Management of Congenital Duodenal Obstruction by Diamond-Shaped Duodenoduodenostomy

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Abstract

A prospective study of 20 patients with clinical diagnosis of duodenal obstruction done at pediatric surgery center in AL Khanssa maternity and children Teaching Hospital in Mosul from December 2006-January 2010, a detailed case-record of 20 consecutive newborn patients treated for duodenal obstruction. The aims of the study was to analyze our experience and to evaluate the clinical presentation, diagnosis, postoperative care, and outcome in infants with duodenal obstruction.The 20 patients were classified according to classification system modified from James A. O'Neill: duodenal web, atresia , annular pancreas and malrotation.The presumptive diagnosis and decision regarding the need for surgery was based on clinical findings and investigation of plain abdominal radiographs in all patients without the need of dye study. Abdominal ultrasound examination was done for all patient to evaluate the associated renal anomalies and echocardiogram was done for 15 patients because of suspicion of congenital heart disease.other laboratory investigation including complete blood count, serum electrolyte, blood urea and total serum bilirubin were done for all patients.the management strategy for all patients was outlined as follows: After initial evaluation, a nasogastric tube (NGT) was placed for gastric decompression. The operative procedures performed through supra umbilical transverse abdominal incision. The type of duodenal obstruction was assessed after mobilizing the ascending and transverse colon to the left and identifying any associated malrotation. Kocherization of duodenum then performed and a transpyloric tube was passed to determine if a windsock abnormality was present . In duodenal atresia intraoperatively injection of saline or air into the distal segment was done to rule out a second atresia. Using a single layer of interrupted suture with posterior knots tied inside and anterior knots tied outside by using 5-0 or 6-0 Vicryl (polyglactin) o Polydiaxonone suture(PDS) 5/0 to complete the anastamosis. The age of our patients were ranging from1day to 16 days and divided in to two groups from 1 up to 7 days. The Common clinical findings in our patients were bilious emesis, upper abdominal distension, failure to pass meconium . And accordingly the incidence of each symptoms and signs.The available investigations in our center at any time was the plain abdominal x ray, the finding in plain x-ray of abdomen was double bubble sign in 18(90%)of the patients and single gastric gas shadow in 2(10%) of patient. Abdominal ultrasound examination was done for all patients locking for any associated anomalies especially of the urinary tract. The finding was ectopic kidney in 1(5%) and hydronephrosis in 1(5%) of our patient. Echocardiography has been performed in 15 patients , abnormal in 2 male babies one of them had VSD and another one had ASD. Careful examination and follow up locking for associated anomalies were done and their types and percentile shows male patient have more associated anomalies than female.

Keywords: *Management; Congenital; Duodenal obstruction; Diamond-shaped duodenoduodenostomy*

Introduction

Congenital Duodenal atresia and stenosis are the most common causes of intrinsic duodenal obstruction in the newborn, the first description of duodenal atresia is credited to Calder, who described two cases of duodenal atresia in newborns in 1733.(1) The etiology of duodenal atresia and stenosis is probably related to a failure of recanalization of the duodenal lumen from its solid cord stage . (2) The duodenum is derived

from the distal portion of the foregut and develops at the same time as the extrahepatic ductal system and pancreas. Vacuolization of the solid cord stage begins at 8 to 10 weeks' gestation, resulting in a lumen.[3] Depending on the degree of obstruction, the proximal duodenum and stomach dilate to several times their normal size. The pylorus is distended and hypertrophic. The bowel distal to the obstruction is collapsed,and in cases of complete atresia, thin walled. Because the obstruction is high, it is decompressed proximally in utero,and perforation proximally is rare .[10] Associated polyhydramnios is recorded in up to one half (50%) of cases, with premature delivery in one third (33%), growth retardation also common, which may imply that the fetus has been deprived of nutritional contribution of swallowed amniotic fluid.[15] The diagnosis of neonatal duodenal obstruction may be suspected before birth, the presence of a high intestinal obstruction in the fetus always should be considered in any pregnant woman with polyhydramnios, prenatal ultrasonography should be performed in all pregnancies associated with amniotic fluid abnormalities, including polyhydramnios, of infants born with duodenal obstruction, 30% to 59% have a history of maternal polyhydramnios.[20] Although duodenal obsrruction is a relative emergency, the patient should not be rushed to the operating room until hemodynamic status and fluid and electrolyte status are normalized.[31] It is usually possible to operate on infants with duodenal atresia semielectively while orogastric drainage and intravenous fluids are given. Because of the high incidence of associated anomalies, a prompt system review should be done to rule out other congenital defects, particularly cardiac.[14]. The aims of the study was to analyze our experience and to evaluate the clinical presentation, diagnosis, postoperative care, and outcome in infants with duodenal obstruction.

