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Clinical Research

Long-Term Outcomes of Colon Conduits in Surgery for Primary Esophageal Cancer: A Propensity Score-Matched Comparison to Gastric Conduits

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Background: In the treatment of esophageal cancer, a gastric conduit is typically the first choice. However, when the stomach is not a viable option, the usual alternative is a colon conduit. This study compared the long-term surgical outcomes of gastric and colon conduits over the same interval and aimed to identify factors influencing the prognosis.
Methods: A retrospective review was conducted of patients who underwent esophagectomy followed by reconstruction for primary esophageal cancer between January 2006 and December 2020.
Results: The study included 1,545 patients, with a gastric conduit used for 1,429 (92.5%) and a colon conduit for 116 (7.5%). Using propensity-matched analysis, 116 patients were selected from each group for comparison. No significant difference was observed in long-term survival between the gastric and colon conduit groups, irrespective of anastomosis level and pathological stage. A higher proportion of patients in the colon conduit group experienced postoperative complications compared to the gastric conduit group (57.8% vs. 25%, $p<0.001$). Multivariable analysis revealed that age over 65 years, body mass index below 22.0 kg/m^2, neoadjuvant therapy, postoperative anastomotic leakage, and renal failure were risk factors for overall survival in patients with a colon conduit. Regarding conduit-related complications, cervical anastomosis was the only significant risk factor among those with a colon conduit.
Conclusion: Despite the association of colon conduits with high morbidity rates relative to gastric conduits, the long-term outcomes of colon conduits were acceptable. More consideration should be given perioperatively to the use of a colon conduit, particularly in cases involving cervical anastomosis.

Keywords: Esophageal neoplasms, Esophageal reconstruction, Colon conduit, Gastric conduit

Introduction

According to the Korean Central Cancer Registry, Korea recorded 2,870 cases of esophageal cancer in 2019: 2,573 in men and 297 in women [1]. Surgical resection and lymph node dissection represent the standard treatment methods for localized esophageal cancer, a condition with high mortality and morbidity rates [2]. The estimated 5-year survival rate is 40%–60%, a figure attributed to the frequency of perioperative complications associated with esophageal reconstruction [3-5].

A gastric conduit is typically the first choice for treatment due to its ease of preparation, robust vascular supply, and sufficient length to reach the neck [6]. However, several situations preclude the use of such a conduit, such as cases involving previous gastrectomy, synchronous gastric cancer, or injury to the gastric conduit during surgery. In these instances, a colon conduit is generally considered a viable alternative [7-9]. Several retrospective studies have indicated that the use of a colon conduit in esophageal

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cancer surgery is associated with a relatively poor prognosis (5-year survival rate, 10%–42.2%) and high complication rates (24%–86%) compared to a gastric conduit [7,10-13] (Supplementary Table 1). However, most of these outcomes were derived from surgical procedures conducted before the year 2000, meaning that the data do not reflect modern outcomes [11]. Furthermore, these studies are limited in that the outcomes of gastric conduit surgery were compared to colon conduits using reference data, rather than comparing to conduits from the same institution during the same period [12,13]. Therefore, it is informative to compare the surgical outcomes of colon conduits in primary esophageal cancer surgery to those of gastric conduits performed during the same period.

The objective of this study was to compare the long-term surgical outcomes of gastric and colon conduits over the same timeframe, as well as to identify any factors impacting prognosis in the context of colon conduits for primary esophageal cancer.

Methods

Patients

A retrospective review was conducted of patients who underwent esophagectomy followed by reconstruction for primary esophageal cancer at Asan Medical Center in Seoul, Korea between January 2006 and December 2020. This study included operations that utilized a colon conduit as the initial treatment. Cases in which a colon conduit was used in reoperation due to an issue at the anastomosis site after the use of a gastric conduit were excluded. Three patients were omitted from the study due to a lack of sufficient data.

The study incorporated a total of 1,545 patients. Of these, a gastric conduit was utilized in 1,429 patients (92.5%), while 116 patients (7.5%) received a colon conduit. The reasons for selecting a colon conduit included a history of gastrectomy for previous gastric cancer (n=40), a history of gastrectomy for previous gastric ulcer (n=10), synchronous gastric cancer (n=49), gastroesophageal junction cancer (n=9), intraoperative gastric conduit injury (n=7), and corrosive esophageal stricture (n=1) (Supplementary Fig. 1).

