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Pooled Analysis of the Routine Nasogastric Decompression Necessity for Elective Gastrectomy

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Abstract

Background: Nasogastric decompression is routinely used for intestinal drainage or decompression after gastrectomy. However, nowadays its efficacy is under debate.
Objectives: The purpose of this study was to investigate the efficacy and necessity of nasogastric decompression in radical gastrectomy for gastric cancer.
Methods: Two PubMed and EMBASE electronic databases were retrieved by November 2018. A prospective randomized controlled trial (RCT) and comparison of nasogastric decompression with and without nasogastric decompression after gastrectomy are required for eligible studies.
Results: A total of 1,885 cases were included in 13 randomized controlled studies. There were 941 cases in nasogastric decompression group and 944 cases in non-nasogastric decompression group after gastrectomy. The patients in non-nasogastric decompression group had significantly shorter time of bowel sound return (WMD = -0.20, 95% CIs = -0.38 - 0.02, P = 0.03), shorter time of first oral intake (WMD = -0.58, 95% CIs = -0.92 - 0.24, P = 0.0007), faster tolerance to semi-solid diet (WMD = -0.65, 95% CIs = -0.96 - 0.34, P < 0.0001), and shorter time of postoperative hospital stay (WMD = -0.99, 95% CIs = -1.70 - 0.27, P = 0.007). No statistically significant differences were observed in the first time to passage of flatus, vomiting, mortality rates, total complications, gastrointestinal complications, wound complications, respiratory complications, anastomosis or duodenal stump fistula, and general complications.
Conclusions: The routine nasogastric decompression was not recommended for patients after elective gastrectomy.

Keywords: Nasogastric Decompression, Gastrectomy, Meta-Analysis

1. Background

Nasogastric decompression is considered to reduce postoperative intestinal obstruction (nausea, vomiting and abdominal distention), wound and respiratory complications, as well as the incidence of anastomotic fistula after gastrointestinal surgery (1-3). Therefore, after most abdominal operations, the nasogastric tube is routinely used to absorb air and gastrointestinal fluids. Although the need for nasogastric decompression after abdominal surgery has been increasingly investigated over the past 20 years, many general surgeons utilize it for several days until the patient passes the flatus. Over the past few years, a number of clinical studies have shown that this practice not only results in no benefit but also increases discomfort and respiratory complications in patients (4-7).

Gastrectomy is the main methods for stomach diseases in the gastrointestinal surgery department, especially for gastric tumors. Anastomotic fistula and prolonged postoperative ileus are important problems after gastrectomy because it may lead to severe morbidity and mortality. Although enhanced recovery after surgery (ERAS) protocols provides standardized preoperative, intraoperative, and postoperative care principles (8), some surgeons insist on the routine placement of gastrointestinal decompression tubes for gastrectomy. Consequently, the prophylactic use of nasogastric decompression has become a surgical dogma after gastrectomy to date. A number of studies have emphasized the need for this practice. A meta-analysis published in 2008 reported that the duration of oral diet was significantly shorter in patients who did not undergo nasogastric decompression after gastrectomy (9). This meta-analysis should be updated and revised because further new randomized clinical trials (RCT) have been reported since 2008.

2. Objectives

The objective of this meta-analysis was to reassess the need for nasogastric decompression after elective gastrectomy and to send an updated and revised summary of available evidence to general surgeons in order to better align their practice with current evidence.

3. Methods

3.1. Literature Search Strategy

Two PubMed and EMBASE electronic databases were retrieved by November 2018. The following terms were used: nasogastric or nasojejunal decompression, nasogastric or nasojejunal suction, nasogastric or nasojejunal intubation, nasogastric or nasojejunal tube insertion, gastrectomy, and gastric resection. The search was restricted to those studies published in English or Chinese. We did not consider abstracts or unpublished reports. At the same time, the reference lists of reviews and retrieved articles were hand-searched. This meta-analysis study was carried out in accordance with preferred reporting of systematic reviews and meta-analyses (PRISMA).

3.2. Inclusion and Exclusion Criteria

We reviewed the abstracts of all references and retrieved studies. The following criteria were used to include published studies: (a) they had to be prospective randomized controlled trials (RCTs), (b) they had to be studies comparing individuals with and without nasogastric decompression after gastrectomy, and (c) they had to contain sufficient raw data to estimate the weighted mean difference (WMD) and the odds ratio (OR) with a 95% confidence interval (CI). The main exclusion criteria were: (1) lack of raw data; (2) duplication; and (3) unavailability of data.

