Review Article

Post-Operative Nasogastric Decompression after Intestinal Surgery in Children: Systematic Review and Meta-Analysis

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Abstract

Background: Nasogastric decompression the usage of a Nasogastric Tube (NGT) has been robotically executed after intestinal surgery as it's far believed that the drainage of gastrointestinal content and intraluminal air can prevent postoperative complications consisting of an anastomotic leak, wound dehiscence, pulmonary headaches, nausea, and vomiting at the same time as stimulating the return of bowel feature, and shortening the length of hospital stay. But, ordinary postoperative NGT placement can cause discomfort and pain in children. **Aim:** This work aims to determine the efficacy and safety of postoperative nasogastric decompression (NGT), in intestinal surgery children. **Methodology:** A systematic search was performed over different medical databases to identify general surgery studies, which studied the outcome of the NGT group versus the non-NGT group of intestinal surgery children. We conducted a meta-analysis process on Length of Hospital Stay (LOS), as a primary efficacy outcome, and on complications rate (vomiting, abdominal distention, and NGT reinsertion) as secondary safety outcomes. Five studies were identified involving 507 patients, with 241 patients in the NGT group, and 266 patients in the non-NGT group. Our meta-analysis process showed a non-significant difference in LOS, overall complications rate and NGT reinsertion rate in the NGT group compared to the non-NGT group ($p>0.05$ respectively). **Conclusion:** To conclude, routine postoperative nasogastric decompression in children undergoing intestinal surgery has no benefit in reducing postoperative complications or the return of bowel function while causing patient discomfort. In addition, postoperative management without nasogastric decompression shortens the time to first oral intake, time to full oral intake, and the length of hospital stay. Therefore, routine postoperative nasogastric decompression can be safely abandoned in children undergoing intestinal surgery.

Keywords: Nasogastric decompression; Intestinal surgery; Children

Introduction

Small bowel obstruction attributable to adhesive disorder is a significant contributor to postoperative morbidity in children. Similarly, operative treatment for the adhesive disease is relatively excessive-chance, with as many as one-third of adult sufferers maintaining further bowel injury at some point of adhesiolysis strategies. For this reason, the availability of a powerful non-operative intervention may want to result in decreased affected person morbidity, expanded patient safety, reduced hospital period of stay, and cost savings. [1]

Nasogastric decompression the usage of a Nasogastric Tube (NGT) has been robotically executed after intestinal surgery as it's far believed that the drainage of gastrointestinal content and intraluminal air can prevent postoperative complications consisting of an anastomotic leak, wound dehiscence, pulmonary headaches, nausea, and vomiting at the same time as stimulating the return of bowel feature and shortening the length of hospital stay. But, ordinary postoperative NGT placement can cause discomfort and pain in children. [2]

The need for early postoperative enteral nutrients has won worldwide attractiveness and has been a first-rate element in postoperative rehabilitative regimens, especially in children. Even though a few surgeons practice routine nasogastric tube feeding in children due to the ease to titrate the feeds, it bypasses many essential physiological aspects of digestion. There's enough literature in adults thinking about the usefulness of postoperative nasogastric tubes following optionally available bowel surgery. [3] This work aims to determine the efficacy and

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safety of postoperative nasogastric decompression (NGT), in intestinal surgery children.

Methodology

Our review came following the (PRISMA) statement guidelines. [4]

Study eligibility

The included studies should be in english, a journal published article, and a human study describing intestinal surgery children. The excluded studies were either animal or non-English studies or articles describing intestinal surgery (adult) patients.

Study identification

Basic searching was done over the pubmed, cochrane library, and google scholar using the following keywords: nasogastric decompression, intestinal surgery and children.

Data extraction

Comparative studies, clinical trials, and Randomized Controlled Trials (RCTs), which studied the outcome of the NGT group versus the non-NGT group of intestinal surgery children, will be reviewed. Outcome measures included Length of Hospital Stay (LOS), as a primary efficacy outcome, and complications rate (vomiting, abdominal distention, and NGT reinsertion) as secondary safety outcomes.

Study selection

We found 150 records, 90 excluded because of the title; 60 articles are searched for eligibility by full-text review; 24 articles cannot be accessed; 13 studies were reviews and case reports; 11 were not describing functional outcome; the desired procedure not used in 7 studies. The studies which met all inclusion criteria were 5 studies.

Statistical analysis

Pooled Odds Ratios (OR), Standard Mean Differences (SMDs), Proportions (%), with 95% Confidence Intervals (CI) assessed, using a statistical package (MedCalc, Belgium). The meta-analysis process was established *via* I^2-statistics (either the fixed-effects model or the random-effects model), according to the Q test for heterogeneity.

