ORIGINAL ARTICLE

Role of Bishop–Koop Procedure for Jejunal and Proximal Ileal Atresia

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ABSTRACT

Background: This study was undertaken to review the Bishop–Koop procedure as a treatment option with a grossly dilated proximal segment in jejunal and proximal ileal atresia.

Materials and Methods: This was a retrospective cohort study conducted from January 2012 to June 2018 in the Department of Pediatric Surgery at King George's Medical University, Lucknow, India. The outcome, complication rate, and the follow-up study for postoperative adverse outcomes were assessed.

Results: Thirty-two neonates underwent Bishop–Koop procedure. The mean age at presentation was 4.37 □ 2.3 days. The male (n=22) to female (n=10) ratio was 2.2:1. Sixteeen had jejunal (type II-9, type III- 7), and 16 (type II-6, type III-10) had proximal ileal atresia. The mean duration of the hospital stay was 13.03 □ 5.7 days. Oral feeds were initiated by the 7th postoperative day. In our study, the complication rate was 31.25% (n=10) and mortality rate was 37.5% (n=12).

Conclusions: Bishop–Koop procedure appears to be a technically efficient method in desperate cases of jejunoileal atresia with a grossly dilated proximal segment, although more extensive studies may be needed to compare Bishop–Koop procedure and other operation techniques.

Key words: Bishop–Koop procedure; Atresia; Surgery

INTRODUCTION

The choice of surgery in jejunoileal atresia depends on the pathologic findings and specific set of circumstances encountered in an individual case. Most authors prefer an oblique anastomosis after resection of dilated proximal atretic segment up to 10-15 cm.[1,2] Some prefer resection of the proximal dilated atretic segment back to the level where the diameter of the intestine approaches 1 to 1.5 cm in ileal atresia, or near the ligament of Treitz in jejunal atresia followed by primary anastomosis. The outcome in such cases depends upon meticulous postoperative neonatal intensive care, prevention of sepsis, and Total Parenteral Nutrition (TPN). However, there may be certain situations that carry the risk of anastomotic leakage or non-function due to a discrepancy in the bowel size between the proximal and distal ends. These include sepsis (bacterial overgrowth in the proximal dilated atonic loop), perforations, doubtful bowel viability, and healing problems.[3,4] The resection of the atretic segment and exteriorization is performed either by Mikulicz, Bishop Koop, Santulli, or Rehbein technique. [3]

An ostomy may not be possible in proximal ileal and jejunal atresia because of the possibility of high output fistula. In Bishop–Koop procedure, the end of the proximal bowel is anastomosed to the side of the distal bowel segment. Along with this, the end of the distal section is exteriorized as an end-stoma. This procedure maintains the continuity of the intestinal tract and retains the distal fistula for treatment, inspection, and decompression of bowel. This study aimed to review Bishop–Koop procedure as a treatment option in jejunal and proximal ileal atresia, where primary anastomosis was not deemed feasible due to gross proximal bowel dilatation.

MATERIALS AND METHODS

This was a retrospective cohort study conducted from January 2012 to June 2018 in the Department of Pediatric Surgery in a tertiary care hospital. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines endorsed by the EQUATOR Network for conducting this study.

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The records of all patients of proximal ileal and jejunal atresia in whom Bishop-Koop procedure was performed were evaluated and included. In these patients, after excision of the terminal dilated part of the proximal atretic segment, single layer end to side anastomosis was performed. Postoperatively, all patients were kept in the neonatal surgical unit and treated with intravenous (IV) fluid, TPN, and IV broad-spectrum antibiotics. We started test feeding via a nasogastric tube when abdominal distension subsided and with the establishment of regular bowel movement. It included the absence of any signs of peritonitis or sepsis. The test feeds were started with 5 ml of expressed breast milk.

Care of the stoma was ensured by simple cleaning with normal-saline soaked cotton if needed and the application of liquid paraffin and gauze. The patient was allowed breastfeeding by mouth when test feedings were well tolerated. After the establishment of adequate breastfeeding, patients were discharged with advice to attend the outpatient department once in a fortnight in the first month. After that, they were called monthly for the next three months. They were called at three monthly intervals after that.

The patients were evaluated for any early (anastomotic leak, sepsis) and late long-term complications (stomal diarrhea, excoriation, blind loop syndrome). The overall outcome of this technique was assessed considering time to establish oral feeding and regular bowel movement, cessation of coming distal stoma's effluent. Quantitative data analysis has been presented as a mean □ standard deviation (SD) as well as median values.

RESULTS

The total number of patients (n) was 32 (Table 1, 2, 3). Of these, 16 had jejunal (type II-9, type III- 7), and 16 (type II-6, type III-10) had proximal ileal atresia. The male (n=22) to female (n=10) ratio was 2.2:1. The mean age at presentation was 4.37 ±2.3 days (median=4 days; range 1 to 9 days). The patients who expired had a mean age of 4.64 ±2.5 days (median =4 days) and low mean weight of 2.09 kg (median weight 2.1kg) as compared to patients who survived (4.2 ±2.21 days, 2.41 kg; median age five days, median weight 2.5kg). After resection of dilated atretic bowel, the approximate discrepancy in proximal and distal bowel segments was approximately 3:1.

