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Title: Fetal presentation of Klippel–Trénaunay–Weber syndrome with massive pleural effusion and ascites

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Running head: **Fetal presentation of KTS**

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- **Summary**

Background: Although fetuses with Klippel-Trénaunay-Weber syndrome (KTS) show various morphological abnormalities on imaging studies, fetal presentation with hydrops fetalis is relatively uncommon in KTS.

Case: A 28-year-old Japanese woman who had previously given birth to a healthy infant was referred to us at gestational week (GW) 22 due to huge pleural effusion and ascites. The possibility of fetal pulmonary hypoplasia prompted us to place bilateral thoracoamniotic shunts at GW 23 after extensive discussion with both parents. The bilateral shunts were effective in preventing recurrence of pleural effusion. However, ascites increased gradually and clinical signs of fetal cardiac failure necessitated cesarean section at GW 34. A male infant, weighing 4252 g at birth and 2860 g after removal of ascites, survived to the neonatal period and did not require oxygen since 63 days after birth. The infant left hospital on day 103 with a diagnosis of KTS.

Conclusion: Fetuses with KTS may present with massive pleural effusion and ascites. Thoracoamniotic shunting may be effective in such hydropic fetuses with KTS.

Key Words: prenatal diagnosis, pleural effusion, hemangioma, port-wine stain

INTRODUCTION

Klippel–Trénaunay–Weber syndrome (often simply called Klippel–Trénaunay syndrome, abbreviated to KTS) is a condition that affects the development of blood vessels, soft tissues, and bones. The disorder has three characteristic features: a red birthmark called a port-wine stain, abnormal overgrowth of soft tissues and bones, and vein malformations. Fetal presentation of KTS with massive pleural effusion is relatively uncommon, although fetuses with KTS exhibit a variety of abnormalities detectable on ultrasound and magnetic resonance imaging (MRI) studies, including subcutaneous cystic lesions in the axilla, abdomen, pelvis, and lower limbs, lower limb edema or hypertrophy, and ascites [1,2]. Here, we report a fetus presenting with massive bilateral pleural effusion and massive ascites diagnosed postnatally as having KTS. The parents granted permission for this report.

PRESENTATION OF THE CASE

A 28-year-old Japanese woman was referred to our hospital due to massive pleural effusion, massive ascites, and skin edema in the fetus at gestational week (GW) 22. The majorities of the thorax and abdomen were occupied with pleural effusion and ascites

on MRI study performed at GW22 (Fig. 1). These observations suggested increased risk of pulmonary hypoplasia unless the pleural effusion was removed. Fetal echocardiography detected neither malformed heart nor heart failure. Serological tests and frequent measurement of fetal middle cerebral artery peak systolic flow velocity with Doppler ultrasound suggested that parvovirus B19 infection and fetal anemia were unlikely. Bilateral fetal thoracocentesis on GW23 aspirated 56 mL and 28 mL of fluid suggestive of chyle (abundant lymphocytes in the aspirated fluid) from the right and left lungs, respectively, and the patient was confirmed to have a normal karyotype. However, bilateral massive pleural effusion recurred within 48 h after thoracocentesis. Then, thoracoamniotic shunts were successfully placed bilaterally using two double-basket catheters (shunt tube inner diameter 0.9 mm, outer diameter 1.47 mm; Hakko Co, Nagano, Japan)[3] at GW23 after extensive discussion with the parents. This procedure prevented recurrence of pleural effusion until delivery. However, ascites increased gradually and clinical signs of fetal cardiac failure as evidenced by cardiomegaly (cardiothoracic dimension ratio [CTR] of 45%) and increased skin edema that had once decreased after thoracoamniotic shunting necessitated cesarean section at GW34. A male infant, weighing 4252 g at birth (Fig. 2) and 2860 g after removal of the ascites, survived to the neonatal period and did not require oxygen after postnatal day 63. The

54 infant left the hospital on postnatal day 103 after control of complicated atrial
55 arrhythmia with a diagnosis of KTS showing all three features of the triad, i.e.,
56 port-wine stain in the lower abdomen and left thigh, vascular abnormality as evidenced
57 by pleural effusion and ascites, and left lower limb hypertrophy (below the knee).