The included studies were published between 2007 and 2019. Regarding the type of included studies, 2 studies (out of 5 studies) were retrospective cohort, 1 prospective cohort, and 2 studies were RCTs. Regarding patients' characteristics, the total number of patients in all the included studies was 507 patients, with 241 patients in the NGT group, and 266 patients in the non-NGT group. The mean age at surgery was (6 years) [**Table 1**]. [5-9] Our meta-analysis included 5 studies comparing 2 different groups of patients; with a total number of patients (N= 507) [**Table 2**].

Each outcome was measured by

Standard Mean Difference (SMD)

• For LOS.

Odds Ratio (OR)

• For overall complications rate.

• For vomiting rate.

• For abdominal distention rate.

• For NGT reinsertion.

Concerning the primary efficacy outcome measure, we found 5 studies that reported LOS. I^2 (inconsistency) was 97.2%, Q test for heterogeneity ($p<0.001$), so random-effects model was carried out; with overall SMD=1.17 (95% CI=-0.102 to 2.442). The random-effects model of the meta-analysis process revealed a non-significant difference in mean LOS in the NGT group compared to the non-NGT group ($p>0.05$) [**Figure 1**].

Concerning the secondary safety outcome measures, we found 5 studies that reported an overall complications rate. I^2 (inconsistency) was 60%, Q test for heterogeneity ($p=0.037$), so random-effects model was carried out; with overall OR=0.509 (95% CI=0.174 to 1.483). The random-effects model of the meta-analysis process revealed a non-significant difference in overall complications rate in the NGT group compared to the non-NGT group ($p>0.05$) [**Figure 2**]. We found 4 studies that reported NGT reinsertion rate. I^2 (inconsistency) was 29.6%, Q test for heterogeneity ($p>0.05$), so fixed-effects model was carried out; with overall OR=0.678 (95% CI=0.260 to 1.768).

Table 1: Patients and study characteristics.

N	Author	Type of study	Number of patients			Age at surgery (average years)
			Total	NGT group	Non-NGT group	
1	Peter et al. [5]	Retrospective cohort	159	105	54	8
2	Davila-Perez et al. [6]	RCT	60	29	31	4.5
3	Abantanga et al. [7]	Prospective cohort	166	46	120	5
4	Khan et al. [8]	RCT	60	30	30	4.65
5	Sekioka et al. [9]	Retrospective cohort	62	31	31	7.8

Table 2: Summary of outcome measures in all studies.

N	Author	Primary efficacy outcome		Secondary safety outcomes			
		LOS		Overall complications rate		NGT reinsertion rate	
		NGT group	Non-NGT group	NGT group	Non-NGT group	NGT group	Non-NGT group
1	Peter et al.	6	5.6	0	2	0	2
2	Davila-Perez et al.	6.5	6.6	3	14	0	1
3	Abantanga et al.	12.8	8.3	4	6	4	6
4	Khan et al.	4.8	3.8	3	7	1	3
5	Sekioka et al.	9	7	9	8	---	---