The time for bowel movement to start was 5.48 ±1.31 (range 3-7 days, median: 6 days), and the oral feeds were started on 10.2 ±1.73 days (range 9-14 days, median: 10 days). The time for cessation of effluents coming from distal stoma was 10.5 ±2.83 days (range 7-22 days, median: 11 days); however, some discharge persisted in two patients.

The complications were 31.25% (n=10), which included anastomotic leak (n=6), intestinal obstruction (n=1), high output stoma and cholestasis (n=1) and early mortality (n=8; congenital heart disease: 2, Anastomotic leak: 3). The mean length of the hospital stay was 15.25 ±4.41 days (median 15 days; range 8 to 22 days). For anastomotic leak, re-exploration was required in three patients, while three patients responded to conservative management. Intestinal obstruction responded to conservative management, while high-output stoma was taken care of by early closure of the stoma. In our study, the mortality was 37.5% (n=12). The complications in these patients were also dealt with aggressively. Re-exploration was performed in three patients with anastomotic leak (Table 2), diarrhea was managed by fluid management. The mean length of follow up was 1.9 ±1.34 years (1 to 3 years). In the long term follow up, the problems and complications faced were unsightly appearance and peristomal excoriation in all patients. Recurrent diarrhea (n=8), discharge from stoma (2), and mortality (n=4) due to recurrent diarrhea/ sepsis were also noted. Six patients were lost to follow up for reasons not known to us. In the follow up, we performed the reversal of stoma in 14 patients. Reversal could not be in the patients, who did not return in the follow up (n=6).

DISCUSSION

The Bishop–Koop procedure, first reported in 1957, was initially used to treat meconium peritonitis, and this technique increased the survival rate from 30-70%. The principle of this procedure was resection of the grossly enlarged proximal bowel, creating an appropriately sized end of the proximal loop to the side of distal loop anastomosis close to the abdominal wall exiting the distal loop for decompressing proximal stoma while distal obstruction persists. The stoma provided access for insertion of a catheter into the distal bowel for irrigation and often spontaneous closure or bedside closure of chimney stoma. The distal bowel irrigation was initiated within 24 hours after the operation with normal saline 10-15 ml through the distal chimney stoma until normal bowel movement started with the trans-colonic passage of stool established and then the catheter is removed.[5,6]

This procedure may also useful in the surgical management of jejunoileal atresia where anastomotic dysfunction and leakage is the most important cause of morbidity and mortality. Anastomotic dysfunction/leakage in these patients is due to the gross discrepancy of a diameter of the proximal and distal gut at the site of anastomosis resulting in a funnel-like effect as the contents in the dilated proximal segment could not pass adequately into the distal narrow part leading to increase in intraluminal pressure at the anastomotic site, anastomotic dysfunction, and ultimate leakage.[6]

Table 1- Clinical profile of patients who survived the Bishop-Koop procedure

S. No.	Age (days)	Sex	Weight (Kg)	Type of Atresia	Length of Stay (days)	Early Complication	Late Complication
1.	4	M	2.7	ileal	18	Anastomotic leak	Diarrhea
2.	1	M	2.2	jejunal	15	-	Loss to Follow up
3.	7	F	2.3	jejunal	22	-	Lost to Follow up
4.	5	F	2.8	ileal	11	-	Diarrhea/ stoma discharge
5.	3	M	2.5	ileal	16	Anastomotic leak	-
6.	6	M	2.6	jejunal	11	-	-
7.	1	M	2.5	ileal	10	-	Lost to Follow up
8.	5	M	2.7	ileal	8	Anastomotic leak	-
9.	1	M	2.5	ileal	15	-	-
10.	5	F	2.8	ileal	17	-	-
11.	3	F	2.7	jejunal	19	Stoma discharge	Diarrhea
12.	6	M	2.2	jejunal	10	Burst abdomen	Diarrhea/ stoma discharge
13.	6	M	1.5	ileal	8	-	-
14.	7	F	2.3	jejunal	15	Burst abdomen	-
15.	1	M	2.4	jejunal	22	-	Lost to Follow up
16.	5	M	2.6	ileal	18	-	Lost to Follow up
17.	6	F	1.8	ileal	13	-	-
18.	4	M	2.8	jejunal	18	-	Lost to Follow up
19.	7	M	2.8	ileal	19	-	-
20.	1	M	1.5	ileal	20	-	-

