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Clinical relevance of endoscopically identified extrinsic compression of the oesophagus and stomach

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ABSTRACT

Background Various degree of extrinsic compression of the oesophagus and stomach are experienced during upper endoscopy. However, its utility in clinical practice has not been studied.

Methods Electronic chart review of all upper gastrointestinal endoscopies done at our hospital between 2005 and 2016 was performed. A total of 79 patients with documented extrinsic compression on upper gastrointestinal procedure report who had a preceding or subsequent abdomen/chest CT imaging performed within 6 months were included.

Results 30 (38%) out of 79 patients had abnormal finding on CT scan. 14 (47%) out of 30 patients had an associated malignant lesion, whereas remaining had a benign lesion. Overall, patients with associated gastrointestinal symptoms (60% vs 22%, p=0.001) or history of weight loss (50% vs 16%, p=0.001) had increased odds of having an abnormal finding on CT scan compared with the patients who lacked such symptoms. Pancreatic cancer was the most commonly diagnosed malignancy. On subgroup analysis of patients with extrinsic compression and malignant lesion on imaging study, the likelihood of a malignancy was higher in blacks as compared with Hispanics (71%:29% vs 39%:61%, p=0.031), and with presence of gastrointestinal symptoms (64% vs 22%, p=0.003), presence of weight loss (64% vs 16%, p=0.0001) and hypoalbuminaemia (p=0.001).

Conclusion Finding an extrinsic compression of the oesophagus and stomach on an upper endoscopy may suggest malignancy, and hence should prompt further work-up. Posterior wall gastric body compression may signal the presence of pancreatic cancer.

Summary box

What is already known about this subject?

- Extrinsic compression of the oesophagus and the stomach may be observed on upper endoscopy.
- Only one prior study has previously evaluated the clinical significance of this endoscopic finding.

What are the new findings?

- Extrinsic compression as seen on upper endoscopy may be associated with benign or malignant lesion.
- Malignancy is more commonly seen in patients who have associated symptoms including weight loss.
- Gastric body posterior wall compression may signal the presence of pancreatic cancer.
- Hypoalbuminaemia is a predictor of malignancy in such cases.

How might it impact on clinical practice in the foreseeable future?

- Extrinsic compression on upper endoscopy should not be ignored.
- Further work-up, especially cross-sectional imaging like CT of abdomen, may help in investigating the underlying cause.

INTRODUCTION

Symptoms related to the gastrointestinal tract are common in the primary care setting. In 2009, individuals with abdominal pain accounted for a total of 15.9 million visits.[1] Gastrointestinal symptoms accounted for a total of 12.8 million endoscopies, including 6.9 million oesophagogastroduodenoscopy (EGD) and 11.5 million colonoscopies in 2009. Extrinsic compression of the gastrointestinal tract (EC-git) is a frequently reported finding during the endoluminal examination; however, its importance and utility in clinical practice is not known.[2]

EC-git usually results from a mass lesion compressing on the gastrointestinal lumen. Depending on the size and location of the mass, it may or may not get detected on palpation during an abdominal examination. In cases of a known mass, EC-git noted during the endoscopy may corroborate findings of an already known diagnosis. Nevertheless, in some cases where endoscopy is performed early enough during the diagnostic work-up, EC-git may provide the first clue toward a serious and an unexpected diagnosis.

The upper gastrointestinal submucosal lesion, another incidental finding, though more common than EC-git is often considered in its differential diagnosis. In a study evaluating accuracy of endosonography in

differentiating EGD diagnosed submucosal lesions from EC-git, a total of 32% patients indeed had EC-git.[3] Thus, endoscopic evaluation has poor specificity to differentiate the submucosal lesion from the extramural compression and hence further evaluation is warranted.

There is paucity of data looking at relationship between EC-git diagnosed at endoscopy with its underlying aetiology. So far, there is only one study published as an abstract which reviewed the outcomes of the EC-git finding.[4] Here with the aim to understand the relevance of this finding during endoscopy, we have further looked into underlying aetiologies and the associated factors. We also attempted to study the risk factors which could help physicians decide whether further investigation for extrinsic compression observed during endoscopy is warranted.