3.3. Data Extraction

Data for each study were extracted by two reviewers (Yang Ping and Lin Xiu-Feng) according to predetermined selection criteria. Any disagreements that arise in the screening and quality assessment process were resolved through discussion.

3.4. Exposure Definition

The non-nasogastric decompression (non-NGD) group was defined as: no tubes inserted or tube was removed after operation or tube was removed in the recovery room whereas the nasogastric decompression (NGD) group was defined as: the tube was placed and drained continuously to the passage of the exhaust or stool after the operation. Postoperative oral intake was restricted for all patients until the passage of flatus.

3.5. Statistical Analysis

RevMan5.3 software provided by Cochrane Collaboration was used for statistical analysis. Dichotomous variables were analyzed using the OR; when both means and standard deviations were presented, continuous variables were evaluated using the WMD. Heterogeneity was checked by chi-square test. If the results of the trials had heterogeneity, a random effect model was used for meta-analysis. Otherwise, a fixed effect model was used. The $P < 0.05$ was considered statistically significant. The results were expressed with OR and WMD for the dichotomous variables and continuous variables with 95% CIs. The publication bias of literature analysis had adopted Begg's funnel plot.

4. Results

4.1. Study Characteristics

There were 205 papers relevant to the searching words (Figure 1). Through the steps of filtering the title, abstracts, and full text, 13 papers were found to conform to our inclusion criteria finally (10-22). Among thirteen RCT studies, which included 1,885 cases, 941 were randomly divided into the NGD group and 944 to the non-NGD group after gastrectomy. Characteristics of the studies included in this meta-analysis are presented in Table 1.

4.2. Quality of Included Studies

All the thirteen studies were prospective, randomized, and nine of thirteen had a detailed description of methods for randomization, four with a computer-generated random number allocation, four with a randomization numbers table, and one with an envelope method random.

4.3. Quantitative Data Synthesis

4.3.1. Return of Bowel Sound

Two studies (11, 16) reported means of time to return of bowel sound with precise standard deviations. The results showed that there was a statistically significant difference (WMD = -0.20, 95% CIs = -0.38—0.02, P = 0.03) between non-NGD group and NGD group. The heterogeneity was not observed among two studies, so the fixed effects model was used (Table 2).

4.3.2. Time to Passage of Flatus

Ten studies (11, 13-19, 21, 22) reported means of time to flatus with precise standard deviations. The other two studies (10, 12, 20) did not report on this variable. The results showed that there was no statistically significant difference between non-NGD and NGD groups (WMD = -0.17,

Table 1. Characteristics of RCT Studies Included in This Meta-Analysis

First Author (Ref.)	Country	Study Period	No. of NGD/Non-NGD	Total Gastrectomy	Randomization Method	Definition of Non-NGD
Wu (10)	China	1990.8 - 1991.8	37/37	0/0	No referred	Tube was removed after operation
Lee (11)	Korea	2000.3 - 2000.6	63/56	22/26	Random numbers table	No tubes inserted
Yoo (12)	Korea	1999.7 - 2000.7	69/67	18/17	Random numbers table	No tubes inserted
Doglietto (13)	Italy	2001.6 - 2001.12	116/121	116/121	Computer-generated random numbers	No tubes inserted
Carrere (14)	France	1995.5 - 2002.5	43/41	14/13	Computer-generated random numbers	Tubes were removed in the recovery room
Hsu (15)	China	2005.1 - 2005.12	76/75	25/23	Random numbers table	No tubes inserted
Mei (16)	China	2007.10 - 2009.1	53/55	13/13	Envelope method random	No tubes inserted
Tavassoli (17)	Iran	2001 - 2008	25/25	25/25	No referred	Tubes were removed in the recovery room
Li (18)	China	2007.10 - 2009.1	50/54	13/13	Computer-generated random numbers	No tubes inserted
Yu (19)	China	2009.12 - 2011.3	86/88	Not stated	Random numbers table	Tube was removed after operation
Rossetti (20)	Italy	2008.1 - 2012.11	70/75	0/0	No referred	No tubes inserted
Pacelli (21)	Italy	2010.1 - 2012.6	134/136	0/0	Computer-generated random numbers	No tubes inserted
Kimura (22)	Japan	2005.1 - 2009.12	119/114	0/0	No referred	Tube was removed after operation

Abbreviations: RCT, randomized controlled study, NGD, nasogastric decompression.

