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Sonographic aspects of neck masses in children

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Abstract
Aim: To determine the contribution of ultrasound to the etiological diagnosis of neck masses in children.
Introduction: Neck masses are common in paediatric patients. Their etiology is multiple. Ultrasound is the main examination for their management.
Patients and methods: This was a 12-month retrospective descriptive study from January 2013 to December 2013, carried out at the CHUJRA Medical Imaging Department, including all children aged 0 to 15 referred for cervical ultrasound. All files with incomplete information or normal results were excluded from this study.
Results: Boys were more affected (65.33%), with a predominance of children aged over 2 years (74.67%). The most common clinical manifestation was cervical swelling (64%). The masses were of latero-cervical location in 93.05% of cases and of heterogeneous tissue echostructure in 76.39%. Lesions were color-coded for vascularity in 80.56% of cases. Ganglion chains were the most affected structures, followed by soft tissue and salivary glands. Inflammatory lesions, including lymphadenopathy, were most frequently encountered, followed by malignant tumor lesions such as lymphomas.
Conclusion: Ultrasound coupled with Doppler plays an important role in the diagnostic orientation of neck masses in children.

Keywords: Neck masses, child, ultrasound, doppler, lymphadenopathy

Introduction

Neck masses are common in children and are a frequent cause of visiting the emergency department. They are defined as any abnormal lesion in the neck that can be seen, palpated, or identified on imaging [1]. Neck masses are generally classified as congenital or acquired. Congenital neck masses are by far more common in paediatric age groups than the acquired [2]. The most common etiologies include congenital lesions and their complications, lymphadenopathy, vascular, inflammatory, and malignant lesions. Radiologic investigation plays a vital role in the pre-operative diagnosis of paediatric neck masses. The use of plain radiographs, ultrasonography, computed tomography (CT) scan and magnetic resonance imaging in establishing the diagnosis of neck masses in children have been described in the literature [3]. In most cases, ultrasonography is the initial and very useful modality in paediatric patients presenting with neck masses. It can provide useful information like the size, consistency (solid vs. cystic), shape, vascularity, location of the mass and determining the presence or absence of normal thyroid tissue [3]. It can also help in guiding the pathologist during fine-needle aspiration cytology [3].

Methods

We conducted a retrospective descriptive study over a 12-month period from January 2013 to December 2013, in the Medical Imaging Department of the Joseph Ravoahangy Andrianavalona University Hospital. All children aged 0 to 15 years referred for cervical ultrasound were included. Patients with incomplete records or normal results were excluded from this study.
Study parameters were

- Sex
- Age
- Clinical information
- Ultrasound data: location, component, homogeneity, vascularization

Ultrasound examinations were performed with three MINDRAY® DC6, DC3 and TOSHIBA® ultrasound machines.
The statistical tool used was Excel® 2010.

Results

A total of 72 patients were included.
Boys were the most affected, with a sex ratio of 1.9.
Children aged over 2 years predominated, with an average age of 6.12 years and extremes of 20 days and 15 years.
The most common clinical manifestation was cervical swelling (64%), followed by known lymphadenopathy (17.3%).
Ultrasound data showed that the masses were located in lateral in 93.05% of cases, and midline in 6.95%.
In 76.39% of cases, the component of the masses was tissue; liquid in 11.11% and mixed in 12.50%. These masses were heterogeneous in 76.39% of cases.
Lesions were color-coded for vascularity in 80.56%.
Inflammatory lesions were the most common (55.56%), followed by malignant tumors (22.22%) and vascular lesions (9.72%). There were also benign (8.33%) and congenital (4.17%) tumoral lesions.
The masses developed mainly in the lymph node chains (50%), followed by the soft tissue (31.95%), salivary glands (9.72%), sterno-cleido-mastoid muscles (6.94%) and thyroid (1.39%).

