GASTRIC TUMORS ON CHEST RADIOGRAPHS

Shozo Tamura*, Takashi Kawanami** and Walter J. Russell***

Department of Radiology, Radiation Effects Research Foundation

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*Department of Radiology, University Hospitals of Cleveland, Cleveland, Ohio

**Department of Radiology, Grady Memorial Hospital, Atlanta, Georgia

***Department of Radiology, Radiation Effects Research Foundation (Formerly Atomic Bomb Casualty Commission), Hiroshima, Japan

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胸部X線写真にみられた胃腫瘍

放射線影響研究所（放影研）放射線部

田村　正三　　川波　喬　　ウォルターJ.ラッセル

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胃穹隆部のガス像の中に突出して増殖し，胸部X線写真で初めに発見された胃腫瘍3例を検討した．これらの腫瘍は，内視鏡所見あるいは手術標本により，それぞれ，ポリープ，平滑筋腫，腺癌であることが証明された．これら3者の内，最小のものはポリープで直径 1.3cm であつたが，より小さい病変も“条件”が良い場合には発見可能と思われる．“条件”とは，適当な技術と位置合わせ，病変が胃の上部にあつて一定以上の大きさを有すること，腫瘍がX線束に対して接線方向に存在すること，胃上部に充分空気が入つていること，注意深い読影を行うことである．このような病変は胸部の撮影前に経口的に発泡錠を投与して胃を膨らませることにより，発見し易くなると思われる．胸部X線検査において，フイルムの価格と被曝線量の観点から，照射野を肺野のみに絞ることが奨励されている．しかし，あまりに小さい照射野にすれば，患者にとつて有用であるかもしれない情報が失われる可能性もある．通常用いられている35×43cm，35×35cm のフイルムの内，小さい方を用いることによつて得られる表面線量，骨髄線量の減少は極めてわずかであり，生殖器線量は適当な防御によりほぼ零にすることができる．胸部X線写真の読影の際，読影者の注意は肺，心臓の病変の方に集中しがちであるので，X線写真全体の注意深い観察が必要である．

Abstract

Gastric neoplasms of three patients protruded into their gas-containing fornices and were first visualized on plain chest radiographs. Endoscopy and/or surgery confirmed these to be a polyp, a leiomyoma and an adenocarcinoma. The polyp, 1.3 cm in diameter, was the smallest of these three, but smaller lesions may be detectable under suitable conditions. Adequate technique and positioning, sufficiently large lesions in the upper portion of the stomach, a central beam tangential to the tumor, sufficient gas in the stomach, and careful scrutiny by the observer are required. Lesions may be more readily visualized during chest radiography when oral sodium bicarbonate is used to distend the stomach. In chest radiography, exposure limited to the lung fields has been advocated for economy and dose reduction. However, too small an exposure field may result in loss of information potentially beneficial to the patient. Using the smaller of two popular film sizes (35 × 43 cm, 35 × 35 cm), the saving in surface and bone marrow doses is negligible, and the saving in gonad dose may be nil over that when shielding is used. The interest of the observer may be absorbed by a concomitant cardiac or pulmonary lesion. Careful scrutiny of the entire radiograph is therefore essential.

Introduction

We must be on the alert for any subtle changes on the radiograph, even at its margins, in order to thoroughly evaluate the patient's condition. We sometimes fail to perceive such abnormalities, especially when another more prominent one concomitantly exists on the film.

A gas bubble is usually seen in the gastric cardia on the plain chest radiograph, though the amount of gas varies from patient to patient. However, it is doubtful that sufficient attention is always paid to that area of the film, or whether such a thorough evaluation is made for each patient. The "gastric air bubble" on the plain chest radiograph is probably easily overlooked, though it is well-known that polypoid fundal tumors may occasionally be first identified by an abnormal gastric air bubble on the chest radiograph[1-4].

Presented here are three cases whose gastric lesions were detected on plain chest radiographs, by perceiving the unusual shapes of their gas-distended gastric fornices. A discussion of the perception of such lesions on plain chest radiographs is included, and the pertinent literature is reviewed.

Case 1 (M.F. # 843893)

This 48-year-old male had no complaints referable to the gastrointestinal tract. Routine chest radiographs in October 1974 revealed a small polypoid lesion protruding from the mucosa of the gastric fornix (Fig. 1A).

