

Treatment of Duodenal Atresia with Kimura's Diamond-Shaped-Duodeno-Duodenostomy (DSD)

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ABSTRACT

Background: Kimura's diamond shaped duodeno-duodenostomy (DSD) is a well-recognized treatment for the management of duodenal atresia.

Purpose: The aim of this study is to determine and share the experience of diamond shaped duodeno-duodenostomy and an overview of the benefits of this procedure.

Place and Duration: In the Pediatric Surgery department of Govt. Sardar Begum Teaching Hospital Sialkot and Bacha Khan Medical Complex Swabi for five and half years from January 2016 to November 2021.

METHODS: 42 neonates were surgically treated for duodenal atresia by Kimura's technique. The transverse incision was given in the proximal dilated duodenum and longitudinal incision was given in the distal part of duodenum.

Results: On 5th to 8th day post-operatively, oral feeding was started (mean 6.2 days), full oral feeds were commenced between 7th to 10th day (mean 9.2), peripheral intravenous fluids were discontinued 7th day to 10th day (mean 9.2), and hospital stay varies from 7th to 21st day (mean 10.8). The complications such as anastomosis leakage 1(2.4), infection 1(2.4), abnormal duodenal morphology 6(14.2) and Gastroesophageal reflux in 2(4.8) of patients. In prenatal ultrasonography of the fetus, obstruction of the duodenum was diagnosed in 31/42 (73.9%) and polyhydramnios in 19/42 (45.2%) cases.

Conclusion: DSD offers a valuable technique to guard the ampulla of Vater from injury and blind loop can be avoided by this technique. The outcomes exhibited that patients of DSD attain complete per-oral nutrition in a very brief duration after surgery and subsequently the extent of hospital stay is reduced significantly.

INTRODUCTION

For the surgical management of inherited intrinsic obstruction of the duodenum, KIMURA introduced a two-layered side to side duodeno-duodenostomy anastomosis technique in 1977 by making diamond-shaped intestinal (DSD) anastomosis to form a larger stoma¹⁻². In 1990, Kimura technique was introduced and in this technique; transverse incision is given in upper dilated portion and longitudinal incision is given in distal part³⁻⁴. The anastomosis was done with single layer interrupted Vicryl 5-0 or 6-0 suture. There was no trans-anastomotic stent or gastrostomy or tube used⁵⁻⁶. With this procedure, the anastomosis regained its normal function in a short duration and it was possible to start feeding early after the procedure⁷⁻⁸.

The intention of this analysis is to determine the results of diamond shaped duodeno-duodenostomy and an overview of the benefits of this procedure.

MATERIAL AND METHODS

From 2016 to 2021, 42 consecutive neonates (18 males and 24 females) were surgically treated for inherited intrinsic obstruction of the duodenum. (Table 1).

Table 1: The neonates clinical features with duodenal atresia (DA)

Total number of patients	42
Gender	
Male	18 (42.8)
Female	24 (57.2)
Polydramnios no. (%)	19(45.2)
Gestational age-weeks	
mean (range)	37.4 (34-42)
Prenatal scan no. (%)	21(50)
Birth weight-grams	
mean (range)	2760 (2231-3701)
Associated anomalies	18(42.9)

37.4 weeks was the mean gestational age, 2760 g was the mean birth weight and 1.80 days was the mean age at surgery. All children had atresia in the 2nd part of the duodenum (DA). In

prenatal ultrasonography of the fetus, obstruction of the duodenum was diagnosed in 31/42 (73.9%) and polydramnios in 19/42 (45.2%) cases. Associated abnormalities were detected in 18 patients. After appropriate nasogastric decompression, electrolyte and fluid support and resuscitation was done. The surgery was performed under GA with an upper right transverse abdominal incision. The muscles of the abdomen were diathermically incised transversely and the peritoneal cavity was opened in the incision line. The hepatic flexion of the colon was mobilized in downward projection to reveal a duodenum which is dilated. Then properly mobilization of the duodenum with the Kocher maneuver was done. A soft tube of the rubber was introduced through orogastric route into the duodenum to determine the nature and level of the obstruction. The proximal duodenum redundant wall was lowered to overlie the proximal part of the distal duodenum. If this couldn't be accomplished effortlessly, more mega duodenum was mobilized. In order to further mobilize the distal duodenum, Treitz's ligament was divided in two cases. In Kimura technique; The transverse incision in the proximal duodenum was given and a longitudinal incision was given to open the distal end.

A transverse incision was made in the dilated proximal duodenum the distal most part of the blind pouch (or in the immediate vicinity of the annular pancreas, if extant). The papilla of Vater was determined by monitoring bile flow following compression of the gallbladder. The longitudinal incision over (or in the immediate vicinity if there was annular pancreas) was given to open the distal duodenum. The saline and air mixture were injected into the lumen of the distal part of the intestine to know the obstruction at distal site. During this manoeuvre, the duodenum in the distal part was effortlessly inflated to a higher extent by obstructing the jejunum in the proximal part and removing the filled Foley balloon (5 ml). The anastomosis (DSD) was made in a single layer with interrupted 5-0 or 6-0 Vicryl sutures. Begin at the posterior wall of the duodenum by bringing middle of inferior portion of transverse incision of proximal dilated part to the upper corner of the longitudinal incision given distally. Each longitudinal incision midpoint was then connected to the conforming corner of the transverse incision. The intermediate stitches are applied to

complete the posterior wall. Finally, the anterior anastomosis wall was constructed by approximating the far corner of the longitudinal incision with the anterior midpoint of transverse incision, and supplemented with intermediate stitches on both sides. There was no duodenal tapering, gastrostomy or trans-anastomotic tube used. Vicryl 2-0 sutures were applied for the abdominal wall reconstruction in layers and proline 4/0 for skin closure. In the initial period postoperatively, the stomach was emptied continuously by gravity through the NG tube; When the residual amount left in the stomach with passive drainage was <20 ml, 30 ml oral feeding normal formula was started, gradually increasing it as tolerated and intravenous nutrition was reduced and finally discontinued.

