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Research Article

Comparative Study of Effect of Nasogastric Tube Decompression on Bowel Activity and Time to Oral Intake After Laparotomy in Children

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Abstract

Background: The belief that nasogastric (NG) decompression reduces vomiting from ileus after laparotomy is based largely on tradition. The aim of this study was to determine the need for nasogastric decompression after laparotomy in children.

Objective: To compare the safety and effectiveness of nasogastric decompression and no decompression after laparotomy in children.

Methods: The study was a prospective clinical trial among patients, 15 years and below, undergoing laparotomy at University of Ilorin Teaching Hospital. Consecutive patients were randomized into NG tube group and no NG tube group. All patients were assessed for time to full oral intake, time to return of bowel motility, vomiting and abdominal distension

Results: Both groups were comparable in terms of age, sex, diagnosis and procedure performed. Mean time to return of bowel motility was 2.54±0.74 days in NG tube group compared to 2.81±0.40 days in no NG tube group (p=0.09). Mean time to commencement of oral intake was 2.43±0.10 days in NG tube group compared to 2.56±0.85 days in no NG tube group (p=0.56) . Mean time to full oral intake was 4.59±1.5 days in NG tube group compared to 4.26±1.0 days in no NG tube group (p=0.34). Abdominal distension occurred in 2 patients with NG tube compared to 9 of those that had no NG tube (p=0.02). Three patients in NG tube and 2 in no NG tube had postoperative vomiting (p=1.00).

Conclusion: There was no statistically significant difference in risk of postoperative vomiting, abdominal distension, mean time to return of bowel motility and mean time to full oral intake after laparotomy in both groups.

Key Words: postoperative ileus; nasogastric tube decompression; laparotomy; paediatric laparotomy

Introduction

Surgical practice entails some routines which have evolved by elimination of many variables to achieve safe outcomes.[1] One of such routines practiced for the past 50 years is postoperative nasogastric (NG) decompression.[1] Despite the paucity of properly designed studies to support the theoretical advantages, this routine is still the standard practice of most adult and paediatric surgeons. [2-7]

Normal bowel motility results from interactions between the enteric nervous system, central nervous system, and humoral factors affecting smooth-

muscle activity.[7] Food is propelled through the small and large intestine by peristalsis, under the control of humoral and neural system. During this process, digestion and absorption of nutrients, water, electrolytes, and minerals occurs.[7]

Following laparotomy, motility and absorption capacity of the small bowel returns within a few hours.[1,8,9] Although small bowel is mobile, it contains little fluid or gas and therefore does not generate bowel sounds until the stomach resumes activity after 24 hours, pushing swallowed air and fluid into the bowel. The gas that reaches the small bowel is then rapidly emptied into the caecum. However, the colon remains inert for a long time (48 - 72 hours), with the passage of flatus or stool as a marker for motility. [8,9]

After laparotomy, physiologic ileus resolves spontaneously within 2-3 days.[8,9] It may be prolonged for more than 5 days when it is described as postoperative paralytic ileus.[8,9]

Post-operative ileus is mediated via activation of inhibitory spinal reflex arcs which are classified anatomically into ultra-short, short and long reflexes involving bowel wall, prevertebral ganglia and spinal cord respectively.[10] Other factors such as metabolic response to surgical trauma, opioids and anaesthesia may also be contributory.[7-9,11]

Clinical consequences of post-operative ileus include immobilization, with associated discomfort, increased risk of pulmonary complications and enhanced catabolism because of poor nutrition. Post-operative ileus is usually associated with abdominal distension which has been thought to be responsible for the increase incidence of these post-operative complications, hence the routine use of NG tube for post-operative decompression. This practice has enjoyed widespread acceptance for the past eight decades without consideration for patients' complaints.[8] Reason for its use varied across disciplines; anaesthetists use it to prevent aspiration and postoperative nausea and vomiting, while surgeons were concerned (in addition to the aforementioned) with prevention of wound dehiscence, incisional hernia and anastomotic leakage.[8]

The possible serious complications associated with use of routine postoperative nasogastric tube have not been appreciated by most clinicians. In fact it is regarded so lightly by some surgeons that some may consider abdominal operation as its sole indication.[12]

