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Original Article

Esophageal cancer surgery in Greece during the era of the financial crisis

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SUMMARY. **The aim of this study is to describe outcomes of esophageal cancer surgery in a quaternary upper gastrointestinal (GI) center in Athens during the era of the Greek *financial crisis*. We performed a retrospective analysis of patients that underwent esophagectomy for esophageal or gastroesophageal junction (GEJ) cancer at an upper GI unit of the University of Athens, during the period January 2004–June 2019. Time-to-event analyses were performed to explore trends in survival and recurrence. A total of 146 patients were identified. Nearly half of the patients (49.3%) underwent surgery during the last 4 years of the financial crisis (2015–2018). Mean age at the time of surgery was 62.3 ± 10.3 years, and patients did not present at older ages during the recession ($P = 0.50$). Most patients were stage III at the time of surgery both prior to the recession (35%) and during the financial crisis (39.8%, $P = 0.17$). Ivor–Lewis was the most commonly performed procedure (67.1%) across all eras ($P = 0.06$). Gastric conduit was the most common form of GI reconstruction (95.9%) following all types of surgery ($P < 0.001$). Pre-recession anastomoses were usually performed using a circular stapler (65%). Both during (88.1%) and following the recession (100%), the vast majority of anastomoses were hand-sewn. R0 resection was achieved in 142 (97.9%) patients. Anastomosis technique did not affect postoperative leak ($P = 0.3$) or morbidity rates ($P = 0.1$). Morbidity rates were not significantly different prior to (25%), during (46.9%), and after (62.5%) the financial crisis, $P = 0.16$. Utilization of neoadjuvant chemotherapy (26.9%, $P = 0.90$) or radiation (8.4%, $P = 0.44$) as well as adjuvant chemotherapy (54.8%, $P = 0.85$) and irradiation (13.7%, $P = 0.49$) was the same across all eras. Disease-free survival (DFS) and all-cause mortality rates were 41.2 and 47.3%, respectively. Median DFS and observed survival (OS) were 11.3 and 22.7 months, respectively. The financial crisis did not influence relapse ($P = 0.17$) and survival rates ($P = 0.91$). The establishment of capital controls also had no impact on recurrence ($P = 0.18$) and survival ($P = 0.94$). Austerity measures during the Greek *financial crisis* did not influence long-term esophageal cancer outcomes. Therefore, achieving international standards in esophagectomy may be possible in resource-limited countries when centralizing care.**

KEY WORDS: **circular stapler, esophageal cancer, esophageal carcinoma, financial crisis, Greece, hand-sewn anastomosis, Ivor–Lewis, linear stapler, McKeown.**

INTRODUCTION

Esophageal cancer constitutes the eighth most common malignancy worldwide.[1] Although, squamous cell carcinoma (SCC) used to account for the majority of esophageal cancer in western societies, in recent decades, adenocarcinoma has emerged as the predominant histological subtype of esophageal cancer in North America and Europe.[2] This phenomenon seems to be related to an increase in obesity rates and gastroesophageal reflux, which predispose to the development of Barrett's esophagus and ultimately to the development of adenocarcinoma.[3]

Despite advances in the fields of surgery, gastroenterology, and oncology, esophageal cancer prognosis continues to be poor. Particularly, esophageal malignancies account for over 15,000 deaths per year, which equals to approximately 10% of gastrointestinal (GI) cancer-related mortality.[4] In the United States, 1.5 billion US dollars (USD) are annually allocated to the care of patients with esophageal malignancies.[5] There is little data assessing whether esophageal

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cancer surgery performed in resource-limited environments can result in outcomes comparable to those seen in economically flourishing countries.

Although Greece has several tertiary hospitals, these are not accredited for esophageal surgery, and thus these sites almost never perform such complex procedures. Indeed, the majority of esophageal cancer patients undergo surgery at a handful of quaternary referral centers in Athens. During the period 2010–2018, Greece was afflicted by a devastating *financial crisis* necessitating three bailout packages from the European Union worth a total of 360 billion USD.[6,7] In the present study, we reviewed esophagectomy outcomes in a quaternary upper GI surgical center in Athens during three distinct time periods, aka prior to, during, and following the aftermath of the *financial crisis*.

