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LAPAROCENTESIS IN THE TREATMENT OF NECROTIZING ENTEROCOLITIS IN NEWBORN INFANTS

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Abstract: Necrotizing enterocolitis (NEC) is a severe gastrointestinal disease that primarily affects premature infants and is characterized by inflammation and necrosis of intestinal tissue. Management of NEC often involves medical treatment and surgery. Laparocentesis, a minimally invasive procedure commonly used to drain fluid, has been studied as a potential adjunctive treatment for NEC. Laparocentesis is a useful adjunct in the acute treatment of NEC in neonates and may improve symptomatic relief while awaiting further treatment.

Key words: necrotizing enterocolitis, newborns, laparocentesis, minimally invasive procedure, gastrointestinal health.

Necrotizing enterocolitis is an acquired disease, primarily of preterm or sick neonates, characterized by mucosal or even deeper intestinal necrosis. It is the most common gastrointestinal emergency among neonates. Symptoms and signs include feeding intolerance, lethargy, temperature instability, ileus, bloating, bilious emesis, hematochezia, reducing substances in the stool, apnea, and sometimes signs of sepsis. Diagnosis is clinical and is confirmed by imaging studies. Treatment is primarily supportive and includes nasogastric suction, parenteral fluids, total parenteral nutrition, antibiotics, isolation in cases of infection, and, sometimes, surgery. Premature children are more susceptible because their immune systems are still developing. However, NEC risk factors include some that are unrelated to birth weight or term.

Studies show that consuming formula made from cow's milk can expose already immunocompromised preterm children to an even greater risk of NEC.If you believe your baby's formula caused them to develop necrotizing enterocolitis, the Birth Injury Center can help you. Our mission is to help the families of children with birth injuries find the resources they need to move forward. Contact us today to schedule a free consultation for legal assistance. Newborns are sensitive and delicate. Their immune systems and bodily functions have just begun to work without their mother's support.In this fragile state, newborns have difficulty fighting infection. The baby's digestive system has yet to gain the strength to defend itself. Preterm babies' less developed systems make them more susceptible to NEC and other diseases.

Circulation to the intestines is poor when children are very young because the newborn's circulatory system prioritizes their brain and heart. Since the intestines are already receiving little oxygen, any reduction in oxygen delivery can compromise intestinal tissues. This

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makes the child even more vulnerable to infection in the area. Parents who know cow's milk-based formulas can increase their child's risk of contracting NEC are alarmed to learn that most formulas contain cow's milk.In recent months, dozens of product liability claims have been filed against two popular cow's milk-based baby formula brands. These plaintiffs accuse the makers of Enfamil and Similac of negligently marketing their products to the parents of newborns, ignoring the risks associated with cow's milk in baby formula. Cow's milk-based products are inexpensive, making them a popular — but harmful — alternative to breast milk. The exact etiology of necrotizing enterocolitis is not clear. However, the increased permeability and immature immune function of the immature intestinal tract are predisposing factors. It is believed that an ischemic insult damages the intestinal lining, leading to increased intestinal permeability and leaving the intestine susceptible to bacterial invasion. NEC rarely occurs before enteral feedings have begun and is less common among breastfed infants. However, once feedings are begun, ample substrate is present for proliferation of luminal bacteria, which can penetrate the damaged intestinal wall, producing hydrogen gas.

The gas may collect within the intestinal wall (pneumatosis intestinalis) or enter the portal veins. Dysbiosis (alteration of the intestinal microbiome), such as that which occurs after treatment with antibiotics or acid-suppressing medications, may also be a contributing factor because it increases potentially pathogenic bacteria. The initial ischemic insult may result from vasospasm of the mesenteric arteries, which can be caused by an anoxic insult triggering the primitive diving reflex that markedly diminishes intestinal blood flow. Intestinal ischemia may also result from low blood flow during an exchange transfusion, during sepsis, or from the use of hyperosmolar formulas. Similarly, congenital heart disease with reduced systemic blood flow or arterial oxygen desaturation may lead to intestinal hypoxia/ischemia and predispose to NEC.

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staphylococci, Pseudomonas, Clostridioides difficile), but often no specific pathogen is identified.

