Sonographic evaluation of congenital cystic neck masses with histopathological correlation

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Abstract

Background: Accurate diagnosis is important for planning of management of the congenital cystic neck mass. Clinical history, physical examination and appropriate knowledge of embryology and anatomy of the cervical region frequently allow the differential diagnosis to be narrowed and ultrasound especially high frequency ultrasound help to further confirmation. USG has been used as the initial imaging procedure in the evaluation of them. Ultrasound not only confirms the cystic nature of the lesion but also evaluates exact location, size, extent, relation to the surrounding structures and internal characteristic of mass.

Objectives: To establish the usefulness of ultrasound in the evaluation of congenital cystic neck masses.

Methods: From January 2014 to March 2018 a total 50 patients with clinically suspected congenital cystic mass in the neck region were selected who under want operative treatment and histopathological examination. A through history taking and physical examination were done then patient were scanned with gray scale ultrasound and colour Doppler in necessary case. Histopathological report collected from the patient and compare with USG diagnosis.

Results: In USG 37 patient diagnosed as congenital lesions and 13 patient diagnosed as non-congenital lesion. Among the congenital lesions thyroglossal duct cyst-19, branchial cleft cyst-12, cystic hygroma-4, hemangioma-1 and epidermoid cyst-1. In histopathology 32 patient diagnosed as congenital lesion and 18 diagnosed as non-congenital lesion. Among the congenital lesions thyroglossal duct cyst-18, branchial cleft cyst-8, cystic hygroma-4, hemangioma-1 and epidermoid cyst-1. Among the 19 USG diagnosed thyroglossal duct cyst 17 is confirmed by histopathology and 2 is differ. Among the 12 USG diagnosed branchial cleft cyst 7 is confirmed by histopathology and 5 is differ. Over all sensitivity of USG-93.7% and specificity-64% and accuracy-74%.

Conclusion: USG is a useful modality for the diagnosis of congenital cystic mass in the cervical region.

Keywords: Congenital, Sonography, Histopathology, Thyroglossal duct cyst, Branchial cleft cyst and Cystic hygroma.

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Introduction

Congenital cystic masses in the cervical region are a relatively frequent findings, usually diagnosed in infancy and childhood but detection may be delayed until adulthood. They often manifest as slow growing masses and causes symptoms only after enlarging sufficiently or after infection.[1]

Common lesions are thyroglossal duct cyst, branchial cleft cyst, cystic hygroma, hemangioma, dermoid and epidermoid cyst. The clinical history and physical examination and appropriate knowledge of embryology and anatomy of the cervical region frequently allow the differential diagnosis to be narrowed and ultrasound especially high frequency ultrasound help to further confirmation. Ultrasound not only confirms the cystic nature of the lesion but also evaluates exact location, size, extent and internal characteristic of mass and act as a guide for FNAC.[1]

During the 4th gestational week, the thyroid primordial grows caudally from the foramen cecum, through the prepharyngeal soft tissues along a midline descent, the anterior neck, anterior and in close proximity to the developing hyoid bone, to its eventual destination in the inferior neck.[2] As the developing gland travels caudally, an epithelial tract is left behind that develops into the thyroglossal duct.[3] The duct generally involutes

by the 5th to 10th week of gestation, leaving only a proximal remnant at the foramen cecum, and a distal portion that differentiates into the pyramidal lobe of the thyroid gland.[2] Persistence of any portion of the duct can lead to the formation of cysts or ectopic thyroid rests along the tract.

Thyroglossal duct cysts represent 70% of all congenital neck masses and are the most common congenital cervical abnormality after Thornwaldt cysts.[4] About 50% of patients present before 20 years of age with a second group of patients presenting in young adulthood.[5,6] Usually manifests as an enlarging, painless mass in the anterior midline of the neck. They characteristically move upward with tongue protrusion, a reflection of the origin of the duct at the foramen cecum.[7] They have variable sonographic appearance such as anechoic 28%, homogenously hypoechoic with internal debris 18%, pseudosolid 28%, and heterogeneous 28%. The majority showed posterior enhancement 88%, were midline 63% and infrahyoid in location 83%. Only half of all thyroglossal duct cysts showed a typical thin wall.[8]

Branchial cleft cysts are the most common non-inflammatory pediatric lateral neck masses; almost all arise from the second branchial cleft.[1] Which represent 95% of bronchial cleft anomalies with cyst being more common than fistulae and sinus.[9] These lesions are thought to arise from incomplete obliteration of the embryologic cervical sinus of His. Second branchial cleft cysts are most commonly found at the angle of the mandible along the anteromedial border of the sternocleidomastoid muscle, but can occur anywhere from the oropharyngeal tonsillar fossa to the supraclavicular neck.[10]

These cysts usually appear as painless, fluctuant masses in the lateral portion of the neck adjacent to the anteromedial border of the sternocleidomastoid muscle at the mandibular angle.[11] Sonographically they are sharply marginated, round to ovoid, centrally anechoic mass with a thin peripheral wall and shows distinct acoustic enhancement.

