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# Gastric Cancer, Update in management; clinical case presentation

# Cáncer gástrico, avances recientes en su tratamiento; presentación de un caso

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#### Resumen

The current problem of advanced gastric cancer is its high morbidity and mortality, it represents the fifth most frequent tumor and the fourth cause of death, surgical treatment determines a benefit in the patient's survival, however; most tumors at the time of diagnosis are in advanced stages, resulting in the surgical procedure being ineffective, the case of an 82-year-old male patient is presented, who consults for abdominal distension, unquantified weight loss and hyporexia. Endoscopically, a tumor lesion was evidenced whose histological report was gastric adenocarcinoma, therefore, a total gastrectomy and subsequent chemotherapy were performed, it presents a torpid evolution and finally dies. Conclusion: multiple factors influence the genesis of the tumor, gastrectomy remains the standard of treatment in early stages but most cases are in advanced stages.

Keywords: adenocarcinoma, gastrectomy, helicobacter pylori, digestive endoscopy.

#### Abstract

El problema actual del cáncer gástrico avanzado es su alta morbilidad y mortalidad, representa el quinto tumor más frecuente y la cuarta causa de muerte, el tratamiento quirúrgico determina un beneficio en la sobrevida del paciente, sin embargo, la mayoría de los tumores al momento del diagnóstico se encuentran en estadios avanzados resultando un procedimiento quirúrgico efectivo, presentamos el caso de un paciente masculino de 82 años, que consulta por distensión abdominal, pérdida de peso no cuantificada e hiporexia. La endoscopia reveló una lesión tumoral cuyo reporte histológico fue adenocarcinoma gástrico, por lo que se realizó gastrectomía total y posterior quimioterapia, presentó una evolución tórpida y finalmente falleció. Conclusión: múltiples factores influyen en la génesis del tumor; la gastrectomía sigue siendo el estándar de tratamiento en estadios tempranos pero la mayoría de los casos se encuentran en estadios avanzados.

**Palabras clave**: adenocarcinoma, gastrectomía, helicobacter pylori, endoscopia digestiva.

# 1. Introduction

Gastric cancer is one of the most common malignancies, being the fourth cause of death worldwide; according to statistical data, in East Asian countries there is a higher mortality rate; in Japan, mortality occurs in 1.4% of men and 5.8% corresponds to women; in Ecuador, in 2018, around 2.3% of mortality was recorded with an approximate of 9.8/100,000 inhabitants; despite this, its incidence has decreased and the male sex is the most affected population (1, 3).

It is considered a multifactorial condition; gastric adenocarcinoma is a malignant neoplasm with high aggressiveness, so its early diagnosis is of vital importance to reduce the number of incidences as well as modify the risk factors. There are various classifications of this disease, whether endoscopic or histopathological, it is staged by the TNM system established by the American Cancer Committee. Currently, the presence of certain risk factors has been observed, including family history, alcohol consumption, diet, smoking, infections by Helicobacter Pylori or the Epstein Barr virus (2).

Depending on the cell type, the location of the tumor, the degree of cellular differentiation, and the presence or absence of metastasis, treatment is directed either to a partial or total gastrectomy with lymphadenectomy.

The purpose of this work is to carry out a bibliographic review related to gastric cancer based on the presentation of a clinical case that was managed in a reference center in the country.

# 2. Clinical Case

Male patient, 82 years old, farmer, Catholic, mestizo, personal pathological history: inguinal herniorrhaphy and knee osteosynthesis, no family history; argues clinical picture of distension and abdominal pain at the epigastrium level according to EVA 4/10, without radiation, six months of evolution, with periods of remission and exacerbation, weight loss not quantified 3 months ago for which reason he comes to the consultation, at the time of admission presents: BP: 110/80 mm Hg, FR 20 rpm; Temperature of 35.8°C, SAO2: 97%, weight: 45 kg, height: 1.57. His general appearance is regular, the head and neck normocephalic, at the level of the thorax the pulmonary fields are ventilated and vesicular murmur normal; heart: R1 and R2 normophonetic synchronous with

the pulse; At the abdominal level, palpation shows soft, depressible and painful at the epigastrium level and auscultation shows increased RHA, oriented in time, space and person. Since this is an elderly patient with weight loss without history, blood tests are requested with the following results:

