

Postoperative and Postradiation Changes on Imaging

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KEYWORDS

• Neck dissection • Post radiation neck • Diffusion neck • Perfusion neck

KEY POINTS

- Assessment of the posttherapy neck creates compound challenges because of alterations in normal anatomy that usually provide a framework for interpretation for the radiologist.
- Interpreting imaging in the immediate postoperative period is often complicated by a variety of normal trauma-related changes involving the soft tissue in and around the operative bed: subcutaneous emphysema, edema, hemorrhage, cellulitis, and lymph or suppurative fluid collections.
- The imaging appearance of flap reconstruction depends on the specific surgery performed. In general, the nerve supply to myocutaneous flaps is interrupted, which in combination with disuse leads to muscular fatty atrophy.
- Changes from radiation therapy are visible on posttreatment CT and MRI, most pronounced in the first month or two after irradiation, and may include thickening of the skin and platysma muscle, retropharyngeal edema, postradiation sialadenitis, lymphatic tissue atrophy, and thickening and increased enhancement of the pharyngeal walls and of the laryngeal structures.

INTRODUCTION

Imaging has always played an important role in pretherapy assessment of head and neck cancer providing crucial information on the anatomic extent of primary tumors, lymph nodal metastases, and involvement of critical adjacent structures that can preclude surgical resection. Although assessment of the pretherapy neck has its

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own challenges (eg, poor contrast enhancement in tumors causing difficulty in margin delineation), these are only compounded in the posttherapy neck because of alterations in normal anatomy that usually provide a framework for interpretation for the radiologist. This article discusses the normal appearance of the posttherapy neck after common surgical procedures and chemoradiation therapy. The recognition of complications and disease recurrence is emphasized with illustrated examples.

THE POSTSURGICAL NECK

Types of Neck Dissection

Although there are a variety of classification schemes for the surgical management of neck disease in head and neck cancer, the nomenclature most widely used is the one developed by the Committee for Head and Neck Surgery and Oncology of the American Academy of Otolaryngology/Head and Neck Surgery.¹ It is based on the concept that a full radical neck dissection (RND) is the standard for treating nodal cervical disease in patients with head and neck cancer, and all other procedures involve one or more modifications of the RND. There are five limited surgeries that involve the preservation of one or more nonnodal structures or nodal groups¹: (1) modified RND (MND), (2) supraomohyoid selective neck dissection (SND), (3) lateral SND, (4) posterolateral SND, (5) anterior compartment SND.

The option to perform a more extensive operation than the full RND also exists, and is referred to as an extended RND. On occasion surgeries do not precisely fit into this classification scheme because certain nodal levels were or were not resected, and should be described accordingly. If MND is performed for limited disease in an N1 or N2 neck, the nonnodal structures spared should be specifically mentioned in the report.

RND

The imaging-based numerical cervical lymph node classification scheme devised by Som and colleagues² as a radiologic adjunct to the widely accepted clinically based scheme devised by the American Joint Committee on Cancer and the American Academy of Otolaryngology-Head and Neck Surgery^{1,2} is used in this article. In the setting of extensive neck disease, with or without extracapsular nodal spread, RND is the operation of choice and is often followed by radiation therapy (RT) (the effects of radiation as it pertains to imaging are described later). Traditionally, this applies to patients with disease surrounding the spinal accessory nerve (SAN) or the internal jugular vein (IJV). The procedure includes en bloc resection of all ipsilateral cervical lymph nodes extending from the body of the mandible superiorly to the clavicle inferiorly, and from the lateral border of the sternohyoid muscle, hyoid bone, and contralateral anterior belly of the digastric muscle anteriorly to the anterior border of the trapezius muscle posteriorly.¹ Included along with the levels I through V lymph node groups are the ipsilateral SAN, IJV, submandibular gland (SMG), and sternocleidomastoid muscle (**Fig. 1**).

MND

MND is performed in patients with limited nodal disease not fixed to or directly infiltrating the aforementioned nonlymphatic structures. The MND involves en bloc resection of lymph node groups I through V, but spares one or more of the ipsilateral nonlymphatic structures removed during RND: the SAN, IJV, SMG, and SCM (**Fig. 2**). As such, it is important to specifically mention what structures were preserved

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