Neckmasses in infancy and childhood:
Clinical and radiological classification and imaging approaches

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Introduction

- Neck masses are a frequent finding in pediatric age.
- From clinical point of view the neck masses should be classified in different age groups.
- Congenital malformations and anomalies will reveal in the first 3 months of life.
- Acquired neck masses should be suspected later in life including complications of congenital anomalies.
Introduction

- Lymphadenitis as a neck mass is a frequent finding appearing in late infancy and early childhood and is mostly unspecific.
- In late childhood neoplastic masses including malignant lymphoma and soft tissue tumours are more frequently observed.
A. Submandibular triangle (suprahyoid division)
B. Submental triangle (suprahyoid division)
C. Infrahyoid division of anterior triangle
D. Posterior triangle
Imaging procedures

- Sonography
- MRI
- CT
- Nuclear scanning
- Fistulography or esophagography
- Angiography
Sonographic imaging

- Sonography is the first modality of choice in diagnostics of neck masses.
- It should be used as a modality in screening, follow-up and sonographic guided biopsy of neck masses.
- Cystic lesions are easily differentiated from solid masses.
- The anatomic location and its origin can often be recognized.
- Additional colour Doppler contributes largely in characterizing tumour type by its vascularity.
MR imaging

- Evaluation of benign or malignant neurogenic tumours and its relation to central nervous system.
- To assess the nature and extension of other soft tissue malignant masses.
- In addition to sonography in large and extended lymphangioiomas and hemangiomas.
CT and other imaging modalities

- CT angiography in vascular malformation.
- CT in diagnostics of cervicothoracic masses such as malignant lymphomas or others.
- CT of neck masses originated from the skeleton or secondary involvement.
- Nuclear scanning of neurogenic tumour (MIBG) masses originated from thyroid gland.
- Fistulography in thyroglossus cyst or branchogenic cysts with cutaneous fistula.
- Angiography in large vascular malformation.
## Congenital benign neck masses

<table>
<thead>
<tr>
<th>Cystic</th>
<th>Solid</th>
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<tbody>
<tr>
<td>Thyroglossal duct cysts</td>
<td>Cervical thymus</td>
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<td>Branchial cleft cyst</td>
<td>Fibromatosis colli</td>
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<tr>
<td>Cystic hygroma (lymphangioma)</td>
<td>Hemangioma</td>
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<tr>
<td>Dermoid cyst, teratoma</td>
<td>Hamartoma</td>
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<tr>
<td>Cervical thymus cyst</td>
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Thyroglossal duct cysts

Location: midline, mostly below the hyoid bone with close relation to the bone

Echogenicity: an- or hypoechoic, ovoid shaped
Branchial cleft cysts

Location: anywhere along the anterior border of musculus sternocleidomastoideus

Echogenicity: mostly anechoic, increased echogenicity in cases with infection

Fistulography: communication of cyst with laryngeal cavity
Cystic hygroma

Type:  
  a. simple composed or capillary sized lymphatics  
  b. cavernous  
  c. cystic hygroma

Location: mostly in posterior triangle with extension to other compartments

Echogenicity: diverse echogenicity depending on the type, varying from echogenic masses to large anechoic hygroma
Left-sided giant cystic hygroma
Dermoid cyst (1) and teratomas (2)

Location: mostly midline
Echogenicity: echogenic or complex with or without calcification
Cervicothoracal cystic thymus

Location: infrahyoid or anterior triangle with continuation in thoracic cage.

Echogenicity: hypoechoic fluctuating giant cystic mass

MRI: hyperintens on T2 with air-fluid level.
Cervical thymus

Location: infrahyoid or anterior triangle with continuation in thoracic cage

Echogenicity: hypoechoic (similar to normal located thymus)
Fibromatosis colli

Location: sternocleidomastoid muscle right- or left-sided

Echogenicity: increased echogenicity with respect to normal muscle
Hemangioma

- Capillary or cavernous type
- Location in all layers and regions of the neck
- Echogenicity: echogenic or predominantly hypoechoic with echogenic septation (cavernous type)
- Color Doppler: highly and low vascularized mass
- MRI: hyperintens highly vascularized mass (MRA) with extension to other parts of neck
Hemangioma
Hamartomatous tumor of neck

Location: variable

Echogenicity: inhomogenous with calcification

CT: calcificated tumor
Acquired inflammatory masses

1. Unsupperative and supperative lymphadenitis
2. Specified lymphadenitis
Non-suppurative lymphadenitis

Location: jugodigastric, along internal carotid sheath

Echogenicity: hypoechoic, larger than 5 mm

Color Doppler: only hilar vascularization
Supplicative lymphadenitis

Location: jugodigastric, deep internal jugular

Echogenicity: well-defined mass with fluid-filled areas, irregular hypo- or anechoic

Color Doppler: often with hypervascular rim
Specified lymphadenitis

Location: deep lateral cervical nodes

Echogenicity: inhomogeneous hypoechoic, frequently with calcification

TBC lymphadenitis
Specified lymphadenitis

Location: deep lateral cervical nodes
Echogenicity: inhomogeneous hypoechoic

Sarcoidosis

Chronic granulomatous disease
Atypical mycobacterial lymphadenitis

Location: deep lateral cervical nodes

Echogenicity: inhomogeneous hypoechoic, frequently with calcification
Non-inflammatory benign and malignant masses

1. Benign neck masses
2. Lymphoma, Hodgkin disease, etc
3. Neuroblastoma
4. Rhabdomyosarcoma
Lipoma

Location: anywhere in the body, especially subcutis

Echogenicity: inhomogenous hypo- or echogenic

MRI: hyperintens on T1WI
Aggressive fibromatosis

Location: around mandible

Echogenicity: inhomogenous, hypo- and hyper-echogenic mass

MRI: hypointens on T1, moderate hyperintens on T2
Neurofibromas or schwannomas

Location: paraspinal

Echogenicity: hypoechoic

MRI: hyperintens on T2W1
Burkitt lymphoma

Location: lateral cervical chain

Echogenicity: mostly large in size, hypoechoic or heterogenous echopattern
Hodgkin disease

Location: lateral cervical chain

Echogenicity: mostly large in size, hypoechoic or heterogenous echopattern

CT: hypodens masses in neck extending into mediastinum
Neuroblastoma

**Location:** paraspinal

**Echogenicity:** echogenic mostly with calcified notches

**MRI:** hypointens on T1 and T2

![Images of ultrasound, MIBG, and MRI scans related to neuroblastoma.](image-url)
Rhabomyosarcoma

Location: mostly originating from parapharyngeal spaces

Echogenicity: hypoechoic

MRI: hypointens on T1 and mildly hyperintens on T2
Conclusion

- Neck masses recognized in the first 3 months of age are mostly congenital.

- Acquired inflammatory masses such as lymphadenitis are observed in late infancy and early childhood.

- Lymphadenitis is rarely specific.

- Malignant lymphoma appears mostly in late childhood.
Conclusion

- Sonography is the first modality of choice in screening and follow up of neck masses.

- MRI should be performed in all benign and malignant neurogenic masses as well as other malignant soft tissue tumours and giant cystic masses.

- CT is a useful modality in assessment of cervicothoracic masses.
Conclusion

- The use of other modalities depends on clinical and sonographic findings.

- Attention should be paid to the choice of modality in relation to radiation dose and its invasivity.