

Fetal toxoplasmosis: ultrasonographic signs

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ABSTRACT

Eighty-nine cases of proven *Toxoplasma gondii* fetal infection were studied in order to describe the morphological lesions which could be demonstrated on ultrasound examination; these were present in 32 of the infected cases. Cerebral ventricular dilatation was the most common sign and was generally bilateral and symmetrical. Its evolution was always very rapid over a period of a few days. Other signs observed included intracranial and intrahepatic densities, increased thickness and hyperdensity of the placenta, ascites and rarely pericardial and pleural effusions. Thirteen fetuses demonstrated two or more ultrasound features. Intrauterine growth retardation and microcephaly were not observed. Ultrasonographic assessment of the fetus infected with *Toxoplasma gondii* is important. It improves the reliability of prenatal diagnosis and is of important prognostic value in cases with severe brain lesions, but is of little value in detecting brain necrosis without ventricular dilatation.

INTRODUCTION

Prenatal diagnosis of fetal infection with *Toxoplasma gondii* is possible using biological and morphological signs. It includes ultrasonography, amniocentesis and fetal blood sampling under ultrasound guidance, as previously described¹. Non-specific signs of infection and toxoplasma specific IgM can be demonstrated on fetal blood samples. Parasitological studies are performed on fetal blood and amniotic fluid. Since fetal infection can now be successfully treated with antibiotics in the absence of morphological lesions², the ultrasonographic diagnosis and assessment are of utmost importance to detect those fetuses whose prognosis would not be improved by therapy.

The purpose of this study is to describe the lesions demonstrated on ultrasound examination in cases of proven fetal infection.

MATERIAL AND METHOD

Eighty-nine cases of proven *Toxoplasma gondii* fetal infection were considered in this study. These include all the congenital toxoplasmosis cases among the 1270 women referred for prenatal diagnosis because of *Toxoplasma* infection during pregnancy; 3/250 occurred as a result of maternal infection during the periconceptional period; 36/787 from a maternal infection during weeks 6–16; 26/150 from maternal infection during weeks 17–20; and 24/83 from maternal infection during weeks 21–35. Fetal infection was proven in all cases by fetal blood sampling under ultrasound guidance and amniocentesis. Parasites were demonstrated in all 89 cases, on amniotic fluid and/or fetal blood.

Ultrasound examination was performed between the 20th and the 32nd weeks of gestation. All ultrasonographic examinations were performed by two examiners on a ATL Mark III (3.5 MHz) (Advanced Technology Laboratories, Washington, USA) or a Toshiba Sonolayer 100A (3.5 MHz) (Toshiba Corporation, Tokyo, Japan). Reports and photographs were reviewed in all 89 cases.

RESULTS

Prenatal diagnosis took place between the 20th and 32nd weeks of pregnancy. Thirty-two of the 89 infected fetuses had abnormal ultrasound examinations. The number of fetuses showing ultrasonographic signs was higher in cases of early fetal infection during pregnancy (Table 1).

Termination of pregnancy

Termination of pregnancy was performed in 34 cases and autopsy showed the presence of severe brain lesions in all examined cases (33/34). Ultrasonographic morphological abnormalities were the indication for termination in 27/33 cases and are summarized in Table 2. In 18 cases, these lesions were already present at the time of prenatal

Table 1 Number of fetuses showing morphological abnormalities according to the trimester during which maternal infection occurred

Time of maternal infection	Number of fetuses examined	Fetuses with lesions	
		n	%
1st trimester	26	20	77.9
2nd trimester	54	11	20.4
3rd trimester	9	0	0

Table 2 Ultrasonographic signs demonstrated in cases resulting in termination of pregnancy