Table 2. Postoperative Courses Statistical Results by RevMan5.3 (non-NGD Group vs. NGD Group)

Groups	No. of Studies	WMD/OR (95% CIs)	Statistical Method	P Value
Return of bowel sound, d	2	-0.20 (-0.38 - 0.02)	Fixed	0.03
First flatus, d	10	-0.17 (-0.48 - 0.15)	Random	0.30
Time to first oral intake, d	8	-0.58 (-0.92 - 0.24)	Random	0.0007
Tolerance to semi-solid diet, d	3	-0.65 (-0.96 - 0.34)	Fixed	< 0.0001
Nausea/vomiting	6	0.83 (0.34 - 2.07)	Random	0.70
Nausea	5	0.38 (0.15 - 0.98)	Random	0.04
Vomiting	6	1.05 (0.59 - 1.88)	Fixed	0.86
Discomfort from the tube	6	0.01 (0.00 - 0.02)	Fixed	< 0.00001
Postoperative hospital days	11	-0.99 (-1.70 - 0.27)	Random	0.007

Abbreviations: NGD, nasogastric decompression, WMD, weighted mean difference.

95% CIs = -0.48 - 0.15, P = 0.30). Since a heterogeneity was observed in seven studies ($\chi^2 = 104.21, P < 0.00001, I^2 = 91\%$), thus the random effects model was used (Figure 2 and Table 2).

4.3.3. Time to First Oral Intake

Eight studies (11, 13-18, 21) reported means of time to first oral intake with precise standard deviations. The other five studies (10, 12, 19, 20, 22) did not report on this variable. The results of this meta-analysis showed that there was a significant difference between the non-NGD and NGD groups (WMD = -0.58, 95% CIs = -0.92 - 0.24, P = 0.0007). Since the heterogeneity was observed among eight studies; therefore, the random effects model was used (Figure 3 and Table 2).

4.3.4. Tolerance to Semi-Solid Diet

Three studies reported means of time of tolerance to semi-solid diet with precise standard deviations (11, 16, 18). The combined results showed that time of tolerance to

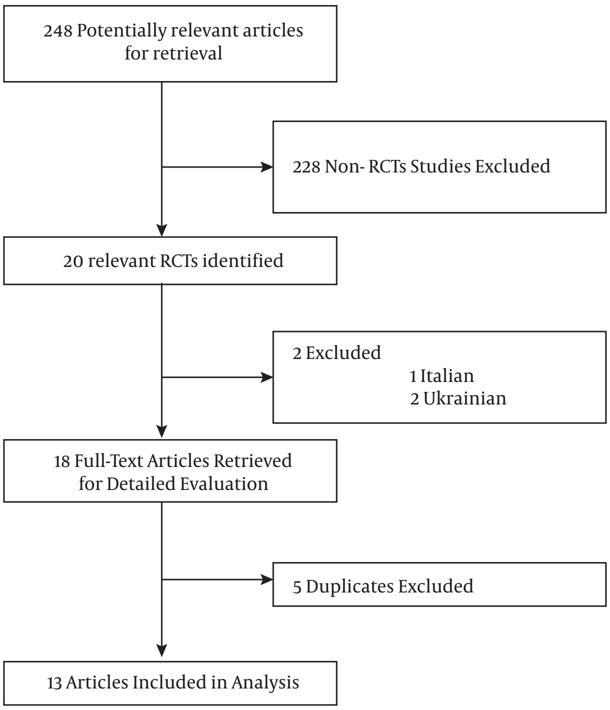

Figure 1. Study identification, inclusion, and exclusion

semi-solid was significantly shorter in the non-NGD group than the NGD group (WMD = -0.65, 95% CIs = -0.96 - 0.34, P < 0.0001) accompanied by no evidence of significant heterogeneity (Table 2).

4.3.5. Nausea and Vomiting

Six studies reported nausea/vomiting (10, 12, 14, 15, 19, 22). No significant difference was found between the non-NGD group than the NGD group (OR = 0.83, 95% CIs = 0.34 - 2.07, P = 0.70), and a similar outcome was detected in vomiting (OR = 1.05, 95% CIs = 0.59 - 1.88, P = 0.86) accompanied by no obvious heterogeneity. However, subgroup analysis showed that nausea was significantly lower in the non-NGD group than the NGD group (OR = 0.38, 95% CIs = 0.15 - 0.98, P = 0.04), and there was a significant heterogeneity between the two groups (Table 2).