58

59 **DISCUSSION**

60 The main clinical manifestation in this case with KTS was a large amount of fluid
61 accumulated in the thorax and abdomen even at mid-gestation (Fig. 1). Favorable
62 outcome may have been associated with the use of thoracoamniotic shunt in this patient.
63 Perinatal mortality is high among KTS infants with prenatal presentation
64 involving the fetal thigh; the mortality rate in the neonatal period was 45% among 11
65 infants after excluding 10 terminated pregnancies [1]. The pleural effusion and ascites
66 were considered to have been due to lymphatic dysplasia in the present case. Lymphatic
67 (vascular) dysplasia accounts for 5.7% of all etiologies of 6361 cases with non-immune
68 hydrops fetalis (NIHF) [4]. NIHF, accounting for ~90% of all cases of hydrops fetalis
69 described to date, should be considered a nonspecific, end-stage status of a wide variety
70 of disorders [4]. NIHF indicates significant fetal compromise and is associated with

high rates of perinatal mortality [5]; among 56 pregnancies with NIHF after excluding 15 terminated pregnancies, 12 (21%) fetuses died in utero and 10 (18%) neonates died within 28 days of life [5]. Thus, an unfavorable outcome was expected in this case of prenatal presentation of KTS with hydrops fetalis.

However, a recent report suggested a favorable outcome in fetuses with pleural effusion treated by thoracoamniotic shunting using a double-basket catheter [3]; in a multicenter, prospective single-arm clinical study to determine the efficacy of thoracoamniotic shunting for fetal pleural effusion with and without ascites (n = 17 and n = 7, respectively), overall survival rates were 79% (19/24) and 71% (12/17) in cases with hydrops fetalis [3]. If severe and longstanding, fetal pleural effusion has the effect of a space-occupying lesion that impedes normal lung development, with the risk of pulmonary hypoplasia and neonatal death [6]. Thoracoamniotic shunting may have had a favorable effect on lung development in this patient.

Pleural effusion or ascites may develop in adolescents with known KTS [7,8]. In a review by Peng et al. [1], 2 (9.5%) of 21 cases with prenatal presentation of KTS involving the fetal thigh had pleural effusion. Thus, fetuses with KTS may present with pleural effusion with and without ascites, as seen in the present case. Thoracoamniotic shunting may be effective in such hydropic fetuses with KTS.

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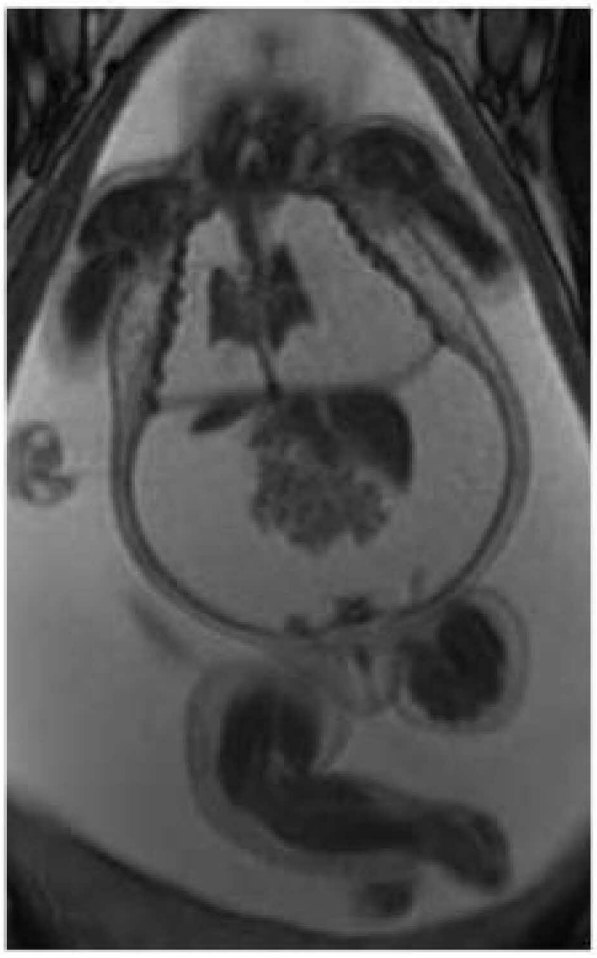
FIGURE LEGENDS

