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Late referral of fetal congenital cystic adenomatoid malformation in COVID-19 pregnant women: Diagnostic and management dilemma from limited resource setting country: Case report

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***Abstract*---**we reported a case of late congenital cystic malformation (CCAM) diagnosis with problematic COVID-19 infected condition during delivery and dilemmatic neonatal management. A 24-year-old pregnant woman, second pregnancy, came very late in pregnancy (38 weeks gestational age), misdiagnosed with congenital diaphragmatic hernia. Our ultrasound examination revealed congenital cystic malformation type-1 in the right lung, with some of the normal lung lobes. The Left side lung was normal. CCAM volume ratio (CVR) 2,79 cm. Due to COVID-19 infection, our multidisciplinary team decided to perform quick chest tube insertion during the ex-utero intrapartum therapy (EXIT) procedure to avoid pneumothorax complications continued with intubation for the newborn. Neonatal middle right lung

lobectomy was done after optimal condition at 20 days old with pathology anatomic result of CCAM type 1. The diagnosis, type, and prognosis of CCAM should be established earlier to make enough time for the better-prepared multidisciplinary management of the newborn.

***Keywords*---**Congenital cystic malformation, diagnostic, multidiscipline management, covid-19.

Introduction

The Congenital cystic adenomatoid malformation is a rare case, but it is the most common congenital malformation of the lung. Incidence CCAM one in 11.000 to one in 35.000 live birth (Dessole et al., 2019). Stocker et al. divided CCAM into five subtypes; type 0 (rare), consists of microcytic cells throughout the lung and has poor prognosis. Type I accounts for 50–70%; consists of single or multiple large cysts (>2 cm), filled with air or fluid and often cause mediastinal impulse, and has good prognosis. Type II (15–30%), consists of several small cysts (<2 cm), usually associated with other congenital abnormalities, and has poor prognosis. Type IIi (5-10%), is a mixture of microcytic cells and dense tissue, also has poor prognosis. Type IV originates from distal acini has peripheral large cystic type (>10 cm) (Thomas Stocher et al., 1977).

Ex Utero intrapartum therapy (EXIT) procedure is the maintenance of uteroplacental blood flow and gas exchange. The ex-utero intrapartum therapy (EXIT) procedure was designed initially for the reversal of tracheal occlusion in fetuses with a severe congenital diaphragmatic hernia (CDH), but now the use of the the EXIT procedure has been widely used in other cases such as in the CCAM. EXIT procedure is usually followed directly by an operative procedure such as lobectomy in the CCAM case (Moldenhauer, 2013).

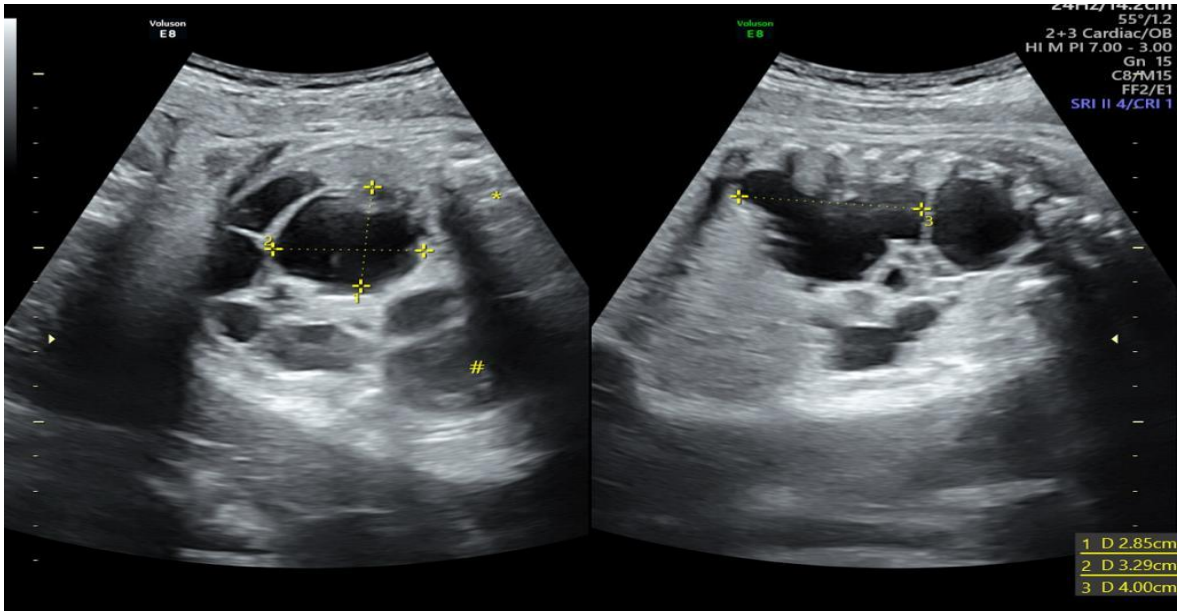
We reported a case of Ex Utero intrapartum therapy (EXIT) procedure in covid-19 pregnant women with fetal congenital cystic adenomatoid malformation type-1 which performed lobectomy of neonatal middle lung lobe, very rare case and dilemma management in a limited resource setting country.