An upper gastrointestinal series one month later confirmed the presence of this polyp (Fig. 1B). A repeat plain chest radiograph made immediately before the upper gastrointestinal series did not clearly outline the polypoid lesion because of lack of air in the stomach.

Case 2 (M.F. # 022834)

This 48-year-old female had vague epigastric discomfort with occasional lower abdominal pain prior to routine chest radiography in April 1968. A small mass lesion was outlined by gas in the medial portion of the fornix (Fig. 2A).

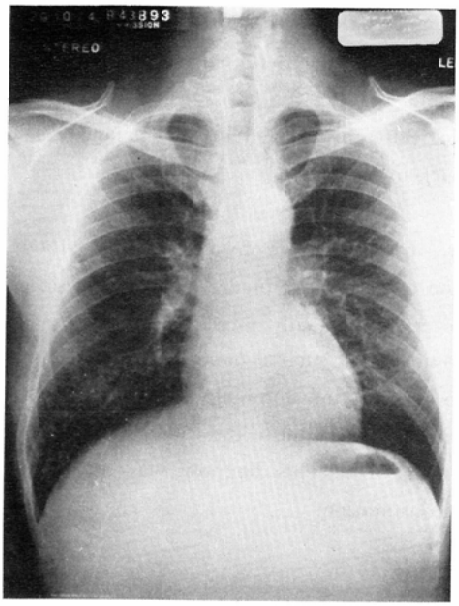

Fig. 1A. Chest radiograph showed a small mass protruding downward into the gastric air bubble.

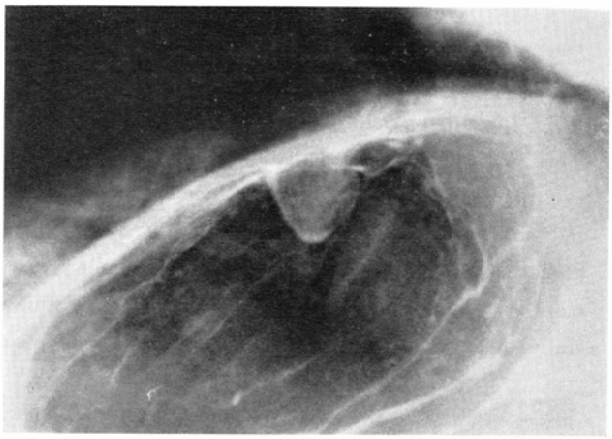

Fig. 1B. Double contrast barium study of the stomach outlined a polypoid lesion.

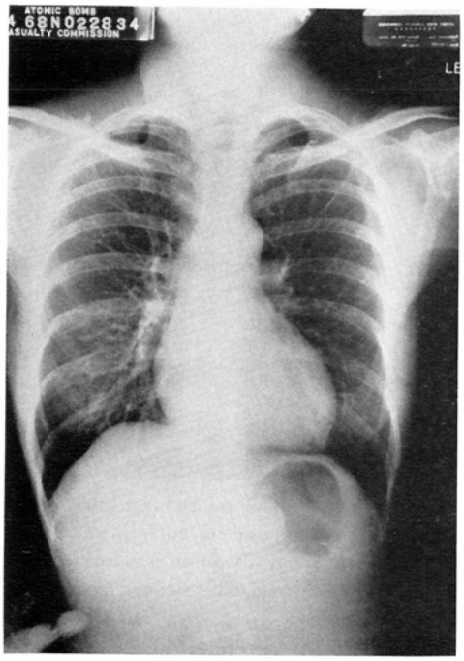

Fig. 2A. Chest radiograph showed asmooth-margined mass on the medial aspect of the gas-filled cardia.

