

ORIGINAL ARTICLE

Conservative Management of Pneumoperitoneum in Necrotising Enterocolitis- Is it Possible?

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ABSTRACT

Introduction: Necrotizing enterocolitis (NEC) is a common in neonatal intensive care unit (NICU) patients; especially in premature and low birth weight ones. Surgery is indicated when there is pneumoperitoneum. Other therapies include conservative observation or primary peritoneal drain (PPD). This study was conceived to evaluate peritoneal tapping, rather than primary peritoneal drain (PPD) as a treatment of NEC.

Material and Methods: This prospective observational study conducted from December 2012 to December 2014 and including all patients of NEC having pneumoperitoneum on X-ray.

Results: There were 12 patients of NEC. Seven patients responded to single peritoneal tapping. Three patients needed one more tapping. Laparotomy was required in remaining two patients. One patient, who underwent laparotomy, expired due to severe sepsis. The mean duration of follow up was 4.83 months (range 2 to 8).

Conclusion: Peritoneal tapping in NEC who develops pneumoperitoneum appears to be a viable option. Further studies in this regard may substantiate this mode of therapy.

Key words: Necrotising enterocolitis; Pneumoperitoneum; Neonates; Premature; Peritoneal tapping

INTRODUCTION

NEC is common in NICU patients especially premature and LBW babies following initiation of enteral feeding [1] and cause of significant morbidity and mortality [2,3]. NEC is classified according to Bell's staging a stage I (suspect), stage II (definite), or stage III- (advanced disease) [4].

Surgery has been the standard for managing the pneumoperitoneum. Non-surgical management of this entity in form of peritoneal tapping has been reported sporadically [5]. This study was undertaken to see if peritoneal tapping is a viable treatment option in patients of pneumoperitoneum due to NEC.

MATERIALS AND METHODS

This study was conducted from December 2012 to December 2014. All patients of NEC having pneumoperitoneum on X-ray were included in this study. Patient were admitted directly or referred from the Paediatrics department. All patients were put on intravenous (IV) antibiotics covering aerobic and anaerobic organisms. Clinical parameters such as pulse rate, respiratory rate, temperature, and capillary filling time (CFT) were monitored. Complete blood counts, renal function test, electrolytes, and C reactive protein (CRP) were recorded. An assessment of abdominal girth at umbilical level and abdominal wall erythema was made, both before and after the peritoneal tapping.

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Under aseptic precautions, a 22 Fr IV cannula was inserted into the peritoneal cavity in the epigastric region about 1cm to the left of mid-line. Right side was avoided to prevent inadvertent injury to the umbilical vein. The peritoneal cavity was deflated with the help of cannula, which was left at its place for about two hours in a sterile close circuit. If there was recurrence of abdominal distension after more than 24 hours of first tapping, a repeat peritoneal tapping was performed. After two attempts of peritoneal tapping, if there was recurrence of

distension, laparotomy was performed within 24 hours.

A positive outcome was made on the basis of decreased abdominal girth, improvement in abdominal wall erythema, improved values of blood count, renal function tests, and CRP. The patients were allowed orally on 7th day after peritoneal tapping. At that time, oral probiotics were also started. They were discharged after 14 days of IV antibiotics.

Table 1: Details of the patients having necrotising enterocolitis

Sr. no.	Age (days)	Sex	Weight (grams)	TLC*	Pre-IAG (cm)	Post-IAG (cm)	Hospital stay (day)	Follow-up (Months)
1	10	Male	2200	15000	40	33	15	6
2	13	Male	2100	13000	39	32	16	5
3	15	Male	2800	18000	41	33	15	8
4	12	Male	1800	12000	39	30	16	4
5	11	Female	2000	13000	42	32	17	6
6	14	Male	2100	6000	38	33	18	6
7	17	Female	1700	5000	40	31	19	2
8	12	Female	2000	13000	41	30	16	6
9	13	Male	2300	4000	41	32	16	5
10	13	Female	2600	8000	44	32	15	4
11	10	Male	1800	11000	38	33	17	6
12	9	Male	1900	3000	37	31	19	0

* IAG: Intervention Abdominal Girth; TLC- total leucocyte count

RESULTS

There were 12 patients of NEC with pneumoperitoneum (table 1). Of these, five were premature and seven were full term neonates. Male to female ratio was 2:1. The mean birth weight of the patients was 2108.33 grams (range 1700 to 2800). At the time of presentation, the mean pulse rate and respiratory rate were 109.83 (range 95 to 120) and 55.75 (range 50 to 62) respectively. The mean total leukocyte count was 10083.33 (range 3000 to 18000).

At the time of peritoneal tapping, the mean abdominal girth was 40 cm (range 37 to 42). After abdominal decompression, it was 31.83 (range 30 to 33). Seven patients responded to single peritoneal tapping. Of these, six were full term and one was premature neonate. Three patients needed one more tapping. Of these, one was full term and remaining two were premature neonates. Laparotomy was required in remaining two premature patients, which revealed extensive disease. One patient, who underwent laparotomy, expired due to severe sepsis.

