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CASE REPORT

Minimal intestinal resection during primary repair of type IV congenital small intestinal atresia

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ABSTRACT

Background: Multiple intestinal resection and anastomosis are common surgery options for type IV jejunoileal atresia, although anastomotic leakage is associated with a 15% mortality rate. **Objectives:** to describe a surgical approach involving a single intestinal anastomosis bypassed through additional intraluminal obstructions using an intravenous (IV) catheter followed by enteroplasty. **Case Report**: A six-hour-old low-birth-weight preterm female newborn presented from the neonatal division with bilious vomiting prior to initial feeding, accompanied by generalized abdominal distention. A plain abdominal radiograph revealed the "countable bubble" sign. Exploratory laparotomy was performed and discovered multiple jejunoileal atresia and microcolon. A resection of 20 cm of jejunum, followed by and end-to-oblique jejunal anastomosis, was performed. An IV catheter was used to bypass additional intraluminal obstructions in the jejunum and ileum, followed by jejuno-ileoplasty at the catheter insertion site. Routine rectal irrigations and total parenteral nutrition were administered postoperatively. By five weeks, the patient was able to defecate spontaneously, fully breastfeeding, and discharged from the hospital. **Conclusion**: The use of an IV catheter to bypass intraluminal obstructions may be an option to avoid multiple intestinal resection and anastomosis in type IV congenital jejunoileal atresia.

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Highlights

1. Jejunoileal atresia and stenosis present significant challenges as causes of neonatal intestinal obstruction, especially type IV (multiple atresia) in neonates.
2. Medical management including exploratory laparotomy along with appropriate nutritional intervention.

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BACKGROUND

Although jejunoileal atresia and stenosis remain relatively uncommon, they present significant challenges as causes of neonatal intestinal obstruction, with 33% of cases affecting premature infants (Goodluck et al., 2022). Small intestinal atresia (compared to stenosis) accounts for 95% of these cases, with a prevalence of 1.3 to 2.5 cases per 10,000 live births. Among the four types of jejunoileal atresia, type IV (multiple atresia) is the least common, often involving the proximal jejunum (Govindarajan and Annamalai, 2021; Hoffman, 2012).

In cases of type IV atresia, it is important to preserve as much bowel as possible, which may be achieved by performing multiple resections and anastomoses, or by performing enteroplasty to address intraluminal obstructions. A dilemma arises when deciding between a single anastomosis after resecting long atretic segments or multiple resections and anastomoses with the risk of anastomotic leakage (Govindarajan and Annamalai, 2021; Hoffman, 2012).

OBJECTIVES

This report describes a case where a single anastomosis was performed after resecting a segment of multiple atretic intestine. An intravenous (IV) catheter was used to bypass a distal atretic segment, followed by ileoplasty after ensuring there were no further ileal obstructions.

CASE

A six-hour-old low-birth-weight preterm female newborn presented from the neonatal division with bilious vomiting prior to initial feeding, accompanied by generalized abdominal distention, primarily in the upper umbilical region. A fetomaternal ultrasound performed at 20 weeks of pregnancy had revealed intestinal dilation and polyhydramnios. Upon evaluation, an orogastric tube was inserted and the patient was kept nil per os. Within the first 24 hours, 200 ml of bilious retention was collected. A postnatal abdominal plain radiograph at 24 hours showed the “countable bubble” sign as seen in **Figure 1**.