Patient baseline characteristics, operative profiles, clinical outcomes, and complications were examined through a review of medical records. The requirement for informed consent from individual patients was omitted because of the retrospective design of this study. This study was approved by the Institutional Review Board of Asan Medical Center (IRB registration number: S2022-2817-0001; IRB approval date: 2023/5/3).

Preoperative workup and neoadjuvant treatment

The preoperative evaluation for the colon conduit involved several diagnostic procedures. These included neck, chest, and abdominopelvic computed tomography; esophagogastroduodenoscopy; colonoscopy; angiography of the superior mesenteric artery and inferior mesenteric artery; pulmonary function testing; positron emission tomography; and transthoracic echocardiography.

Neoadjuvant chemoradiotherapy was administered to patients with clinical stages of T2, N1, or higher, unless they were over 75 years old or in very poor physical condition. Notably, while the composition and regimen of chemoradiotherapy have evolved, until 2009, oxaliplatin and titanium silicate-1 were administered twice daily in conjunction with a total radiation dose of 46 Gy, divided into 23 fractions of 2.0 Gy each.

Surgical approach

The surgical procedure was implemented using 2 methods: traditional open surgery and DaVinci surgery. The choice between these was determined by the patient's financial situation, personal preference, and surgical feasibility. In the case of traditional surgery, open procedures such as laparotomy and thoracotomy were performed during both the abdominal and thoracic phases. For DaVinci surgery, laparoscopy was used during the abdominal phase, while the DaVinci system was employed in the thoracic phase.

The level of anastomosis was determined based on the relative position of the tumor to the carina. If the upper margin of the tumor was situated below the carina, intrathoracic anastomosis was typically performed. Otherwise, cervical anastomosis was employed. However, in cases involving high suspicion of lymph node metastasis in the upper esophageal area, cervical anastomosis was favored irrespective of tumor location.

Gastric and colon conduits were constructed by experienced stomach or colon surgeons. In the abdominal phase, dissections of the left gastric, celiac, gastrohepatic, paracardial, and diaphragm lymph nodes were performed. In contrast, during the thoracic phase, the left and right recurrent laryngeal, subcarinal, hilar, azygous vein, upper, middle, lower para-esophageal, and inferior pulmonary ligament lymph nodes were routinely resected. If a patient had cervical esophageal cancer or if cervical mediastinal lymph node metastasis was suspected, a head and neck surgeon performed the cervical node dissection.

Additionally, when the stomach was not available for reconstruction, colon conduit interposition was performed. A total gastrectomy was generally conducted through a midline laparotomy. Then, the left colon was mobilized and dissected with concurrent monitoring of the pulsation of the middle and left colic arteries. The left colon was then transected using a linear stapler, and colo-colonic anastomosis was performed using a linear stapler and reinforced with manual sutures. Jejuno-colonic anastomosis was conducted using a circular stapler and similarly reinforced with manual sutures. The proximal end of the colon graft was attached to the distal end of the esophagus using a #3 silk tagging suture. After the formation of the colon conduit in the abdominal phase, a right posterolateral thoracotomy was performed with the patient in the decubitus position. The mobilized colon graft was interposed *in situ*, and esophago-colonic anastomosis was performed using a circular stapler.

Postoperative care

Patients were admitted to the intensive care unit following surgery for close monitoring, usually for a duration of 1 day. Prior to the initiation of a soft diet, contrast radiography was performed approximately 1 week postoperatively to evaluate the patency of the anastomosis site. Notably, in 2015, the protocol for esophagography was modified to expedite its administration. Subsequently, around 2017, the practice evolved further: either esophagography was conducted on the third day after surgery, or oral intake was initiated without the necessity for esophagography. Following this, patients were transitioned to a liquid diet. If chylothorax and pneumothorax were not present, the chest tube was removed. Discharge from the hospital was authorized when the patient could consume a normal diet and blood laboratory test results fell within acceptable ranges.