METHODS

We conducted a retrospective review of patients who underwent upper endoscopy during the study period of 12 years from January 2005 to December 2016. The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki, as reflected in a prior approval by the BronxCare Health System's Institutional Review Board Committee.

Study population

We ran a query in our institute's procedure documentation software (Provation MD) and looked for upper gastrointestinal endoscopic procedures with the findings of 'Extrinsic Compression'. A total of 223 unique patients were extracted from a total of 31 518 procedures. We reviewed the records of these 223 patients to see if CT scans were performed within 6 months, before or after the endoscopic procedure, to explain the extrinsic compression finding. CT scans of chest and the abdomen were reviewed for the findings of oesophageal and gastric extrinsic compression, respectively. One hundred and fourty-four patients who did not have a CT scan performed or had a CT scan performed more than 6 months apart from the endoscopic procedure were not included in the final review (figure 1). For the remaining 79 patients who had a CT scan performed within 6 months, we extracted information regarding the patient's age, gender and self-reported race or ethnicity. The information about body mass index, comorbid conditions, smoking status, as well as laboratory parameters like serum albumin, haemoglobin were also collected.

For the study purpose, we have enumerated the following definitions to describe the patient findings.

The study definitions

Abnormal CT scan: correlation of endoscopic findings with CT scan

All the CT scan findings that were available within 6 months of the EGD were reviewed with the general radiologist to determine if the findings on the imaging studies could explain the endoscopic finding of EC-git. Patients who had positive findings on their CT scan that could explain the extrinsic compression as agreed on by the gastroenterologist and the radiologist were included in the group called 'abnormal CT scan'. The insignificant findings of the CT scan that could not account for the endoscopic finding of EC-git were not included in this group of abnormal CT scan. For instance, the finding of a 12 cm liver cyst extending out of the liver capsule and compressing gastric lumen was considered as 'abnormal CT scan' as opposed to a 1 cm liver cyst that could not explain the finding of an extrinsic compression.

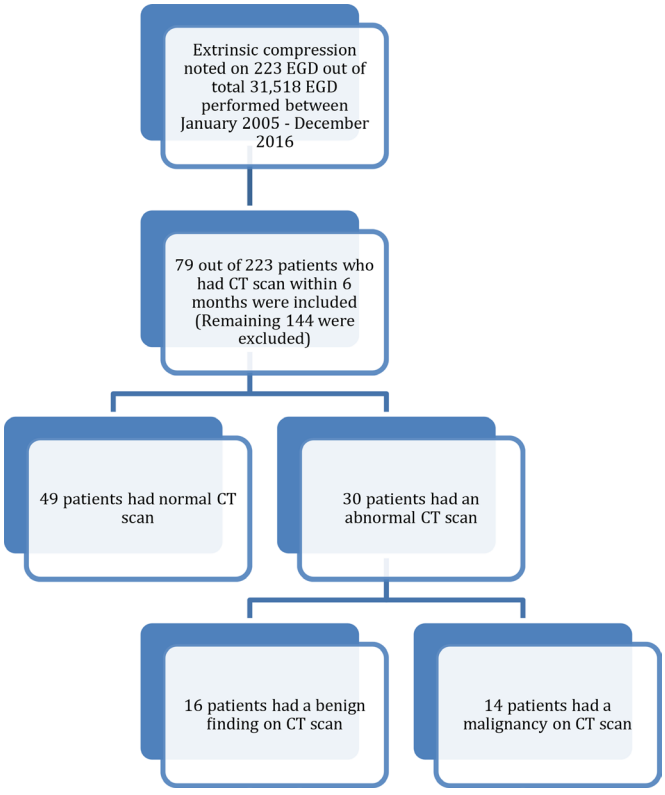

Figure 1 Figure 1Demonstrates flow chart of patients with extrinsic compression on EGD and CT scan findings. EGD, oesophagogastroduodenoscopy; CT scan, computerized tomography of abdomen

Site of the EC-git

The endoscopy reports and images of all the patients were reviewed by two gastroenterologists to confirm the site of the gastrointestinal tract compression. As in the standard practice the patient lies in the left lateral position, leading to the lesser curvature lying in the 12 o'clock position, the posterior wall of stomach lying in the 3 o'clock position, the greater curvature lying in the 6 o'clock position and the anterior wall of the stomach lying in the 9 o'clock position. Sites of compression in the oesophagus were documented as upper and lower oesophagus. The compression sites in the stomach were topographed as fundus, gastric body posterior, gastric greater curvature and antrum. No duodenal compression was noted in our study group. Examples of extrinsic compression as seen on endoscopy in our patient population can be seen in figure 2A-C.