MATERIALS AND METHODS

Study design

We retrospectively reviewed the charts of all patients who underwent surgery for esophageal cancer at one of the highest-volume upper GI surgical centers in Athens, Greece. Our dedicated upper GI team initially operated at Attikon University Hospital but relocated to Laiko General Hospital in 2014. Both institutions are quaternary academic medical centers. Enrollment period was January 2004 to June 2019. The following variables were extracted: demographics, tumor location, histology, grade, stage, surgical approach, extent of resection and lymphadenectomy, conduit, anastomosis technique, postoperative complications, chemotherapy and radiation, recurrence, and mortality. We excluded patients who were inoperable or metastatic at diagnosis and underwent definitive chemotherapy as well as those with prohibitory performance status for esophagectomy. Institutional Review Board approval was obtained prior to the start of the study.

Statistical analysis

The Shapiro–Wilk test was used to determine whether data followed a normal distribution. Chi-square was used for hypothesis testing between categorical variables. One-way ANOVA with Bonferroni correction was used to assess the impact of group membership on continuous variable changes.

Disease-free survival (DFS) and observed survival (OS) were estimated using the Kaplan–Meier method. The log-rank test was used to compare Kaplan–Meier curves. Cox proportional hazard models were constructed to identify variables independently associated with recurrence and mortality. Statistical significance was set at $P < 0.05$ for all comparisons, and all P-values were two-sided. All statistical analyses were performed in STATA IC15 (StataCorp College Station, TX: StataCorp LLC).

Periods of the financial crisis

For time-to-event sub-analyses, we opted to split our study period in three distinct eras: pre-recession (2004–2009), recession (2010–2018), and post-recession (2019).[7] The recession period was further subcategorized in three groups, each of which coincided with new austerity policies and a new bailout package or memorandum of understanding: first recession, 2010–2011; second recession, 2012–2015; and third recession, 2016–2018.[8]

We also explored the impact of capital controls on time-to-event outcomes. Capital controls were introduced in Greece in 2015, when the extension of the second bailout package ended. At that time, the European Central Bank ceased its Emergency Liquidity Assistance program. All national banks closed for almost 20 days and implemented controls on transfers from Greek to foreign banks, while imposing restrictions on cash withdrawals to prevent a national banking system collapse. Capital controls were lifted on September 1, 2019.[8]

RESULTS

Demographics

A total of 146 patients were enrolled in our study. Seventy-two (49.3%) patients underwent surgery during the last four years of the financial crisis (2015–2018). Mean age at the time of surgery was 62.3 ± 10.3 years, and patients did not present at older ages during the recession ($P = 0.50$). The most prevalent lesions were Siewert II (49.3%) followed by Siewert I carcinomas (32.9%), $P < 0.01$. Overall, the most common histology was adenocarcinoma (80.8%). Mean length of hospital stay was not statistically different among patients treated before (13.4 days), during (24.7 days), and after the recession (13.1 days), $P = 0.27$. Complete overview of demographics and perioperative data stratified by financial era and tumor location can be found in Table 1 and Supplementary Table 1, respectively.

Grade and stage

The majority of the patients had grade 3 (51.5%), T3 (53.8%), N3 (41.1%) and M0 (98.6%) disease. Most patients were stage III at the time of surgery both prior to the recession (35%) and during the financial crisis (39.8%, $P = 0.17$) (Table 2). As described in Supplementary Table 2, grade and staging were also not influenced by tumor location or histology.