4.3.6. Discomfort from the Tube

Six studies reported discomfort from the tube (14-16, 18, 21, 22). Here, 221 patients (46.53%) complained of moderate to severe discomfort caused by the nasogastric tube. The results were significant (OR = 0.01, 95% CIs = 0.00 - 0.02, P < 0.00001) without heterogeneity (Table 2).

4.3.7. Postoperative Hospital Stay Days

Eleven articles reported means of time of postoperative hospital stay with precise standard deviations (11, 13-22). The other two studies reported medians of time to postoperative hospital stay, but without standard deviations (10, 12). The meta-analysis results showed that time of postoperative hospital stay was significantly shorter in the non-NGD group than the NGD group (WMD = -0.99, 95% CIs = -1.70 - 0.27, P = 0.007). The random effects model was used because the heterogeneity was observed among seven studies (Figure 4 and Table 2).

4.3.8. Mortality Rates

Deaths were recorded in only four studies (13-15, 21), the others had no deaths. The combined results showed that mortality rates were similar between the two groups (OR = 1.00, 95% CIs = 0.32 - 3.14, P = 1.0), without significant heterogeneity (Table 3).

4.3.9. Total Complications

Nine papers (10, 11, 14-16, 18, 20-22) recorded total complications. No significant difference was observed (OR = 0.98, 95% CIs = 0.74 - 1.29, P = 0.86) accompanied by no evidence of significant heterogeneity (Table 3).

4.3.10. Gastrointestinal Complications

Seven studies (11, 14-16, 18, 19, 22) reported postoperative obstruction and the summary statistic showed that there was no statistical significance (OR = 0.77, 95% CIs = 0.25 - 2.34, P = 0.64) without evidence of significant heterogeneity. In addition, a similar outcome was observed in Gastroparesis (OR = 0.58, 95% CIs = 0.14 - 2.43, P = 0.45) and intra-abdominal abscess (OR = 0.96, 95% CIs = 0.53 - 1.74, P = 0.89) (Table 3).

4.3.11. Wound Complications

Nine studies (10-15, 18, 21, 22) reported wound infection and seven studies (10, 12-15, 18, 21) reported wound dehiscence, but no significant difference was reported (wound infection: OR = 0.80, 95% CIs = 0.43–1.46, P = 0.46; wound dehiscence: OR = 1.09, 95% CIs = 0.46–2.60, P = 0.84) (Table 3).

4.3.12. Respiratory Complications

Ten studies (10-16, 18, 21, 22) reported pneumonia and six studies (11-13, 15, 16, 22) reported atelectasis, but there was no significant difference (pneumonia: OR = 0.72, 95% CIs = 0.45 - 1.16, P = 0.18; atelectasis: OR = 0.89, 95% CIs = 0.46 - 1.72, P = 0.72) (Table 3).

Study or Subgroup	Non-NGD Group Mean	Non-NGD Group SD	Non-NGD Group Total	NGD Group Mean	NGD Group SD	NGD Group Total	Weight	Mean Difference IV, Random, 95% CI
Carrère(2007)	3.7	0.2	41	4.5	0.2	43	12.2%	-0.80 [-0.89, -0.71]
Doglietto(2004)	4.5	1.7	121	4.6	1.3	116	10.4%	-0.10 [-0.48, 0.28]
Hsu(2007)	4	0.6	75	4.1	1	76	11.3%	-0.10 [-0.36, 0.16]
Kimura(2017)	3	7.2	114	3	1.8	119	3.7%	0.00 [-1.36, 1.36]
Lee(2002)	3.5	0.9	56	3.8	0.9	63	10.8%	-0.30 [-0.62, 0.02]
Li(2011)	3	0.7	54	3.1	0.9	50	10.9%	-0.10 [-0.41, 0.21]
Mei(2009)	3	0.7	55	3.2	0.9	53	11.0%	-0.20 [-0.50, 0.10]
Pacelli(2014)	4.2	1.7	136	3.5	1.9	134	10.0%	0.70 [0.27, 1.13]
Tavassoli(2011)	2.83	1.04	25	2.6	1.1	25	8.5%	0.23 [-0.36, 0.82]
Yu(2012)	3.11	0.77	88	3.75	1.03	86	11.2%	-0.64 [-0.91, -0.37]
Total (95% CI)			**765**			**765**	**100.0%**	**-0.17 [-0.48, 0.15]**

