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CLINICAL REPORT

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Correlation of Radiographic and Pathologic Findings of Dermal Lymphatic Invasion in Head and Neck Squamous Cell Carcinoma

SUMMARY: HNSCC that involves the skin is able to invade the dermal lymphatic system. Currently there is no way to identify patients with dermal lymphatic invasion preoperatively. The purpose of this study is to determine whether CT can predict dermal lymphatic invasion. Medical records, CT scans, and corresponding histopathologic slides were reviewed of HNSCC patients with skin resected as part of their treatment. Dermal lymphatic invasion was defined radiographically as linear reticulations of the dermis and subcutaneous fat adjacent to the tumor. Twelve patients were identified with imaging suggestive of dermal lymphatic invasion. The corresponding pathology slides showed only 1 of the 12 patients had dermal lymphatic invasion, whereas the other 11 specimens showed peritumoral inflammation without evidence of tumor invasion. This study demonstrates that the linear areas of reticulation are most commonly caused by peritumoral inflammation and are not due to dermal lymphatic invasion.

ABBREVIATION: HNSCC = head and neck squamous cell carcinoma

Head and neck cancer is the fifth most common cancer in the world, with more than 600,000 cases diagnosed each year.¹ The identification of clinicopathologic prognostic factors in head and neck squamous cell carcinoma is one of the most important tools a clinician has for determining appropriate management and for properly counseling patients regarding outcomes. Probably the most significant prognostic factor in HNSCC is regional or distant metastasis. The presence of regional nodal spread reduces overall survival by nearly half, and distant metastasis greatly reduces survival, with extremely low cure rates.² Other tumor factors such as perineural spread, infiltrating borders, or invasion into cartilage, bone, or adjacent angiolymphatic structures have also been associated with a poor prognosis.³ Dermal lymphatic invasion has also been considered to have negative prognostic significance in HNSCC, though this has not been well studied.⁴

Pretreatment imaging studies are useful to more accurately stage patients and ultimately determine prognosis. The presence of dermal lymphatic invasion has been suggested on pretreatment imaging by the presence of linear areas of reticulation of the dermis and subcutaneous fat.⁵ However, this has not been correlated with pathologic findings in HNSCC. The purpose of this study is to correlate preoperative CT findings of patients with HNSCC with their respective dermatopathology to determine whether dermal lymphatic invasion can be detected on pretreatment imaging.

Case Series

We performed a retrospective review of 12 patients with HNSCC who underwent surgical resection of the skin. All pa-

tients had primary tumors that were cutaneous or mucosal in origin, without previous treatment. All patients had a preoperative CT scan with findings suggestive of dermal lymphatic invasion. The radiologic evidence of dermal lymphatic invasion on CT scan was defined as linear reticulations of the dermis and subcutaneous fat adjacent to the tumor.

All patients had the pathologic specimen available for review. Evidence of dermal lymphatic invasion on dermatopathology was defined as tumor cells that invaded a dermal lymphatic vessel adjacent to the primary tumor, identified under light microscopy with routine staining. This retrospective study was approved by the institutional review board at our institution.

Twelve patients with HNSCC who had skin resected at the time of surgery and whose preoperative CT scans suggested dermal lymphatic invasion were identified. Patient characteristics are presented in Table 1. Four patients had primary tumors of the nasal cavity/paranasal sinuses, 4 had primary tumors of the oral cavity, and 4 had primary tumors that were cutaneous in origin. All patients had T4 tumors and 5/12 developed regional metastasis.

The corresponding pathology slides showed that only 1 of the 12 patients had dermal lymphatic invasion. Fig 1 shows an axial CT scan with corresponding pathology slides of an aggressive skin cancer. In this patient, the linear reticulations in the dermis and subcutaneous fat demonstrate the tumor's invasion into the dermal lymphatics. In contrast, Fig 2 shows an axial CT scan with corresponding pathology slides of a patient with maxillary sinus squamous cell carcinoma, with similar linear reticulations in the dermis and subcutaneous fat. The corresponding pathology slides show peritumoral inflammation with infiltration of inflammatory cells, without evidence of tumor spread.

