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# Cardiac tamponade due to advanced gastric cancer: case report and review

## Cardiac tamponade due to advanced gastric cancer



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## ABSTRACT

**INTRODUCTION AND IMPORTANCE:** Pericardial involvement due to gastric cancer is uncommon, especially when it is secondary to direct tumor infiltration. Its manifestation as cardiac tamponade is an exceptional situation that represents a challenge for the treating medical team.

**CASE PRESENTATION:** a case of a patient with advanced gastric cancer with cardiopericardial infiltration, complicated with cardiac tamponade is reported. A narrative review of the diagnostic and therapeutic management was performed.

**CLINICAL DISCUSSION:** There are no well-established diagnostic and therapeutic algorithms.

**CONCLUSIONS:** It is such an exceptional entity that most of the available bibliography is based on case reports or expert opinions. It is a situation with a very bad prognosis.

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## 1. Introduction

Cardiac tamponade occurs due to an increase in pericardial pressure over central venous pressure, reducing venous return and antegrade flow [1,2]. It is a critical condition that endangers patient's life<sup>1</sup>. Among its etiologies, neoplastic disease is described [1], most frequently due to pericardial involvement secondary to lung cancer, breast cancer or lymphoma [3].

Pericardial involvement due to gastric cancer is rare. When it occurs, it does so in the context of a systemic disease, as a pleural effusion [4–10], or pericardial carcinomatosis [11].

Pericardial involvement due to direct, transdiaphragmatic, tumor infiltration of a primary gastric cancer is even less frequent, and its manifestation as cardiac tamponade is exceptional. It has a poor prognosis, from the hemodynamic and oncological point of view, representing a challenge for the treating physicians.

The aim of this paper is to report the case of a patient with advanced gastric cancer and pericardial infiltration, presenting with a cardiac tamponade, and to perform a narrative review regarding its diagnosis and management.