Patients and Methods

A prospective study of 20 patients with clinical diagnosis of duodenal obstruction done at pediatric surgery center in AL Khanssa maternity and children Teaching Hospital in Mosul from December 2006 to January 2010, a detailed case-record of 20 consecutive newborn patients treated for duodenal obstruction.The gestational age is divided in to two groups, fullterm and preterm babies. The weight at presentation was between 1600 gm to 3500 gm, while the age at presentation ranged from 1 to 16 days. The 20 patients were classified according to classification system modified from James A. O'Neill: duodenal web, atresia , annular pancreas and malrotation . The presumptive diagnosis and decision regarding the need for surgery was based on clinical findings and investigation of plain abdominal radiographs in all patients without the need of dye study. Abdominal ultrasound examination was done for all patient to evaluate the associated renal anomalies and echocardiogram was done for 15 patients because of suspicion of congenital heart disease . Other laboratory investigation including complete blood count, serum electrolyte, blood urea and total serum bilirubin were done for all patients .

The management strategy for all patients was outlined as follows: After initial evaluation, a nasogastric tube (NGT) was placed for gastric decompression. Depending on degree of dehydration, a bolus of 20 ml/kg body weight of Ringer lactate solution was administered to correct the fluid and electrolyte losses and then maintenance fluid was continued . As a routine, preoperative antibiotics were administered. The time-interval between the presentation and the surgery, varied from several hours to 2 days. In several patients, this delay was necessitated by the need for prolonged preoperative resuscitation. Diamond-shaped duodenoduodenostomy was the standerd technique in all types of obstruction. The operative procedures performed through supra umbilical transverse abdominal incision. The type of duodenal obstruction was assessed after mobilizing the ascending and transverse colon to the left and identifying any associated malrotation. Kocherization of duodenum then performed and a transpyloric tube was passed to determine if a windsock abnormality was present . In duodenal atresia intraoperatively injection of saline or air into the distal segment was done to rule out a second atresia. Using a single layer of interrupted suture with posterior knots tied inside and anterior knots tied outside by using 5-0 or 6-0 Vicryl (polyglactin) o Polydiaxonone suture(PDS) 5/0 to complete the anastamosis. Transanastomotic tube was kept at the end of the procedure for drainage and early postoperative feeding. The stomach was decompressed by another NGT. Intravenous fluids and antibiotics were continued. We start dextrolyte through Transanastomotic tube at the 3rd postoperative day, tow days later, milk started through transanastomotic tube, when gastric aspirate was

nonbilious and gradually increased till total oral nutrition could be instituted. Four patient died postoperatively and follow-up were done for the remaining 16 patients for few months to exclude any possible complication .

Results

Age & Sex distribution: The age of our patients were ranging from1day to 16 days and divided in to two groups from 1 up to 7 days and other group old than that as shown in table (1).

Table (1) . Age and sex distribution

Age range	Sex				No. Of patient	%
	Male		Female			
	NO.	%	NO.	%		
1-7 days	7	35	9	45	16	80
8th-16 days	2	10	2	10	4	20
Total	9	45	11	55	20	100

According to gestational age 17 (85%) of our patients were full term and 3 (15%) were pre term as shown below:

The weight of our patients ranging from 1600 gm to 3500 gm as shown in table (2).

