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Systematic Review

Comparing Gastrostomy and Self-Expandable Metallic Stent for Treatment of Dysphagia Caused by Cancer: A Systematic Review, Meta-analysis and Meta-regression

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Abstract

Background: Dysphagia is an important complication that occurs in some patients with cancers and malignancies, such as esophageal and lung cancer, and can influence patients' weight and serum albumin levels. The placement of Self-Expanding Metallic Stents (SEMS) and gastrostomy are common therapies for cancer-related dysphagia. The aim of the present study was to compare SEMS and gastrostomy in terms of changes in serum albumin level, changes in weight, three-, six-, nine- and twelve-month Overall Survival (OS) of patients and also the need for additional reintervention and incidence of aspiration pneumonia after the first procedure.

Methods: This was a systematic review and meta-analysis study based on the PRISMA guidelines. Scopus, Web of Sciences, and PubMed databases were searched for studies, reporting out comes of interest mentioned above and compared both groups. The Egger bias test and funnel plot were used to detect and depict publication bias.

Results: Five studies were eligible for inclusion in this study. SEMS group had a higher decrease in serum albumin level (SMD =-0.53, 95% CI: -0.92 to-0.15 *mg/dl*; p=0.006) and weight (SMD=-0.08, 95% CI: -0.38 to 0.21; p=0.57) and need for additional reintervention (OR=5.23, 95%CI: 1.27 to 21.48; p=0.02) compared to the gastrostomy group after the intervention, patients that underwent the SEMS placement had lower twelve-month OS (OR=0.24, 95%CI: 0.14 to 0.41; p<0.001).

Conclusion: Patients of gastrostomy group have lower decrease in serum albumin level, need for additional intervention and better twelve-month OS.

Keywords: Aspiration, Deglutition disorders, Gastrostomy, Incidence, Lung neoplasms, Pneumonia, Publication bias, Self expandable metallic stents, Serum albumin

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Introduction

Esophageal cancer (EC) remains one of the least studied and deadliest malignancies globally, with significant variations in incidence and outcomes across regions (1). Recent advancements in early detection and treatment have improved survival rates, yet EC continues to pose a major clinical challenge due to its aggressive nature (2). The two primary subtypes, Esophageal Squamous Cell Carcinoma (ESCC) and Esophageal Adenocarcinoma (EAC), exhibit distinct epidemiological and etiological patterns, influenced by factors such as smoking, alcohol, and gastroesophageal reflux disease (3). Innovations in endoscopic screening and artificial intelligence are enhancing diagnosis and personalized therapy, offering hope for better management (4). Despite progress, EC's high mortality underscores the need for further research into risk factors, molecular mechanisms, and effective screening strategies (5).

Dysphagia is an important complication that occurs in some patients with cancers and malignancies, such as esophageal and lung cancer, and can influence patients' weight and serum albumin levels (6). The treatment options for dysphagia resulting from malignant esophageal obstruction include esophageal stents, gastrostomy, surgery, dilation, radiation therapy, and laser ablation (7,8). Although the method of choice depends on the dysphagia mechanism, Self-Expanding Metallic Stents (SEMS) and gastrostomy are commonly used to treat dysphagia.

The placement of a SEMS may rapidly improve dysphagia and prompt patients to swallow food through their mouths. On the other hand, long-term stent use is associated with complications, such as severe retrosternal discomfort, fistula, pneumonia, and the need for reintervention (9,10). In contrast, gastrostomy is incapable of restoring swallowing function and has side effects including pneumonia, tube closure, wound infection, and the need for reintervention (11,12). Common issues include stent migration, perforation, and obstruction, with migration occurring in up to 37% of cases, particularly with plastic stents (13). In colorectal cancer, SEMS placement has a technical failure rate of 13%, often due to tumor characteristics such as extracolonic origin or carcinomatosis (14). Long-term clinical failure occurs in 51% of colorectal cases, driven by migration (22%), obstruction (17%), and perforation (7%), with chemotherapy increasing these risks (15). For esophageal salvage, SEMS shows promise in managing anastomotic leaks and perforations, with an 81.9% success rate in preserving the esophagus, though migration (7.2%) and perforation (1.2%) still pose challenges (16). The placement of SEMS and gastrostomy are common therapies for cancer-related dysphagia. Until now, no systematic review and meta-analysis have compared weight changes, changes in serum albumin levels, Overall Survival (OS), and the need for re-intervention between these treatments; therefore, it is crucial to undertake such a study.

Materials and Methods

This systematic review and meta-analysis was done and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses recommendations.

Two reviewers independently reviewed the studies and extracted the data from Scopus, Web of Science and PubMed limiting results to English-language articles, regardless of study period, while a third reviewer evaluated the obtained data. A fourth reviewer was consulted in the case of a disagreement over the inclusion or exclusion of studies. Search strategies included the Medical Subject Heading term (MeSH) and text words using keywords of: Carcinoma, Cancer, Dysphagia, Gastrostomy and Self expandable metallic stent.

