Original Article

Analysis of the prenatal ultrasound diagnostic value and prognostic factors of fetal mediastinal cysts

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Background: A prenatal fetal mediastinal cyst is a benign disease. However, if a cyst enlargement grows, it may compress the adjacent organs and affect the fetal cardiopulmonary function. This study aimed to compare and analyze the prenatal ultrasound characteristics of different mediastinal cysts, and to evaluate the pregnancy outcome of the fetus and the factors affecting the prognostic of the fetus. To compare and analyze the prenatal ultrasound characteristics of different types of mediastinal cysts, and to evaluate the fetal pregnancy outcome and the influencing factors of fetal prognosis.

Methods: A retrospective analysis of patients with prenatal diagnoses of mediastinal cysts was conducted to evaluate the ultrasound characteristics and to monitor the pregnancy outcomes to identify prognostic influences and provide a reliable basis for patient prognosis.

Results: In total, 30 patients were diagnosed with mediastinal cysts [including bronchogenic cysts (n=12), esophageal cysts (n=9), pericardial cysts (n=5), and thymic cysts (n=4)] on prenatal ultrasonography. The diagnostic accuracy rate was 93.33%; two cases of esophageal cysts were misdiagnosed as bronchial cysts. In total, 4 (44.44%) of 9 esophageal cysts and 4 thymic cysts were located in the anterior mediastinum, 10 (83.33%) of 12 bronchogenic cysts and 5 pericardial cysts were located in the middle mediastinum, and 2 (16.67%) of 12 bronchogenic cysts and 5 (55.56%) of 9 esophageal cysts were located in the posterior mediastinum. There were significant differences in the distribution of the cyst location, morphology, and cyst wall thickness ($P<0.05$). After delivery, 17 patients had clinical symptoms. There was a significant difference in the clinical symptoms between patients with a maximum diameter of postpartum cysts <5 and ≥5 cm ($P<0.05$), and children with a low gestational age and birth weight were more likely to have clinical symptoms.

Conclusions: The prenatal ultrasound features of fetal mediastinal cysts were similar. However, the ultrasound characteristics related to the cyst location, morphology, and cyst wall thickness were helpful in providing an accurate diagnosis. In addition, the postpartum cyst size, location, adjacent relationship with the surrounding tissues, volume, gestational age, and weight were related to patient prognosis.

Keywords: Prenatal ultrasound; fetus; bronchial cyst; esophageal cysts; prognosis

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Introduction

The mediastinum is a part of the chest located between the two pleural cavities, and it contains various organs and tissues, including the trachea, esophagus, heart, and major blood vessels (1). Mediastinal cysts, which are benign and slow growing, can cause compression symptoms and affect cardiac and pulmonary function if they grow (2). As the clinical symptoms after birth are non-specific, it is difficult to make an accurate prenatal diagnosis of different mediastinal cysts, which is important for fetal prognosis. There are numerous case reports on mediastinal cysts. However, research on prenatal ultrasound characteristics is limited. This study aimed to improve our ability to differentiate among mediastinal cysts during fetal development by assessing their prenatal ultrasound features and evaluating their effects on pregnancy outcomes, thereby providing reliable imaging-based evidence for assessing fetal prognosis. We present this article in accordance with the STROBE reporting checklist (available at https://qims.amegroups.com/article/view/10.21037/qims-23-1591/rc).

Methods

Study participants

This study included patients with fetal mediastinal cysts diagnosed prenatally at the Gansu Provincial Maternity and Child-Care Hospital from January 2019 to August 2023. The pregnant women were aged between 26 and 36 (average: 30.92±3.87) years. The cysts were first detected on prenatal ultrasonography between gestational weeks 18 and 32 (average gestational age: 24.48±5.14 weeks). To be eligible for inclusion in this study, the patients had to meet the following inclusion criteria: have complete clinical and ultrasound data. Patients were excluded from the study if they met any of the following exclusion criteria: had incomplete ultrasound or clinical data; and/or were lost to follow up. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the ethics board of Gansu Provincial Maternity and Child-care Hospital (No. (2023) GSFY Lun Review [77]), and informed consent was obtained from all the patients.

Instruments and methods

American GE E10 color Doppler ultrasound diagnostic instrument with a C5-1 probe (frequency: 2.0–5.0 MHz) was used in this study. Initially, routine prenatal ultrasound examinations were performed on the fetuses. In cases of suspected fetal mediastinal cystic lesions, a detailed multiplane scan of the fetal thorax was performed. For the mediastinal division and prenatal assessment, we used the international standard for the trichotomous division of the mediastinum to classify the mediastinum into the prevascular (anterior mediastinum), visceral (middle mediastinum), and paraspinal (posterior mediastinum) zones (3). The prenatal assessments focused on the location and size of the cysts, internal septum, cyst wall thickness, calcification, and maximal diameter in relation to the adjacency to the surrounding tissues. The final ultrasound diagnosis was determined by two senior physicians with deputy-senior titles.