RESULTS

In this study, a total of 42 patients were operated. Two patients died postoperatively due to a concomitant heart anomaly. The most important postoperative evaluation parameters were analysed such as the day of commencement of oral nutrition, day of intravenous fluid administration suspension, time to full feeding, extent of hospital stay and possible complications (Table 2).

Table 2: The results and Procedures in patients operated on for Duodenal atresia

Type of technique (DSD) no.	42
Age at operation-day mean (range)	1.80(1-4 days)
Intravenous fluid discontinuity day mean (range)	9.2(7-10days)
Oral feeding start-day mean (range)	6.2(5-8 days)
Length of hospitalization-day mean (range)	10.8(7-21 days)
Full oral feeds-day mean (range)	9.2(7-10days)
Postoperative complications	
Abnormal duodenal morphology (<4-5 y) no. (%)	6(14.2)
Late follow-up scans duodenal transit (time)	Normal scan in all
Gastroesophageal reflux	2(4.8)
Wound Infection	1(2.4)
Anastomosis Leakage	1(2.4)

In the postoperative period, gastric residues usually disappear within 2 or 3 days. All patients began oral feeding within 5th to 8th day (mean 6.2 days). Feed volume and concentration gradually increased and at 7th to 10th days full feeding was restored (mean 9.2). The peripheral intravenous fluids were discontinued after 7th to 10th days when full feeding was restored (mean 9.2). No patients were commenced on total parenteral nutrition (TPN). The complications such as anastomosis leakage 1(2.4), wound infection 1(2.4), abnormal duodenal morphology 6(14.2) and Gastroesophageal reflux in 2(4.8) of patients. The length of stay in the hospital ranged from 7-21 days (average 10.8 days).

In addition to follow-up clinical examination, comprehensive medical history regarding morbidity and growth development was documented.

DISCUSSION

Congenital duodenal obstruction can result from atresia, stricture, duodenal membrane and is most common in the 2nd part of duodenum or below the Vater's papilla⁹⁻¹⁰. Historically, the transmesolic side-to-side duodenojejunosomy has been a widely accepted surgical technique for the management of inherited intrinsic obstruction of the duodenum in new-borns¹¹⁻¹². The various complications of anastomosis and mortality persisted high until the gastrostomy and trans-anastomotic feeding tube was performed¹³. Outcomes have significantly improved due to better supportive care especially respiratory and nutritional care of high-risk neonates in the ICU. Good results are obtained with direct duodeno-duodenostomy¹⁴⁻¹⁵. However, a review of the literature drew attention to the complications of anastomosis like stagnant pouch may influence to persistent abnormal duodenal morphology and blind loop syndrome in late follow-up. Dysfunction and deformation of the duodenum which may be dilated was the cause of morbidity and other subjects may sometimes require

duodenoplasty for stenosis¹⁶⁻¹⁷. Other writers found no difference in the timing of feeding initiation, cessation of intravenous feeding or total hospital stay in patients undergoing duodenal atresia treatment¹⁸. Kimura in 1977, accomplished duodeno-duodenal diamond-shaped anastomosis in 9 consecutive patients of congenital obstruction of the duodenum and described 15 years of practice using a diamond-shaped anastomosis for duodenal atresia¹⁹. Arnbjörnsson retrospectively reviewed 18 consecutive new-borns, 9 of whom had duodenal atresia, each from two different pediatric surgery centers; Upadhyay described 34 consecutive cases of duodeno-duodenostomy (9 cases of diamond-shaped anastomosis)²⁰. Kimura DSD significantly shortened the postoperative time of cannulation and was superior to previous duodenal types²¹. His barium studies showed a less deformed duodenal configuration. Weber recognized the dominance of this "diamond-shaped anastomosis," but nearly all of his cases had a gastrostomy tube²².

Kimura found better long-term outcomes and low complication rate in DSD. In Kokkonen's practice, although most of his patients were asymptomatic, altogether but three had barium abnormalities and he determined that few GIT disorders are communal even in patients who are asymptomatic and cautious monitoring is significant among patients done with DSD²³. Salonen testified an experiment on a small group of nine subjects between the ages of 3 and 21 days, and instead found a usual barium meal in all groups excluding one²⁴. Our results are comparable to Kimura and Salonen.

CONCLUSION

In conclusion, it is suggested that diamond shaped anastomosis can be used with very good results for any type of duodenal obstructions (i.e., atresia, stenosis, duodenal web or annular pancreas) and have satisfying outcomes with shorter hospital stay and low hospitalization costs.

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