Some studies have shown that nasogastric decompression does not shorten time to first bowel movement or decrease time to adequate oral intake and the inappropriate use may contribute to post-operative complications in patients.[3,7,13] Dinsmore et al in 1997 questioned routine nasogastric decompression after major abdominal surgery in children, establishing that it is particularly unnecessary in children older than two years.[2] St. Peter et al in 2007, after a retrospective study of children who had surgery for perforated appendix also suggested that nasogastric tube contributes to patient's discomfort and increases time to commencement of oral intake and full oral intake and therefore should be regarded as an adjunct to symptom control and not a method of preventing complications or shortening postoperative course.[7] Despite these evidences, many surgeons still practice routine nasogastric decompression. A re-evaluation of this routine use is therefore necessary.

Most of the studies that have been carried out on this topic are in adult population and are mostly retrospective and, at best, case series with unanswered questions as to whether non-use of nasogastric intubation shortened time to resumption of oral feeding, whether it hastened discharge from hospital, and whether it produced fewer complications.

The purpose of this study was to compare the effect of the use of nasogastric decompression or non-decompression on time of resumption of oral intake, time to full oral intake, vomiting and abdominal distension after laparotomy in children.

Methods

The study was a prospective, randomized, controlled clinical study among children aged 15 years and below who underwent laparotomy in University of Ilorin Teaching Hospital from December 2016 and November 2017.

Informed consent was obtained from parents/guardians and assent from children >10 years from patients recruited from the paediatric outpatient clinic and emergency paediatric unit of the hospital. All consecutive patients who met the inclusion criteria were randomized into either the treatment (NG tube) group or control (no NG tube) group by asking blinded observer to pick a sealed envelope before induction of anaesthesia which was then opened just before closure of the abdominal wall.

Inclusion Criteria

All patients aged 15 years and below undergoing laparotomy during the study period

Exclusion Criteria

1. Patients with intestinal atresia
2. Patients with ASA Score > 3
4. Patient who had gastric surgery
5. Patients on gastrostomy
6. Patient who were undergoing re-operation

Preoperative details

All patients had standard routine preoperative evaluation and preparation for laparotomy. All procedures were done under general anaesthesia with endotracheal intubation. Standard anaesthetic care including drugs and fluid therapy were applied to all patients and recorded.

Prophylactic antibiotics where given as indicated.

Operative details

Strict adherence to operative principles with meticulous handling was ensured intra-operatively and nature of the procedure was recorded for all patients. A sealed envelope attached to the patient chart was opened by the anaesthetist before closure of the abdomen in all cases. The content of the envelope indicated whether nasogastric tube should be passed or not.

For group 1, appropriate sized NG tube was inserted by the anaesthetist just before closure of the abdomen (if not previously passed) or any NG tube already passed preoperatively is left in situ for drainage.

For group 11, any nasogastric tube placed preoperatively or intra-operatively was removed at the end of the procedure and was not replaced unless vomiting, gross abdominal distension or obstruction occurs in the postoperative period. No NG tube was inserted in those who did not have it preoperatively.

Postoperative details

All patients were maintained on appropriate management indicated by the procedure.

Graded oral intake was commenced at onset of bowel activity which was indicated by presence of two or more of: normoactive bowel sounds, clearance of NG tube effluent and passage of flatus/feaces. The time of commencement of oral intake and time to full oral intake were recorded. Morbidity(ies) incurred were also recorded.

All patients were assessed for abdominal distension at 4 hours, 24 hours, 48 hours, 4 days and 7 days. Vomiting and features of aspiration of gastric contents were also watched out for.

Results

Data was analyzed using statistical package for social sciences (SPSS version 20.0 SPSS Inc., Chicago, IL, USA)). P-value less than 0.05 was accepted as significant. Tables, and charts were used to report descriptive statistics, while mean and standard deviation (SD) were provided for continuous variables.

Of the 56 patients in this study, 28 were in each group. Their age ranged between 10 days and 15 years, mean age was 88.3±56 months. NG tube group had 15 males and the no NG tube group had 14 males.