Lymphangiomas of the head and neck most commonly occur in the posterior cervical triangle followed by the axilla and the tongue

musculature.[12] Lymphangiomas are thought to develop from sequestration of a portion of the embryologic lymphatics (most commonly involving the jugular lymph sac), resulting in continued growth and accumulation of fluid.[13]

Cystic hygroma is the most common form of lymphangioma. Majority (about 80%-90%) are detected by the time the patient is 2 years old.[14,15] Most cystic hygromas manifests as a multilocular predominantly cystic mass with septa of variable thickness. The echogenic portions of the lesions correlate with clusters of small, abnormal lymphatic channels.[16]

Dermoids and epidermoids are the second-most common midline cervical anomalies after thyroglossal duct cysts.[17] The most common clinical appearance of a dermoid cyst in the neck is a midline, suprahyoid, and slowly growing mass.[18] Unlike thyroglossal duct cysts, they have no intimate association with the hyoid bone and therefore do not move with tongue protrusion.[19] All the cysts have internal echoes, with a solid appearance with only slight or no posterior echo enhancement.[20] Epidermoid cysts are rare lesion; they have same sonographic appearance as dermoid cyst.

Ultrasound, CT and MRI are the imaging modalities for evaluation of cystic neck masses. It is already mansion ultrasound not only confirms the cystic nature of the lesion but also evaluates exact location, size, extent, relation to the surrounding structures and internal characteristic of mass and act as a guide for FNAC. CT and MRI also provides this information and is ideally suited for evaluation of soft tissue planes adjacent to larger masses that cannot be entirely visualized with US. But CT and MRI is costly, CT has radiation hazard and MRI time consuming On the other hand ultrasound is easy, low cost, radiation free, readily available and repeatedly useable for follow up scans of the patient.

The main objectives of this study was to establish the usefulness of ultrasound in the evaluation of congenital cystic neck masses.

Materials and methods

This cross sectional study was carried out on randomly selected 50 patients with clinically suspected congenital cystic mass in the neck region attended the department of Radiology & Imaging of Khulna medical college hospital and Vital research diagnostic centre, Khulna from January 2014 to March 2018 for performing ultrasound and later on underwent operative treatment and histopathology examination. History taking and physical examination were done first then ultrasongram were done by high resolution gray-scale ultrasonography by using 7.5 MHz liner array probe and help of 3.5 MHz probe were taken in the relevant cases. Color flow study also done to identify vascular malformation. The following outcome variables were studied- age, sex, time of presentation in relation of birth, site, USG feature such as echogenicity, loculation, wall thickness, far wall echo enhancement and internal debri of the lesion. Finding of histopathological examination were collected from the patient. Data were collected in a pre-designed structured data collection sheets. All the relevant collected data were compiled on a master chart. The result USG diagnosis is compare with histopathological diagnosis and finally discrepancy between them is shown. Further statistical analysis of the result was done by using computer software (SPSS).

Results

From January 2014 to March 2018 total 50 consecutive cases with clinically suspected congenital cystic neck masses were studied. 48% of the patients were in 2nd decade, followed by 38% in 1st decade & 12% in 3rd and above decade group. The mean age of the patient was 14.2±1.33 years. (Table-I)

Out of 32 histopathologically confirmed congenital cystic lesion 19(59.37%) were located medial position and 13(40.62%) were lateral position of the neck. (Table- II) All thyroglossal duct cysts are anterior midline mass with close association with hyoid bone, Branchial cleft cysts are lateral neck mass. In

USG both are anchoic or hypoechoic with or without debri and sepation with posterior echo enhancement of all the lesion. (Fig-I & Fig-II) Cystic hygroma are multilocular predominantly cystic mass with septa of variable thickness. (Fig-III) Epidermoid cyst showing moderately thin walled, unilocular cystic lesion having coarse internal echoes without posterior echo enhancement. (Fig-IV)