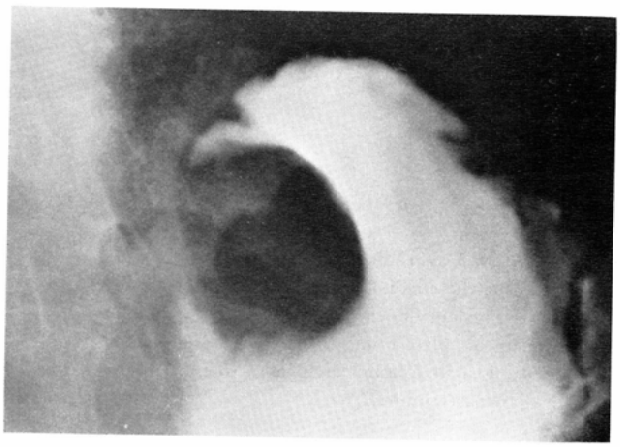

Fig. 2B. Barium study of the stomach suggested the round defect was benign, such as leiomyoma, which it proved to be histologically.

An upper gastrointestinal series one month later revealed a mass lesion with a smooth surface, suggesting a submucosal tumor in the cardia, such as a leiomyoma (Fig. 2B). Its presence was confirmed endoscopically

Two years later, gastrectomy was performed, and histologically this proved to be a leiomyoma. Retrospectively, the tumor was visible on chest films dating back to 1966.

Case 3 (M.F. # 257711)

This 74-year-old male had no gastrointestinal complaints. Chest radiography from 7 April 1966 to 12 July 1976 demonstrated a curvilinear density in the region of the apical pleura on the right side. This was initially regarded to be pleural thickening. However, it gradually increased in thickness, eventually protruding into the parenchyma, suggesting a benign neoplasm, such as mesothelioma. Chest radiography in July 1976, revealed a massive irregular density protruding intraluminally from the medial aspect of the gastric fornix (Fig. 3A). One month later, advanced carcinoma of the cardia with lower esophageal invasion was found at upper gastrointestinal series (Fig. 3B). This diagnosis was confirmed endoscopically, and the patient was advised to have surgical consultation.

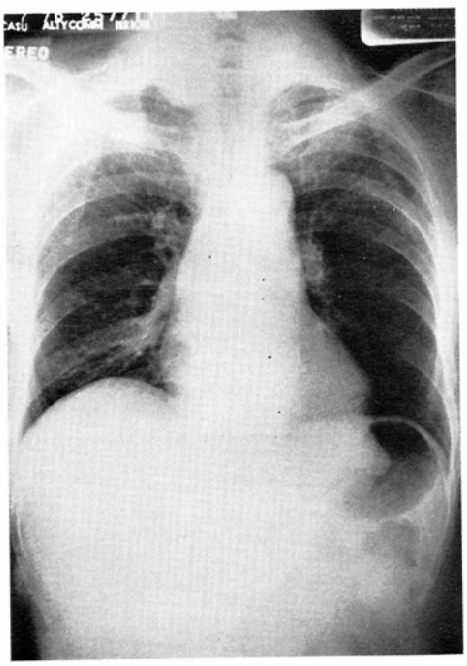

Fig. 3A. Chest radiograph showed a lobulated mass on the medial aspect of the gastric cardia. The curvilinear density in the region of the apical pleura on the right was suspected of being a neoplasm, such as a mesothelioma or Pancoast tumor.

Fig. 3B. Barium study of the stomach one month later outlined a large irregular mass in the cardia. The radiologic diagnosis was carcinoma. Histologically, the resected specimen proved to be adenocarcinoma.

Discussion

These three gastric tumors were initially detected on plain chest radiographs. The existence of each

gastric lesion was previously unknown.

Clear visualization of mass lesions in the stomach by chest radiography depends on the following conditions:

(1) Adequate technique and positioning of the patient
(2) Sufficiently large lesions for radiologic demonstration
(3) Tumors situated in the upper portion of the stomach
(4) Tangential incidence of the central beam to the tumor
(5) Sufficient gas in the stomach
(6) Careful scrutiny by the observer

The primary aim in chest radiography is the assessment of the pulmonary, cardiovascular, and skeletal structures. However, if all visible structures are scrutinized, we can better contribute to the welfare of the patient. Had the exposure field and/or scrutiny been strictly confined to the lung fields, only the polyp could have been diagnosed. Opaque gallstones, splenomegaly, and other abnormalities are occasionally detectable, providing the upper portion of the abdomen is included in the exposure field.