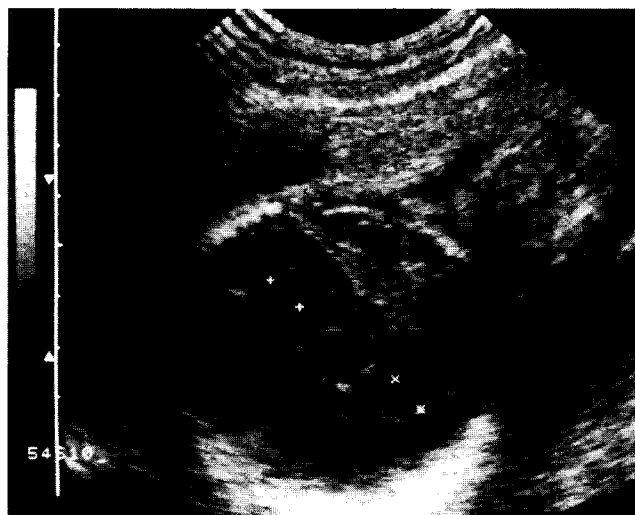
	n
Brain lesions	
ventricular dilatation*	25
intracranial densities	6
Placental inflammation	
increased thickness*	11
hyperdensity	2
Liver lesions	
intrahepatic densities	4
hepatomegaly*	2
Ascites	5
Pericardial effusion	2
Pleural effusion	1

*All values above the 95th percentile for the reference ranges for our population

**Figure 1** Cranial sonogram demonstrating bilateral and symmetrical ventricular dilatation

diagnosis. Nine pregnancies were continued until secondary ventricular dilatation occurred and were then terminated. In six cases, termination was performed upon parental request in view of the high risk of fetal abnormalities associated with first-trimester infections, despite the absence of ultrasonographic abnormalities. In these six cases, brain lesions found on postmortem examination consisted of multiple foci of brain necrosis and abscesses, sometimes in very large areas.

Brain damage was frequently observed. Hydrocephaly was the most common sign, found in 25 cases. The ventricular dilatation was bilateral and symmetrical (Fig-

**Figure 2** Sonogram of fetus with ventricular dilatation beginning in the occipital region**Figure 3** An example of intracranial densities due to foci of brain necrosis

ure 1) except in one case, and occurred first in the occipital region (Figure 2), before involving the entire lateral ventricles. The evolution was always very rapid over a period of a few days. It was not associated with an increase of the biparietal diameter. Intracranial densities were less frequently demonstrated (six cases) (Figure 3).

Thirteen cases showed signs of placental inflammation, mainly an increase of placental thickness (11 cases) and rarely (two cases) an increase of placental density.

Liver lesions observed on ultrasound consisted of intrahepatic densities (four cases) and hepatomegaly (two cases), as shown by an increase of the transverse abdominal diameter and the abdominal circumference.

Ascites was found in five cases and was generally moderate. Less frequent ultrasonographic signs included pericardial (two cases) and pleural (one case) effusions (Figure 4).

No ultrasonographic lesions could be demonstrated in six cases of pregnancy termination. The presence of one sign was observed in 13 cases and the remaining 14 cases showed two signs or more.

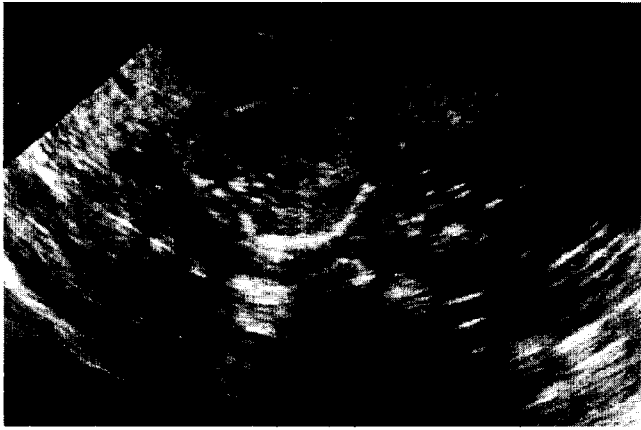


Figure 4 Fetal thorax with massive pleural effusion

Live births

Fifty-two pregnancies were allowed to proceed, leading to the birth of 55 infants. One twin pregnancy was allowed to continue despite known cerebral lesions in one fetus (severe ventricular dilatation and multiple bilateral calcifications), because the second twin had no lesions on ultrasonograms. This critically ill twin died at birth. Regular assessment of the pregnancies was carried out and three fetuses showed intracranial densities corresponding to intracranial calcifications observed after birth. In the neonatal period, transfontanellar ultrasound, skull X-rays and computed tomography allowed the diagnosis of two cases of multiple calcifications and two cases of isolated calcification that were missed on prenatal ultrasound examination. Two fetuses had ascites at one stage during pregnancy, but this sign disappeared after specific antibiotic treatment was started.