The mean duration of hospital stay was 16.58 days (range 15 to 19 days). At the time of discharge, all patients had normal vitals and serum biochemistry. The mean duration of follow up was 4.83 months (range 2 to 8). There was no problem in the follow up of all patients.

DISCUSSION

Mild cases of NEC may be managed by medical management [3] which includes cessation of enteral feeding, empiric antibiotics, and supportive care [2, 6]. The available surgical options include laparotomy or primary peritoneal drainage (PPD). PPD has been evaluated in various studies, some claiming it to be useful while others found it doubtful [7-10]. Two randomized control trials [11, 12] have found that survival rates were not statistically different between peritoneal drainage and laparotomy groups. A recent Cochrane Review, combining the results of the two studies, concluded that no significant benefits or harms of peritoneal drainage versus laparotomy could be identified [13].

The success of peritoneal tapping in this study was about 83%. The technique of peritoneal tapping differs from that of PPD, which involves penrose drain placement under vision. Peritoneal tapping is a less invasive method, whereas PPD involves opening of the peritoneal cavity and placement of the drain. Hence, we feel that is not justified to place peritoneal tapping at par with PPD as regard to invasiveness. Despite the claims that pneumoperitoneum denotes extensive disease, which requires immediate surgery, we feel that many such patients may have small perforations in the inflamed bowel. When supported with appropriate supportive management and peritoneal decompression, the bowel gets a chance to heal. However, we do agree that this is a speculation, as those patients who responded to the treatment were not explored surgically so as to look at the bowel condition; but since these patients responded, we assume it to be true. The tapping was successful in both premature and mature neonates; however, given the limited number of patients, we did not apply any statistical test between them. This may be considered as a limitation of this study. Also, it may be queried

that why NEC occurred in full term neonates. In this regard, it is imperative to see that most of our patients, despite being full term, were low birth babies (table 1). Low birth is also a risk factor for NEC [3].

CONCLUSION

To conclude, conservative management of pneumoperitoneum by peritoneal tapping in NEC appears to be a viable option. Further studies in this regard may substantiate our efforts.

REFERENCES

1. Raval MV, Moss RL. Current concepts in the surgical approach to necrotizing enterocolitis. *Pathophysiol.* 2014; 21:105-10.
2. Kastenberg ZJ, Sylvester KG. The surgical management of necrotizing enterocolitis. *Clin Perinatol.* 2013; 40:135-48.
3. Sylvester KG, Liu GY, Albanese CT. Necrotizing enterocolitis. In: Coran AG, Krummel TM, Laberge J, Shamberger RC, Caldamone AA (Eds) *Pediatric Surgery 7th Ed Elsevier Saunders Philadelphia PA* 2012; 1187-1207.
4. Lin PW, Stoll BJ. Necrotizing enterocolitis *Lancet.* 2006; 368:1271-83.
5. Upadhyaya VD, Gangopadhyay AN, Pandey A, Upadhyaya A, Mohan TV, Gopal S, et al. Is pneumoperitoneum an absolute indication for surgery in necrotizing enterocolitis? *World J Pediatr.* 2008; 4:41-4.
6. Raval MV, Hall NJ, Pierro A, Moss RL. Evidence-based prevention and surgical treatment of necrotizing enterocolitis—A review of randomized controlled trials. *Sem Pediatr Surg.* 2013; 22: 117-21.
7. Ein SH, Shandling B, Wesson D, Filler RM. A 13-year experience with peritoneal drainage under local anesthesia for necrotizing enterocolitis perforation. *J Pediatr Surg.* 1990; 25: 1034-7.
8. Demestre X, Ginovart G, Figueras-Aloy J, Porta R, Krauel X, Garcia-Alix A, et al. Peritoneal drainage as primary management in necrotizing enterocolitis: a prospective study. *J Pediatr Surg.* 2002; 37:1534-9.
9. Moss RL, Dimmitt RA, Henry MC, Geraghty N, Efron B. A meta-analysis of peritoneal drainage versus laparotomy for perforated necrotizing enterocolitis *J Pediatr Surg.* 2001; 36: 1210-3.
10. Dimmitt RA, Meier AH, Skarsgard ED, Halamek LP, Smith BM, Moss RL. Salvage laparotomy for failure of peritoneal drainage in necrotizing enterocolitis in infants with extremely low birth weight. *J Pediatr Surg.* 2000; 35:856-9.
11. Moss RL, Dimmitt RA, Barnhart DC, Sylvester KG, Brown RL, Powell DM et al. Laparotomy versus peritoneal drainage for necrotizing enterocolitis

- and perforation. N Engl J Med. 2006; 354:2225-34.
12. Rees CM, Eaton S, Kiely EM, Wade AM, McHugh K, Pierro A. Peritoneal drainage or laparotomy for neonatal bowel perforation? A randomized controlled trial. Ann Surg. 2008; 248:44-51.
 13. Rao SC, Basani L, Simmer K, Smanakay N, Deshpande G. Peritoneal drainage versus laparotomy as initial surgical treatment for perforated necrotizing enterocolitis or spontaneous intestinal perforation in preterm low birth weight infants. Cochrane Database Syst Rev. 2011; 15:CD006182.

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