Case report

Challenges in diagnosing ectopic thymus tissue in children

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Accepted 21 August 2019

SUMMARY

The presentation of a fast-growing cervical mass necessitates prompt attention due to risk of the mass effect on vital structures and requires preferential screening for infections, bleeding and malignancies in an extensive list of differential diagnoses. This case report describes a 4.5-year-old boy with a fast-growing, unilateral lesion in the neck, with clinical features in keeping with malignant characteristics. Surgical excision with pathocytological examination revealed an exceptional diagnosis of haemorrhage in an ectopic cervical thymic cyst. Thymic cysts are a rare cause of unilateral masses in the neck, usually presenting as an asymptomatic, painless, slow-growing or stable mass anywhere along the thymopharyngeal duct. Spontaneous haemorrhages in thymic tissue can occur, often due to coagulation defects. Treatment of symptomatic thymic cysts is based on surgical excision. Partial resection of the thymus should be encouraged if possible, since clinical consequences of removing all thymic tissue in children are still unclear.

BACKGROUND

Fast-growing cervical masses require clinicians to investigate diverse differential diagnoses, including infectious and anatomical causes. Although they frequently appear to be benign, making the correct diagnosis is paramount for the exclusion of life-threatening diseases like tumorous processes.

We report the exceptional case of a 4.5-year-old boy with a fast-growing, tumour-like mass in the neck, which appeared to be an atypical presentation of a rare anatomical anomaly.

CASE PRESENTATION

A 4.5-year-old boy was referred to our department with a fast-growing swelling on the right side of his neck. The size of the mass had doubled in 1 day before receding in size prior to consultation, with the remaining dimensions of 3.5 cm x 2 cm. The swelling presented as painless, non-pulsatile and non-fluctuating without any signs of inflammation. Some local compression was suspected as was evident with a new-onset hoarseness. Clinical examination showed no further abnormalities apart from some subcentimetre lymph nodes in the inguinal region. No constitutional features such as fever, night sweating or weight loss were recorded. The patient's prior medical history was insignificant. The only notable family history was

that of a grandfather who had died of a pulmonary malignancy.

INVESTIGATIONS

Complete blood count revealed no cytopaenias that would indicate bone marrow abnormalities. Biochemical blood tests did not show any raised non-specific tumour markers, such as lactate dehydrogenase, ferritin or uric acid and inflammatory markers were normal. An ultrasound of the cervical region showed a unilateral, submandibular, asymmetric lobulated heterogeneous mass with maximal dimensions of 6×1.5×2.8 cm ([figure 1](#)) but no cystic component was demonstrated. An MRI with intravenous gadolinium revealed multilocular cystic components in a solid mass, situated in the deep carotid region, yet clearly demarcated from the surrounding structures ([figure 2](#)). A definitive diagnosis could not be made. Evaluation of the humoral immune system, often disturbed in B-cell pathologies, showed normal immunoglobulins. Neuron specific enolase, which is related to neuroendocrine tumours, was only slightly elevated. Urine sample for catecholamine levels was negative, excluding neuroblastoma. The chest X-ray could not identify any abnormal lymph nodes or other mediastinal abnormalities, suggesting the presence of a normal size thymus.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis included congenital anomalies such as branchial malformations and cysts, infective aetiologies and malignant lesions.

TREATMENT

An excision biopsy was done for both diagnostic and treatment purposes due to the fast-growing nature and possible malignant features of this tumour. The mass was localised around the hypoglossal nerve in the carotid triangle, above the vagal nerve.

Pathological examination revealed a complete resection of a 5.5×2.5×1.5 cm mass with central cystic structures. The peripheral wall of the cyst consisted of thymic tissue and connective tissue. Centrally, inside the lumen, cholesterol clefts, macrophages and giant cells were found. There was no associated thymopharyngeal duct. The diagnosis of a cervical thymic cyst was made. Traces of intracystic haemorrhage were found, which possibly explained the rapid increase in size of the cyst ([figure 3](#)).

