J Med Sci, Volume 48, No. 4, 2016 October: 193-199

Correlation between clinical findings and patient's survival rate in congenital duodenal obstruction

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DOI: http://dx.doi.org/10.19106/JMedSci004804201602

ABSTRACT

Congenital duodenal obstruction (CDO) is one of the most common anomalies in newborns (0-30 days), and accounting for nearly half of all cases of neonatal intestinal obstruction. Although the survival rate in infants with congenital intestinal obstruction has improved, duodenal obstruction continues to present unique challenges. A retrospective correlational study was used in this study, and 49 patients with CDO were analyzed within the years of 2004 to 2009. A chi-square test was used to investigate the correlation between clinical findings (age, weight, gestational age, surgical techniques, comorbidity, and early enteral feeding) and the patient's survival rate. None of the clinical findings showed a significant correlation with the patient's survival rate, except comorbidity (sepsis). Early enteral feeding showed a significant correlation with the patient's survival rate ($p < 0.05$). In conclusion, this study revealed that comorbidity (sepsis) and early internal feeding correlate with patients' survival rate.

ABSTRAK

Obstruksi kongenital duodenum merupakan salah satu anomali yang sering ditemukan pada neonatus (0-30 hari), dan merupakan hampir setengah dari semua kasus obstruksi usus pada neonatus. Meskipun angka kelangsungan hidup pada pasien dengan obstruksi kongenital duodenum semakin meningkat, penatalaksanaannya merupakan suatu tantangan yang tersendiri. Penelitian ini menggunakan metode penelitian restrospektif dengan pengumpulan data antara tahun 2004 sampai 2009 dengan jumlah 50 kasus di RSUP Dr Sardjito Yogyakarta. Analisis chi-square digunakan untuk menganalisis hubungan antara temuan klinis (usia, berat, usia kehamilan, tindakan operasi, komorbid, dan pemberian diet awal) dengan angka kelangsungan hidup pasien. Pada penelitian ini, tidak didapatkan hubungan antara temuan klinis dengan angka kelangsungan hidup pasien. Namun dmikian komorbiditas (sepsis) dan pemberian diet awal menunjukkan hubungan dengan kelangsungan hidup pasien ($p < 0,05$). Sehingga dapat disimpulkan pada penelitian ini bahwa komorbiditas (sepsis) dan pemberian diet awal memiliki hubungan dengan kelangsungan hidup pasien.

Key words: congenital duodenal obstruction - preoperative condition – outcome – comorbid - laparotomy

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INTRODUCTION

Congenital duodenal obstruction (CDO) is a blockage in the duodenum which is present at birth. This blockage can be either total or partial, and caused by either intrinsic or extrinsic factors. This anomaly is the 3rd most common atresia of the gastro intestinal (GI) tract. The estimated incidence is 1 in 20,000 to 40,000 live births. Most common cause of duodenal obstruction is duodenal atresia.[1,2] Other common causes of duodenal obstruction are annular pancreas, Ladd's bands, malrotation, superior mesenteric artery syndrome, and pre-duodenal portal vein (PDPV).[3-5]

With the improvement in the current neonatal care systems and the availability of Neonatal Intensive Care Unit (NICU), the survival rate of congenital duodenal obstruction has also increased. Escobar reported that the survival rate has increased to 60% - 90% of all cases.[6] Long-term surgical complications have been reported to achieve 12% - 15% of all cases. In addition to the better care of the patient, surgical techniques also play a role in increasing the life expectancy of patients with duodenal obstruction.[6] There are several surgical techniques for CDO; i.e. by connecting the stomach to the jejunum (gastro-jejunostomy), Kimura's diamond shape duodeno-duodenostomy, Zuccarello's reverse Kimura technique, laparoscopy, and using robot assisted surgery.[7-10] The variety of surgical techniques has been proved to provide better results to the patient's survival rate. Reverse Kimura technique shows an earlier oral feeding and reducing the hospital stay.[7] Laparoscopy shows a shorter hospital stay and earlier oral feeding.[10] Robot assisted surgery also shows good results.[9]

In Dr. Sardjito General Hospital, we manage congenital duodenal obstruction by laparotomy surgical technique and then perform various surgical techniques based on intra-operative findings. In this study, we investigated the correlation between clinical findings (age, weight, gestational age, surgical techniques, and comorbidity) and the patient's survival rate in patients with CDO in Dr. Sardjito General Hospital, Yogyakarta.

