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A Prospective Study of Antenatal and Clinical Suspected Duodenal Obstruction with Their Etiological Diversities

Abstract

Introduction: Congenital duodenum obstruction is a very common cause of intestinal obstruction. Though usually diagnosed in the neonatal period, partial obstruction may also present at a later age. A study of 84 cases of congenital duodenal obstruction with their different etiologies and management was conducted at our institute.

Materials and Method: A prospective study of congenital duodenal obstruction in 84 children was conducted from July 2012 to October 2016. The cases were selected on the basis of the antenatal diagnosis and postnatal clinical manifestation. We included antenatal diagnosis, age at presentation, gender distribution, clinical manifestation, investigation, diagnosis, associated anomalies, intraoperative finding, surgical procedure, complications and outcomes as study parameters.

Discussion: The study included 84 patients with 55 male and 29 female patients. Congenital duodenal obstruction was diagnosed in the neonatal period in 60.71%(n=51) patients, while 21.4%(n=18) patients presented between 1 month to 12 months of age. Fifteen patients presented after 1 year of age (17.89%). Though seventy-three patients had undergone antenatal ultrasonography, only eighteen cases were diagnosed to have congenital duodenal obstruction. Forty patients (48.5%) had a classical radiological diagnosis on plain abdominal X-ray. Ultrasonography and upper GI contrast study were required in 44 cases (51.5%) for confirmation of diagnosis. Associated anomalies were observed in 40.47% patients. We found complete duodenal obstruction in 40(48.5%) cases (duodenal atresia- 34, annular Pancreas-6), while partial obstruction was detected in 44(51.5%) cases (malrotation-32, duodenal web-12). Kimura's Duodeno-duodenostomy was performed in 40 patients (34-duodenal atresia, 6-annular pancreas). Duodenotomy with web excision was done for 12 patients in case of duodenal web. Ladd's procedure was performed for 32 patients in case of gut malrotation. Twelve patients (14.28%) died postoperatively.

Conclusion: ongenital duodenal obstruction is a very common surgical entity in neonates with diversity of embryonic developmental etiologies. Duodenal atresia is the most common of them. Antenatal ultrasonography has an important role in the early diagnosis. The treatment is always surgical.

Keywords: Antenatal diagnosis; Congenital duodenal obstruction; Duodenal atresia; Kimura's duodenoduodenostomy

Research Article

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Aniz Ratani[1], Rakesh S. Joshi[2], Maheshkumar Manilal Vaghela[3]* and Jaishri Ramji[4]

[1]Senior resident, Department of pediatric surgery, B J Medical College and Civil hospital, Saurasthra University, India
[2]Professor and HOD, Department of pediatric surgery, B J Medical College and Civil hospital, Saurashtra University, India
[3]Assistant professor, Department of pediatric surgery, B J Medical College and Civil hospital, Saurashtra University, India
[4]Associate professor, Department of pediatric surgery, B J Medical College and Civil hospital, Saurashtra University, India

***Corresponding author:** Maheshkumar Manilal Vaghela, Assistant professor, Department of pediatric surgery, B J Medical College and Civil hospital, Saurashtra University, Ahmedabad, India, Tel: 9914200992; Email: dr.maheshvaghela7@gmail.com

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Abbreviations: USG: Ultrasonography; NSICU: Neonatal Surgical Intensive Care Unit; NG: Nasogastric; GI: Gastrointestinal; DA: Duodenal Atresia; ARM: Anorectal Malformation; TEF: Tracheo-Esophageal Fistula

Introduction

Congenital duodenal obstruction is a common cause of intestinal obstruction. The incidence is around 1:10000 to 1:40000 with a male preponderance [1]. It is usually detected in antenatal period by fetal ultrasonography. A neonate with bilious vomiting is a classical presentation of congenital duodenal obstruction [2]. In some cases, it may progress to severe electrolyte imbalance and dehydration. In cases of malrotation with midgut volvulus, there is vascular compromise of the intestine. The duodenal obstruction could be partial or complete. Causes of duodenal obstruction can be categorized into intrinsic or extrinsic, with widely differing embryological origins [3]. Intrinsic causes include atresia, stenosis or web, while extrinsic causes may be annular pancreas and congenital duodenal band [4]. In our study, a series of 84 patients of congenital duodenal obstruction with their different causes and management have been reviewed.