The following data were extracted from each included study: (1) specific study characteristics (authors, year of publication, study design); (2) characteristics of the studies participants (number of the participants, mean age, diagnosis, stage of cancer); (3) primary outcomes (3,6-,9- and 12-month OS, weight (*kg*) and serum albumin (*g/dl*) changes following the procedure); secondary outcomes (need for additional intervention and rate of aspiration pneumonia after the intervention)

For better enhancement and extraction of OS of participants of each group from Kaplan Meier curves reported in each study we used an online tool named Web plot Digitizer (https://apps.automeris.io/wpd/), that sensitivity of this tool for extraction of data measured ten times, with mean sensitivity of (98±1) %.

Inclusion and exclusion criteria

Inclusion criteria for studies were as follows: (a) patients' population had dysphagia caused by esophageal obstruction or fistula due to carcinoma or cancer; (b) patients undergoing placement of SEMS or gastrostomy; (c) comparing outcomes of self-expandable metallic stent placement and gastrostomy including primary outcomes and/or secondary outcomes.

The exclusion criteria for studies were as follows: (1) the study population's dysphagia was caused by a factor other than malignancy or cancer; (2) both treatments were used concurrently to treat the study population; (3) the study reports results only for one group; and no comparison has been made; (4) studies did not report one of the primary out comes of interest and (5) the indication for the intervention was not dysphagia.

Quality assessment

For the quality assessment New castle ottava scale was used (17) and studies with score 7-9 were considered high quality and included in the present study.

Statistical analyses

For both the SEMS and gastrostomy groups, quantitative outcomes of interest (changes in serum albumin level and weight after the procedure) were collected and analyzed using Standardized Means Difference (SMD). Binary outcomes of interest were extracted in form of event rate in the total number of cases (3-, 6-, 9-, 12-month OS, need for additional reintervention, and incidence of aspiration pneumonia) for both groups and analyzed with odds ratio.

The heterogeneity of the studies was assessed using the Cochran Q test (two-test for heterogeneity). I^2 was used to calculate the percentage of total heterogeneity to total variability. Significant statistical heterogeneity was considered by a Q test with a $p<0.1$ or an I^2 statistic more than 60%. In the presence or absence of heterogeneity, the random-effect model or fixed-effect model was used, respectively. A 2-sided $p<0.05$ was considered statistically significant. Publication Bias assessment was conducted by Funnel Plot to depict publication bias. Egger's bias test was used to determine asymmetry.

To assess the potential contribution to inter-study variation, we analyzed the effects of age, SMD changes in serum albumin level after intervention (SEMS-Gastrostomy), the Rate Ratio (RR) of patients, those who received Chemotherapy (CT) after intervention and Radiotherapy (RT) after intervention (SEMS/Gastrostomy) by univariate meta-regression analysis.

Results

As shown in figure 1, the initial search yielded 2707 articles, of which 758 duplicates were removed. Then, on the basis of the abstracts, unrelated articles, including reviews, studies that evaluated just one of the two stent or gastrostomy groups, where the cause of dysphagia was not cancer, and studies where the cause of intervention was not dysphagia, were excluded. Finally, a list of 137 potentially relevant papers for full text review were listed.

Five studies were eligible to be included in this study. A checklist including the name of the researchers, year of publication, design of study, mean age of studies population, number of participants for each group, diagnosis and stage of cancer was used to collect specific characteristics of studies and their participants (Table 1). Another check list was used to collect outcomes of interest (Table 2), and regression of the outcome variable on the explanatory variable was collected in table 3.

Changes in serum albumin level after the procedure (SEMS-Gastrostomy)

All included studies measured the mean changes in serum albumin level after the procedure. Based on the random-effect model (I^2=80.09), participants of the SEMS group had a higher decrease in serum albumin level compared to the gastrostomy group after the intervention (SMD=-0.53, 95%CI: -0.92 to-0.15 *mg/dl*, p=0.006, Figure 2). There was no evidence of publication bias (Funnel Plot Asymmetry, p= 0.86, Supplementary Figure 1). The univariant meta-regression showed that the mean age of studies population was significantly associated with the pooled SMD (coefficient: -0.05, p<0.001, Supplementary Figure 2). On the other hand, pooled SMD was not associated with the RR of chemo therapy after procedure (coefficient: 0.28, p=0.056), RR of receiving radio therapy after procedure (coefficient:

