

Imaging Spectrum of Pediatric Neck Masses: A Pictorial Review with Emphasis on Radiological Differentiation

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ABSTRACT

Background: Pediatric neck masses are a common clinical presentation and often pose a diagnostic challenge due to their diverse etiologies. Imaging plays a crucial role in narrowing differential diagnoses and guiding management.

Objective: To illustrate and characterize the imaging features of pediatric neck masses using ultrasound (US), computed tomography (CT), and magnetic resonance imaging (MRI), and to highlight key differentiating features based on institutional cases and literature review.

Methods: This pictorial review includes a spectrum of pediatric neck masses categorized into congenital/developmental, neoplastic, and infectious etiologies. Imaging findings from ultrasound, CT, and MRI are described, with emphasis on distinguishing characteristics.

Results: Congenital lesions such as thyroglossal duct cysts, cystic hygromas, dermoid cysts, and thymic cysts demonstrate characteristic imaging patterns. Neoplastic lesions, including neuroblastoma, rhabdomyosarcoma, and lymphoproliferative disorders, show variable but distinctive radiologic features. Infective causes such as lymphadenitis and deep neck abscesses exhibit typical inflammatory imaging findings.

Conclusion: A structured imaging approach based on lesion characteristics and anatomical location allows accurate diagnosis and differentiation of pediatric neck masses, reducing diagnostic uncertainty and guiding appropriate management.

Keywords: Pediatric Neck Masses, Ultrasound, MRI, CT, Thyroglossal Duct Cyst, Cystic Hygroma, Neuroblastoma

Introduction

Neck masses are frequently encountered in the pediatric population and can present a diagnostic dilemma for clinicians. Their etiology is broad, encompassing congenital, inflammatory, and neoplastic causes. Accurate diagnosis is essential for timely and appropriate management.

Pediatric neck masses may be classified based on age at presentation, anatomical location, imaging characteristics, or underlying etiology. Imaging plays a pivotal role in evaluation, with ultrasound (US) serving as the first-line modality due to its lack of ionizing radiation and accessibility. Cross-sectional imaging with computed tomography (CT) and magnetic resonance imaging (MRI) is often employed for further characterization and problem-solving, particularly in complex or acute cases.

Materials and Methods

This pictorial review is based on pediatric cases encountered at our institution. Imaging findings were analyzed using ultrasound, CT, and MRI. Lesions were categorized into:

- Congenital and developmental
- Neoplastic
- Infectious

Relevant literature was reviewed to support imaging interpretations and differential diagnoses.

Imaging Findings and Discussion

Congenital and Developmental Lesions

Thyroglossal Duct Cyst

Typically presents as a midline cystic lesion near the hyoid bone.

- **Ultrasound:** Anechoic, avascular lesion with posterior acoustic enhancement
- **CT:** Well-defined cyst with attenuation <20 HU
- **MRI:** Hypointense on T1, hyperintense on T2

Cystic Hygroma (Lymphangioma)

The most common lymphatic malformation, often located in the posterior triangle.

- Ill-defined, multiloculated cystic lesion
- May appear pseudo-solid on US due to internal echoes
- MRI: Low T1, high T2/STIR signal
- Differential: Occipital meningocele (associated with skull defect)

Dermoid Cyst

Uncommon but important differential for midline neck masses.

- Located near the hyoid or floor of mouth
- May mimic thyroglossal duct cyst
- Slow-growing, often presenting later in childhood

Thymic Cyst

Arises due to abnormal descent of thymic tissue.

- Found along thymopharyngeal tract
- Ultrasound: Echotexture similar to liver parenchyma
- May extend into deeper fascial planes

Neoplastic Lesions**Neuroblastoma**

A common pediatric malignancy; neck involvement often represents metastasis.

- Heterogeneous soft tissue mass
- MRI: T1 hypointense, T2 hyperintense with diffusion restriction
- CT: May show calcifications

Rhabdomyosarcoma

Most common pediatric soft tissue sarcoma.

- Aggressive lesion with local invasion
- May involve adjacent structures and lymph nodes
- Common in head and neck region

Lymphoma and Leukemia**Present as lymphadenopathy.**

- Ultrasound: Hypoechoic, round nodes with absent hilum
- CT: Nodes isodense to muscle
- Calcification usually post-treatment
- MRI useful for CNS involvement assessment

Infectious Lesions**Lymphadenitis**

- Enlarged lymph nodes with increased vascularity
- May show central necrosis

Deep Neck Abscesses (Retropharyngeal / Peritonsillar)

- Rim-enhancing collections on CT
- Associated with surrounding inflammatory changes
- Require prompt diagnosis due to airway risk

Discussion

A systematic imaging approach based on lesion location, morphology, and internal characteristics is essential in evaluating pediatric neck masses. Ultrasound remains the initial modality of choice, while CT and MRI provide additional anatomical detail and tissue characterization.

Recognition of characteristic imaging features helps narrow differential diagnoses and reduces the need for invasive procedures. Correlation with clinical presentation further enhances diagnostic accuracy.

Conclusion

Pediatric neck masses encompass a wide spectrum of pathologies. Familiarity with their imaging appearances across modalities enables accurate diagnosis and appropriate management. A structured radiological approach is essential to distinguish between congenital, neoplastic, and infectious causes.