

Spectrum and Interdisciplinary Management of Incidental Fetal Head and Neck Anomalies: A Retrospective Analysis at a Tertiary Care Teaching Hospital

Kalaivani Tamilselvan¹, Sahana Shruthi Vasikaran², Naveenkumar Pruthivirajan³

¹Assistant Professor, Department of Radiology, Sri Venkateshwaraa Medical College Hospital & Research Centre, Puducherry, India. ²Assistant Professor, Department of Obstetrics & Gynaecology, Sri Venkateshwaraa Medical College Hospital & Research Centre, Puducherry, India. ³Assistant Professor, Department of ENT, Sri Venkateshwaraa Medical College Hospital & Research Centre, Puducherry, India

Abstract

Background: The current standard of care for fetal structural anomalies is routine fetal second trimester ultrasonography at 18–22 weeks. These, in turn, include less common primary masses of the fetal head and neck that have a specific perinatal morbidity. These incidental findings include soft markers, as well as more serious deformities, including but not limited to, massive cervical teratomas, cystic hygroma and more or less severe micrognathia (with or without cleft). These anomalies should be identified early and an assessment of esophageal compression (for anticipation of polyhydramnios) and tracheal deviation (for anticipation of neonatal airway obstruction) should be performed. This study evaluates the frequency, ultrasound characteristics, and complications of fetal head/neck anomalies at a Tertiary center and underscores the importance of collaboration amongst radiology, obstetrics, and pediatrics/pediatric otolaryngology. **Material and Methods:** We conducted a retrospective, single-center cohort study at Sri Venkateshwaraa Medical College Hospital & Research Centre, covering all singleton pregnancies undergoing routine TIFFA scans between 18 and 22 weeks from January 2020 to December 2025. Inclusion required documented sonographic evidence of a cranial, facial, or cervical anomaly. Exclusions were multiple gestations, incomplete records, and loss to follow-up. Data from the Picture Archiving and Communication System (PACS) and medical records were entered into a proforma. Radiology data included lesion location, morphology (cystic vs. solid/mixed), maximal diameter, and any tracheal deviation. Obstetric data included amniotic fluid index (AFI, polyhydramnios defined as ≥ 24 cm), karyotype results, delivery mode, and gestational age. Neonatal/ENT data captured airway status at birth, need for intubation or surgical airway, and survival. Categorical variables are reported as counts (%) and continuous variables as mean $\pm$ SD. Owing to small sample size ($N=17$), Fisher's Exact Test was used to assess associations; $p<0.05$ was considered significant. Statistical analysis was performed using the Jamovi software suite. **Results:** Seventeen cases met inclusion criteria. The mean maternal age was 28.3 ± 4.2 years, with fetal anomalies detected at a mean gestational age of 19.5 ± 1.1 weeks. The spectrum of anomalies was led by cystic hygroma (8/17, 47.1%), followed by cervical teratoma (4/17, 23.5%), fetal goiter (2/17, 11.8%), severe micrognathia with/without cleft palate (2/17, 11.8%), and a branchial cleft cyst (1/17, 5.9%). All chromosomal abnormalities (3 cases, 17.6%) were confined to the cystic hygroma group (two Turner syndrome [45,X] and one trisomy-18). Polyhydramnios ($AFI\geq 24$) complicated 7 pregnancies (41.2%), predominantly those with solid/mixed masses. Three pregnancies were electively terminated for severe aneuploidy, and one pregnancy ended in spontaneous intrauterine fetal demise. Among the 13 neonates born alive, 5 (38.5%) were preterm (<37 wks). Emergency cesarean delivery was required in three cases, all with very large cervical teratomas (mean diameter ~ 88 mm). Airway compromise at birth occurred in 8 of 13 (61.5%) liveborn infants; 5 were successfully intubated, 2 required tracheostomy, and 1 (with a 102 mm teratoma) died after failed airway management. Statistical analysis showed a significant link between solid/mixed lesion morphology and polyhydramnios ($p=0.027$). Likewise, prenatal tracheal deviation on ultrasound was a strong predictor of postnatal airway intervention: every liveborn with a deviated trachea needed advanced airway support ($p=0.033$). The association of aneuploidy with cystic hygroma did not reach statistical significance ($p=0.082$), though all aneuploid cases were in that group. Details of the cohort's characteristics and outcomes are summarized in Tables 1–3. **Conclusion:** A critical time for fetal head/neck anomalies and prediction of the airway risk is the routine 18–22 week TIFFA scan. Esophageal compression (polyhydramnios) and more specifically tracheal deviation are important prognostic factors. Such complicated cases require a coordinated workflow – the radiographical localization of the anomaly helps in planning the delivery as needed; at the time of birth the pediatric ENT service is prepared to perform definitive airway measures.