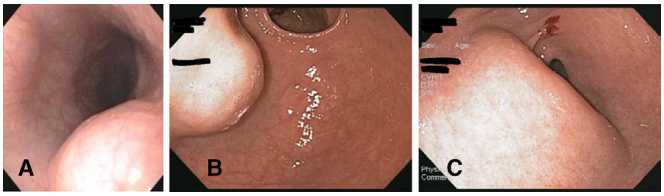

Figure 2 (A) Extrinsic compression as seen on endoscopy in oesophagus. (B) Extrinsic compression as seen on endoscopy in gastric body. (C) Extrinsic compression as seen on endoscopy in gastric antum.

Indication for the endoscopic procedure

The indication for the study procedure was noted as documented in the endoscopy report by the performing endoscopist. The three most common indications for performing an endoscopic procedure were abdominal pain, anaemia and dysphagia.

Laboratory parameters

The laboratory parameters including serum albumin and haemoglobin which were available within 3 months before the endoscopy were reviewed and recorded.

Associated symptoms

Medical records of patients included in the study were reviewed to see if there were any other associated gastrointestinal symptoms in addition to the documented indication for the endoscopic procedure on the final report. Symptoms like abdominal pain, persistent vomiting, gastrointestinal bleeding, dysphagia and weight loss were noted.

Statistical analysis

Demographic information, endoscopic findings, imaging study findings and laboratory values were stratified into two different groups: one with abnormal CT scan (including benign and malignant findings) and the other with normal CT scan. The group including only malignant findings was also compared against the group which had a normal CT scan. Frequency and percentages were reported for categorical variables, whereas mean and SD were reported for continuous variables. Fisher's exact tests were used to assess the association between categorical variables, and analysis of variance tests were used to assess the association between continuous variables and the outcome variable. Logistic regression assessing the predictors of malignancy was also performed. P-value <0.05 was considered statistically significant.

RESULTS

Among the 79 patients selected for final chart review, 40 (51%) were females and 39 (49%) were males. The mean age of participants was 57.9 (±15.2) years. The study cohort was divided into two groups: a group of 30 patients who were found to have extrinsic compression of the oesophagus and stomach on upper endoscopy and who had an abnormal CT scan (57% males, 43% females and mean age 60 years) which was compared with a second group of 49 patients (45% males, 55% females and mean age 57 years) who were found to have extrinsic compression of the oesophagus and stomach on upper

Table 1 All patient with extrinsic compression on upper gastrointestinal endoscopy

	Patients with abnormal CT scan (N=30)	Patients with normal CT scan (N=49)	P value
Age, mean (SD)	60 (±13.9)	57 (±15.9)	
Gender			0.310
Female	13 (43.3%)	27 (55.1%)	
Male	17 (56.7%)	22 (44.9%)	
Race			0.067
African-Americans	18 (60.0%)	19 (38.8%)	
Hispanics	12 (40.0%)	30 (61.2%)	
Smoking status			0.586
Non-smoker	19 (63.3%)	28 (57.1%)	
Smokers	11 (36.7%)	21 (42.9%)	
Presence of symptoms	18 (60.0%)	11 (22.4%)	0.001
Presence of weight loss	15 (50.0%)	8 (16.3%)	0.001
Hypertension	19 (63.3%)	26 (53.1%)	0.371
Diabetes mellitus	9 (30.0%)	11 (22.4%)	0.454
BMI (kg/m^2), mean (SD)	24 (±5.79)	24 (±5.98)	1.000
Haemoglobin (g/L), mean (SD)	120 (±20.8)	110 (±23.1)	0.823
Albumin (g/dL), mean (SD)	3 (±0.9)	4 (±0.9)	0.112

Table 2 Malignant and benign lesions corresponding to the site of the compression on endoscopy

