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Original Research Article

A comparative study of surgical procedures in neonatal intestinal atresia - resection and anastomosis, Bishop Koop, Santulli and Mikulicz procedure

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ABSTRACT

Background: The aim of this work was to assess the outcome for patients with jejunoileal atresia who underwent primary anastomosis, Bishop–Koop, Santulli procedure and Mikulicz procedure. Intestinal atresia is one of the most common causes of intestinal obstruction in neonates. But ideal surgical management of this condition remains controversial.
Methods: During the period from January 2017 to January 2019, 112 neonates (62 males and 50 females) suspected to have intestinal atresia were operated in NRSMCH, Kolkata. 30 patients were treated with primary resection/ anastomosis, 30 patients underwent Bishop-koop (BK) technique, 27 patients who were treated with Santulli technique and 25 patients who were treated with Mikulicz procedure. Demographics, treatment and outcomes including mortality, morbidity and nutrition status were reviewed and were compared among the four groups.
Results: 20 patients (17.86%) died during the perioperative period. Among them, 10 died due to uncontrolled sepsis and 10 due to malnutrition. Mortality was highest in Primary anastomosis group (33.33%) followed by BK group (13.3%), Santulli group (11.1%) and lowest in Mikulicz group (4%). The Mikulicz group experienced the lowest re-operation rate (4%) and Primary anastomosis group experienced highest re-operation (26.7%). This difference was statistically significant (P<0.003).
Conclusions: Using Mikulicz procedure in the current study has improved the survival of these patients and minimized the post-operative complications.

Keywords: Jejunoileal atresia, Bishop–Koop procedure, Santulli technique, Mikulicz procedure

INTRODUCTION

Congenital jejunoileal atresia is the most common cause of neonatal bowel obstruction, with a reported morbidity ranging from 0.4 to 3.1/10,000 live births.[1-4] Various surgical procedures have been described worldwide to correct JIA like primary resection with end to end anastomosis, Bishop-Koop procedure, Mikulicz ileostomy and Santulli technique. The goal of these surgical procedures is to achieve low pressure anastomosis, less leakage problems, less disturbance in electrolyte and nutritional status. Each of these techniques has potential complications as well as varied success rates in the treatment of jejunoileal atresia.[6-8] Ideal surgical procedure is still matter of debate and challenging for surgeon as well.[5] Only few comparative studies are available on the outcomes of different surgical techniques on jejunoileal atresia. The aim of this work was to assess the outcome for patients with jejunoileal atresia who underwent primary anastomosis, Bishop–Koop, Santulli procedure and Mikulicz procedure.

Aim

Aim of this work was to assess the outcome for patients with jejunoileal atresia who underwent primary anastomosis, Bishop–Koop, Santulli procedure and Mikulicz procedure

METHODS

During the period from January 2017 to January 2019, 112 neonates (62 males and 50 females) suspected to have intestinal atresia were operated in Nil Ratan Sircar Medical College, Kolkata, West Bengal. All neonates presented with bilious vomiting and failure to pass meconium. These cases were classified according to the surgical technique into four groups.

Group A included 30 patients who were treated with primary resection/ anastomosis. Group B including 30 patients had undergone Bishop-Koop technique. Group C included 27 patients who were treated with Santulli technique. Group-D included 25 patients who were treated with Mikulicz procedure (Figure 6 and 7).

The choice of surgical procedure was made by the attending surgeon based on the patient's hemodynamic state and the condition of the bowel during laparotomy. The stoma closure is an elective surgery performed 6 weeks after the operation when the patients had gained ideal weight. A written informed consent form was obtained from all participants' parents or guardians.

Study variables

Patients' characteristics, including sex, age at operation, birth weight, birth gestational age and type of atresia, were collected. Surgical data, including surgical approach, operative time and intra-operative blood loss, were also collected.

Outcome variables

Clinical outcomes such as duration of hospital stay, duration of total parenteral nutrition (TPN), time to initial enteral nutrition after operation, post-operative complications, and patients requiring re-operation and body weight during stoma closure were documented.

Working definitions

High output stoma [output at the stoma >20 ml/ (kg day) with severe water–electrolyte imbalance requiring intravenous fluid therapy.[8]

Premature birth was defined as gestational age >37 weeks.

Low birth weight was defined as birth weight <2500 grams.

The weight-for-age Z-score (WAZ) was calculated according to the World Health Organization (WHO) growth standards of children <2 years of age and patients with a WAZ of less than –2 were defined as malnourished.[9]

Statistical analysis

Data collected was checked for completeness and consistency. Data was be entered in IBM statistical package for the social sciences (SPSS) statistics 21 for Windows (IBM Corp. 1995, 2012). Descriptive statistics like percentage and proportions were used to present the data. Chi square was used for significant testing. A p value of <0.05 was considered as significant.