In USG 37 diagnosed as congenital lesions and 13 as non-congenital lesions. Among the congenital lesions thyroglossal duct cyst-19 (51.4%), branchial cleft cyst-12 (32.4%), cystic hygroma-4 (10.8%), hemangioma-1 (2.7%) and epidermoid-1 (2.7%). (Table–III & V)

In histopathologically 32 diagnosed as congenital lesions and 18 as non-congenital lesions. Among the congenital lesions thyroglossal duct cyst-18 (56.3%), branchial cleft cyst-8 (25%), cystic hygroma-4 (12.5%), hemangioma-1 (3.1%) and epidermoid-1 (3.1%). (Table–IV & V)

Among the 19 USG diagnosed thyroglossal duct cyst 17 is confirmed by cytology and 2 is differ. Among the 12 USG diagnosed branchial cleft cyst 7 is confirmed by cytology and 5 is differ. Accuracy of USG for thyroglossal duct cyst-89.4%, branchial cleft cysts-58.33%, cystic hygroma, hemangioma and epidermoid cyst-100% for each. (Table-VI) Over all sensitivity of USG -93.7%, specificity-64% and accuracy-74%.

Table-I: **Distribution of the patients by their age-group.**

Age Group (in years)	**Number of patients**	**Percentage of patients**	**Mean age $\pm$ SE in year**
≤ 10	19	38	14.2±1.33yr
11-20	24	48	
21-30	06	12	
31-40	01	02	
Total	**50**	**100**	

Table-II: **Types of neck masses with their location.**

Histopathological types	**Location of neck mass**		**Total**
	Medial	**Lateral**	
Congenital masses	19 (59.37%)	13 (40.62%)	32
Non-congenital masses	6 (33.33%)	12 (66.66%)	18
Total	25 (50%)	25 (50%)	50

Table-III: Distribution of individual lesion on the basis of USG diagnosis.

Congenital lesions		**Non-congenital lesions**	
Types of lesion	**Number patient**	**Types of lesion**	**Number patient**
Thyroglossal duct cyst	19	Cold abscess	05
Branchial cleft cyst	12	Thyroid cyst	03
Cystic hygroma	04	Thyroid carcinoma	01
Hemangioma	01	Lymphadenopathy	04
Epidermoid cyst	01		
Total	**37**	**Total**	**13**

Table-IV: Distribution of individual lesion lesions on the basis of hitopathological diagnosis.

Congenital lesions		**Non-congenital lesions**	
Types of lesion	**Number patient**	**Types of lesion**	**Number patient**
Thyroglossal duct cyst	18	Cold abscess	07
Branchial cleft cyst	08	Thyroid cyst	05
Cystic hygroma	04	Thyroid carcinoma	01
Hemangioma	01	Lymphadenopathy	05
Epidermoid cyst	01		
Total	**32**	**Total**	**18**

Table-V: Comparative chart of USG and histopathological diagnosis of congenital cystic mass.

Congenital mass	**USG diagnosis**	**Histopathological diagnosis**
Thyroglossal duct cyst	19 (51.4%)	18 (56.3%)
Branchial cleft cyst	12 (32.4%)	08 (25%)
Cystic hygroma	04 (10.8%)	04 (12.5%)
Hemangioma	01 (2.7%)	01 (3.1%)
Epidermoid cyst	01 (2.7%)	01 (3.1%)
Total	**37** (100%)	**32** (**100**%)

Table-VI: Comparative chart & discrepancy between USG and histopathological diagnosis with accuracy of USG diagnosis.

USG diagnosis	Number of patient	Histopathological diagnosis		Accuracy of USG diagnosis
		Number of case confirm	Number of case differed	
Thyroglossal cysts	19	17	2 (Thyroid cyst)	89.4
Branchial cleft cysts	12	7	3 (Cold abscess) 2 (lymphadenopathy)	58.33
Cystic hygroma	4	4		100
Hemangioma	1	1		100
Epidermoid cyst	1	1		100
Cold abscess	5	4	1 (Thyroglossal cysts)	80
Thyroid cyst	3	3		100
Thyroid carcinoma	1	1		100
Lymphadenopathy	4	3	1 (Branchial cleft cyst)	75
Over all	50	41	9	82

