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Original Research Article

T-tube enterostomy in neonates with perforated necrotizing enterocolitis as an alternative option

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ABSTRACT

Background: The use of T tube enterostomy (TTES) as an alternative option for stoma in neonatal emergency is known long time ago.
Methods: We introduced T-tube ileostomy as technical innovation in our institution as a way of treatment for intestinal perforation in low birth weight premature neonates.
Results: In this study 14 neonates underwent TTES procedures at university-based pediatric surgery and neonatology department. 11 (78.6%) patients treated with TTES, discharged home. Three babies (22.4%) died in postoperative course. One of them developed recurrent severe fulminant NEC ileostomy was created and kept on TPN but died after 2 weeks due to septicaemia. The two others were dysmorphic with metabolic diseases.
Conclusions: T tube is effective in selected cases of necrotizing enterocolitis (NEC) because of its simplicity in application and removal. But it could not replace the formal stoma in general, its advantages are saving one more time exposure to surgery in those risky patients, Author recommend the use it in cases of post NEC intestinal perforation and extreme low birth weight neonates.

Keywords: Enterocolitis, Enterostomy, Tube

INTRODUCTION

Stoma either ileostomy or colostomy have been used in the majority of neonates since many years for management of emergency cases as necrotizing enterocolitis (NEC).[1] These stomas is usually required in cases with generalized peritonitis and when questionable distal parts of the intestinal tract are found, necessitate resection of the dead bowel and anastomosis. The rational is to divert the intestinal contents away from damaged intestine through stoma which will result in improvement of survival.[2]

The main disadvantage of intestinal exteriorization is the need of staged procedures for closure with prolonged hospitalization and repeated admissions. Apart from stoma associated complications like stenosis, skin excoriation and prolapse or retraction of the stoma or parastomal or internal herniation through mesenteric defect.[3]

The use of T tube enterostomy as an alternative option in neonatal emergency is known long time ago (Herberg 1981).[4]

It is used in a variety of diseases because of its simplicity and effectiveness such as necrotizing enterocolitis (NEC), spontaneous intestinal perforation (SIP), inspissated meconium of prematurity (IMP) and recently in intestinal occlusion in middle celosomy (MC): gastroschisis and

omphalocele.[5-7] And even it can be used in very low birth weight premature babies.[8]

The purpose of this study was to evaluate the results of using T-tube enterostomy in selected cases of intestinal perforation in ELBW neonates.

METHODS

This is a retrospective study of our experience using T-tube enterostomy to treat neonates with intestinal perforation as a complication of necrotizing enterocolitis between January 2016 and December 2018 in King Saud Medical city hospital, KSA.

Author included in this study all premature neonates below 35 weeks gestational age with birth weight below 2 kg admitted in the NICU diagnosed as NEC complicated by pneumo-peritoneium. Exclusion criteria includes, those patients with major cardiac anomalies, those patient on high frequency oscillatory ventilation or those improved after insertion of penrose drain only.

Before surgical intervention, a surgical consent was obtained from the perents and ethical committee approved the study as well.

Demographic data obtained included gestational age, weight, age at operation and final diagnosis. Postoperative outcome and follow-up information were obtained.

In this study we shall not go into the whole indications for the employment of an enterostomy, Author only evaluate its use in low birth weight premature babies with intestinal perforation that need laparotomy and resection of dead bowel due to NEC.

Decision of T tube usage was planned before operation as an option instead of creation of a stoma. Accordingly, we prepare the convenient size 10-14 Fr depending on intestinal size of the patients.

In all cases T-tube enterostomy was performed by installing the short limb (horizontal part) of T-shaped tube inside intestinal lumen.

Before insertion both fragments of this part of T-tube were trimmed accordingly to bowel dimensions and slit the tube to be transformed into a gutter like (Figure 1). Insertion then performed in both afferent and efferent intestinal limbs 7-10 cm proximal to anastomosis site and not crossing it. If there are more than one anastomosis the tube was inserted in an apparently healthy part proximal to the first one (Figure 2).

The vertical part of T tube was brought out through separate stab incision of intestinal wall. In cases of perforation was very high close to the duodeno-jejunal junction we insert the tube through the perforation itself after trimming of the devitalized edges.