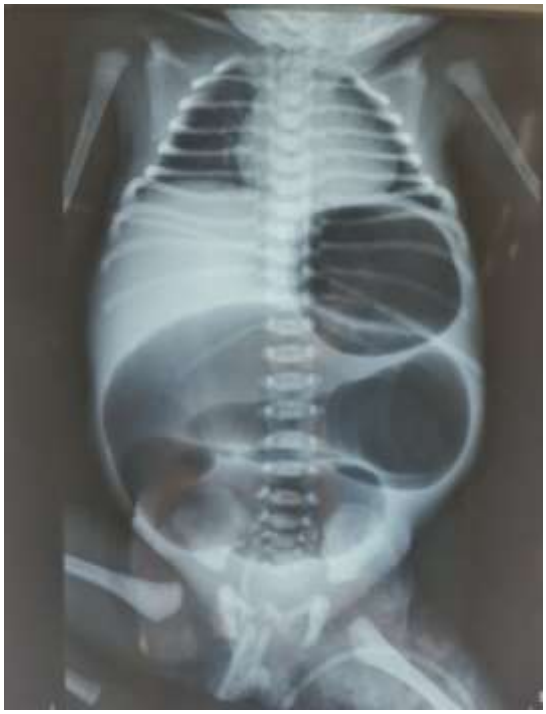

Figure 1. Plain thoracoabdominal radiograph at 24 hours showing the “countable bubble” sign

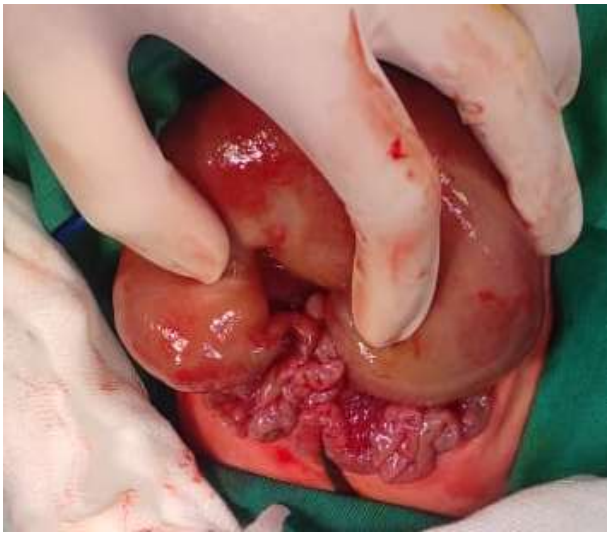

Figure 2a. First obstruction site (dilated to collapsed intestine)

An exploratory laparotomy was performed and discovered multiple jejunoileal atresia and microcolon, with multiple intraluminal obstructions. The first obstruction was located 30 cm distal to the ligament of Treitz, characterized by a transition from dilated to collapsed intestine (Figure 2a). Saline (0.9% NaCl) was instilled into the distal segment to assess patency, and two additional obstructions were identified: a fibrous cord at 5 cm (second obstruction site) and an intraluminal obstruction (third obstruction site) 20 cm distal to the first site. A resection of 20 cm of jejunum (out of a total small intestine length of 155 cm) was performed. Further evaluation revealed an intraluminal obstruction (fourth obstruction site) 25 cm distal to the last site, located 80 cm proximal to the ileocecal junction (Figure 2b). A jejunal end-to-oblique anastomosis was performed proximal to the fourth site (Figure 2c). An IV catheter was then used to bypass the intraluminal obstruction, and distal patency was confirmed. Ileoplasty was subsequently performed at the catheter insertion site. This approach was chosen to reduce operative time, considering the risks of hypothermia and prolonged anesthesia in this patient.