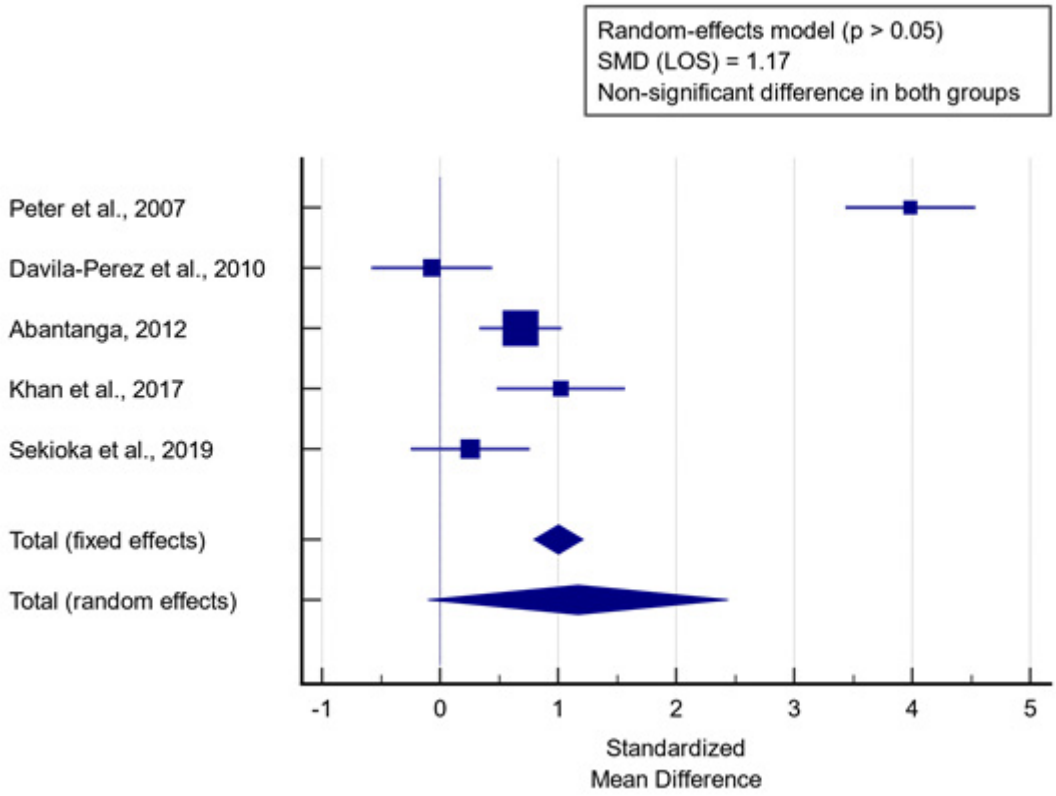

Figure 1: Forest plot (LOS).

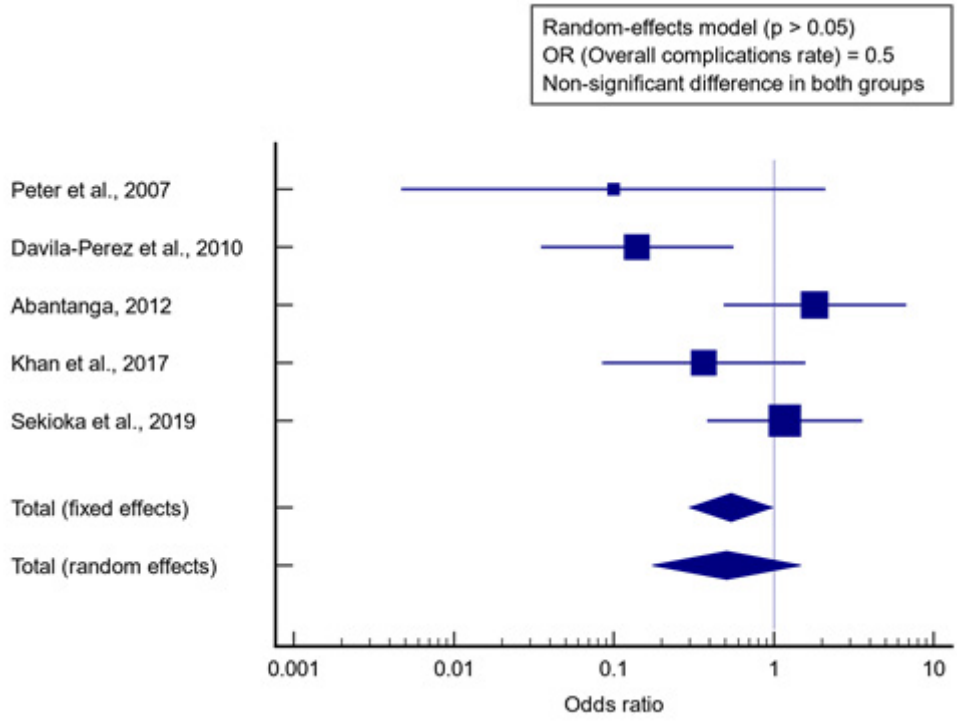

Figure 2: Forest plot (overall complications rate).

The fixed-effects model of the meta-analysis process revealed a non-significant difference in NGT reinsertion rate in the NGT group compared to the non-NGT group (p>0.05) [**Figure 3**].

Discussion

This work aims to determine the efficacy and safety of postoperative nasogastric decompression (NGT), in intestinal surgery children. The included studies were published between 2007 and 2019. Regarding the type included studies, 2 studies (out of 5 studies) were retrospective cohort, 1 prospective cohort, and 2 studies were RCTs. Regarding patients' characteristics, the total number of patients in all the included studies was 507 patients, with 241 patients in the NGT group, and 266 patients in the non-NGT group. The mean age at surgery was (6 years).

