

## Necrotizing Enterocolitis with Perforation in Neonates: Primary Peritoneal Drainage Irrespective of Birth Weight Resulting in Improved Survival

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### Abstract

*Background:* Necrotizing enterocolitis (NEC) is the most common life threatening emergency of the gastrointestinal tract in newborn period. Despite aggressive medical management many patients develop complications which require surgical intervention. There is controversy regarding the optimal timing and type of surgical intervention in these high risk patients. This paper presents our experience of peritoneal drainage as the primary treatment in all patients of NEC with bowel perforation and its effect on the overall survival of these patients. *Method:* Total 142 patients of NEC with perforation were admitted in the study period of 5 years. These patients were prospectively analysed. Patients were divided in two groups according to their body weight to judge the clinical improvement by the peritoneal drainage (Group 1- birth weight < 1500 grams, and group 2- birth weight > 1500 grams). All these patients of NEC (irrespective of their weight and gestational age) with perforation were subjected to primary peritoneal drainage. *Results:* Primary peritoneal drainage (PPD) provided a cure in more than half of these high risk babies. Out of 142, 80 patients required no other operative procedure and they were considered cured by PPD only. The survival was 61.7% in group 1 while group 2 had a survival rate of 68.9%. *Conclusion:* The study shows that, though the primary peritoneal drainage is not a

definitive cure in patients of NEC with perforation, but it definitively reduces the number of laparotomies and also helps in improving the general condition of the patients who need surgery later on. Primary peritoneal drainage (PPD) reduces the mortality in these high risk neonates.

**Key words:** Necrotizing Enterocolitis; Primary Peritoneal Drainage; Laparotomy; Mortality; High Risk.

### Introduction

Necrotizing enterocolitis (NEC) is the most common life threatening emergency of the gastrointestinal tract in newborn period [1]. The disease is characterized by various degrees of mucosal and transmural necrosis of intestine. The disease is prevalent in premature low birth weight (LBW) infants but term babies can also be affected. With advances in neonatal intensive care, the incidence of NEC is increasing and the disease affects up to 3-7% of the babies admitted to neonatal intensive care unit (NICU). The pathogenesis is multifactorial. Majority of the patients respond to intensive medical treatment which involves treatment of sepsis with parenteral broad spectrum antibiotics, intestinal decompression with nasogastric tube, correction of acidosis and electrolyte imbalance, ventilatory support for respiratory failure and other supportive measures including total parenteral nutrition. Despite aggressive medical management many patients develop complications which requires surgical intervention. There is still controversy regarding the type and timing of surgical intervention in these high risk patients.

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Peritoneal drainage was first reported in 1977 by Ein and coworkers [2] in the management of NEC. Later on Demestre and coworkers [3] evaluated the role of primary peritoneal drainage as the only surgical modality in the management of NEC. They found that 64% of these patients required no additional initial surgical treatment after primary peritoneal drainage.

This present paper shares our experience of peritoneal drainage as the primary surgical treatment in all patients of NEC with intestinal perforations and its effect on the overall survival of these patients.

### Material and Methods

All of the patients of NEC with perforation admitted in five years, at KGMU Lucknow India were prospectively analysed in this study. Total 142 patients of NEC with perforation were admitted in the study period. The patients were divided in two groups according to their weight. Group 1: weight <1500 gm and Group 2: weight >1500 gm. The patients of NEC (irrespective of their weight and gestational age) satisfying the following criteria underwent primary peritoneal drainage.

1. Free gas under diaphragm on erect or lateral X-Ray abdomen.
2. Presence of free fluid in the peritoneal cavity with abdominal distension and abdominal wall erythema.

The procedure was performed either bedside in NICU or in operation theatre depending on general condition of the patient with all sterile precautions under local anaesthesia. After giving local anaesthesia a small infraumbilical incision was made and peritoneal cavity opened. An 8 Fr feeding tube was placed in the peritoneal cavity and a wash was given with warm saline. This was followed by placement of pelvic drain. Middle finger of saline washed glove was used as drain and fixed to the skin with silk

suture. The drain was covered with soakage dressing. The frequency of dressing changes depends on the amount of drainage fluid.

After placement of drain the patients were monitored closely for hemodynamic stability, oxygen saturation, urine output, electrolytes and blood gas analysis. The drain was removed 24 hours after the drainage of fluid stopped. Patients were allowed oral feeds once they started passing stools regularly, ryle's tube suction nil and abdomen became soft and non distended.

The patients with peritoneal drainage who had following features were subjected to laparotomy for definitive management.

1. Progressive abdominal distension.
2. Increasing fluid or fecal drainage from drain site.
3. Progressive abdominal wall edema and erythema.
4. Continued deterioration in clinical and biochemical parameters (ABG, electrolytes) after drain placement.
5. Features of intestinal obstruction.

### Results

Total 142 patients of NEC with perforation were admitted to our department in the study period. They were divided in two groups according to their birth weight. In all of the patients of NEC with intestinal perforation, a primary peritoneal drainage was performed. It was done irrespective of the gestational age or birth weight of the patients. The patients of NEC who presented to us late with already perforated bowel, peritoneal drainage was done immediately after initial resuscitation at the bedside. The results are studied separately for both groups of the patients and interpreted accordingly. The results are summarized in Table 1.