Follow up

The patients with fetal mediastinal cysts were followed up to assess their pregnancy outcomes. The postpartum gestational age and weight of the patients with mediastinal cysts were recorded. Additionally, magnetic resonance imaging (MRI) and computed tomography (CT) scans were performed, with the CT scan adhering to a minimum dose of 1.2 mSv for newborns. The patients were divided into the two groups comprising patients with a maximum cyst diameter of <5 cm, and patients with a maximum cyst diameter of ≥5 cm based on the maximum cyst diameter after birth (4). The volume of each cyst was calculated and tracked over a follow-up period of 3 years at intervals of 3 months, 6 months, 1 year, 2 years, and 3 years. The mean follow-up time and median were calculated. Data on clinical symptoms after birth, including cough, regurgitation, tachycardia and breathing difficulties, were recorded. This information was essential for the analysis of patient prognosis and the factors influencing it. In the cases in which symptomatic children's families opted for surgical treatment during the follow-up period, the prenatal MRI or CT scan results and postoperative cyst pathology results were compared with the prenatal ultrasound diagnosis.

For the asymptomatic cases, continuous follow up and observation were maintained throughout the designated study period.

Statistical analysis

The data analysis was performed using the Statistical Package for the Social Sciences software version 25.0. The enumeration data are expressed as the number and percentage. The measurement data are expressed as the mean ± standard deviation. An analysis of variance or the non-parametric Kruskal-Wallis test was used for the within-group comparisons. The chi-square test was used for the between-group comparisons, and Fisher's exact test was applied if theoretical frequencies were <1 or the sample size was <40. A P value <0.05 was considered statistically significant.

Results

Analysis of prenatal ultrasound data on mediastinal cysts

In total, 30 patients were diagnosed with mediastinal cysts [including bronchogenic cysts (n=12), esophageal cysts (n=9), pericardial cysts (n=5), and thymic cysts (n=4)] on prenatal ultrasonography (see *Table 1* and *Figures 1-5*).

Location of mediastinal cysts and adjacency of the maximum diameter to anatomic structures

In total, 4 (44.44%) of 9 esophageal cysts and 4 thymic cysts were located in the anterior mediastinum; 10 (83.33%) of 12 bronchogenic cysts and 5 pericardial cysts were located in the middle mediastinum, and 2 (16.67%) of 12 bronchogenic cysts and 5 (55.56%) of 9 esophageal cysts were located in the posterior mediastinum. The distribution of cyst location differed significantly (P<0.05) (see *Tables 2,3*).

In relation to the 12 cases of bronchial cysts, the maximum cyst diameter was proximal to the tracheal bifurcation in 5 cases, posterior trachea in 2 cases, right side of the trachea in 3 cases, and posterior mediastinal paraspinal in 2 cases. In relation to the 9 cases of esophageal cysts, the largest cyst diameter was near the cervical esophagus in 2 cases, lower third of the esophagus in 4 cases, right side of the esophagus in 3 cases, and posterior part of the esophagus adjacent to the spine in 3 cases. The five cases of pericardial cysts had the largest diameter and were positioned close to the pericardial cavity in 1 case, the right posterior aspect of the left atrium in 1 case, and the right septal angle in 3 cases. The four cases of thymic cysts were positioned near the posterior great vessels in 1 case and away from the posterior great vessels in 3 cases (see *Table 1*).

Ultrasound morphology, cyst wall thickness, calcification, and intracystic septal features of antenatal mediastinal cysts

On prenatal ultrasonography, the cystic masses were round or oval in 23 (76.67%) patients and irregular in 7 (23.33%) patients. Based on the cyst wall thickness analysis, 3 (10%), 23 (76.67%) and 4 (13.33%) patients had a cyst wall thickness of <1, 1–2, and >2 mm, respectively. Of the patients, 8 (26.67%) presented with cyst wall calcification, and 22 (73.33%) presented with no cyst wall calcification. Intracystic septation was observed in 10 (33.33%) cases but not in 20 (66.67%) cases. Significant differences were observed in terms of prenatal cyst location, morphology, and cyst wall thickness (P<0.05) (see *Table 2*).

Postnatal outcome follow-up

Postnatal Imaging and Cyst Growth: 30 fetuses with mediastinal cysts underwent postnatal MRI or CT scanning, with 23 patients undergoing MRI alone, 4 patients undergoing CT scanning alone, and 3 patients undergoing both MRI and CT. The cyst size, as estimated by MRI or CT, increased compared to the prenatal period in 6 cases of bronchogenic cysts (2 cases), esophageal cysts (2 cases), pericardial cysts (1 case), and thymic cysts (1 case). The median gestational age was 38.5 (38.00, 39.25) weeks in the maximum diameter of cyst <5 cm group and 39 (37.00, 39.00) weeks in the maximum diameter of cyst ≥5 cm group. There was no significant difference in the distribution of gestational age between the two groups (z=0.567, P>0.05). The median weight of the group with the maximum diameter of cyst <5 cm was 3,300 (3,240.00, 3,475.00) g, and that of the group with the maximum diameter of cyst ≥5 cm was 3,250 (3,090.00, 3,342.50) g. There was no significant difference in the overall weight distribution between the two groups (z=1.316, P>0.05). The average follow-up time was 36 (27.00, 36.00) months in the group with the maximum diameter of cyst <5 cm, and 17 (5.25, 25.50) months in the group with the maximum diameter of cyst ≥5 cm. After delivery, the maximum cyst diameter of 18 patients was <5 cm, and 6 (33.33%) patients exhibited