Keywords: Fetal neck mass, cervical teratoma, cystic hygroma, polyhydramnios, prenatal ultrasound, EXIT procedure, fetal goiter, micrognathia.

Received: 01 July 2026

Revised: 18 July 2026

Accepted: 10 August 2026

Published: 03 October 2026

INTRODUCTION

Professional societies suggest the use of a routine fetal anomaly scan between 18–22 weeks as “gold standard” for structural abnormality detection.^[1] At high resource centers, many major birth defects can be detected as early as the

second trimester by ultrasonography, facilitating prediction and management and enabling informed choices. Primary masses occur in the head and neck region and these masses can be life-threatening at birth (roughly 2–3% of all structural anomalies, are

rare).^[2] Lymphatic Malformations (cystic hygromas), branchial anomalies, vascular tumors, thyroid goiters and teratomas are common lesions of the fetal neck.^[3] Fetal mass in the neck area is the most common abnormality seen during screening and is known as cystic hygroma.^[4] The range of these anomalies ranges from those that do not resolve or create an important problem (such as small isolated, lymph-filled collections) to those that affect the fluid dynamics and/or the shape of the airways (massive vascular tumors, solid tumors).

There are two reasons why it is important to diagnose a fetal cervical mass clinically. Large anterior cervical masses (cervical teratomas and goiters), can compress the fetal esophagus, preventing the baby from swallowing and causing an excess of fluid to accumulate in the womb (polyhydramnios). Polyhydramnios will cause the uterus to become stretched as well, and raise the risk of early labor and delivery. Second, a large neck mass can compress or displace a fetal windpipe, and cause the neonate to have a blocked windpipe at birth, after clamping of the umbilical cord. In fact, very large cervical teratomas may literally pull the lungs up (lung hypoplasia) and in some instances totally block the air passages.^[5] This is why the assessment of neck masses typically involves studying the position and symmetry of the trachea while looking at it in utero. A tracheal deviation on ultrasound at 20 weeks is regarded as a bad prognostic sign for the risk of intubation failure in the post-natal period.

Such multidisciplinary coordination from diagnosis to delivery is crucial. Close working partnerships must be established between maternal fetal medicine, radiology and the pediatric otolaryngology services. For instance, if there is expected airway compromise (e.g. massive teratomas or a very small jaw), uteroplacental gas exchange is maintained via an intact umbilical cord while the neonatal airway is secured; this may require an Ex Utero Intrapartum Treatment (EXIT) procedure. Along with this, embryological abnormalities of the neck (especially septated cystic hygromas) carry a high risk of chromosomal abnormalities, so there is a further level of treatment by genetic counseling and testing. In this report we share our institutional experience of how incidental fetal head and neck anomalies are found on routine TIFFA scans. We report the relative incidence of each type of lesion, sonographic characteristics and genetic analysis results and the perinatal outcomes. Correlation of sonographic sign (mass morphology and deviation of the trachea) with critical outcomes (polyhydramnios, premature labor and neonatal airway intervention) is studied in particular.

MATERIALS AND METHODS

Study Design and Setting: We performed a retrospective chart and imaging review at Sri Venkateshwara Medical College Hospital & Research Centre, Ariyur, Pondicherry. The study period spanned January 2020 through December 2025. The Institutional Ethics Committee (IEC) granted a waiver of informed consent due to the retrospective nature of the medical records audit.

