How to Cite:
Agarwal, M., & Agarwal, A. (2022). Scrutinising the factors determining the adverse outcome following duodenal atresia surgery in children: An institutional based study. *International Journal of Health Sciences*, *6*(S6), 8804–8809.
https://doi.org/10.53730/ijhs.v6nS6.12358

Scrutinising the factors determining the adverse outcome following duodenal atresia surgery in children: An institutional based study

Monica Agarwal
Associate Professor, Department of Paediatrics, Rajshree Medical Research Institute and Hospital, Bareilly, Uttar Pradesh, India
*Corresponding author email: drmonicably@gmail.com

Amit Agarwal
Assistant Professor, Department of Surgery, Rajshree Medical Research Institute and Hospital, Bareilly, Uttar Pradesh, India

Abstract---Introduction: The most common causes of congenital abnormalities reported in newborns is duodenal obstruction. There are several conditions which may lead to worsen the patient's prognosis are prematurity, type of obstruction and the type of surgery performed. The major objective of the present study was to summarise our clinical experience with 34 infants with duodenal atresia who underwent surgical procedures over the past 20 years. Materials and Methodology: Of the total of 96 patients, those who were reported with the diagnosis of duodenal atresia were included in the study. And this group comprised of 34 patients. The group was compared in terms of sex, birth weight, age at the time of the operation and morbidity rates. All patients were assessed by neonatal and other relevant specialists when observed to be presented with additional anomalies. Data were analysed using SPSS software (ver. 15.0; SPSS Inc., Chicago, IL, USA). Results: Of the 34 patients, 22 were males and 12 females, with a mean birth weight of 2.282.92 ± 592.98 (range, 1,180-3,400) g. The average age at the time of the operation was 6.98 ± 5.09 (range, 1-38) days. The postoperative time to full oral intake was 10.36 ± 5.39 (range, 4-39) days. 26 (76.4%) patients underwent duodenoduodenostomy. Conclusion: To conclude based on our observations, the early preterm and very low birth weight are associated with a reported higher incidence of postoperative complications and a prolonged time to full oral intake in patients with duodenal atresia and stenosis. Further studies should be carried and to be focussed on the risk stratification among a cohort of infants with

duodenal atresia and stenosis and optimization of the operative management strategies accordingly to reduce the surgical risk of susceptible infants.

Keywords---congenital duodenal obstruction, congenital abnormalities, duodenal atresia.

Introduction

Congenital duodenal obstruction is one of the most common congenital abnormalities in newborn which accounts for 2500 to 10,000 live births and nearly 50% of all cases reported with intestinal obstruction.[1] Although the mortality cases of congenital duodenal obstruction are observed to be about 5% and this abnormality pose a major burden for paediatric surgeons.[2] Congenital duodenal obstruction is basically divided into total and partial obstruction types. Total obstruction majorly includes duodenal atresia which might be accompanied with annular pancreas. Moreover, partial obstruction includes net-type obstruction (perforated diaphragm), anomalies in the Ladd band, annular pancreas, preduodenal portal vein, superior mesenteric artery syndrome and duplication of cysts. Those two types of obstruction have observed with different mortality rates.[3,4] There are various congenital disorders which have often accompany with the congenital duodenal obstruction, such as congenital heart defects, Down syndrome and other congenital intestinal anomalies.[5] Some types of surgery for congenital duodenal obstruction are duodenoplasty, duodenojejunal anastomosis and duodenoduodenostomy. These types of surgery are thought to also affect the prognosis of mortality in patients with congenital duodenal obstruction.[2]

The most worrying early morbidities that are associated with CDO are anastomotic leakage, peritonitis, sepsis and anastomosis stenosis. Long-term complications might be reported to develop because of the additional anomalies that might trigger the underlying duodenal pathologies.[5] Two decades ago, the CDO survival rate was observed to be 60- 70%, but now it exceeds 95%.[6,7] The major objective of the present study was to summarise our clinical experience with 34 infants with duodenal atresia who underwent surgical procedures over the past 20 years.

Materials and Methodology

Of the total of 96 patients, those who were reported with the diagnosis of duodenal atresia were included in the study and this group comprised of 34 patients. Out of 34 patients, 8 patients were treated in other hospitals and later reported to our institute due to post-op complications. The group was compared in terms of sex, birth weight, age at the time of the operation and morbidity rates. Diagnoses was made or confirmed using simple abdominal radiography and patients suspected to have duodenal obstruction were subjected to barium-passage testing. All patients were assessed by neonatal and other relevant specialists when observed to be presented with additional anomalies. Data were analysed using SPSS software (ver. 15.0; SPSS Inc., Chicago, IL, USA).

Continuous variables are expressed as means ± standard deviations (SDs) and categorical variables as numbers with percentages (%).

