

# Paediatric neck lumps

## *An approach for the primary physician*

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### Background

Paediatric cervical masses are a common presentation in general practice causing significant parental anxiety and a potential diagnostic dilemma. While these masses are commonly benign, a broad array of diagnostic possibilities exist. Sound knowledge of relevant anatomy and a systematic approach in history, examination and investigations are crucial to ensure appropriate assessment and management.

### Objectives

The aims of this article are to review the common and red flag causes of paediatric neck masses and to provide a pragmatic approach to assessment and management in general practice.

### Discussion

While paediatric neck lumps encountered in general practice are most commonly benign, a number of aetiologies require further investigation and aggressive management. A focused history and examination is crucial to ensure red flag conditions are not missed while avoiding unwarranted investigation and parental anxiety.

**NECK LUMPS** in children are a common presentation encountered in general practice. While these masses are most often benign, they can elicit significant anxiety in carers of the child and present a diagnostic dilemma for physicians.

A broad array of differential diagnoses exists, many of which require specialist referral and aggressive management.<sup>1</sup>

The aetiology of paediatric cervical masses is often divided into the broad categories of congenital, inflammatory/infective and neoplastic (Table 1).<sup>2</sup> While the majority of paediatric neck lumps seen in general practice occur as a result of an inflammatory/infective process, persistent congenital abnormalities and red flag neoplastic diagnoses must be considered (Table 2).<sup>3</sup> Numerous aspects of history and examination help to guide diagnosis towards one of these categories.

### History

#### Timeline

Cervical masses in the neonatal period and early infancy are predominantly congenital and may include teratomas, sternocleidomastoid tumours of infancy and vascular or lymphatic malformations.<sup>4</sup> Vascular and lymphatic malformations are present at birth and typically grow commensurately with the growth of the child. Reactive lymphadenopathy is most common in infancy and early childhood, with 40–55% of young children found to have palpable cervical lymph nodes.<sup>5</sup>

Congenital masses may present in later childhood/adolescence because of continuous growth or superimposed infection, while the likelihood of malignancy also rises in this age group.<sup>2</sup>

### Time course

Rapidly developed masses are typically inflammatory and may include reactive lymphadenopathy, lymphadenitis or secondary infection of underlying congenital or neoplastic masses. Inflammatory pathology typically resolves within four weeks. Cervical masses that persist past six weeks warrant further evaluation.

Rapidly growing masses should be immediately referred if they are thought to potentially affect the airway or have features suggestive of abscess formation. Masses that grow at a slower rate, for months to years, are suggestive of benign neoplasms or a slowly enlarging congenital malformation.

### Associated symptoms

Viral prodrome, fevers and cervical tenderness are associated features consistent with reactive lymphadenopathy. It is, however, important to consider suppurative lymphadenitis or infection of an underlying congenital or neoplastic mass, as this may present similarly. Malignant neck masses in children are typically asymptomatic, although they can become infected secondarily. Constitutional symptoms including

weight loss and night sweats are included in a range of red flag features concerning for malignancy (Table 3). Symptoms suggestive of anaemia or thrombocytopenia or symptoms that may immunocompromise the patient are concerning for haematological malignancy.

#### Associated risk factors and exposures

Personal history of, or exposure to others with, upper respiratory tract infection raises the likelihood of reactive lymphadenopathy. Risk factors for more atypical infections such as cat-scratch disease and mycobacterial infection include animal exposure, overseas travel and tick bites. The patient's history of irradiation and their family's history of malignancy should also be reviewed as malignancy risk factors.

### Examination

#### Location

The location of the cervical mass provides some guidance in diagnosis (Table 1). Midline masses are more likely congenital and are typically thyroglossal duct cysts or dermoid cysts. Thyroglossal duct cysts are the most common midline congenital

abnormality and may arise anywhere along the embryological pathway of the thyroid from the base of the tongue to the final position of the thyroid gland; however, they are most commonly found at the level of the hyoid bone. Thyroglossal duct cysts will elevate with tongue protrusion or swallowing, while dermoid cysts are tethered to the overlying skin. Thyroid masses are potentially malignant and need further evaluation. Lymphadenopathy commonly arises as a lateral lump in the anterior or posterior triangle, and may present an inflammatory or neoplastic process. Lymphadenopathy in the posterior triangle has a higher risk of malignancy, while supraclavicular lymphadenopathy is considered a red flag.<sup>6</sup> Other masses of the lateral neck include lymphatic and vascular malformations and branchial cleft cysts.