Site of compression on endoscopy	Malignancy type	Benign lesion
Lower oesophagus	Hepatocellular cancer	Lymph node
Gastric fundus	Metastatic malignant fibrohistiocytoma Colon cancer Cholangiocarcinoma Hepatocellular cancer	Lung bulla Pancreatic cyst
Gastric greater curvature	Liver mass—ovarian cancer metastases Liver mass—lung cancer metastases	Large adnexal cyst Hepatic haemangioma Pancreatic cyst Hepatic cyst
Gastric body—posterior	Pancreatic cancer	Pancreatic cyst
Gastric antrum	Diffuse large B-cell lymphoma Hepatocellular cancer	

endoscopy, but with a normal CT scan. Patients' characteristic and demographics were compared as shown in table 1.

Sixteen out of 30 (53%) patients with abnormal finding on CT scan were found to have benign lesion involving different organs including pancreas, liver, uterus, thoracic lymph node and lung. The remaining 14 (47%) patients had a malignant lesion involving different abdominal viscera including pancreas, liver, colon and lymph nodes (table 2). Among these 14 patients with a malignant finding on the CT abdomen, 13 had previously known malignancy and 1 patient was diagnosed with malignancy subsequently. More than 50% (8 out of 14) of cancers caused compression in gastric body posteriorly and fundus combined. There were four patients with pancreatic cancer and all four were found to cause compression on the gastric body posterior wall. In the group with benign lesions causing extrinsic compression, the most common site was gastric greater curvature (table 3).

Table 3 Site of compression in patient with CT scan showing malignancy versus patients with normal CT scan

Site of compression	Malignancy on CT scan (N=14)	Normal CT scan (N=49)
Upper oesophagus	0	6
Lower oesophagus	1	2
Gastric fundus	4	9
Gastric greater curvature	3	17
Gastric body posterior	4	3
Gastric antrum	2	12

Overall, the presence of gastrointestinal symptoms (eg, abdominal pain, gastrointestinal bleeding, dysphagia, persistent vomiting) in patients (60% vs 22%) or the presence of of weight loss (50% vs 16%) had increased odds of having abnormal finding on CT scan compared with the patients who did not have gastrointestinal symptoms or weight loss. These findings were statistically significant with p-value <0.05.

Extrinsic compression of the oesophagus and stomach on upper endoscopy and having abnormal CT imaging was more common in the African-American population compared with Hispanics (60%:40% vs 39%:61%); however, this finding was not statistically significant. It is worthwhile noting that despite having less African-American patients in our cohort (37 African-Americans and 42 Hispanics), African-Americans were more likely to have abnormal CT scan. Abnormal CT scan finding was not associated with smoking status in our study population. The likelihood of finding an abnormal imaging result in a patient with extrinsic compression of the oesophagus and stomach was not associated with gender.

Table 4 shows the differences between the group of patients having an extrinsic compression of the oesophagus and stomach with a malignant lesion on CT scan compared with the group of patients having an extrinsic compression of the oesophagus and stomach with a normal CT scan. In this subgroup, the likelihood of concurrent malignant lesion in patients with endoscopic extrinsic compression was consistently higher in the African-American population compared with the Hispanics (71%:29% vs 39%:61%, p=0.031), for patients with associated gastrointestinal symptom compared with patients without associated gastrointestinal symptom (64% vs 22%, p=0.003), and for patients with history of weight loss compared with patients without history of weight loss (64% vs 16%, p=0.0001). The mean serum albumin was lower for patients with malignancy compared with patients without malignancy (3.0±0.0 mg/dL vs 4.0±0.0 mg/dL, p=0.001). In addition, male gender had increased propensity (64% vs 45%) for malignant lesion, though not statistically significant. Smoking status did not influence the occurrence of malignant lesions. Malignant lesions were more common at later age (61 years vs 57 years), in patients with hypertension (64% vs 53%) and diabetes mellitus (29% vs 22%); however, these were not statistically significant. Table 5 shows the results from multiple logistic regression. The OR of having a malignancy was 5.49 (1.48–20.4) for one unit decline in serum albumin.