Table 1 Prenatal ultrasound and postnatal data of mediastinal cysts

Case	Type of cyst	Prenatal cyst size (mm)	Relationship between the maximum diameter of the cyst and the anatomical structure	Gestational age (weeks)	Weight of the patient (g)	Postpartum cyst size (mm)	Postpartum cyst volume (cm^3)
1	Bronchogenic cyst	15×15×10	The bifurcation of the trachea	35	2,000	52×42×32	36.34
2	Bronchogenic cyst	9×9×8	The bifurcation of the trachea	38	3,350	11×10×9	0.51
3	Bronchogenic cyst	17×16×11	Posterior to trachea	38	3,250	17×17×12	1.80
4	Bronchogenic cyst	53×42×29	Right side of trachea	39	3,320	55×45×30	38.61
5	Bronchogenic cyst	24×18×8	Posterior to trachea	38	3,340	25×19×10	2.47
6	Bronchogenic cyst	51×28×28	The bifurcation of the trachea	39	3,250	53×30×26	21.49
7	Bronchogenic cyst	38×28×30	The bifurcation of the trachea	38	3,260	36×28×31	16.25
8	Bronchogenic cyst	52×36×26	Posterior mediastinal paraspinal	36	2,950	52×38×24	24.66
9	Bronchogenic cyst	22×19×19	Right side of trachea	37	3,140	20×20×21	4.37
10	Bronchogenic cyst	28×28×20	Right side of trachea	38	3,240	50×40×37	38.48
11	Bronchogenic cyst	29×27×19	Posterior mediastinal paraspinal	39	3,250	30×33×36	18.53
12	Bronchogenic cyst	54×32×37	The bifurcation of the trachea	37	3,180	55×44×35	44.04
13	Esophageal cyst	18×13×10	Lower third of the esophagus	38	3,460	36×32×29	17.37
14	Esophageal cyst	52×35×29	Lower third of the esophagus	37	2,670	51×33×27	23.63
15	Esophageal cyst	53×32×31	Posterior esophageal paraspinal	40	3,470	53×30×32	26.45
16	Esophageal cyst	36×34×15	Cervical esophagus	39	3,250	38×35×16	9.48
17	Esophageal cyst	53×42×40	Lower third of the esophagus	39	3,460	51×37×37	36.30
18	Esophageal cyst	12×11×10	Posterior esophageal paraspinal	40	3,450	25×24×13	4.06
19	Esophageal cyst	55×33×35	Posterior esophageal paraspinal	34	3,250	54×36×31	31.33
20	Esophageal cyst	51×29×31	Lower third of the esophagus	37	3,350	52×40×33	35.69
21	Esophageal cyst	35×30×13	Cervical esophagus	38	3,240	37×32×16	9.85
22	Pericardial cyst	50×37×29	Left atrium right posterior	40	3,060	51×39×27	27.92
23	Pericardial cyst	39×35×38	In the pericardial cavity	39	3,210	38×40×30	23.71
23	Pericardial cyst	57×42×33	Right septal angle region	39	3,220	55×40×35	40.04
25	Pericardial cyst	37×34×28	Right septal angle region	39	3,240	45×45×36	37.91
26	Pericardial cyst	27×26×22	Right septal angle region	39	3,340	29×30×24	10.85
27	Thymic cyst	53×39×35	Close to large vessels	40	3,600	52×37×34	34.01
28	Thymic cyst	26×25×13	Stay away from large vessels	40	3,520	28×25×15	5.46
29	Thymic cyst	14×12×13	Stay away from large vessels	39	3,610	26×24×17	5.51
30	Thymic cyst	7×5×6	Stay away from large vessels	40	3,560	8×7×6	0.17

mm, millimeter; W, weeks; g, grams; cm^3, Cubic centimeter.

