Research Letter

What is Our Development Progress for the Treatment Outcome of Newborn with Intestinal Atresia and Stenosis in a Period of 28 Years?

Intestinal atresia is a well-recognized cause of bowel obstruction in the newborn. The aim of this study was to examine the serial regarding the intestinal atresia and stenosis patients in a period of 28 years in a developing country and to display our progress in treatment and survival rates today. In this study, a total of 141 intestinal atresia and stenosis cases were retrospectively evaluated. The cases were categorized in two groups as 45 cases before the 1990 (group 1) when it was impossible for total parenteral nutrition (TPN) solutions to be used regularly, without complication and for a long time and 96 cases after 1990 (group 2) when this was possible. While the survival rate before 1990 was 55%, after 1990 it was 94%. As a result, long-term regular TPN usage significantly improved survival in newborns with intestinal atresia and stenosis in a developing country.

In this study, a total of 141 intestinal atresia and stenosis cases comprising of 118 cases treated in Dr. Sami Ulus Maternity and Children's Hospital (Ankara, Turkey) Pediatric Surgery Department from 1983 to 1997 and 23 cases treated in Dr. Faruk Sükan Maternity and Children's Hospital (Konya, Turkey) Pediatric Surgery Department from 1998 to 2011 were retrospectively evaluated. All information's were collected from patient's file and computer records. All patients were treated with the same protocol. A nasogastric tube was placed in the stomach and intravenous fluid replacement was done to correct hypovolemia and electrolyte abnormalities. Postoperative triple antibiotic treatment (penicillin or sefalosporin+aminoglikoside+anti-anaerobic) was administered, and such screenings methods as abdominal ultrasonography (USG) and echocardiography were used. In clinically poor cases, surgery was postponed until electrolyte abnormality and general situations were recovered.

The cases were categorized in two groups as 45 cases before the 1990s when it was impossible for parenteral nutrition solutions to be used regularly, without complication and for a long time (the first group) and 96 cases after 1990 when this was possible (the second group). Both groups were compared in terms of such factors that can affect the survival rate as prenatal diagnosis, admission age of the patients, brought in with poor general condition, prematurity, associated anomaly (syndrome, congenital heart disease, congenital short bowel syndrome, etc.), postnatal perforation, postoperative surgical complications (anastomotic leakage, prolonged anastomosis dysfunction, adhesive small-bowel obstruction, anastomotic stricture, wound infection, etc.), reoperation, average TPN usage time, and complications related to TPN. In this study, number and percentage, mean±standard deviation values for descriptive statistics were given. In both groups, the Chi-square test and Fisher's exact Chi-square test were used in comparison of qualifier variables percentage. Independent *T*-test was used in comparison of numerical values' average. $P<0.05$ was accepted for statistical significance.

The level of obstruction was duodenal in 55 cases (39%), jejuno-ileal in 80 (56.7%) and colonic in 6 (4%). In the first group there were 14 duodenal (31%), 28 jejuno-ileal (62%) and three colonic atresias (6.6%), in the second group there were 41 duodenal (42.7%), 52 jejuno-ileal (54%), and three colonic atresias (3%) ($P=0.229$, $P=0.432$, $P=0.384$, respectively). Among the factors that can affect mortality between groups, prenatal diagnosis rate in the first group was 0%, in the second group it was 3% ($n=3$) ($P=0.551$). While the admission age was 4±5.25 days (1-21) before 1990, after 1990 it was 2.8±4.52 (1-23) ($P=0.165$). The rates of 'brought in with poor general condition' were respectively 44% ($n=20$) and 32% ($n=31$) ($P=0.162$). Prematurity in the first group was 35% ($n=16$) and in the second group it was 40% ($n=39$) ($P=0.565$). The rates of associated anomaly were respectively 26.6% ($n=12$) and 31% ($n=30$), but differences was not statistically different ($P=0.569$). Postnatal perforation was seen in only jejun-oileal atresia cases, in the first group it was 11% ($n=3$) and in the second group it was 4% ($n=2$) (0.334). While in the first group the postoperative surgical complication rate was 22% ($n=10$), in the second group it was 33% ($n=32$) ($P=0.169$). Re-operation rates were respectively 18% ($n=8$) and 25% ($n=24$) ($P=0.339$). Up to this point, there was no statistical difference as of all factors that can affect mortality [Table 1]. The operation types performed for the duodenal and jejuno-ileal atresia

Table 1: Comparison of two groups before and after 1990 in patients with intestinal atresia and stenosis