DISCUSSION

EC-git during upper gastrointestinal endoscopy can be a normal or an abnormal finding. Normal extrinsic oesophageal compression due to aortic arch and left

Table 4 Characteristics of the patient with CT scan showing malignancy versus patients with normal CT scan (Fisher's exact test for categorical variables)

	Malignancy on CT scan (N=14)	Normal CT scan (N=49)	P value
Age			
Mean (SD)	61 (±15.28)	57 (±15.02)	
Gender			0.201
Female	5 (35.7%)	27 (55.1%)	
Male	9 (64.3%)	22 (44.9%)	
Race			0.031
African-Americans	10 (71.4%)	19 (38.8%)	
Hispanics	4 (28.6%)	30 (61.2%)	
Smoking status			0.635
Non-smoker	7 (50.0%)	28 (57.1%)	
Smoker	7 (50.0%)	21 (42.9%)	
Presence of symptoms	9 (64.3%)	11 (22.4%)	0.003
Presence of weight loss	9 (64.3%)	8 (16.3%)	0.0001
Hypertension	9 (64.3%)	26 (53.1%)	0.456
Diabetes mellitus	4 (28.6%)	11 (22.4%)	0.635
BMI (kg/m^2), mean (SD)	21 (±6.10)	24 (±3.61)	
Haemoglobin (g/dL), mean (SD)	11 (±2.28)	11 (±1.95)	0.986
Albumin (g/dL), mean (SD)	3 (±0.87)	4 (±0.66)	0.001

BMI, body mass index.

main bronchus has been well described in the literature; however, the significance of extrinsic compression finding in the stomach during EGD is unknown. Due to the increasing use and availability of upper gastrointestinal endoscopy, finding of an abnormal extrinsic compression during endoscopy is not uncommon. However, there are no standard guidelines to guide further management in such cases. There is dearth of studies exploring the significance of such a finding of EC-git on endoscopy. We found only one research study conducted by Chung *et al* which was presented as an abstract during the poster session of 2010 Digestive Disease Week.[4] At our institution, we have noticed lack of consensus among different gastroenterologists for such a finding and accordingly some physicians ignore extrinsic compression findings, considering them non-specific or of no clinical significance.

Table 5 Logistic regression assessing the relationship between demographic and clinical variables and having malignancy or not on CT scan

	OR (95% CI)	P value
Age	0.988 (0.923 to 1.057)	0.723
Gender male	1.411 (0.222 to 8.954)	0.715
Race	5.502 (0.924 to 32.757)	0.061
Smoking	1.976 (0.364 to 10.715)	0.430
Symptoms	0.932 (0.102 to 8.492)	0.950
Weight loss	0.164 (0.018 to 1.464)	0.106
Haemoglobin	1.592 (0.980 to 2.588)	0.061
Albumin	5.490 (1.48 to 20.4)	0.011
Hypertension	0.538 (0.073 to 3.940)	0.542
Diabetes mellitus	1.065 (0.125 to 9.072)	0.954
BMI	0.918 (0.768 to 1.097)	0.345

BMI, body mass index.

In our data analysis, 38% of extrinsic compression on EGD was related to a pathological finding on imaging, either benign or malignant. A total of 47% of patients with extrinsic compression had an association with malignancy. On our data analysis, we found no significant difference based on patient's age and gender between the two groups with and without malignancy, but the chance of finding a malignancy was higher in African-American population as compared with Hispanics. The most common site of extrinsic compression in individuals with normal CT scan was gastric greater curvature (17/49: 35%). In the group with malignancy, the most common sites were gastric body posterior wall and gastric fundus. The most common visceral pathology which possibly contributed to this extrinsic compression whether benign or malignant was related to liver (8/30: 27%) and pancreas (8/30: 27%). Besides our study, only other study available exploring this relationship showed pathological extrinsic compressions of the stomach during EGD in 18% (26 out of 142) of their patients, and pancreatic cancer was the most common aetiology

among their patients.[4] Pancreatic cancer was the most common cancer related to extrinsic compression noted in our study population as well.