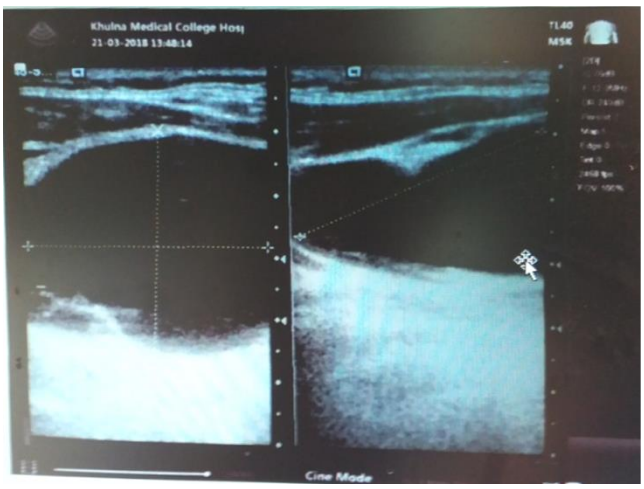

Fig I: Thyroglossal duct cyst: A midline infrahyoid neck mass showing anechoic thin walled, unilocular cystic lesion with posterior echo enhancement.

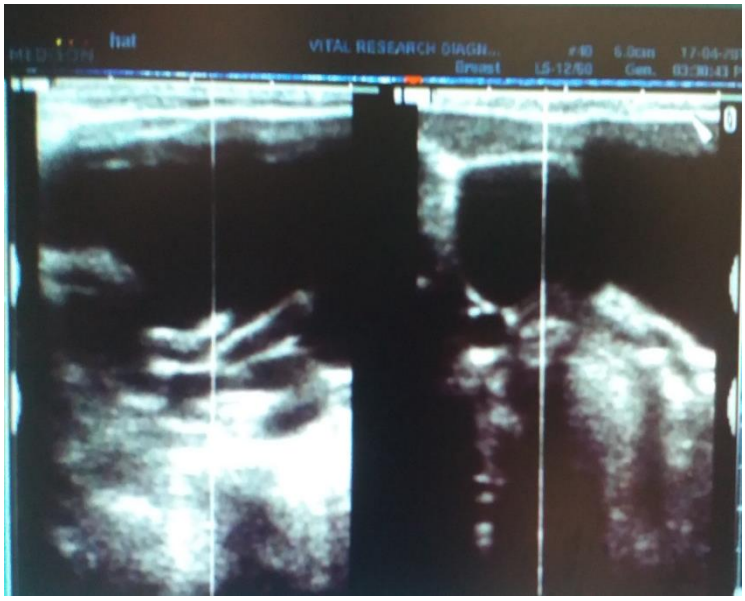

Fig II: Branchial cleft cyst: A lateral neck mass showing anechoic, thin walled septet cystic lesion with posterior echo enhancement.

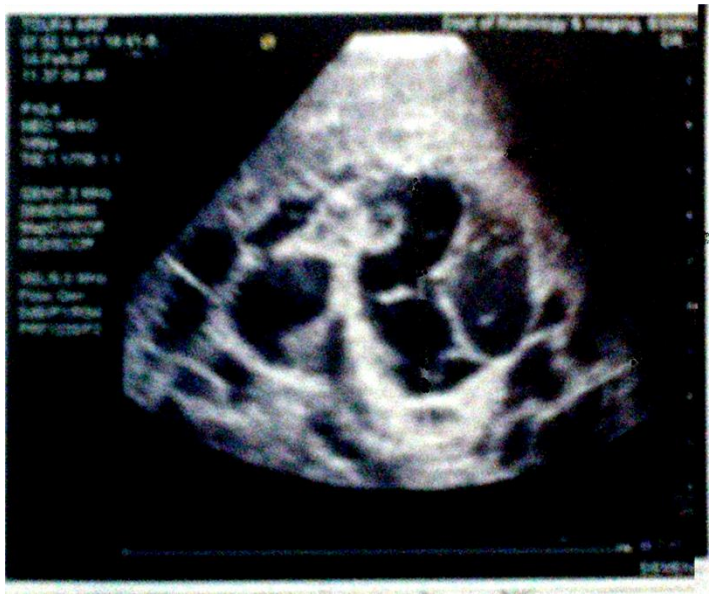

Fig III: Cystic hygroma: Multilocular predominantly cystic mass with septa of variable thickness.