Methods

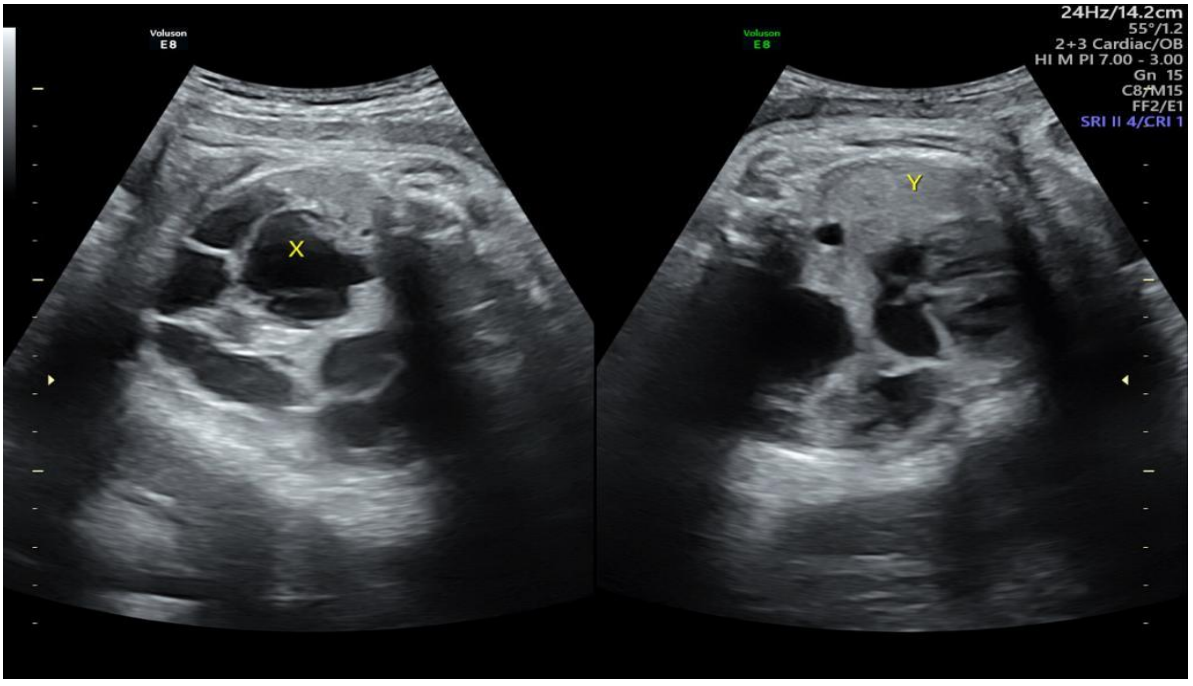
A 24-year-old pregnant woman, second pregnancy, was referred because of a congenital anomaly, misdiagnosed with diaphragmatic hernia. The gestational age was 38 weeks, last menstrual period was July 17, 2021, and the estimated delivery date was April 4, 2022. The previous pregnancy was delivered by cesarean section. The patient diagnosed with covid-19, with Sarcov-2 was positive. The patient has received the covid vaccine twice. General state and vital signs were normal. The patient had a BMI score of 22 kg/cm2. There was no dyspnoea and cyanotic. Oxygen saturation was 99%. The fundal height was 32 cm, head presentation, fetal back was on the right, estimated fetal weight was 3.300 grams, the fetal heart was 150 times/second, and there was no contraction. Antenatal care has been carried out by specialists in obstetrics and gynecology 4 times. The patient was referred to Soetomo hospital in the

gestational age of 38 weeks, they misdiagnosed this patient with a diaphragmatic hernia.