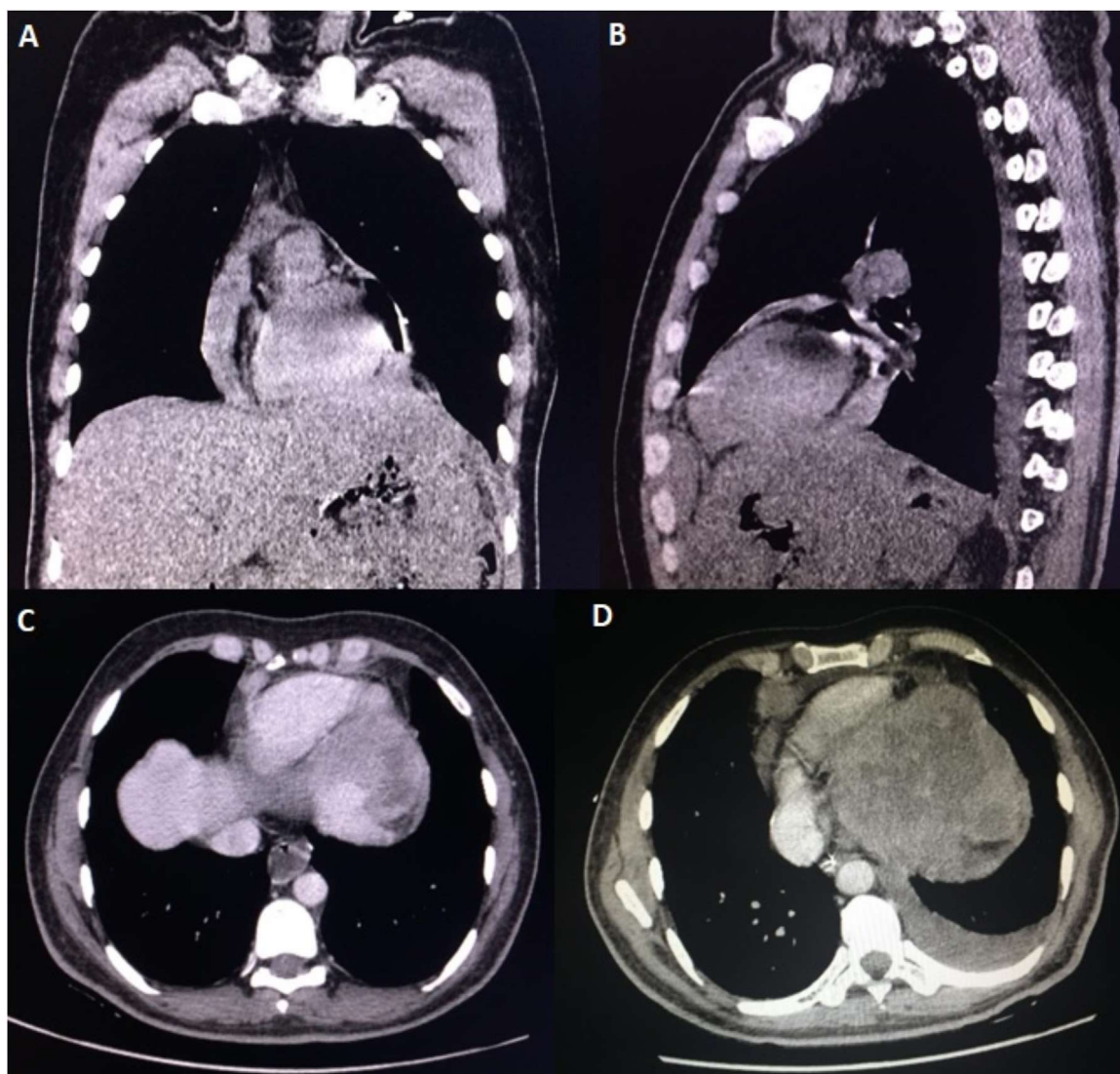
## 2. Case report

A 45-year-old patient was studied for dyspepsia. Fibrogastroscopy (FGC) revealed an ulcer located at the stomach's anterior wall, involving body and fundus. Histological findings confirmed a moderately differentiated adenocarcinoma. Computed tomography scan (CT) suggested involvement of the anterior abdominal wall. A staging laparoscopy was performed, which confirmed abdominal wall invasion and ruled out peritoneal carcinomatosis. Therefore, being classified as a stage III gastric cancer, neoadjuvant chemotherapy was administered. 10 weeks after the onset of neoadjuvant therapy, the patient developed heart failure with hemodynamic instability and was admitted to the emergency department. A cardiac tamponade was diagnosed, and rapid resuscitation measures and emergency pericardiocentesis were performed, obtaining blood from the pericardial sac. A new CT revealed pneumopericardium and the tumor's direct infiltration of the pericardium through the diaphragm (see Fig. 1). Pericardiocentesis cytological study was negative for malignancy.

After discharge, patient started palliative systemic treatment. A new CT at three months showed tumor growth (see Fig. 1).

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**Fig. 1.** Abdomino-thoracic CT showing pneumopericardium and cardio pericardial infiltration due to advanced gastric cancer. A: Sagittal section. B: Coronal section. C: Axial section. D: Tomographic control (axial section) at 3 months showed tumor growth.

### 3. Material and methods

This work has been reported in line with the SCARE Guidelines 2020 [12] and registered on research registry (unique identifying number: 6367) [13].

A bibliographic search was carried out in the Pubmed and LILACS databases. The search terms (Pericardium[Mesh]) AND Stomach Neoplasms[Mesh], and ([Gastric Neoplasms OR Gastric Cancer] AND Pericardium) were used. Search filters used were language (Spanish, English, French and Portuguese). Reports referring to gastric tumors with pericardial effusion in the context of systemic spread, pericardial carcinomatosis or cardiac metastasis, as well as gastric tumors with synchronous pericardial tumors were also excluded.

### 4. Results

A total of 30 publications identified the presence of pericardial involvement due to gastric pathology. 13 were included in the analysis, referring to neoplasm involvement. Among these, 7 reported pericardial involvement due to direct infiltration of an advanced gastric cancer (see Table 1). We found no reports of its clinical

manifestation in the form of cardiac tamponade, as the case we presented.

### 5. Discussion

Pericardial involvement due to gastric pathology is extremely rare, and most of reports refer to gastro-pericardial fistulas [14]. In a review carried out by Azzu et al., only 65 reports of gastro-pericardial fistulas are published worldwide [12]. The majority of them are secondary to peptic ulcers, or post-surgical complications of gastroesophageal interventions [14–16]. Only 9% of gastro-pericardial fistulas are secondary to advanced gastric cancer infiltration [14]. In these cases, the stomach is usually in an intrathoracic position, due to a hiatal hernia or a prior esophagectomy [14–16]. This heterotopic anatomical situation brings the stomach close to the pericardial sac.

Pericardial involvement secondary to infiltration by an advanced gastric cancer in a normotopic stomach was only reported 7 times worldwide (see Table 1). There are no reports of its manifestation as a cardiac tamponade.

The first description of a gastric neoplasm infiltrating the pericardium was made by Gottesman et al. in 1926. They report a case

**Table 1**  
Literature review.

	Age	Sex	Clinical presentation	Diagnosis	Topography	Management	Survival
<b>Harp (1949)</b>	56	Man	Functional decline	Autopsy	Gastric Fundus	–	–
<b>Chinnaiyan (2004)</b>	57	Man	Toracic pain	CT	Gastric Fundus	Pericardiocentesis and confort measures	25 days
<b>Tang (2009)</b>	47	Man	Toracic pain	CT	Gastric Fundus	Pericardiocentesis and sistemic treatment	6 months*
<b>Prasad (2011)</b>	70	Man	Toracic pain	CT	Gastric Fundus	Confort measures	1 day
<b>Grillo (2014)</b>	68	Man	Epigastric pain	FGC	Gastric Fundus	Surgery	–
<b>Montaño (2015)</b>	70	Female	Epigastric pain	CT	Gastric Fundus	Surgery	4 days
<b>Hirani (2020)</b>	65	Man	Shortness of breath	CT	Esophagogastric junction	Confort measures	–

(-) no data (\*) lost at follow up.

of pneumopericardium due to gastric cancer secondary to radiation necrosis [17]; the original article is not available on the web. The following report, by Harp et al. in 1947 [18] presents a case of pneumopericardium in a patient in whom a necropsy revealed a gastric cancer infiltrating diaphragm and pericardium. The rest of the published reports were about alive patients at the time of diagnosis, and date from 2004 to the present.

