A comprehensive analysis of 51 neonates with congenital intestinal atresia

Hayrettin Ozturk, MD, Hulya Ozturk, MD, Senol Gedik, MD, Hatun Duran, MD, Abdurrahman Onen, MD.

ABSTRACT

Objective: To determine contemporary patterns of presentation and trends in the management and outcome of 51 newborn infants with intestinal atresia.

Methods: We retrospectively reviewed 51 cases of intestinal atresia between January 1983 and February 2003. Clinical data included antenatal history, age, gender, weight, presenting symptoms and signs, diagnostic procedures, location and type of atresia, associated abnormalities, surgical treatment, associated problems, morbidity, mortality and plans of treatment.

Results: Twenty children had duodenal obstruction, 24 had jejunoileal atresia, and 7 had colonic atresia. Approximately one-fourth of patients associated with duodenal atresia had preterm delivery and all patients with jejunoileal and colonic atresia were full term. Clinical features such as vomiting, abdominal distention, delayed meconium passage and jaundice were more frequent in jejunoileal atresia patients. Other associated organ anomalies particularly Down's syndrome were more frequent in duodenal atresia patients. A duodeno-duodenostomy was preferred in most of the patients with duodenal atresia and annular pancreas; duodenotomy and web excision for those with duodenal webs; and resection with end-to-end anastomosis for those with jejunoileal atresia. In all patients with colonic atresia, colostomy procedure was performed as the first step of surgery.

Conclusion: Experienced neonatal care and prompt total parenteral nutrition by placing central line during surgery may improve the outcome of such patients.

Saudi Med J 2007; Vol. 28 (7): 1050-1054

From the Department of Pediatric Surgery (Ozturk H), Abant Izzet Baysal University, Medical School, Department of Pediatric Surgery (Ozturk H), Izzzet Baysal Obstetrics and Children Hospital, Bolu, Department of Pediatric Surgery (Gedik), Diyarbakir Children Hospital, and the Department of Pediatric Surgery (Duran, Onen), Dicle University, Medical School, Diyarbakir, Turkey.

Received 1st October 2006. Accepted 11th February 2007.

Address correspondence and reprint request to: Dr. Hayrettin Ozturk, Department of Pediatric Surgery, Abant Izzet Baysal University, Medical School, 14280 Bolu, Turkey. Tel. +90 (374) 2534656 Ext. 3220. Fax: +90 (412) 2488440.

Intestinal atresia is one of the major causes of neonatal intestinal obstruction.[1] During the past 2 decades a better understanding of the etiology and improvement in anesthesiology and perioperative care have led to a significant improvement in survival.[2-4] Although favorable outcome has been achieved in developed countries, with resultant high survival,[5-7] mortality still remains high in developing countries.[8,9] The aim of this study was to evaluate contemporary patterns of presentation and trends in the management and outcome of 51 newborn infants with intestinal atresia.

Methods. We retrospectively reviewed 51 cases of intestinal atresia between January 1983 and February 2003. Clinical data included antenatal history, age, gender, weight, presenting symptoms and signs, diagnostic procedures, location and type of atresia, associated abnormalities, surgical treatment, associated problems, morbidity, mortality and plans of treatment (first 10 years and second 10 years). The type of jejunoileal atresia was determined according to Grosfeld's classification.[1] The type of duodenal atresia was determined according to Gray and Skandalakis's classification.[10] Antenatal diagnosis was made in 5 neonates (9.8%) on the basis of polyhydramnios and dilated loops of bowel observed on antenatal ultrasound scans. Plain abdominal x-ray was carried out in all 51 children. It showed a double gas shadow in duodenal atresia, and the other plain films showed varying degrees of multiple air-fluid levels. Lower and upper gastrointestinal (GI) contrast studies aided diagnostic suspicion of intestinal atresia. An upper GI series was carried out in 3 patients who showed proximal jejunal atresia, and one patient with colonic atresia had a barium enema, which showed a blind-ended descending colon. Each of the neonates received intravenous 10% dextrose in saline, nasogastric tube decompression, and urethral catheter insertion. Resuscitation was modified according to biochemistry results. Triple antibiotics

and total parenteral nutrition were given. Ampicillin, gentamicin and clindamycin were the antibiotic of choice in the majority of patients. Surgery was then performed through an upper transverse abdominal incision.