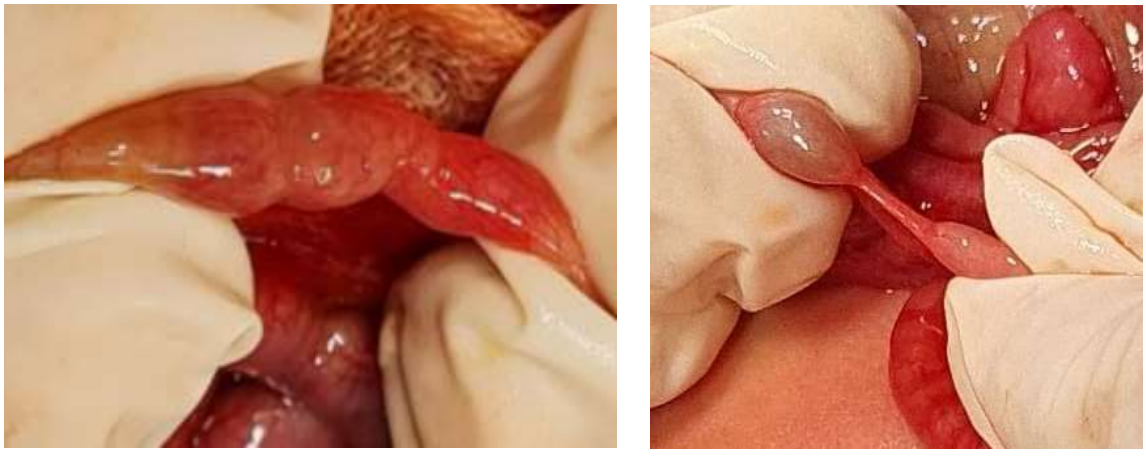

Figure 2b. Other small intestine intraluminal obstructions

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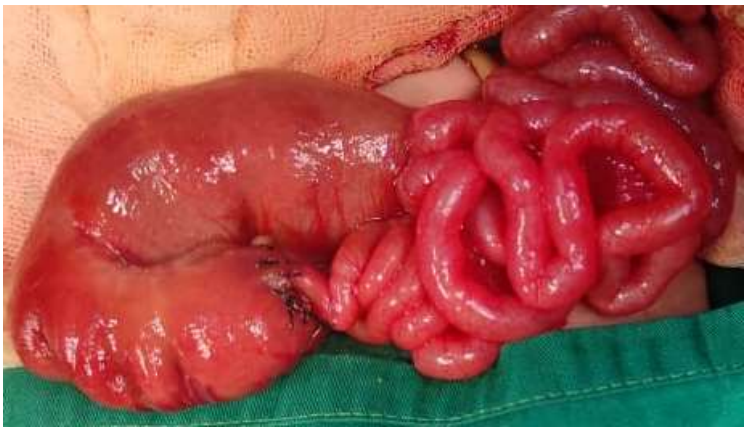

Figure 2c. End-to-oblique jejunal anastomosis

Postoperatively, routine rectal irrigations with hyperosmolar fluids and total parenteral nutrition were administered. One week later, the patient defecated spontaneously for the first time, and a thoracoabdominal radiograph was obtained (Figure 3.) Three weeks postoperatively, a follow-up radiograph showed more evenly distributed intestinal gas as seen in Figure 4. By five weeks, the patient was able to defecate spontaneously, fully breastfeeding, and discharged from the hospital.

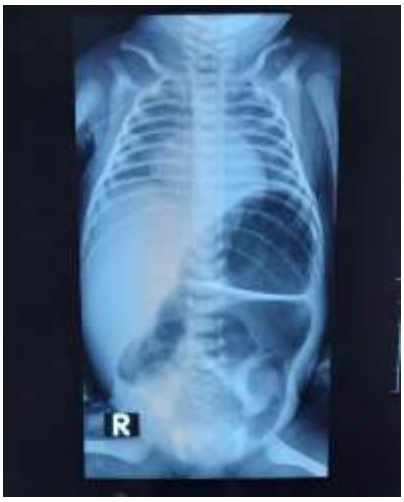

Figure 3. One-week postoperative thoracoabdominal radiograph

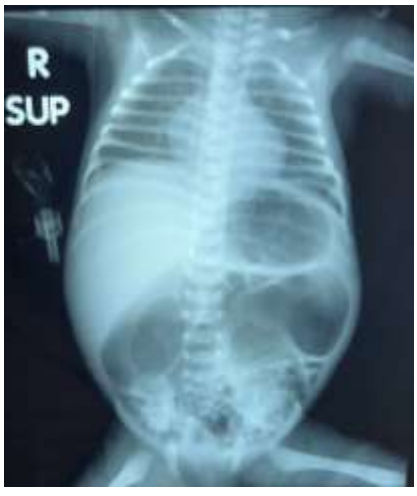

Figure 4. Three-week postoperative thoracoabdominal radiograph

DISCUSSION

The survival rate for intestinal atresia was historically only 9.3% (139 of 1498 patients), but it has improved significantly with the introduction of high-calorie long-term intravenous nutrition intraoperation (Miller, 1979). A recent study noted a long-term survival rate of 97.7%, with nutritional intervention via enteral autonomy and catch-up growth at a median follow-up of 4.7 years (Yeung et al., 2016). However, the highest mortality rate is still observed in patients with type IIIb or type IV jejunoileal atresia (Chadha et al., 2006).