Inclusion and Exclusion Criteria: We included all

Address for correspondence: Dr. Naveenkumar Pruthivirajan, Assistant Professor, Department of ENT, Sri Venkateshwara Medical College Hospital & Research Centre, Puducherry, India
E-mail: getdmaveen@gmail.com

DOI:

10.21276/amit.2026.v13.i3.1088

How to cite this article: Tamilselvan K, Vasikaran SS, Pruthivirajan N. Spectrum and Interdisciplinary Management of Incidental Fetal Head and Neck Anomalies: A Retrospective Analysis at a Tertiary Care Teaching Hospital. *Acta Med Int.* 2026;13(3):449-454.

singleton pregnancies that underwent a routine Level II fetal anatomy (TIFFA) scan at 18–22 weeks gestation and were found to have a craniofacial or cervical abnormality. Exclusion criteria were multiple gestations, missing/incomplete clinical data, and cases lost before final diagnosis or delivery. Electronic records (MRD database and PACS) were queried using relevant keywords (e.g. “cystic hygroma,” “teratoma,” “fetal goiter,” “micrognathia,” “branchial cleft”) to identify cases. A standardized form was used to abstract data.

Data Extraction: For each case, radiologic data included: type and location of the lesion, internal characteristics (predominantly cystic vs. solid/mixed), maximal dimension (in millimeters), and presence of tracheal displacement on the ultrasound images. Obstetric data captured were: amniotic fluid index (AFI) – with polyhydramnios defined as AFI ≥ 24 cm (in line with standard practice) – karyotype or microarray results, gestational age at delivery, and mode of delivery (spontaneous vaginal, elective cesarean, emergency cesarean). Otorhinolaryngology and neonatal data included the condition of the airway at birth (open vs. obstructed), necessity for immediate interventions (failed intubation, use of rigid bronchoscopy, or performing a neonatal tracheostomy), and ultimate neonatal outcome (survival vs. death).

Statistical Analysis: Continuous variables (maternal age, gestational age at diagnosis) are reported as mean $\pm$ SD. Categorical data (e.g. rates of polyhydramnios, termination, airway intervention) are given as counts with percentages. Given the small sample (N=17), we used Fisher’s Exact Test to assess significance of associations (e.g. between sonographic mass features and clinical outcomes). A p-value <0.05 was considered statistically significant. All analyses were performed using Jamovi (an open-source statistical software).

RESULTS

A total of 17 fetal head/neck anomalies met the inclusion criteria over the six-year period.

Patient demographics and lesion spectrum: The mean maternal age was 28.3 ± 4.2 years. The mean gestational age at anomaly detection on the TIFFA scan was 19.5 ± 1.1 weeks. Table 1 summarizes the distribution of lesion types. Cystic hygroma was the most common (8 cases, 47.1%), followed by cervical teratoma (4 cases, 23.5%), fetal thyroid goiter (2 cases, 11.8%), severe micrognathia with or without cleft (2 cases, 11.8%), and one branchial cleft cyst (5.9%). Chromosomal studies (via amniocentesis or postnatal karyotype) revealed significant aneuploidy in 3 cases (17.6% of total): two fetuses had Turner syndrome (45,X) and one had trisomy 18.

Notably, all three aneuploid fetuses were among the cystic hygroma group, whereas all teratomas, goiters, and isolated

micrognathias were euploid. The difference in aneuploidy rates between hygroma vs. other lesions did not reach statistical significance ($p=0.082$), though it aligns with known genetics (cystic hygroma is classically linked to Down's and Turner's syndromes).