Statistical analysis. Data were entered and analyzed on a personal computer using Statistical Package for Social Sciences Version 10.0. Comparative analysis for the first 10 years and second 10 years in terms of morality, morbidity: Fischer's exact test. Data are reported as the mean ± SD, and P value of less than 0.05 was considered statistically significant.

Results.

Demographic data. The main demographic data of patients associated with duodenal, jejunoileal, and colonic atresia are summarized in **Tables 1 and 2**. Approximately one-fourth of patients associated with duodenal atresia had preterm delivery, all patients with jejunoileal and colonic atresia were full term. Clinical features such as vomiting, abdominal distention, delayed meconium passage and jaundice were more frequent in jejunoileal atresia patients. Other associated organ anomalies particularly Down's syndrome were more frequent in duodenal atresia patients.

Surgical findings. A duodeno-duodenostomy was preferred in 13 patients. The patients with duodenal atresia had side-to-side retrocolic duodenojejunostomy in 3 patients, and a Ladd's procedure was performed for the 3 patients who had malrotation. The children with duodenal web had duodenotomy and excision of the web. The children with annular pancreas had duodenoduodenostomy. In addition, the 3 patients associated with anal atresia underwent sigmoid loop colostomy. They are diagnosed prior to surgery. Nine neonates had jejunal atresia, 2 had multiple atresias along to jejunum and ileum, and the remaining 15 had ileal atresia. Three patients with jejunoileal atresia additionally had malrotation of the midgut. Operative treatment included wide proximal resection with end-to-end anastomosis in 16 neonates (9 with jejunal atresia, 7 with ileal atresia) and proximal resection

Table 1 - The demographics of patients with duodenal atresia (n=20).

Patient variables	No. of patients with duodenal atresia
Median age (days, (range)	3.7 (1-12)
Gender (male/female)	11/9
Weight at presentation (kg, range)	2.1 (1.3-3.1)
Preterm newborn	5
Clinical features	
Vomiting	20
Abdominal distension	-
Delayed meconium passage	-
Jaundice	-
Hospitalization (days, range)	11.5 (1-23)
Type of duodenal obstruction	
Type I	3
Type II	4
Type III	10
Annular pancreas	3
Type of associated anomalies	
Anal atresia	3
Meckel's diverticulum	2
Malrotation	2
Down syndrome	5
Jejunal atresia	1
Colonic atresia	1
Cardiac anomaly	2
Undescended testis	1
Extremity anomalies	1

Table 2 - The demographics of patients with jejunoileal and colocnic atresia (n=31).

Patient variables	No. of patients with jejunoileal atresia (n=24)	No. of patients with jejunoileal atresia (n=7)
Median age (days, (range)	4 (1-15)	3.6 (3-12)
Gender (male/female)	13/11	3/4
Weight at presentation (kg, range)	2.3 (1.3-3.5)	2.9 (2.5-3.5)
Preterm newborn	-	-
Clinical features		
Vomiting	21	5
Abdominal distension	23	7
Delayed meconium passage	17	5
Jaundice	6	-
Hospitalization (days, range)	9.6 (2-20)	9.4 (5-24)
Type of duodenal obstruction		
Type I	4	2 (1 hepatic, 1 splenic flexure)
Type II	5	5 (3 sigmoid, 2 transverse colon
Type IIIa	11	-
Type IIIb	2	-
Type IV	2	-
Type of associated anomalies		
Anal atresia	-	-
Meckel's diverticulum	1	-
Malrotation	3	1
Down's syndrome	-	-
Jejunal atresia		
Colonic atresia		
Cardiac anomaly	2	-
Undescended testis	-	-
Extremity anomalies	1	-
Cleft lip	1	-
Hypospadias	2	-
Bifid scrotum	-	-
Renal agenesis	-	1
Annular pancreas	-	1

with antimesenteric tapering enteroplasty and end-to-end anastomosis in 6 (4 with jejunal atresia, 2 with ileal atresia). Four neonates had a trans anastomotic tube for early enteral feeding. The 2 neonates with multiple atresia had multiple resection with end-to-end anastomosis. A Ladd's procedure was added in 3 neonates with malrotation. All patients received total parenteral nutrition (TPN). Postoperative oral feeding tolerance time was differed between 7 and 20 days.