Table 1 Demographics and surgical approach according to time period

Variable	Pre-recession ($n=20$)	Recession ($n=118$)	Post-recession ($n=8$)	Total	*P*-value
Age (y) mean ± SD	63.0 ± 9.8	62.4 ± 10.5	59.5 ± 7.5	62.3 ± 10.3	0.50
Sex					0.20
Male	19 (95%)	99 (83.9%)	8 (100%)	126 (86.3%)	
Female	1 (5.0%)	19 (16.1%)	0 (0%)	20 (13.7%)	
Location					0.06
Siewert I	8 (40.0%)	39 (33.1%)	1 (12.5%)	48 (32.9%)	
Siewert II	5 (25.0%)	61 (51.7%)	6 (75.0%)	72 (49.3%)	
Esophageal cancer	7 (35.0%)	18 (15.2%)	1 (12.5%)	26 (17.8%)	
Histology					0.03
Adenocarcinoma	11 (55.5%)	100 (84.7%)	7 (87.5%)	118 (80.8%)	
Squamous cell carcinoma	6 (30.0%)	11 (9.3%)	1 (12.5%)	18 (12.3%)	
Adenosquamous cell carcinoma	3 (15.5%)	4 (3.3%)	0 (0%)	7 (4.8%)	
Other	0 (0%)	3 (2.5%)	0 (0%)	3 (2.1%)	
Esophagectomy					0.06
Open					
McKeown	5 (25.0%)	24 (20.3%)	2 (25.0%)	31 (21.2%)	
Ivor–Lewis	8 (40.0%)	70 (59.3%)	6 (75.0%)	84 (57.6%)	
Left thoracoabdominal	6 (30.0%)	6 (5.2%)	0 (0%)	12 (8.2%)	
PLO	1 (5.0%)	1 (0.8%)	0 (0%)	2 (1.4%)	
Minimally invasive				17 (11.6%)	
McKeown	0 (0%)	3 (2.5%)	0 (0%)	3 (2.1%)	
Ivor–Lewis	0 (0%)	14 (11.9%)	0 (0%)	14 (9.5%)	
Conduit					0.06
Gastric	19 (95.0%)	114 (96.6%)	7 (87.5%)	140 (95.9%)	
Colon	0 (0.0%)	4 (3.4%)	1 (12.5%)	5 (3.4%)	
Jejunum	1 (5.0%)	0 (0.0%)	0 (0%)	1 (0.7%)	
Anastomosis					0.01
Circular stapler	13 (65.0%)	6 (5.1%)	0 (0%)	19 (13.0%)	
Hand-sewn	7 (35.0%)	104 (88.1%)	8 (100%)	119 (81.5%)	
Linear stapler	0 (0.0%)	8 (6.8%)	0 (0%)	8 (5.5%)	
Resection					0.69
R0	20 (100%)	114 (97.4%)	8 (100%)	142 (97.9%)	
R1	0 (0%)	3 (2.6%)	0 (0%)	3 (2.1%)	
Abdominal field lymphadenectomy					0.23
D0 lymphadenectomy	0 (0%)	1 (0.8%)	0 (0%)	1 (0.7%)	
D1 lymphadenectomy	20 (100%)	83 (70.4%)	6 (75%)	109 (74.6%)	
D2 lymphadenectomy	0 (0%)	33 (28.0%)	2 (25%)	35 (24.0%)	
D3 lymphadenectomy	0 (0%)	1 (0.8%)	0 (0%)	1 (0.7%)	
Overall complication rates	4 (25.0%)	53 (46.9%)	5 (62.5%)	62 (42.5%)	0.16
Leakage	2 (10.0%)	21 (17.8%)	1 (12.5%)	24 (16.4%)	0.65
Clavien–Dindo					0.28
0	11 (73.3%)	58 (52.7%)	5 (83.3%)	74 (56.5%)	
I	0 (0%)	5 (4.5%)	0 (0%)	5 (3.8%)	
II	1 (6.7%)	25 (22.7%)	1 (16.7%)	27 (20.6%)	
IIIA	2 (13.3%)	15 (13.6%)	0 (0%)	17 (12.9%)	
IIIB	1 (6.7%)	0 (0%)	0 (0%)	1 (0.7%)	
IVA	0 (0%)	2 (1.8%)	0 (0%)	2 (1.4%)	
IVB	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
V	0 (0%)	5 (4.5%)	0 (0%)	5 (3.8%)	
Length of hospital stay (days) mean ± SD	13.4 ± 4.1	24.7 ± 35.7	13.1 ± 3.2	22.6 ± 32.5	0.27

n, number of patients; PLO, pharyngolaryngoesophagectomy; y, years; SD, standard deviation
Pre-recession (2004–2009), recession (2010–2018), and post-recession (2019)

Surgical approach

Open and minimally invasive esophagectomies were performed in 129 (88.4%) and 17 (11.6%) of the patients, respectively. Overall, Ivor–Lewis was the most commonly performed procedure (67.1%) during all economic phases of the study ($P=0.06$). Gastric conduit was the most common form of GI reconstruction (95.9%) following all types of surgery ($P<0.001$) irrespective of financial era and tumor location. Pre-recession anastomoses were usually performed using a circular stapler (65%). Both during (88.1%) and following the recession (100%), the vast majority of anastomoses were hand-sewn. That said, the circular stapler was used in 66.6% of left thoracoabdominal resections, whereas the linear stapler was the most common means of anastomosis in minimally invasive esophagectomies (75%).