Heterogeneity: Tau² = 0.21; Chi² = 104.21, df = 9 (P < 0.00001); I² = 91%
Test for overall effect: Z = 1.04 (P = 0.30)

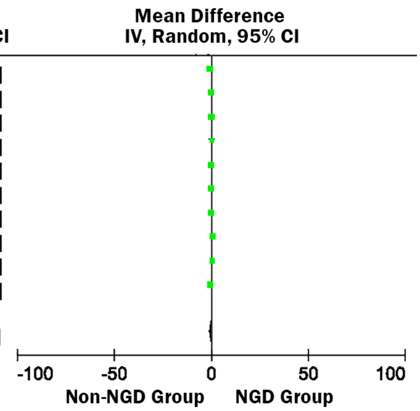

Figure 2. Forest plot of time to first passage of flatus (non- NGD vs. NGD group)

Study or Subgroup	Non-NGD Group Mean	Non-NGD Group SD	Non-NGD Group Total	NGD Group Mean	NGD Group SD	NGD Group Total	Weight	Mean Difference IV, Random, 95% CI
Carrère(2007)	4.7	0.2	41	5.8	0.3	43	17.4%	-1.10 [-1.21, -0.99]
Doglietto(2004)	7.7	1.6	121	7.8	2.6	116	12.0%	-0.10 [-0.65, 0.45]
Hsu(2007)	4.3	0.7	75	4.7	0.9	76	16.0%	-0.40 [-0.66, -0.14]
Lee(2002)	4.6	0.9	56	5.2	1	63	15.0%	-0.60 [-0.94, -0.26]
Li(2011)	5	1.3	54	5.9	3.4	50	6.9%	-0.90 [-1.90, 0.10]
Mei(2009)	5.1	1.6	55	5.9	3.4	53	6.8%	-0.80 [-1.81, 0.21]
Pacelli(2014)	4.5	1.6	136	5	1.7	134	14.2%	-0.50 [-0.89, -0.11]
Tavassoli(2011)	6	1.4	25	6.3	0.4	25	11.7%	-0.30 [-0.87, 0.27]
Total (95% CI)			**563**			**560**	**100.0%**	**-0.58 [-0.92, -0.24]**

Heterogeneity: Tau² = 0.17; Chi² = 46.84, df = 7 (P < 0.00001); I² = 85%
Test for overall effect: Z = 3.37 (P = 0.0007)

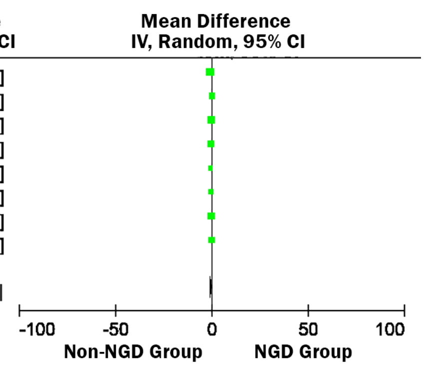

Figure 3. Forest plot of time to first oral intake (non- NGD vs. NGD group)

Study or Subgroup	Non-NGD Group Mean	Non-NGD Group SD	Non-NGD Group Total	NGD Group Mean	NGD Group SD	NGD Group Total	Weight	Mean Difference IV, Random, 95% CI
Carrère(2007)	9.8	1	41	12.4	0.7	43	13.0%	-2.60 [-2.97, -2.23]
Doglietto(2004)	13.9	10.9	121	13.5	7.3	116	5.4%	0.40 [-1.95, 2.75]
Hsu(2007)	10.8	4.1	75	11.3	5.1	76	8.5%	-0.50 [-1.98, 0.98]
Kimura(2017)	19	15.6	114	19	27.8	119	1.4%	0.00 [-5.76, 5.76]
Lee(2002)	10.3	1.7	56	11.1	3.7	63	10.5%	-0.80 [-1.82, 0.22]
Li(2011)	10.2	2.1	54	11.3	3	50	10.6%	-1.10 [-2.10, -0.10]
Mei(2009)	10.2	2.1	55	11.7	4.3	53	9.3%	-1.50 [-2.78, -0.22]
Pacelli(2014)	10.5	8.4	136	10.5	5.3	134	7.7%	0.00 [-1.67, 1.67]
Roseetti(2014)	6.2	3.1	75	7.6	3.4	70	10.3%	-1.40 [-2.46, -0.34]
Tavassoli(2011)	9.3	2	25	9.7	1.3	25	10.9%	-0.40 [-1.34, 0.54]
Yu(2012)	12.3	2.2	88	13.1	1.9	86	12.2%	-0.80 [-1.41, -0.19]
Total (95% CI)			**840**			**835**	**100.0%**	**-0.99 [-1.70, -0.27]**

