Computed Tomography Versus Magnetic Resonance in Head and Neck Cancer

When to Use What and Image Optimization Strategies

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KEYWORDS

• Head and neck cancer • AJCC TNM • Anatomic landmarks

KEY POINTS

- CT is a good initial assessment modality when the primary tumor is adjacent to fat, vessels, air-filled aerodigestive tract lumen, and bone/cartilage, such as oropharyngeal cancer, hypopharyngeal cancer, and laryngeal cancer.
- MR imaging offers superior soft tissue contrast, and is preferred when tumor has to be differentiated from adjacent soft tissue structures and bone marrow. This is especially applicable for assessment of nasopharyngeal carcinoma and oral tongue cancer. MR is also useful for problem solving after an initial CT, for example in evaluating for cartilage invasion by a larynx cancer.
- Non–fat-saturated unenhanced T1-weighted MR imaging is a very important sequence for assessing primary tumor and perineural invasion, due to the natural contrast provided by the high signal intensity of fat against tumor, both at the primary site and particularly at the tiny skull base foramina through which cranial nerve branches course through fat.

NASOPHARYNGEAL CARCINOMA

The nasopharynx is an epithelial-lined cavity composed of both stratified squamous and columnar epithelium, located at the upper end of the aerodigestive tract. Its boundaries are: anteriorly, the nasal choana; posteriorly and superiorly, the inferior aspect of the basisphenoid and the entire basiocciput (clivus), anterior arch of C1, a portion of C2, and the overlying prevertebral muscles; inferiorly, continuous with the oropharynx (separated from it by an imaginary line drawn at the level of the hard palate and the Passavant muscle); and laterally, outlined by the fossa of Rosenmüller, the eustachian tube orifice, and torus tubarius.

Squamous cell carcinoma of the nasopharynx (nasopharyngeal carcinoma [NPC]) accounts for 70% of all nasopharyngeal neoplasms and is the most common malignancy of the nasopharynx. The remaining 30% consist of lymphomas, salivary gland tumors, melanomas, and some rare varieties of sarcoma.[1] Some factors thought to be associated with NPC include genetic predisposition linked to human leukocyte antigen loci; latent Epstein-Barr virus (EBV) infection; and environmental exposures, such as nitrosamines in

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preserved salted foods, polycyclic hydrocarbons, and chronic nasal inflammation.[2] Patients typically present with a focal neck mass related to metastatic adenopathy because NPC is associated with early lymphatic spread to retropharyngeal nodes (nodes of Rouvière) and nodes along the jugular and spinal accessory chains (**Fig. 1**). The incidence of nodal involvement at presentation has been reported to range from 60% to as high as 96%. Less often, patients present with serous otitis media caused by eustachian tube obstruction (**Fig. 2**), epistaxis, or nasopharyngeal obstruction related to the primary tumor.

Imaging is a key component in the clinical staging of NPC. Recognition of key staging landmarks in the American Joint Committee on Cancer (AJCC) tumor, node, metastasis (TNM) criteria[3] is important for understanding the relative utility of

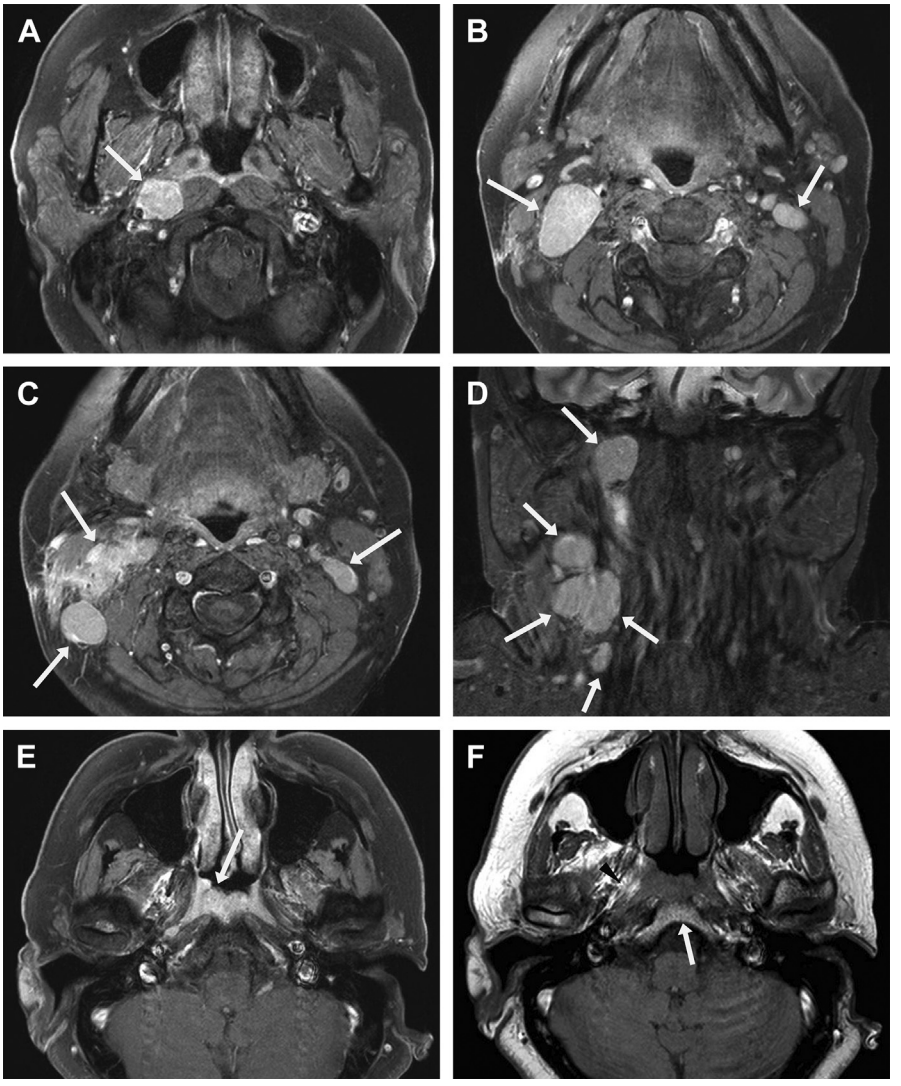

Fig. 1. A 48-year-old woman with EBV and NPC. She initially presented to her primary care physician with a right neck mass, and magnetic resonance (MR) imaging of the nasopharynx and neck was performed. (*A–C*) Axial postcontrast T1-weighted images show avidly enhancing nodes in the lateral retropharyngeal region (node of Rouvière) (*arrow* in *A*) and bilateral level II nodes (*arrows* in *B* and *C*). (*D*) Coronal short-tau inversion recovery image shows the T2-hyperintense nodes (*arrows*). (*E*) Axial postcontrast fat-saturated T1-weighted sequence at the level of the nasopharynx shows nodular soft tissue thickening in the nasopharynx representing the primary tumor, which is small relative to the nodes. Mass effect causes effacement of the fossae of Rosenmüller, more on the right than the left (*arrows*). (*F*) Axial noncontrast T1-weighted sequence helps to assess marrow signal in the clivus (*arrow*) and the parapharyngeal fat (*arrowhead*); in this case, both are uninvolved. The patient subsequently underwent nodal biopsy, which revealed EBV and metastatic carcinoma.