Colostomy procedure was performed in all these patients as the first step of surgery. The type of colostomy performed was sigmoid loop in 2 patients, transverse loop in 3, and sigmoid diverting in 2 patients. Colonic anastomosis was performed 4-8 weeks after the first operations.

Outcome. The clinical features of complicated cases are summarized in **Tables 3 and 4**. Of the 20 duodenal atresia patients, 9 (45%) developed postoperative complications, while 7 (35%) died. Of the 24 jejunoileal atresia patients, 9 (46%) developed postoperative complications, while 8 (33%) died. No morbidity or mortality was observed in colonic atresia patients. The comparison of plans of treatment. For all patients, the postoperative complication and mortality rate was decreased in the last 10 years compared to previous 10 years ($p<0.05$, $p<0.05$) (**Table 5**).

Discussion.

Intestinal atresia is a congenital malformation, which occurs from one of 400 to one

Table 3 - The clinical features of complicated duodenal atresia patients.

Gender	Weight (g)	Admission day	Associated atrisia	Type of atresia	Repair	Complications
Male	1500	2	Anal atresia	Duodenal atresia, Type 3	Duodeno-jejunostomy, ostomy	Central venous line sepsis
Male	1700	3	Anal atresia	Duodenal atresia, Type 3	Duodeno-duodenostomy	Wound infections
Female	1500	2	Anal atresia	Duodenal atresia, Type 1	Duodeno-duodenostomy	Necrotizing enterocolitis
Male	2500	5	Anal atresia	Duodenal atresia, Type 2	Duodeno-duodenostomy	Sepsis
Female	2700	2	Anal atresia	Duodenal atresia, Type 3	Duodeno-duodenostomy, Resection anastomosis, ostomy	Sepsis
Female	2200	7	Anal atresia	Duodenal atresia, Type 1	Web exist	Anastomotic leak, sepsis
Male	1600	3	Anal atresia	Duodenal atresia, Type 2	Duodeno-duodenostomy	Sepsis
Female	1300	4	Anal atresia	Duodenal atresia, Type 1	Web exist	Wound infections
Female	2100	4	Anal atresia	Duodenal atresia, Type 3	Duodeno-Jejunostomy	Anastomotic leak

Table 4 - The clinical features of complicated jejunoileal atresia patients.

Gender	Weight (g)	Admission day	Associated atrisia	Type of atresia	Repair	Complications	Results and outcome
Female	3200	2	-	Jejunal atresia, Type 2	RA	Sepsis	Dead
Male	2400	3	-	Jejunal atresia, Type 3	RA	Anastomotic leak	Dead
Female	1920	2	Malrotation	Jejunal atresia, Type 3	RA	Sepsis	Dead
Female	1300	3	-	J-IA, Type 1	RA	Necrotizing enterocolitis	Dead
Female	2300	5	Perforation	Multiple JA, Type 1	JJ, ostomy	Sepsis	Dead
Female	3200	3	Peritonit	IA ,Type 2	RA	Wound infections	Alive
Male	2000	12	Peritonit	IA, Type 3	RA	Sepsis	Alive
Female	2870	3	Peritonit	IA ,Type 3	RA	Wound infections	Alive
Male	3050	5	Perforation	IA, Type 4	Ostomy	Sepsis	Dead
Female	2300	6	-	IA, Type 2	RA	Sepsis	Dead
Female	1750	12	-	IA, Type 2	RA	Central venous line sepsis	Dead

JA - jejunal atresia, IA - Ileal atresia, RA - resection anastomosis, J-J - Jejuno-jejunostomy

Table 5 - The comparison of plans of treatment.