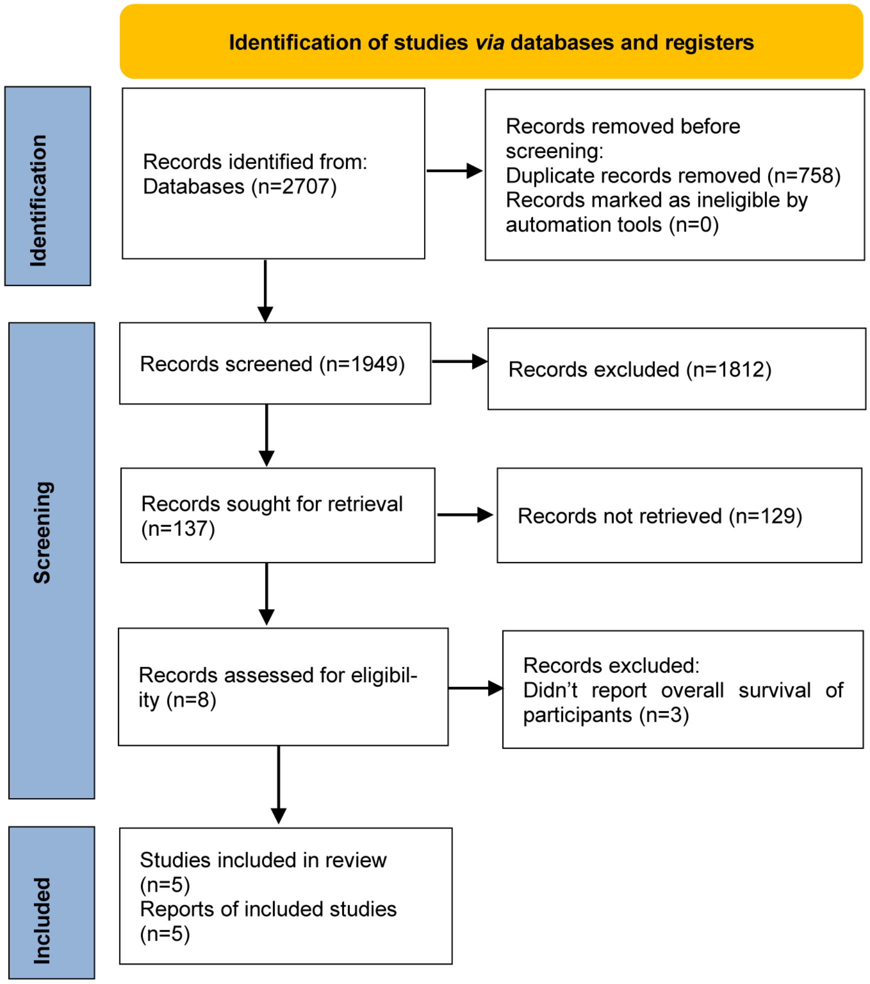

Figure 1. PRISMA flow chart of the present study.

Table 1. Specific characteristics of studies and their participants

Author and year	Design	Number of participants	Mean age (SD)	Diagnosis	Stage of cancer (II+III/IV)
Min YW *et al*, (2017) (18)	Retrospective	SEMS: 169 Gastrostomy: 64	63.89(10.22)	Esophageal cancer	SEMS: 19/150 Gastrostomy: 27/37
Wang T *et al*, (2021) (19)	Retrospective	SEMS: 47 Gastrostomy: 66	75.4(7.37)	Esophageal cancer	SEMS: 22/25 Gastrostomy: 20/46
Song JH *et al*, (2020) (20)	Retrospective	SEMS: 94 Gastrostomy: 94	65.01(9.83)	Esophageal cancer	SEMS: 33/61 Gastrostomy: 37/57
Chen YH *et al*, (2012) (21)	Retrospective	SEMS: 30 Gastrostomy: 35	50.29(9.9)	Esophageal cancer	SEMS: 11/19 Gastrostomy: 12/23
Kim J *et al*, (2018) (6)	Retrospective	SEMS: 68 Gastrostomy: 16	61.65(10.78)	Lung cancer	SEMS: 15/53 Gastrostomy: 5/11

0.81, p=0.12).

Changes in weight after the procedure (SEMS-Gastrostomy)

All included studies measured the mean changes in weight after the procedure. Based on the random-effect model (I^2=68.78), there was no significant statistical difference in SMD change of weight

Table 2. outcomes of interest

Author		Need for additional reintervention	Aspiration pneumonia	Changes of serum albumin level (*mg/dl*)	Changes of weight (*kg*)	3-month OS	6-month OS	9- month OS	12-month OS
Min YW *et al*	SEMS	37(21.9%)	26(15.4%)	-0.39±0.58	-0.61±3.59	98	52	33	18
	Gastrostomy	2(3.1%)	11(17.2%)	-0.15±0.56	-0.36±2.60	49	41	30	27
Wang T *et al*	SEMS:	5(10.6%)	7(14.9%)	-0.98±0.58	-0.9±0.4	23	13	1	0
	Gastrostomy	7(10.6%)	6(9.1%)	-0.36±0.47	-0.4±0.9	46	24	7	4
Song JH *et al*	SEMS	22(23.4%)	13(13.8%)	-0.41 ±0.59	-0.27±3.48	58	29	16	8
	Gastrostomy	2(2.1%)	13(13.8%)	-0.15 ±0.57	-0.69±2.56	67	41	21	18
Chen YH *et al*	SEMS	5(16.6%)	NA	-0.06±0.61	-0.38 ±4.3	19	6	3	0
	Gastrostomy	NA	NA	-0.17±0.65	-1.1±4.1	8	3	1	0
Kim J *et al*	SEMS	15(22.1%)	30(44.1%)	-0.65±0.57	-0.84±3.41	19	9	6	4
	Gastrostomy	0(0%)	5(31.3%)	-0.20±0.54	-1.00±1.92	9	3	2	1