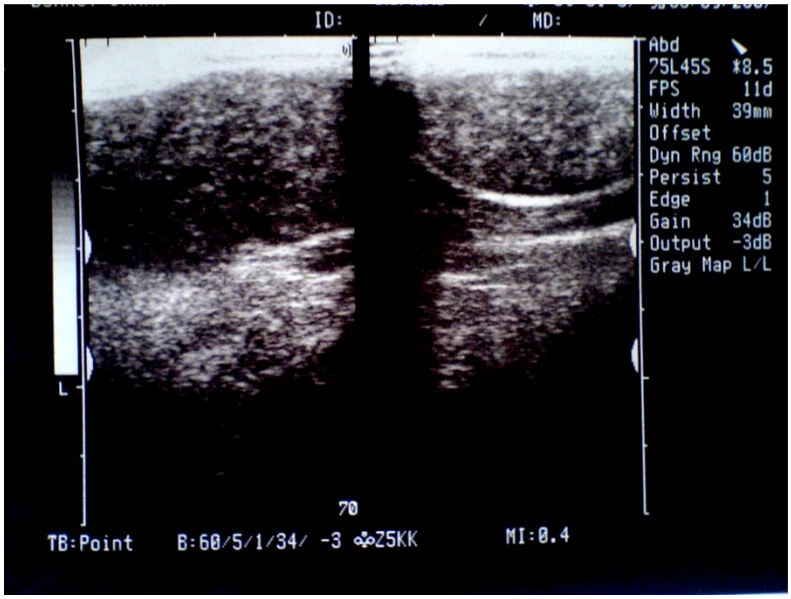

Fig IV: Epidermoid cyst: Midline suprahyoid, sub-mental mass showing moderately thin walled, unilocular cystic lesion having coarse internal echoes without posterior echo enhancement.

Discussion

Cystic lesions in the cervical region are relatively frequent findings. Differentiation of these disease processes is important for proper management. Clinical history and physical examination are often not enough for definite diagnosis. Ultrasound especially high frequency ultrasound not only confirms the cystic nature of the lesion but also evaluates exact location, size, extent, relation to the surrounding structures and internal characteristic of mass.

Congenital cystic mass are a common malformation in the neck region develop from embryonic rests. The main objective of the present study was to differentiation of them by USG and correlation with histopathology. Clinically suspected 50 patients were studied. The out come of the study were discussed below.

The age of the patient in this series ranged from 1 day to 38 years. The mean age was 14.2±1.33 (mean ± SE) years. The peak incidence was between 11 to 20 years and most of the patients belong to 1st and 2nd decades.

In a study shown that congenital cystic masses in the cervical region usually diagnosed in infancy and childhood.[1] Most of the lesion present within 2nd decade of life such as 50% of thyroglossal cyst present before 20 years of age.[5,6] 80% to 90% cystic hygroma present in 2nd years old.[21, 11] In the current study 90% of lesions present within 20 years of age.

In an article among the congenital cystic neck masses 70% are thyroglossal duct cysts and cystic hygroma 5%.[9] In another article Mazharul Alam Siddique, Mahbuba Hossen showing thyroglossal cysts 58.33%, Branchial cyst 19.44%, Lymphangioma 8.33%, haemangioma 8.33% Dermoid cyst 5.55%.[22] In the current study thyroglossal duct cyst 56.3%, bronchial clef cyst 25%, cystic hygroma 12.5%, Hemangioma 3.1% and epidermoid 3.1%.

In an article on sonography of congenital neck masses in children, 53 patients

were evaluated. Out of the total population; 58% of lesions were located at the midline and 42% in the lateral portions of the neck.[23] In the current study 59.37% of lesions were located at the midline and 40.62% in the lateral portions of the neck.

Histopathology reports of present study revealed 32(64%) congenital mass and 18(36%) non-congenital masses. The USG reports provided 37(74%) congenital and 13(26%) non-congenital masses.

30 patients were diagnosed as congenital cystic mass by ultrasound and confirmed by histopathology, they were true positive. 7 patients of USG diagnosis of congenital masses not confirmed by histopathology, they were false positive. 11 patients were diagnosed as non-congenital cystic mass by ultrasound confirmed by histopathology, they were true negative. And remaining 2 USG diagnosis not confirmed by histopathology, they were false negative.

Sensitivity of USG to diagnose of congenital cystic neck mass was 93.7%, specificity 64% and accuracy 74%.

Conclusion

The results of the present study conclude that USG is a useful modality for the diagnosis of congenital cystic mass in the cervical region. Since the USG diagnosis correlate with histopathological connection is a gold standard on the basis of above findings.

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