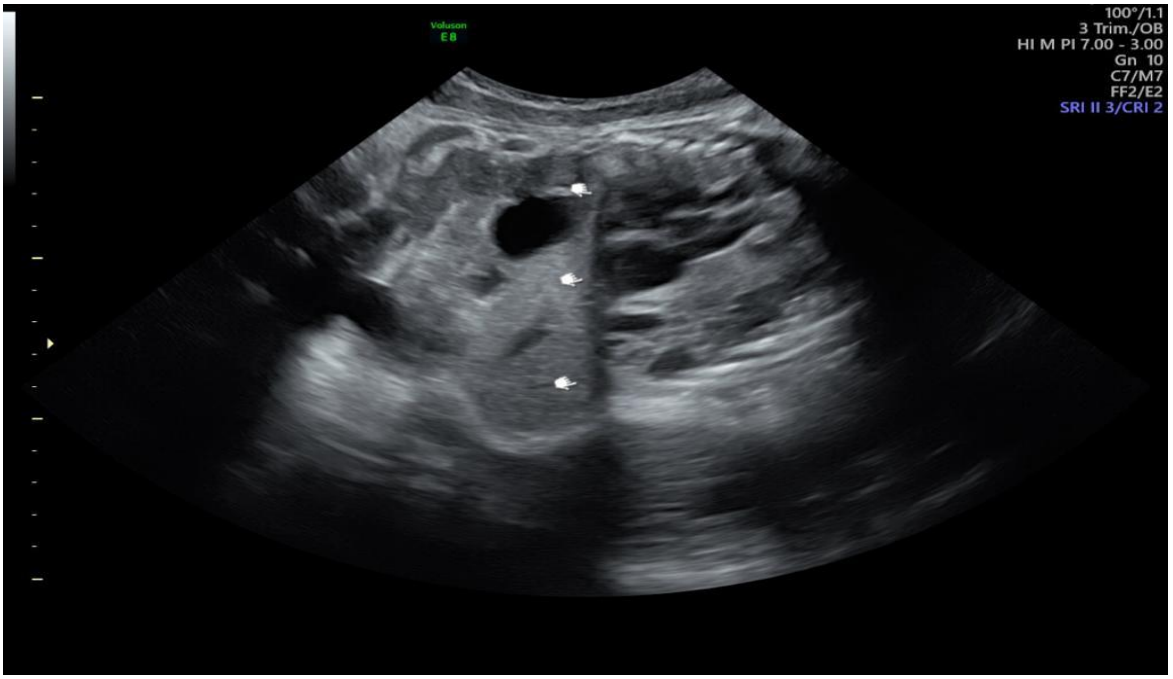
Ultrasound examination, showed multiple cystic masses in the medial right lung with a diameter of 5,69 cm x 5,36 cm, and the largest cystic mass was 2,85 cm x 3,29 cm x 4 cm. The superior and inferior lungs were still normal. And the left side lung was normal. CCAM volume ratio (CVR) was 2,79 cm (figure 1).



X was CCAM in the right lung, and Y was a normal left lung (Figure 2).

