# Updates In The Modalities Of Gastrointestinal Cancers Screening Programs

Essay

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# Abstract

**Key words:** Gastrointestinal cancers, screening programs, endoscopic surveillance.

Gastrointestinal cancers compromise one of the most rising incidence cancers worldwide. Owing to their late clinical presentation, the prognosis of these malignancies has a very grave outcome. From this piece of information came the thought of introducing a mass screening programs to identify true high risk population for the development of such cancers and those with precancerous lesions, and then to enroll them into an intensified surveillance protocol with well defined separation intervals to monitor any neoplastic transformation in these population.

Endoscopic surveillance modalities have been always regarded as the golden surveillance measures for these patients, and the newer endoscopic modalities such as chromoendoscopy, autufluoresecence endoscopy, confocal endomicroscopy, and narrow band imaging, have largely replaced conventional esophagogarstroduodenoscopy (EGD), and colonoscopy. But since most of these measures are invasive, coasty, and may not be applicable, another non invasive screening and surveillance protocol has emerged which relies mainly upon serum biomarkers for different gastrointestinal cancers or genetic succeptibility tests. However , neither of these tools have proven the same or even the near efficacy and accuracy of endoscopic measures, and that lead to the invention of anon invasive endoscopic modalities such as optical coherence tomography (OCT), FICE system, and virtual colonoscopy

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# Introduction

Gastrointestinal malignancies compromise more than 40% of total human malignancies with the incidence of gastric cancer for instance rising to be the third most common cancer affecting males (after lung and prostate) and the fifth most common cancer affecting females (after breast, cervical, large bowel, and thyroid) cancers ***(Ferlay et al., 2004)***.

Gastrointestinal cancers are also responsible for over 60% of cancer related mortality with colorectal cancer for example being the third most common cause of cancer death in both genders after prostate and breast cancers. The latter information was not just related to the multi-factorial causation in the etiology of gastrointestinal malignancies involving many adverse environmental and negative life style habits which might also obstruct their treatment course, but also due to the late presentation of the disease at the time of diagnosis and that might carry a very poor prognosis regarding operability and curative modalities ***(Levin et al., 2008).***

Recently, most of the researches concerned with the curative treatment modalities of gastrointestinal cancers are focusing on the importance of their prevention by detection of their preneoplastic lesions and earliest discovery of any neoplastic transformation in which the tumor is highly curable ***(Levin et al., 2008)***

Early diagnosis of gastrointestinal cancers has been an obstacle for many years owing to their late clinical presentation and reliance on complex radiological investigations for their diagnosis that may even progress to an open laparotomy to achieve a true diagnosis and staging. From here came the thought of introducing a reliable screening and surveillance protocol that would enable the physician to

diagnose the tumors in the earliest time and with the simplest means ***(Chiu et al., 2000).***

By definition; **a screening program** involves the assessment of an asymptomatic population to determine whether they can be classified as a high risk or not for a cancer. The purpose of a screening program is to identify the patients at a disease stage in which treatment offers a substantial advantage over that needed when the disease becomes clinically apparent ***(Kenneth and Wang, 2005).***

**A surveillance program** entails periodic examination of individual patients who have already been identified as having a high risk for cancer development. The purpose of surveillance also is to identify cancer at an early stage to permit curative therapy ***(Kenneth and Wang, 2005).***

Screening programs have already been suggested for several types of gastrointestinal malignancies (e.g. esophageal, gastric, and colorectal cancers) in which middle and old age individuals with long standing preneoplastic illness but still a symptomatic or negative for any true sign of malignancy, these individuals are enrolled in a screening program to decide weather they are a true high risk or not for cancer and then become enrolled into the appropriate surveillance protocol ***(Greenberger et al., 2009).***

However, such screening and surveillance programs have been faced by many debates regarding its coast effectiveness and the availability of the tools required for its' application, but all these debates couldn't deny its grave importance for early tumor detection ***(Fennerty, 2005).***

From this point of view, multiple scenarios for the ideal screening program have been proposed by many high incidence countries to achieve the maximum

benefit from such a program which relay on: earliest diagnosis with the least invasion and the most applicable techniques. Unfortunately, none of the current screening tools has achieved such benefit; however, advances in endoscopic measures as well as non invasive serum tests have crossed along distance in the way to achieve higher accuracy with minimal invasion ***(Leung et al., 2008).***

# Aim of work

In this essay, an overview on the epidemiology of the most common and important gastrointestinal malignancies will be discussed with a particular focus upon lifestyle and pathological risk factors for these cancers and precancerous lesions that may predispose for such cancers. This is followed by an overview over the latest modalities of screening programs for different types of gastrointestinal malignancies that provide the privilege of their earliest detection and to be discussed regarding sensitivity, specificity, availability and cost effectiveness coming out finally to an algorithm explaining when to use each screening method for a given cancer at a time that best match each patient criteria.