MATERIALS AND METHODS

The present study was a retrospective and descriptive, which used medical records of patients with CDO. This study was conducted in Dr. Sardjito General Hospital during the period from June 2009 to September 2009. The subjects of this study were all pediatric patients who had been diagnosed with CDO at Pediatric Surgery Division, Dr. Sardjito General Hospital, Yogyakarta, within the period of January 2004 to December 2008. We included all subjects who had been diagnosed with CDO with a complete medical record containing complete anamnesis, physical examination, radiological examination indicating a congenital duodenal obstruction, and were admitted to the Pediatric Surgery Division Dr. Sardjito General Hospital, Yogyakarta. Protocol of this study has been approved by the Medical and Health Research Ethics Committee, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta.

Operation Procedure

Laparotomy was performed by a large incision through the abdominal wall to gain access into the abdominal cavity. Duodenoplasty and web excision were conducted by an incision on the duodenal wall next to the front until the lumen of

the duodenum, elimination of barriers in the lumen of the duodenum, and finally closing the duodenum using a single 3-0 silk transverse interrupted outer layer suture. Kimura's duodeno-duodenostomy was made by an anastomotic technique of side-to-side duodeno-duodenostomy in two layers, arranging the bowel incisions to form a "diamond-shaped" (DSD) and creating a larger stoma, using transverse incision in the distal end of the proximal duodenum and a longitudinal incision in the distal duodenum. The double layer anastomosis was completed using 5–0 or 6-0 catgut or Vicryl continuous inner and 6–0 silk interrupted outer layer suture. Duodeno-jejunostomy was performed by joining part of the duodenum and the jejunum with a creation of an artificial opening between them.

Statistical analysis

Data were presented as frequency or percentage. A chi-square test was used to investigate the correlation between clinical findings (age, weight, gestational age, surgical techniques, comorbidity, and early enteral feeding) and the patient's survival rate. A p value < 0.05 was considered as significant.

RESULTS

During the 5 years' period of study (2004-2008), 50 patients were recruited. The characteristics of the subjects are presented in TABLE 1. The annual incidence of CDO was approximately 10 patients per year. The sex distribution was equal, namely 25 (50%) subjects were male and 25 (50%) subjects were female. Most patients came to the hospital at the age of 0-10 days old (35%), and the average age was 8.84 days old (range, 0-90 days), with weight under 2500 grams (68%), at term (76%), was delivered per-vaginal (76%). There were two cases with the history of polyhydramnios. The remaining cases were not clearly understood. The main complaint of all cases with CDO was vomiting, but it was not clear what type of vomiting. Vomiting was occurred since newly born in all cases. Meconium was excreted on the first 24 hours for all patients, except for 6 cases which were not clearly understood. Comorbid diseases were found in 30 (60%) cases with duodenal obstruction. There were 21 (42%) patients who had a single comorbid disease (42%), and there were 9 (18%) patients who had multiple comorbid diseases. The most common comorbid disease was sepsis (55%). In this study, 31 (58%) patients underwent surgery and 19 (42%) patients did not undergo surgery. Most patients underwent duodeno-duodenostomy (45%). Most of the causes of congenital obstruction according to Ladd's classification on operation findings was intrinsic factor (66%), and the most common of this intrinsic factor was annular pancreas (31%). There were no multiple causes of obstruction which were found during surgery.