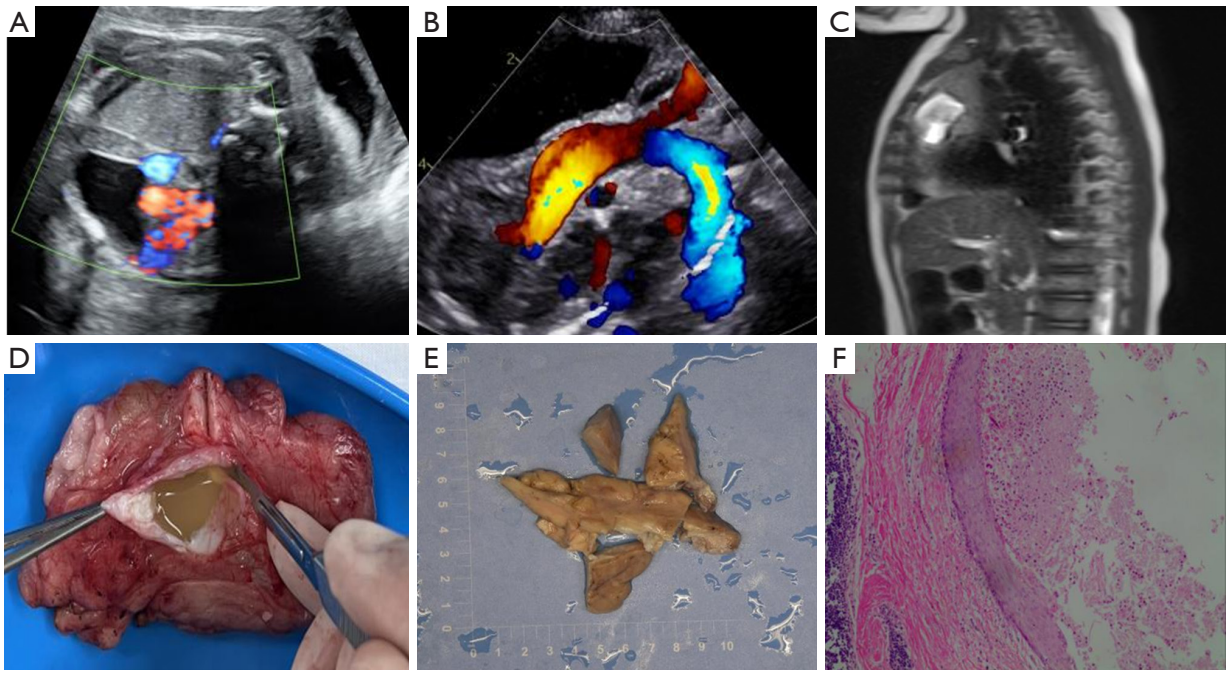

Figure 1 Anterior mediastinal thymic cyst. (A) Prenatal ultrasonographic image. (B) Postnatal ultrasonography depicting the cyst's intrathymic location. (C) Postnatal MRI sagittal T2-weighted image. (D) Postoperative specimen. (E) Postoperative cyst wall structure; the cyst wall is thick, and has a yellowish-brown color. (F) Postoperative pathology (hematoxylin-eosin staining, ×100). MRI, magnetic resonance imaging.

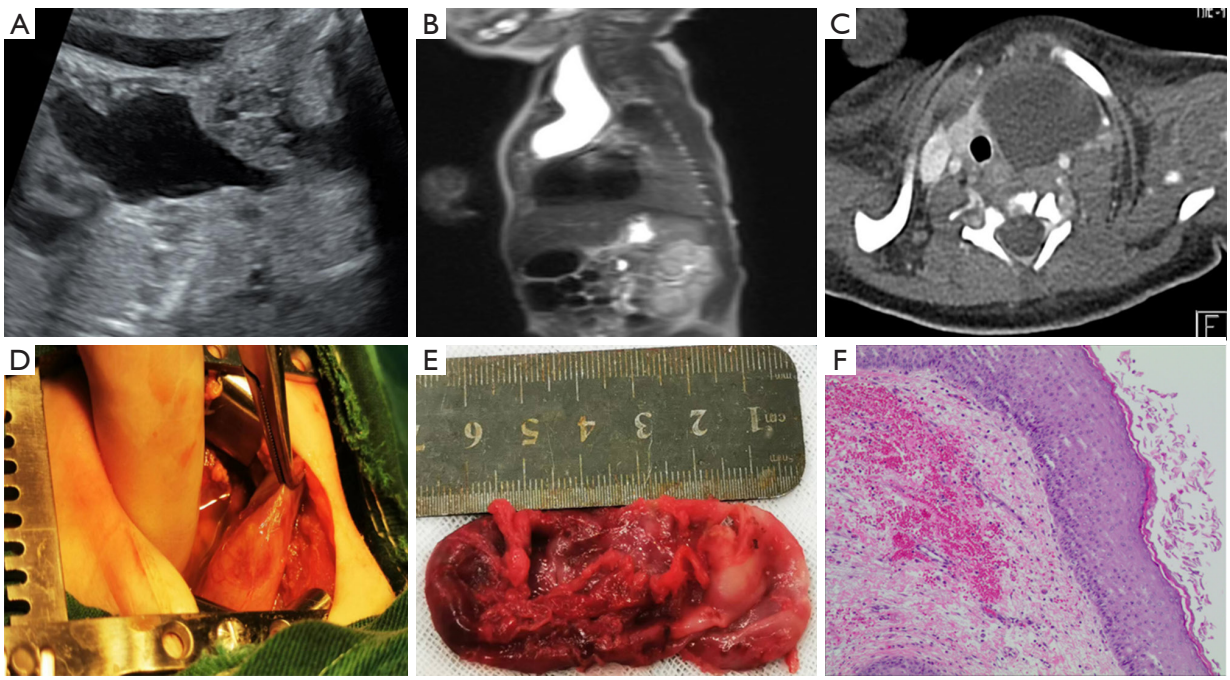

Figure 2 Anterior mediastinal esophageal cyst. (A) Prenatal ultrasonographic image. (B) Postnatal fetal MRI sagittal T2-weighted image. (C) Cross-sectional CT scan revealing a cystic mass adjacent to the esophagus. (D) Intraoperative observation. (E) Postoperative cyst specimen. (F) Postoperative pathology (hematoxylin-eosin staining, ×100). MRI, magnetic resonance imaging; CT, computed tomography.