Heterogeneity: Tau² = 0.98; Chi² = 52.95, df = 10 (P < 0.00001); I² = 81%
Test for overall effect: Z = 2.72 (P = 0.007)

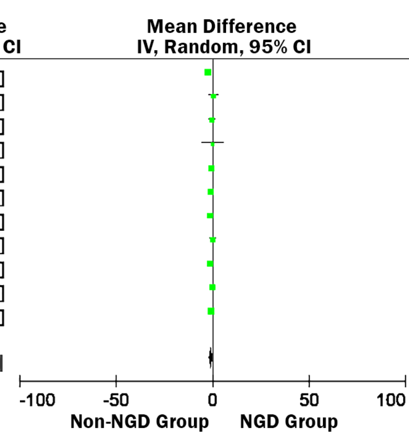

Figure 4. Forest plot of postoperative hospital stay (non- NGD vs. NGD group)

4.3.13. Anastomosis or Duodenal Stump Fistula

All studies reported anastomosis or duodenal stump fistula (10-22). No significant difference was found between the non-NGD group and the NGD group (OR = 0.80, 95% CIs = 0.46 - 1.41, P = 0.44); also, there was no significant hetero-

Table 3. Statistical Results of Postoperative Complications by RevMan5.3 (Non-NGD Group vs. NGD Group)

Groups	No. of Studies	OR (95% CIs)	Statistical Method	P Value
Mortality rates	11	1.00 (0.32 - 3.14)	Fixed	1.00
Total complications	9	0.98 (0.74 - 1.29)	Fixed	0.86
Gastrointestinal complications				
Postoperative obstruction	7	0.77 (0.25 - 2.34)	Fixed	0.64
Gastroparesis	4	0.58 (0.14 - 2.43)	Fixed	0.45
Intra-abdominal abscess	10	0.96 (0.53 - 1.74)	Fixed	0.89
Wound complications				
Wound infection	9	0.80 (0.43 - 1.46)	Fixed	0.46
Wound dehiscence	7	1.09 (0.46 - 2.60)	Fixed	0.84
Respiratory complications				
Pneumonia	10	0.72 (0.45 - 1.16)	Fixed	0.18
Atelectasis	6	0.89 (0.46 - 1.72)	Fixed	0.72
Anastomosis or duodenal stump fistula	13	0.80 (0.46 - 1.41)	Fixed	0.44
General complications				
Abdominal distension	3	0.92 (0.43 - 1.94)	Fixed	0.82
Fever	5	0.71 (0.44 - 1.15)	Fixed	0.16

geneity (Table 3).

4.3.14. General Complications

Two studies (12, 17) reported abdominal distension and five studies (13, 14, 16-18) reported fever, but there was no significant difference (abdominal distension: OR = 1.47, 95% CIs = 0.43 - 5.01, P = 0.53; fever: OR = 0.71, 95% CIs = 0.44 - 1.15, P = 0.16) (Table 3).

4.4. Sensitivity Analyses and Publication Bias

Removing individual studies from the list did not alter the level of significance for the most important clinical outcomes (nausea and vomiting, postoperative hospital stay days, mortality rates, total complications, gastrointestinal complications, wound complications, respiratory complications, and anastomosis or duodenal stump fistula). The funnel plots shapes of anastomosis or duodenal stump leakage did not reveal any evidence of obvious asymmetry, which means no much publication bias exists in this meta-analysis (Figure 5).