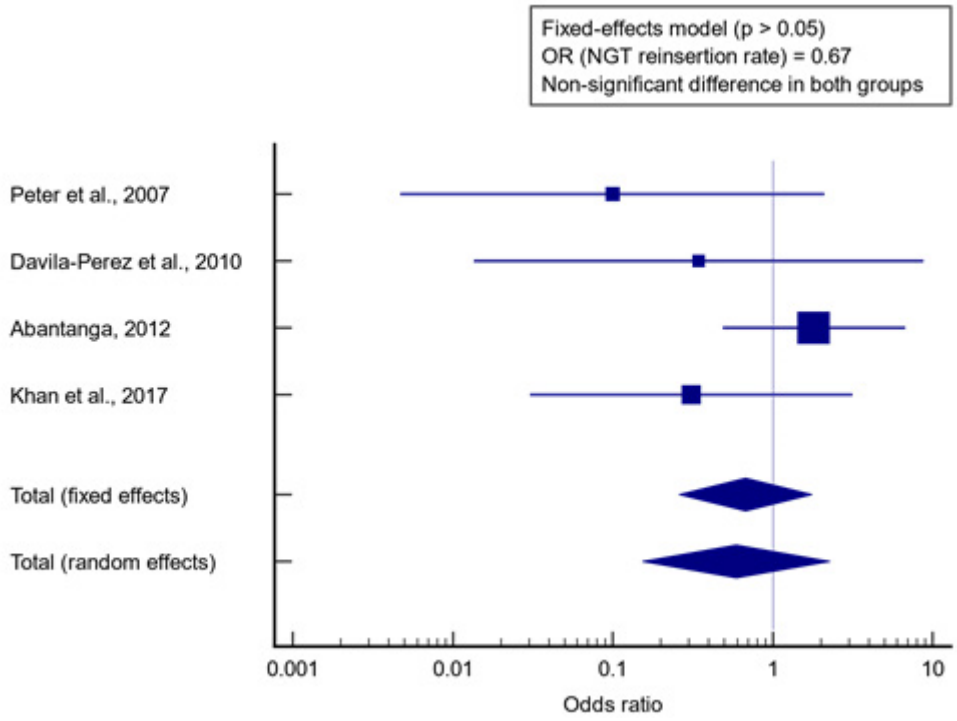

Figure 3: Forest plot (NGT reinsertion rate).

Our meta-analysis included 5 studies comparing 2 different groups of patients; with a total number of patients (N=507). Concerning the primary efficacy outcome measure, we found 5 studies that reported LOS. The random-effects model of the meta-analysis process revealed a non-significant difference in mean LOS in the NGT group compared to the non-NGT group (p>0.05) which came in agreement with Linden et al.; Bergeat et al. [1,10]

Linden et al. reported that median overall hospital LOS trended shorter in the post protocol group, though was not statistically significant (6.2 days (pre protocol) *vs.* 3.6 days (post protocol); p=0.12). No patients were readmitted within 30 days in the post protocol cohort. Further, median hospital LOS for non-operative patients was slightly shorter in the post protocol group, but not statistically significant (3.5 days (pre protocol) *vs*. 3.1 days (post protocol); p=0.56). [1] Bergeat et al. reported that, median (interquartile) length of hospital stay for patients without NGTD was not significantly different compared with those with NGTD (10.0 (9.0-16.3) *vs*. 12.0 (10.0-16.0) days; P=0.14). [10] Our result came in disagreement with Chusilp et al.; Arena et al.; Khan et al.; Dagorno et al.; Sekioka et al. [2,3,11-13] Chusilp et al. reported that all of six included studies reported length of hospital stay. The overall ranges of the length of hospital stay were 5 days-13 days in the NGT group and 4 days-8 days in the no NGT group. Five studies reported a significantly shorter length of hospital stay in the no NGT group compared to the NGT group (p<0.05).

Arena et al. reported that length of stay" was significantly lower in the ERAS groups (p<0.0001, OR 0.310, lower limit 0.241, upper limit 0.401). [11] Khan et al. reported that patients in the NNG group progressed to full oral feeds significantly earlier (57 ± 18 *vs*. 106.07 ± 18.35 h, p<0.001) and had a shorter duration of hospital stay (91.93 ± 26.03 *vs*. 114.67 ± 18.83 h, p<0.001) as compared to the NG group. [3] Dagorno et al. reported that, of 180 abstracts screened, 20 full-text articles were analyzed, and 9 were included in our systematic review (1 randomized controlled trial, 3 prospective, and 5 retrospective studies), involving a total number of 531 patients. ERAS has been applied to laparoscopy for digestive (n=7 studies) or urologic surgeries (n=1), as well as thoracoscopy (n=1). Mean LOS was decreased in ERAS children compared to controls (6 studies, -1.12 days, p<0.0 0 0 01). [12]