Table 3. regression of outcome variables on explanatory variables

Explanatory variable / Outcome variable		Mean age	RR of CT after the intervention	RR of RT after the intervention	SMD of albumin
SMD of albumin	p-value	<0.001	0.056	0.81	-
	Coefficient	-0.05	0.28	0.12	-
SMD of weight	p-value	0.02	0.45	0.38	0.01
	Coefficient	-0.03	0.1	0.39	0.62
Need for additional reintervention	p-value	0.003	0.96	0.99	0.003
	Coefficient	-0.2	0.3	-0.07	3.1
3-month OS	p-value	0.02	<0.001	<0.001	0.01
	Coefficient	-0.09	0.86	2.44	1.77
6-month OS	p-value	0.31	0.01	0.002	0.53
	Coefficient	-0.04	0.67	2.19	0.54
9-month OS	p-value	0.09	0.02	0.006	0.18
	Coefficient	-0.11	0.89	2.57	1.50
12-month OS	p-value	0.61	0.12	0.07	0.80
	Coefficient	-0.06	2.41	2.95	-0.47

after the procedure between the two groups (SMD =-0.08, 95% CI: -0.38 to 0.21, p=0.57, Figure 3). There was no evidence of publication bias (Funnel Plot Asymmetry, p=0.89, Supplementary Figure 3).

Study name	Sample size: SEMS	Sample size: Gastrostomy	Std diff in means	Variance	Lower limit	Upper limit	p-Value
Min YW *et al* (2017)	169	64	-0.418	0.022	-0.708	-0.128	0.005
Wang T *et al* (2021)	47	66	-1.196	0.043	-1.601	-0.791	0.000
Song JH *et al* (2020)	94	94	-0.448	0.022	-0.738	-0.159	0.002
Chen YH *et al* (2012)	30	35	0.174	0.062	-0.314	0.663	0.485
Kim J *et al* (2018)	68	16	-0.797	0.081	-1.355	-0.239	0.005
			-0.536	0.039	-0.922	-0.151	0.006

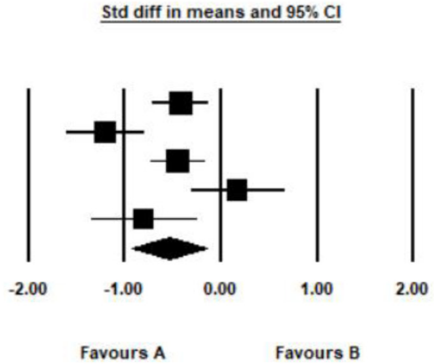

Figure 2. Forrest plot of changes in serum albumin level after the intervention (SEMS-Gastrostomy).

Study name	Sample size: SEMS	Sample size: gastrostomy	Std diff in means	Variance	Lower limit	Upper limit	p-Value
Min YW *et al* (2017)	169	64	-0.075	0.022	-0.362	0.213	0.611
Wang T *et al* (2021)	47	66	-0.680	0.038	-1.064	-0.296	0.001
Song JH *et al* (2020)	94	94	0.137	0.021	-0.149	0.424	0.346
Chen YH *et al* (2012)	30	35	0.172	0.062	-0.317	0.660	0.491
Kim J *et al* (2018)	68	16	0.050	0.077	-0.494	0.595	0.857
			-0.086	0.024	-0.389	0.216	0.576

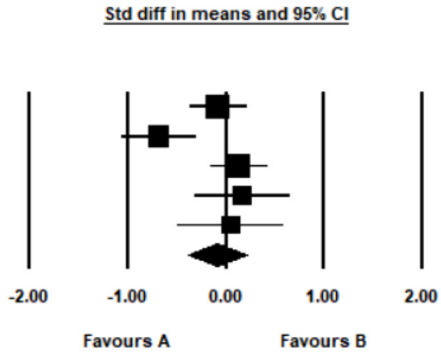

Figure 3. Forrest plot of changes in weight after the intervention (SEMS-Gastrostomy).

univariant meta regression showed that change of weight has a significant association with the mean age of the study population (coefficient: -0.03, p=0.02, Supplementary Figure 4) and the SMD of serum albumin level after the procedure (coefficient: 0.62, p=0.01). Changes in weight, on the other hand, have no statistically significant association with the RR of patients receiving chemo therapy after the procedure (coefficient: 0.1, p=0.45) and the RR of patients receiving radiotherapy after the procedure (coefficient: 0.39, p=0.38).