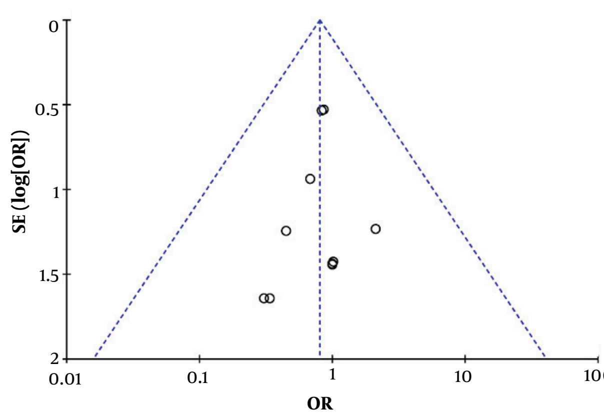

Figure 5. Funnel plot of anastomosis or duodenal stump leakage

5. Discussion

The incidence of complications after traditional selective gastrectomy is 10% - 20% and the postoperative hospital stay is 7 - 15 days (23-25). Given that eating too early after increases the tension of the anastomosis and the risk of postoperative ileus, surgery most general surgeons believe that the prophylactic use of nasogastric decompression and fasting until the bowels are opened is essential for the rehabilitation of patients following gastrectomy. However, in recent years, enhanced recovery after surgery (ERAS) has become increasingly popular, especially in colorectal surgery (26). No conventional nasogastric tube drainage is one of the FTS principles. However, due to the concern about complications, this clinical practice is not generally accepted in gastrectomy (27).

This meta-analysis revealed that using a nasogastric tube cannot achieve the desired goals. On the contrary, without NGD, patients could either shorten the time of first oral intake or decrease postoperative hospital stay. This result was slightly different from the previous studies (9). The current study shows that regardless of a nasogastric tube was used or not, postoperative recovery of gastrointestinal function did not differ significantly, but the time of bowel recovery in the non-NGD group is shorter than the NGD group. A study reported that early oral feeding after gastrectomy would improve postoperative bowel movement and the inflammatory response; therefore, the duration of hospital stays is decreased (28).

Gastrectomy, especially for gastric cancer with D2 lymph node dissection, can severely affect the postoperative gastrointestinal motility by cutting off the sympathetic and parasympathetic nerve fibers, particularly celiac branch (29, 30). The anastomosis and duodenal stump may develop digestive fistula in the early postoperative period owing to potential risk factors. Consequently, NGD has been a routine part of care after gastrectomy until now. However, in this meta-analysis, the outcomes showed that the anastomotic fistula and postoperative obstruction rates were similar between the two groups. This means that the decompression does not reduce the risk of anastomotic leakage and postoperative ileus.

Postoperative pulmonary complications are common after gastrectomy, especially in elderly patients. Postoperative pneumonia was associated with increased hospital stay and costs. A recent multivariate analysis found that the presence of a nasogastric tube was an independent risk factor of postoperative pulmonary complications after hepatic resection (31). However, our study has failed to confirm their results. Our findings have shown that the postoperative pulmonary complications rates were similar between the two groups.

The discomfort caused by the nasogastric tube is one of the most unpleasant aspects of the operation. In this meta-analysis, 46.53% of the patients in NGD group complained of moderate to severe discomfort caused by a nasogastric tube; however, the rates of nausea and vomiting were similar between the two groups. The discomfort could postpone the time of tolerance to oral intake. Moreover, a nasogastric tube may cause other complications such as sore throat, nasal skin necrosis, and dry oral mucosa (17). Therefore, removing the prophylactic nasogastric tube may reduce discomfort.

Similar to most meta-analyses, these results should be carefully explained. First, a limitation of this meta-analysis is the methodological quality of the studies and their small numbers of patients; however, this research includes high-quality RCT studies. Second, all included studies did not refer to the allocation concealment and blinding label; therefore, there is the possibility of selection bias, implementation bias, and measurement bias. Third, due to the lack of raw data, no economic evaluation was carried out in this study.

In conclusion, this meta-analysis confirms that patients in non-NGD group could gain a shorter time to first oral intake, shorter postoperative hospitalization, and more comfort after gastrectomy. Furthermore, the incidence of postoperative complications cannot increase without NGD. Therefore, routine nasogastric decompression was not recommended for patients after elective gastrectomy.

Footnotes

Authors' Contribution: Ping Yang: study design, data extraction, and drafting paper; Xiu-Feng Lin and Chen-Fei Xie: retrieval literature, data extraction, statistical data; Hai-Ying Liang and Fan Luo: retrieval literature, statistical and interpretation of data; Wei Li: revised draft and approved the final version of the publication.

Conflict of Interests: The authors declare that there was no conflict of interest regarding this study.

Ethical Considerations: We checked the articles one by one according to the PRISMA guidelines to ensure that we met the requirements of the PRISMA guidelines.

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