### 5.1. Clinical presentation

The patients were mostly men (6/7) with an average age of 62 years (range 47–70). Our patient is the youngest reported. The most frequent symptoms were chest pain and dyspnea (4 cases). In two cases the cardinal symptom was epigastric pain [19], and in one, weight loss and asthenia [20]. No case presented with cardiac tamponade.

Three cases had received treatment with radiotherapy [20,21], and one had chemotherapy [22]. Tang et al. suggest that treatment with radiotherapy could be a predisposing factor for the formation of a gastro-pericardial fistula [20].

### 5.2. Diagnosis

CT was the main diagnostic tool. The most frequent finding is the presence of pneumopericardium [16,20], associated to a gastric lesion with diaphragmatic and pericardial infiltration [21]. In the report by Prasad et al., a gastro-pericardial fistulous tract could also be identified [21]. In our report we cannot discard that the pneumopericardium was secondary to pericardiocentesis, and not to the existence of a communication between both cavities.

Another diagnostic method is the FGC [19]. Its use is debatable to some authors, given the risk of pneumopericardial tamponade secondary to insufflation [14]. We found no published evidence regarding this eventuality.

The tumor topography in most of the cases (5 patients) was at the anterior wall of the gastric fundus, immediately below the diaphragm. In only one report the lesion was at the gastroesophageal junction [22].

Pathological anatomy corresponded in most of the cases to moderately differentiated adenocarcinomas, as was the case of our patient [23].

### 5.3. Treatment

There is no established treatment for malignant cardiac tamponade, as most of what is published on the subject are reports on pericardial effusion due to broncho-pulmonary carcinoma [7]. Therefore, the level of evidence of this rare condition is low, consisting mostly on case reports and expert opinions. In this bibliographic review, confort measures were established in two patients [21,22], in two cases treatment was performed by percutaneous pericardial drainage, pericardiocentesis [16,20] and radical surgical treatment were performed in two patients [19,23]. One of these patients underwent a thoracotomy approach, gastro-diaphragmatic release

and closure of the fistula; with a poor post-operative evolution, dying after 4 days [23]. Regarding the other patient, no tactics, evolution or survival were described [19]. In the case of our patient, who presented with cardiac tamponade, a pericardiocentesis was performed (level of evidence class 1A) [1]. In the absence of hemodynamic instability, in a patient presenting cardiovascular and/or respiratory symptoms, pericardiocentesis is part of the symptom relieving treatment. Additionally, it allows us to study the etiology of the effusion [1].

The diagnostic sensitivity for malignancy of the cytological study of the pericardial fluid is highly variable. Saab et al. (2017), studied 365 patients with neoplastic pericardial involvement, and reported a sensitivity of 92.1%, while a tissue biopsy had a sensitivity of 55.3% [24]. This could be explained because direct or metastatic neoplastic involvement of the pericardium usually associates a lymphatic blockage, which is the pathophysiological basis of the effusion. The neoplastic cells remain suspended in the pericardial fluid, while the biopsy would only be positive if performed on the site of focal involvement by the tumor [24]. False negatives reach 7.9%, so a negative result as in our case does not exclude the diagnosis [24,25]. In some cases there was gastric content and/or methylene blue leakage through pericardial drainage [16].

The efficacy of pericardial instillation of cytostatic, sclerosing or immunomodulatory substances, commonly used in pericardial effusions of neoplastic etiology in order to prevent recurrences, is uncertain [1,25].

### 5.4. Prognosis

The reported survival is poor, from 24 hours (or one day) to six months [20]. The patients with the longest survival were those treated by pericardial drainage, associated with palliative systemic treatment. We found no data regarding the recurrence of cardiovascular and/or hemopericardium symptoms.

## 6. Conclusions

We present the first case report of a patient with advanced gastric cancer with cardiopericardial infiltration, complicated by cardiac tamponade.

CT appears to be the main diagnostic tool, while pericardiocentesis plays a fundamentally therapeutic role in the presence of tamponade, or cardio-respiratory symptoms.

The fact that it is a rare entity explains the absence of well-established therapeutic algorithms, and that most of the available bibliography is based on case reports and expert opinions. This is a situation with a very bad prognosis.

We highlight the relevance of publishing this case report as a way of sharing this experience among colleagues, therefore improving the management of patients with this condition.

## Declaration of competing interest

The authors disclose no proprietary or commercial interest in any product mentioned or concept discussed in this article

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## Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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## Author contribution

The order of the authors listed in the manuscript has been approved by all. Also we declare each author contributions:

- Guarantor of integrity of the entire study: SM
- Study concepts and design: NM and SM
- Literature research: SM, CH, AP, NB
- Manuscript writing and editing: SM, CH, AP, NB, MV
- Manuscript correction: NM and CC

## Registration of research studies

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