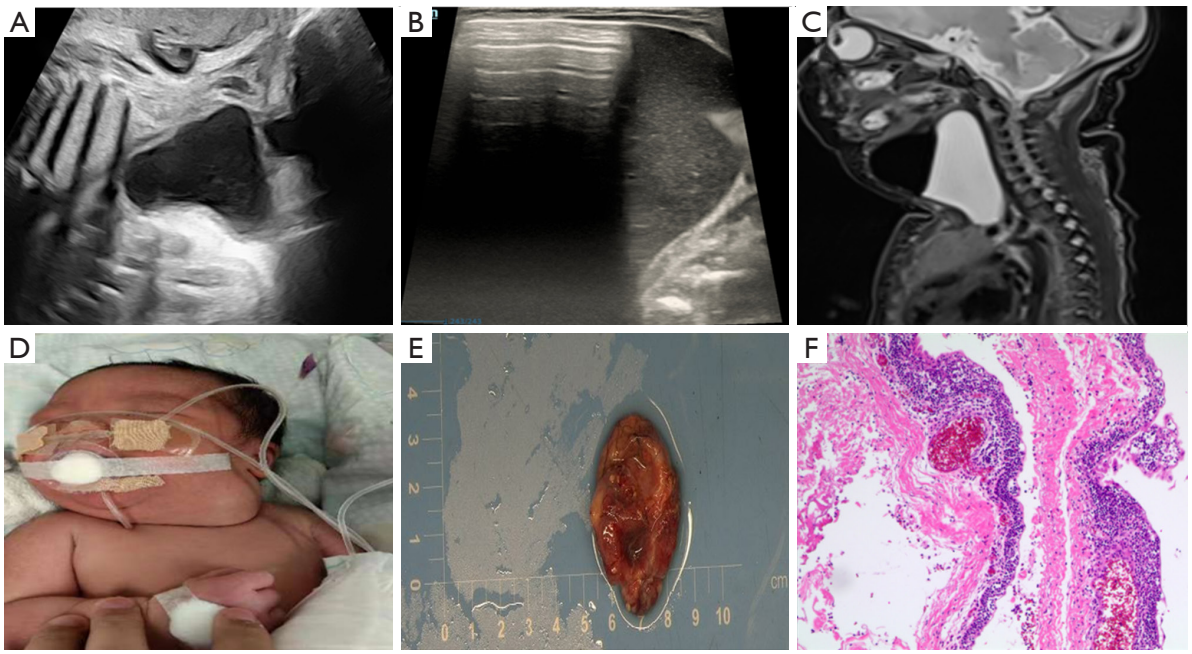

Figure 3 Posterior mediastinal esophageal cyst. (A) Prenatal ultrasonographic image. (B) Postnatal ultrasound showing that the cyst lead to the esophagus and had gas echoes. (C) Postnatal MRI sagittal T2-weighted image of the affected child. (D) Postnatal findings, illustrating bilateral neck asymmetry in the child, with localized skin and subcutaneous tissue bulging due to cyst pressure on the left side. The image is published with the consent of the parents of the patient. (E) Postoperative cyst specimen. (F) Postoperative pathology (hematoxylin-eosin staining, ×100). MRI, magnetic resonance imaging.

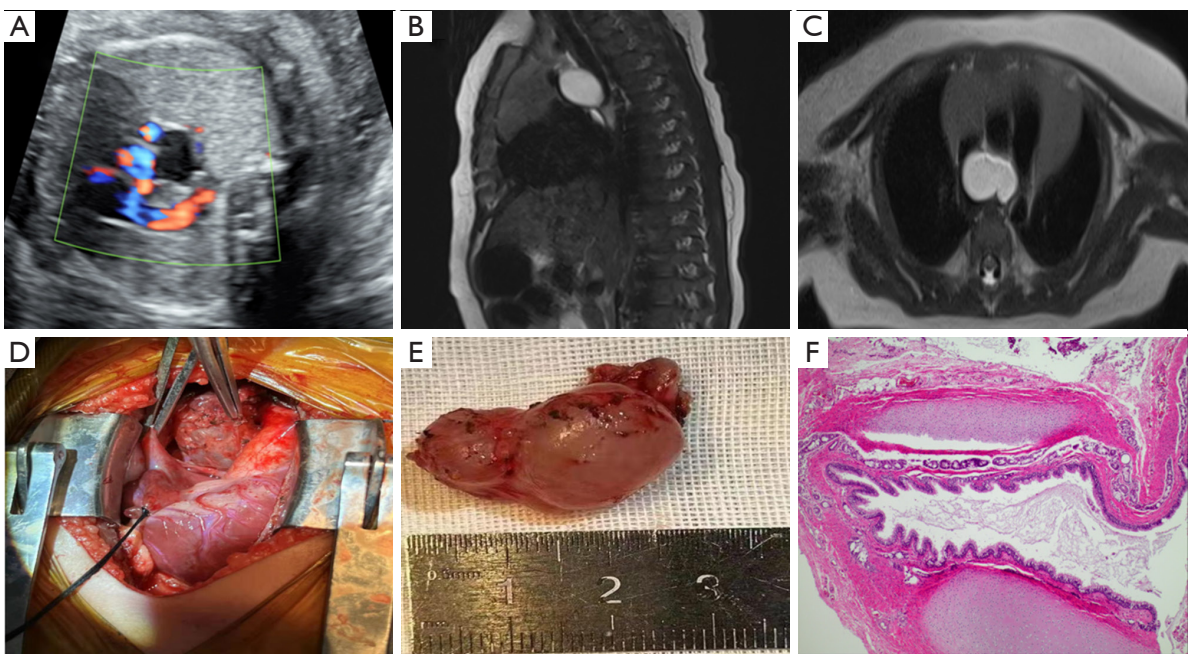

Figure 4 Middle mediastinal bronchogenic cyst. (A) Prenatal three-vessel cross-section displaying a cyst adjacent to the trachea. (B) Postnatal fetal MRI Sagittal T2-weighted image. (C) CT cross-section revealing a cyst adjacent to the trachea with three blood vessels. (D) Intraoperative observation, locating the cyst beside the trachea. (E) Postoperative cyst specimen. (F) Postoperative pathology (hematoxylin-eosin staining, ×100). MRI, magnetic resonance imaging; CT, computed tomography.

