Case report: parenteral nutrition combined with rice soup can be a safe and effective intervention for congenital chylous ascites

doi: 10.6133/apjcn.092015.10
Published online: September 2015

Yi Cao MD1,2,3, Weihui Yan MD, PhD1,2,3, Lina Lu MD1,2,3, Yijing Tao MD1,2,3, Wei Lu MD1,2,3, Yingwei Chen MD, PhD1,2,3, Qingya Tang MD1,2,3, Wei Cai MD, PhD1,2,3

1Department of Pediatric Surgery, Xin Hua Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai 200092, China
2Shanghai Institute of Pediatric Research, Shanghai 200092, China
3Shanghai Key Laboratory of Pediatric Gastroenterology and Nutrition, Shanghai 200092, China

Email addresses:
YC: chaoyi20@163.com
WY: yanweihui1982@sina.com
LL: rena_lu@163.com
YT: ekingsse@126.com
WL: lisalu1979@hotmail.com
YC: way_01chen@hotmail.com
QT: tangqingya@163.com
WC: caiw1978@163.com

First author: Yi Cao had done the clinical collection, compilation work, the preparation of draft manuscript and revisions

Corresponding author: Wei Cai, No. 1665, Kong Jiang Road, Yangpu, Shanghai, China. Tel.: +86 21 65791316; Fax: +86 21 65791316; Email: caiw1978@163.com

The other authors also involved in the clinical treatment of the following cases.

Declaration: This paper is original, and the study was approved by the ethical committee of Shanghai Jiaotong University.
**ABSTRACT**
Congenital chylous ascites in the neonatal period is a rare entity. Total parenteral nutrition (TPN), medium chain triglyceride (MCT)-based diet, octreotide and repeated paracentesis are regarded as appropriate medical treatment for congenital chylous ascites, and surgery is recommended when conservative therapy has failed. We present two cases in which ascites were confirmed via an abdominal sonogram and diagnostic paracentesis. In our clinical experience, rice soup combined with PN can be a safe and effective intervention.

**Key Words:** congenital chylous ascites, neonate, optimal treatment, rice soup, parenteral nutrition

**INTRODUCTION**
Congenital chylous ascites are rare clinical entities that arise due to numerous factors and with changing dynamics of the disease. The treatment is multidirectional with several therapeutic steps, starting with the least invasive to surgical treatment, usually as a last resort. Because of the lack of therapeutic standards, this disease continues to be a medical challenge, and the therapeutic approach extremely individual. Here we present two infants with congenital chylous ascites. Experience with them suggests that rice soup combined with parenteral nutrition (PN) can be an efficacious and safe approach to management.

**CASE REPORTS**

*Case 1*
A four-month-old male infant was transferred to the Department of Pediatric Gastroenterology and Nutrition of our hospital due to abdominal distension. He was born full term by Caesarean section with a birth weight of 3500 g. Fetal ascites was found by antenatal sonography performed at 34 weeks of gestation. The mother was a 29-year-old primigravida. The parents were not consanguineous, and family history was negative for lymphatic disorders.

On admission, physical examination revealed massive abdominal distension and bilateral hydroceles. The abdominal girth was 55 cm. Abdominal computerized tomography (CT) indicated massive ascites and bilateral hydroceles. Ultrasonogram showed massive ascites without pleural effusion or other abdominal anomalies. Both echocardiography and electronic gastroscopy revealed no abnormalities. Laboratory examination included: liver function count as alanine aminotransferase (ALT): 18 U/L, aspartate aminotransferase (AST): 56 U/L, total protein: 55.9 g/L and albumin: 31.3 g/L; and normal blood count as white blood cells (WBC):
5130/mm³, PLT: 684000/mm³ and Hb: 103 g/L. Renal and coagulation functions were normal. Abdominal paracentesis yielded the milky ascitic fluid with a raised WBC of 351×10⁶/L, predominantly lymphocytes (52%), and the Rivalta test was strongly positive. Combined with the positive result of the ascites chyle test, the chylous nature of the ascites was confirmed. The results of both the blood microfilaria and feces parasite eggs tests were negative.

The infant was initially fasted and was supported by total parenteral nutrition (TPN) [20% medium-chain triglycerides (MCT) / long-chain triglycerides (LCT) lipid: 2 g/kg/d, calorie: 72 kcal/kg/d]. Additionally, octreotide (a somatostatin analogue), which was to be continued until discharge, was started at a dose of 0.8 μg/kg/h. On days 1, 5 and 9 after admission, abdominal paracentesis was performed three times in total, and the volumes were 105 ml, 95 ml and 25 ml, respectively, accompanied by regular measurement of abdominal girth and review of ultrasonogram. On the 11th day, the baby was given 50% MCT-based formula (Peptijunior®; Nutricia advanced medical nutrition, Cuijk, Holland), and the nutrient solution was decreased correspondingly due to evidence of remarkable reduction of ascites on an abdominal ultrasonogram and based on physical examination. On the 15th day, the formula increased while PN was stopped. Repeated ultrasonogram showed that ascites did not increase after four days of full enteral feeding. Then, the patient was discharged.