The mean age in the NG tube group was 92.1±57 months and that of no NG tube group was 84.5±56 months. More than two-third of the patient were between 5 and 15 years in both groups. Table 1 shows sex and age distribution of the patients

Variables	NGT (n=28) n(%)	No NGT(n=28) n(%)	P value
Sex			0.79
Male	15(53.6)	14(50.0)	
Female	13(46.4)	14(50.0)	
Mean age (months) +- standard deviation	92.1+-57	84.5+-56	0.62
Age groups			0.25
<28 days	1(3.6)	0(0.0)	
28 days to 12 months	3(10.7)	6(21.4)	
12 months to <5years	4(14.3)	2(7.1)	
5 years to <10 years	7(25.0)	12(42.9)	
10 years to 15 years	13(46.4)	8(28.6)	
NGT= Nasogastric tube			

Table 1: Sex and age distribution

Nine patients in NG tube group and 10 of those in no NG tube group had ruptured appendicitis. Thirty six percent of patients in NG tube group had typhoid intestinal perforation, compared with 21.4% in no NG tube group. These differences were however not statistically significant (p=0.54).

Both groups were well matched in the type of procedure done as shown in table 2.

Variables	NGT (n=28) n(%)	No NGT (n=28) n(%)	Total	P value
Diagnosis				0.54
Ruptured appendicitis	9(32.1)	10(35.7)	19	
Typhoid intestinal Perforation	10(35.7)	6(21.4)	16	
Intussusception	6(21.4)	8(28.6)	14	
PUJ obstruction	1(3.6)	2(7.1)	3	
Nephroblastoma	0(0.0)	2(7.1)	2	
Malrotation	1(3.6)	0(0.0)	1	
Splenic rupture	1(3.6)	0(0.0)	1	
NGT=Nasogastric tube, PUJ=Pelviureteric junction				

Table 2: Mode of presentation and diagnosis

Mean time to return of bowel motility was 2.54±0.74 days in NG tube group compared to 2.81±0.40 days in no NG tube group, p=0.09. Twenty five percent of the patients on NG tube had return of bowel motility on the 1st postoperative day. Of the patients who had NG tube, 32.1% had return of bowel motility on the 3rd postoperative day compared to 39.3% of those who had no NG tube. The differences observed between the two groups in relation to procedures performed did not reach statistical significance as shown in table 3.

Return of bowel motility		Small bowel surgery	Large bowel surgery	Appendicectomy	Transperitoneal nephrectomy	Transperitoneal pyeloplasty	Splenectomy	Total	P VALUE
1st DPO	NGT	3	1	3	0	0	0	7(25)	0.35
	No NGT	1	1	0	0	1	0	3(10.7)	
2nd DPO	NGT	4	1	3	0	0	0	8(28.6)	0.47
	No NGT	1	2	5	1	0	1	10(35.7)	
3rd DPO	NGT	5	1	3	0	0	0	9(32.1)	0.60
	No NGT	3	3	4	0	1	0	11(39.3)	
4th DPO	NGT	2	1	0	0	1	0	4(14.3)	1.00
	No NGT	2	0	0	1	0	0	3(10.7)	
DPO= post operative day NGT= Nasogastric tube									

Table 3: Time to return of bowel motility

As shown in figure 1, mean time to commencement of oral intake was 2.43±0.10 days in NG tube group compared to 2.56±0.85 days in no NG tube group (p=0.56). 10 patients in NG tube and 12 in no NG tube group commenced oral intake on the 3rd postoperative day. These differences were not statistically significant (p=0.78)

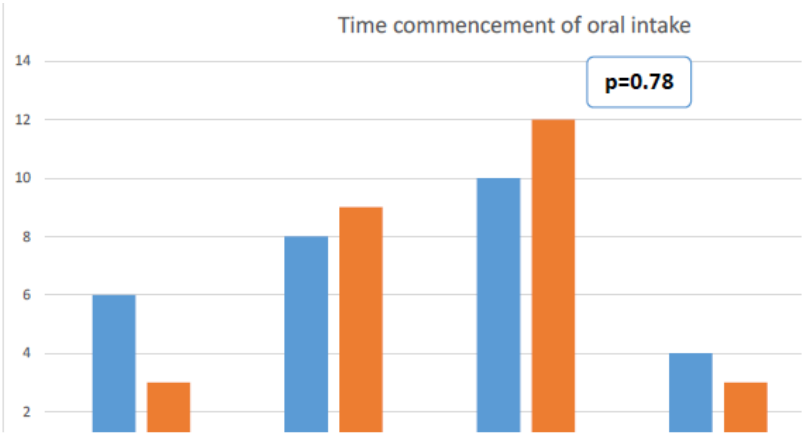

Figure 1: Time to commencement of oral intake

Mean time to full oral intake was 4.59±1.5 days in NG tube group compared to 4.26±1.0 days in no NG tube group (p=0.34) as shown in figure 2.