Parameter	Result	Normal Values
Neutrophils	40%	45-70%
Hemoglobin	12 g/dl	13-17 g/dl
INR	1.08	Up to 1
Lactic dehydrogenase	$236 \mathrm{U/L}$	250-450 U/L

### Table 1. Laboratory Results

Note . The rest of the laboratory tests were normal. Source : Solca Cuenca Laboratory data (2022)

The low hemoglobin level was noted and tumor markers were also performed, the results of which are shown in *Table 2*. After this, an Upper Digestive Endoscopy (EDA) was performed, the report of which indicated: the esophagus had no alterations (*Figure 1*); the stomach did not show contraction or relaxation; in the middle part of the gastric body, an ulcerated fibrotic neoplastic lesion was observed that decreased the diameter of the gastric chamber, giving it the shape of an hourglass, without affecting the antrum and fundus (*Figure 2a and b*); the duodenum showed no alterations until the third portion (*Figure 3*).



Figure 1. Upper digestive endoscopy. Source: SOLCA Cancer Institute (2022).



Figure 2a and b. Upper digestive endoscopy. Source: SOLCA Cancer Institute (2022).



Figure 3. Upper digestive endoscopy. Source: SOLCA Cancer Institute (2022).

# Table 2. Tumor Markers

Parameter	Result	Normal Values
Carcinoembryonic Antigen (CEA)	3.00 ng/dl	<4.70 ng/dl
CA 19-9	15.46 U/ml	<39 U/ml

Source : Solca Cuenca Laboratory data (2022)

Samples were taken for pathology, the report indicates gastric mucosa infiltrated by a diffuse infiltrating epithelial-type neoplastic proliferation, with a predominantly solid pattern, made up of atypical, cohesive, large cells, broad cytoplasm, eccentric and atypical nucleus, with marked pleomorphism, hyperchromasia and focally cells with a *"signet ring"* appearance; lymphoid neoplasia is ruled out and the examination for *Helicobacter Pylori* negative (*see figure 4*). Subsequently, a CT scan of the abdomen with contrast was performed, which showed thickening of the gastric wall of 16 mm thick with 56 mm in length in the antrum and perigastric lymph nodes of approximately 6 mm and 5 mm with no distant lesions suggesting metastasis.





Figure 4. Tissue samples for pathological anatomy.

The definitive diagnosis was *Borrmann type IV diffuse gastric adenocarcinoma*. The patient underwent total gastrectomy plus Roux-en-Y esophagogastro anastomosis; however, during this procedure, important findings were obtained, including: "*peritoneal carcinomatosis and a 6 cm ulcerated tumor at the level of the greater curvature in the middle third of the gastric body that infiltrated all layers*."

The patient was discharged on the twelfth day and one month after surgery, postoperative chemotherapy was started.

Three months after surgery, the patient presented dysphagia for solids and liquids, developing gastroesophageal reflux; based on this, it was decided to perform new laboratory and imaging tests; the results of the blood count and blood biochemistry are shown in *table 3 and table 4*. The CT scan showed abundant free fluid in the abdominal cavity (*see figure 5*). Then, an esophagogram was performed, which showed a stenosis in the esophagoduodenojejunal anastomosis (*see figure 6*). Having said this, an intervention was carried out consisting of an esophageal balloon dilation after prior informed consent.

Parameter	Result	Normal Values
White Blood Cells	3.42	$4.50 - 10 /\mathrm{mm^3}$
Red Blood Cells	3.51	$4.50 - 5.90 /\mathrm{mm^3}$
Hemoglobin	11.20	11.60 – 16.30 g/dl
Hematocrit	31.90	42 - 54%
Red blood cell distribution width	19.20	11.50 - 14.50 %

#### Table 3. Post-Complications Blood Count

Note . The rest of the blood count parameters were normal. Source : Solca Cuenca Laboratory data (2022)



Figure 5. Abdomino-pelvic CT scan showing the presence of free fluid. Source : SOLCA Cancer Institute (2022).