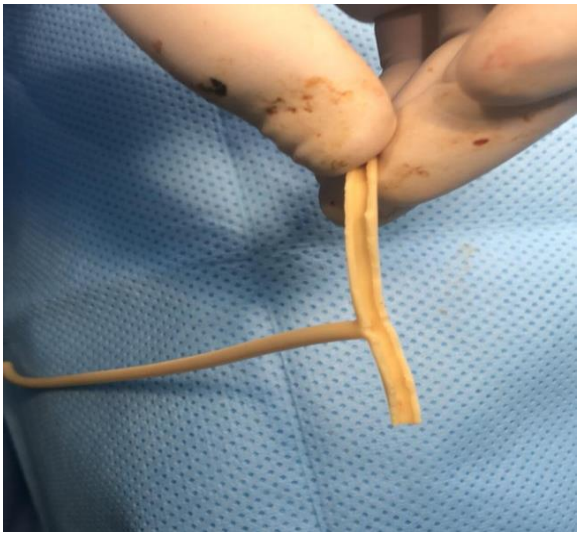

Figure 1: Insertion guttering if the T-tube.

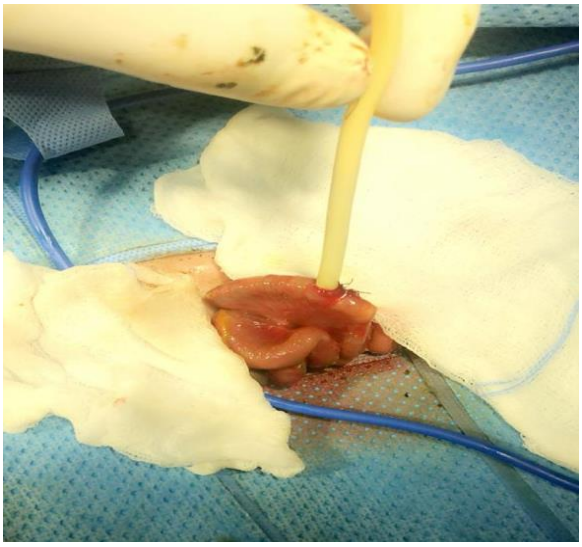

Figure 2: After insertion of the tube in healthy part.

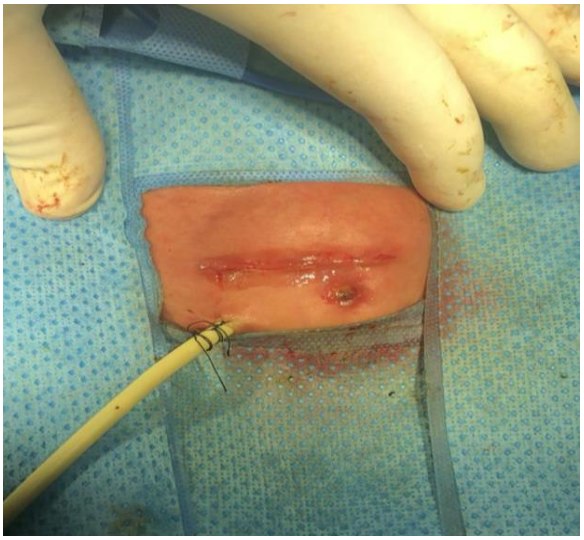

Figure 3: Exit of the tube through separate stab.

At the end of operation, the long limb of the tube was brought out through small separate stab incision of abdominal wall away from laparotomy wound and with T-tube inside was pulled close to abdominal wall by gentle tube traction and secured with two or three stitches to the inside of the abdominal wall (Figure 3).

Postoperatively, total parenteral nutrition was initiated and continued.

We start flushing of the T-tube with 3-5 ml of warm normal saline once daily to preserve its patency from third post-operative day.

Generally, there will be no leakage around the tube until the function of the bowel has returned. If there is considerable leakage around the tube, we consider to remove it and do contrast through the fistula created.

Before removing the T-tube (After 10-15 days), a contrast study was performed, a diluted water soluble contrast material was injected in the tube to confirm the patency and function of distal part of intestines (Figure 4).

Figure 4: Postoperative contrast study via T-tube.

Removal was easy by extracting the tube, it will be folded thanks to the guttering maneuver we did before, even without the need for sedation or anesthesia. Usually within 2-5 days later the fistula will close spontaneously.

All data will be collected and analyzed and tabulated.

RESULTS

From 2016 to 2018, 14 neonates underwent TTES procedures at university-based pediatric surgery and neonatology department in. Demographic data Numbers of patients operated on, using TTES according to their primary diagnosis, median, mean and standard deviation were presented in Table 1.

Table 1: Demographic data.

Total no. (14)	Male no. (%)	Female no.(%)
Gender	10 (71)	4 (29)
Deaths	2 (20)	1 (25)

In all cases T-tube was inserted in small intestine. Duration of TTES depended on recovery of alimentary tract function of average from 10 to 15 days. The output by T-tube was small in amount and sometimes minimal. There were gases mainly.