Statistical analysis

To account for heterogeneity in patient characteristics within the gastric conduit and colon conduit groups, propensity score matching was employed. Propensity scores for all patients were calculated using multiple logistic regression, considering covariates such as age, sex, body mass index (BMI), Charlson comorbidity index, tumor location, neoadjuvant therapy, clinical stage, and tumor resection margin. Individuals in the colon conduit group were paired on a 1:1 basis with those in the gastric conduit group, using an optimal method based on the estimated propensity scores. Patient characteristics were compared between groups using the chi-square test for categorical variables and the t-test for continuous variables. Survival was calculated using the Kaplan-Meier method and compared using the log-rank test. Multivariable logistic and Cox regression models were used to determine factors associated with overall survival (OS) and conduit-related complications. The optimal cut-off points for continuous variables, such as age and BMI, were determined based on the highest Youden index (sensitivity+specificity–1) [14].

All statistical calculations were performed using R ver. 4.2.2 (R Foundation for Statistical Computing, Vienna, Austria). A p-value of less than 0.05 was considered to indicate statistical significance.

Results

The median follow-up period was 52.8±45.1 months. Table 1 outlines the clinicopathological characteristics of the patients. Both groups were predominantly male, as was over 90% of the study population. Prior to matching, the Charlson comorbidity index was higher in the colon group (p=0.007), and neoadjuvant treatment was more frequently performed in the gastric group (p=0.006). No significant differences were observed in baseline characteristics, such as cancer location, cancer histology, resection margin, and pathologic stage, between the groups. After matching, the 2 matched groups exhibited no significant differences. A comparison of surgical methods revealed that cervical anastomosis was more common in the gastric group, regardless of matching. Additionally, before matching, the conventional operation was significantly more common than DaVinci surgery (86.2% versus 75.6%, p=0.013). However, after matching, no significant differences were found between these methods (86.2% versus 77.6%, p=0.125). Interestingly, the operation time of the colon conduit group was approximately 95 minutes longer (457.9±94.4 minutes) than that of the gastric conduit group (362.6±103.0 minutes) (p<0.001) (Supplementary Table 2).

Fig. 1 presents the Kaplan-Meier survival curves for both the colon and gastric groups. Prior to matching, the OS of patients with a colon conduit was significantly lower than that of patients with a gastric conduit (p=0.003). The 3- and 5-year OS rates for patients with a colon conduit were 60% and 46%, respectively, compared to 72.3% and 62.2% for patients with a gastric conduit. However, after match-

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Table 1. Baseline characteristics of patients

Characteristic	All patients (n=1,545)				Propensity-matched patients (n=232)			
	Colon conduit	Gastric conduit	p-value	SMD	Colon conduit	Gastric conduit	p-value	SMD
No. of patients	116	1,429			116	116		
Age (yr)	63.5±7.2	62.9±7.9	0.369	0.090	63.5±7.2	63.8±7.6	0.796	0.034
Sex			0.658	0.063			1.000	0.035
Female	7 (6.0)	109 (7.6)			7 (6.0)	8 (6.9)		
Male	109 (94.0)	1,320 (92.4)			109 (94.0)	108 (93.1)		
History of smoking	90 (77.6)	1,094 (76.6)	0.890	0.024	90 (77.6)	94 (81.0)	0.627	0.085
Charlson comorbidity index			**0.007**	**0.288**			0.632	0.126
0	14 (12.1)	237 (16.6)			14 (12.1)	12 (10.3)		
1	61 (52.6)	868 (60.7)			61 (52.6)	56 (48.3)		
≥2	41 (35.3)	324 (22.7)			41 (35.3)	48 (41.4)		
Body mass index (kg/m^2)	22.3±3.3	25.2±7.1	0.136	0.056	22.3±3.3	22.8±3.2	0.320	0.131
Location			0.296	0.183			0.296	0.148
Cervical	3 (2.6)	20 (1.4)			3 (2.6)	3 (2.6)		
Upper thoracic	16 (13.8)	179 (12.5)			16 (13.8)	22 (19.0)		
Mid-thoracic	37 (31.9)	572 (40.0)			37 (31.9)	37 (31.9)		
Lower thoracic	60(51.7)	658 (46.0)			60(51.7)	54 (46.6)		
Neoadjuvant treatment	29 (25.0)	546 (38.2)	**0.006**	**0.287**	29 (25.0)	33 (28.4)	0.656	0.078
Histology			0.207	0.139			0.845	0.076
Squamous cell carcinoma	111 (95.7)	1,401 (98.0)			111 (95.7)	112 (96.6)		
Adenocarcinoma	3 (2.6)	14 (1.0)			3 (2.6)	1 (0.9)		
Others	2 (1.7)	14 (1.0)			2 (1.7)	3 (2.6)		
Resection margins			0.156	0.140			1.000	0.033
Complete	107 (92.2)	1,316 (95.6)			107 (92.2)	108 (93.1)		
Incomplete	9 (7.8)	63 (4.4)			9 (7.8)	8 (6.9)		
Pathological stage			0.610	0.159			0.641	0.171
Stage I	57 (49.1)	770 (53.9)			57 (49.1)	49 (42.2)		
Stage II	41 (35.3)	403 (28.2)			41 (35.3)	47 (40.5)		
Stage III	16 (13.8)	234 (16.4)			16 (13.8)	16 (13.8)		
Stage IV	2 (1.7)	22 (1.5)			2 (1.7)	4 (3.4)		