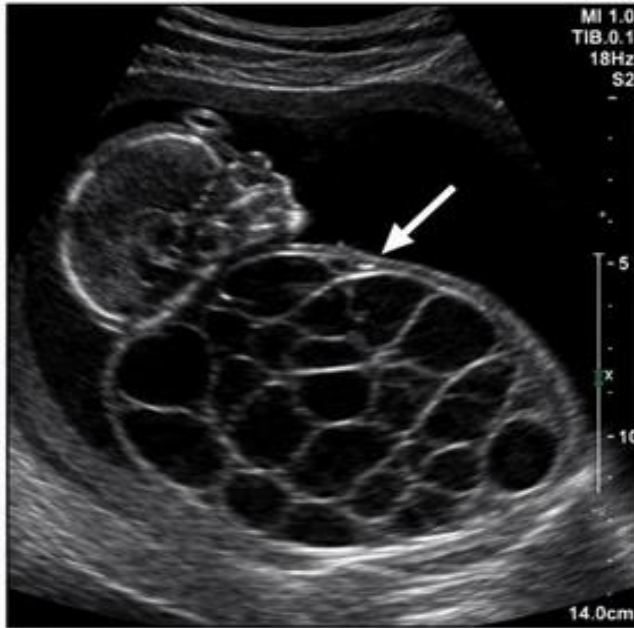


Figure 1: Fetal ultrasound at 20 weeks showing a large cystic hygroma (arrow) in the posterior neck. The lesion is multiseptated and dominates the ultrasound image. Prenatal cystic hygromas often appear as fluid-filled cavities in the nuchal region.



Figure 2: Prenatal thyroid ultrasound demonstrating a fetal goiter (arrows) as a homogeneously enlarged anterior neck mass. Large fetal goiters can compress the trachea and esophagus, often causing polyhydramnios and respiratory compromise



Figure 3: A newborn with severe micrognathia (small lower jaw) as seen in Pierre Robin sequence. The recessed chin and posteriorly placed tongue (glossoptosis) are evident. Such anatomy can cause immediate airway obstruction, and polyhydramnios often occurs in utero due to fetal swallowing difficulty. The baby's airway was secured by an emergency tracheostomy at birth.

Obstetric outcomes: Polyhydramnios was diagnosed in 7 of 17 pregnancies (41.2%). All cases of polyhydramnios occurred in pregnancies with solid or mixed lesions (cervical teratomas, goiters, or severe micrognathia). In fact, 100% of the cervical teratomas and goiters in our series were complicated by polyhydramnios. This supports the pathophysiology that a bulky anterior neck mass impinges on the fetal esophagus, preventing swallowing of amniotic fluid. Three pregnancies were electively terminated due to severe fetal aneuploidy (2 Turner's, 1 T18), and one pregnancy ended in spontaneous intrauterine fetal demise (hygroma with hydrops). Of the remaining 13 live-born infants, 5 (38.5%) were delivered preterm (<37 weeks). Emergency cesarean delivery was performed in 3 cases (17.6% of total), each involving a very large cervical teratoma (mean diameter ~88 mm) and maternal distress from massive polyhydramnios. Table 2 details these obstetric findings.

Neonatal airway management: Among the 13 live-born neonates, airway compromise at birth occurred in 8 infants (61.5%). In all 8, standard laryngoscopic intubation failed due to distorted anatomy. Five of these neonates were successfully intubated only after multiple attempts with specialized equipment. Two cases (both massive cervical teratomas) required an immediate surgical airway (tracheostomy) in the delivery room. Unfortunately, one infant died from failed airway management; this baby had a 102-mm teratoma with marked tracheal deviation (shown in prenatal imaging). Among the 13 live-born infants, 4 had documented prenatal tracheal deviation and 9 had no documented deviation. All 4 live-born infants with prenatal tracheal deviation required advanced airway rescue, while 4 of the 9 without documented deviation had airway compromise. The association between sonographic tracheal deviation and postnatal airway intervention

was statistically significant ($p=0.033$). Table 3 summarizes neonatal airway interventions.

Statistical correlations: Fisher's Exact Test confirmed that solid/mixed echogenic lesions were significantly associated with polyhydramnios (7/8 solid vs. 0/9 purely cystic, $p=0.027$). Prenatal tracheal deviation strongly predicted postnatal airway compromise: all neonates with deviation needed intervention ($p=0.033$). Because of the small cohort

size, specific diagnostic accuracy percentages were not calculated. Although all identified aneuploidies were in the cystic hygroma subgroup, the sample size limited statistical power ($p=0.082$). These findings are concordant with prior reports: large cervical masses are known to cause polyhydramnios via esophageal compression, and prenatal neck anatomy on ultrasound strongly guides delivery planning for airway management.