In our study, finding of an EC-git on endoscopy had a higher chance of being associated with cancer in individuals who had gastrointestinal symptoms and unintentional weight loss. Hence, taking a detailed history with special emphasis on presence of associated symptoms as well as presence of unintentional weight loss is of paramount importance. In a prospective follow-up study of 2677 patients with unintentional weight loss, about 33% (N=883) eventually were noted to have a malignancy. The digestive system malignancies prevailed in 47% of cases with pancreatic cancer constituting 20% of all cancer cases.[5]

In our study population, we also noticed that having a low serum albumin was a statistically significant predictor for having an underlying malignancy. A diagnostic value of unexplained low albumin has been shown previously. In a study conducted by Merriel *et al*, in a 12-month follow-up of a total of 5753 patients with serum albumin less than 3.5 g/dL, 28.4% patients eventually developed cancer. The authors concluded that patients with low albumin had OR of 2.29 of having diagnosed with a cancer in following 12 months.[6]

Even though smoking has been shown consistently to be associated with higher chances of developing a cancer, we did not notice any difference in smoking status among the two groups. This may have been due to incorrect reporting of smoking status by patients or due to small sample size in our study. Patient with a history of hypertension and diabetes had higher rates of having abnormal imaging and underlying malignant lesions; however, it was not statistically significant.

This study demonstrates the significance of extrinsic compression of the oesophagus and stomach seen on upper endoscopy and its association with malignancy. However, it cannot be ignored that 49 of our patients in the control group who had extrinsic compression of the oesophagus and stomach had normal CT scan. Thus, finding extrinsic compression of the oesophagus and stomach on endoscopy without any lesion on CT scan is more common than finding any kind of lesion associated with extrinsic compression. We believe that such extrinsic compressions without any lesion on CT scan may have resulted due to: (1) normal adjacent viscera pushing on the stomach with the patient lying in the left lateral position or (2) anatomical variations of stomach due to rotation along vertical or horizontal axis, presence of pleural or ascitic fluid or congenital abnormalities. In a study reviewing upper gastrointestinal radiological examinations of individuals with unoperated stomach, 821 individuals among 1389 included in the study had some variations in stomach shape and topography.[7] As noted by some researchers, it is possible that changing the patient position may change the appearance or site of compression but this should happen with all lesions benign or malignant and hence would not help differentiating one from another.

LIMITATIONS

Our data represent a single-centre experience with a small sample size and needs further validation. Our patient population included only Hispanics and African-Americans which limits the possibility of generalising our results to other ethnic groups without further studies and validation. Nevertheless, our findings may indicate that certain ethnic groups may be at greater risk than others. By nature of the fact that this is a retrospective study, it does have the inherent limitations of a retrospective design study. A total of 223 patients had extrinsic compression noted on EGD, but due to lack of CT abdomen in all these patients, only 79 were included for final review creating a selection bias. Lastly, site of extrinsic compression was defined based on the assumption that all the EGD procedures, as a standard practice, were performed in the left lateral position. With the study design being retrospective, it is not possible to know the exact patient position during the procedure, and some procedures may have been performed in positions other than the standard left lateral position. However, such a deviation from standard patient position during procedure may have happened equally in both the groups—control as well as study group.

CONCLUSIONS

The finding of an extrinsic compression on an upper endoscopy is not uncommon. Extrinsic compression can be due to a benign or a malignant lesion. If noted to have an extrinsic compression of the oesophagus and stomach on endoscopy, with associated symptoms such as weight loss and laboratory finding of hypoalbuminaemia, it may suggest malignancy and further work-up should be pursued. Posterior wall gastric body compression may signal the presence of pancreatic cancer. In our study, one patient was newly diagnosed with malignancy after further work-up pursued for extrinsic compression on endoscopy, and the remaining patients were diagnosed recently with malignancy. Regardless the timing of malignancy diagnosis and the endoscopic finding of an extrinsic compression, our study highlights the fact that these malignant pathologies can cause extrinsic compression and can be diagnosed on an upper endoscopy. Further studies with larger patient pool are needed to validate our results and identify predictors of malignancy associated with endoscopically identified extrinsic compression of the oesophagus and stomach.

Contributors KK, HP and JM contributed to the concept and design. HP, ME, KK, HT, JM and AD contributed to the drafting of the manuscript. SM, KK and HT contributed to the acquisition of data. AZ was responsible for the statistical analysis. JM supervised the study. HP, JM, HT and KK contributed to the analysis and interpretation of data. JM, HP, AD, MG and ME was responsible for the critical revision of the manuscript for important intellectual content.

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Competing interests None declared.

Patient consent for publication Not required.

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