Values are presented as number, mean±standard deviation, or number (%). Statistically significant results are marked in bold.
SMD, standardized mean difference.

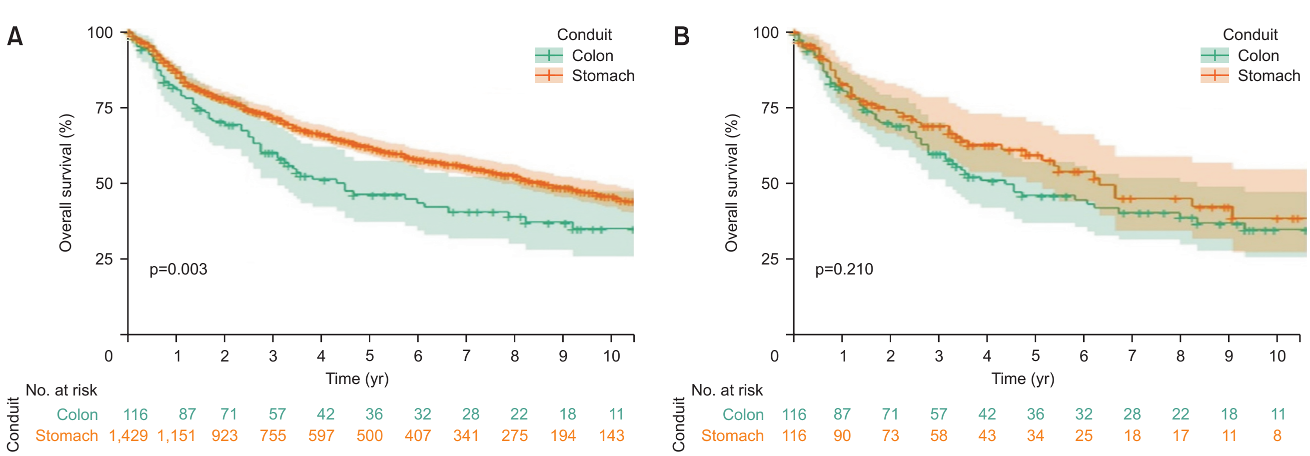

Fig. 1. (A) Overall survival curve for the unmatched cohorts. (B) Overall survival curve for the matched cohorts.

ing, no significant difference was found in the OS between the matched cohorts (p=0.210). In addition, a subgroup analysis was conducted according to cancer stage. Before matching, stage I patients with a gastric conduit demonstrated superior OS to those with a colon conduit (p=0.04). A similar trend was also observed in patients in stages II and III, but statistical significance was not achieved due to the relatively small patient population. After matching, no significant difference in OS was found according to the stage (Supplementary Fig. 2). Fig. 2 compares the OS rate based on the anastomosis level. Before matching, patients with a colon conduit consistently exhibited a lower OS for thoracic anastomosis (p=0.01). However, due to the limited number of cases of cervical anastomosis, statistical significance could not be observed (p=0.13). After matching, no significant difference in OS was observed based on the anastomosis site.