Table 1: Maternal demographics and distribution of fetal head/neck anomalies (N=17). The data show cystic hygromas (fluid-filled lymphatic malformations) as the most common finding. Aneuploidy (genetic abnormality) was detected only in hygroma cases (no liveborns with teratomas, goiters or micrognathia had chromosomal abnormalities).

Characteristic	Value
Total cases (singleton pregnancies)	17
Maternal age, mean $\pm$ SD (years)	28.3 $\pm$ 4.2
Gestational age at ultrasound, mean $\pm$ SD (weeks)	19.5 $\pm$ 1.1
Lesion type – no. (%)	
– Cystic hygroma	8 (47.1%)
– Cervical teratoma	4 (23.5%)
– Fetal thyroid goiter	2 (11.8%)
– Micrognathia ($\pm$ cleft palate)	2 (11.8%)
– Branchial cleft cyst	1 (5.9%)
Genetics – no. with aneuploidy (%)	3 (17.6%)*
– Turner syndrome (45,X)	2
– Trisomy 18	1
– Others (normal karyotype)	13

Table 2: Obstetric outcomes and delivery data. Polyhydramnios (AFI $\geq$ 24 cm) occurred predominantly with solid/mixed lesions. Elective terminations were for genetic anomalies, while spontaneous intrauterine fetal demise was recorded separately. Preterm delivery and emergency cesarean sections were common in massive neck tumors.

Outcome	Number (%) or Value
Polyhydramnios (AFI $\geq$ 24 cm)	7 (41.2%)
Elective pregnancy terminations	3 (17.6%)
– for confirmed aneuploidy	3
Spontaneous intrauterine fetal demise	1
Liveborn infants (after terminations/demise)	13
Preterm birth (<37 wk)	5 (38.5% of liveborn)
Elective cesarean (planned)	2 (one due to known airway issues)
Emergency cesarean (LSCS)	3 (17.6% of total)
– All required for massive cervical teratoma	3 (mean tumor diameter 88.3 mm)

Table 3: Neonatal airway management and outcomes for the 13 live-born infants. More than half had airway obstruction at birth. Those with prenatal tracheal deviation uniformly required advanced intervention (intubation or tracheostomy).

Airway Outcome	Number (%) of live births (13)
No airway compromise (normal intubation)	5 (38.5%)
Airway compromise at birth	8 (61.5%)
– Required immediate intervention	8 (100% of compromised)
– Successful endotracheal intubation	5
– Surgical airway (tracheostomy)	2
– Neonatal death (failed airway)	1
Prenatal tracheal deviation noted on US	4 (31% of liveborn)
– All with deviation had compromised airway	4 (100% of those with deviation)
– No deviation & no compromise	5

DISCUSSION

If a fetal head or neck mass is detected during a routine fetal ultrasound, the normal-risk status of a pregnancy becomes high-risk. The most common lesions, in our series, were cystic hygroma (almost half of cases) which is highly similar with the worldwide figure that shows that the most common fetal cervical mass is a lymphatic malformation. Lymphangioma (cystic hygromas) are genetically anomalous, as up to 50% are chromosomal anomalies. We found 37.5% (3/8) aneuploid (aneuploid karyotype consistent

with Turner, T18) cases among the hygromas in our small cohort, whereas none of the fetuses with solid tumors (teratoma, goiter) had abnormal karyotypes.^[6] It shows that a fetal cystic neck lesion is an opportunity for genetic counseling and testing which is in line with current guidelines. Mixed or solid cervical masses, however, present mechanical dangers. Cervical teratomas and goiters are almost solid tumors and can become very large.^[7] In this data 100% of those that developed teratoma and goiters had clinically significant polyhydramnios [Table 2]. This is a physiologic explanation: the fetus' esophagus gets squashed and