Table (2): Weight range

Weight in (gm)	No. Of the patient	Percentage
From 1600- 3000	9	45%
3000 up to 3500	11	55%

The Common clinical findings in our patients were bilious emesis, upper abdominal distension, failure to pass meconium . And accordingly the incidence of each symptoms and signs was shown in the table (3).

Table (3). Common clinical findings

	Bilious emesis	Upper abdominal distension	Failure to pass meconium
No. Of patient	18	6	6
Percentage	90%	30%	30%

The available investigations in our center at any time was the plain abdominal x ray, the finding in plain x-ray of abdomen was double bubble sign in 18(90%)of the patients and single gastric gas shadow in 2(10%) of patient as shown in table (4).

Table (4) finding in plain x-ray of abdomen

Plain x-ray of abdomen	No. Of the patient	Percentage
Double bubble sign	18	90%
Single gastric gas shadow	2	10%

Abdominal ultrasound examination was done for all patients locking for any associated anomalies especially of the urinary tract. And the finding was ectopic kidney in 1(5%) and hydronephrosis in 1(5%) of our patient as shown in table(5).

Table (5). Ultrasound finding

US finding	No. Of patient		Percentage
	Male	Female	
Normal	7 (35%)	11 (55%)	90 %
Ectopic kidney	1 (5%)	0 (0%)	5 %
Hydronephrosis	1 (5%)	0 (0%)	5 %
Total	20		100 %

Echocardiography has been performed in 15 patients and was abnormal in 2 male babies one of them had VSD and another one had ASD as shown in table (6).so Careful examination and follow up locking for the Associated anomalies were done and their types and percentile shows male patient have more associated anomalies than female patients (table-6).

Table (6). Finding of Echocardiography and associated anomaly and their percentile

Echo study finding	No. of patient (%)		Total
	Male	Female	
VSD	1(5%)	0 (0%)	2 (10%)
ASD	1(5%)	0 (0%)	
Normal	7(35%)	11(55%)	18 (90%)
Total	9(45%)	11(55%)	20 (100%)
Associated anomaly			
Cardiac (VSD,ASD)	2(10%)	0(0%)	2 (10%)
Renal	2(10%)	0(0%)	2 (10%)
Trisomy 21	3(15%)	2(10%)	5 (25%)
Anorectal	0(0%)	1(5%)	1 (5%)
Esophageal atresia	0(0%)	1(5%)	1 (5%)
No associated anomaly	2(10%)	7(35%)	9 (45%)
Total	9(45%)	11(55%)	20 (100%)

Discussion

The most common causes of duodenal obstruction in the newborn are duodenal atresia and stenosis.[12] Whereas atresia produces symptom shortly following birth, duodenal stenosis may take several weeks before its presence becomes obvious. Annular pancreas and malrotation are another common causes of duodenal obstruction .[1] In our study the age at presentation ranging from 1 day to 16 days. Sixteen patients (80%) presented in the 1st week of age and 4 patients (20%) after 1st week .In other study done by Sung-Eun Jung[22] in which 27 patients (81.8%) presented below one month the majority of them below one week(n=18)(54%) , and 6 patients (18.2%) above one month which reflect good primary health system referring these condition at early time of presentation .