R0 resection was achieved in 97.9% of the patients. Recession ($P=0.69$), tumor location ($P=0.45$), histology ($P=0.94$), type of surgical procedure ($P=0.92$), neoadjuvant chemotherapy ($P=0.28$),

Table 2 Grade, TNM staging, and medical treatments by time period

Variable	Pre-recession	Recession	Post-recession	Total	*P*-value
Grade					0.27
Grade 1	0 (0%)	8 (7.4%)	1 (14.3%)	9 (6.7%)	
Grade 2	5 (27.8%)	49 (44.9%)	2 (28.3%)	56 (41.8%)	
Grade 3	13 (72.2%)	52 (47.7%)	4 (57.2%)	69 (51.5%)	
Tumor (T)					<0.01
TIS	2 (10.0%)	5 (4.3%)	1 (12.5%)	8 (5.5%)	
T1A	1 (5%)	3 (2.5%)	0 (0%)	4 (2.8%)	
T1B	3 (15.0%)	13 (11.1%)	1 (12.5%)	17 (11.7%)	
T2	4 (20.0%)	27 (23.1%)	0 (0%)	31 (21.4%)	
T3	8 (40.0%)	66 (56.4%)	4 (50%)	78 (53.8%)	
T4A	2 (10.0%)	3 (2.5%)	0 (0%)	5 (5.0%)	
T4B	0 (0%)	0 (0%)	2 (25.0%)	2 (1.4%)	
Lymph nodes (N)					0.07
N0	14 (70.0%)	44 (37.6%)	3 (37.5%)	61 (41.1%)	
N1	1 (5.0%)	19 (16.2%)	1 (12.5%)	21 (14.5%)	
N2	1 (5.0%)	24 (20.5%)	0 (0%)	25 (17.2%)	
N3	4 (20%)	30 (25.6%)	4 (50%)	38 (26.2%)	
Metastasis (M)					
M0	20 (100%)	114 (98.3%)	8 (100%)	142 (98.6%)	0.78
M1	0 (0%)	2 (1.7%)	0 (0%)	2 (1.4%)	
Stage					
0	0 (0%)	3 (25.4%)	1 (12.5%)	4 (2.7%)	0.17
I	4 (20.0%)	18 (15.2%)	1 (12.5%)	23 (15.7%)	
II	7 (35.0%)	22 (18.6%)	1 (12.5%)	30 (20.6%)	
III	7 (35.0%)	47 (39.8%)	1 (12.5%)	55 (37.7%)	
IV	2 (10%)	28 (23.7%)	4 (50.0%)	34 (23.3%)	
Neoadjuvant					
Chemotherapy	2 (14.3%)	30 (27.8%)	3 (37.5%)	35 (26.9%)	0.44
Radiation	1 (7.1%)	9 (8.3%)	1 (7.1%)	11 (8.4%)	0.90
Adjuvant					
Chemotherapy	6 (50%)	57 (54.8%)	5 (62.5%)	68 (54.8%)	0.85
Radiation	2 (16.7%)	15 (14.4%)	0 (0%)	17 (13.7%)	0.49

Pre-recession (2004–2009), recession (2010–2018), and post-recession (2019)

and neoadjuvant radiotherapy ($P = 0.59$) did not affect the radicality of the resection. Two-field lymphadenectomy (abdominal and thoracic) was performed in all patients during all phases of the study. In terms of abdominal lymphadenectomy, D1 was performed in 74.6% of the cases. The extent of abdominal lymphadenectomy was not influenced by the financial crisis ($P = 0.23$), surgical technique ($P = 0.28$), or histopathology type ($P = 0.34$).

Postoperative complications

Postoperative complications developed in 42.4% of the patients. Morbidity rates were not significantly different prior to (25%), during (46.9%), and after (62.5%) the financial crisis, $P = 0.16$. According to the Clavien–Dindo classification, 20%, 19.9%, and 18% ($P = 0.28$) of the patients developed class III–V complications during pre-recession, recession, and after the recession, respectively. Tumor location ($P = 0.09$), anastomosis technique ($P = 0.12$), conduit type ($P = 0.19$), and R status ($P = 0.16$) also did not affect morbidity rates.

Overall, 16.4% of the patients developed leakage. This was seen most commonly with the McKeown technique (70.8%, $P = 0.001$) (Supplementary Table 3). Importantly, leakage rates remained similar prior to (10%), during (17.8%), and after (12.5%) the financial crisis ($P = 0.65$). Furthermore, no difference was found in leakage rates among patients who underwent a hand-sewn (18.4%) versus a circular (5.3%) or linear stapler (12.5%) anastomosis ($P = 0.3$). Patients who received gastric (15.7%) and colonic (40%) conduits also had similar leakage rates ($P = 0.3$).

Chemotherapy and radiation

There were no significant trends in the utilization of neoadjuvant chemotherapy (26.9%, $P = 0.90$) or radiation (8.4%, $P = 0.44$) during the different financial phases of our study. Similarly, adjuvant chemotherapy (54.8%, $P = 0.85$) and irradiation (13.7%, $P = 0.49$) were administered at similar rates across the entire 15-year spectrum of our analysis. Tumor location, histology, and grade also did not affect pre- or post-operative needs for medical treatments.