cannot swallow the amniotic fluid which accumulates. This is seen well in other reports from fetal treatment centres such as CHOP who report that giant masses in the fetal neck commonly compress the esophagus and lead to polyhydramnios and preterm labor. In our cases of teratoma, the clinical symptoms confirmed this group: 3 cases of the very large teratomas had refractory polyhydramnios and maternal discomfort and did require emergency cesarean delivery. The main concern with any fetal neck mass is the difficulty with passageways. Therefore, antenatal imaging is more directed towards the alignment and patency of the trachea, which directly impact on delivery planning. Within our cohort, sonographic tracheal deviation was the only predictor of immediate postpartum airway failure ($p=0.033$).^[8] This finding exemplifies the obstetric and otolaryngologic rule: if the trachea appears shifted on the 20-week scan, be prepared for an EXIT. Indeed, prenatal guidelines actually warn of babies with large neck masses and severe displacement of the airway that the baby must be delivered through EXIT, to ensure a surgical airway before cutting the umbilical cord. In our single case of neonatal death, we had a 102 mm teratoma which was grossly displacing the trachea, which could easily have been life saving if it was a planned EXIT. Hence, the fetal tracheal position is very much in favor as a triage marker—a delivery should be scheduled with the pediatric ENT on hand and fetal tracheostomy preparations in place if it is significantly deviated. Aside from the trachea, the tongue might also be involved in micrognathia. When the lower jaw is small (micrognathia) the tongue will often fall down (glossoptosis) and may obstruct airways after birth. Swallowing problems lead to polyhydramnios in most fetuses with micrognathia, according to the ISUOG patient information leaflet about swellings of the fetus's mouth and jaw. In two cases of micrognathia, we found it was true in our own experience that the two were associated, one by polyhydramnios and the other by airways blockage at birth. This is consistent with literature suggesting that if the fetus has severe mandibular hypoplasia there is a high suspicion of Pierre Robin sequence. So, detailed imaging (3D ultrasound or MRI) and early airway planning for the neonate are warranted if such findings were made. Our results highlight the need for an interdisciplinary pathway. Upon ultrasound detection of a head/neck mass, referral to a fetal medicine specialist should be immediate. This requires at least having the help of pediatric otorhinolaryngologists for prenatal counseling and delivery plan. As outlined in the Amboss guidelines, any mass in the fetal neck should be accompanied by a team approach, including a plan for EXIT and neonatal intensive care. We have looked at selected cases and used fetal MRI to improve identification of tumor extent and to predict the airway anatomy, which echoes the recommendation to use complementary MRI and ultrasound in surgical planning.^[9] Lastly, documentation of the airway findings in a 20 week scan helped to prepare the neonatal team in advance; this may have contributed to improved outcome in our liveborn infants.^[10] There are some limitations in this study. Due to its retrospective, single center design, and the relatively small number of patients, its generalizability and statistical power

— particularly in the case of genetic correlations — are limited. However, it does show a real-life case scenario in a tertiary care hospital and correlates with the literature from specialist hospitals. Among others, it confirms that risk stratification with imaging during the 18-22 week window is possible, by showing that large solid neck masses are associated with polyhydramnios and preterm labor, whereas prenatal tracheal deviation with imaging is associated with neonatal airway compromise.