3-month OS (SEMS/Gastrostomy)

Patients' 3-month OS was extracted from Kaplan-Meier survival curves for all included studies. Based on the random-effect model (I^2=80.36), there was no significant statistical difference between the 3-month OS of SEMS and the gastrostomy group (OR= 0.69, 95%CI: 0.3-1.5, p=0.38, Figure 4). There was no evidence of publication bias (Funnel Plot Asymmetry, p=0.51, Supplementary Figure 5). Univariant meta regression showed that 3-month OS has a statistically strong association with RR of receiving chemotherapy after the procedure (coefficient:0.86, p<0.001, Supplementary Figure 6), RR of receiving radiotherapy after the procedure (coefficient:2.44, p<0.001, Supplementary Figure 7), SMD of serum albumin level after the intervention (coefficient:1.77, p=0.01, Supplementary Figure 8) and mean age of studies population (coefficient: -0.09, p=0.02, Supplementary Figure 9).

6-month OS (SEMS/Gastrostomy)

Patients' 6-month OS was extracted from Kaplan-Meier survival curves for all included studies. Based on the random-effect model (I^2=62.96), there was no significant statistical difference between the 6-month OS of SEMS and the gastrostomy group (OR=0.58, 95%CI: 0.30-1.11, p=0.1, Figure 5). There was no evidence of publication bias (Funnel Plot Asymmetry, p=0.2, Supplementary figure 10).

Univariant meta regression showed that 6-month OS has a statistically strong association with the RR of receiving chemotherapy after the procedure

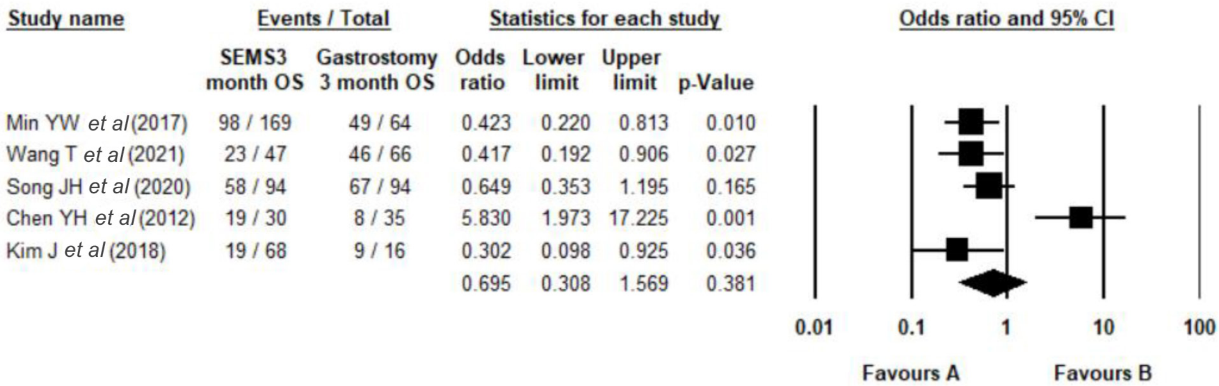

Figure 4. Forrest plot of 3-month OS after the procedure.

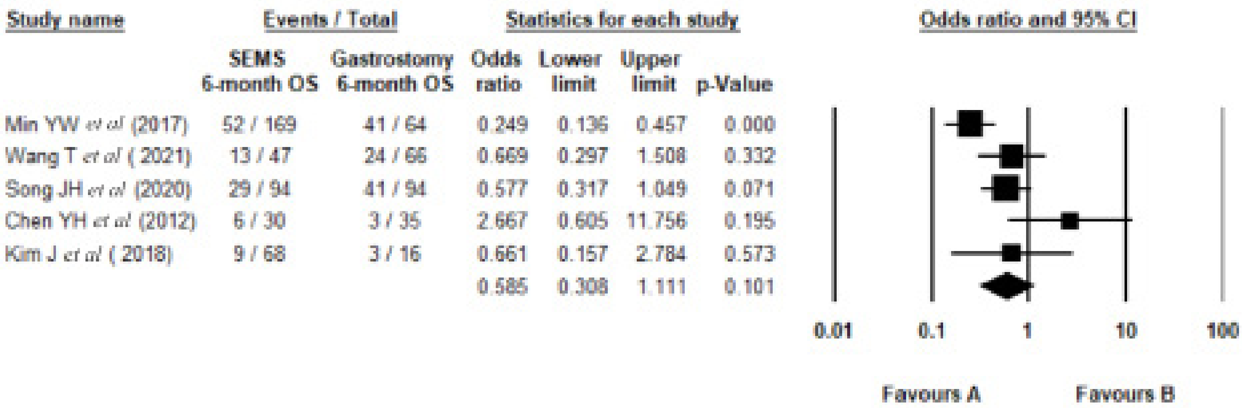

Figure 5. Forrest plot of 6-month OS after the procedure (SEMS/Gastrostomy).

(coefficient: 0.67, p=0.01, Supplementary figure 11) and the RR of receiving radiotherapy after the procedure (coefficient: 2.19, p=0.002, Supplementary figure 12). However, 6-month OS has no statistically strong association with mean age of study population (coefficient: -0.04, p=0.31) and SMD of serum albumin changes after the procedure (coefficient: 0.54, p=0.53).