The multivariable analysis of OS in all patients prior to matching revealed the following as independent risk factors: the use of a colon conduit, age over 65 years, Charlson comorbidity index of 2 or higher, BMI less than 22.0 kg/m^2, neoadjuvant treatment, incomplete resection, and advanced stage (Table 2). Overall, the use of a colon conduit was a significant negative prognostic factor for OS (hazard ratio [HR], 1.48; 95% confidence interval [CI], 1.13–1.93; p=0.003). After matching, age over 65 years, BMI less than 22.0 kg/m^2, incomplete resection, and advanced stage were all identified as independent risk factors for OS. However, univariable analysis indicated that the use of a colon conduit was not independently associated with any adverse outcomes (HR, 1.27; 95% CI, 0.87–1.84; p=0.212).

After matching, a higher proportion of patients with colon conduits experienced postoperative complications than those with gastric conduits (Table 3). The most common

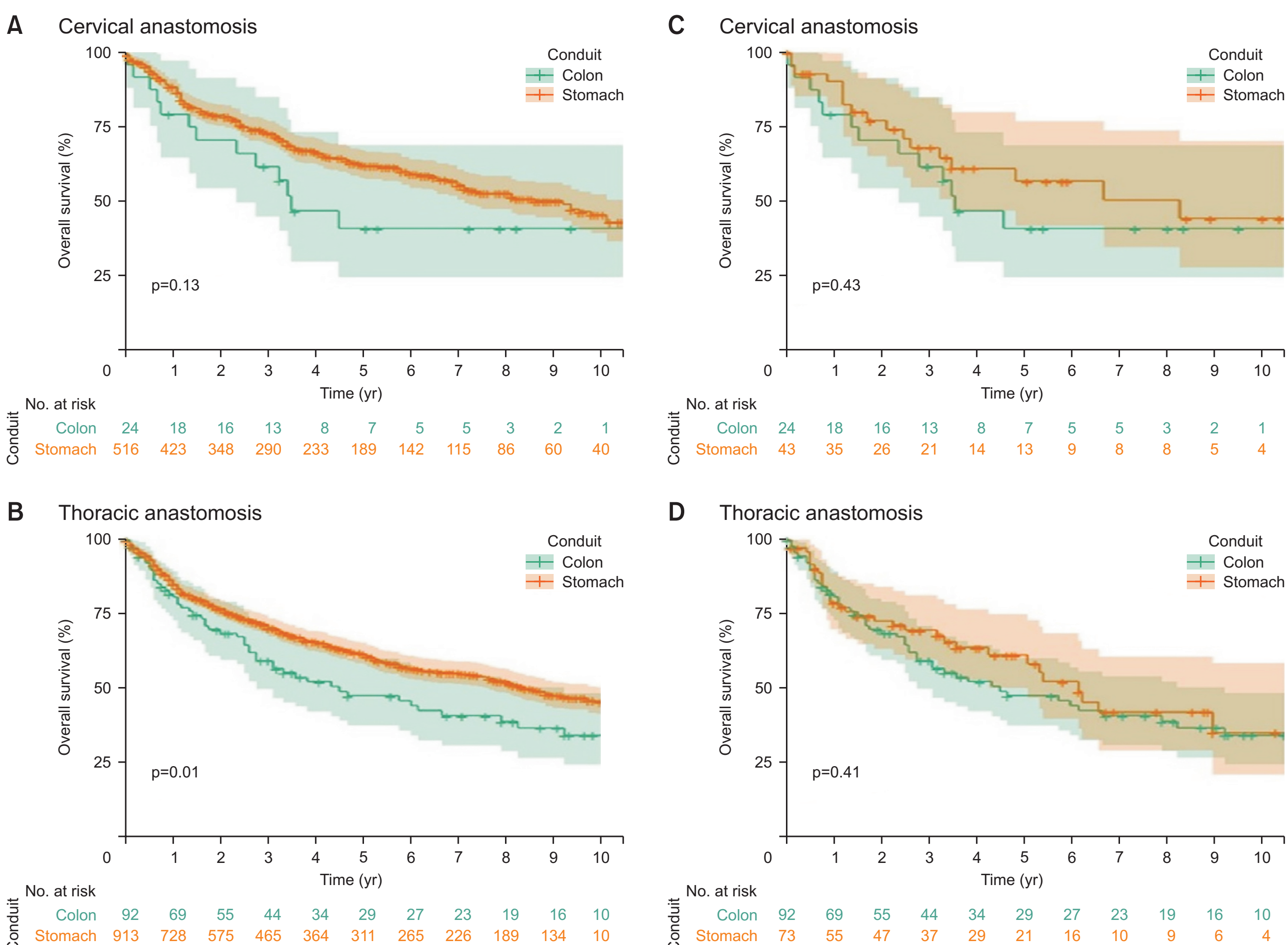

Fig. 2. Kaplan-Meier curve of overall survival according to anastomosis level. (A) Cervical anastomosis in the unmatched cohort. (B) Thoracic anastomosis in the unmatched cohort. (C) Cervical anastomosis in the matched cohort. (D) Thoracic anastomosis in the matched cohort.