#### Palpation

Reactive lymphadenitis is typified by a local collection of small, tender, mobile lumps. The possibility of suppurative lymphadenitis should be considered if there is palpable warmth, fluctulence, induration or severe tenderness. Red flags concerning for malignancy include firm, irregular masses that are immobile or fixed (Table 3).<sup>6</sup>

#### Size

Review of the lump size is a simple measure that can help determine level of clinical concern. Palpable cervical lymph nodes less than 1 cm in size can be considered normal in children, while increasing node size is associated with a significantly increased risk of malignancy.<sup>6</sup> Lymph nodes greater than 1 cm in size that persist for longer than six weeks or despite antibiotic therapy should be evaluated with medical imaging and a possible tissue biopsy.

#### General examination

An ear, nose and throat examination should be performed to identify any local sources of infection. An examination for peripheral stigmata of haematological malignancy, such as signs of pancytopenia or generalised lymphadenopathy, should also be conducted.<sup>7</sup>

#### Investigations

A dilemma faced by general practitioners (GP) is when to employ watchful waiting and when to investigate further with potentially invasive investigations. While

**Table 1. Paediatric cervical masses according to anatomical location**

Location	Aetiology		
	Congenital	Inflammatory/infective	Neoplastic
<b>Submental</b>	Thyroglossal cyst Dermoid cyst	Sialadenitis Lymphadenitis Reactive lymphadenopathy	Malignant lymphadenopathy Benign connective tissue tumour
<b>Submandibular</b>	Vascular or lymphatic malformation Branchial cleft cyst	Sialadenitis Lymphadenitis Reactive lymphadenopathy	Malignant lymphadenopathy Salivary gland tumour Benign connective tissue tumour
<b>Carotid triangle</b>	Vascular or lymphatic malformation Branchial cleft cyst	Lymphadenitis Reactive lymphadenopathy Sternocleidomastoid tumour of infancy	Malignant lymphadenopathy Benign connective tissue tumour
<b>Muscular triangle</b>	Thyroglossal duct cyst Dermoid cyst	Goitre	Thyroid tumour Benign connective tissue tumour
<b>Posterior triangle</b>	Vascular or lymphatic malformation	Lymphadenitis Reactive lymphadenopathy	Malignant lymphadenopathy Benign connective tissue tumour

Adapted with permission from Meier J, Grimmer JF. Evaluation and Management of Neck Masses in Children. *Am Fam Physician* 2014;89(5):353–58.

there is no strong evidence for the value of a routine full blood count (FBC), it is recommended if systemic disease is suspected or if the diagnosis of infection is uncertain.<sup>8</sup> An FBC and blood film may help identify pancytopenia and atypical cells suggestive of haematological malignancy, while the differential may suggest a viral or bacterial pathology. Targeted serological investigations for atypical infections (Table 4) may be indicated if the patient has associated risk factors or if a presumed reactive lymphadenitis has not improved with conservative management.

Ultrasonography (USS) is a readily accessible, inexpensive and radiation-free

imaging modality that can provide crucial information about the location, size and consistency of a cervical mass. For this reason, ultrasound is the preferred initial imaging study for most children with a neck mass.<sup>9</sup> USS can identify features typical of numerous congenital masses as well as benign and malignant lymphadenopathy, and can provide guidance for fine needle aspiration (FNA) if deemed necessary. USS is the initial imaging modality of choice for thyroid gland pathology including malignancy and thyroglossal duct cysts. Computed tomography (CT) involves radiation exposure and should be avoided in children unless a malignancy or deep cervical abscess is suspected. Magnetic

resonance imaging (MRI) is an increasingly available and popular alternative to CT and is considered the gold standard imaging study for vascular malformations. While MRI does not involve radiation exposure, the frequent requirement for sedation in the paediatric population does decrease its utility.<sup>9</sup>

Histopathology may be required to confirm diagnoses and guide treatment in certain cases. The use of FNA in children is controversial and should only be performed by clinicians with expertise in the paediatric population. While FNA can be traumatic and carries a risk of inadequate tissue sampling, it is considered a highly sensitive and specific