Table 1:

Patients	Group 1(wt< 1500 gm)	Group 2(wt>1500gm)
No.	68 (47.88%)	74 (52.22%)
Mean gestational age	28 +_ 4 weeks	32+_ 4 weeks
Age at presentation	4 days	6 days
P D only	39 (57.35%)	41 (55.40%)
P D + laparotomy	29 (42.64%)	33 (44.59%)
Overall survival	42 (61.76%)	51 (68.91%)
Total mortality	26 (38.23%)	23 (31.08%)
Mortality(PD only)	12	14
Mortality(PD + Lap)	14	9

Out of total 142 patients 68 were less than 1500 gm at the time of admission and their mean gestational age was 28 weeks. Their mean age at presentation in this group of patients was 4 days. In the second group of 74, the patients were more than 1500 gm in weight and their mean gestational age was 32 weeks. In the group 1, 57.3% of patients needed no further initial operative procedure after peritoneal drainage. Rest of the patients in this group who were not improved after PPD were subjected to laparotomy. The overall mortality in this group was 38.2%. In the second group 55.4% of patients were cured initially with PPD only. The overall mortality in this group was 31%. The secondary operative procedures performed included, resection of gangrenous bowel with single or multiple anastomoses, and resection with exteriorization of intestine as double barrel stoma.

## Discussion

Necrotizing enterocolitis (NEC) is the most common acquired disease of the gastrointestinal tract (GIT) in premature infants and newborns. It is defined as an ulcerative inflammation of the intestinal wall. The clinical signs of incipient NEC are often very discrete, and range from localized intestinal symptoms to generalized signs of sepsis [4].

Initially peritoneal drainage was considered as a temporising measure to stabilize the patient before subjecting them to laparotomy. Later on many investigators showed that significant numbers of patients were improved with primary peritoneal drainage (PPD) only and no additional surgical interventions were needed. But it remained a matter of debate that PPD should be used as a primary procedure or it should be used as a method of stabilization before laparotomy. In 1988 Cheu et al [5] reported their experience with primary peritoneal drainage and concluded that PPD was useful in resuscitation of low birth weight babies of NEC with perforation and considered it as a method of stabilization and not an alternative to laparotomy. In 1990 Ein and co-workers [6] presented their 13 years experience with primary peritoneal drainage and showed that one third of these patients completely recovered after PPD only. But they recommended PPD for extremely low birth babies not stable enough for surgery. Peritoneal drainage in patients of NEC with perforation reduces the abdominal distension by evacuating air and free fluid from the peritoneal cavity thus it reduces the septic load in peritoneal cavity and improves circulation and respiration by relieving the abdominal compartment syndrome.

Increased abdominal distension also causes splanchnic hypoperfusion which causes more insult to already injured intestinal mucosa [8]. This mucosal injury permits the intestinal flora to breach the mucosal barrier and amplifies the inflammatory process which already existed in the patients of NEC. The PPD helps in halting this process by reducing the abdominal pressure. One study suggested propensity score-matched analysis of surgical NEC treatment found that peritoneal drainage followed by laparotomy was associated with decreased mortality compared with peritoneal drainage alone but at significantly increased costs [9].

In our study we found that out of total 142 patients 80 patients i.e. 56.33% required no other operative procedure and they were considered cured by PPD only. 43.6% of patients required laparotomy after peritoneal drainage and primary anastomosis or exteriorization of bowel was done depending on the patient's condition and length of bowel involved. Overall mortality was 34.5% in our study. This high mortality was due to prematurity and delayed presentation of these sick babies to our hospital. The patients who died after 'PPD only' were too sick and septicaemic, that they could not be revived and prepared for definitive surgery. So it can not be concluded that they could be saved if they were subjected to direct laparotomy. The mortality in the 'PPD only patient cohort' can not be attributed to peritoneal drainage or delay in performing definitive surgery. We want to emphasise that PPD provides a cure in more than half of these high risk babies with low general condition and the need for extensive procedures under general anaesthesia was avoided which would be poorly tolerated by these sick babies. PPD also provides enough time to stabilize those babies who ultimately required a definitive surgical procedure, and it had a positive impact on the survival after laparotomy.

## Conclusions

Although the primary peritoneal drainage is not a definitive cure in all of our patients of NEC with perforation, but it definitely reduced the number of laparotomies to less than half, and also helped in improving the general condition of the patients who need surgery later on. Peritoneal drainage can provide time to prepare these sick babies so that they can withstand the general anaesthesia and extensive surgical procedures which may be needed in some cases. Thus primary peritoneal drainage definitely helps in reducing the mortality in these high risk

neonates.

We recommend an early bedside peritoneal drainage in all patients of NEC with bowel perforation and keep a close watch on the vital parameters of these patients. The patients where the clinical deterioration continues after PD or whose condition does not show the expected improvement definitive surgical procedure should not be delayed.

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