

INTRAUTERINE FETAL GOITER: DIAGNOSIS AND MANAGEMENT

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SUMMARY

Objective: The diagnosis and management of a fetal neck mass encountered during routine antenatal ultrasound screening, and later diagnosed definitely as a intrauterine fetal goiter, is discussed in this case report.

Case Report: A 28-year-old primigravida at 36 weeks' gestation with normal vital findings, normal laboratory values, and no history of pathologic findings was examined in our outpatient department for the first time. Her previous antenatal visits were done in secondary maternal care units. The ultrasound screening revealed polyhydramnios (amniotic fluid index, 21 cm), a homogeneous solid mass of 3.67×7.88 cm on the anterior of the fetal neck, and fetal abdominal ascites. Other fetal organs appeared normal. Maternal thyroid panel was in the normal range. The fetus was delivered abdominally at 38 weeks' gestation and diagnosed with defective thyroid hormone biosynthesis. With appropriate treatment, the size of the thyroid gland was observed to decrease.

Conclusion: The early diagnosis and appropriate treatment of intrauterine fetal goiter is crucial, owing to the potential mental and motor outcomes of this disease. [*Taiwan J Obstet Gynecol* 2008;47(1):87-90]

Key Words: diagnosis, intrauterine fetal goiter, treatment

Introduction

Anterior fetal neck masses are rarely encountered during the second or third trimester of pregnancy. Careful routine ultrasound screening easily reveals intrauterine fetal goiters, which usually appear as symmetrical homogeneous masses at the anterior of the neck, and are relatively easy to observe because of the fetal neck extension and accompanying polyhydramnios [1]. Primary congenital hypothyroidism is seen in 1/3,000–1/4,000 deliveries all over the world [2]. Most of these cases (80%) are due to dysgenesis of the thyroid gland. The remaining 15% and 5% are due to dyshormonogenesis and hypothalamo-hypophysial abnormalities, respectively [3]. Congenital hypothyroidism has an incidence of one in every 4,000 live births and is one of the most common treatable causes of mental retardation [4].

Fetal hypothyroidism usually goes unrecognized when there is no maternal history of thyroid disease or use of antithyroid medication. However, the consequences of both fetal goiter and impaired thyroid function are serious [5]. Usually, dyshormonogenesis is responsible for fetal goiter. Blockage of hormone biosynthesis increases fetal thyroid-stimulating hormone (TSH) levels and this leads to fetal goiter, resulting in compression of the esophagus and the trachea and leading to polyhydramnios, hyperextension of the neck, and dystocia during labor [6]. Mental and motor retardation also have been reported in the later stages of life in some affected infants [7]. These are all reasons why the diagnosis of fetal hypothyroidism should be established at an early stage and appropriate hormone replacement treatment should be started. Timely hormone replacement therapy prevents neurologic sequelae, thus national programs are essential.

Especially when fetal goiter is diagnosed in the second trimester, amniocentesis to check TSH levels in the amniotic fluid may be useful to check fetal thyroid metabolism. However, the gold standard for the diagnosis is fetal blood sampling with cordocentesis to measure fetal TSH, free triiodothyronine (FT3) and



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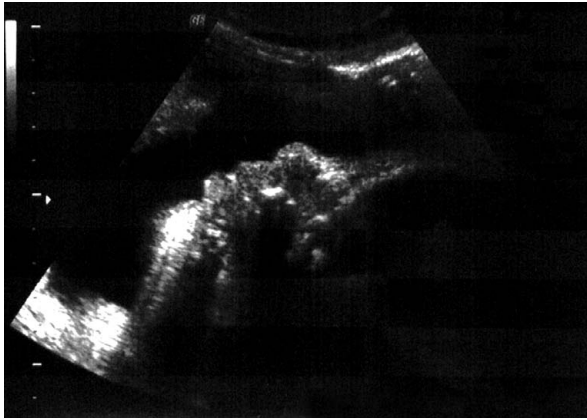


Figure 1. A symmetrical, homogeneous solid mass at the anterior of the fetal neck.

free thyroxine (FT4) levels [8]. According to these results, weekly intra-amniotic thyroxine injections (with optional simultaneous amniodrainage) can be done and fetal pulmonary maturation can be followed until delivery at the 37th week or later, as suggested by Grüner et al [8]. Monitoring therapeutic efficacy is still problematic; serial cordocentesis is a reliable method, but it carries unacceptably high fetal risks. Close thyroid function monitoring by repeated cordocentesis to adjust fetal treatment does not appear to be essential and may be substituted by ultrasonographic follow-up to monitor fetal goiter decrease [9].