Regularly, the amounts of fluid intestinal contents evacuated by T-tube did not exceed 12 ml per day.

Only, in two patients' distal parts of alimentary tract could not be visualized by contrast study and the dye was arrested. These two neonates were operated on.

In one of them massive intestinal adhesions were found. After release of adhesions the postoperative course was bad, finally he expired.

The second one developed intestinal kink and stricture at the site of the ileocecal valve previously he had cecal perforation and closed by 2 stitches and he was treated with resection of the ileocecal area and ileocolic end-to-end anastomosis.

In two patients TTES related complications were noted. One developed post removal fecal fistula the tube was left in place for 15 days as he was extreme premature 850 gram with delays passage of meconium and was critically ill.

The other had his tube out accidentally on 2nd post-operative day treated by re-laparotomy and closure of the previous opening and create another one proximal to it.

Table 2: Patients outcomes.

	Gestational age (weeks)	Weight (gm.)	Age at op. time (days)	Duration of tube insertion (days)
Range	28-34	850-1730	5-25	10-15
Mean	30.71±1.87	1238.57±276.53	14.14±6.28	11.36±1.49
Median	30.5	1190	13	11

For the rest of patient, T-tube removal was done by simple maneuver performed without the need of sedation. Minimal leakage of intestinal contents or stool followed the removal and stopped maximum in 3-5 days.

11 (78.6%) patients treated with TTES were discharged home. 3 (22.4%) patients died in postoperative course. One of them developed recurrent severe fulminant NEC ileostomy was created and kept on TPN but died after 2 weeks due to septicemia. Out of the other two, one was mentioned above and the other was dysmorphic with metabolic diseases.

DISCUSSION

Enterostomy which is recommended in cases of extended bowel damage may has a high rate of complications such as stricture, prolapse, wound infection, fluid loss, and requires secondary surgery.[2,4-6]

The use of T-tube as a venting (syphon) tube inserted inside the lumen of the intestine instead of enterostomy is well known, Harberg described the use of T-tube ileostomy in 1981 in the treatment of uncomplicated meconium ileus.[4]

The use of TTES has been extended further because of its simplicity and effectiveness in SIP, IMP and recently in intestinal occlusion in MC gastroschisis and omphalocele.[5-7]

Therefore, in our study we highlight its use in low birth weight and premature babies with perforated NEC. We introduced T-tube ileostomy as technical innovation in our institution as a way of treatment for intestinal perforation even in ELBW neonates.

T-tube ileostomy combines advantages of enterostomy such as intestinal decompression, early feeding, and rapid technique, with those of primary anastomosis (restoration of intestinal continuity and avoiding secondary operation).[1]

Also, its removal is easy made by simple maneuver even without anesthesia. Also, it remained advantageous as for evaluation of the bowel continuity in the distal part, by injecting contrast material through the T-tube.[16]

The mechanism of insertion in those cases is similar to the usual way described elsewhere but only the suitable size and choosing an apparently healthy loop of intestine proximal to the first anastomosis without extending it to cross the anastomotic line to avoid the pressure effect on it due to edema.[17]

Rygl and his colleagues who use the tube in extremely low birth weight neonates with isolates intestinal perforation but in this study, we emphasize that it can be used in cases have more extensive ischemia which need even more than on anastomosis with good results.[8]

Unlike other studies that recommended Irrigation of the distal part of intestine in case of intestinal atresia, we found that injection of 3 to 4 ml of warm saline on the second day after surgery without irrigation once a day is enough, as long the distal pathway is patent. Just to keep the tube opened which is helpful in keep its role in decompressing the bowel and protecting the anastomosis.[16]

The number of patients is limited in this study because of, perforated NEC patient is mostly unstable and either not candidate for surgical intervention, or there are no experts in giving anesthesia to those particular very low birth weight, highly risk and unstable patients. Also, in many pediatric surgery centers, T tube is not available in operative rooms as routinely.

Actually, this procedure is not without complication. Leaking and fistula formation can occur this usually due to unavoidable post NEC stricture that show up by contrast study and may need relaparotomy.[18]

In one of our cases, NEC was recurrent after removal of the tube. In this particular case stoma is needed for a long time to pass the period beyond which the risk of developing NEC is less.

Further study is need in the future to elicit the risk factors of those patients for developing relapse of the disease or post NEC stricture by the disease itself or due to anastomotic complications.

CONCLUSION

T-tube is effective in selected cases of necrotizing enterocolitis (NEC) because of its simplicity in application and removal. But it could not replace the formal stoma in general, its advantages is saving one more time exposure to surgery in those risky patients, we recommend the use it in cases of post NEC intestinal perforation and ELWB neonates.

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