

Case 7

Squamous Cell Carcinoma of the Head and Neck: Volume Perfusion CT

By Timothy J. Amrhein, MD, Zoran Rumboldt, MD, PhD

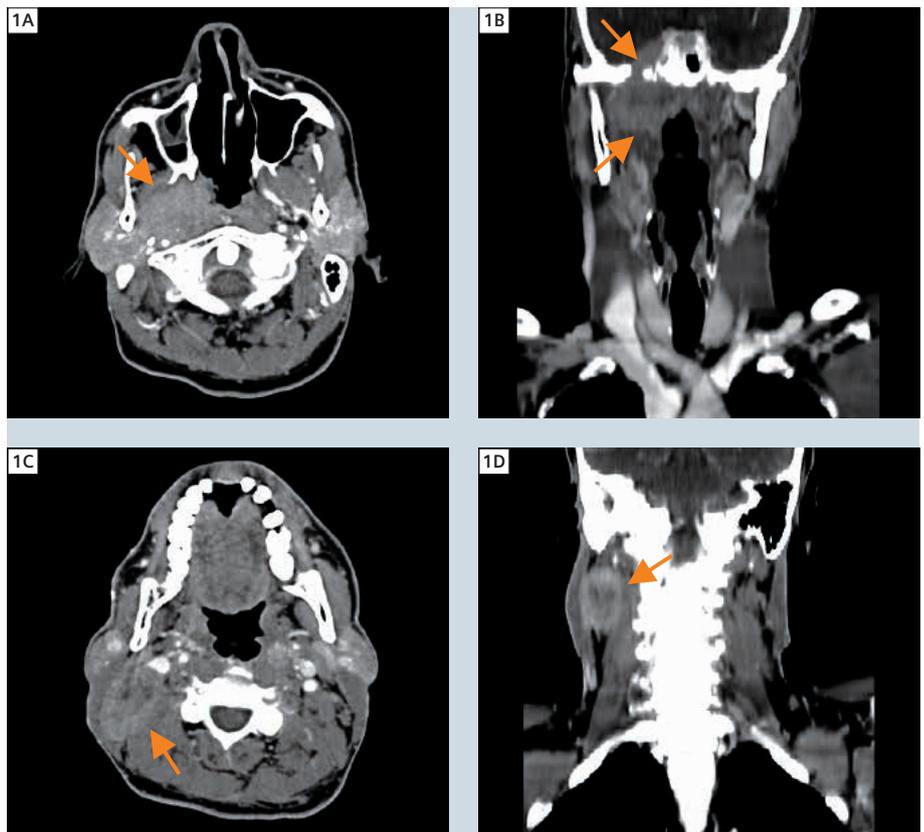
Department of Radiology and Radiological Sciences, Medical University of South Carolina, Charleston, SC, USA

HISTORY

A 54-year-old male with a three-month history of a tender right neck mass associated with right-sided headaches, epistaxis, otalgia, diplopia, and paresthesias of the right face and tongue, was referred to the otolaryngology for further evaluation. The patient reported fevers, night sweats and weight loss. A fine needle aspirate of the dominant right neck mass yielded a preliminary diagnosis of squamous cell carcinoma. The patient was then referred to the radiology for diagnostic imaging.

DIAGNOSIS

An initial pre-treatment contrast enhanced neck-CT (CENCT) demonstrated an avidly enhancing heterogeneous 4.2 x 2.6 x 5.7 cm mass, arising from the right nasopharynx with lateral extension into the right masticator space and superior extension into the right foramen ovale and cavernous sinus (Figs. 1A and 1B). Additionally, there was an enlarged avidly enhancing right level IIB lymph node with central hypoattenuation suggestive of necrosis (Figs. 1C and 1D). The patient then underwent Volume Perfusion CT (VPCT) of the neck to further characterize the underlying pathology. This VPCT demonstrated elevated capillary permeability (CP), blood volume (BV), and blood flow (BF) within the primary mass relative to normal adjacent tissues (Fig. 2A). Similar characteristics were identified within the viable periphery of the centrally necrotic right level 2B lymph node (Fig. 2B). Of note, this lymph node was located approximately 5 cm inferior and