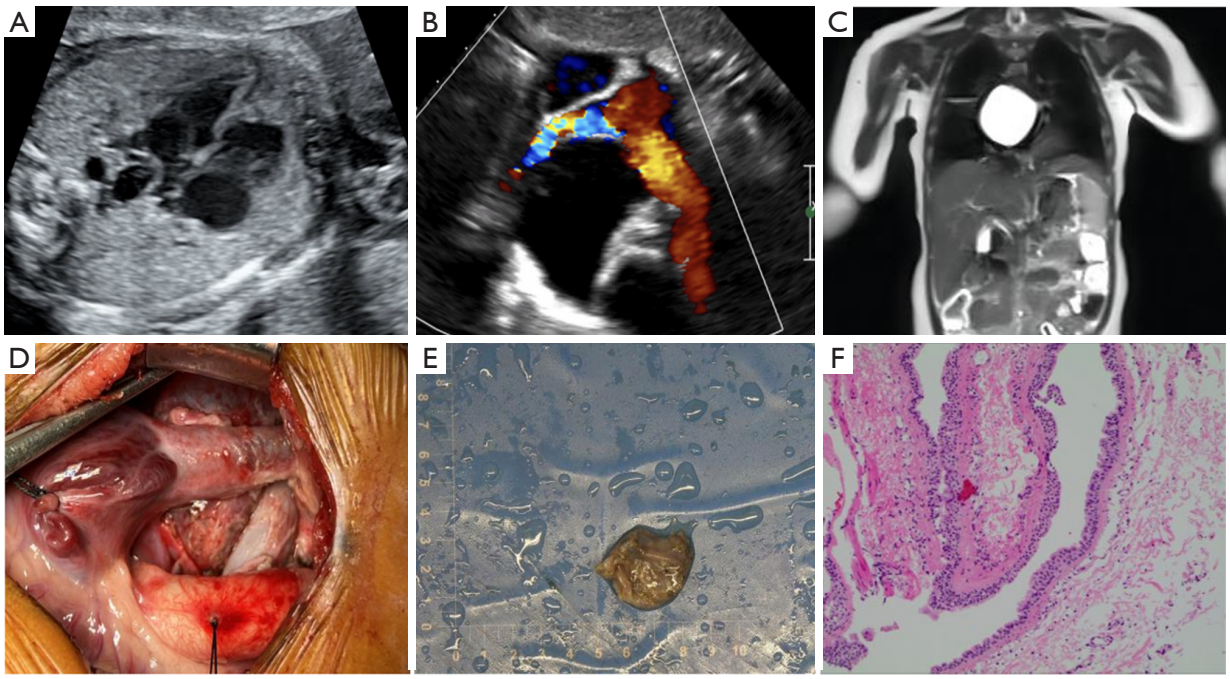

Figure 5 Middle mediastinal pericardial cyst. (A) Prenatal four-chamber heart section featuring sonographic visualization of the cyst. (B) Postnatal transverse section below the manubrium, displaying a cyst above the left atrium with a thin wall and excellent sonographic transparency. (C) Postnatal coronal T2-weighted MRI image. (D) Intraoperative observation of the cyst. (E) Postoperative cyst specimen. (F) Postoperative pathology (hematoxylin-eosin staining, ×100). MRI, magnetic resonance imaging.

clinical symptoms. Conversely, among the 12 patients with cysts ≥5 cm in maximum diameter, 11 patients (91.67%) developed clinical symptoms. The two groups differed significantly in terms of clinical symptoms ($P<0.05$) (see *Table 3*). In addition, we also found that children with a lower gestational age and a lower body weight exhibited more pronounced symptoms and an earlier onset of symptoms than those with a higher gestational age and a higher body weight during the follow-up period, even those with cysts of the same size.

The families of 17 newborns who developed clinical symptoms after birth selected elected surgery. The subsequent pathological examination revealed that the prenatal ultrasonographic diagnosis of bronchial cyst in 2 cases did not align with the postoperative pathological findings. Interestingly, the initial prenatal diagnoses of bronchial cysts were later confirmed to be esophageal cysts through postoperative pathology. Further, the prenatal diagnostic findings of the other 15 mediastinal cysts corresponded to the postoperative pathological outcomes.

No associated structural malformations were observed in 29 cases, but 1 case had a bronchial cyst with a small amount of pleural and peritoneal effusion. The middle cerebral artery-peak systolic velocity of the pregnant woman was 1.35 times that of the median, and the cord blood hemoglobin was 88 g/L. The prenatal diagnosis was mild fetal anemia. The child's pleural and peritoneal effusion was caused by fetal hemolysis, and anemia caused by maternal alloimmunization, which led to fetal edema (5); thus, the cause of effusion was related to anemia, and it was not associated with the bronchial cyst. There was no significant change in the volume of the bronchial cyst and no compression of the surrounding tissues after delivery, and the child displayed no obvious clinical symptoms during the follow-up period.

