Fish Oil Lipid Emulsion: to Treat and Prevent Parenteral Nutrition Associated Liver Disease

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Advances in parenteral nutrition (PN) support revolutionized the management of patients with intestinal failure in infants. Long term PN induces the liver disease in these infants. Parenteral nutrition associated liver disease (PNALD) presents with jaundice (a serum direct bilirubin concentration > 2 mg/dL), and failure of thrive. Incidence of PNALD is 25% to 60% in infants receiving long term PN and the mortality with PNALD was reported 100% at 1 year of diagnosis unless they were weaned off PN or received liver/small bowel transplantation.

Although etiology of PNALD is multifactorial (prolonged duration of PN, enteral nutrition intolerance, preterm birth, low birth weight, septicemia, overfeeding, and micronutrient imbalances), soybean lipid emulsion (SOLE) is a major risk factor of pathogenesis of PNALD. SOLE contains high amount of phytosterols which contribute to the development of cholestasis. The large amount of omega-6 fatty acid and relatively paucity of antioxidants in SOLE may potentiate inflammation and liver injury. Fish oil lipid emulsion (FOLE) at 1g/kg per day replacement of SOLE shows resolution of biochemical cholestasis with significant decreases in morbidity and mortality. The mechanism of FOLE for PNALD may be from differences in its components of FOLE that contains minimal phytosterol and is rich in omega-3 fatty acid and alpha-tocopherol. The strategy of FOLE monotherapy for infants with PNALD increased survival and many infants with intestinal failure remained alive with long term PN without liver/small bowel transplantation.

Despite these good outcomes, FOLE monotherapy may induce essential fatty acid deficiency (EFAD) because FOLE have relatively small amount of linoleic acid (LA) and alpha linolenic acid (ALA). However, FOLE monotherapy does not lead to the development of EFAD.

Intestinal rehabilitation team of Samsung Medical Center consisting of a pediatric surgeons, pharmacists, clinical dietitian, and specialized nursing staff applied FOLE monotherapy to infants with PNALD. We have good results.