Material and methods

A prospective study of 84 patients with congenital duodenal obstruction was conducted at our pediatric surgery department from July 2012 to October 2016. The period of follow up ranges from 2 months to 2 years. The sample was selected on the basis of the antenatal diagnosis of congenital duodenal obstruction and postnatal clinical manifestation especially bilious vomiting. A few patients presented with non-bilious vomiting. Severe electrolyte

imbalance and dehydration was seen in the late presenters. The age and gender of patients were recorded. Initially, patients were stabilized clinically and fluid and electrolyte imbalances were corrected. The abdomen X-ray was evaluated for double bubble which was suggestive of duodenal atresia and dilated stomach. Ultrasonography was significant in the diagnosis of the malrotation with or without volvulus and associated abdominal and urological anomalies. Upper GI dye study was done for confirmation of diagnosis in case of partial obstruction or inconclusive ultrasonography finding in case of malrotation. Karyotyping and 2-D echo were done as and when required. Associated anomalies were recorded. After confirmation of diagnosis, patient was subjected to surgical intervention. The type of surgery depended on the intraoperative finding. For duodenal atresia and annular pancreas, Kimura's duodenoduodenostomy was done with silk 5-0. Duodenotomy with web excision was done for duodenal web. Ladd's procedure was done for gut malrotation. Postoperatively, the patient was kept in neonatal surgical ICU. The patient was kept nil by mouth till the bilious aspirate cleared and bowel sounds started. Feeding was started and gradually advanced. They were discharged in a stable clinical condition with tolerating oral feeds adequately. Outcome and complications were recorded.

Discussion

Result and Discussion

Congenital duodenal obstruction generally presents in the neonatal period but it can be seen in the older child also [5]. It is a dictum that any newborn who presents with bilious vomiting and scaphoid abdomen or a stat aspirate of bile>15ml should be evaluated for duodenal obstruction [6]. In older child, recurrent bilious vomiting associated with loss of weight and failure to thrive raise the suspicion of congenital duodenal obstruction [5].

Our study included 84 cases of congenital duodenal obstruction. There were 65.47% (n=55) male and 34.52% (n=29) female patients (Table 1). The male preponderance is comparable with Osifo OD study [7].

Table 1: Gender Distribution.

Sex	Present study	Hamza MU et al. Study [6]	Osifo OD Study [7]
Male	55(65.47%)	20(40%)	41(65.07%)
Female	29(34.52%)	30(60%)	22(34.92%)

Almost, one third of the patients were delivered prematurely, which is quite high compared to Hamza et al. study (Table 2) [8].

Table 2: Maturity at Presentation.

Maturity	Present study	Hamza MU et al. Study [6]	Kaddah SN et al. Study [8]
Full term	58(69.04%)	42(84%)	56(78.87%)
Preterm	26(30.95%)	8(16%)	15(21.12%)

As it is an early antenatal defect, it can be detected during antenatal ultrasonography. It could be suspected in presence of dilated stomach/duodenum or large fluid bubble with or without polyhydroamnios [9]. Partial obstructions may go unnoticed during antenatal period. With increased awareness and availability of radiological services even at peripheral centers, antenatal ultrasonography has become a routine protocol for pregnancy checkup; still detection of surgical anomalies needs expertise with wide experience. In our study of 84 cases, 73 patients had undergone antenatal ultrasonography, but only 18 (24.65%) cases were diagnosed to have duodenal obstruction. On the other hand, Lawrence MJ et al. showed 87% detection rate of double bubble and diagnosis of congenital duodenal obstruction on antenatal fetal ultrasonography study [2].

Congenital duodenal obstruction was diagnosed in the neonatal period in 60.71 %(n=51) patients, while 21.4 %(n=18) patients presented between 1 month to 12 months of age. Fifteen patients presented after 1 year of age (17.89%). In our study, we found complete duodenal obstruction in 40(48.5%) cases (duodenal atresia- 34, annular Pancreas-6), while partial obstruction was detected in 44(51.5 %) cases (malrotation-32, duodenal web-12). When we consider age at presentation, patients with duodenal atresia and annular pancreas presented in the neonatal period. Patients with malrotation commonly presented from early neonatal life to infancy, but sometimes presented in the older age group also. Duodenal web was usually found in younger children. (Table 3) [10].

Table 3: Mean age at presentation as per cause of congenital duodenal obstruction.

Causes	Number of Patient	Mean Age at Presentation	Mean Age at Presentation in Osifo OD Study [7]
Duodenal atresia	34(40.47%)	4days	8 days±1.4
Annular pancreas	6(7.15%)	3.5days	15days±0.2
Duodenal web	12(14.28%)	9.5months	22 days±2.1
Malrotation	32(38.1%)	30days	2.5 years±3.5
Other causes	0	0	Variable

The age at presentation was earlier as compared to the study by Osifo OD [7].

Bilious vomiting was the most common clinical manifestation seen in 80% of the patients. Only 2 patients had non-bilious vomiting in our study. Associated dehydration with electrolyte imbalance was found in 40% patients. This result is comparable with Hamza MU et al. study, in which bilious vomiting; non-bilious vomiting and dehydration were presenting manifestation in 84%, 4% and 30% patients' respectively [8].