Sekioka et al. reported that there were no significant differences between the two groups in most parameters of patient demographics, or surgical data. Notably, the meantime to first oral intake and regular diet was significantly shorter in the non-NGT group (1 day *vs*. 3 days, P<0.0001; and 4 days *vs*. 7 days, P=0.003, respectively). Postoperative length of stay was significantly shorter in the no-NGT group (7 days *vs*. 9 days, P<0.0001). [13] Concerning the secondary safety outcome measures, we found 5 studies that reported an overall complications rate. The random-effects model of the meta-analysis process revealed a non-significant difference in overall complications rate in the NGT group compared to the non-NGT group (p>0.05) which came in agreement with Chusilp et al.; Arena et al.; Bergeat et al.; Dagorno et al. [2,10-12]

Chusilp et al. reported that the general rate of wound dehiscence was 2.4% (4/169) in the NGT group and 1.6% (4/245) in the no NGT group. Meta-evaluation of RCTs in children undergoing elective intestinal surgical operation confirmed massive growth of mild vomiting in no NGT group as compared with NGT group (OR 3.54) but no widespread difference in persistent vomiting requiring NGT reinsertion (OR 3.11), abdominal distension (OR 2.36), NGT reinsertion (OR 3.11), wound contamination (OR 1.63) and time to go back of bowel motion (MD-0.14). [2]

Arena et al. reported that, there was no significant difference

in post-operative complication occurrence (p=0.286, OR 0.742, lower limit 0.429, upper limit 1.283). [11] Bergeat et al. reported that the 2 groups had similar affected person demographic and scientific characteristics at baseline. The median (interquartile range) age turned into (57.0-66.5) years within the institution with NGTD (38 (64.4%) have been adult males) and 64.0 (58.0-68.0) years within the organization without NGTD (31(59.6%) were adult males). The postoperative hassle costs grade II or better were comparable among the two corporations (risk ratio, 0.99; P>0.99). Pulmonary hassle charges (threat ratio, 0.59; P=0.44) and delayed gastric emptying quotes (threat ratio, 1.07; P>0.99) were no longer significantly exclusive between the groups. [10]

Dagorno et al. reported that, there was no difference in complication rates between ERAS children and control children (5 studies, 13% *vs*. 14%, OR=0.84, p=0.52). The 30-day readmission rate was decreased in ERAS children compared to controls (6 studies, 4% *vs*. 10%, OR=0.34, p=0.001). [12] Our result came in disagreement with Gaignard et al. [14] Gaignard et al. reported that, Patients in the NGT+group had presented more grade 2 or higher complications, 82 (82.8%) versus 16 (40%) in the NGT-group (p<0.001). Rates of pancreatic fistula grades B-C according to ISGPF classification were 19.2% (n=19) and 15% (n=6).

We found 4 studies that reported NGT reinsertion rate. The fixed-effects model of the meta-analysis process revealed a non-significant difference in NGT reinsertion rate in the NGT group compared to the non-NGT group (p>0.05) which came in agreement with Chusilp et al.; Khan et al. [2,3] Chusilp et al. reported that the RCTs in children undergoing elective intestinal surgery with anastomosis showed no significant difference in NGT reinsertion between the 2 groups (OR 3.11; p=0.24; I^2=0). The overall rate of NGT reinsertion from four studies was 2.4% (5/210) in the NGT group and 5.1% (12/235) in the no NGT group.

Khan et al. reported that a considerable wide variety of sufferers with nasogastric tubes reported sore throat (9 *vs*. 1 p=0.03) and nausea (5 *vs*. 0 p=0.010). There has been no significant difference in return of bowel function (39 h ± 15.92 *vs*. 43.60 h ± 17.77, p=0.171), hiccups, sleep disturbance, complications, and nasogastric tube reinsertion rate between the two groups. [3] Our result came in disagreement with Gaignard et al. [14] Gaignard et al. reported that Reinsertion of an NGT turned into required in nine (22.5%) sufferers within the NGT-organization, after a mean of three ± 1 days following surgery. among these nine patients, 5 (55.6%) required NGT reinsertion for secondary DGE because of the postoperative problem.

Conclusion

To conclude, routine postoperative nasogastric decompression in children undergoing intestinal surgery has no benefit in reducing neither postoperative complications nor the return of bowel function while causing patient discomfort. In addition, postoperative management without nasogastric decompression shortens the time to first oral intake, time to full oral intake, and the length of hospital stay. Therefore, routine postoperative nasogastric decompression can be safely abandoned in children undergoing intestinal surgery.

Acknowledgment

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