Table 2. Multivariable analysis of overall survival across all patients

Characteristic	All patients (n=1,545)		Propensity-matched patients (n=232)	
	HR (95% CI)	p-value	HR (95% CI)	p-value
Colon vs. stomach	1.48 (1.13–1.93)	**0.003**		
Age >65 yr	1.51 (1.28–1.77)	**<0.001**	1.99 (1.36–2.90)	**<0.001**
Charlson comorbidity index				
0	1			
1	1.22 (0.97–1.54)	0.094		
≥2	1.59 (1.23–2.06)	**<0.001**		
Body mass index <22.0 kg/m^2	1.74 (1.49–2.05)	**<0.001**	1.81 (1.25–2.65)	**0.002**
Neoadjuvant treatment	1.39 (1.11–1.73)	**0.004**		
Incomplete resection	2.13 (1.60–2.84)	**<0.001**	1.84 (1.21–3.71)	**0.008**
Pathologic stage				
Stage 1	1		1	
Stage 2	1.53 (1.23–1.90)	**<0.001**	1.84 (1.19–2.82)	**0.006**
Stages 3 and 4	2.24 (1.70–2.95)	**<0.001**	3.24 (1.90–5.52)	**<0.001**

Statistically significant results are marked in bold.
HR, hazard ratio; CI, confidence interval.

Table 3. Postoperative complications

Characteristic	All patients (n=1,545)			Propensity-matched patients (n=232)		
	Colon conduit	Gastric conduit	p-value	Colon conduit	Gastric conduit	p-value
No. of patients	116	1429		116	116	
Early mortality (<30 day)	0	10 (0.7)	0.763	0	0	
Pneumonia	19 (16.4)	58 (4.1)	**<0.001**	19 (16.4)	8 (6.9)	**0.041**
Bleeding	2 (1.7)	6 (0.4)	0.226	2 (1.7)	0	0.478
Anastomotic leakage	16 (13.8)	46 (3.2)	**<0.001**	16 (13.8)	4 (3.4)	**0.010**
Neck	6 (5.2)	16 (1.1)	**0.002**	6 (5.2)	1 (0.9)	0.125
Abdomen	2 (1.7)	2 (0.1)	**0.023**	2 (1.7)	0	0.478
Thorax	8 (6.9)	28 (2.0)	**0.002**	8 (6.9)	3 (2.6)	0.217
Recurrent laryngeal nerve injury	19 (16.4)	220 (15.4)	0.882	19 (16.4)	12 (10.3)	0.247
Wound problem	15 (12.9)	24 (1.7)	**<0.001**	15 (12.9)	1 (0.9)	**0.001**
Chylothorax	3 (2.6)	31 (2.2)	1.000	3 (2.6)	3 (2.6)	1.000
Renal failure	2 (1.7)	5 (0.3)	0.161	2 (1.7)	1 (0.9)	1.000
Conduit necrosis	2 (1.7)	0	**<0.001**	2 (1.7)	0	0.478
Conduit stricture	7 (6.0)	1 (0.1)	**<0.001**	7 (6.0)	0	**0.021**

Values are presented as number or number (%). Statistically significant results are marked in bold.

complication in the colon conduit group was pneumonia, and its incidence was significantly higher than in the gastric conduit group (16.4% versus 6.9%, p=0.041). The rate of anastomotic leakage was also higher among patients with colon conduits compared to those with gastric conduits (13.8% versus 3.4%, p=0.010). Both wound complications and conduit stricture rates were significantly higher in the colon conduit group compared to the gastric conduit group. When the postoperative complication rate was examined in relation to anastomosis level and conduit type, the rate of anastomotic leakage was found to be greater among cases involving cervical anastomosis. In the gastric group, this difference in the incidence of anastomotic leakage was slight, from 2.7% (for patients with a thoracic anastomosis) to 4.7% (among those with a cervical anastomosis). However, in the colon group, the difference was much larger, from 9.8% to 29.2% (Supplementary Table 3).