Discussion

Dermal lymphatic invasion has been implicated as a poor prognostic finding in various cancers including HNSCC.^{4,6,7} While invasion into the dermal lymphatic system has been studied extensively in breast cancer and is associated with re-

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Tumor site and subsite, stage, and evidence of dermal lymphatic invasion

Case #	Tumor Site	Tumor Subsite	T Stage	N Stage	M Stage	Overall Stage	Dermal Lymphatic Invasion
1	NC/PS	Lateral nasal wall	T4	N2C	M0	4	No
2	NC/PS	Maxillary sinus	T4	N0	M0	4	No
3	NC/PS	Maxillary sinus	T4	N0	M0	4	No
4	NC/PS	Ethmoid sinus	T4	N0	M0	4	No
5	CUT	Cheek and temple	T4	N0	M0	3	No
6	CUT	Auricle	T4	N1	M0	3	No
7	CUT	Forehead	T4	N0	M0	3	No
8	CUT	Preauricular region	T4	N1	M0	3	Yes
9	OC	Floor of mouth	T4	N2A	M0	4	No
10	OC	Alveolar ridge	T4	N0	M0	3	No
11	OC	Alveolar ridge	T4	N0	M0	4	No
12	OC	Lower lip	T4	N2C	M0	4	No

Note:—N indicates nasal cavity; PS, paranasal sinus; CUT, cutaneous; OC, oral cavity.

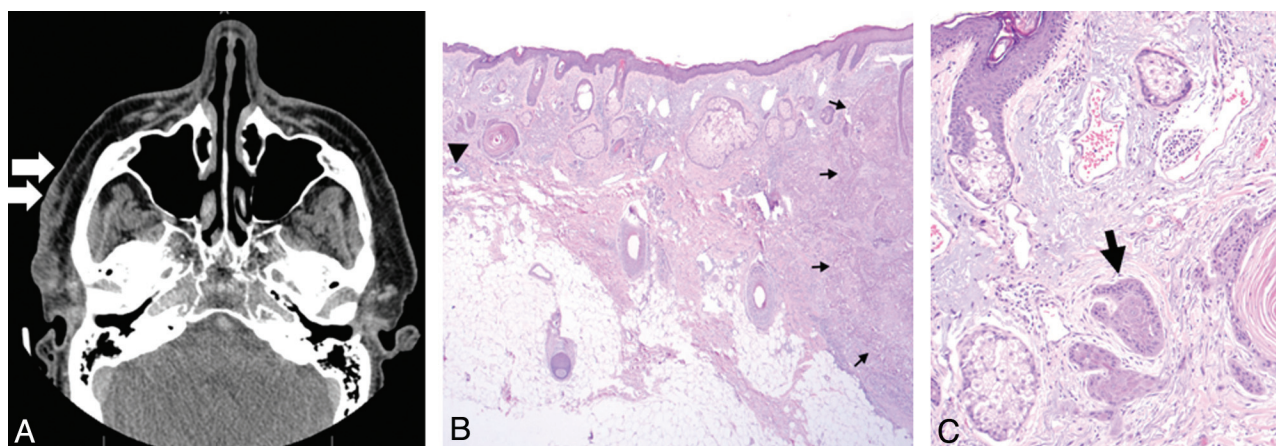


Fig 1. 64-year-old man with a history of cutaneous squamous cell carcinoma. (A) Axial contrast-enhanced CT shows an aggressive skin cancer (large arrows) associated with reticulation within the dermis and subcutaneous fat. (B) Low-power image (4x) of the same tumor (arrows) invading into the dermal lymphatics (arrowhead). (C) Higher power image (10x) showing the tumor in the dermal lymphatics (arrow).