RESULTS

Participant characteristics

A total of 112 patients were included in the study. 62 patients were males and 50 were females.

Mean age at surgery (Figure 1) was calculated for each group. 30 (26.79%) patients were included in the PA group, with a mean age at intestinal surgery of 3 days. 30 (26.79%) patients were included in the BK group, with a mean age of 2 days. 27 (24.1%) patients were included in the Santulli group, with a mean age of 2.5 days. 25 (22.32%) in the Mikulicz group with a mean age of 2.5 days.

Most of the patients in each group were mature and normal BW babies. Mikulicz group had highest number of premature and LBW babies (24%) followed by primary anastomosis group (16.66%), Bishop-Koop (16.66%) and Santulli technique (13.33%) (Figure 2). There is no significant difference in each group in terms of prematurity and LBW.

23 (76.6%) patients in Bishop-Koop group, 20 (74.04%) in Santulli group, 20 (66.6%) in primary anastomosis group and 15 (60%) in Mikulicz group belong to less severe (type I-IIIA) type of atresia. Severe type of atresia patient was found to be highest in Mikulicz group (40%) followed by primary anastomosis group (33.3%). There is no statistically significant difference in each group (Figure 3).

The clinical outcomes are summarized in Table 1.

Operative time is longest in Mikulicz group (2.4 hour) and shortest in primary anastomosis group (1.75 hour). But this was not statistically significant. There is no statistically significant difference in blood loss in each group. The TPN duration in the Mikulicz group was shortest (12.76 days) and Santulli group was (18.78 days) longest, whereas the time to enteral nutrition was shortest in Mikulicz group (6.64%) and similar among other groups. The length of hospital stay in the PA group was the longest (25 days) and

shortest in Mikulicz group (17 days) but the difference was not statistically significant.

No statistically significant difference was noted in terms of weight at discharge and stoma closure among the groups.

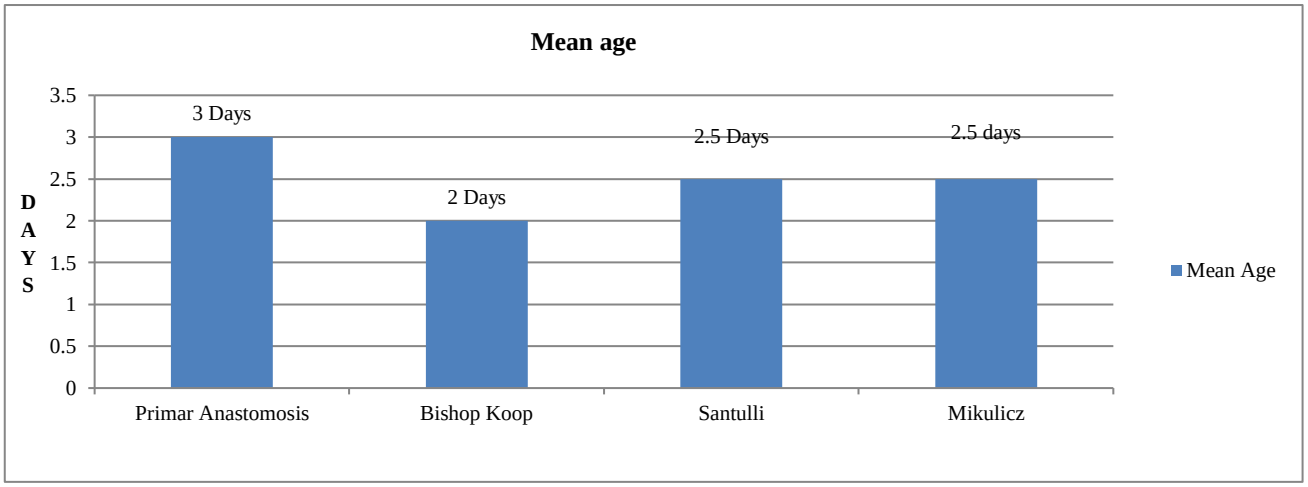

Figure 1: Mean age at surgery.