Recurrence

DFS and median time to recurrence were 41.2% and 11.3 months, respectively. During the different periods of the financial crisis, relapse rates were the same ($P = 0.17$) (Fig. 1). The establishment of capital controls had no impact on recurrence as

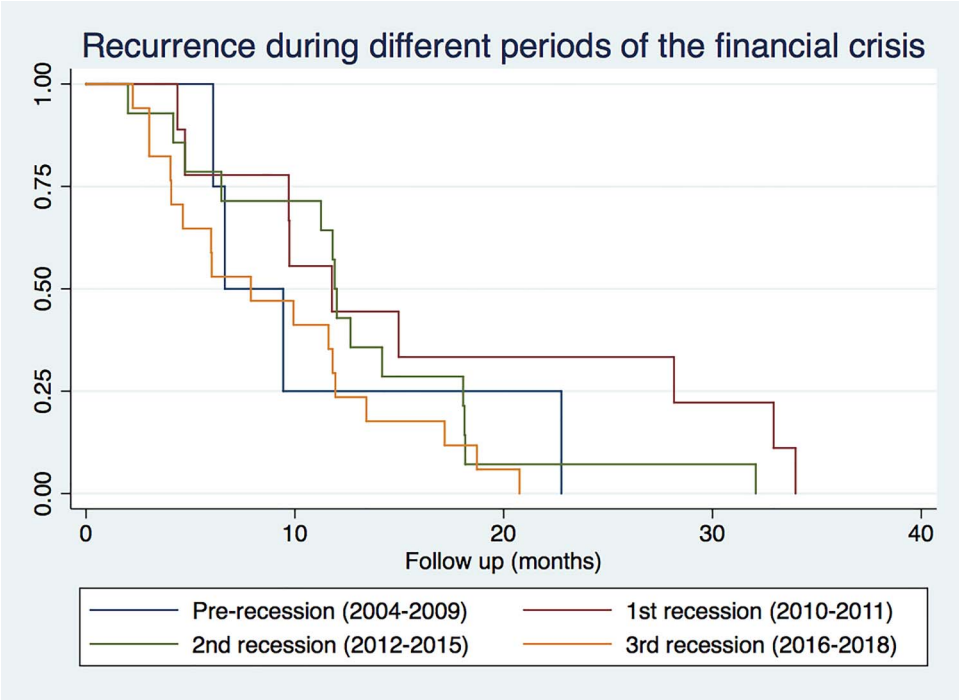

Fig. 1 Kaplan–Meier for recurrence stratified by financial period.

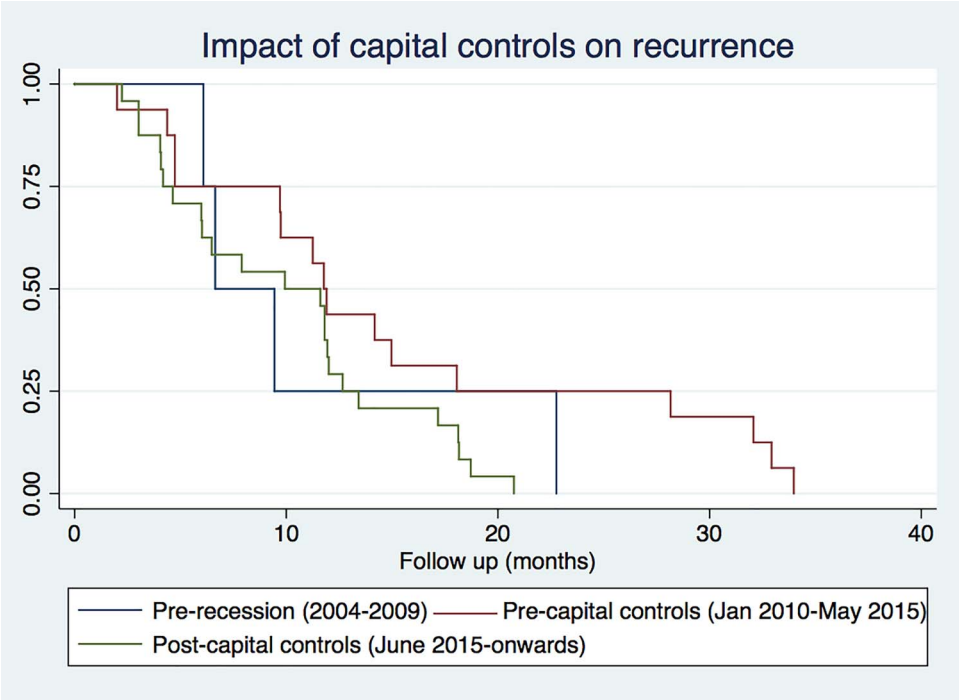

Fig. 2 Kaplan–Meier for recurrence stratified by capital controls.

