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Abdominal Imaging / Imagerie abdominale

Esophageal Carcinoma: Current Concepts in the Role of Imaging in Staging and Management

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Abstract

Over the past few decades, the survival of esophageal cancer patients has improved owing to early detection and advances in multimodality treatment strategies. Imaging plays an important role in every step in the management of esophageal cancer, including diagnosis, staging, assessment of treatment response, and post-treatment surveillance. In this article, we provide a comprehensive review of the role of imaging in these various time points of esophageal cancer management.

Résumé

Au cours des dernières décennies, le taux de survie des patients atteints d'un cancer de l'œsophage a augmenté grâce à la détection précoce et aux nouvelles stratégies de traitement multimodales. L'imagerie joue un rôle important à toutes les étapes de la prise en charge du cancer de l'œsophage: diagnostic, stadification, évaluation de la réponse au traitement et surveillance post-traitement. Dans cet article, nous présentons une étude exhaustive du rôle de l'imagerie aux différentes étapes de la prise en charge du cancer de l'œsophage.

Key Words: Esophageal cancer; TNM staging; Computed tomography; Endoscopic ultrasound; Positron emission tomography/computed tomography

Esophageal cancer is the eighth most common cancer in the world [1]. In the United States, it is estimated that 16,980 people will be diagnosed with new esophageal cancer in the year 2015 and about 15,590 deaths will be attributable to it in the due course [2]. The overall prognosis of esophageal cancer is poor, with 14% 10-year survival [3]. The median survival drops from 35 months for patients with local disease to 6 months for patients with metastatic disease [3]. However, a recent analysis of the Surveillance Epidemiology and End Results (SEER) database between 1973 and 2007 has shown that there has been gradual increase in the cure rates of all stages of esophageal cancer with consequent increase in survival [3]. The median survival of local esophageal cancer has increased from 11 months in 1970s to 35 months after 2000 [3].

The optimal management of esophageal cancer is largely determined by the stage of the disease, performance status of the patient and the location of the tumour [4]. The last few decades have seen a paradigm shift in the esophageal cancer staging and management. There have been major changes in the way esophageal cancer is staged in the 2010 revised TNM staging of American Joint Committee on Cancer (AJCC) [5]. From a treatment point of view, the oncologists now routinely employ neoadjuvant chemoradiotherapy followed by curative surgery and adjuvant systemic chemotherapy [6]. Trastuzumab, the monoclonocal antibody against human epidermal growth factor receptor2 (HER2-neu) receptor, which is overexpressed in esophageal adenocarcinoma has been shown to significantly improve the overall survival of patients with HER2-neu receptor over expression [7]. New molecular targeted drugs like inhibitors of vascular endothelial growth factor (VEGF) and epidermal growth factor receptors (EGFR) are under research for advanced and metastatic esophageal cancer [8−12].

In this context, the proper selection of patients for appropriate treatment strategies becomes important. The

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corner stone for appropriate patient selection in esophageal cancer is imaging—endoscopic ultrasonography (EUS), multidetector computed tomography (MDCT), and 18F-fluorodeoxyglucose (FDG) positron emission tomography (PET)/computed tomography (CT). Each of these modalities has a specific role in each component of the TNM staging. The assessment of treatment response as determined by imaging is also crucial in treatment planning. Accordingly the aim of this article is to provide a comprehensive review of the role of imaging in the initial staging and subsequent management of esophageal carcinoma.

Epidemiology, Etiopathogenesis, and Pathology

Squamous cell carcinoma (SCC) is the most common type of esophageal cancer but has a great degree of geographic variation in its incidence with very high incidence rates seen in eastern countries such as China [8]. Risk factors for SCC include alcohol abuse, smoking, human papilloma virus (HPV) infection, achalasia, Plummer–Vinson syndrome, and celiac disease [13]. SCC typically occurs in the middle and lower third of the esophagus, with only 10%-15% occurring in the upper one-third segment [8] (Figure 1). Grossly, SCC can have fungating, ulcerative, or infiltrating growth patterns.