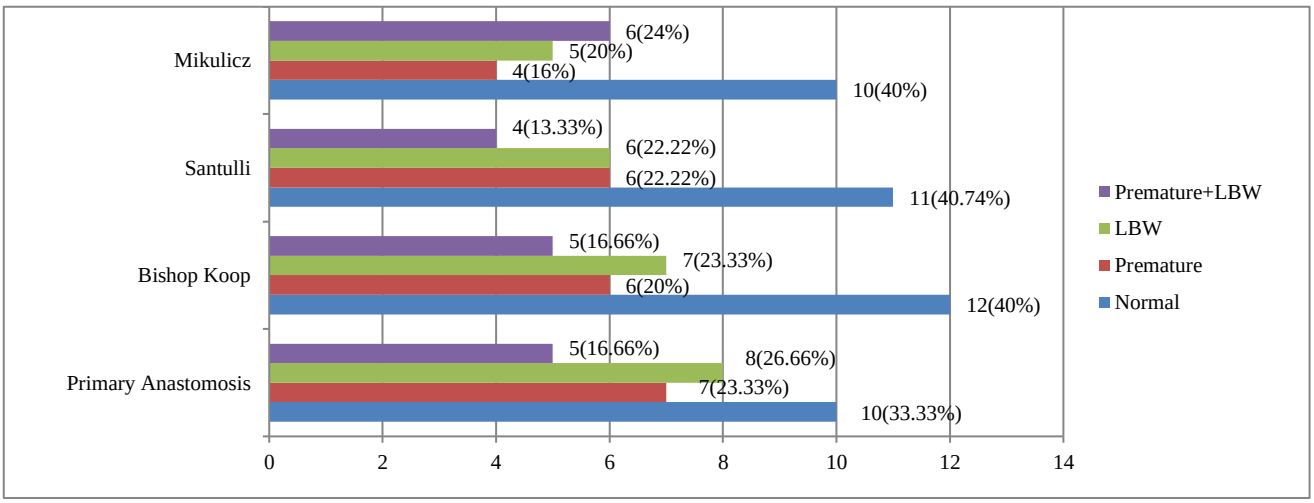

Figure 2: Premature and LBW babies in each group.

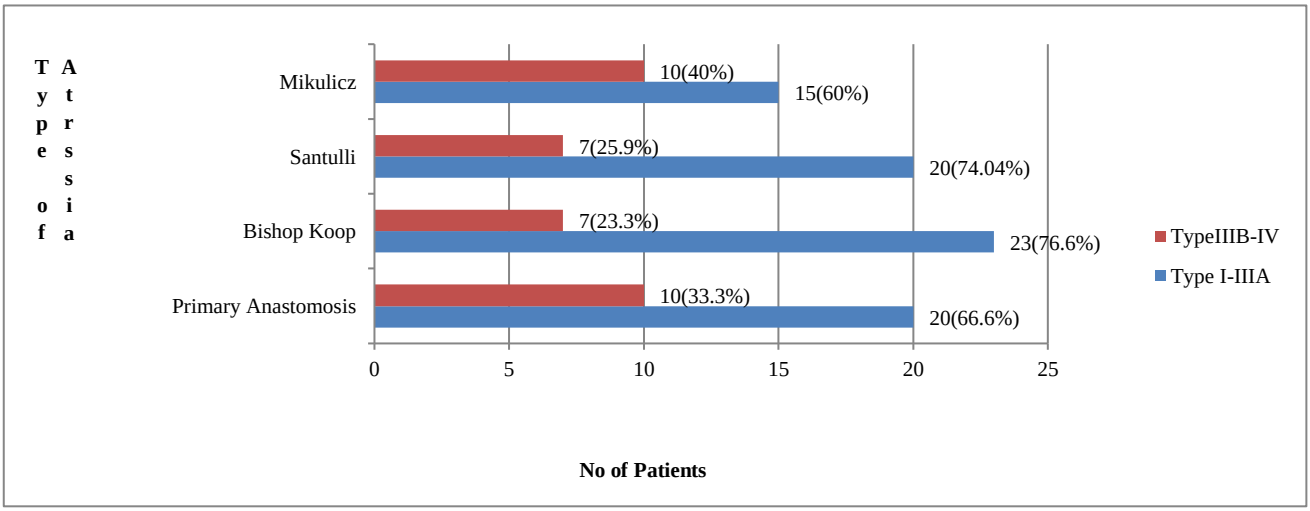

Figure 3: Type of atresia in each group.