Despite its rarity, jejunoileal atresia is commonly found in neonatal intestinal atresia. The most common type is single atresia (types I and IIIa), whereas only 6-12% of cases present with multiple atretic segments (type IV), which combines type I and type III with reduced intestinal length and a sausage-like appearance (Sukewanti et al., 2020). The clinical manifestations include bilious emesis and abdominal distention, with or without delayed meconium passage or the presence of gray mucus plugs (Antonoff et al., 2009; Bălănescu et al., 2013). In this case report, the patient displayed typical signs of abdominal distention and vomiting (Bălănescu et al., 2013).

Various surgical techniques can be employed, such as tapering enterostomy and anastomosis, enterostomy with or without resection, and end-to-oblique anastomosis. The choice depends on specific circumstances, and the management of patients remains complex (Filipa et al., 2019). Anastomosis offers the advantage of early recovery, while enterostomy is preferred in cases with contamination, doubts about bowel viability, or a significant size discrepancy between bowel ends (Filipa et al., 2019). A case series reported by Bălănescu et al. (2013) reported good outcomes with multiple resections and anastomoses to avoid stomas in patients with type IIIb and type IV atresia (Bălănescu et al., 2013). However, a case series in Indonesia reported poor survival rates for patients undergoing primary anastomosis in cases of type IV, type IIIa, and type I jejunal atresia, with two out of three patients not surviving (Sukewanti et al., 2020). Although a study comparing anastomosis and enterostomy showed that enterostomy had fewer postoperative complications, short- and long-term outcomes, including surgical site infection, wound dehiscence, short bowel syndrome, and adhesive bowel obstruction, were better with anastomosis (Eeftinck Schattenkerk et al., 2022). Nevertheless, significant bowel shortening is a concern after resection and anastomosis (Chadha et al., 2006).

Preserving bowel length is important to achieve good outcomes, minimize complications, and support optimal growth (Calisti et al., 2012). Even though residual intestinal peristalsis may be ineffective, particularly if ischemic, more recent studies suggested that nutrient flow can stimulate distal intestinal motility. Mortality in jejunoileal atresia remains high due to short bowel syndrome in cases with extensive atresia (type IIIa or type IV), or from associated anomalies, prematurity, sepsis, malnutrition, functional obstruction, and anastomotic leak (Chadha et al., 2006). However, advances in surgical techniques and good clinical nutrition intervention have increased survival rates to over 90% (Calisti et al., 2012). Another alternative to preserve intestinal length is to perform double jejunostomy combined with multiple anastomoses. A distal jejunostomy can address size discrepancies between proximal and distal intestine, with a silicone stent inserted into the distal stoma through the anastomoses, followed by stoma closure (Bălănescu et al., 2013; Rich et al., 2013; Sukewanti et al., 2020).

Intraoperative management of jejunoileal atresia includes grouping multiple atresia for resection, adequate resection of the dilated proximal atonic loop, end-to-end anastomosis, avoiding intraluminal catheters, additional resection of a segment of the distal loop with “Christmas tree” deformities, and considering the “shish kebab” technique for multiple atretic webs. Postoperative management should involve early intravenous nutrition (Miller, 1979). Multiple intestinal atresia causes extreme loss of intestinal length, disparities in residual bowel wall sizes, and discontinuities in multiple short segments (Alexander et al., 2002). This case report identified a type IV jejunoileal atresia with three intraluminal obstructions, one fibrous cord atresia, and no mesenteric defects, as seen in the figures above. To avoid prolonged surgery time and multiple resections and anastomoses, a resection of 20 cm of jejunum was performed, followed by jejunal end-to-oblique anastomosis and the insertion of an IV catheter into another intraluminal ileum to bypass the most distal obstruction. Ileoplasty was then performed at the catheter insertion site after confirming the patency (Figure 5). One-week postoperative care included