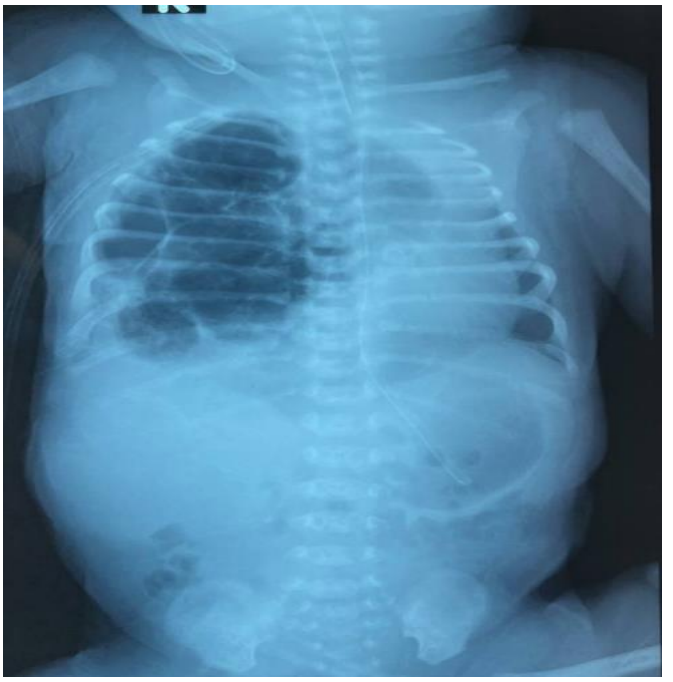


Ultrasound examination could differentiate with congenital diaphragmatic Hernia. Narrow sign, There was a diaphragm still intake, stomach position below the cardiac (figure 3).

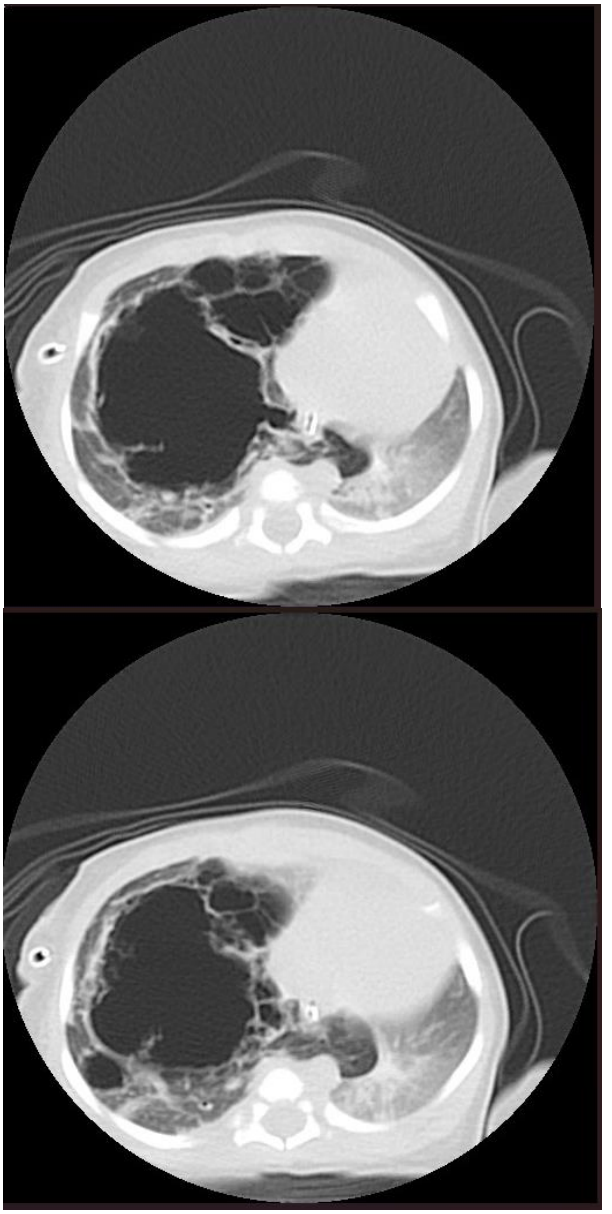


Multidiscipline collaboration was needed to manage this patient. We collaborated with colleagues from thoracic cardiovascular surgery, pediatrician, anesthesiology and team management of Soetomo hospital. We decided just to do the EXIT procedure by quick chest tube insertion to avoid pneumothorax complications continued with intubation for the newborn without doing lobectomy directly after the baby was born. The operation was not flexible as usual, because we conducted cesarean section with covid protocol. The female baby was born, 3300 grams, body length of 48 cm.