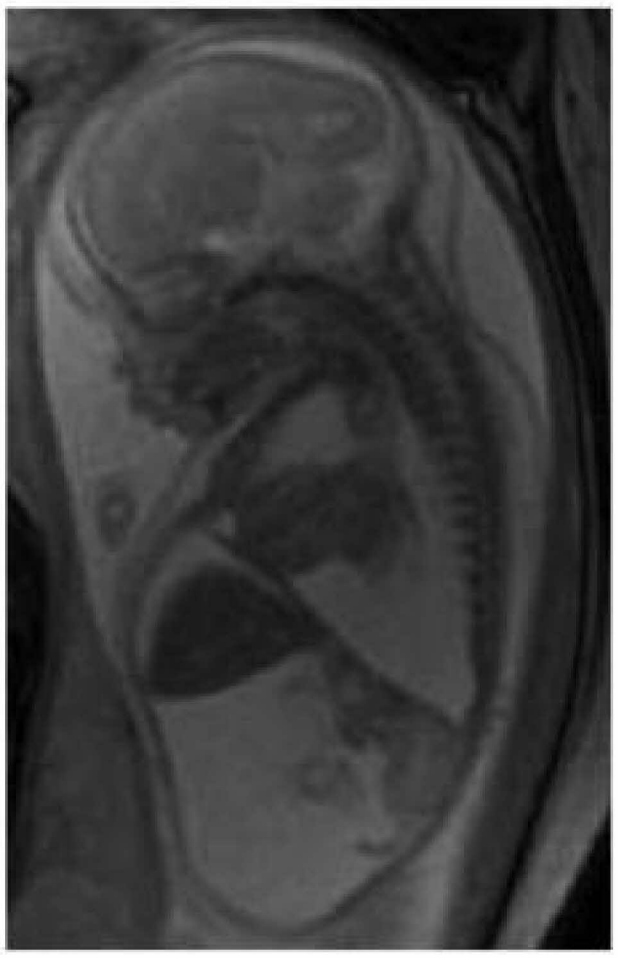
Fig. 1: Magnetic resonance imaging at gestational week 22

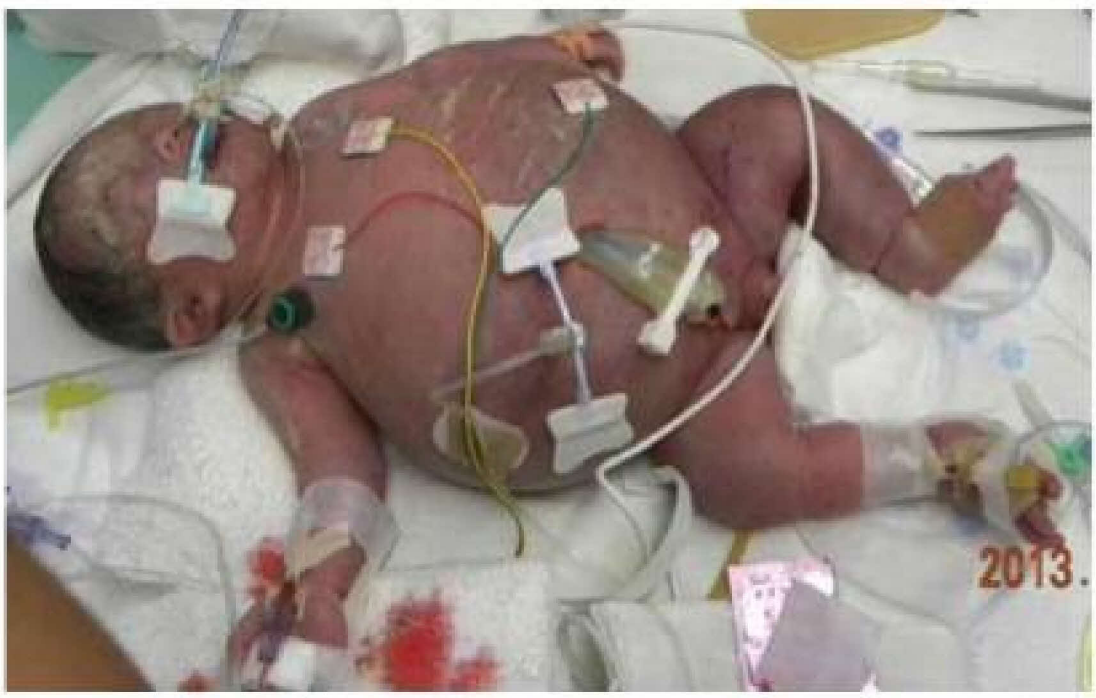
The thorax and abdomen were occupied with massive pleural effusion and ascites. Left, axial view; and right, sagittal view.

Fig. 2: Neonate before aspiration of ascites

Body weight decreased from 4252 g at birth to 2860 g after aspiration of massive ascites. Skin edema somewhat masked the left lower limb hypertrophy (below the knee) at birth.



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