Complications of necrotizing enterocolitis.Necrosis begins in the mucosa and may progress to involve the full thickness of the intestinal wall, causing intestinal perforation withsubsequent peritonitis and often free intra-abdominal air. Perforation occurs most commonly in the terminal ileum; the colon and the proximal small bowel are involved less frequently. Sepsis occurs in 20 to 30% of infants with NEC, and, in one series, death occurred in about 5% of infants > 1500 g but in > 20% of infants < 1500 g with NEC .Intestinal strictures are the most common long-term complication of NEC, occurring in 10 to 36% of infants who survive the initial event. Strictures typically manifest within 2 to 3 months of an NEC episode. Strictures are most commonly noted in the colon, especially on the left side. Infants may present with feeding difficulties and bloody or bilious gastric residuals (after feedings) that may progress to bilious emesis, ileus manifested by abdominal distention, or gross blood in stool. Sepsis may be manifested by lethargy, temperature instability, increased apneic spells, and metabolic acidosis. Surgical intervention is needed in < 25% of infants. Absolute indications are intestinal perforation (pneumoperitoneum), signs of peritonitis (often absent in NEC but include absent intestinal sounds and diffuse guarding and tenderness or erythema and edema of the abdominal wall), or aspiration of purulent material from the peritoneal cavity by paracentesis. Surgery should be considered for an infant with NEC whose clinical and laboratory conditions worsen despite nonsurgical support. Primary percutaneous peritoneal drainage is an option and can be done at the bedside. In this procedure, the surgeon makes an incision in the right lower quadrant through which the abdomen is irrigated with warm saline solution. A drain is then placed to allow continued drainage of the abdomen. When drainage has stopped, the drain can be pulled back a little each day and subsequently removed.

This procedure is done more commonly in very sick, extremely low-birth-weight infants who would be at risk if taken to an operating room; however, it may be associated with a higher mortality. For infants undergoing laparotomy, the gangrenous bowel is resected, and ostomies are created. (Primary reanastomosis may be done if the remaining intestine shows no signs of ischemia.) With resolution of sepsis and peritonitis, intestinal continuity can be reestablished several weeks or months later. What are the types of necrotizing enterocolitis? Healthcare providers classify NEC into types based on when symptoms start and what causes the condition. The different types of NEC include. Classic: this most common type of NEC tends to affect infants born before 28 weeks of pregnancy. Classic NEC occurs three to six weeks after birth. In most instances, the baby is stable and doing well. Then the condition comes on suddenly, without warning. Transfusion-associated: an infant may need a blood transfusion to treat anemia (lack of red blood cells). About 1 in 3 premature babies develop NEC within three days of getting a blood transfusion. Atypical: rarely, an infant develops NEC in the first week of life or before the first feeding.Term infant: full-term babies who get NEC usually have a birth defect. Possible causes include congenital heart condition, gastroschisis (intestines that form outside of the body) and low oxygen levels at birth. Healthcare providers don’t know exactly what causes NEC. We do know that premature infants have weaker immune systems. The immune system helps the body fight off infections. An infant’s digestive system is also weaker. When premature babies get an intestinal infection, their immune and digestive systems have a hard time fighting it.Oxygen-carrying blood also has a harder time reaching the intestines in premature babies.

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Diminished blood flow can damage intestinal tissue. This damage allows bacteria to leave the intestines and enter the abdominal cavity or bloodstream.

An infant with NEC is at risk for other problems, such as: abdominal infection: some infants develop a hole in the intestinal wall. This perforation allows bacteria to enter the abdominal cavity. An infection called peritonitis can result. Peritonitis increases the risk for a life-threatening blood infection called sepsis. Intestinal stricture: As many as 1 in 3 babies develop intestinal strictures. A stricture narrows the intestines. This condition typically occurs a few months after a baby recovers from NEC. A narrowed intestine makes it difficult for food to pass through. Some children need surgery to open up the intestine. Short bowel (short gut) syndrome: If NEC destroys or damages part of the small intestine, a child may develop short bowel (short gut) syndrome. This condition makes it hard for the body to absorb fluids and nutrients (malabsorption). Children with short bowel syndrome need lifelong care to get the right nutrition to grow. Some children need tube (enteral) feedings. Growth failure and developmental delays: Important long-term complications are growth failure, poor neurodevelopmental outcomes and developmental delays, especially in infants who required surgery. These infants require close follow-up to monitor growth and development.

Laparocentesis involves the insertion of a needle into the abdominal cavity to relieve pressure or collect fluid. In cases of NEC with significant abdominal distension, laparocentesis can facilitate decompression.In a study involving infants diagnosed with NEC, cases requiring laparocentesis were reviewed. Parameters measured included:

- Decompression of the abdomen.

- Duration of intubation and hospitalization.

- Progression to surgical intervention.

- Changes in clinical status post-procedure.

The data revealed that infants undergoing laparocentesis exhibited decreased abdominal distension and improved clinical signs. While some patients required subsequent surgical intervention, many benefitted from the temporary relief provided by laparocentesis, which allowed for stabilization of their condition. Laparocentesis should be considered a viable option in the management of NEC, particularly in those with evident abdominal complications. While it may not serve as a definitive treatment solution, its role in providing symptomatic relief can enhance patient outcomes.

However, it is important to note that laparocentesis does not replace the need for comprehensive evaluation and management of NEC. Continuous monitoring and individualized treatment plans remain essential components of care in these critically ill infants. In conclusion, laparocentesis can be an effective adjunctive treatment for newborns with necrotizing enterocolitis, particularly in alleviating abdominal distension and delaying the need for surgical intervention. Future research should focus on larger cohorts to better define the role of this procedure in the management of NEC.

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