CONCLUSION

Routine anatomical ultrasound examination remains the basis for prenatal screening for anomalies. Early identification of fetal head and neck masses is crucial — not only to offer genetic counseling but also to plan obstetric and neonatal care. Our data support the notion that there are specific sonographic findings (particularly solid lesion morphology and tracheal deviation) which are consistent predictors of the most severe outcomes (polyhydramnios/preterm labor, and airways obstruction, respectively). Seamless interdisciplinary flow is essential for optimal management of these cases. Radiologists must accurately describe the anatomy of lesions; obstetricians must make deliveries at appropriate times and follow correct procedures; pediatric surgeons and anesthesiologists must be prepared to perform airway intervention at any second. Accurate fetal cervical ultrasound mapping directly impacts and enhances fetal care throughout the fetal, perinatal and early neonatal periods, ensuring the limited timeframe required to save the life of the newborn.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Salomon, L. J., Alfirevic, Z., Berghella, V., Bilardo, C. M., Chalouhi, G. E., Da Silva Costa, F., Hernandez-Andrade, E., Malinger, G., Munoz, H., Paladini, D., Prefumo, F., Sotiriadis, A., Toi, A., & Lee, W. (2022). ISUOG Practice Guidelines (updated): performance of the routine mid-trimester fetal ultrasound scan. *Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology*, 59(6), 840–856. <https://doi.org/10.1002/uog.24888>
- Laje, P., Howell, L. J., Johnson, M. P., Hedrick, H. L., Flake, A. W., & Adzick, N. S. (2013). Perinatal management of congenital oropharyngeal tumors: the ex utero intrapartum treatment (EXIT) approach. *Journal of pediatric surgery*, 48(10), 2005–2010. <https://doi.org/10.1016/j.jpedsurg.2013.02.031>
- Tonni, G., Granese, R., Martins Santana, E. F., Parise Filho, J. P., Bottura, I., Borges Peixoto, A., Giacobbe, A., Azzerboni, A., & Araujo Júnior, E. (2017). Prenatally diagnosed fetal tumors of the head and neck: a systematic review with antenatal and postnatal outcomes over the past 20 years. *Journal of perinatal medicine*, 45(2), 149–165. <https://doi.org/10.1515/jpm-2016-0074>
- Malone, F. D., Ball, R. H., Nyberg, D. A., Comstock, C. H., Saade, G. R., Berkowitz, R. L., Gross, S. J., Dugoff, L., Craigo, S. D., Timor-Tritsch, I. E., Carr, S. R., Wolfe, H. M., Dukes, K., Canick, J. A., Bianchi, D. W., D'Alton, M. E., & FASTER Trial Research Consortium (2005). First-trimester septated cystic hygroma:

- prevalence, natural history, and pediatric outcome. *Obstetrics and gynecology*, 106(2), 288–294. <https://doi.org/10.1097/01.AOG.0000173318.54978.1f>
5. Hirose, S., Farmer, D. L., Lee, H., Nobuhara, K. K., & Harrison, M. R. (2004). The ex utero intrapartum treatment procedure: Looking back at the EXIT. *Journal of pediatric surgery*, 39(3), 375–380. <https://doi.org/10.1016/j.jpedsurg.2003.11.011>
 6. Chen, Y. N., Chen, C. P., Lin, C. J., & Chen, S. W. (2017). Prenatal Ultrasound Evaluation and Outcome of Pregnancy with Fetal Cystic Hygromas and Lymphangiomas. *Journal of medical ultrasound*, 25(1), 12–15. <https://doi.org/10.1016/j.jmu.2017.02.001>
 7. Liechty, K. W., & Crombleholme, T. M. (1999). Management of fetal airway obstruction. *Seminars in perinatology*, 23(6), 496–506. [https://doi.org/10.1016/s0146-0005\(99\)80028-7](https://doi.org/10.1016/s0146-0005(99)80028-7)
 8. Hedrick, H. L., Flake, A. W., Crombleholme, T. M., Howell, L. J., Johnson, M. P., Wilson, R. D., & Adzick, N. S. (2005). The ex utero intrapartum therapy procedure for high-risk fetal lung lesions. *Journal of pediatric surgery*, 40(6), 1038–1044. <https://doi.org/10.1016/j.jpedsurg.2005.03.024>
 9. Wilson, L., Whitby, E. H., & Raghavan, A. (2026). A Clearer Picture: Using Fetal MRI to Diagnose Neck Masses and Predict Airway Compromise. *Prenatal diagnosis*, 46(3), 339–347. <https://doi.org/10.1002/pd.70078>
 10. Erikci, V., & Hoşgör, M. (2014). Management of congenital neck lesions in children. *Journal of plastic, reconstructive & aesthetic surgery* : JPRAS, 67(9), e217–e222. <https://doi.org/10.1016/j.bjps.2014.05.018>