TABLE 1. Baseline characteristics of subjects

Characteristics	Frequency	Percentage (%)
Sex		
• Male	25	50
• Female	25	50
Age at diagnosis (days)		
• 0 – 10	35	70
• 11 – 20	10	20
• 21 – 30	4	8
• >30	1	2
Weight (gram)		
• <2500	34	68
• ≥2500	16	32
Gestational age (weeks)		
• <37	11	22
• ≥37	39	78
Types of delivery		
• Spontaneous	38	76
• Vacuum extraction	5	10
• Caesarean section	7	14
Comorbid diseases		
• Sepsis	16	55
• Atrial Septal Defect	4	15
• Ventricular Septal Defect	2	6
• Down syndrome	2	6
• Aspiration pneumonia	1	3
• Anal atresia	2	6
• Undescended Testicle	1	3
• Dextrocardia	1	3
• Asphyxia	1	3
Surgical techniques		
• Duodenoplasty	1	3
• Duodeno-jejunostomy	14	45
• Duodeno-duodenostomy	15	49
• Ladd's procedure	1	3
Causes of obstruction		
• Atresia	11	38
• Stenosis	7	24
• Duodenal web	1	3
• Annular pancreas	9	31
• Malrotation	1	4

This study also provided data for nutrition intake after duodenal patency repair. Early enteral feeding was given approximately at day 6.63 (range: 2-15 days), whereas the nutrition was given according to the age of patients at day 16.42 (range: 8-35 days). The number of survived newborns with duodenal obstruction in Dr. Sardjito General Hospital was 19 (38%) cases, and the number of death was 31 (62%) cases. Based on sex distribution, the male newborn survival rate was 8 (42.1%), and the female newborn survival rate was 11 (57.9%). Based on age at diagnosis, the highest number of survival rate was 14 (73.3%) for 0-10 days old, 3(15.8%) for 11-20 days old, 2 (10.5%) for 21-30 days old. The survival rate of newborns with the birth weight under 2500 gram was 11 (57.9%), while that of newborns with the birth weight of more than or equal to 2500 gram was 8 (42.1%). Based on the gestational age, the survival rate of newborns of less than 37 weeks' gestational age was 2 (10%) and that of newborns of more than or equal to 37 weeks gestational age was 17 (89.5%).

Based on the presence of comorbid diseases, the survival rate was 13 (68.4%) for cases with no comorbid disease, 3 (15.8%) for cases with 1 comorbid disease, and 3 (15.8%) for cases with more than 1 comorbid disease. Cases with sepsis had survival rate as much as 4 (21.1%). The survival rate of cases with atrial septal defect (ASD) was 2 (10.5%). The survival rate of cases with ventricular septal defect (VSD), down syndrome, aspiration pneumonia, and asphyxia was 1 (5.3%). Two cases with anal atresia as a comorbid disease did not survive. Patients with cryptorchidism and dextrocardia also did not survive. Thirteen cases did not survive after undergoing surgery, eight and five cases of which undergoing duodeno-duodenostomy and duodeno-jejunostomy, respectively. In

conclusion, operation success rate in Dr. Sardjito General Hospital was 59.375%. The hospitalization time for newborn with CDO was approximately 27.94 days.

The correlations between clinical findings (age, weight, gestational age, surgical techniques, and comorbidity) and the patient's survival rate is shown in TABLE 2. We found that the birth weight and the gestational age had no significant correlation with the survival rate of newborn with duodenal obstruction. Variables which had a significant correlation were comorbid diseases (p=0.004) and early enteral feeding (p=0.03). Sepsis, among other comorbid diseases, had a significant correlation with survival rate (p=0.001).