Characteristics of both groups	Group 1 <1990 *n*=45	Group 2 >1990 *n*=96	*P* value
Duodenal atresia *n*	14	41	0.229
Jejuno-ileal atresia *n*	28	52	0.432
Colonic atresia *n*	3	3	0.384
Prenatal diagnosis *n*	0	3	0.551
Age at admission days	4±5.25	2.8±4.52	0.165
Brought in with poor general condition *n*	20	31	0.162
Prematurity *n*	16	39	0.565
Associated anomaly *n*	12	30	0.579
Postnatal perforation *n* (in jejuno-ileal ones)	3	2	0.334
Surgical complication *n*	10	32	0.179
Reoperation *n*	8	24	0.339
Cases, with duodenal atresia, received TPN days	5±2.25 (2-8)	12±8.7 (3-35)	*P*<0.001
Cases, with jejuno-ileal atresia, received TPN days	19±10.8 (3-59)	59±34.3 (3-145)	*P*<0.001
Complications due to TPN *n*	14	0	*P*<0.001
Rates of survival (%)	55	94	*P*<0.001

Table 2: Procedures performed in cases with duodenal atresia

Procedures	*n*
Standard DD	36
Duedenotomy with web emcisin	12
Duedonojejunostomy	3
Gastrojejunostomy	2
Gastroduedonostomy	1
Diamond-shaped DD	1
Toplam	55

DD: Duedono-duedonostomy

Table 3: Procedures performed in cases with jejuno-ileal atresia

Procedures	Number of patients		
	Jejunal	İleal	Total
Wide proximal resection and anastomosis	9	7	16
Minimal resection and anastomosis	18	27	45
Minimal resection and tapering enteroplasty	5	-	5
Jejunotomy with web excision	7	-	7
Temporary ostomy and delayed closure	1	6	7
Total	40	40	80

cases are shown in Tables 2 and 3. Patients with colon atresia were managed with initial colostomy and delayed anastomosis in all patients (*n*=6).

In the first group, TPN was only applied to four duodenal atresia cases for 5±2.25 days (2-8), in the second group TPN was applied to 41 duodenal atresia cases for 12±8.7 days (3-35) (*P*<0.001). In the first group, TPN was applied to 16 jejuno-ileal atresia cases for 19±10.8 days (3-59) and in the second group it was applied to 56 jejuno-ileal atresia cases for 59±34.3 days (5-171) (*P*<0.001). For colonic atresia patients, TPN was not required.

When we start with TPN on the third day and change to full TPN in 6 or 7 days, we generally provide 85-106 kcal/kg energy with a TPN use of 160-200 ml/kg/day. We can assist the patients in weight gain of approximately 11.6 g/day. The weight gain in our patients who receive TPN for more than 15 days was 28.1 g/day.

While the survival rate was only 55% before 1990, after 1990 it was 94% (*P*<0.001). All our patients were given TPN peripherally. Complications following TPN were seen in 14 (70%) of our 20 patients who could take TPN before 1990. Five patients suffered from catheter infection, four patients suffered from oedema, four patients seriously suffered from thrombophlebitis, and one patient suffered seriously from hepatic cholestasis. After 1990, no complication related to TPN was seen (*P*<0.001).

Intestinal atresia is responsible for approximately 1/3 of intestinal obstructions in newborns. Although the mortality rate was over 90% until the mid-20th century, it is below 10% in developed countries thanks to the developments in anesthesia and surgery techniques in the last 30 years, modern surgical intensive care units and TPN.[1-4] There are lot of factors affecting the rates of survival of the newborns with this disease. One of them is prenatal diagnosis. In particular, the fetuses with duodenal and high jejunal atresia can make up a high proportion of diagnosis (especially around the gestational age of ≥18 weeks). Early diagnosis reduces pre-operative metabolic derangements and facilitates appropriate and rapid surgical treatment; which positively impacts the rates of survival.[5,6] In our study, while we had no patient with prenatal diagnosis in the first 10 years, our three patients with prenatal diagnosis were in the last 10 years. The fact that only six of a total of 141 cases had prenatal diagnosis resulted in delay in both groups; and contributed highly to the rate of the patients brought in with poor general condition. Although the rate of the patients brought in with poor general condition has decreased, it is still high.

Another factor affecting mortality was prematurity. Patent ductus arteriosus (PDA), hyaline membrane

disease, intracranial hemorrhage, apnea, sepsis and feeding problems are frequent in prematures compared to full-term infants.[7] For these reasons, mortality may be high in prematures exposed to surgical stress due to intestinal atresia or stenosis. However, prematurity did not affect mortality in our series.

Some associated anomalies can be seen in newborns with intestinal atresia. In duodenal atresias, Down's syndrome and cardiac malformations are common. In intestinal atresias, associate diseases such as congenital short bowel, meconium peritonitis, intrauterine or postnatal perforation can increase mortality. However, additional anomaly at similar rates has been observed in both groups in our serial.