Figure 6. Esophagogram with evidence of esophagoduodenojejunal stenosis. Source: SOLCA Cancer Institute (2022).

Parameter	Result	Normal Values
Urea	55.9	10-50 mg/dl
Creatinine	0.62	0.70-1.20 mg/dl

### Table 4. Post-Complication Blood Biochemistry

Note. The rest of the blood biochemistry parameters were normal.

Source: Solca Cuenca Laboratory data (2022)

The patient's condition deteriorated 6 months after surgery , and the patient passed away.

# 3. Gastric cancer

### 3.1 Concept

Gastric cancer (GC) is defined as an affection of the cells that line and form part of the gastric wall, in which apoptosis of malignant cells fails. It develops in any portion of the stomach and can spread via lymphatic, hematogenous or continuous routes (4)(5).

According to a study carried out in 2022 by the Calixto García Hospital, the most frequent anatomical location of this type of cancer is in the antrum, followed by tumors of the gastric body. Regarding the histological classification of GC, there is a predominance of adenocarcinoma around 95% (4,5).

### 3.2 Etiopathogenesis

Some conditions have been identified that have a great impact on the development of CG, such as those observed in *Figure 7*, on exogenous or environmental factors.



Figure 7. Most frequent exogenous factors associated with gastric cancer.

Gastric cancer is multifactorial, however, Helicobacter pylori infection is the main cause, being considered a type 1 carcinogen. The infection progresses from a duodenal ulcer, gastric ulcer to the development of GC. This bacteria alkalizes the gastric pH, allowing it to live there and thus proliferate and cause a chronic inflammatory response (6).

H. pylori comes into contact with the cell through adhesins, then produces a type IV secretion system (CagL), certain toxins (VacA) and the cytotoxin associated with gene A (CagA) that alter the normal functioning of the epithelium. The host generates an inflammatory response due to the infiltration of polymorphonuclear cells and consequently the patient suffers from gastritis. The bacteria protects itself from reactive oxygen species (ROS) through enzymes that reduce the production of nitric oxide (NO) by the cells of the immune system. ROS leads to damage to cellular DNA, which decreases apoptosis and thus prevents complete DNA repair(6, 7).

From another perspective, studies have shown that a diet high in salt content is the most prevalent for the appearance of gastric neoplasias. This is because salt produces an increase in the inflammatory response and an increase in DNA synthesis and cell proliferation. Among other epidemiological studies, GC is also associated with smoked foods due to their content of polycyclic aromatic hydrocarbons. On the other hand, fruits and vegetables (rich in vitamin C or beta-carotene) have been considered as means of protection against the appearance of GC; however, there are convictions against it that have not yet been defined (6, 7).

Tobacco is a type 1 carcinogen that increases with the intensity and duration of smoking. Since cigarettes contain a number of chemical substances, including polycyclic aromatic hydrocarbons, benzopyrenes, heterocyclic amines and nitrosamines, which could trigger GC. The smoke generated by tobacco contains NO, which when combined with nicotine produces nitrosamines and promotes oxidative DNA damage. Another factor involved is alcohol consumption, although it is not well catalogued, there are some studies that reveal that beer increases the risk, unlike wine, which is considered a protective factor (6, 7).

According to Buján (7) ), obese populations (body mass index between 30-35) are more prone to suffer from GC, mainly in the region of the cardia and the gastroesophageal junction. The theories propose that it is due to an increase in gastroesophageal reflux, given the accumulation of abdominal fat, which in turn releases excess insulin and insulin-like growth factor (IGF-1), which in a certain way alters cell proliferation and apoptosis. In another sense, radiation is less frequent but no less important, since gamma radiation predisposes to GC, as does chemotherapeutic agents such as procarbazine. Figure 8 shows the endogenous factors that increase the risk of GC.



Figure 8. Most frequent endogenous factors associated with gastric cancer.

Recently, studies from 2019 have revealed that the cancer rate is more prevalent in men as opposed to women. Approximately 0.8% of the population will be diagnosed with GC at some point in their life, but the risk increases with age. The average diagnosis of GC occurs in people between 65-74 years old, despite this, today cancer is not limited and also affects young people. On the other hand, race is influenced by environmental factors more than genetic ones for the presence of GC (6,7).