Discussion

Mediastinal cysts are congenital, benign conditions that account for approximately 12–30% of all mediastinal lesions (6). If the volume of a cyst expands, it can exert pressure on adjacent organs, thereby affecting the cardiac and

Table 2 Prenatal ultrasound and postnatal data analysis of mediastinal cysts

Parameter	Bronchogenic cyst (number)	Esophageal cyst (number)	Pericardial cyst (number)	Thymic cyst (number)	H/F	P
Total number/case	12	9	5	4		
Cyst location/case					8.724[a]	0.03
Anterior mediastinum	0	4	0	4		
Middle mediastinum	10	0	5	0		
Posterior mediastinum	2	5	0	0		
Cyst morphology/case					20.594[a]	<0.01
Round or oval	12	2	5	4		
Irregular	0	7	0	0		
Cyst wall thickness/case					22.461[a]	<0.01
<1 mm	2	0	1	0		
1–2 mm	10	7	4	2		
> 2 mm	0	2	0	2		
Cyst intracystic septation/case/case					2.876[a]	0.41
Yes	3	2	3	2		
No	9	7	2	2		
Cyst wall calcification/case					2.527[a]	0.47
Yes	4	1	1	2		
No	8	8	4	2		
Gestational age (weeks)	37.67±1.23	38.00±1.87	39.20±0.45	39.75±0.50	11.486[a]	<0.01
Weight of the patient (g)	3,127.50±370.83	3,288.89±252.36	3,214.00±100.40	3,572.50±41.13	13.536[a]	<0.01
Postpartum cyst volume (cm^3)	20.63±16.04	21.57±11.97	28.09±11.78	11.29±15.35	3.541[b]	0.32

Measurement data are expressed as the mean ± standard deviation. [a], Kruskal-Wallis test; [b], analysis of variance. H, Kruskal-Wallis rank-sum test; F, analysis of variance.

pulmonary function of the fetus. Hence, an accurate prenatal diagnosis plays an important role in determining the prognosis of the affected fetus. Mediastinal cysts are typically identified during the 25th–28th weeks of gestation (4). They do not coexist with other structural anomalies or chromosomal irregularities. On ultrasonography, mediastinal cysts frequently manifest as rounded, anechoic structures with smooth walls, good internal sonographic transmission, and enhanced posterior echoes. However, the prenatal ultrasound features of various conditions often significantly overlap, thereby posing a diagnostic challenge. Consequently, this study aimed to consolidate the prenatal ultrasound characteristics of mediastinal cysts and evaluate the factors influencing fetal outcomes, thereby offering valuable insights into the diagnosis of mediastinal cysts and the selection of appropriate treatment modalities in clinical settings.

Mediastinal cysts are diverse and difficult to distinguish, and understanding the division of the mediastinal partitions is crucial for clinical diagnosis and surgical planning. With an incidence rate of approximately 20%, bronchial cysts are the most prevalent type of mediastinal cyst and are caused by abnormal embryonic development (7). They are characterized by the atypical branching or budding of the bronchial tree between the 3rd and 6th gestational weeks. Most (79%) mediastinal bronchial cysts are located in the

Table 3 Clinical symptoms of different mediastinal cysts

Parameter	Bronchogenic cyst (number)	Esophageal cyst (number)	Pericardial cyst (number)	Thymic cyst (number)
Grouping/case	12	9	5	4
Maximum cyst diameter of <5 cm/case	8	4	3	3
Coughing	2	0	0	0
Swallowing difficulties	0	3	0	0
Arrhythmias	0	0	1	0
Maximum cyst diameter of ≥5 cm/case	4	5	2	1
Coughing	1	0	0	0
Swallowing difficulties	0	4	0	0
Breathing difficulties	2	0	0	0
Arrhythmias	0	0	2	1
Breathing and swallowing difficulties	0	1	0	0

middle mediastinum (7). However, a lower proportion of cysts (17%) are located in the posterior mediastinum, and a minor subset (3%) are located in the anterior mediastinum (8). In this study, 10 (83.33%) of the 12 bronchial cysts were located in the middle mediastinum, and 2 (16.67%) of the 12 bronchial cysts were located in the posterior mediastinum. Esophageal cysts account for approximately 15% of all mediastinal cysts and evolve from the expansion of esophageal wall segments by sloughed primitive gut cells (9). Notably, approximately 60% of these cysts are located in the right posterior mediastinum, primarily in the lower esophageal segment. In a few cases, esophageal cysts may be located in the anterior mediastinum, manifesting as tubular or spherical structures (10), which aligns with the findings of our study. Thymic cysts, which are associated with the migration of thymic tissue to the anterior mediastinum during embryonic development, tend to occur in this region. Pericardial cysts are closely associated with the pericardial sac, and account for approximately 7% of mediastinal cysts (11). They arise from certain embryonic structures in the cephalic and lateral plates of the mesoderm that failed to fuse completely. These cysts are commonly located in the middle mediastinum at the base of the heart (11). Similarly, our study found that most pericardial cysts were located in the right septal angle region.