All infants were investigated after birth and 54/55 showed benign toxoplasmosis and normal psychomotor development after a follow-up period of 6 months to 4 years. One infant developed ventricular dilatation at 1 month of life, necessitating a ventriculo-peritoneal shunt.

Intrauterine growth retardation and microcephaly were not observed in the 89 cases of fetal infection.

DISCUSSION

Among the 89 cases of fetal infection, 36% showed abnormal morphological signs. Cerebral lesions were more common when infections occurred early in pregnancy².

Ventricular dilatation (hydrocephaly) is a frequent ultrasonographic sign and is easy to demonstrate. It is due to necrotizing lesions in the region of the Sylvius duct. It should be remembered that hydrocephaly is due to toxoplasmosis lesions in a particular location in the fetal brain and that major cerebral damage can be observed without ventricular dilatation. Six patients asked for a termination of pregnancy despite the absence of morphological lesion on ultrasound. They did so because of the increased risk associated with a fetal infection occurring early in pregnancy. All 33 examined terminations of pregnancy showed major cerebral dam-

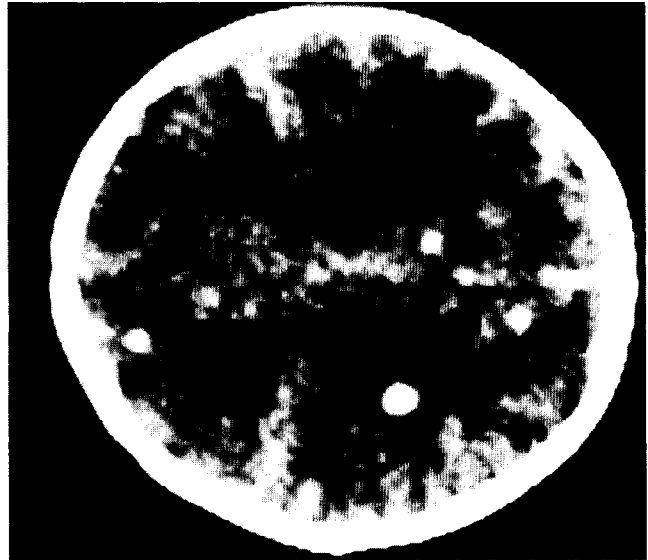


Figure 5 Computed tomography demonstrating several intracranial calcifications in a neonate

age at autopsy (multiple foci of brain necrosis). This shows that the absence of ventricular dilatation is not of a good prognostic value in cases of early fetal infection.

So-called intracranial calcifications are foci of necrosis observed as echo-dense areas. They are often poorly calcified at the time of prenatal diagnosis and therefore difficult to detect through the fetal skull. They are well demonstrated by high-frequency (7.5 MHz) transfontanellar ultrasound³ or computed tomography after birth^{4,5} (Figure 5).

Thickening of the placenta is observed frequently, but the placenta usually has a normal ultrasonographic density.

Fetal hepatomegaly and intrahepatic densities correspond to the *Toxoplasma gondii* hepatitis often demonstrated in the fetal blood by an elevation of the γ -glutamyl-transferase activity. It is classically associated with a left deviation of the intra-abdominal umbilical vein, due to an enlargement of the right liver lobe, but this was never observed in this series.

Ascites is also relatively common and has already been described as a possible sign of fetal toxoplasmosis^{6,7}. In one of our cases it was also associated with pleural and pericardial effusions, demonstrating that toxoplasmosis is a multisystemic disease. This is confirmed by the number of cases where more than one ultrasonographic sign was observed. The disappearance of ascites shows that ultrasonic signs can occasionally be used in monitoring the effect of the antibiotic treatment.

Although fetal infection is less common after first-trimester maternal infection, there is a high incidence of severe brain lesions in these cases, so it is reasonable to offer termination of pregnancy once fetal infection has been proven. When maternal infections occur in the second and third trimesters and ultrasound findings are normal, antibiotic therapy should be instituted and frequent serial ultrasound studies performed in case ultrasonographic morphological abnormalities appear.

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