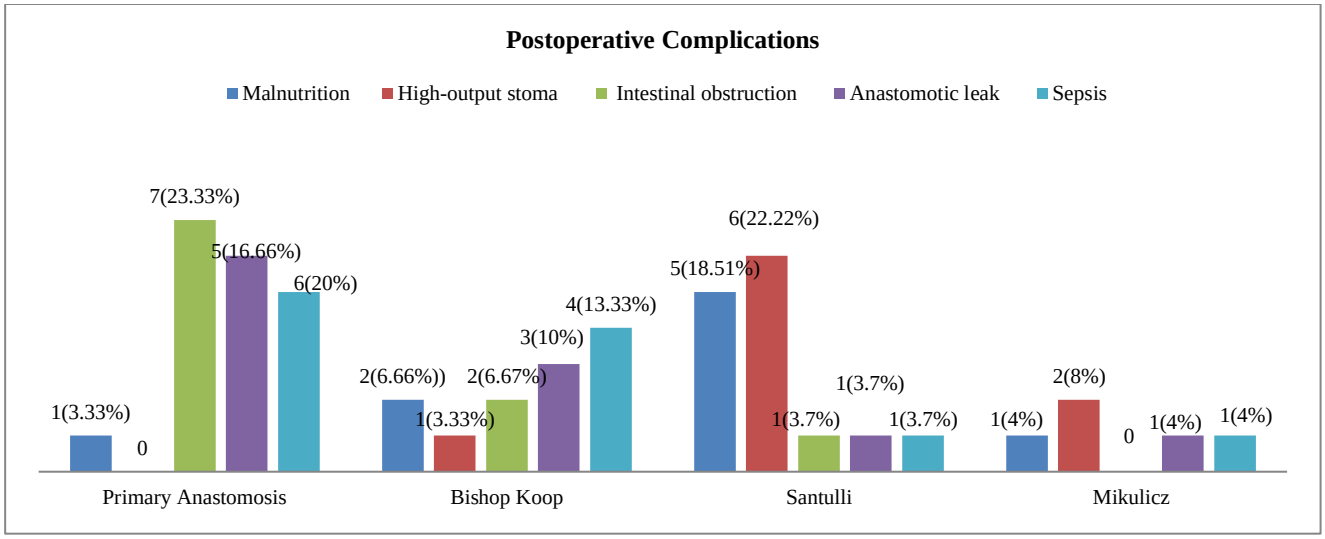

Figure 4: Post-operative complications in each group.

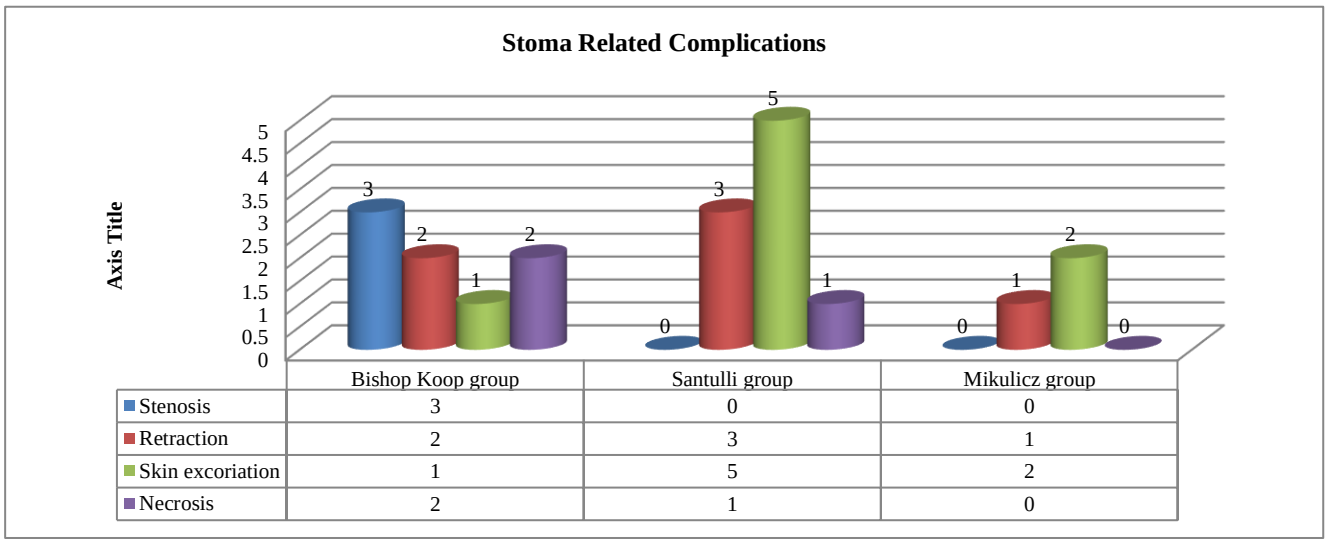

Figure 5: Stoma related complications in each group.

