

THE IMPACT OF DIRECT LARYNGOSCOPY AND BIOPSY ON PET SCAN RESULTS

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INTRODUCTION

Direct laryngoscopy (DL) with biopsy followed by Positron Emission Tomography (PET) is an established staging protocol for newly-diagnosed head and neck squamous cell carcinoma (HNSCC). However, inflammation from recent procedures could lead to false-positives on PET scans. We therefore sought to determine the rate of false findings on staging PET scans following DL.

METHODS AND MATERIALS

All initial staging PET scans performed over a one year period at a tertiary referral center for newly-diagnosed HNSCC were reviewed. Clinical charts were reviewed to determine timing of DL, and matched controls without DL performed were identified. The gold standard for tumor location was determined by the surgeon's operative report and biopsy results and/or flexible laryngoscopy in clinic.

False positives were determined by 1)PET positivity clearly distinct from the primary tumor site noted in radiology reports and 2)Blinded reads of all scans by an attending nuclear medicine radiologist.

RESULTS

Seventeen newly diagnosed HNSCC patients were identified with a PET scan performed within 14 days after DL and biopsy, with demographic data and location of the primary lesions shown in **Table 1**. These scans were performed an average of 6 days (range: 1 -13 days) following the procedure. 53% of index patients had false-positives on PET scan, compared to 18% of matched controls. Stroboscopic images of two cases with primary tumor and false positive findings in the base of tongue are presented in **Figure 1**.

The odds ratio for a false positive finding on PET scan was 5.6 (CI: 1.2, 26.1; p=0.028) for index patients compared to controls (**Table 2**). Most of the false positive findings were in the oropharynx, with a lower SUV than the primary site, but a much higher signal than expected for background noise (**Table 3**).

Table 2: Odds ratio for false positive finding of cases vs controls

| | No FP | FP | Odds Ratio | 95% CI | p-value |
|----------------|-------|----|------------|-------------|---------|
| Case (n=17) | 8 | 9 | 5.6 | (1.2, 26.1) | 0.028 |
| Control (n=17) | 14 | 3 | | | |