In our study, we found that the morphology and wall thickness of cysts provide valuable diagnostic insights into mediastinal cysts. Research has shown that prenatal bronchial cysts often have a round shape, but a few bronchial cysts have droplet-like, D-shape or irregular forms (12). Thus, they are more likely to be detected on ultrasonography due to their fluid-filled airways, bronchi, and alveoli, which do not disrupt lung echogenicity (13). Conversely, esophageal cysts are closely associated with the esophagus. These cysts frequently have thick walls and, in some cases, muscular layers. When situated in the cervical esophagus, they often follow a longitudinal path along the esophagus due to the absence of connective tissue spacing between the upper and lower mediastinal compartments. This close esophageal association accounts for the irregular shapes of esophageal cysts, such as elliptical or tubular, which often distinguishes them from other mediastinal cysts. Notably, both esophageal and bronchial cysts originate from the foregut. Thus, they are challenging to distinguish prenatally, particularly when both have a round form (14). Coronal and sagittal reconstructed images may elucidate droplet-like or D-shaped configurations that can more definitively establish bronchial cyst diagnosis.

Thymic cysts, which are characterized by thicker cystic walls, can be differentiated from esophageal cysts based on their location, morphology, and adjacency to surrounding structures. When cysts are positioned in the anterior mediastinum and thymic tissue is visible in the periphery, these cysts are more likely to be athymic cysts. One key differentiation marker is the alteration in thymic

cyst morphology during the respiratory phases, with shape variations evident during inspiration and expiration (15). Thus, it is an invaluable distinguishing feature.

Pericardial cysts, which are characterized by thin cystic walls, are primarily differentiated by observing the cyst's location and its adjacency to the heart. In this study, one child with a bronchial cyst had a small amount of pleural and peritoneal effusion; however, the cause of effusion was related to anemia, and not to the bronchial cyst. The other children with cysts did not display any other structural malformations and had a good prognosis.

The maximum diameter of the mediastinal cyst is adjacent to the anatomical structure, which is closely related to the clinical symptoms of the newborn after birth. The growth of cysts may lead to symptoms such as chest pain, breathing difficulties, and coughing, which emphasizes the importance of early surgical intervention (16). In our study, the bronchial cysts were predominantly situated in the middle mediastinal tracheal bifurcation. Postnatally, children with cysts with a maximum diameter of ≥5 cm, and those exhibiting an increase in cyst size compared to the prenatal period, were more likely to display respiratory symptoms, such as dyspnea during the follow-up period. This may be due to the larger cyst size compressing the trachea (17).

Prenatal esophageal cysts can be located in the upper, middle, and lower thirds of the esophagus. Esophageal cyst is closely linked to the esophageal wall. Small postnatal cysts may manifest as spitting up when the child swallows, while an increase in cyst size (to a maximum diameter of ≥5 cm) may lead to difficulties in swallowing, which is likely due to the substantial size of the cyst compressing the esophagus. Cysts in the anterior mediastinum, encompassing thymic and fatty tissues, were more likely to be asymptomatic when small. However, larger cysts may cause various symptoms, including chest pain, respiratory difficulties, arrhythmias, and coughing. In children with pericardial cysts, no obvious clinical signs are evident post-delivery. However, if the cyst becomes sufficiently large to compress the heart, arrhythmia can ensue (18).

Our study also revealed that the prognoses of the children were associated with their gestational age and body weight. Children with a lower gestational age and lower body weight exhibited more pronounced symptoms and an earlier onset of symptoms than those with a higher gestational age and higher body weight, even with cysts of the same size. The reason may be that most of the infants with a low gestational age and a low birth weight belonged to the group with the maximum diameter of cysts ≥5 cm, which might have led to premature delivery and growth restriction. Postpartum cysts compress the surrounding tissues, and children with such cysts are more likely to have clinical symptoms.

This study underscores the utility of prenatal ultrasonography in distinguishing among various mediastinal cysts. These types of cysts exhibit distinctive features in terms of the relationship between the maximum diameter of the cyst and the anatomical structure, morphology, and cyst wall thickness, which can provide invaluable information for an accurate differential diagnosis. In addition, the postpartum cyst size, location, adjacent relationship with the surrounding tissues, volume, gestational age and weight are closely related to the prognosis of patients, and thus can guide clinical interventions. However, our study showed that even small cysts that are not in proximity to other structures might cause clinical symptoms. Follow up may be linked to postpartum cyst enlargement compressing adjacent structures. Hence, further research should be conducted to elucidate the underlying mechanisms.

The current study had several limitations. For example, it had a small sample size, and it was retrospective in nature. Thus, future studies with larger sample sizes that undertake a systematic analysis of prenatal ultrasound features should be conducted to enhance the differential diagnosis of fetal mediastinal cysts.

Conclusions

In summary, prenatal ultrasound can be used to identify the types of fetal mediastinal cysts according to the location, shape, maximum diameter of the cyst, and the adjacent relationship with the surrounding structures. The prognostic factors of fetal mediastinal cysts are the size, location, the adjacent relationship with the surrounding tissues, volume, gestational age, and weight of the cyst.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work, including ensuring that any questions related to the accuracy or integrity of any part of the work have been appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the ethics board of Gansu Provincial Maternity and Child-care Hospital (No. (2023) GSFY Lun Review [77]), and informed consent was obtained from all the patients.

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