Case Report

A 28-year-old primigravida at 36 weeks' gestation (who had previously been followed up at secondary prenatal care centers) was admitted to our tertiary maternal care center for a regular antenatal visit for the first time. She did not mention any abnormalities in her pregnancy history. She had completely normal physical findings, and laboratory panels revealed normal routine blood chemistry and urinalysis results. However, routine ultrasound examination revealed polyhydramnios (amniotic fluid index, 21 cm), and a symmetrical, homogeneous solid mass of 3.67 × 7.88 cm was identified at the anterior of the fetal neck. There was also fetal ascites (Figures 1–3). No additional abnormalities were identified in the fetus, and maternal thyroid hormone levels were in the normal range (Table 1).

After a close follow-up of the pregnancy for 2 weeks, a 3,250-g fetus with Apgar scores of 8 and 10 at 1 and 5 minutes, respectively, was delivered by cesarean section at 38 weeks' gestation. Blood levels of TSH, FT3 and FT4 for the newborn revealed abnormal thyroid hormone biosynthesis (Table 2). Thyroxine treatment was started after labor, and the dosing was adjusted

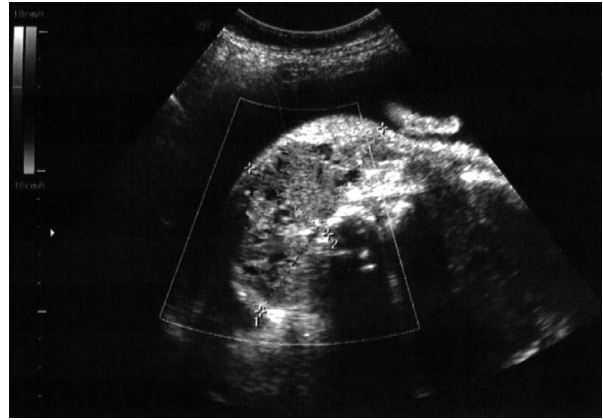


Figure 2. A solid mass (3.67 × 7.88 cm) at anterior fetal neck.



Figure 3. Fetal ascites and polyhydramnios.

Table 1. Maternal thyroid hormone levels

TSH (μU/mL)	1.9 (0.5–4)
FT3 (pmol/L)	5.7 (2.9–8.9)
FT4 (ng/dL)	1.6 (0.75–1.95)

TSH = thyroid-stimulating hormone; FT3 = free triiodothyronine; FT4 = free thyroxine.

Table 2. Newborn thyroid hormone levels

FT3 (pmol/L)	0.7 (0.9–2.9)
FT4 (ng/dL)	0.2 (0.75–1.5)
TSH (μU/mL)	125 (3.5–10.4)

TSH = thyroid-stimulating hormone; FT3 = free triiodothyronine; FT4 = free thyroxine.

according to the monthly TSH levels. A decrease in the size of the fetal goiter was noted during follow-up.

Discussion

Congenital hypothyroidism is quite a rare disorder, with reported prevalences of 1/3,000 and 1/5,000 deliveries

in Europe and the USA, respectively [10]. A differential diagnosis of teratoma, thyroglossal duct cyst, cystic hygroma, lymphangioma, hemangioma, branchial cleft cyst, or other cystic lesion should be kept in mind when diagnosing an anterior fetal neck mass ultrasonographically [11].

The first *in utero* treatment of fetal hypothyroidism by injecting thyroxine into the amniotic fluid was successfully conducted in 1980 in a fetus who was exposed to large doses of propylthiouracil, which was administered to the mother who suffered from Graves' disease [12]. Since then, 18 cases, excluding the present case, have been reported in the English literature. Among these 18 cases, seven (42%) had maternal hyperthyroidism, which was treated with antithyroid drugs such as propylthiouracil. Eleven cases (58%) showed normal maternal thyroid functions, and the congenital hypothyroidism of these fetuses may have been due to the dysmorphogenesis of the thyroid system or to the acquisition of maternally derived goitrogen [13]. Polyhydramnios was seen in 10 of 17 cases (59%), in which the amount of amniotic fluid was documented. In response to *in utero* treatment with thyroxine, all cases showed regression of fetal goiters. No significant maternal or fetal complications were reported, except one case of fetal growth restriction, and all the neonates showed normal psychomotor development after birth [13]. Especially in the fetal goiter cases diagnosed in the second trimester, maternal thyroid function should be evaluated and any history of maternal antithyroid therapy should be questioned. If the maternal thyroid functions are in the normal range, amniotic fluid sampling for fetal TSH, FT3 and FT4 levels should be done to detect fetal hypothyroidism. If fetal hypothyroidism is diagnosed, intra-amniotic thyroxine injections (200–600 µg/week) are administered and serial amniocenteses or preferentially cordocenteses are performed to follow the changes in the fetal thyroid metabolism [9,14].