9-month OS (SEMS/Gastrostomy)

The 9-month OS of patients was extracted from the Kaplan–Meier survival curves for all included studies. Based on the random-effect model (I^2=50.63), there was no significant statistical difference between the 9-month OS of SEMS and the gastrostomy group (OR=0.51, 95%CI: 0.23-1.09, p=0.085, Supplementary figure 6). There was no evidence of publication bias (Funnel Plot Asymmetry, p=0.50, Supplementary Figure 13).

Univariant meta regression showed that 9-month OS has a statistically strong association with RR of receiving chemotherapy after the intervention (coefficient: 0.89, p=0.02, Supplementary Figure 14) and RR of receiving radiotherapy after the intervention (coefficient: 2.57, p=0.006, Supplementary Figure 15). However, 9-month OS has no statistically strong association with the mean age of the study population (coefficient: -0.11, p=0.09) and SMD of serum albumin change after the intervention (coefficient: 1.5, p=0.18).

12-month OS (SEMS/Gastrostomy)

Patients' 12-month OS were extracted from Kaplan-Meier survival curves for all included studies (Chen YH *et al*, study excluded from analysis due to 0 OS in both groups). Based on the fixed-effect model (I^2=22.17), there was a significant statistical difference between the 12-month OS of SEMS and the gastrostomy group (OR=0.24, 95%CI: 0.14-0.41, p<0.001, Figure 7). There was no evidence of publication bias (Funnel Plot Asymmetry, p=0.58, Supplementary Figure 22).

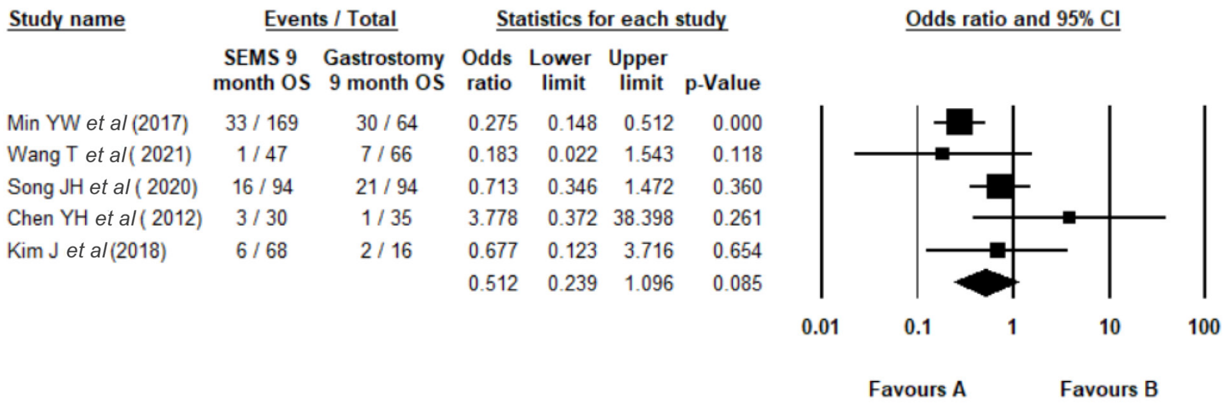

Figure 6. Forrest plot of 9-month OS (SEMS/Gastrostomy).

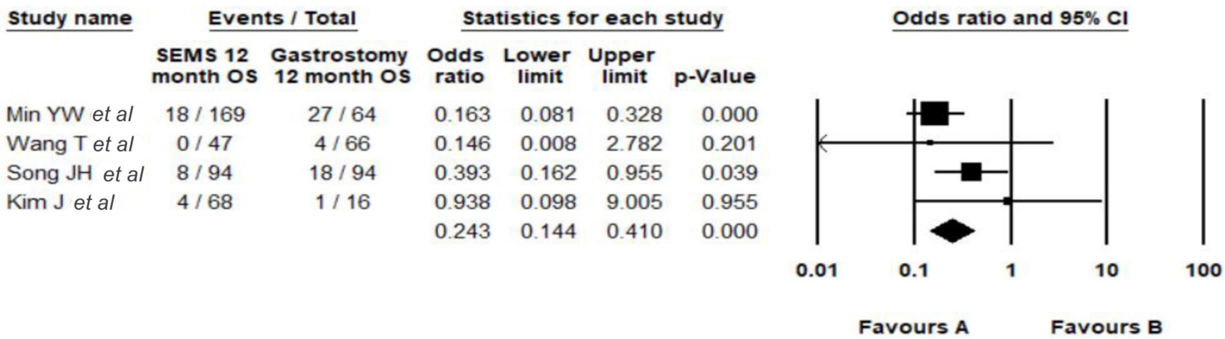

Figure 7. Forrest plot of 12-month OS (SEMS/Gastrostomy).

Need for additional reintervention (SEMS/Gastrostomy)

Four included studies reported rate of need for additional reintervention after the first procedure. Based on the random-effect model, there is a statistically significant higher need for additional reintervention for the SEMS group compared to gastrostomy (OR=5.23, 95% CI: 1.27 to 21.48; p=0.02, Supplementary figure 8). There was no evidence of publication bias (Funnel Plot Asymmetry, p=0.52, Figure 16). According to univariate regression, the OR of needing additional reintervention was related to the mean age of the study population (coefficient: -0.2, p=0.003, Supplementary figure 17) and the SMD of serum albumin after procedure (coefficient: 3.1, p = 0.003, Supplementary figure 18).