Two weeks after discharge, at the age of five months old, the baby was rehospitalized with recurrent ascites. Vital function was stable; however, the abdomen was again massively distended. TPN, octreotide and abrosia were restarted, and abdominal paracentesis was given twice during this period of hospitalization. On the 15th day, unfortunately, the liver function of the baby was impaired as indicated by elevated ALT (199 U/L) and AST (283 U/L). Considering that the impairment may be associated with TPN, the baby was given rice soup, and the nutrient solution was reduced by nearly one-half (20% MCT / LCT lipid: 0.8 g/kg/d, calorie: 25 kcal/kg/d). Meanwhile, liver-protection drugs, such as polyene phosphatidylecholine and compound glycyrrhizin, were injected. On the 25th day, the liver function returned to normal after ten days of the liver-protection drugs. On the 35th day, an abdominal ultrasonogram indicated that the number ascites decreased. Hence, the patient was discharged and then fed with 50% MCT-based formula and rice soup. At the age of eight months old, the patient was weighed 7.5 kg (<P15) and had a height of 71 cm (P50-P85). Repeated abdominal ultrasonogram showed almost no ascites in the abdominal cavity.

**Case 2**

A five-month-old male infant was transferred to the Department of Pediatric Surgery because
of abdominal distension. He was born full term with a birth weight of 3100 g by eutocia. He had no history of injury or abdominal surgery. As his mother lived in a remote village, she did not bring him in for antenatal care regularly, and it could not be ascertained if there were any fetal ascites. The mother was a 23-year-old primigravida. The parents were not consanguineous, and the family history was negative for lymphatic disorders.

Before admission, the baby received diagnostic abdominal paracentesis at the local hospital. The paracentesis yielded 50 ml of milky ascitic fluid, and the chyle test was positive. On admission, physical examination revealed abdominal distension and shifting dullness existed. Abdominal CT and ultrasonogram showed moderate ascites without other abdominal anomalies. Echocardiography revealed no abnormalities. Laboratory examination included:

- Liver function count as ALT: 102 U/L, AST: 172 U/L, total protein: 27.4 g/L and albumin: 18.2 g/L;
- Normal blood count as white blood cells (WBC): 8290/mm³, PLT: 688000/mm³; and Hb: 141 g/L.

Renal and coagulation functions were normal. The results of both blood microfilaria and feces parasite eggs test were negative.

The infant was initially fed rice soup and PN (20% MCT / LCT lipid: 1 g/kg/d, calorie: 31 kcal/kg/d) at the same time. During hospitalization, human albumin at a dose of 0.8 g/kg/d was given four times in total, and each time, furosemide was injected thereafter. On the 18th day, ultrasonogram revealed no ascites in the abdomen. Liver function count was: ALT: 23 U/L, AST: 34 U/L, total protein: 35.6 g/L and albumin: 26.6 g/L; normal blood count was indicated by WBC: 3390/mm³, PLT: 106000/mm³ and Hb: 106 g/L. After 20 days of hospitalization, the patient was discharged at nearly six months of age. The baby was fed rice soup and 50% MCT-based formula (Peptijunior ®; Nutricia advanced medical nutrition, Cuijk, Holland) after discharge. At the age of eight months, complementary feeding was added to the diet. The patient was fed a normal diet at 10 months of age. A 2.5-year follow-up study has revealed no recurrence of the ascites with a weight of 14 kg (P50) and a height of 101 cm (>P85). Nonspecific performance, including abdominal distension, edema and hypoalbuminemia, has not appeared after discharge.

**DISCUSSION**

Chylous ascites may arise for a variety of reasons, which include developmental defects of the lymphatic system, nonspecific bacterial and parasitic infection, liver cirrhosis, malignant neoplasm, blunt abdominal trauma and surgical injury. Congenital chylous ascites is probably the result of maldevelopment and immaturity of lymphatic vessels, which are the most common cause in the neonatal period. Dysplastic lymphatic vessels, both hypo- and
hyperplastic, favor lymphatic leakage in the mechanism of increasing pressure in the lymphatic system and lymphatic congestion.\textsuperscript{2} Delayed maturation of lymphatic vessels, which lead to abnormal structure of their walls, also lead to a condition called “leaky lymphatics”, which results in lymph accumulation in the peritoneal cavity.\textsuperscript{3}

The initial step to confirm the presence of ascites is ultrasonography of the abdomen. Due to its noninvasiveness, it can be repeated; thus, it is possible to evaluate the course of the pathological process. Analysis of the fluid obtained by abdominal paracentesis is the key stage in the diagnosis of this disease. The ascitic fluid, known as chyle, is usually color-free or milky white. The protein and triglyceride content is usually high with predominance of lymphocytes on differential count.\textsuperscript{4} The presence of chylomicrons is considered to be pathognomonic.\textsuperscript{2} However, the next step to determine the underlying cause of the chylous ascites is the true challenge because it is technically difficult to carry out and a high risk exists in newborns and infants.\textsuperscript{5} The initial diagnostic investigation includes ultrasonography and CT or magnetic resonance imaging (MRI) of the abdomen to exclude conditions that necessitate immediate surgical intervention. Diagnosis of malformation of the lymphatics is suspected when all results are negative. Further diagnostic tests, such as lymphangiography and lymphoscintigraphy, are imperative if surgery is decided, with the purpose of identifying the site of the leakage of chyle preoperatively. However, it is usually difficult to clearly show leakage.