1 Initial pretreatment CENCT. Axial image demonstrated avidly enhancing heterogeneous mass arising from the right nasopharynx with lateral extension into the right masticator space (Fig. 1A). Coronal image demonstrated superior extension of the primary mass into the foramen ovale and cavernous sinus (Fig. 1B). Axial image demonstrated a markedly enlarged and peripherally enhancing right level IIB lymph node concerning metastatic involvement (Fig. 1C). Coronal image redemonstrated the enlarged concerning right level IIB lymph node (Fig. 1D).

4.5 cm posterolateral to the primary mass and would not typically have been included with standard neck perfusion CT protocols. Mean BF and CP values within the primary mass were 144.6 (mL/100g/min) and 38.7 (mL/100g/min), respec-

tively. These elevated values predicted a good treatment response to chemotherapy and radiation therapy. Similar values were present in the nodal metastasis (111.8 mL/100g/min and 29.7 mL/100g/min respectively).

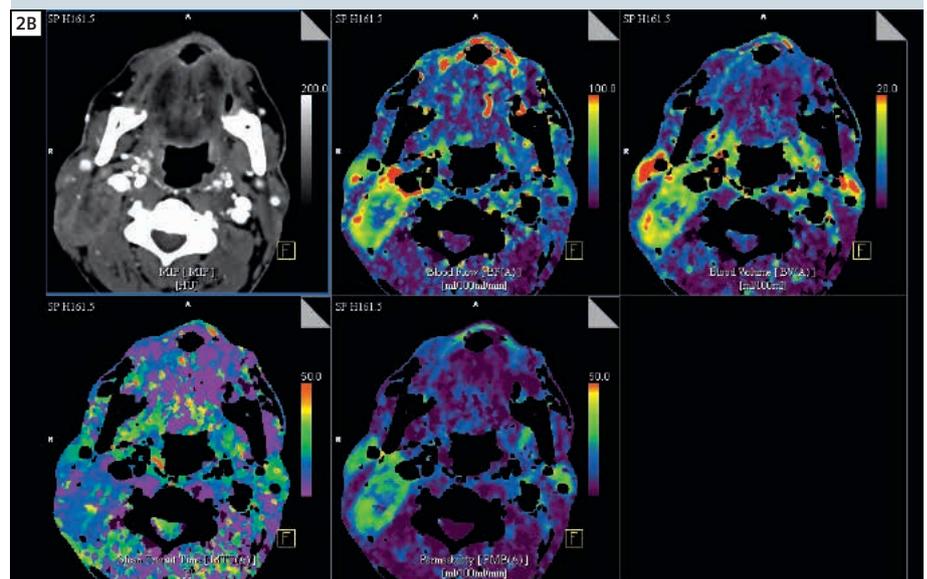
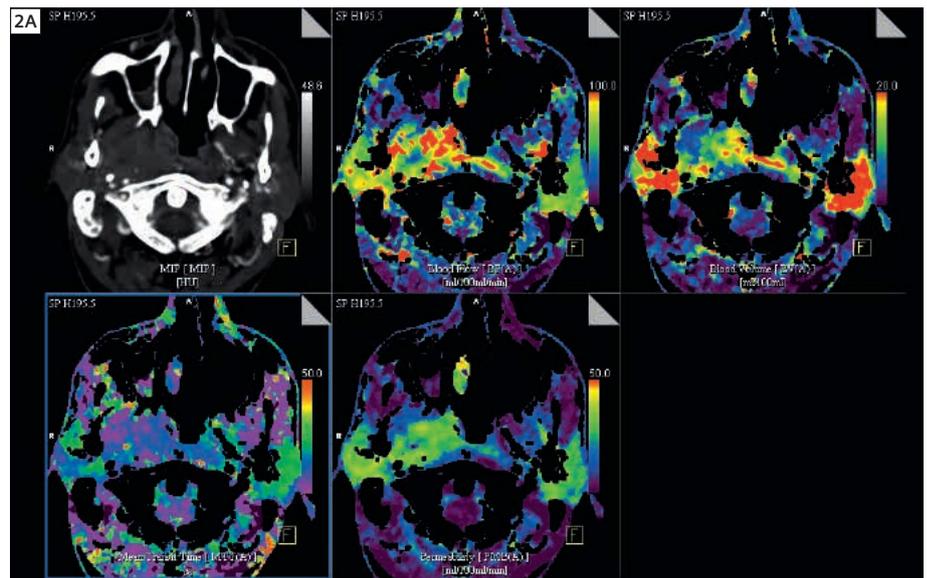
The patient underwent standard chemotherapy and radiation therapy and returned for a follow up CENCT four months after the initial scan. This demonstrated a near complete to complete response with macroscopic resolution of the primary neoplasm and nodal disease (Fig. 3). There was no evidence of residual or recurrent disease over the following 3 months.