Incidence of aspiration pneumonia after the procedure (SEMS/Gastrostomy)

Four included studies reported the incidence of aspiration pneumonia after the intervention, based on the fixed-effect model(I^2=0) there was statistically significant difference in incidence of aspiration pneumonia after the procedure (OR=1.13, 95%CI: 0.71-1.81, p=0.58, Figure 9) p-value of eggers test was statically significant for this reason trim and fill was performed and the results didn't change significantly (Funnel Plot Asymmetry, p=0.001, Supplementary figure 19).

Discussion

Dysphagia is a common and debilitating symptom of EC, often leading to malnutrition and reduced quality of life. It occurs when tumors obstruct the esophagus or impair muscle function. Early-stage dysphagia may involve solid foods, progressing to liquids as the disease advances. Palliative treatments like stents or dilation provide relief, while emerging therapies aim to restore swallowing function (5-8). Despite interventions, many patients struggle with persistent dysphagia, highlighting the need for better management strategies.

The present systematic review's significant findings were as follows: The meta-analysis revealed

Study name	SEMS Additional reintervention	Gastrostomy Addional reintervention	Odds ratio	Lower limit	Upper limit	p-Value
	event / Total		Statistics for each study			
Min YW (2017)	37 / 169	2 / 64	8.689	2.029	37.212	0.004
Wang T (2021)	5 / 47	7 / 66	1.003	0.298	3.378	0.996
Song JH (2020)	22 / 94	2 / 94	14.056	3.200	61.746	0.000
Kim J et al (2018)	15 / 68	0 / 16	9.561	0.542	168.578	0.123
			4.257	1.990	9.108	0.000

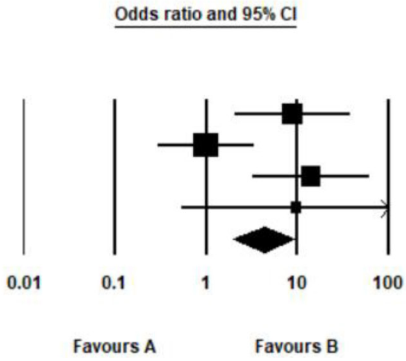

Figure 8. Forrest plot of incidence of aspiration pneumonia after the procedure (SEMS/Gastrostomy).

Study name	SEMS Aspiration pneumonia	Gastrostomy Aspiration pneumonia	Odds ratio	Lower limit	Upper limit	p-Value
	Events / Total		Statistics for each study			
Min YW *et al*(2017)	26 / 169	11 / 64	0.876	0.405	1.896	0.737
Wang T *et al*(2021)	7 / 47	6 / 66	1.750	0.548	5.591	0.345
Song JH *et al*(2020)	13 / 94	13 / 94	1.000	0.437	2.289	1.000
Kim J *et al*(2018)	30 / 68	5 / 16	1.737	0.544	5.543	0.351
			1.139	0.715	1.815	0.582

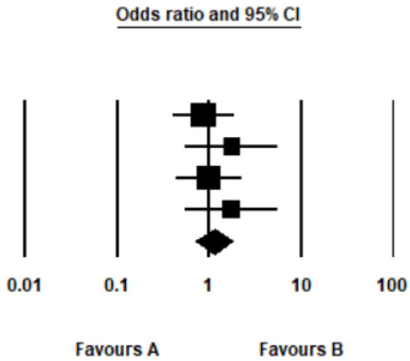

Figure 9. Forrest plot of incidence of aspiration pneumonia after the procedure (SEMS/Gastrostomy).

a statistically significant difference in serum albumin levels between the SEMS and gastrostomy groups. Patients who underwent SEMS placement experienced a greater decline in serum albumin levels compared to those who received a gastrostomy (SMD=-0.53, 95%CI: -0.92 to -0.15 *mg/dl*, p=0.006). This suggests that gastrostomy may better preserve nutritional status in patients with malignant dysphagia. The high heterogeneity (I^2=80.09%) indicates variability across studies, possibly due to differences in patient characteristics or follow-up durations. Meta-regression further identified that older age was significantly associated with a greater decline in albumin levels (coefficient: -0.05, p<0.001), whereas chemotherapy and radiotherapy rates did not significantly influence this outcome. A significant difference was observed in 12-month OS, favoring the gastrostomy group (OR=0.24, 95%CI: 0.14 -0.41, p<0.001). This suggests that gastrostomy may be associated with better long-term survival compared to SEMS in patients with malignant dysphagia. The low heterogeneity (I^2=22.17%) supports the consistency of this finding across studies. However, no significant differences were observed in shorter-term survival (3-, 6-, or 9-month OS), indicating that the survival benefit of gastrostomy becomes more apparent over time. Patients in the SEMS group had a significantly higher need for re-intervention compared to the gastrostomy group (OR=5.23, 95%CI: 1.27-21.48, p=0.02). This may be attributed to complications such as stent migration, tumor overgrowth, or obstruction, which are common with SEMS. Meta-regression indicated that younger patients and those with a greater decline in serum albumin were more likely to require reinterventions (p=0.003 for both).