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To cite: Claes L, Dendooven A, van Heerden J. *BMJ Case Rep* 2019;**12**:e228807. doi:10.1136/bcr-2018-228807

Figure 1 Ultrasound of the cervical lesion showing an asymmetric lobulated, heterogeneous mass in the carotid region.

OUTCOME AND FOLLOW-UP

Postoperatively, the hoarseness resolved completely with no further complications.

DISCUSSION

Cervical masses in children, whether benign or malignant, present with heterogeneous clinical signs, making benign childhood illnesses and malignant pathology nearly indistinguishable. Early diagnosis of malignancies improves treatment outcomes and thereby highlights the importance of sufficient awareness.¹ For this reason, a fast-growing cervical mass necessitates prompt attention with preferential screening for infectious aetiologies and bleeding, but also malignancies in an extensive list of differential diagnoses. A second important consideration is the limited space in the neck to accommodate an expanding lesion that could have significant, even fatal, physiological consequences due to the presence of small but vital anatomical structures.²

Important diagnostic clinical information that signals unfavourable pathology includes a longstanding non-tender, immobile, hard or irregular mass associated with systemic symptoms including night sweats, weight loss, fever, fatigue or hepatosplenomegaly.^{1,2} Valuable non-specific biochemical information like leucopenia and elevated levels of serum C-reactive protein, lactate dehydrogenase or uric acid³ can delineate between infections and increased cell activity while an elevation of ferritin and erythrocyte sedimentation rate may be associated with tumours or chronic diseases.⁴

When a neoplastic disorder has been excluded, the differential diagnosis of a cervical lesion is extensive, including infectious causes like Epstein-Barr virus, cat scratch disease, tuberculosis and abscess. Benign masses like haematomas, haemangiomas and dermoid cysts are clinically difficult to distinguish

Figure 3 The resection specimen showed connective tissue and thymic tissue, characterised by a very basophilic cortex mainly composed of small lymphoid cells and a more clear-looking medulla with characteristic Hassall's corpuscles (A, C). Centrally, we see a cyst wall, with many cholesterol clefts and multinucleated giant cells. This probably reflects trauma and bleeding of the cyst. In some parts, some residual cystic epithelium was present (B, D).

from anatomical abnormalities such as branchial cleft cysts in the absence of a hallmark symptomatology to support the diagnosis.^{5,6}

This case report presents an exceptional aetiology, describing an ectopic cervical thymic cyst. The thymus is an important immunological organ during childhood. As a primary lymphoid organ its principal role is in the proliferation and maturation of lymphoid progenitors or thymocytes. Selected thymocytes migrate from the cortex to the medulla to become mature immunocompetent T cells, primed to attack foreign cells.⁷ Moreover, a negative selection of potential self-reactive T cells is made to avoid autoimmunity.^{8,9} The newly generated T cells, called 'thymic emigrants', go through a final maturation step outside the thymus.⁹ An over-representation of thymic emigrants is seen in patients with auto-immune diseases, suggesting they might play a role in their pathophysiology.⁷

Thymic cysts are a rare cause of a unilateral mass in the neck, representing 0.3% of all congenital cervical cysts in children.¹⁰ Ectopic cervical thymus, with or without cysts, presents at any age, but is less frequent in older age groups.¹¹ Thymic remnants can be found anywhere along the thymopharyngeal duct which follows the embryonic descent of the thymus from the neck to the mediastinum.¹⁰ Unsuccessful regression of this canal can lead to the formation of a congenital cervical thymic cyst with remnants of thymopharyngeal duct.¹⁰ A second anatomical variant without ductal fragments arises due to the degeneration of Hassall's corpuscles in ectopic thymic remnants.^{6,10} Only 20% to 30% of thymic cysts are located on the right side of the neck; the basis of this predilection is at present unidentified.⁶ The cysts usually present in the first decade of life as an asymptomatic, painless, slow-growing or stable mass in the lateral aspect of the neck, occasionally accompanied by signs of compression, such as hoarseness, dysphagia or dyspnea.¹⁰