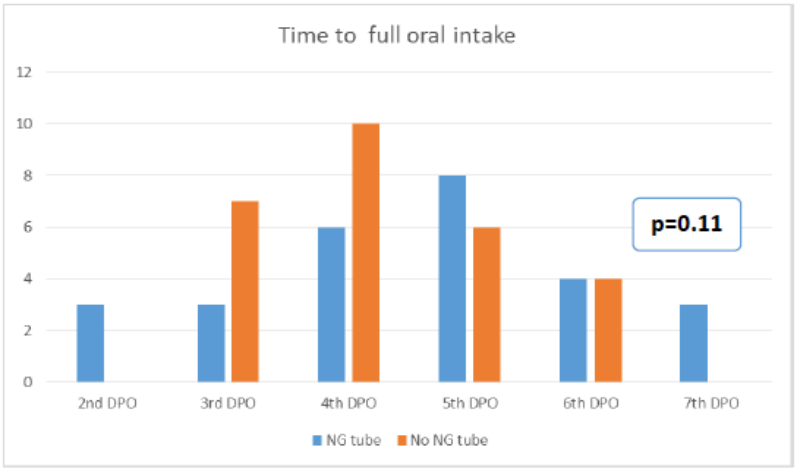

Figure 2: time to full oral intake

Abdominal distension occurred in 2(7.1%) patients with NG tube compared to 9(32.1%) of those that had no NG tube (p=0.02). Five of the patients in no NG tube group had NG tube passed due to significant abdominal distension.

Three patients in NG tube and 2 in no NG tube had postoperative vomiting. The 2 patients in no NG tube group had NG tube passed and 1 out of the 3 patients in NG tube group required re-passage of the tube after initial removal on account of persistent post-operative vomiting.

Discussion

The socio-demographic characteristics, diagnosis and procedures performed in this study were comparable in both groups. The most common diagnoses in this study were ruptured appendicitis (33.9%) and Typhoid intestinal perforation (28.6%). This is comparable to another study where the most common diagnosis among subjects studied was ruptured appendicitis and perforation of gastrointestinal tract.[14]

There was no statistically significant difference in mean time to return of bowel motility between the 2 groups (2.54±0.74 days in NG tube group and 2.81±0.40 in no NG tube group). In contrast, other authors who have reported longer duration in patients who had decompression compared to those who didn't.[15-17,19] Wolff et al,[1] reported longer mean time to return of bowel activity in both groups (3.9 days) in a similar study, although there was no significant difference between the 2 groups.[1] In studies by Zhou et al and Abatanga, patients who had NG tube removed within 12 to 24 hours after surgery had earlier return of bowel motility compared to those who had routine NG tube decompression.[12,14]

The similarity in mean time to return of bowel motility observed in the two groups studied may be explained by the fact that postoperative ileus is mediated by multiple factors such as autonomic nervous system, anaesthesia, metabolic response to trauma and postoperative medications and may not be directly influenced by the use of NG tube alone. [7,8,10,12]

The mean time to commencement of oral intake was 2.43±0.10 days in the NG tube group and 2.56±0.85 days in no NG tube group. There was no statistically significant difference between both groups (p=0.60). However, some authors reported earlier commencement of oral feeding in no NG tube group,[4,7,14,17,18,20,21] while others have reported earlier commencement of oral feeding in the NG tube group.[15] In a review of 166 children who underwent abdominal surgeries, Abatanga,[14] also reported a significant decrease in the mean time to first oral sips in those patients with the NGT removed within 24 hours after an abdominal surgical procedure as compared to those in who NG tube was left in situ for 3-5 days.[14]

The time to commencement of oral intake in this study is significantly affected by time to return of bowel motility which is in turn dependent on other factors which may not be related to the use of NG tube alone.