These changes in patients' weight and serum albumin levels have an effect on patient survival and quality of life (22). Hypoalbuminemia, for instance, is a potential predictor of delayed recovery of intestinal function after surgery and is significantly linked to postoperative complications in patients with right colorectal cancer who have undergone right hemicolectomy. However, the correction of hypoalbuminemia achieved by albumin injection does not improve patients' prognosis (23,24). On the other hand, hypoalbuminemia is significantly related to reduced survival in esophageal cancer patients and is regarded as a good predictor of poor prognosis in these patients (25,26).

Although a significant difference was observed in albumin levels after the intervention, this difference was not seen in weight changes—another marker of nutritional status. This discrepancy could be because most studies included in this systematic review and meta-analysis measured weight changes only one or two months after the intervention, which might be too short a time for changes in body stores to manifest as measurable weight loss or gain. In contrast, serum albumin levels may respond more rapidly to nutritional interventions. Additionally, the present results suggest that the older the average age of participants in the studies, the greater the difference in both serum albumin levels and weight change between the two groups. This could reflect age-related metabolic differences or slower weight changes in older populations, further highlighting the importance of longer follow-up periods to detect meaningful weight differences.

The present study showed that the survival of 3-, 6- and 9-months of patients in the stent and gastrostomy groups was not significantly different, but the 12-month OS was significantly higher in the gastrostomy group. Serum albumin level, cancer stage, receiving chemotherapy and radiotherapy after intervention were among the factors that affected the survival of those participating in the studies included in this analysis. The serum albumin level decreased more after the intervention in the patients of the stent group, and SMD of changes in the serum albumin level had a significant relationship with the 3-month survival of the patients, but it did not have a significant relationship with the 6-, 9-, and 12-month survival. The observation of these results can be due to the fact that most of the studies included in this review measured the changes in serum albumin levels of patients 1-2 months after the intervention, and to answer the question of whether the difference in changes in serum albumin levels is related to patients' survival. The 3-month survival of the patients was used as a criterion to answer this question, and the answer to this question is that yes, the difference in changes in serum albumin level is related to the survival of patients. But it seems that the amount of this difference in serum albumin levels was not enough to cause a significant difference in the survival of the patients, or that other factors may have had an effect on the survival of the patients. The relationship between chemotherapy after the intervention and the survival of the patients decreases with the passage of time, so that the 3-, 6-, and 9-month OS of the patients has a significant relationship with the chemotherapy after the intervention, but the 12-month OS of the patients does not. It should be noted that chemotherapy causes anorexia and swallowing disorders in patients (27,28), and in the stent group, the patient must swallow food. On the other hand, the decrease in the level of serum albumin reduces the tolerance of chemotherapy by patients (27,28). The mentioned factors go hand in hand and cause disturbances in the chemotherapy process of stent patients after the intervention.

Although in the present study, there was no significant relationship between changes in albumin levels and the rate of receiving chemotherapy, but it was very close to being statistically significant (p=0.056). Unfortunately, the patients' albumin levels and their chemotherapy status after 6-, 9-, and 12-months were not reported in the studies included in this review. For this reason, the relationship between chemotherapy after the intervention and the difference in albumin level of the patients with the survival of the patients in these periods of time cannot be relied upon to draw conclusions. However, the positive effect of chemotherapy after the intervention on the 6- and 9-month OS of patients can be seen in the obtained results.

Cancer patients are more likely to get infections. Pneumonia is the most frequent type of infection in this group and a frequent cause of ICU admission and mortality (29). This study showed that the incidence of aspiration pneumonia in two groups is not significantly different. have given Among the studies included in this review, only two studies reported complications related to the intervention, but by analyzing the four studies that reported the need for re-intervention, they showed that the need for intervention in the stent group was much higher than in the gastrostomy group. This shows that the complications of intervention in the stent group are higher than in the gastrostomy group.

Limitations

The studies included in this study measured the changes in serum albumin levels compared to the baseline levels only in the period of one to three months after the intervention, and only two studies specifically reported the complications related to the intervention.

Conclusion

In patients who underwent gastrostomy as a therapeutic intervention to treat dysphagia caused by cancer, the decrease in serum albumin levels after the intervention was lower, the twelve-month OS was higher, and the need for re-intervention was significantly lower compare to patients who underwent SEMS placement. As the age of the patients increases, so does the disparity in albumin levels between the two groups and the requirement for reintervention. On the other hand, there is no significant difference between the stent and gastrostomy groups in terms of 3-, 6-, and 9-month OS and incidence of aspiration pneumonia after intervention.

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Ethical approval

All ethical principles were considered in this article.

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Conflict of Interest

The authors have declared that no competing interests exist.

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