Though SCC is the most common type of esophageal malignancy, there has been a dramatic increase in the incidence of adenocarcinoma, especially among white men and women [14]. Risk factors for adenocarcinoma include obesity, chronic gastroesophageal reflux, and Barrett's esophagus. There is a higher male preponderance for adenocarcinoma than SCC [14]. Adenocarcinoma typically arises from the metaplastic columnar epithelium in the lower third of the esophagus especially esophagogastric junction [6]. At a molecular level, esophageal adenocarcinomas have more frequent HER2-neu gene amplification and overexpression than SCC [6] At gross histopathology, adenocarcinomas are predominantly ulcerated, flat lesions with only 33% of the tumours having a polypoidal or fungating growth patterns [8] (Figure 2).

Revised Tumor, Node, Metastasis (TNM) Staging of Esophageal Cancer (2010)

Esophageal cancer is staged according to the International Union Against Cancer and AJCC TNM staging [5]. There have been changes in all the components of TNM staging in the revised 2010 AJCC staging system. The availability of extensive data pertaining to the association of histopathologic type and survival formed the basis for the revisions in the staging system. Distinct staging systems have been proposed for esophageal adenocarcinoma and SCC in the new AJCC staging. The T stage is determined by the depth of invasion of the esophageal wall (T1-4). The criteria for subdivisions in T4 tumours has been revised in the new TNM (2010) staging system: T4a tumours invade the pericardium, pleura, or diaphragm and are potentially resectable, whereas T4b tumours invade the heart, aorta, trachea, and other great vessels, and are unresectable (Figure 3). The N stage has been subdivided into N1-N3 based on the number of lymph nodes. This is based on the evidence that the number of positive nodes is a significant prognostic factor. N1 refers to metastases in 1-2 regional nodes, N2 metastases in 3-6 regional nodes, and N3 metastases in 7 or more

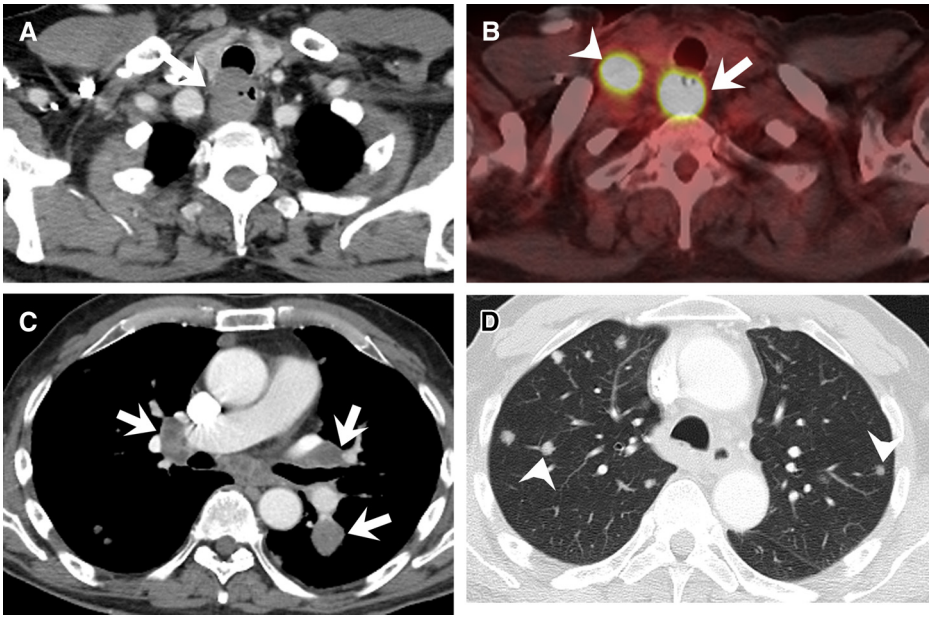

Figure 1. A 60-year-old woman with cervical esophageal cancer. (A) Axial contrast-enhanced computed tomography (CT) image of the chest reveals an intraluminal polypoid mass in the esophageal lumen (arrow). (B) Axial fused fluorodeoxyglucose (FDG) positron emission tomography/CT image demonstrates intense FDG uptake in the esophageal mass (arrow) and a concurrent FDG-avid right supraclavicular node (arrowhead). Endoscopic biopsy of the mass confirmed squamous cell carcinoma. Patient was treated with chemoradiotherapy. (C, D) Axial CT images of the chest 12 months after the treatment demonstrate extensive metastatic bilateral hilar lymphadenopathy (arrows) and metastatic pulmonary nodules (arrowheads).