well ($P = 0.18$) (Fig. 2). Tumor location ($P = 0.43$) and histology type ($P = 0.09$) also did not affect recurrence rates (Supplementary Figs 1 and 2). On univariate analysis, the only factors associated with relapse rates were patient age ($P < 0.001$), surgical approach ($P < 0.001$), grade ($P < 0.001$), number of positive lymph nodes ($P < 0.001$), and need for neoadjuvant chemotherapy ($P < 0.001$). On multivariate Cox regression analysis, however, only the number of positive lymph nodes (HR = 1.1; 95% CI: 1.0–1.1, $P = 0.03$) was independently associated with increased risk of recurrence, whereas neoadjuvant chemotherapy (HR: 0.40; 95% CI: 0.17–0.95; $P = 0.03$) was protective against relapse.

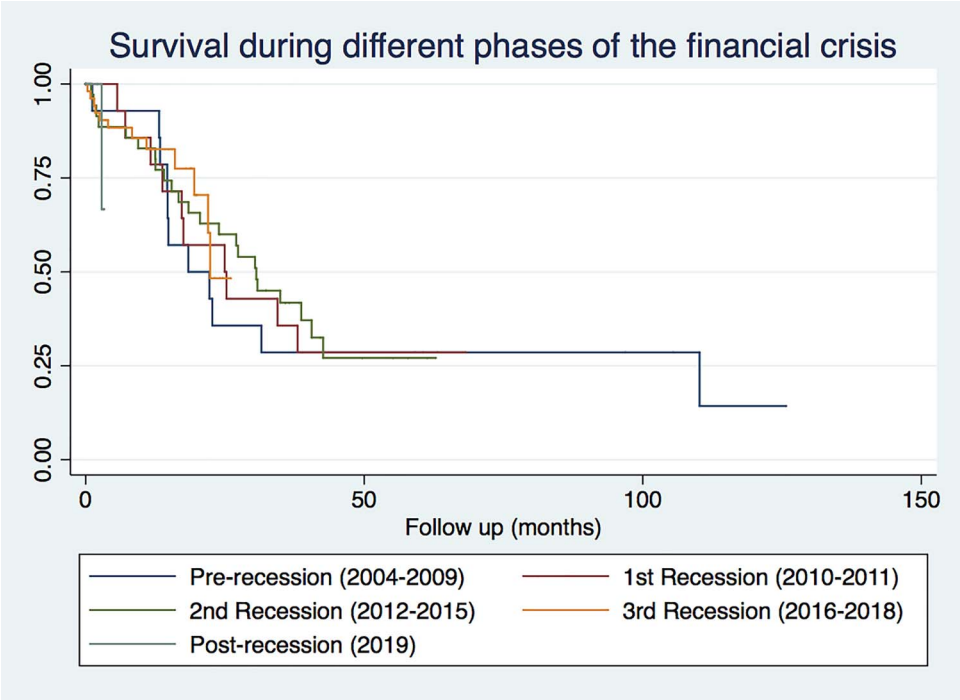

Fig. 3 Kaplan–Meier for survival stratified by financial period.