COMMENTS

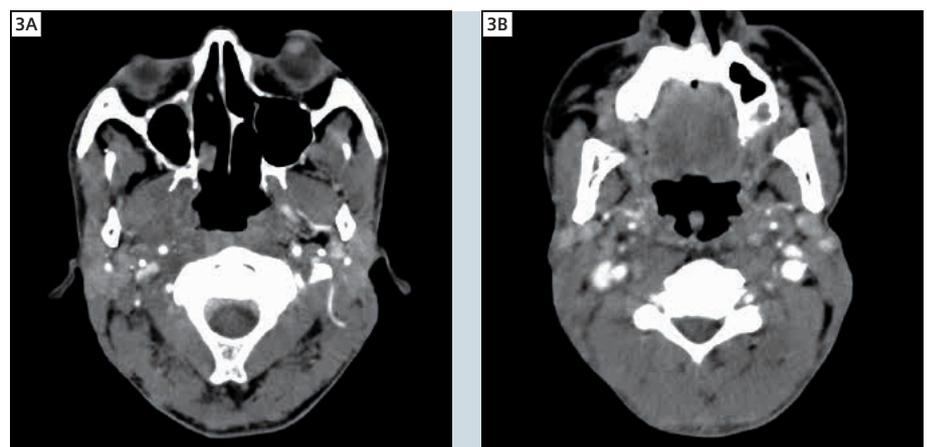
VPCT offers dynamic perfusion analysis of the entire neck allowing for characterization of both the primary neoplasm and areas of nodal involvement. Standard neck perfusion CT is unable to cover the entire neck volume precluding the concomitant acquisition of perfusion information in areas of nodal metastatic disease. Changes in functional parameters acquired with VPCT may allow for prediction of treatment response before and during therapy.

EXAMINATION PROTOCOL

Scanner	SOMATOM Definition AS+
Scan mode	Volume Perfusion Protocol using Adaptive 4D Spiral
Scan area	Neck
Scan length	130 mm
Scan direction	Cranio-caudal
Scan time	49 s
Tube voltage	80 kV
Tube current	150 eff. mAs
Dose modulation	CARE Dose4D
CTDI_{vol}	128 mGy
DLP	1875 mGy cm
Rotation time	0.3 s
Slice collimation	128 x 0.6 mm
Slice width	3 mm
Reconstruction increment	2 mm
Reconstruction kernel	B2of
Contrast	
Volume	40 mL contrast + 50 saline
Flow rate	4 mL/s
Start delay	No delay



2 Neck VPCT: CP, BV, BF and reduced MTT within the primary mass were elevated (Fig. 2A). Similar perfusion characteristics within a right level IIB lymph node concerning metastatic involvement could be detected (Fig. 2B).



3 Post treatment CENCT. Primary right nasopharyngeal mass (Fig. 3A) and right level IIB lymph node were resolved (Fig. 3B).