Results

Prenatal ultrasonography was used to diagnose duodenal atresia. Of the 34 patients, 22 were males and 12 females, with a mean birth weight of 2.282.92 ± 592.98 (range, 1,180-3,400) g. The average age at the time of the operation was 6.98 ± 5.09 (range, 1-38) days. The postoperative time to full oral intake was 10.36 ± 5.39 (range, 4-39) days. 26 (76.4%) patients underwent duodenoduodenostomy. In our hospital set-up, we planned to insert a trans-anastomotic tube through which feeding of breast milk via a catheter commences at 1 mL/kg/h 3 days after the operation had been done in all patients. The amount of feeding is doubled at 4-hour intervals in patients who show tolerance. After 24 h, the catheter is removed, and oral intake were allowed to begin. In patients who do not tolerate nasogastric feeding, the feeding rate is reduced by 50% at regular intervals. Parenteral feeding is delayed in patients who exhibit complete intolerance. Therefore, when the study group was compared in terms of age at the time of the operation, a significant difference was observed (p = 0.015).

Table 1
Clinical features of the patients

Clinical parameters	Duodenal atresia (DA)
Mean age (days)	4.7 (1-14)
Mean weight (gr)	2219 (1455 - 3110)
Mean full oral intake time (days)	12.3 (8 - 39)
GA (weeks)	37.8 (27.4 – 42.0)
Preterm, n (%)	11 (30%)
Early preterm <34 weeks, n (%)	3(13%)
Surgical methods	
Duodenoduodenostomy	26
Gastrojejunostomy	3
Duodenojejunostomy	1
Duodenotomy	0
Plication	12

Table 2
Postoperative morbidity in the study groups

Parameters	Duodenal atresia (DA)
Morbidity	
Wound infection	2
Adhesive bowel obstruction	1
Incisional hernia	-
Anastomosis leak	1
Anastomosis strict	1
Total	5

Discussion

Duodenal obstruction is observed to be one of the major reasons among the most common causes of infant bowel obstruction. About half of all bowel obstructions are reported to be caused by intestinal duodenal atresia and the other half by stenosis.[8] All these cases are basically considered to be CDOs; both the internal and external causes of CDO have been well-documented.[9] The diagnosis of ultrasonographic rate of prenatal CDO is observed to be 16-54%.[8,10] It should be taken into account that this low rate of such diagnosis in this study is observed to be due to technical deficiencies and physician inexperience in diagnosing such condition.

Earlier studies have been established that the CDO is more common in males than females and is most commonly associated with prematurity and low birth weight.[11] CDO pathology may be classified as internal, external, or both.[12,13] The anomalies that were predominantly observed in the present case series mostly mimic those observed in other reports. Duodenoduodenostomy and laparoscopic duodenoduodenostomy are the standard treatment protocols for the management of CDO, although other procedures are also performed in a fewer rate, including Heineke-Mikulicz (H-M) duodenoplasty, duodenoduodenostomy and duodenojejunostomy.[14] Although duodenoduodenostomy has many types and forms such as the diamond-shaped side-to-side anastomosis, pioneered by *Kimura*, is mostly the preferred technique because this facilitates early full oral intake and is associated with a shorter hospitalisation time and minimizes the risk of later stenosis.[15,16] Proximal segment narrowing is highly recommended in patients observed with CDO who develop a “mega-duodenum” in order to reduce the stasis caused by inadequate peristaltic movement.[17,18] In this study, plication had been performed on almost half of all patients undergoing duodenoduodenostomy. Plication is preferred especially when antimesenteric tissue has to be treated effectively. The postoperative time to full oral intake was short in patients reported with narrowed proximal segments. Gastrojejunostomy has often been avoided because of the risk of morbidities, including gastric ulcers.[16]

We had undergone gastrojejunostomies on three patients who were premature or exhibited severe additional anomalies; second operations to be done in order to treat associated morbidities that were performed if required. Complications were not observed during follow-up of 1-16 years (although some have been described in the literature). There are few studies have demonstrated that a trans-anastomotic tube significantly shortens the time to full enteral feeding in patients with CDO, significantly minimizing the need for central venous access and total parenteral nutrition (TPN), which further shortens the risk of septicaemia.[19] Bishay et al observed that approximately 37% of patients with CDO who had received TPN developed sepsis frantically.[20] In this study, we planned to insert a transanastomotic tube containing a catheter to all patients. There were fewer studies that have documented the early morbidity rates in patients with CDO.[21] Anastomotic leakage, sepsis and anastomotic stenosis dysfunction might develop in the short term after an operation, whereas prematurity and additional anomalies may trigger the problems in the longer term.[7]

Laura et al demonstrated that the anastomotic obstruction in 3% of patients, prolonged adynamic ileus in 4% and superficial wound infection in 3%.[8] There is another study which reported that 2.6% of patients had adhesive bowel obstructions and 3.9% had incisional hernias.[11] The anastomotic difficulties that had occurred in patients with repaired CDO who had been operated on initially in one patient, but in whom plication had been deferred. Anastomosis problems and adhesive bowel obstruction are also important in early morbidity in CDO; we prefer to use plication if patients have mega duodenum.

Conclusion

To conclude based on our observations, the early preterm and very low birth weight are associated with a reported higher incidence of postoperative complications and a prolonged time to full oral intake in patients with duodenal atresia and stenosis. Further studies should be carried and to be focussed on the risk stratification among a cohort of infants with duodenal atresia and stenosis and optimization of the operative management strategies accordingly to reduce the surgical risk of susceptible infants.