The fact that the patients are brought in with intestinal perforation findings can be a reason for mortality both in pre-operative preparation and operative and post-operative periods due to peritonitis and sepsis. Intestinal perforation was only observed in our patients with jejuno-ileal atresia. Eleven percent in the first group and 4% in the second group were brought in with perforation. While we perceived a trend toward earlier diagnosis in recent years, no statistical relationship between the two groups was found.

In newborns operated for intestinal atresia, complications such as anastomotic leakage, prolonged anastomotic dysfunction, adhesive small bowel obstruction, anastomotic stricture and wound infection can be observed in the post-operative period. The surgical complication rate of 22% in the first period rose to 33% in the second period; but it did not affect mortality. However, we think, the rise in this rate may also be related to the fact that the patients survived longer through TPN use in the second period; and that they were not lost in the post-operative early periods. Similarly and possibly for the same reasons, the re-operation rate of 18% in the first period rose to 24% in the second period.

In our patients before 1990, there were defects in the supply of TPN solutions; thus, TPN administered for a long period of time and regularly could not have been possible. In our patients on whom TPN could be administered, defects were observed frequently. However, after 1990, the TPN solutions were prepared under laminar air flow and, in recent years, by a trained staff member with a compounder; thus, routine use of TPN for a long period of time was made possible. We prefer using TPN in the peripheral method in all our newborns. Through this method, we are able to perform TPN for a long period of time and without complications. The incidence of observing complications and sepsis of catheter in peripheral TPN application is quite low compared to central TPN.[8]

To the best of our knowledge, this study, the second largest serial in English literature, includes the largest series from a developing country. While survival rates of 89-90% are reported from developed countries, survival rates such as 58.3-71.5% are reported from developing countries.[9-12] As shown in our study, we can deduce that in a developing country, the survival rate of newborns with intestinal atresia or stenosis will be at a very good level as it is in developed countries.

As a result, it can be said that regular, uncomplicated use of TPN over a long period of time, when necessary, dramatically stabilizes the rates of survival in newborns with intestinal atresia.

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References

1. Dalla Vecchia LK, Grosfeld JL, West KW, Rescorla FJ, Scherer LR, Engum SA. Intestinal atresia and stenosis: A 25-year experience with 277 cases. Arch Surg 1998;133:490-6.
2. Toulakian RJ. Diagnosis and treatment of jejunoileal atresia. World J Surg 1993;17:310-7.
3. Evans CH. Collective review: Atresias of gastrointesinal tract. Surg Gynecol Obstet 1951;92:1.
4. Akkoyun I. Congenital intestinal atresia and stenosis: Analysing of 118 cases. Thesis study. Ankara: Dr. Sami Ulus Educational and Research Hospital; 1997. p. 685.
5. Stoll C, Alembik Y, Dott B, Roth MP. Evaluation of prenatal diagnosis of congenital gastro-intestinal atresias. Eur J Epidemiol 1996;12:611-6.
6. Miro J, Bard H. Congenital atresia and stenosis of the duodenum: The impact of a prenatal diagnosis. Am J Obstet Gynecol 1988;158:555-9.
7. Dawson J, Rosenbaum J, Wickline K, Hauft SM, Mathur A, Hamvas A, *et al*. Common problems and complications of premature and full-term infants. In: Oldham KT, Colombani PM, Foglia RP, Skinner MA, editors. Principles and Practice of Pediatric Surgery. Philadelphia: Lippincott Williams & Williams; 2005. p. 49.
8. Yiğit C. Total parenteral nutrition in pediatric surgery. Thesis study. Ankara: Dr. Sami Ulus Educational and Research Hospital; 1997.
9. Kumaran N, Shankar KR, Lloyd DA, Losty PD. Trends in the management and outcome of jejuno-ileal atresia. Eur J Pediatr Surg 2002;12:163-7.
10. Stollman TH, de Blaauw I, Wijnen MH, van der Staak FH, Rieu

PN, Draaisma JM, *et al*. Decreased mortality but increased morbidity in neonates with jejunoileal atresia; a study of 114 cases over a 34-year period. J Pediatr Surg 2009;44:217-21.
11. Shakya VC, Agrawal CS, Shrestha P, Poudel P, Khaniya S, Adhikary S. Management of jejunoileal atresias: An experience at eastern Nepal. BMC Surg 2010;10:35.
12. Chirdan LB, Uba AF, Pam SD. Intestinal atresia: Management problems in a developing country. Pediatr Surg Int 2004;20:834-7.

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