**Table 2. Comparison of common benign and red flag conditions**

Condition	Pathophysiology	Clinical features	Management
<b>Thyroglossal duct cysts</b>	<ul style="list-style-type: none"> <li>• Congenital abnormality that may present at any age, though typically diagnosed prior to adulthood</li> <li>• Occurs as a result of failure of the thyroglossal duct to involute</li> </ul>	<ul style="list-style-type: none"> <li>• Most common midline congenital neck mass<sup>13</sup></li> <li>• Arises anywhere along the midline path of the thyroglossal duct</li> <li>• Suspect if ongoing midline mass following resolution of infection</li> </ul>	<ul style="list-style-type: none"> <li>• If asymptomatic, can be managed conservatively</li> <li>• Treatment involves surgical excision (Sistrunk's procedure)</li> </ul>
<b>Branchial cleft abnormality</b>	<ul style="list-style-type: none"> <li>• Congenital abnormality that may present at any age, though typically diagnosed prior to adulthood</li> <li>• Occurs as a result of failure of the pharyngeal clefts to involute</li> </ul>	<ul style="list-style-type: none"> <li>• Most common lateral congenital neck mass<sup>14</sup></li> <li>• May present as a cyst, sinus or fistula that can become infected</li> <li>• Can arise in numerous positions in the head and neck, most typically in the anterolateral neck</li> </ul>	<ul style="list-style-type: none"> <li>• If asymptomatic, can be managed conservatively</li> <li>• Treatment involves surgical excision</li> </ul>
<b>Reactive lymphadenopathy</b>	<ul style="list-style-type: none"> <li>• Occurs secondary to a local infective or inflammatory process</li> <li>• May be complicated by secondary infection</li> </ul>	<ul style="list-style-type: none"> <li>• Most common cause for paediatric neck mass<sup>15</sup></li> <li>• Presents with transiently enlarged, tender lymph nodes</li> <li>• May occur at any age, though most commonly seen in infancy</li> </ul>	<ul style="list-style-type: none"> <li>• Expectant management appropriate for up to six weeks</li> <li>• Empiric antibiotics may be used if bacterial infection is suspected</li> </ul>
<b>Lymphoma</b>	<ul style="list-style-type: none"> <li>• Diffuse group of malignant tumours of lymphoid tissue</li> <li>• Hodgkin's lymphoma is differentiated by the presence of Reed-Sternberg cells</li> </ul>	<ul style="list-style-type: none"> <li>• Most common cause for malignant paediatric neck mass<sup>16</sup></li> <li>• Rare in children younger than five years</li> <li>• Hodgkin's lymphoma presents with cervical adenopathy more commonly than non-Hodgkin's lymphoma<sup>17</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Depending on the cell subtype, treatment involves chemotherapy or radiotherapy</li> </ul>
<b>Rhabdomyosarcoma</b>	<ul style="list-style-type: none"> <li>• Thought to arise from primitive striated muscle cells</li> <li>• Most cases are sporadic, though an association with neurofibromatosis and Li Fraumeni syndrome exists</li> </ul>	<ul style="list-style-type: none"> <li>• Incidence peaks at age 2–5 years and 15–19 years</li> <li>• Most common soft tissue malignancy in children</li> <li>• Up to 89% of cases present in the neck<sup>18</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Management may involve a combination of surgery, radiotherapy and chemotherapy</li> </ul>

investigation (both reported up to >90%) and is less invasive than open biopsy.<sup>10,11</sup> The requirement for general anaesthesia in paediatric FNA has been reported to be as high as 76%, evidencing the careful consideration that should be undertaken when ordering this investigation.<sup>8</sup>

### Management

Unfortunately, no proven algorithm for managing paediatric neck masses exists. As such management depends on the use of sound clinical judgement and judicious surveillance for red flags. Watchful waiting for up to six weeks is recommended for patients with suspected reactive lymphadenitis (bilateral lymphadenopathy with no red flag features for malignancy or deep cervical abscess). The use of empirical

antibiotics is controversial, although widely accepted, in patients thought to have suppurative lymphadenitis (eg lymphadenopathy with marked erythema and tenderness, asymmetric lymphadenopathy and systemic symptoms). A 10-day course of amoxicillin/clavulanate, cephalexin or clindamycin is recognised as appropriate coverage for the most commonly involved organisms.<sup>12</sup> If symptoms have not improved with antibiotics or if the mass persists longer than four weeks, investigation with USS and serological screens for atypical infections including mycobacteria (Table 4) is warranted. It is recommended that patients with suspected reactive lymphadenitis are referred to a head and neck surgeon if the patient's condition deteriorates while on antibiotics, the mass persists longer than six weeks of observation or a collection requiring incision and drainage develops.

Timely referral to a head and neck surgeon for consideration of surgical management is advised for all suspected congenital neck masses. Medical imaging (typically USS) should be considered within the referral process to aid diagnosis and prompt expedition of specialist management. Secondary infection of a congenital mass may require more urgent specialist review when the patient does not respond to oral antibiotics and may result in expedited surgical management following resolution of infection.

All neck masses suspicious for non-haematological malignancy (Table 3) are best referred urgently to a head and neck surgeon for further evaluation including possible biopsy. Medical imaging, including USS, CT or MRI, may be considered as part of the referral.

