Imaging of Vascular Lesions of the Head and Neck

Jared M. Steinklein, MD*, Deborah R. Shatzkes, MD*

KEYWORDS

• Hemangioma • Lymphatic • Venous • Arteriovenous • Malformation • Pediatric • Head and neck • Radiology

KEY POINTS

- Diagnostic imaging plays an important role in the diagnosis of vascular lesions in the head and neck.
- Imaging provides precise lesional mapping of malformations, with MRI being the preferred imaging modality.
- Imaging may offer a differential diagnosis when a lesion differs from classic patterns, which are discussed in this article.

INTRODUCTION

Diagnostic imaging has an important role in both the diagnosis and management of vascular lesions of the head and neck. Imaging confirms the diagnosis, maps the lesion, identifies associated anomalies, and provides surveillance of disease and/or response to therapy.[1] The true nature and extent of a clinically evident vascular lesion may not be fully appreciated until the lesion is imaged.[2] In addition, imaging provides a means for guided therapy for some vascular anomalies. With advances in imaging technology, including multiplanar and cross-sectional technique, imaging provides intricate detail as to lesional mapping and relationship to adjacent vital structures. Furthermore, discovery of additional anomalies may lead to the diagnosis of a clinical syndrome. This article provides an overview of imaging techniques and discusses and displays imaging findings of vascular tumors, such as hemangiomas, vascular malformations, and other anomalies.

In the armamentarium of a radiologist are varied imaging modalities, each having their advantages and disadvantages. Ultrasound is readily available and noninvasive,

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Department of Radiology, Lenox Hill Hospital, 100 East 77th Street, Radiology 3rd Floor, New York, NY 10075, USA
* Corresponding authors.
E-mail addresses: jsteinklein@northwell.edu (J.M.S.); dshatzkes@northwell.edu (D.R.S.)

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can be performed without anesthesia, and best evaluates superficial lesions while limited in evaluating deeper soft tissue and bony anatomy. Computed tomography (CT) is the traditional cross-sectional technique for evaluating both the bony and the deeper anatomy, but its use of ionizing radiation makes it less preferable in the pediatric population, particularly when multiple imaging examinations are required for follow-up. In the last few decades, MRI has become an indispensable imaging tool with its superior contrast resolution for soft tissues and lack of ionizing radiation. Disadvantages of MRI include lengthy acquisition time and the need for the patient to stay still. In the pediatric population, this may require anesthesia or moderate sedation to ensure diagnostic image quality. With the evolution of noninvasive imaging techniques, catheter angiography is generally reserved for treatment; a discussion of transcatheter treatment applications and techniques is beyond the scope of this article.

Because MRI provides the most discriminatory detail of soft tissue, it is the mainstay in the imaging evaluation of vascular anomalies. This article focuses therefore on the MRI findings of specific lesions and presents a simplified algorithm for the radiologist and clinician to best narrow the differential diagnosis.

TECHNICAL CONSIDERATIONS

Using a high-frequency transducer, ultrasonography provides excellent spatial resolution of superficial structures. Deeper lesions are seen but at a lower spatial resolution, and sometimes incompletely if obscured by bony anatomy.[3,4] Vascular anatomy is often imaged with ultrasound because of its real-time ability to demonstrate flowing objects and Doppler technique to quantify flow. As a first-line diagnostic tool, ultrasound confirms the presence of a vascular mass and can assess for venous or arterial-type flow.[4,5]

CT uses ionizing radiation akin to conventional radiography and is generally less preferred than MRI. Current multidetector systems allow the postprocessing of image data into multiplanar reconstructed image sets.[6] Although soft tissue resolution of CT is inferior to MRI, CT is well suited to assess bony anatomy and the presence of calcification, for example, a phlebolith of a venous malformation (VM). Another benefit of CT is its quick acquisition time, with most scans performed in less than 1 minute. This benefit is useful in an emergency care situation or when sedation for MRI is not available.

Cellular injury from ionizing radiation is a cumulative phenomenon. Although a single CT examination may impose a minimal amount of radiation, repeated examinations do incur cumulative dose. Total cumulative dose is causally related with increased risk of pediatric cancers.[7] In recent years, CT manufacturers have developed algorithms to process and reconstruct imaging data of lower dose scans while maintaining image quality.[8] The Image Gently campaign and the Society of Pediatric Radiology provide guidelines and resources to minimize ionizing radiation dose for imaging procedures, available at their Web site www.imagegently.org.

For the most part, vascular lesions, as the name implies, have some connection to local vascular supply and will enhance following intravenous contrast administration. Contrast-enhanced imaging is the standard of care for both CT and MRI. For CT, iodinated contrast agents are generally safe for use in children. Contrast reactions may be mild and include hives or rash, or, rarely, may be more severe, resulting in anaphylaxis. Contrast-induced nephropathy may occur in patients with underlying renal insufficiency.

MRI has emerged as the primary modality for the evaluation of most vascular anomalies.[5] Using a superconducting magnet and selective image parameters, MRI