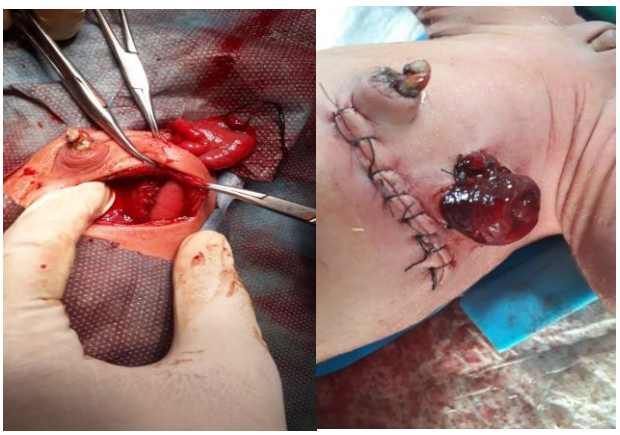

Figure 6: Intra-operative and post-operative pictures of Mikulicz procedure.

Post-operative complications

The most common complications in the PA group were intestinal obstruction (23.33%) followed by anastomotic leak (20%) whereas that in the BK group was sepsis (13.33%) and Santulli group was high output stoma (22.22%).

There was a significant decline in these complications in the Mikulicz group. The most common complication in Mikulicz group was high output stoma (4%). The Mikulicz group experienced the lowest re-operation rate (4%) and primary anastomosis group experienced highest re-operation (26.7%). This difference was statistically significant ($p<0.003$). 20 patients (17.86%) died during the perioperative period. Among them, 10 died due to uncontrolled sepsis and 10 due to malnutrition. Mortality

was highest in primary anastomosis group (33.33%) followed by BK group (13.3%), Santulli group (11.1%) and lowest in Mikulicz group (4%). This difference was found to be statistically significant (p<0.001) (Figure 4).

Stoma related complications

Stenosis (10%) was the most common stoma related complication in Bishop Koop procedure whereas skin excoriation (18.51%) and retraction (11.11%) were most common in Santulli group. Stoma related complications were relatively less in Mikulicz group (Figure 5).

Figure 7: Post-operative day 2 of Mikulicz.

DISCUSSION

With modern advances in medical care, including parenteral nutrition and neonatal intensive care, the survival rate of neonates with jejunoileal atresia has improved dramatically.[2,14] Complication rate of jejunoileal atresia still remains high due to the great disparity in the proximal and distal bowel, ineffective peristalsis, multiplicity of lesions and associated peritonitis. So, the appropriate treatment for jejunoileal atresia remains controversial. The common techniques include primary anastomosis, the Bishop–Koop procedure, Santulli procedure and Mikulicz procedure. The total mortality of jejunoileal atresia in this study was 17.86% which was similar to the figures described in other studies.[2,6] In the current study, PA group had 23.33% intestinal obstruction and 20% anastomotic leakage .Due to the high complication and re-operation rates, primary anastomosis was not recommended for the management of severe jejunoileal atresia. Anastomotic leakage is a serious complication.[11] Approximately one-half of the sepsis cases are due to anastomotic leakage and therefore functional anastomosis remains a key prognostic factor for the early survival of these children.[13] High-output stoma was the most prominent problem in the Santulli group. It is necessary to closely monitor the volume of output from the stoma during the short-term follow-up period. So in this group most of the mortality was due to malnutrition and dyselectrolytaemia. Bishop Koop procedure is a variant of primary anastomosis with a distal stoma acting as a vent. In our study this group experienced high mortality (13.33%) due to anastomotic leakage and sepsis. Though this procedure is better than primary anastomosis but it did not have favorable outcome. The Mikulicz group experienced the lowest post-operative complication rate (p<0.003) and re-operation rate (p<0.001). The improvement was attributed to the low pressure anastomosis performed with less leakage problems. The early start of oral feeding in relation to other groups helped in reducing the bacterial overgrowth in the gut and decreasing the sepsis rate. Stoma creation may provoke postoperative complications, with an estimated incidence of 20%-60%.[15,16] These complications included stoma stenosis, retraction, skin excoriation and necrosis. Stoma related complications were lowest in Mikulicz group.

Limitations

The results of the current study have certain limitations. Pediatric TPN had been replaced with mixed fluid due to its unavailability in our institution. The patient to bed ratio in NICU was almost 4:1 which contributed to the post-operative sepsis and mortality. Since most of the babies were out born and were referred to our institution at later age so the actual outcome of surgery is still controversial.

CONCLUSION

The Mikulicz group experienced the lowest re-operation rate (p<0.003) and mortality (p<0.001). The improvement was attributed to the low pressure anastomosis performed with less leakage problems. The early start of oral feeding in relation to other groups helped in reducing the bacterial overgrowth in the gut and decreasing the sepsis rate.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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