. PMID: 28731808.
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- Ke Z, Liu M, Liu Y, et al. [Diagnostic value of 18F-FDG PET/CT in the detection of the cervical lymph nodes metastasis]. *Lin Chuang er bi yan hou ke za zhi = Journal of Clinical Otorhinolaryngology.* 2006 Mar;20(6):243-245.