Variable	Terms of treatment		
	First 10 years n=24 n (%)	Second 10 years n=27 n (%)	*P* value
Postoperative complications	14 (58)	5 (22)	0.05*
Mortality	11 (46)	4 (15)	0.05*

*Significant value ($p<0.05$)

of 5,000 newborns.[11] With improved neonatal care and the introduction of safe anesthesia and refined surgical techniques, survival has risen from <10% in the 1950s to 90% in the 1980s particularly in developed countries.[2-4] However, mortality still remains high in developing countries.[8,9] In our series, the most common postoperative complication and cause of death was sepsis; it might be due to such several factors as hemodynamic instability and bacterial translocation resulted from great delay in admission to our clinic. With the introduction of routine antenatal scanning using high resolution imaging and increasing experience, more atresias are diagnosed antenatally. The potential benefits of antenatal diagnosis include earlier recognition and parental counseling and prompt delivery in an appropriate center.[12] Although a limited number of our patients diagnosed prenatally, we agree that antenatal diagnosis will decrease the complications by preventing delayed treatment. The standard bypass procedure for duodenal atresia or stenosis with or without annular pancreas is direct duodenoduodenostomy, which seems to be a more physiologic bypass procedure that helps to hasten the return of intestinal function after surgery and to promote duodenal emptying.[10] We agree that duodenoduodenostomy might be the procedure of choice because of better outcome. Usually, type I, II, IIIa atresias are the types of atresias observed, and most of the atresias are jejunoileal.[13,14] In jejunoileal atresia, generous excision of the proximal pouch is recommended before bowel continuity is established, as the ischemic event is known to extend up to 20 cm into the proximal pouch.[5,15,16] Dilated bowel in postoperative patients with intestinal atresia is dysfunctional and might be responsible for postoperative disturbed intestinal transit, especially in patients with jejunal atresia.[1] Additionally, operative techniques and postoperative parenteral nutrition have improved the outcome, but prolonged intestinal motility disorders remain common in the postoperative period, even in the absence of any mechanical lesions.[17,18] Khen et al[18] suggested that intestinal atresia impairs the development of the enteric nervous system and provide an anatomical substrate for the motility disorders observed after surgical repair. They point to the role of peristalsis in normal gut development and suggest that stimulation of peristalsis might be used to accelerate recovery. We prefer resection of the dilated proximal segment in our patients associated with jejunoileal atresia. In addition, we routinely use parenteral nutrition as soon as hemodynamic stability was achieved. This may be facilitated by insertion of a central venous catheter. Because of tube dislodgment and obstruction at the site of anastomosis, the trans anastomotic feeding technique has been abandoned in the literature.[1] Some authors have suggested the additional insertion of a feeding jejunostomy tube at the time of correction of duodenal atresia.[1] The jejunostomy tube allows enteral feeding at the early postoperative period. When the infant has spontaneous bowel motions and the gastric drainage fluid is clear and of minimal volume, the orogastric tube is removed, and clear oral liquids are initiated. There has been a debate over whether primary anastomosis or a staged operation is indicated in colonic atresia patients. It has been reported that the type of surgery (primary anastomosis without prior colostomy) and associated abnormalities may be the major determinants of poor outcome.[19] Because of significant delay in most of our patients, we performed colostomy in our colonic atresia cases. Since we observed no morbidity in these patients, colostomy may be an alternative procedure particularly in hemodynamically unstable, septic patients who had delayed admission. The most common cause of death in infants with intestinal atresia is infection related to pneumonia, peritonitis, or sepsis. The most significant postoperative complications include functional intestinal obstruction at the site of anastomosis and anastomotic leak. Other contributing factors affecting morbidity and mortality include associated anomalies, respiratory distress, prematurity, short-bowel syndrome, and postoperative bowel obstruction owing to volvulus with bowel infarction.[1] In our study, the postoperative complication and mortality rate decreased in the last 10 years compared to previous 10 years. An important point was that no morbidity or mortality was observed in our colonic atresia patient may be, at least partially, because we preferred colostomy. Experienced neonatal care, improvements in neonatal anesthetic techniques, resection of proximal dilated bowel along with the atretic segment and primary anastomosis and prompt total parenteral nutrition by placing central line during surgery may improve the outcome of such patients, as the second 10 years in our clinic.

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