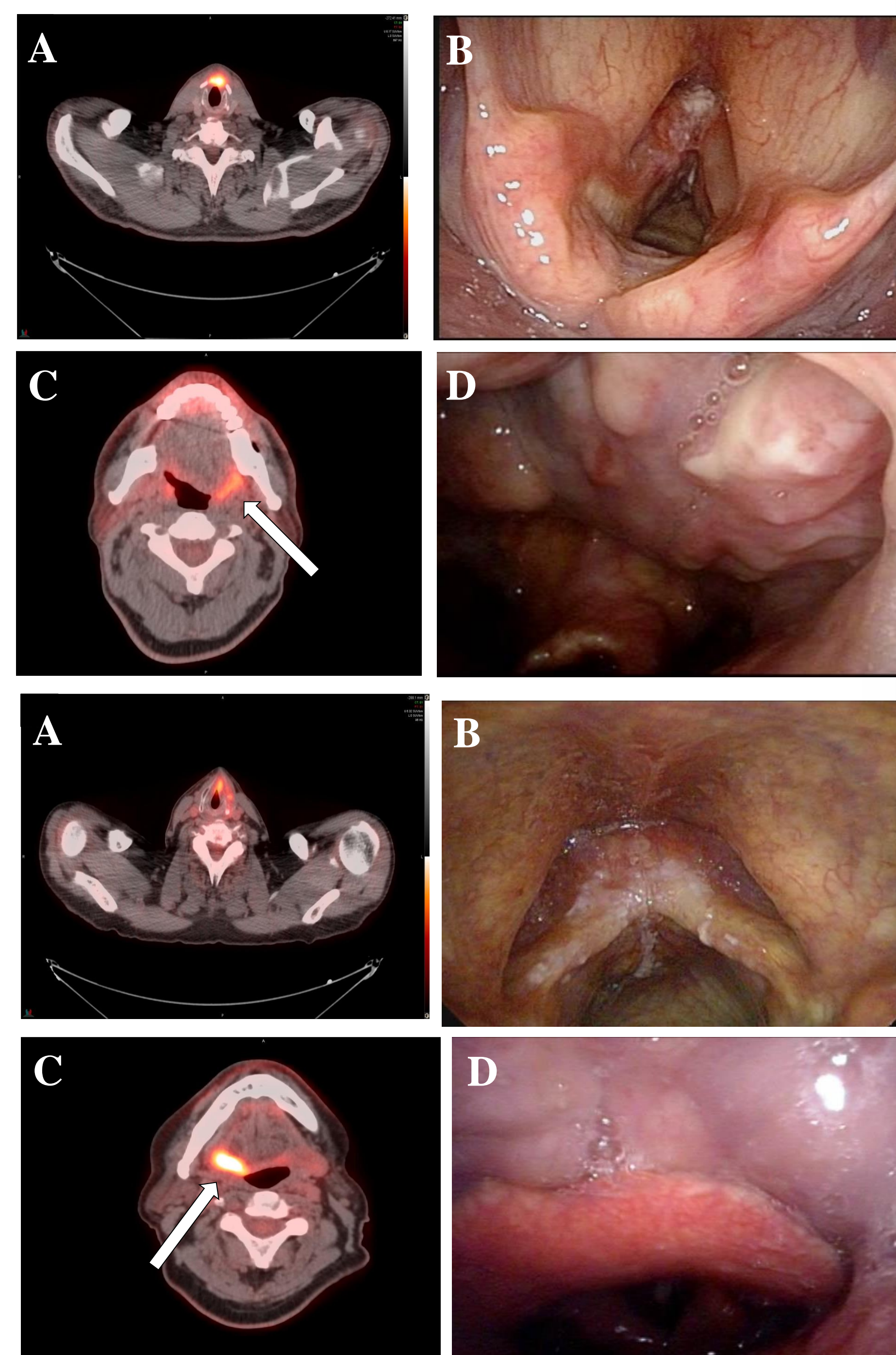


Figure 1: (A) FDG uptake in the primary tumor location. (B) Laryngoscopic image of glottis. (C) False positive FDG uptake in base of tongue. (D) Laryngoscopic image of normal base of tongue.

DISCUSSION

Our findings show a high rate (53%) of false positivity on initial staging PET scans related to DL in newly diagnosed head and neck SCC patients.

PET scans are important tools for initial staging and surveillance of SCC. Tearing or perforation of the oropharynx, pharynx, and larynx can occur during DL. We demonstrate here that the resulting inflammation from DL enhances FDG uptake and may be falsely interpreted as tumor activity.

It is well-known that acute inflammation such as tonsillitis can increase FDG uptake (1). Intense FDG uptake in the palatine tonsils, lingual tonsils and soft palate can be seen in patients with no history of head and neck cancer (2). In our study, it is likely that most of the false positives are either direct trauma, or inflammation leading to tonsillar / base of tongue uptake.

Radiologists and otolaryngologists should be aware of the possibility of increased FDG uptake in the base of tongue and tonsil region after SML in order to avoid misdiagnosis.

Table 3: False positive locations of cases vs controls

| False positive location | Case (n=17) | Control (n=17) | p-value |
|---------------------------|-------------|----------------|---------|
| Tongue base | 3 | 2 | 0.14 |
| Tonsil | 3 | 0 | |
| Larynx | 2 | 0 | |
| Hypopharynx/esophagus | 1 | 1 | |
| No FP | 8 | 14 | |
| Avg SUV of tumor | 11.2 | 11.7 | 0.76 |
| Avg SUV of false positive | 5.4 | 6.3 | 0.56 |

CONCLUSIONS

Inflammation from SML can lead to an increase in false positive signals on staging PET scans. Radiologists and otolaryngologists should be aware of this possibility to avoid misdiagnosis.

REFERENCES

- 1) Kawabe J et al. Physiological FDG uptake in the palatine tonsils. *Annals Nucl. Med.* 2001; 15:297-300.
- 2) Nakamoto Y, Tatsumi M, Hammoud D, et al. Normal FDG distribution patterns in the Head and Neck: PET/CT evaluation. *Nucl. Med.* 2005; 234:879-885.
- 3) Scadding GK. Immunology of the tonsil: a review. *J R Soc Med.* 1990;83(2):104-7.

Table 1: Demographics of cases vs controls

| Variable | Case (n=17) | Control (n=17) | p-value |
|---------------------|-------------|----------------|---------|
| Average age (years) | 62 | 63 | 0.71 |
| Gender | | | 0.69 |
| Male | 12 | 14 | |
| Female | 5 | 3 | |
| Race | | | 0.73 |
| Caucasian | 11 | 13 | |
| African American | 4 | 3 | |
| Other | 2 | 1 | |
| T stage | | | 0.09 |
| Early (T1, T2) | 1 | 6 | |
| Late (T3, T4) | 16 | 11 | |
| N stage | | | 0.12 |
| N (-) | 7 | 2 | |
| N (+) | 10 | 15 | |
| True tumor location | | | 0.41 |
| Larynx | 7 | 6 | |
| Tongue base | 5 | 6 | |
| Hypopharynx | 4 | 1 | |
| Tonsil | 1 | 4 | |
| SUV Tumor | 10.9 | 11.8 | 0.54 |