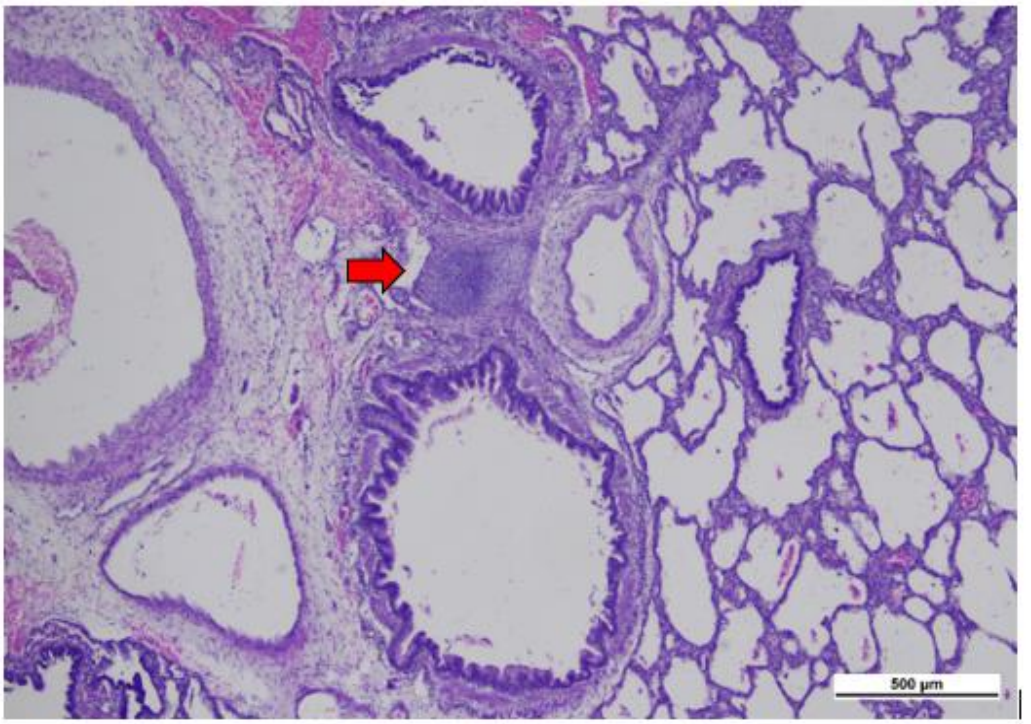
The results from the baby gram, there was visualized infiltration of the right lung, and infiltration in the lower right hemithorax to upper lateral covering the right phrenic costal sinus and right hemidiaphragm. Sharp left phrenic costal sinus. Lung mass in this examination was difficult to evaluate, pulmonary inflammation, and right pleural effusion. An endotracheal tube was detected at level 2-3 thoracic vertebra and the distance of 1,4 cm from the carina (Figure 4).



CT-Scan result, there were multiple cystic lesions with varying sizes, firm borders, irregular edges with the largest size 5,5 x 6,6 x 7 cm in the middle lobe of the right lung, the lesion pressing the superior and inferior lobes of the right lung, the hearth was pushed to the left side. Supports the diagnosis of CCAM type 1 (Figure 5).



Lobectomy of the neonatal right lung was done after optimal condition at 20 days old. Durante operation was done lobectomy of the middle lobe, lung superior and inferior were still normal. Pathology anatomy result from the mass of the lobectomy of the middle lobe was congenital cystic adenomatoid malformation type 1. Pathology anatomy result showed sections of lung tissue with cystic areas of various sizes and shapes covered by cuboid-columnar epithelium. The distribution of bronchiole-like structures and goblet cells was seen. Pillars of cartilage tissue appeared. (Figure 6)



Discussions

The patient underwent antenatal care to the specialist obstetrics and gynecology 3 times, and the last antenatal care misdiagnosed with hernia diaphragm and then the patient was referred to Soetomo Hospital. CCAM was diagnosed at 38 weeks gestational age in Soetomo Hospital. It was too late to diagnose CCAM at 38 weeks because CCAM should have been diagnosed earlier in the first or second trimester. Prenatal diagnosis of CCAM and classification into subtypes by ultrasound have been established. Detail ultrasound can diagnose CCAM and another congenital anomaly. The referred to a tertiary hospital should be earlier, because to determine crucial perioperative management in this patient. (Xia et al., 2017) (Moldenhauer, 2013).

Diaphragmatic hernia is one of the differential diagnostics of CCAM. It was not easy to diagnose and to make a differential diagnosis of diaphragmatic hernia. In order to differentiate hernia diaphragm, the heart and stomach are seen as superior to the diaphragm in the same plane in the sagittal view of ultrasound examination (creasy R., 2014) Different from CCAM, there was no defect in the diaphragm, and the position of the heart was a different plane with the stomach.