The difference in mean time to full oral intake was not statistically significant between both groups (4.59±1.5 days in the NG tube group vs 4.26±1.0 days in the no NG tube group, p=0.34), similar to reports by Davila-Perez et al,[21] in a study comparing use and non-use of NG tube among children undergoing elective distal bowel anastomoses where they reported 5.2±0.41 days in NG tube group and 5.1±0.6 days in no NG tube group. In a report by St Peter et al,[7] time to full oral intake was significantly longer in patients who had decompression compared to those who didn't. There is also report of significantly shorter time to full oral intake in patients who didn't have routine decompression in similar studies. [14,18]

A larger percentage of patients in no NG tube group had abdominal distension compared with those in no NG tube group (32.1% of patients in no NG tube vs 7.1% of those in NG tube group, p=0.02). This is similar to finding in a meta-analysis by Cheatham et al. [3] Although the incidence of abdominal distension was increased in the absence of NG tube, only five of the 9 patients who had persistent abdominal distension with splinting of the diaphragm in the no NG tube group had the tube passed for them. This therefore means that, the use of NG tube can still be avoided even in some cases of abdominal distension after laparotomy.

The incidence of vomiting in this study was higher in NG tube group compared with no NG tube group (10.7% of patients in NG tube group versus 7.1% of those in no NG tube group), although this difference did not reach not statistical significance. This was comparable to findings from previous studies. [4,7,8] NG tube was passed for 2(7.1%) the patients in no NG tube group who had persistent vomiting post operatively and 3.6% of those in the NG tube group in this study also needed re-placement of the tube after initial removal. Thus, 92% of the patients in this study avoided routine NG tube decompression. Only 7.1% of the patients in no NG tube group needed an NG tube passed, which is similar to the report of 11% by Dinsmore et al. [2] Some other studies however found significant decrease in incidence of nausea, vomiting and abdominal distension in patients who had NG tube. [1,19]

There are literature reports of an increase in incidence of post-operative vomiting in the absence of NG tube decompression.[15] Cheatham et al observed in a meta-analysis comparing selective versus routine nasogastric decompression after elective laparotomy that 8.5% of routinely decompressed patients still had vomiting while on NG tube.[3] The finding of vomiting in patients with NG tube in this study is supported by literature report that the use of NG tube does not completely eliminate the risk of vomiting, as up to 10% of patients who have NG tube decompression may still vomit after laparotomy.[8,17]

Conclusion

This study has shown that the use of nasogastric tube for decompression postoperatively did not significantly affect time to return of bowel motility, time to commencement and time to full oral intake after laparotomy in children. Although incidence of abdominal distension increased in the absence of NG tube, most of the patients still did well without having the tube re-passed.

A multicenter study with larger sample size is recommended to create more robust and widely acceptable findings from this study.

Limitations of the Study

- This study is non-blinded because it was impossible to hide the nasogastric tube in the NG tube group. However assessment of outcome measures by an independent observer would have reduced the possibility of bias.
- The small sample size in this study may not be a true representative of the larger population

Recommendations

In view of the findings in this study, we recommend that nasogastric tube decompression should not be a routine practice after laparotomy in children, except in clear cases of intractable postoperative vomiting and persistent abdominal distension where it may be useful for the relief of significant gastrointestinal symptoms. Postoperative NG tube decompression is also recommended in patients with high risk of vomiting and abdominal distension such as patients with intestinal atresia, patients who have had gastric surgery and very sick patients with ASA class 111 and above.

A multicenter study with larger sample size is recommended to create more robust and widely acceptable findings from this study

Author Contributions

Conceptualization, Resources, Project administration, Methodology, Writing- original draft preparation: (Muslimat Ajibola Alada)

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Ratification, Supervision: (abdulrasheed nasir) and (lukman olajide abdurrahman) and (james olaniyi adeniran)

Data collection: (muslimat ajibola alada), (adewale olaotan oyinloye), (nurudeen toyin abdulraheem), (olanrewaju moses), (chibueze nwosu)

Conflict of Interest

We declare no conflict of interest in the conduct of this study.

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