References

1. Adzick NS, Harrison MR, deLorimier AA. Tapering duodenoplasty for megaduodenum associated with duodenal atresia. J Pediatr Surg. 1986 Apr;21(4):311-2.
2. Bailey PV, Tracy TF Jr, Connors RH, Mooney DP, Lewis JE, Weber TR. Congenital duodenal obstruction: a 32-year review. J Pediatr Surg. 1993 Jan;28(1):92-5.
3. Bales C, Liacouras CA. Intestinal atresia, stenosis, and malrotation. In: Kliegman RM, Stanton BF, St Geme JW, Schor NF, eds. Nelsons Textbook of Pediatrics. 20th ed. Philadelphia: WB Saunders; 2016.
4. Chandrasekaran S, Asokaraju A. Clinical profile and predictors of outcome in congenital duodenal obstruction. Int Surg J. 2017;4(8):2605- 2611.
5. 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 May;133(5):490-6; discussion 496-7.
6. 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 May;133(5):490-6; discussion 496-7.
7. Daniaty, T. O. W., Wardani, I. A. K., & Ariani, N. K. P. (2022). Psychiatric aspects and the role of consultation liaison psychiatry (CLP) in traumatic amputation due to electrical burns for adolescents. International Journal of Health & Medical Sciences, 5(4), 253-259. https://doi.org/10.21744/ijhms.v5n4.1947
8. Escobar MA, Ladd AP, Grosfeld JL, West KW, Rescorla FJ, Scherer LR, et al. Duodenal atresia and stenosis: long-term follow-up over 30 years. J Pediatr Surg. 2004 Jun;39(6):867-71.
9. Gfroerer S, Theilen TM, Fiegel HC, Esmaeili A, Rolle U. Comparison of outcomes between complete and incomplete congenital duodenal obstruction. World J Gastroenterol. 2019;25:3787-3797.

10. Kilbride H, Castor C, Andrews W. Congenital duodenal obstruction: timing of diagnosis during the newborn period. J Perinatol. 2010 Mar;30(3):197-200.
11. Kimura K, Loening-Baucke V. Bilious vomiting in the newborn: rapid diagnosis of intestinal obstruction. Am Fam Physician. 2000 May;61(9):2791-8.
12. Kimura K, Mukohara N, Nishijima E, Muraji T, Tsugawa C, Matsumoto Y. Diamond shaped anastomosis for duodenal atresia: an experience with 44 patients over 15 years. J Pediatr Surg. 1990 Sep;25(9):977-9.
13. Kimura K, Tsugawa C, Ogawa K, Matsumoto Y, Yamamoto T, Asada S. Diamond shaped anastomosis for congenital duodenal obstruction. Arch Surg. 1977 Oct;112(10):1262-3.
14. Kumar P, Kumar C, Pandey PR, Sarin YK. Congenital duodenal obstruction in neonates: over 13 years experience from a single. J Neonatal Surg. 2016;5:50.
15. Magnuson DK, Schwartz Mz. Stomac and duodenum, Principles and practice of pediatric surgery; Oldham KT, Colombani PM, Foglia RP, Skinner MA (Editors); second edition. Lippincott Williams and Wilkins, Philadelphia. 2005, chapter 72, P: 1149- 79.
16. Mikaelsson C, Arnbjörnsson E, Kullendorff CM. Membranous duodenal stenosis. Acta Paediatr. 1997 Sep;86(9):953-5.
17. Millar AJW,Rode H, Cywes S. Intestinal atresia and stenosis in: Ashcroft KW, Holcomb GW, Murphy JP (eds). Pediatr Surgery 2005 4th edn Saunders: Philadelphia, PA pp 416- 34.
18. Mustafawi AR, Hassan ME. Congenital duodenal obstruction in children: a decade's experience. Eur J Pediatr Surg. 2008 Apr;18(2):93-7.
19. Puger, A. W., Mahardika, I. G., Suarna, I. W., & Suryani, N. N. (2022). Growth and productivity of Kampung chicken fed with different protein levels. International Journal of Life Sciences, 6(2), 49–64. https://doi.org/10.53730/ijls.v6n2.9804
20. Richardson WR, Martin LW. Pitfalls in the surgical management of the incomplete duodenal diaphragm. J Pediatr Surg. 1969 Jun;4(3):303-12.
21. Rowe MI, Buckner D, Clatworthy HW Jr. Wind sock web of the duodenum. Am J Surg. 1968 Sep;116(3):444-9.
22. Spigland N, Yazbeck S. Complications associated with surgical treatment ofcongenital intrinsic duodenal obstruction. J Pediatr Surg. 1990 Nov;25(11):1127-30.
23. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). The COVID-19 pandemic. *International Journal of Health Sciences*, *5*(2), vi-ix. https://doi.org/10.53730/ijhs.v5n2.2937
24. Weber TR, Lewis JE, Mooney D, Connors R. Duodenal atresia: a comparison of techniques of repair. J Pediatr Surg. 1986 Dec;21(12):1133-6.