Multivariable Cox hazard analysis was applied to the patients with colon conduits to identify relevant risk factors (Table 4). Independent prognostic risk factors for OS that were identified as significant included age over 65 years, BMI less than 22.0 kg/m^2, neoadjuvant therapy, incomplete resection, postoperative anastomotic leakage, and renal failure.

Table 4. Multivariable analysis of overall survival for colon conduits

Characteristic	Multivariable analysis	
	HR (95% CI)	p-value
Age >65 yr	2.86 (1.66–4.94)	**<0.001**
Body mass index <22.0 kg/m^2	2.40 (1.42–4.05)	**0.001**
Neoadjuvant treatment	2.52 (1.37–4.65)	**0.003**
Incomplete resection	2.31 (1.10–4.89)	**0.027**
Anastomotic leakage	2.12 (1.05–4.25)	**0.035**
Renal failure	6.89 (1.48–32.12)	**0.014**

Statistically significant results are marked in bold.
HR, hazard ratio; CI, confidence interval.

Logistic univariate analysis was conducted for the colon conduit subgroups to evaluate the prognostic influence of conduit-related complications (Supplementary Table 4). These complications were defined by the occurrence of any of the following 3 conditions: anastomotic leakage, conduit stricture, and conduit necrosis. Consequently, cervical anastomosis was identified as a significant risk factor for conduit-related complications (odds ratio, 4.10; 95% CI, 1.40–12.00; p=0.010). No other significant factors were identified.

Discussion

An ideal esophageal replacement should have sufficient length to connect the cervical or upper thoracic esophagus to the abdominal gastrointestinal tract. It also requires a robust vascular supply to maintain perfusion throughout the entire conduit, which directly influences the healing of the anastomotic site. Moreover, it should possess intrinsic motility to facilitate the passage of food and minimize reflux. However, as of yet, no esophageal replacement can perfectly replicate all of these functions [15]. Therefore, the gastric conduit has become the primary choice for esophageal replacement due to its adequate length, predictable vascular supply, and the need for only a single anastomosis. However, with advancements in diagnostic and therapeutic modalities for gastric cancer, esophageal cancer has been more frequently discovered after gastrectomy. Additionally, the development of early diagnostic tools and the expansion of general healthcare programs have led to an increase in synchronous esophageal and gastric cancer cases, which in turn has driven the expansion of colon conduits [16]. Therefore, we aimed to analyze the recent surgical outcomes of colon conduits in surgery for primary esophageal cancers. We also sought to investigate how prognosis varied among patients treated with gastric conduits during the same period.

Prior to the application of propensity score matching, the use of a colon conduit was associated with a significantly worse prognosis than the gastric conduit, irrespective of the level of anastomosis and pathological stage. However, after adjusting for multiple covariates, such as age, sex, BMI, Charlson comorbidity index, tumor location, neoadjuvant therapy, clinical stage, and tumor resection margin, no significant difference in survival was observed between the groups. Given the lack of significant difference in survival after matching, it can be inferred that the survival discrepancy observed between the groups prior to matching is due to underlying medical conditions. Approximately 84.5% of the individuals in the colon conduit group had a history of gastric cancer, either before or at the time of surgery, which is believed to have influenced survival. After matching, the risk factors influencing survival included age over 65 years, BMI under 22.0 kg/m^2, incomplete resection, and advanced stage.

In contrast to the absence of survival differences between groups following propensity score matching, complications were found to be significantly more common within the colon group, even after matching. The rates of pneumonia, anastomotic leakage, wound complications, and conduit stricture were significantly higher in the colon group than in the gastric group.