There have been case reports that describe spontaneous haemorrhages in thymic tissue with neonates or infants, mostly due to coagulation defects.¹² In adults, the frequency is not known.^{12,13} Neoplastic lesions of the thymic tissue are uncommon^{14,15} with an incidence of about 0.15 per 100,000 persons per year in adults.¹⁶ No clear incidence rates in children are known.¹⁷ The most common histological types are thymoma and thymic carcinoma, arising from thymic epithelial cells.¹⁷ The presentation is variable, manifesting asymptotically as a mediastinal mass, with local symptoms such as coughing and dysphagia. Signs of auto-immune disorders such as myasthenia gravis are not infrequent at presentation, probably because of an altered conditioning of circulating T-cells.¹⁷ To our knowledge, there are no

Figure 2 Coronal (A) and transversal (B) T1-weighted MRI images, without contrast, revealing multilocular cystic components in a solid mass (white arrow), in close proximity to the carotid artery.

case reports describing cervical thymic cysts undergoing malignant transformation.

In infants, thymic tissue is primarily homogenous on ultrasound with the minority presenting heterogeneously.¹⁸ In older children, cervical thymic tissue presents with hyperechoic foci because of the mixture of remaining lymphoid tissue and fat.¹⁹

Thymic cysts commonly have a homogeneous low attenuation on CT imaging, and the injection of gadolinium contrast enhances their smooth, thin, regular walls.²⁰ In-phase and opposed-phase T1-weighted MRI does not clearly distinguish cysts from solid or cellular material unless the cystic lesion is homogeneously T1-hyperintense.²¹ With increased proteinaceous content during infection or bleeding, they mimic solid lesions as attenuation increases and T1-isointense, with an intermediate signal, or T1-hyperintense images can be seen.¹⁸ Solid lesions can vary from mild enhancement, such as lymphomas, to intense enhancement in the case of haemangiomas.²¹ Therefore steady-state free precession T2-weighted imaging, and precontrast and postcontrast dynamic contrast enhanced MRI with postprocessed subtraction are the most helpful MR pulse sequences to distinguish between cystic and solid lesions.²¹ As opposed to the thymus of an adult, where fatty atrophy takes place, the growing thymus of a child limits the value of in-phase and out-of-phase chemical shift MRI, making differential diagnosis of solid components more difficult. Yet chemical shift MRI is valuable in adults.²² In-phase and out-of-phase T1-weighted imaging is a quality sequence for the detection of CT-occult microscopic fat, yet is limited in distinguishing cystic from solid lesions.²²

Treatment of a symptomatic thymic cyst is based on surgical excision.¹⁰ A preoperative investigation of the immunological status including radiological studies, is recommended to prove the presence of normal mediastinal thymic tissue. Long-term postsurgical follow-up should include evaluation of the immunologic status, though, because of the lack of evidence about the immunological consequences of thymectomy, there are currently no clear guidelines available on this topic.

CONCLUSION

Presentations of fast-growing cervical masses necessitate prompt attention with preferential screening for malignancies in an extensive list of differential diagnoses. As seen in this case report, the presence of ectopic thymic tissue presents both diagnostic and management challenges in children, with haemorrhages compounding the diagnostic complexity. A biopsy and/or surgical excision with histopathological examination is important for confirming a definite diagnosis.

Acknowledgements The authors would like to thank Dr Jef Peeters (Radiology AZ Monica Deurne), Dr Özkan Özslarak (Radiology UZA) and Dr Steven Mariën (ENT UZA) for their contribution to this case.

Contributors LC and JvH were the main clinicians whilst AD was the pathologist on the case. All authors contributed to the writing and reviewing of the case report.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Parental/guardian consent obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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