It has been reported that the primary therapeutic modality for congenital chylous ascites is abrosia and TPN.\textsuperscript{6-8} The mechanism of this resolution may involve maturation of the lymphatic system over the time course of the TPN. It is also conducive to reduce lymph flow in the peritoneal cavity so that the leak in the lymphatic system may be repaired during the treatment period. According to Bhatia et al, a satisfactory result can be obtained after 3-4 weeks of treatment. The success rate is 60-100\%.\textsuperscript{9} Although TPN is considered as the “first-line” intervention, there are obvious drawbacks, such as the risks of liver injury, the risks associated with the use of central venous lines and the risk of diffuse atrophy of the gut.\textsuperscript{5} TPN-associated liver injury was observed once in our case. Based on our experience with the second successful case, PN combined with rice soup, which is long-chain fats (LCT)-free, may be a better “first-line” intervention because it reduces the risk of long-term use of TPN, and it is also effective.

As chylous ascites has decreased or remained stable, the next stage is the withdrawal of PN, with introduction of enteral nutrition. Dietary management is an important treatment modality in chylous ascites. An MCT-based diet has even been accepted as the first measure for
reducing chyle production. After it is absorbed by the intestinal mucosa, MCT bypasses the enteric lymphatics and directly enters the portal system. Not only can nutrients be provided by the MCT-based diet, but it also reduces lymphatic flow and pressure within the lymphatic system and decreases the amount of lymph leakage. However, it also has been found that long-term use of the MCT-based diet, which is necessary for the therapeutic effect, has an estimated success rate of approximately 30%. Liao et al reported one case of neonatal chylous ascites that was put on a strict MCT formula, but the abdominal girth continued to increase. Consistent with these findings, our first case showed recurrent ascites after a period of feeding with 50% MCT-based formula. Feeding rice soup only or combined with an MCT diet seems to be more effective.

Paracentesis is not only diagnostic but is also a therapeutic method in the management of chylous ascites. Despite several definite complications, repeated paracentesis is commonly included in conservative treatment regimens to relieve respiratory insufficiency and abdominal distention. The operation should be aseptic to prevent bacterial peritonitis, and rapid or hard lower abdominal pressure should be avoided. Based on our experience, paracentesis is an important supplemental method when ascites are too difficult to manage; otherwise, it is not essential.

Somatostatin analogues, such as octreotide, have been demonstrated to be effective in reducing lymphorrhea. There have been reports of successful use of octreotide in neonatal chylothorax. The exact mechanisms by which somatostatin prevents lymphatic flow are not completely understood. It has been previously shown to decrease the intestinal absorption of fats, lower triglyceride concentration in the thoracic duct and attenuate lymph flow in the major lymphatic channels. Satisfactory results were achieved by the administration of the octreotide combined with TPN. Four case reports of patients with congenital chylous ascites described successful treatment with octreotide. The octreotide dose required for satisfactory outcome has been reported to be 1-2 μg/kg/h of infusion. However, the somatostatin dose in our first case was below this minimum effective concentration, making it difficult to determine whether it is a helpful treatment. Furthermore, it was not used in our second case, who responded to the combination of rice soup and PN.

Surgery is advised in cases that are resistant to conservative treatment, which is usually undertaken for 4-8 weeks. The success of the operation depends on identifying the site of leakage of the lymphatic duct. A shunt joining the peritoneal cavity with the venous system is a last resort because of the possibility of severe complications and limited effectiveness. Due to invasiveness and difficulty, surgery is not the preferred treatment.
Rice soup is home-made for our patients. 50 g rice and 500 ml water are brought to a boil. Rice soup contains only carbohydrate with little fat, and one portion contains 168.5 kcal, while rice is 337 kcal/100 g. It can reduce lymphatic flow and pressure as a LCT-free formula, and it also decreases the risks associated with TPN, including liver injury and diffuse atrophy of the gut. Moreover, the combination of rice soup with an MCT diet seems to be more effective compared with the low success rate of an exclusive MCT-based diet.10-11

In conclusion, the combination of PN and rice soup may be a better ‘first-line’ intervention because it decreases the risk of long-term TPN and is effective at the same time. After withdrawal of PN, feeding rice soup combined with an MCT diet, as a transition, is relatively nutritious and effective. When repeated, the ultrasonogram shows a gradual reduction in ascites or no recurrence, the proportion of MCT diet can gradually increase and complementary feeding can be added to the diet. A patient-specific approach is required for chylous ascites with its various causes should start as soon as possible. Further studies of more patients with chylous ascites are needed before a treatment algorithm can be in place with confidence.

ACKNOWLEDGMENTS
None.

CONFLICT OF INTEREST
None.

REFERENCES