Table 1: Distribution of patients by diagnosis

Diagnostic	Percentage (%)
Inflammatory adenopathy	33,33
Abscess	5,55
Cervical cellulitis	5,55
Parotitis	4,17
Sub maxillitis	5,55
Salivary lithiasis	1,39
Cystic lymphangioma	9,72
Thyroid nodes	1,39
Branchial cyst	1,39
Thyroglossal tract cyst	4,17
Fibromatosis colli	6,95
Suspected adenopathy	16,67
Suspected mass	4,17

Discussion

Imaging is a very important tool for establishing the diagnosis of neck masses in children. American college of radiology recommends ultrasonography as the preferred initial imaging for children presenting with neck masses [4].

Our study, which found a mean age of 6.12 years, is similar to studies carried out in Chicago [5] and Korea [6].

There was a male preponderance, consistent with the findings of other study [6]. However, in Archwin's study, there was no significant influence of sex on the incidence of cervical masses in children [5].

Lesions were located latero-cervically in 93.05% of cases. In Schroeder's study, the masses were located in the midline and mostly congenital [7]. Lateral lesions suggest branchial, vascular and lymphatic anomalies [7], whereas medial lesions suggest congenital lesions [8].

Thyroglossal duct cyst, branchial cleft cysts, and dermoid cyst are the most common cystic lesion of the neck [9, 10].

Acquired neck masses may be due to inflammation, trauma, or rarely neoplasm which may be vascular or non-vascular. Inflammatory masses are the most common acquired neck masses and are mostly due to lymphadenopathy [11].

In our study, inflammatory lesions were the most common, followed by tumoral lesions, which differ from the Turkish study [9]. Inflammatory lesions are the preserve of developing countries [9], whereas in developed countries, congenital and tumoral lesions predominate [2]. Congenital lesions are more frequently encountered in small children, and tumoral lesions in older children.

For lymph node lesions, we noted a predominance of inflammatory origin, followed by suspicious lymphadenopathy. Other studies have found a predominance of lymphoma [9] and a tuberculous infectious origin [12]. There is no formal criterion that can differentiate a tumor adenopathy from an inflammatory adenopathy especially if the size is less than 1,5 cm long axis, On the other hand, an lymphadenopathy with a rounded, hypoechoic shape, larger than 1,5cm long axis is suspicious of malignancy. Doppler vascularity is also important, hilar for adenitis and anarchic vascularity for tumoral lesions (figure 1).

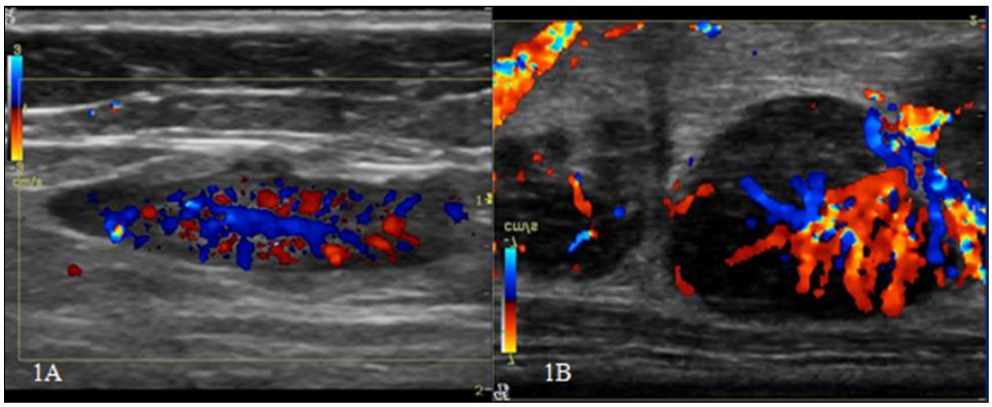

Fig 1: Ultrasound sections showing adenitis with central hilum (A) and suspicious adenopathy with anarchic vascularization (B)

But inflammatory adenopathies, especially those of infectious origin, notably tuberculosis, can be voluminous. In this case, what differentiates them from tumoral adenopathies is the presence of internal fluid zones corresponding to areas of necrosis.

For congenital anomalies, we noted a predominance of thyroglossal tract cysts, similar to Kermani's study [13]. The thyroglossal tract cyst is a median or left lateralized cystic formation, well limited, anechogenic but may be echogenic in case of hemorrhage or infection (figure 2).