Table 2- Clinical profile of patients who expired during treatment

S. No.	Age (days)	Sex	Weight (Kg)	Type of Atresia	Length of Stay	Early Complication	Late Complication
1	3	M	1.2	jejunal	5	-	Diarrhea
2	8	F	2.1	jejunal	7	-	Diarrhea
3*	2	M	1.9	jejunal	6	-	-
4#	4	M	1.8	jejunal	3	-	-
5	8	M	1.2	ileal	9	Anastomotic leak	-
6	6	F	2.6	ileal	14	Burst abdomen	Diarrhea
7	9	M	1.9	jejunal	12	Anastomotic leak	-
8	4	F	2.6	jejunal	10	-	-
9^	4	F	2.7	ileal	22	Anastomotic leak	-
10	2	M	2.1	jejunal	16	-	Diarrhea
11	2	M	2.5	ileal	20	-	-
12	4	M	2.5	jejunal	6	-	-

* had congenital heart disease; # had congenital heart disease and Down's syndrome; ^ had Down's syndrome

Table 3- Summary of patients managed by Bishop-Koop procedure

Total Patients	n=32
Jejunal atresia	n=16 {Type III (n=9), Type III (n=7)}
Ileal Atresia	n=16 {Type III (n=6), Type III (n=10)}
M:F	2.2:1
Mean age of presentation	15.25 ± 4.41 (8 to 22 days)
Complications	Anastomotic leak (n=6), Intestinal obstruction (n=1), High output stoma and cholestasis (n=1)
Mortality	Early mortality (n=8) Late mortality (n=4)
Lost to follow up	n=6

In Bishop Koop procedure, this funnel-like effect at the anastomotic site can be avoided by the wide end to side anastomosis and distal exteriorized stoma, which can effectively decompress the raised intraluminal pressure. It may be useful in the early functioning of the narrow unused distal gut. With gradual dilatation of distal bowel, early enteral feeding may be initiated, thereby reducing the need for parenteral nutrition and associated complications. Besides this, the reversal of the stoma without affecting the anastomotic site can also be performed. These factors may contribute to decreasing hospital stay, financial burden, and increased chances of survival.[6,7]

The complication rate in our study was 31.25 % (n=10), which included anastomotic leak (n=6), burst abdomen (n=2), intestinal obstruction (n=1), high output stoma and cholestasis (n=1). Anastomotic leak is a serious complication after the repair of intestinal atresia. The high incidence of anastomotic leaks in apple peel atresia (14%) compared with the other type of intestinal atresia (4%) is caused by inadequate blood supply at the anastomotic site owing to its single artery retrograde blood supply. Some studies reported that half of the cases of sepsis are because of an anastomotic leak. Therefore, a functional anastomosis appears to be a key prognostic factor for the early survival of these chil-

dren. It may be noticed from Table 1 and 2 that anastomotic leak was managed successfully in three patients, while three patients expired. It is also obvious that the patients who expired were either low birth weight or presented late for treatment. Since the cohort is small, this did not yield any statistically significant result. However, it may be concluded that low birth weight or delayed presentation may affect the overall results.

In our study, a high-output stoma occurred in two patients and recurrent diarrhea in eight patients. All the patients with a high-output stoma were restored, with fading of the mucosal edema and resumption of bowel movement function. A high output stoma is another common complication of enterostomy. The incidence of high output stoma is reported to be 16%.[7-9]

Cholestasis is a common consequence of long term TPN administration. Progressive liver disease rates as high as 30% to 50% have been reported in children on TPN, which was also accompanied by a longer duration of PN and a higher incidence of cholestasis.[10,11]

The mortality rate in our study was 31.2 %, which was similar to the figures described in the literature.[12] The leading causes of the poor prognosis in this study were severe sepsis and malnutrition. There is limited literature on the exclusive Bishop-Koop procedure.[8,13] The mortality is lesser in these reports. However, it may be noted that the inclusion criteria are different from what we had applied. Besides, we have included long term follow up, which is missing from the other studies.

The limitation of this study is the small cohort from a single center and a lack of comparison with other surgical methods (primary anastomosis and Mikulicz double-barrel ileostomy). Furthermore, the study suffers from the inherent issues of being a retrospective design and the possibility of missing data points. The follow-up data was not available for six patients, and 12 patients died, so follow up data on outcomes was available only for half the patients in the study. It may also be considered as a limitation of the study. However, despite this, the Bishop–Koop procedure showed low mortality and morbidity in treating severe jejunoileal atresia. During the follow-up, apart from the complication mentioned before, the growth of the patients was satisfactory.

CONCLUSION

Bishop–Koop procedure appears to be a technically efficient method for severe jejunoileal atresia as an alternative to the primary anastomosis with a grossly dilated proximal segment where the primary anastomosis is not feasible. However, larger studies may be needed to compare it with other procedures.

Consent: Authors declared that they have taken informed written consent, for publication clinical photographs/material (if any used), from the legal guardian of the patient with an under-standing that every effort will be made to conceal the identity of the patient however it cannot be guaranteed.

Author Contributions: All the authors contributed fully in concept, literature review, and drafting of the manuscript and approved the final version of this manuscript.

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