As mentioned by Cala and García (6,8), genetic bases have also influenced this pathology, since having first-degree relatives with the neoplasia increases the risk, as well as individuals with an affected mother as opposed to a father. Thus, we have the mutation of the E-Cadherin gene, responsible for the coding of proteins that have the function of adhesion and intercellular communication. Likewise, GC is attributed to hereditary syndromes in 5-10% as observed in *table* 5.

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Syndrome	Phenotype	Gene involved	Risk
Hereditary diffuse gastric cancer	Diffuse	CDH <sub>1</sub>	>80%
Lynch syndrome	Intestinal	MLH <sub>1</sub>	
		$\mathrm{MSH}_{_2}$	10%
		$\mathrm{MSH}_6$	
Familial adenomatous polyposis	Intestinal	APC	4-7%
Li-Fraumeni Syndrome	Intestinal or diffuse	$\mathrm{TP}_{_{53}}$	2-5%
Hamartomatous polyposis	Intestinal or diffuse	$\mathrm{SMAD}_4$	29%
		STK	

Table 5. Hereditary syndromes responsible for the development of G	ЪС.
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Source: Cala T, Estepa A, Martínez A (2021)

Autoimmune gastritis is due to a chronic inflammatory process, affecting the parietal cells of the stomach, leading to progressive atrophy of the mucosa. This behavior reduces the iron content, and finally vitamin B12 deficiency at the cellular level, triggering what is known as pernicious anemia. Some premalignant lesions such as chronic gastritis, intestinal metaplasia, gastric polyps, previous gastrectomy and peptic ulcer; are also triggering factors of gastric neoplasia (6,7).

# 3.3 Epidemiology

Gastric carcinoma has spread throughout the world, generating a higher prevalence in Asian countries, which is why, based on the latest WHO incidence and mortality estimates for 2019, about 5.7% of new cases of gastric cancer were

reported worldwide, placing GC in fifth place in the incidence of neoplasias and the fourth cause of mortality (7).

At the Ecuadorian level, according to data obtained from the National Institute of Statistics and Census (INEC), in 2018, 1,687 deaths were reported, representing 2.3% of the total mortality of 9.8 cases. It has been shown that the most outstanding risk factors are age (mean age 61 years) and it prevails in the male sex. Approximately 37% of patients have been diagnosed already in stage IV or regionally advanced, followed by stage III in 35% of cases. In turn, the tumor in the majority has been located at the level of the middle third of the stomach; as well, the metastasis presents a predominance at the hepatic level, close to 18.6 of the patients diagnosed with GC (*see figure 9*) (9).



Figure 9. Comparison of the incidence and mortality of GC in Ecuador with other Latin American countries in 2018. Note. Blue: incidence. Red: mortality. Source: Taken from Globocan (2018)

#### 3.4 Gastric Anatomy and Physiology

The gastrointestinal tract (*see figure 10*) has a dilated portion such as the stomach, which is located in the upper left quadrant of the abdomen, occupies part of the epigastrium as well as the left hypochondrium due to its "J" shape, which forms two unequal curvatures, the greater and lesser at the body level. It has a length of 25 cm and a storage capacity of 1-1.5 L. It is entirely covered by the visceral peritoneum, except for the areas of the curvatures and adhered to other structures by means of the epiplons. Among other aspects, five regions are recognized : cardia, fundus, body, antrum and pylorus. At a microscopic level, the stomach has four layers; from the inside to the outside is the mucosa that is in contact with gastric acid and in which some gastric glands are found, it continues with the submucosa covered by the muscular and finally the serosa (10).



Figure 10. Parts of the stomach and important structures. Note . A) portions of the stomach and curvatures, B) layers of the stomach, C) glands present. Source: Cala T, Estepa A, Martínez A (2021)

The stomach is supplied by the celiac trunk , which comes from two systems that anastomose along the curvatures and branch into several direct branches. The anastomosis of the left and right gastric arteries are located along the lesser curvature, which comes from the celiac trunk and the common hepatic artery, respectively. On the other hand, the anastomosis of the greater curvature is formed by the union of the right and left gastroepiploic arteries, which originate from the gastroduodenal and splenic arteries, respectively (11).