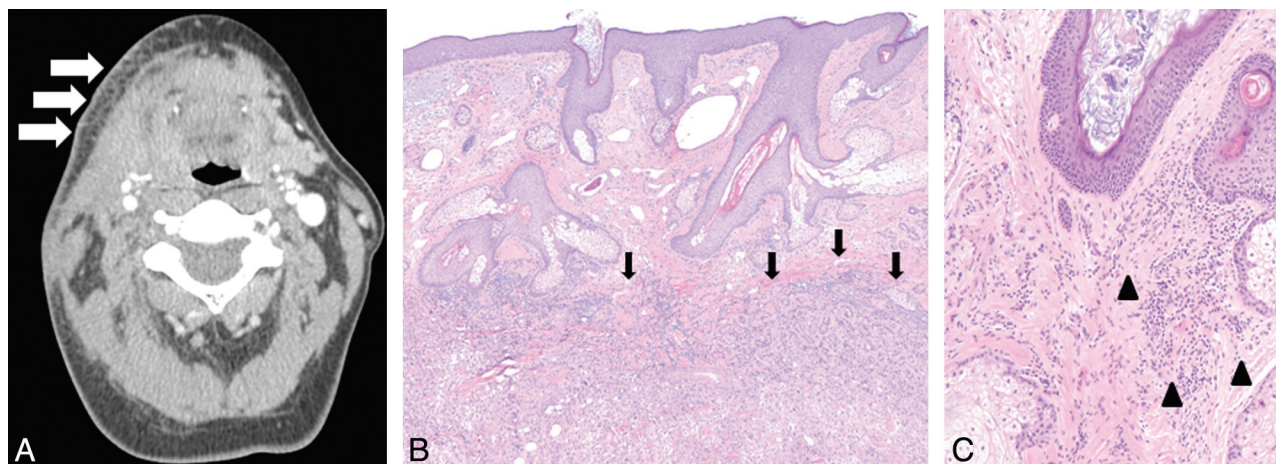


Fig 2. 57-year-old man with a history of floor of mouth squamous cell carcinoma. (A) Axial contrast-enhanced CT shows an aggressive floor of mouth cancer with associated reticulations within the dermis and subcutaneous fat (large arrows). (B) Low-power image (4x) of the same tumor (arrows) showing peritumoral inflammation (arrows) without evidence of tumoral invasion. (C) Higher power image (10x) showing peritumoral inflammation (arrowheads) without evidence of tumoral invasion.

gional metastasis, it has not been well studied in HNSCC. While advanced imaging techniques have allowed for more accurate evaluation of HNSCC, the correlation of these findings to pathologic specimens is extremely important in confirming precise staging and tumor spread to guide appropriate treatments.

Our radiologic-pathologic correlative study demonstrated that the linear reticulations in the subcutaneous tissue adjacent to tumors are primarily due to peritumoral inflammation, with infiltration of inflammatory cells without evidence of tumor spread. Only 1 patient had evidence of dermal lymphatic invasion by tumor.

These findings, while surprising, are not unexpected. Becker et al prospectively studied the diagnostic accuracy of MR for detecting cartilage invasion in patients with laryngeal carcinoma.⁸ They found the sensitivity of MR to be higher than the specificity. The lower specificity was thought to be due to peritumoral inflammation, which has a similar appearance to tumor on MR imaging and can mimic neoplastic cartilage invasion. This peritumoral inflammation has a similar appearance to lymphatic spread of tumor and likely explains our findings. Our results suggest that the reticulations of the dermis and subcutaneous fat seen in our patient series are not specific for peritumoral spread and are most likely due to peritumoral inflammation in the subcutaneous tissue. While only 1 of our cases showed dermal lymphatic invasion adjacent to the primary tumor, all specimens showed patchy chronic inflammation, with associated edema and fibrosis adjacent to the tumor.

To our knowledge, there have been no studies comparing CT findings, with their respective dermatopathology, examining dermal lymphatic invasion. There was only 1 case (7%) in our series with histologic evidence of dermal lymphatic invasion. This case was a patient with a squamous cell carcinoma of the preauricular skin who underwent radical excision with superficial parotidectomy, neck dissection, and adjuvant radiation therapy. On histologic evaluation, 1 lymph node was positive for metastatic squamous cell carcinoma. This patient was on immunosuppressant therapy for a renal transplant, which is a well-known risk factor for cutaneous malignancies.⁹ The patient is alive, with no evidence of disease, but is only 6 months out from treatment.

With our small case series, we did not set out to determine the prognostic significance of this finding in head and neck cancer. We would hypothesize that it may be a surrogate marker for locally advanced disease, much like bony invasion in head and neck cancer is a criterion for advanced T staging; however, a larger cohort of patients would be necessary to draw appropriate conclusions. The study sample was too small to analyze outcome data based on these findings, so no prognostic information can be conferred.

There are several limitations to our study. Our study evaluated a small number of patients within each subsite. Patients were chosen in a nonrandomized fashion to sample different types of commonly encountered head and neck pathology.

Our study used conventional microscopy and staining to examine for dermal lymphatic invasion. Previous studies in the esophagus and cervix have shown precise evaluation of lymphatic invasion by using immunohistochemical stains such as D2-40, a marker for lymphatic vessels, which can be helpful in confirming the diagnosis.¹⁰ Although all of our pathologic specimens were reviewed by an experienced head and neck pathologist, it is possible that conventional microscopy could underestimate the presence of early disease.

In summary, the results of our investigation indicate that peritumoral linear reticulations within the subcutaneous tissue are most often due to peritumoral inflammation, as opposed to dermal lymphatic invasion by tumor. A future prospective study integrating these more advanced immunohistochemical stains would be warranted to confirm our initial results. Further research is needed in detecting dermal lymphatic invasion and determining prognostic significance.

Disclosures: Suresh K. Mukherji—Consultant: Philips Medical Systems, Details: Product feedback.

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