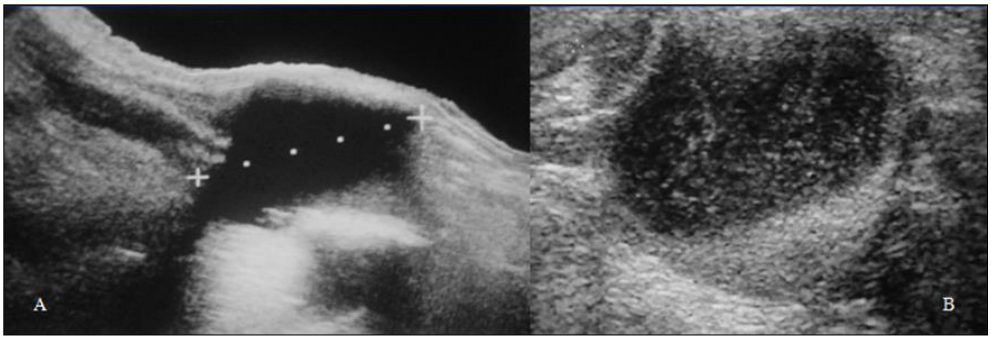

Fig 2: Ultrasound sections showing a cyst of the thyroglossal tract with anechogenic content (A), echogenic content (B)

Among benign tumors, fibromatosis coli, a hypoechoic mass developed at the expense of the sterno-cléido-mastoid muscle (figure 3), was the most common. While other studies have noted the predominance of pleiomorphic adenomas [14, 15].

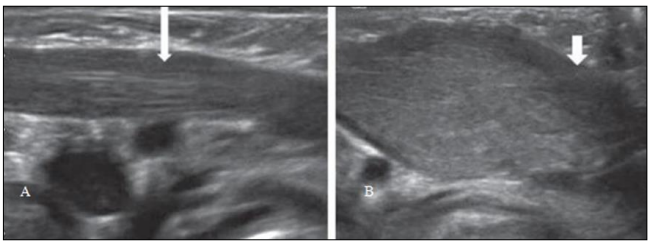

Fig 3: Ultrasonographic sections of a normal sternocleidomastoid muscle (A), fibromatosis coli (B)

Vascular lesions were represented by cystic lymphangioma, which is a compartmentalized, poly-lobed, extensive cystic formation invading adjacent tissues (figure 4).

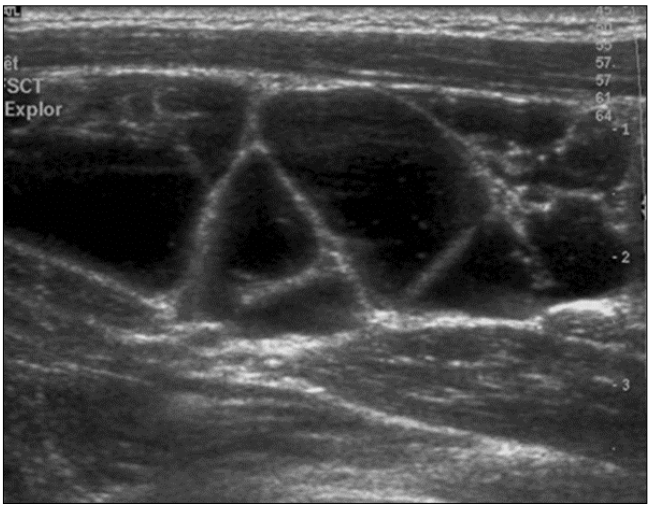

Fig 4: Ultrasound section showing a cystic lymphangioma

Conclusion

In the majority of cases, ultrasound coupled with Doppler provides a sufficient diagnostic approach and guides treatment. In some cases, the investigation may be completed by CT scan or MRI. Histology remains the confirmatory diagnosis, particularly for tumoral lesions.

Our challenge for the future is to promote antenatal ultrasound for early diagnosis of congenital lesions, and to perform ultrasound-guided biopsies in collaboration with the surgeon, pediatrician and pathologist, for etiological diagnosis of tumor lesions.

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