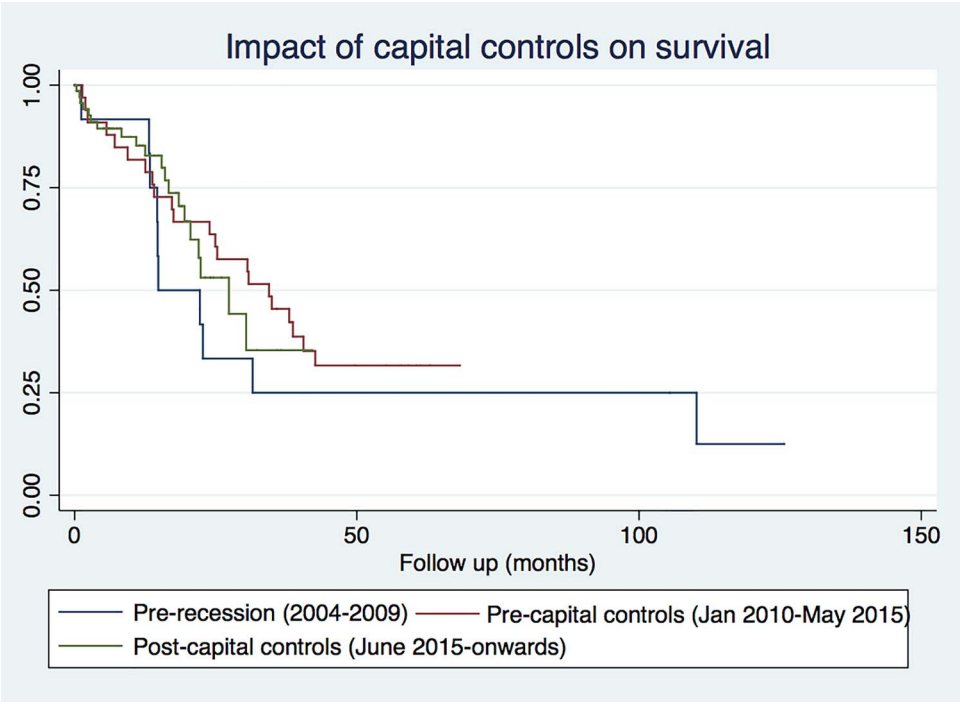

Fig. 4 Kaplan–Meier for survival stratified by capital controls.

Mortality

All-cause mortality was 47.3% and median time of death was 22.7 months. Survival did not differ during the different periods of the financial crisis ($P = 0.91$; Fig. 3) including after the introduction of capital controls ($P = 0.94$) (Fig. 4). Survival was also not affected by tumor location, $P = 0.98$ (Supplementary Fig. 3). Squamous cell carcinoma had the worse prognosis with an 80% mortality during a median of 14.7 months ($P = 0.02$; Supplementary Fig. 4). Importantly, neoadjuvant chemoradiation improved survival in patients with squamous cell carcinoma ($P < 0.001$). On univariate analysis, leakage ($P = 0.01$), postoperative complications ($P < 0.001$), grade ($P < 0.001$), positive lymph nodes ($P < 0.001$), stage ($P = 0.01$), neoadjuvant

radiotherapy ($P = 0.04$), and recurrence ($P < 0.01$) were also associated with prognosis. On multivariate Cox regression, neoadjuvant radiation (HR: 7.1; 95% CI: 2.3–21.3, $P = 0.01$) and recurrence (HR: 3.5; 95% CI: 1.6–7.8; $P = 0.02$) were independently associated with increased risk of mortality.

DISCUSSION

In the United States, the care of esophageal cancer patients who survive for more than 12 months post diagnosis can cost as much as $50,000.[9] This patient population also has the highest cost for malignancy-related hospital admissions ($27,506) due to the requirement for complex surgical and endoscopic procedures. Furthermore, these patients typically need close follow-up with substantial physician service costs ($4,757) and home care expenditure ($4,058).[9] Not surprisingly, the financial burden is significantly higher in the initial and terminal disease phases.[10] National economy restrictions pose challenges to providing complex care.[11] During the recession of 2010–2018, Greece received three bailout packages to avoid bankruptcy. Austerity policies led to healthcare personnel reduction, minimization of available resources and equipment, as well as increased unemployment rates and loss of health insurance for thousands.[7]

In the present study, we analyzed the institutional registry of one of the largest upper GI centers in Athens, a city that accounts for nearly 40% of the population of Greece. Our findings closely resemble the outcomes of esophageal surgery performed in highly specialized centers across the world. It should be emphasized that although Greece has several tertiary hospitals, these are not accredited for esophageal surgery and therefore hardly (if ever) perform these complex procedures. Therefore, the majority of esophageal cancer patients undergo surgery at referral centers such as ours. This means that our results are representative of the care that most patients receive for esophageal cancer in Greece. Indeed, there has been a nationwide effort to follow evidence from Europe and the United States, confirming that high-volume upper GI centers have lower, complication rates, length of stay, and mortality compared to low-volume centers (8.4–13%).[12–14] The beneficial effects of centralization are also applicable in low-risk tumors.[13] Patients of non-White race, uninsured, and low household income also experience a survival benefit when treated in high-volume centers which means that centralization of esophageal surgery can contribute to the reduction of disparities.[14] These metrics are particularly important in the midst of a financial crisis.