The incidence of duodenal obstruction had been reported from as high as 1 in 5000 to 1 in 10,000 live births[35]. In our locality there are no documented statistics for the incidence and no study was found to compare with . In our study 9(45%) patients were male & 11 (55%) were female, male to female ratio is 1:1.2 and this study is the same as other study done by Laura K. And Grosfeld [26], in which 79 females (57%) and 59 was males (43%) ,male to female ratio is 1:1.33, shows that the incidence is higher in female. Seventeen (85%) of our patients were full term & 3 patients (15%) were preterm ,the ratio of fullterm to preterm is 5.67:1. This study differs from study done by Laura K. And Grosfeld [26] in which the ratio was 1.17:1 due to the large number of patients about 138 and longer follow up during 25 years. The common clinical findings which help us to reach the diagnosis of duodenal obstruction in our study included bilious emesis in 18 (90%) patients, upper abdominal distension in 6(30%) patients, and failure to pass meconium in 6 (30%) patients, and our result is the same as other study done by Sung-Eun Jung[22].In which bilious emesis in (91%),upper abdominal distension in (27.3%) . There was high incidence of preoperative hypovolemia, dehydration, electrolyte imbalance, sepsis, pneumonia and unconjugated hyperbilirubinemia, undoubtedly has an adverse effect on the prognosis for patient with duodenal obstruction which seen in 9(45%) patients who were presented with jaundice . Duodenal obstruction is associated with many congenital anomalies. Cardiac & renal anomaly were found in male babies in 4 patients (20%) & Down syndrome in 5(25%) of our patients. This study resemble other study done by Laura K. And Grosfeld [26].In which Down syndrome occurred in 33 patients (24%),cardiac anomalies in 53 patients(38%) and renal anomalies in19 patients(14%). In our study, clinical evaluation and plain abdominal radiographs were found to be sufficient to make a diagnosis of duodenal obstruction and to take a decision regarding the need for surgery. Careful inspection of the bowel during surgery and injection of normal saline in the distal segment right down to the rectum, obviates the necessity of performing routine preoperative contrast studies. Plain abdominal radiographs aided in the diagnosis of obstruction which demonstrated the characteristic "double-bubble" sign in 18(90%) of patients .this result is similar to study done by Laura K. And Grosfeld [26] in which the "double-bubble" sign was found in 108 patients (78.2%) . At the time of surgery our findings were as follows, 9 (45%) as type I (web), 5 (25%%) were type II (atretic fibrous cord), 4 (20%) annular pancreas, and 2 (10%) were malrotation. These finding differs from the study done by Mustafawi AR, Hassan ME[7] in which type I 15(19.5%) , type II 32(41.5%) and annular pancreas 30(39%) this might be due the longer period of collection of data about 10 years and number of their patients (77 patients) which is higher than ours, or those patients are from different nationalities which lives their. And our result is nearly similar to other study done by Laura K. And Grosfeld [26] in which type I (web) 59(64%), type II (atretic fibrous cord) in 16 (17%) and type III 17 (18%) . Our operative management included – diamond - shaped duodenoduodenostomy and ladd's procedure for malrotation . Duration of hospitalization was 10 +/- 2 days and no major complication was reported like anastomotic leak, injury to the ampulla of vator and missed 2nd atresia.This method of anastomosis had been compaired by other methods of anastomosis in a study done by TR Weber,JE Lewis[40]. In which many technique were used including side-to-side duodenoduodenostomy (SDD,10infants),side-to-side duodeno-jejunostomy (SDJ,9infants) ,or diamond-shaped duodenoduodenostomy (DDD, 22 infants) in a nonrandomized series. One-layer anastomosis was used in each case, The time until feeding onset was shortest with DDD (4.1 +/- 0.4 days), compared with 8.0 +/- 1.1 days for SDD and 9.6 +/- 1.9 days for SDJ. Total hospitalization was significantly less in DDD (16.2 +/-

2.1 days) v 24.2 +/- 3.1 days for SDD and 28.3 +/- 4.3 days for SDJ. One complication necessitating reoperation occurred in each group (SDD, adhesions; SDJ, stenotic anastomosis; and DDD, missed second atresia). These data suggest that DDD is superior to SDD and SDJ for repair of duodenal atresia, resulting in earlier feeding and short hospitalization , so the diamond- shaped anastomosis provides the following advantages[33]: (1)early recovery of anastomotic function, and(2) avoidance of early perioperative complication such as injury to ampulla of vator and later complications, such as formation of a blind loop or anastomotic stenosis ,duodenogastric reflux .

Conclusion

Atresia and stenosis are important cause of neonatal duodenal obstruction. The early diagnosis, preoperative preparation, time of surgical intervention and postoperative care, affect the outcome and morbidity, so the operative management for all types of duodenal obstruction is diamond-shaped duodenoduodenostomy, and ladd's procedure if associated malrotation is noted at laparotomy, as well as the treatment in these patients is frequently complicated by concurrent prematurity and serious associated anomalies .

Ethical Clearance: None

Source of Funding: None

Conflict of Interest: None

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