# Chapter I

# CANCER ESOPHAGUS

## Incidence:

The incidence of esophageal cancers has been rising steadily since the late 1970's up to this day on and became considered by some authors as the most rapidly rising incidence o all cancers in the world ***(Zhang et al., 2009).***

Among he two major histological types of esophageal cancers: esophageal adenocarcinoma (EAC) and squamous cell carcinoma (SCC); the major change in incidence occurred in EAC compared with a relative stable incidence o SCC ***(Dibaise, 2008).*** The reason for this change is mainly the diagnosis of a very large number of patients with gastroesophageal reflux disease (GERD) becoming complicated by Barrett's esophagus (BE) the major predisposing actor for EAC ***(Pace et al., 2007).***

Historically, SCC was the predominant histological type, but the incidence of EAC has raised 3.5 folds over the last quarter century accounting from 16 % in mid Eighties to over 56% of all diagnosed esophageal cancer cases and EAC has raised from being a rare tumor to one of the top 15 cancers affecting white males ***(Deresa et al., 2008).*** Males are often affected more than females (ratio 3:1) and Caucasians are more affected than black Africans (4:1) ***(Hay, 2006).***

## Risk factors:

### *A) Squamous cell carcinoma (SCC):*

**Life style risk factors:**

These factors induce chronic epithelial irritation which increases cellular mitotic activity followed by metaplasia, dysplasia and carcinoma. They include:

1. **Smoking:** There is 5 folds increase in risk of SCC in smokers versus non smokers, and 10 folds increase in risk in heavy smokers versus non smokers ***(Freedman et al., 2007).***
2. **Alcohol:** There is 20-50 folds increase in risk of SCC in heavy drinkers versus non drinkers ***(Freedman et al., 2007).***
3. **Diet:** Hot and spicy foods, dietary toxins [Nitrosamines in pickled vegetable, betel nut chewing, barbecued food and salted fish, and mycotoxins in moldy foods ***(Iijima et al., 2002).***
4. **Plummer Vinson syndrome**, rings and strictures ***(Hay, 2006).***

**Pathological risk factors:**

1. **Achalesia:** The risk of cancer in achalesa is about 10-30 folds greater than that in the general population. Cancer occurs 10-20 years earlier (mean age 45) than in patients without achalesia and typically occurs about 20 years after the diagnosis of achlesia has been mad. The esophageal malignancy is SCC in about 95% of cases ***(Dibaise, 2008).***
2. **Tylosis:** this rare condition presents with hyperkeratosis of the skin on the palms and soles, and papilloma of the esophagus that progress to SCC in virtually 100% of cases ***(Dibaise, 2008).***

***B) Esophageal adenocarcinoma (EAC):***

**<u>Life style risk factors</u>:**

**Obesity:** Multiple case control studies support the rule of obesity as amajor risk factor for EAC via increasing the intra gastric pressure which affects gastroesophageal pressure gradient and that causes increase in transient lower esophageal sphincter relaxation (TLESR) and esophageal acid exposure predisposing to the occurrence of GERD. However, precise biological mechanisms underlying the reported associations between increased body mass, GERD, and EAC have yet to be defined ***(El-Serag, 2008).***

**<u>Pathological risk factors</u>:**

**1- Gastroesophageal reflux disease (GERD):**

***Definition:***

Gastro-esophageal reflux is the retrograde movement of gastric contents into the esophagus. It is the normal physiological movement of gastric contents in to the esophagus. It's a normal physiological event that occurs particularly sfter eating. GERD is an abnormal degree of gastroesophageal reflux that exposes the patient to the risk of complications (BE, ulcerative esophagitis, and carcinoma) or symptoms that impair wellbeing or quality of life ***(Gotley, 2006).***

***Etiology:***

Most gastro-esophageal reflux is due to transient relaxations of the lower esophageal sphincter, but most patients with sever GERD have resting basal lower esophageal sphincter hypotension as the principal cause of excessive reflux ***(Gotley, 2006).*** The contribution o a co-existent hiatus hernia does not cause reflux via lower esophageal sphincter hypotension by mechanical factors ***(Van Herwarden et al., 2000).***

***Pathogenesis of which GERD induces adenocarcinoma:***

GERD results in acute mucosal injury (esophagitis), thereby promoting cellular proliferation and inducing specialized columnar metaplasia of the normal squamous epithelium lining the esophagus (Barrett epithelium) ***(Williams et al., 2006).*** This is followed by the development of dysplasia which is regarded as the precursor of invasive cancer, and high grade dysplasia (HGD) in Barrett epithelium is frequently associated with esophageal adenocarcinoma ***(Williams et al., 2006).***

***Clinical presentation of GERD:***

a. **Typical symptoms:** Heartburn and reguirgitation are the main symptoms, but 50% of patients with sever GERD also have intermittent dysphagia ***(Talwar and De Caestecker, 2007).*** Excessive salivation due to exposure of the esophagus to acid "water brush" is also a common symptom ***(Gotley, 2006).***
b. **A typical symptoms:** About 10% o patients present with chest pain that may even mimic ischemic heart pain ***(Talwar and De Caestecker, 2007).*** Another group may present with cough and other laryngeal symptoms (e.g. dysphonia) ***(Gotley, 2006).***

| *Typical symptoms* | *A typical symptom* | *Alarm symptom* |
|---|---|---|
| **Heart burn** | Flatulence | Chest pain |
| **regurgitation** | cough | Nausea, dyspepsia |
| **Water brush** | Dysphonia | Bloting, Belching |
| **Odynophagia** | Sorethroat | Nocturnal shocking |
| **Dysphagia** | | Weight loss |

**Table 1:** symptoms of GERD ***(Gotley, 2006).***