Complete duodenal obstruction can be diagnosed on plain erect abdomen X-ray. It shows a classic double bubble appearance. In case of inconclusive abdomen x-ray, injection of air through the nasogastric tube can better demonstrate double bubble sign. Ultrasonography was significant in the diagnosis of the malrotation with or without volvulus and associated abdominal and urological anomalies. Upper GI contrast study is often needed to demonstrate

partial obstruction like duodenal web or malrotation. In our experience, 40 patients (48.5%) were diagnosed with X-ray abdomen only, while 44 cases (51.5%) required ultrasonography and upper GI contrast study for diagnosis. In a study by Chen QJ et al, they demonstrated typical double bubble sign or air fluid level on plain X-ray in 68.64 patients, while confirmatory upper GI dye study and ultrasonogrphy were required in 64.11% of patients [1].

Patients were admitted, resuscitated and stabilized. Once the diagnosis was confirmed, the surgical management was straight forward and well standardized. In our series of 84 patients, we performed Kimura's diamond shaped duodenoduodenostomy in 40 patients (34-duodenal atresia, 6-annular pancreas). Duodenotomy with excision of web was done for 12 patients in case of duodenal web. Ladd's procedure was performed for 32 patients in case of gut malrotation [3,11]. Uncommon causes of congenital duodenal obstruction like duodenal duplication cyst or pancreatic cysts were not demonstrated in our study. Our study result is comparable with the study by Kaddah SN et al. [12] Hamza MU et al. [8] and Osifo OD [7] have reported some cases of uncommon causes of congenital duodenal obstruction (Table 4).

In our experience, we found associated congenital anomalies in 40.47% (n=34) patients. Cardiac anomalies were the most common seen in 14.28% patients (n=12). Down's syndrome was detected in 11.9% patients (n=10). Esophageal atresia with trachea-esophageal fistula, anorectal malformation and limb deformities were detected in 4.75 %(n=4), 3.6 %(n=3) and 6% (n=5) cases respectively. In the study by Hamza MU et al, associated anomalies were detected in 36 %(n=18) cases which is comparable with our study [8]. These included Down syndrome (20%), GIT anomalies (6%), genitourinary (4%), cardiac (4%) and multiples anomalies (2%). Duodenal atresia has a 16% association rate with other system anomalies [6,3,14].

Age at presentation, maturity of the neonate, severity of associated anomalies, sepsis and availability of proper NSICU care are the main factors affecting the surgical outcome in case of duodenal obstruction.15 Mortality generally occurs due to prematurity, late presentation with sepsis or associated complex congenital anomalies. In our study, the mortality rate was 14.28% (n=12). Gestational age was an important factor for survival. There were 8 preterm babies with low birth weight in our study. Triple atresia in the form of duodenal atresia, esophageal atresia and anorectal malformation (DA+EA+ARM) was found in 2 patients. Double atresia (DA+EA, DA +ARM) was found in 4 patients. Eight of our patients (9.52%) developed sepsis. Anastomotic leak was found in 8 patients (9.52%). This rate is comparable with the study by Kaddah SN et al. [12] whereas Osifo OD reported a higher rate (Table 5).

Overall survival is good and long term prognosis is excellent in the absence of complex congenital anomalies and complications.

Table 4: Causes of duodenal obstruction.

Causes of Duodenal Obstruction	Present Study	Hamza MU et al. Study [6]	Osifo OD Study [7]	Kaddah SN et al. Study [8]
Duodenal Atresia Type 1	34 (40.47%)	15(30%)	12(19.04%)	37(52.11%)
Duodenal Web	12 (14.28%)	12(24%)	8(12.69%)	12(16.90%)
Annular Pancreas	6 (7.15 %)	7(14%)	5(7.93%)	8(11.26%)
Malrotation	32 (38.1%)	10(20%)	19(30.15%)	14(19.71%)
Other causes	0	6 (12%)	19(30.15%)	0

Table 5: Postoperative outcome and complications.

Complications	Present Study	Osifo OD Study [7]	Kaddah SN et al. Study [8]
Sepsis	8(9.52%)	34(54%)	9(12%)
Ileus	12(14.28%)	15(23.8%)	22(32%)
Anastomotic leak	8(9.52%)	2(3.2%)	-
Adhesion obstruction	11(13.09%)	-	-
Death	12(14.28%)	24(38.12%)	15(21.1%)

Conclusion

Congenital duodenal obstruction is one of the most common conditions in neonate with diversity of embryonic developmental etiologies. Duodenal atresia is the commonest cause of congenital duodenal obstruction presenting in the early neonatal life, while duodenal web and malrotation are common in the older children. Antenatal ultrasonography plays an important role for early diagnosis and management. Bilious vomiting is the commonest clinical manifestation of congenital duodenal obstruction. X-ray abdomen is the single most important investigation for diagnosis of congenital duodenal obstruction. Age at presentation, maturity, associated congenital anomalies, sepsis and electrolyte disturbance are important factors for survival. Timely surgery

and proper postoperative management is essential for a good outcome.

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Conflict of Interest

There is no conflict of interest.

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