The strength of our work lies in the completeness of our dataset. No surgically treated patients are missing from our analysis. It would be reasonable to assume that definitive chemo/radiation therapy, esophageal stent placements, and feeding jejunostomy rates could increase in financially struggling countries. However, it should be emphasized that no operable patients were denied surgery due to resource limitations or other factors. Additionally, no difference was observed in the utilization of neoadjuvant or adjuvant chemotherapy/radiation during the progression of the financial crisis. Due to centralization of care, our departmental budget was minimally impacted by the financial crisis; therefore we are able to uphold international standards in management algorithms. On average 10 patients underwent esophagectomy by our team yearly. Importantly, with the progression of time, our annual case volume increased substantially, culminating to 15–20 patients/year during the last and most decisive half of the financial crisis (2015–2018). These data further support the importance of centralization of care for patients dealing with upper GI cancer in resource-limited countries.

The demographics and clinicopathological features of our cohort are consistent with the literature. Particularly, the majority of our patients were males in their 60s with T3N3M0, grade 3, Siewert I adenocarcinomas. Nearly half of our cohort underwent surgery during the last 4 years of the financial crisis. Notably, these patients did not present at older ages or more advanced stages during the recession. Morbidity rates were not significantly different prior to (25%), during (46.9%), and after (62.5%) the financial crisis. The severity of the complications according to the Clavien–Dindo classification was also the same across all financial eras. During all economic phases of our study, the most commonly performed procedure was the Ivor–Lewis (67.1%) using a gastric conduit. Prior to the recession, most anastomoses were performed using a circular stapler (65%). Both during and following the recession the vast majority of anastomoses were hand-sewn. This institutional change was not imposed by scarcity of resources but was rather inspired by our belief that hand-sewn anastomosis may be more reliable and could potentially minimize leakage. Even though we found that the technique of the anastomosis did not affect leak or overall postoperative complication rates[15–18], when performed by experienced surgeons, the hand-sewn anastomosis is known to be more cost-effective compared to circular or linear staplers due to less need for expensive, specialized equipment.[19] This is an important consideration for centers performing esophagectomies with limited resources.[20]

In our series, median OS was 22.7 months, which is comparable to the average prognosis reported from major centers in Japan and the United States (21–25 months).[21,22] It should be emphasized that austerity measures and resource reduction during the different phases of the financial crisis did not

influence recurrence and overall survival rates. Similarly, the introduction of capital controls had no impact on long-term prognosis. Although, on univariate analysis, SCC (80%) exhibited higher mortality compared to adenocarcinoma (41.2%), the impact of histology on prognosis was not statistically significant after controlling for confounders (again in line with literature).[23] Nearly, all of our patients were able to undergo an R0 resection irrespective of tumor location, histology, surgical approach, and neoadjuvant treatment. This is notably higher compared to the approximately 70–80% microscopically margin-negative resection rate reported by other institutions.[4,21,22] We feel that the aforementioned between-center variation is a testament to the importance of identifying the most suitable candidates for surgery.

On multivariate analysis, recurrence and neoadjuvant radiation (in non-SCC lesions) were independently associated with poor prognosis. Although, relapse is a well-documented risk factor for mortality[24], the impact of neoadjuvant radiation on mortality should be further discussed. Following the CROSS trial, the NCCN guidelines adopted neoadjuvant chemoradiation (NACR) as the recommended treatment for cT2-T4a or N + lesions.[25] The CROSS trial, however, compared chemoradiation + surgery versus surgery alone. Subsequent work, including the NeoRes I trial[26–28], a National Cancer Database analysis, as well as several robust meta-analyses[29–33] associated NACR in non-SCC esophageal cancer with statistically significant higher morbidity and long-term mortality due to increased postoperative complications. Our data further support the importance of carefully selecting patients that may benefit from preoperative radiation.

The present work has certain limitations. First, our study is a retrospective analysis, with a relatively small patient sample within a long-time interval and therefore is subject to selection bias. Second, the exact number of referrals during the three different time periods and the time from referral until the start of treatment are unknown. Lastly, no data were collected regarding total healthcare costs and the number of positron emission tomography/computed tomography tests performed.

CONCLUSIONS

We reviewed the institutional databases of a quaternary upper GI center in Athens during the era of the *financial crisis* in Greece. Most patients underwent an Ivor–Lewis using a hand-sewn gastric conduit. Anastomosis technique did not affect leak or postoperative complication rates. DFS and median time to recurrence were 41.2% and 11.3 months, respectively. The number of positive lymph nodes was independently associated with increased risk of recurrence, whereas neoadjuvant chemotherapy was protective against local relapse. All-cause mortality was 47.3% and median OS was 22.7 months. Austerity measures did not influence recurrence and overall survival rates. Therefore, we provide evidence that producing high-quality esophagectomy outcomes is possible in resource-limited environments when care is centralized.

SUPPLEMENTARY DATA

Supplementary data are available at *DOTESO* online.

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