In this patient, CCAM was in the right side of the lung, and the type of the CCAM was type 1. This is correlated with the research by Xia et al, that CCAM is usually most common in one lung or unilateral, and mostly occurs in the right lung. Type 1 is the most common type of CCAM (40-70%) (Xia et al., 2017). Congenital cystic

adenomatoid malformation (CCAM) is a congenital abnormality of lung development caused by an overgrowth of abnormal lung tissue that forms cysts, affecting ≥1 lung lobes (Reis et al., 2015). According to Stocker et al classification, the type I lesion is composed of single or multiple large cysts (more than 2 cm. in diameter), frequently producing mediastinal herniation. The cysts are lined by ciliated pseudostratified columnar epithelium. The walls of the cysts contain prominent smooth muscle and elastic tissue. Mucus-producing cells are present in approximately one-third of the cases, and cartilage in the wall is rarely seen. Relatively normal alveoli may be seen between the cysts. The prognosis is good. Radiographic analysis of the type I lesion can preoperatively suggest the diagnosis, especially with the typical multi cystic pattern. The gross appearance of the lesion corresponds closely to the radiographic image and adds another dimension to the pathologist's evaluation of the disease (Thomas Stocher et al., 1977) (Kobos et al., 2020).

The Congenital cystic malformation volume ratio (CVR) in this patient was 2,79. It was a poor prognosis in this patient. The CCAM volume ratio (CVR) is acquired using dividing the CCAM volume by using the head circumference to correct for variations in fetal length. CCAM volume ratio (CVR) has been predicted the risk of hydrops in CCAM. CVR of more than 1.6 is associated with 75% incidence of hydrops and must be evaluated by ultrasound (Hedrick, 2003). King et all studied have shown CVR > 1.1 has 100% sensitivity and 87.8% specificity to predict patients requiring urgent perinatal surgical intervention (UPSI) in the area under the curve of 0.98. Patients with a final CVR > 1.1 should be referred for delivery at centers with pediatric surgeons equipped for potential UPSI for Congenital lung malformations (CLMs). The primary clinical outcomes included the need for UPSI, defined as surgery before 28 days of life and survival at hospital discharge after delivery (King et al., 2020). CVR >1.6 is generally considered predictive of risk for hydrops, respiratory distress at birth, and probable need for early surgery. whereas CVR <0.91 at presentation predicts a favorable outcome, so follow-up prenatal examinations can be less frequent (Crombleholme et al., 2002).

Because of the condition of the patient with covid -19 infection, the gestational age was 38 weeks, previous cesarean section, so we have done cesarean section with the Covid protocol. Multidiscipline collaboration was needed to manage this patient. We collaborated with colleagues from thoracic and cardiovascular surgery, pediatrician and anesthesiology. The operation was not flexible as usual, we decided to do quick chest tube insertion during the EXIT procedure to avoid pneumothorax complications that continued with intubation for the newborn. From baby gram and CT-scan of the baby, was confirmed diagnosed CCAM. Lobectomy of neonatal right lung was done after optimal condition at 20 days old with pathology anatomic result of CCAM type 1. EXIT procedure and continue with the insertion chest tube, without done the lobectomy was not yet happened in the word. We conducted this procedure to avoid pneumothorax and because the condition covid-19 in the patient. In Soetomo hospital this was the first case of CCAM from a baby that has been done exit procedure and lobectomy. Because the condition was in the pandemic era, and the patient was covid -19, this was a dilemma to manage this patient ideally and also because the limited resource setting country. In developing countries, lobectomy was done with EXITE procedure directly when cesarean section.

Study from ariwibowo, they have succeeded done thoracotomy decortication continued with by bullectomy with the insertion of a chest tube to prevented respiratory distress syndrome. This technic showed that have the same effective as lobectomy (Aribowo et al., 2021).

Conclusion

Late referral of fetal congenital cystic malformation (CCAM) in COVID-19 pregnant women was a dilemma in diagnostic and management from limited resource setting country, rare and challenging case. The diagnostic, type and prognosis of CCAM should be established earlier to make better-prepare multidisciplinary of the newborn. EXIT procedure and lobectomy of the middle lobe were prompt management of this baby.

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