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Hospital of diagnosis and probability to receive a curative treatment for oesophageal cancer

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Abstract

Background: Surgical treatment of oesophageal cancer in the Netherland is performed in high volume centres. However, the decision to refer patients for curative surgery is made in the referring hospital of diagnosis. The objective of this study was to determine the influence of hospital of diagnosis on the probability of receiving a curative treatment and survival.
Material and method: All patients with resectable oesophageal cancer (cT1-3, cN0-3, cM0-1A) diagnosed between 2003 and 2010 ($n = 849$) were selected from the population-based Eindhoven Cancer Registry, an area with ten non-academic hospitals. Multivariate logistic regression analysis was conducted to examine the independent influence of hospital of diagnosis on the probability to receive curative treatment. Furthermore, the effect of hospital of diagnosis on overall survival was examined using multivariate Cox regression analysis.
Results: 849 patients were included in the study. A difference in proportion of patients referred for surgery was observed ranging from 33% to 67% ($p = 0.002$) between hospitals of diagnosis. Multivariate logistic regression analysis confirmed the effect of hospital of diagnosis on the chance of undergo curative treatment (OR 0.1, 95% CI 0.1–0.4). Multivariate Cox regression analysis showed that hospital of diagnosis also had an effect on overall survival, up to hazard ratio (HR) 2.2 (95% CI 1.3–3.7).
Conclusion: There is a strong relation between hospital of diagnosis and the chance of referring patients with oesophageal cancer for a curative treatment as well as overall survival. Patients diagnosed with oesophageal cancer should be discussed within a regional multidisciplinary expert panel.

Keywords: Oesophageal cancer; Curative surgery; Hospital of diagnosis; Survival

Introduction

The incidence of oesophageal cancer in the Dutch population has increased over the past three decades.[1] The European Standard Population adjusted incidence rate (ESR) for oesophageal adenocarcinoma in males tripled from 3.2 per 100, in 1989 to 9.9 in 2008. In females the ESR increased from 0.7 to 1.7 per 100,000. For males no change in the incidence for oesophageal squamous-cell carcinoma was observed, while females showed a slight increase.[2]

According to the Dutch clinical practice guidelines, neoadjuvant chemoradiation followed by surgery is the preferred treatment for patients with locally advanced oesophageal cancer. Endoscopic mucosal resection (EMR) is indicated for early cancer (T1a-lesions).[3] Definitive chemoradiation or palliative treatment is indicated for patients with non-metastasized T4b tumours or for patients who are frail[4–7] Due to a process of centralization, treatment of oesophageal cancer in the Netherlands is now

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largely performed in regional centres of referral. Within these centres of excellence, patients are discussed at multidisciplinary team (MDT) meetings and managed according to the national guidelines and latest evidence. Concentration of care for oesophageal cancer patients is associated with improved peri-operative mortality and overall survival in surgically treated and non-surgically treated patients.[8–11]

Most patients with oesophageal cancer are diagnosed in non-referral centres. In a non-referral hospital, patients might not be discussed in a MDT proficient in all aspects of diagnosis and treatment of oesophageal cancer. These hospitals thus play a crucial role in deciding whether or not a patient is referred to an expert centre for further treatment. MDT meetings for rectal and breast cancer improve surgical outcomes through better patient management.[12,13] MDT meetings for oesophageal cancer improve staging accuracy and often to alter the initial treatment plan.[14,15]

The aim of this study is to assess the relationship between hospital of diagnosis and referral for a curative treatment. Secondly, the referral pattern and its influence on overall survival in patients with resectable oesophageal cancer was explored.

Methods

Population-based data from the Eindhoven Cancer Registry (ECR), which is maintained by the Comprehensive Cancer Centre South, were used. All patients diagnosed with a histological diagnosis of oesophageal cancer between 2003 and 2010 were selected for this study (ICD-0-3: 8010, 8012, 8020, 8021, 8032, 8033, 8041, 8046, 8070–8072, 8076, 8078, 8083, 8140, 8144, 8145, 8210, 8211, 8246, 8260, 8480, 8481, 8490, 8560, 8570, 8574).

The ECR collects data for all patients with newly diagnosed cancer in a large part of the southern Netherlands. This region comprises approximately 2.4 million inhabitants.

This population-based registry includes ten hospitals, six pathology departments, and two radiotherapy institutions. Since 1999 oesophageal cancer surgery has been centralized in two centres.

Information on hospital of first diagnosis, age, gender, socioeconomic status (SES), co-morbidity, histology, tumour stage (classified by the International Union Against Cancer (UICC) TNM 6[16]), tumour location (according to International Classification of Diseases for Oncology (ICD-O-3)),[17] and treatment is routinely extracted from the medical records by specially trained administrators of the cancer registry. Tumour location was classified as proximal (above tracheal bifurcation, C15.0, C15.1, C15.2, and C15.3), mid (between tracheal bifurcation and gastro-oesophageal junction, C15.4), distal (gastro-oesophageal junction, C15.5), and overlapping or not otherwise specified (C15.8, C15.9).

Clinical tumour (cT) and lymph node (cN) were determined by at least endoscopy, CT scanning of the chest and abdomen and ultrasound of the neck. Positron emission tomography (PET)-CT or Endoscopic Ultrasound (EUS) were only performed when indicated.

Tumour stage recorded by the ECR was defined by pathologic examination of the resection specimen or, if not available, clinical tumour stage.

Information on medical history and co-morbidity was based on a modified list of the Charlson co-morbidity index.[18] Hypertension was not scored as co-morbidity given its high prevalence and minor impact on patients' health status. Individual SES, based on fiscal data on value of the home and household income, is provided at an aggregated level for each postal code.[19] Surgery with a curative intent were classified according to the cancer registry as total oesophagectomy, partial oesophagectomy, multi-organ surgery or surgery not otherwise specified. Radiotherapy and chemotherapy were classified as yes or no. Local tumour surgery, palliative therapies in general, and palliative therapy of metastases were defined as 'other therapy'. Treatment with curative intent was defined as surgery or definitive chemoradiation. Treatment with no curative intent included radiotherapy alone, chemotherapy alone, and other therapy. Hospital of diagnosis was classified as the hospital where the clinical or pathological diagnosis of oesophageal cancer was made. Hospitals of diagnosis outside the ECR region were defined as "non-regional" hospitals.

Statistical analysis

Differences in patient and tumour characteristics between hospitals of diagnosis were compared using chi-square tests. Univariable and multivariable logistic regression analyses were conducted to evaluate the influence of hospital of diagnosis, age, gender, SES, co-morbidity, tumour stage, tumour differentiation, and tumour location on surgery and treatment with curative intent (surgery or definitive chemoradiation). Results were reported as odds ratios (OR) and 95% confidence intervals (95% CI). Univariable and multivariable Cox regression analyses were performed to determine the prognostic impact of hospital of diagnosis, age, gender, co-morbidity, SES, tumour location, tumour differentiation, tumour stage, surgery, and definitive chemoradiation on overall survival. Survival time was defined as time from diagnosis to death or until January 1st, 2010 for the patients who were still alive. Survival results were reported as hazard ratios (HR) and 95% CI. In all analyses we used the hospital with the highest percentage of patients receiving oesophageal surgery with curative intent as our reference. All analyses were performed using Statistical Package for Social Sciences version 19.0 (SPSS Inc., Chicago, IL, USA). All reported *p*-values below 0.05 were considered statistically significant.