TABLE 2. Correlation between clinical findings and the patient's survival rate

Characteristics	Survived		p	PR (95% CI)
	Yes	No		
Sex				
• Male	8	17	0.55	0.59 (0.18-1.8)
• Female	11	14		
Age at diagnosis (days)				
• 0 – 10	14	21		
• 11 – 20	3	7	0.42	-0.45 (-0.0076-0.9924)
• 21 – 30	2	2		
• >30	0	1		
Weight (gram)				
• <2500	11	23	0.23	0.47 (0.14-1.61)
• ≥2500	8	8		
Gestational age (weeks)				
• <37	2	9	0.11	0.28 (0.05-1.50)
• ≥37	17	22		
Comorbid diseases				
• Sepsis	4	12		
• Atrial Septal Defect	2	2		
• Ventricular Septal Defect	1	1		
• Down syndrome	1	0		
• Aspiration pneumonia	1	0	0.004	0.70 (-1.7578-2.02)
• Anal atresia	0	2		
• Undescended Testicle	0	1		
• Dextrocardia	0	1		
• Asphyxia	1	0		
Surgical techniques				
• Duodenoplasty	1	0		
• Duodeno-jejunostomy	9	5	0.55	2.05 (0.46-9.14)
• Duodeno-duodenostomy	7	8		
• Ladd's procedure	1	0		

DISCUSSION

In this study, we found that sepsis and early enteral feeding had a significant correlation with the patient's survival rate. Sepsis is caused by the late onset of early enteral feeding.[8] Therefore, early enteral feeding correlates with the patient's survival rate. Sepsis incidence that is caused by the usage of long-term parenteral nutrition is approximately 0.5-2/1000 infections per catheter per day.[9] A previous study reported that early enteral feeding was started at 11.3 days following surgery while the complete enteral feeding was given at 16.9 days.[10] Yet another study finds the average time to early enteral feeding is 2.1 days and time to full oral intake is 9.4 days.[9]

In this study, the demographic data showed an equal sex distribution. On the other hand another study reveals that the demographic data show a slight female predominance, with female to male ratio of 9:5.[10] Yet another study find a distribution of sex is 43% for male and 57% for female.[9] Our study revealed that the average weight was 2566.8 gram (700 – 450 gram). Meanwhile, a study found that the average birth weight is 2730 gram (1190 – 4400 gram).[11] Yet another study finds the average birth weight for newborn with congenital duodenal obstruction is 2715 gram (2210 – 3630 gram).[9] This study found that most patients were premature (<37 weeks of gestational age). A previous study reported that the average gestational age for newborn with congenital duodenal obstruction was 38.2 weeks.[11] Another study found that the average gestational age for newborn with congenital duodenal obstruction was 38.1 weeks (34 – 40 weeks). Comorbid disease was found in 30 (60%) patients who was ascertained for this study, with 21 (42%) patients had a single comorbid disease and 9 patients (18%) had multiple comorbid diseases. A recent study showed that 38% patients with congenital duodenal obstruction have one or more comorbid disease.[11] This study demonstrated that the causes of obstruction were intrinsic lesions (19 cases or 66%) and extrinsic lesions (10 cases or 34%) . Meanwhile, a study shows that 33% of obstruction is caused by intrinsic lesion and 46% is caused by extrinsic lesion.[11]

Our study found that the mortality rate of newborn with congenital duodenal obstruction was 62%. This high mortality rate was caused by the accompanying congenital anomalies. However, success rate for surgical procedure in this study was 59.375%. In the last 25 years, a study shows that the mortality rate of newborns with congenital duodenal obstruction is less than 10%.[10] In this study, we also found that the average hospitalization time was 27.94 days. A recent study shows that the average hospitalization time for newborn with congenital duodenal obstruction is 20.1 days.[8] Yet another study found that the average hospitalization time for newborn with congenital duodenal obstruction is 11.2 days.[11]

CONCLUSION

In conclusion, this study revealed that comorbidity (sepsis) and early internal feeding correlated with patients' survival rate.

ACKNOWLEDGEMENT

We would like to thank all patients who have participated in this study.

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