The question of substituting 35×35 cm for the standard 35×43 cm film was raised by Etter and Cross in the U.S.[5] in 1960 in the interests of film economy and dose reduction for chest radiography. In 1963 this question was considered by the Committee on X-ray of the American College of Chest Physicians and the Committee on Diseases of the Chest of the American College of Radiology[6]. This joint committee officially concluded that routine use of the smaller film is not advisable, because it would result in no appreciable savings in dose or financial expenditures. A more compelling reason to use the larger films and fields is the potential loss of the additional useful information beyond the film periphery in the case of film of insufficient size.

Our own estimates of doses for the two field and film sizes are as follows[7]:

	35×35 cm	35×43 cm
Skin dose	9.2 millirad	9.2 millirad
Bone marrow	1.4 gram rad	1.7 gram rad
Gonadal dose, male	0.01 millirad	0.02 millirad
female	0.02 millirad	0.04 millirad

We routinely use lead shielding for the gonads. A larger exposure field is therefore permissible because dose reduction is minimal from such larger to smaller fields[7], and gonad dose can be essentially eliminated with adequate protection[8]. We must seek the useful information which is potentially lost with small exposure fields.

In reviewing 247 histologically-proven cases of gastric carcinomas, Ochsner and Little found that the cardio-esophageal area was involved in 17%. In 33% of the cardio-esophageal cancers, the tumors could be seen on the plain radiographs of the chest or abdomen[2].

Kirklin and Gilbertson described that about half of their 68 cases of cancer at the cardia could be seen as soft tissue masses projecting into the gastric air bubble[1].

Benign tumors of the stomach which bulge into the gastric air bubble are reportedly less frequent than carcinomas. Ochsner and Janetos[4] reported that in their review of 82 benign gastric tumors, only one adenoma could be seen on the plain radiograph as a mass protruding into the gastric air bubble.

The smallest gastric lesion we have detected on plain chest radiographs was 1.3 cm in diameter. This tumor was situated in the most superior portion of stomach; the central X-ray beam was tangential to it; and there was sufficient air in the stomach. If these conditions prevail, masses smaller than 1.3 cm may be detectable on posteroanterior chest radiography. Even gastric folds in the fornix, which are 5 mm in greatest dimension, can be visualized on plain radiographs with proper technique.

Two of the three patients reported here now have excellent prognoses. Even though gastric cancers detected in this manner are generally advanced and are potentially less amenable to cure, their detection is still of great value, if only for palliative therapy and for the personal reasons of the patient and his family.

Visualization of a mass in the fornix depends to a great extent on the amount of gas in the stomach. This is exemplified in Case 1. This polypoid lesion was not clearly demonstrated on the chest radiograph made immediately before the upper gastrointestinal series which proved its presence.

Gastric air bubbles vary in shape depending on the stomach type, the mucosal folds, and the degree of gastric distension. Suspected fornix tumors on plain chest radiographs may subsequently be proven by barium study as nothing but normal mucosal folds, especially when distension of the stomach by gas is insufficient. Understandably, some radiologists are reluctant to report them, without unequivocal evidence of an abnormality.

Gaseous distension of the stomach on chest radiography using bicarbonate preparations would appear a worthy undertaking. Bicarbonate preparations are harmless, easily ingested, and their cost is negligible. This procedure could be useful not only in the detection of gastric masses, but abnormalities including hiatal hernia and displacement of the stomach by extrinsic pressure, such as with splenomegaly. Using chest radiography, we are randomly examining subjects following their ingestion of a bicarbonate preparation, and results will be reported separately.

The chest radiograph of Case 3, revealed a mass in the right apex in or near pleura, protruding inferi orly into the parenchyma. This lesion had been growing slowly, and a neoplasm such as mesothelioma or other benign tumor—even a Pancoast tumor—was suspected. Therefore, our main interest was in that lesion. Generally, a prominent abnormality such as this distracts the observer so that other findings tend to be overlooked. This can also occur when the radiologist has some information about a lesion before observing the films, concentrating his attention on the known involved area. To avoid this type of error[9], it is important to scan a film first, before reading the report of a previous examiner.

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Requests for reprints should be addressed to:
Walter J. Russell, M.D., D.M.Sc.
Chief of Radiology
Radiation Effects Research Foundation

5-2 Hijiyama Park
Hiroshima, Japan 730

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