### Conclusion

While paediatric cervical masses are most commonly benign and transient in nature, consideration of red flag and congenital conditions is recommended. Suspected inflammatory masses not resolving with expectant management may require timely referral to a head and neck surgeon. Judicious use of investigations may avoid unnecessary stress and

anxiety for patients and their carers, while expediting diagnosis and therapy where appropriate.

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### References

- De Carvalho GM, De Lavor MS, Rickli JCK, Takara TMF, Guimarães AC, Crespo AN. Pediatric neck mass. *Int J Paediatr* 2015;3(6.1):1005-14.
- King SK. Lateral neck lumps: A systematic approach for the general paediatrician. *J Paediatr Child Health* 2017;53(11):1091-95. doi: 10.1111/jpc.13755.
- Connolly AAP, MacKenzie K. Paediatric neck masses – A diagnostic dilemma. *J Laryngol Otol* 1997;111(6):541-45. doi: 10.1017/S0022215100137867.
- Hutson JM, Beasley SW. The Neck. The surgical examination of children. 2nd edn. Berlin: Springer Science and Business Media, 2012, p. 101-21. doi: 10.1007/978-3-642-29814-1.
- Badawy MK. Pediatric neck masses. *Clin Pediatr Emerg Med* 2010;11(2):73-80. doi: 10.1016/j.cpem.2010.05.004.
- Soldes OS, Younger JG, Hirsch RB. Predictors of malignancy in childhood peripheral lymphadenopathy. *J Pediatr Surg* 1999;34(10):1447-52. doi: 10.1016/S0022-3468(99)90101-X.
- Ferrer R. Lymphadenopathy: Differential diagnosis and evaluation. *Am Fam Physician* 1998;58(6):1313-20.
- Meier J, Grimmer JF. Evaluation and management of neck masses in children. *Am Fam Physician* 2014;89(5):353-58.
- American College of Radiology. ACR Appropriateness Criteria: Neck mass/adenopathy. Philadelphia: American College of Radiology, 2018. Available at <https://acsearch.acr.org/docs/69504/Narrative/> [Accessed 22 March 2019].
- Huyett P, Monaco SE, Choi SS, Simons JP. Utility of fine-needle aspiration biopsy in the evaluation of pediatric head and neck masses. *Otolaryngol Head Neck Surg* 2016;154(5):928-35. doi: 10.1177/0194599816631728.
- De Corti F, Cecchetto G, Vendraminelli R, Mognato G. Fine-needle aspiration cytology in children with superficial lymphadenopathy. *Pediatr Med Chir* 2014;36(2):80-82.
- Leung AK, Robson WL. Childhood cervical lymphadenopathy. *J Paediatr Health Care* 2004;18(1):3-7.
- Ayugi JW, Ogeng'o JA, Macharia IM. Pattern of congenital neck masses in a Kenyan paediatric population. *Int J Pediatr Otorhinolaryngol* 2010;74(1):64-66. doi: 10.1016/j.ijporl.2009.10.012.

**Table 3. Red flag features of presentation**

Weight loss
Sustained fevers/night sweats
Generalised lymphadenopathy
Signs and symptoms of pancytopenia
Mass persisting >6 weeks
Lymph node >3 cm
Thyroid mass
Supraclavicular mass
Hard, irregular mass
Fixed mass

**Table 4. Investigations for atypical infection in lymphadenopathy**

Purified protein derivative for tuberculosis
Bartonella henselae titre (cat-scratch disease)
Epstein-Barr virus titre
Cytomegalovirus titre
Human immunodeficiency virus titre
Toxoplasmosis titre

14. Adil E. Pediatric congenital neck masses. *Oper Tech in Otolaryngol Head Neck Surg* 2017;28(3):137.
15. Gómez Cadavid E, Giraldo LM, Espinal DA, Hurtado IC. [Clinical and histological characteristics of adenopathies in paediatric patients.] *Rev Chil Pediatr* 2016;87(4):255-60. doi: 10.1016/j.rchipe.2015.11.007.
16. Rizzi MD, Wetmore RF, Potsic WP. Differential diagnosis of neck masses. In: *Otolaryngology – Head and neck surgery*. 2nd edition. St Louis: Mosby Year Book, 1992. p. 3055-64.
17. Geddes G, Butterly MM, Patel SM, Marra S. Pediatric neck masses. *Pediatr Rev* 2013;34(3):115-25. doi: 10.1542/pir.34-3-115.
18. Rizzi MD, Wetmore RF, Potsic WP. Differential diagnosis of neck masses. In: *Cummings pediatric otolaryngology*. 1st edn. Philadelphia: Elsevier Saunders, 2015. p. 245-54.

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