This intrauterine treatment prevents the possible premature rupture of the membranes and preterm delivery due to polyhydramnios, as well as the possibility of dystocia in normal labor due to fetal neck hyperextension. Normal intrauterine growth, especially central nervous system development, is maintained in a euthyroid metabolic state [15].

In our case, the patient was diagnosed at the 36th week of her pregnancy, leaving no time for treatment to have any positive effects on the fetus before delivery. We, therefore, did not use this mode of diagnosis and treatment which requires invasive fetal procedures. Instead, the patient was followed up with frequent antenatal visits until the 38th week, and considering the possible risks of dystocia due to the previously mentioned

reasons, the fetus was then delivered abdominally. In the postpartum period, the newborn was diagnosed with thyroid hormone biosynthesis disorder and thyroxine replacement was started. By diagnosing the condition antenatally, the possible psychologic trauma to the family was minimized, and the delivery was planned with the neonatology department in our center, also minimizing the neonatal risks.

In conclusion, even though rare, congenital hypothyroidism should be considered in the differential diagnosis of fetal neck masses encountered during ultrasound examination. The adverse effects of this condition on fetal mental and motor development should be kept in mind, and rapid evaluation, quick diagnosis and immediate treatment should be undertaken.

In summary, a case of fetal goiter diagnosed prenatally was reported. Although *in utero* treatment for fetal goiter hypothyroidism seems to be effective, it is imperative to minimize invasive procedures and to administer the minimum effective dose of thyroxine to prevent complications.

References

1. Barone CM, Van Natta FC, Kourides IA, Berkowitz RL. Sonographic detection of fetal goiter, an unusual cause of hydramnios. *J Ultrasound Med* 1985;4:625–7.
2. Macchia PE, De Felice M, Di Lauro R. Molecular genetics of congenital hypothyroidism. *Curr Opin Genet Dev* 1999;9:289–94.
3. Medeiros-Neto GA, Stanbury JB, eds. *Inherited Disorders of the Thyroid System*. Boca Raton: CRC Press, 1994:1–218.
4. Delange F. Neonatal screening for congenital hypothyroidism: results and perspectives. *Horm Res* 1997;48:51–61.
5. Simsek M, Mendilcioglu I, Mihci E, Karagüzel G, Taskin O. Prenatal diagnosis and early treatment of fetal goitrous hypothyroidism and treatment results with two-year follow-up. *J Matern Fetal Neonatal Med* 2007;20:263–5.
6. Davidson KM, Richards DS, Schatz DA, Fisher DA. Successful *in utero* treatment of fetal goiter and hypothyroidism. *N Engl J Med* 1991;324:543–6.
7. New England Congenital Hypothyroidism Collaborative. Elementary school performance of children with congenital hypothyroidism. *J Pediatr* 1990;116:27–32.
8. Grüner C, Kollert A, Wildt L, Dörr HG, Beinder E, Lang N. Intrauterine treatment of fetal goitrous hypothyroidism controlled by determination of thyroid-stimulating hormone in fetal serum. *Fetal Diagn Ther* 2001;16:47–51.
9. Perrotin F, Sembely-Taveau C, Haddad G, Lonnais C, Lansac J, Body G. Prenatal diagnosis and early *in utero* management of fetal dysmorphogenetic goiter. *Eur J Obstet Gynecol Reprod Biol* 2001;94:309–14.
10. Fisher DA, Klein AH. Thyroid development and disorders of thyroid function in the newborn. *N Engl J Med* 1981;304:702–12.

11. Vazquez E, Enriquez G, Castellote A, Lucaya J, Creixell S, Aso C, Regas J. US, CT, and MR imaging of neck lesions in children. *Radiographics* 1995;15:105-22.
12. Weiner CP, Okamura K. Diagnostic fetal blood sampling-technique related losses. *Fetal Diagn Ther* 1996;11:169-75.
13. Hashimoto H, Hashimoto K, Suehara N. Successful *in utero* treatment of fetal goitrous hypothyroidism: case report and review of the literature. *Fetal Diagn Ther* 2006;21:360-5.
14. Agrawal P, Ogilvy-Stuart A, Lees C. Intrauterine diagnosis and management of congenital goitrous hypothyroidism. *Ultrasound Obstet Gynecol* 2002;19:501-5.
15. Glorieux J, Dussault JH, Morissette J, Desjardins M, Letarte J, Guyda H. Follow-up at ages 5 and 7 years on mental development in children with hypothyroidism detected by Quebec Screening Program. *J Pediatr* 1985; 107:913-5.