Specifically, the rate of postoperative pneumonia was over twice as high in the colon conduit group as in the gastric conduit group (16.4% versus. 6.9%, p=0.041). This result could be attributed to the reluctance to apply minimally invasive techniques and the prolonged operation times necessitated by the complexity of forming a colon conduit as opposed to a gastric conduit. Previous research has suggested that thoracotomy and prolonged operation times could contribute to an elevated risk of pneumonia and other pulmonary complications [17,18]. In our study, the use of a colon conduit was associated with a higher rate of open thoracotomy than the use of a gastric conduit. Furthermore, the operation time was extended by approximately 95 minutes when a colon conduit was used, in contrast to the use of a gastric conduit. Therefore, we recommend more assertive management strategies, such as the application of epidural analgesia and body ventilation, for patients with a colon conduit to address postoperative pain and respiratory exercise.

In the existing literature, the incidence of postoperative complications associated with colon conduits is reportedly higher than that of gastric conduits, with rates ranging from 24% to 86% (Supplementary Table 1). In the present study, the rate of complications associated with colon con-

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duits, including anastomotic leakage, conduit necrosis, and conduit stricture, was 21.6%. This rate is acceptable compared to previous studies [7,12,13], but it is significantly higher than the rate for gastric conduits (21.5% versus 3.4%, p<0.001). Regarding anastomotic leakage, when comparing the rate of this complication between cases with thoracic anastomosis and those with cervical anastomosis, colon conduits showed a sharper increase compared to gastric conduits (colon conduit, 9.8%–29.2%; gastric conduit, 2.7%–4.7%). Furthermore, cervical anastomosis was identified as a significant risk factor for conduit-related complications in patients with colon conduits (HR, 4.10; 95% CI, 1.40–12.00; p=0.010). This is likely because the higher the colon conduit is positioned, the poorer the blood supply becomes in comparison to the gastric conduit [11]. Thus, preoperative angiography and intraoperative evaluation of the colonic vasculature should be routinely performed to determine the ideal placement and length of the colon conduit [19].

Although the level of anastomosis is determined by the tumor location and resection margin and not by the surgical outcomes, multiple studies have been conducted to compare the surgical results between transthoracic and transcervical anastomoses by examining the risk factors for transcervical anastomosis [20,21]. Similarly, this study directly compared the surgical outcomes for gastric and colon conduits performed during the same timeframe. The objective of this study was not to establish the colon conduit as inferior to the gastric conduit. Instead, the goal was to elucidate the prognostic differences between these conduit types and identify the factors contributing to these differences. Ultimately, our data serve as a valuable reference for patients requiring a colon conduit, enabling them to understand their prognosis and contemplate subsequent treatments. For instance, definitive chemoradiation treatment, as opposed to surgery, could be considered for patients with the risk factors previously described.

The limitations of this study include its single-center focus, its retrospective design, and the changes in surgical techniques that occurred during the study period. Notably, DaVinci surgery was introduced recently, but the number of patients who underwent this procedure was small, so it was not adequately represented. Ideally, a retrospective study would exclude patients with a history of abdominal surgery and gastric cancer. However, of the 116 total patients, 50 had a history of abdominal surgery (10 due to gastric ulcer, 40 due to gastric cancer) and 49 had synchronous gastric cancer. If we were to exclude all of these patients, the remaining number would be too small to allow for a meaningful comparison between groups. Consequently, we chose to include these patients in our analysis, even though a history of abdominal surgery and gastric cancer could significantly influence the results. Furthermore, the characteristics of the 2 groups were heterogeneous, making any comparison between them potentially contentious. Nevertheless, we believe that this study will be useful in clarifying patient prognosis by considering the surgical method and risk factors prior to surgery, as well as in establishing appropriate surgical indicators.

In conclusion, although colon conduits were associated with higher morbidity rates than gastric conduits, the long-term outcomes of colon conduits are considered acceptable. The difference in mortality between the groups is likely attributable to underlying medical conditions rather than the surgical technique employed. Furthermore, during the perioperative period, more consideration should be given to the use of a colon conduit, particularly in cervical anastomosis.

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Conflict of interest

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Supplementary materials

Supplementary materials can be found via https://doi.org/10.5090/jcs.23.074. **Supplementary Table 1**. Published series of colonic interposition. **Supplementary Table 2**. Operative data. **Supplementary Table 3**. Postoperative complications according to anastomosis level in the matched cohort. **Supplementary Table 4**. Univariate logistic regression analysis of conduit-related complications in patients with colon conduits. **Supplementary Fig. 1**. Schematic of the patient selection process. **Supplementary Fig. 2**. Kaplan-Meier curve of overall survival according to stage.

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