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parenteral nutrition and routine rectal irrigations to dilate the previously collapsed distal intestine. After five weeks, the patient able to defecate spontaneously, fully breastfeeding, and discharged from the hospital. To reduce dependence on total parenteral nutrition, patients should receive glutamine, a modified diet, and growth hormone supplementation (Dalla Vecchia et al., 1998). Proximal dilated bowel loop tapering using antimesenteric sleeve enteroplasty with a linear stapler after the surgery has been shown to improve transit time, reduce stasis and bacterial translocation, allow earlier initiation of oral intake (17 days post-operation compared to 20.2 days) and shorten the length of hospital stay (Kurdi et al., 2023).

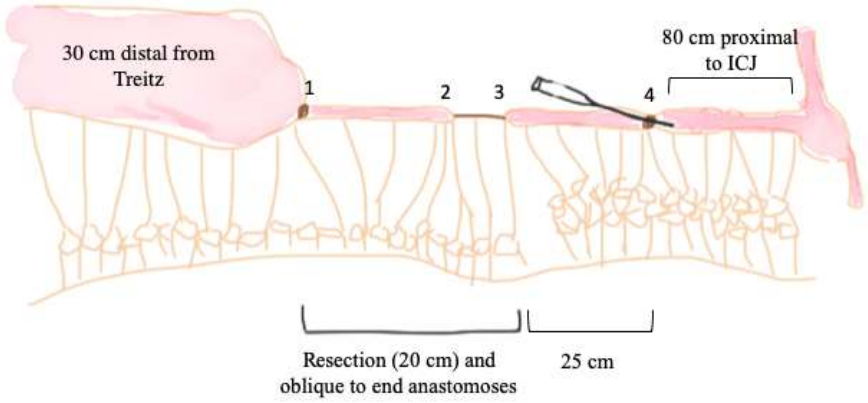

Figure 5. Multiple jejunoileal obstructions in this patient

Postoperatively, parenteral nutrition is mandatory. Enteral feedings can begin when gastric aspirate is clear, minimal, and the patient is stooling. Oral intake is initiated when nasogastric aspiration is unremarkable, peristalsis is audible, and there is no abdominal distention (Kurdi et al., 2023). Nutritional intervention with full oral or nasogastric tube (NGT) feeding is typically possible between 13 to 31 days post-operation (Chadha et al., 2006). Gastrointestinal dysfunctions such as lactose intolerance, malabsorption (due to stasis with bacterial overgrowth), and diarrhea should also be monitored in patients with short bowel syndrome. Therefore, preserving the ileocecal valve is important when residual intestine length is short (Antonoff et al., 2009). The combination of surgical adaptation techniques and early enteral nutrition provides an effective approach to managing jejunoileal atresia (Filipa et al., 2019).

Limitations

This case did not have a long-term follow up so that the quality of life (QoL) can't be access.

CONCLUSION

Inserting an intravenous catheter to bypass intraluminal jejunoileal obstructions, followed by enteroplasty at the catheter insertion site, may be an option for managing multiple small intestinal atresia to reduce multiple resections and anastomoses and minimize the risk of anastomotic leakage. Comprehensive postoperative neonatal care is essential in cases of congenital intestinal obstruction as associated anomalies may be present. Further studies are needed to evaluate the efficacy of this operative technique.

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Conflict of Interest

The author declares no conflict of interest.

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Patient Concern for Publication

The patient's parents have provided consent for the publication of the patient's data and medical images in this case report.

Author Contribution

The authors contributed to all stages of this report, including preparation, data collection, manuscript drafting, and approval for the publication of the manuscript.

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