In addition, the splenic artery is also responsible for branching into short gastric arteries and the posterior gastric artery that go to the fundus and upper part of the body of the stomach. Pyloric irrigation is provided by the gastroduodenal artery. The venous system is parallel to the arterial system with the exception that they flow into the gastrocolic trunk or Henle's trunk. As for lymphatic drainage, the lymph follows a path from the stomach through the lymphatic vessels and flows into the gastric and gastroepiploic lymph nodes, located close to the arteries of the gastric curvatures. In turn, the pylorus is drained by the upper and lower lymph nodes. All vessels flow into the celiac lymph nodes (11).

Regarding gastric physiology, the stomach is involved in both mechanical and chemical digestion of food. Once the ingested food reaches the stomach, it remains stored for a few hours, while some substances interfere with its process of size reduction and decomposition into basic metabolic elements. That said, the stomach secretes gastric juices that are made up of proteolytic enzymes (pepsin) and hydrochloric acid (HCL) secreted by parietal cells; which are essential for the denaturation of proteins and the absorption of nutrients; it also prevents certain infections by reducing the amount of ingested microorganisms, this is due to a pH <2, which limits bacterial colonization and survival (12).

Once the food is mixed with gastric juices, the stomach produces a semiliquid substance called chyme, which then goes to the small intestine, the organ in which most of the absorption of essential nutrients for the human body takes place (12).

### 3.5 Pathophysiology

As Buele (13), points out , the main cause of this malignant disease is the presence of Helicobacter Pylori, a bacteria that causes a series of pathologies that end in cancer. Since it is an inflammatory process, proinflammatory cytokines are released, which intensify the inflammatory response and inhibit acid secretion in the stomach. This leads to the synthesis and accumulation of mutagenic compounds that in a certain way alter the cellular genomic level.

Consequently, premalignant states are generated, which lead to gastric cancer, as highlighted in *Figure 11.* 



Figure 11. Algorithm of the pathophysiology of CG . Source: Arias M (2020)

It must be remembered that the process of cellular homeostasis involves proliferation, differentiation and apoptosis. However, when carcinogenesis occurs, these mechanisms are altered. Therefore, according to Correa's cascade, malignant tissue progresses in several stages, from chronic gastritis that progresses with multifocal atrophy, accompanied by the decrease of gastric glands, due to the loss of parietal cells. Added to this is fibrosis of the lamina propria that progresses from atrophy to intestinal metaplasia (IM). In turn, IM is classified based on intestinal enzymes and the type of mucin secreted (13).

The penultimate stage of oncogenesis is dysplasia , characterized by problems in the maturation of epithelial cells, resulting in growth. Finally, early identification of this stage and the administration of timely treatment could prevent the progression of GC. It should be noted that complete eradication of

H. pylori reduces the development of GC by 40%, which is a great benefit as age progresses (13).

### 3.6 Clinical Manifestations

Most patients with early-stage gastric cancer show no symptoms in approximately 80% of cases. In the remaining 20%, symptoms are similar to those of an ulcer syndrome or other gastric diseases, with epigastric pain being characteristic. Medical attention is rarely sought, so early-stage cancer is detected in only 10% of cases. On the other hand, advanced gastric cancer presents intense symptoms and there may be dissemination or metastasis, the most common sites being the liver and peritoneum. In liver involvement, neoplastic hepatomegaly, ascites or masses on the right side of the abdomen may be observed. On the other hand, when it affects the peritoneum, it is called peritoneal carcinomatosis and manifests with constipation, ascites, and diffuse abdominal pain (*see table 6*) (14).

Paciente Sintomático
Severe abdominal pain
Cachexia
Ascites
Hematochezia
Hepatomegaly
Hematemesis
Dysphagia
Upper gastrointestinal bleeding
Physical exam, palpable mass

Table 6. Comparison of the clinical picture of an asymptomatic and symptomatic patient

Source : Cárdenas Martínez, et al. (2021), Montoya & Montagnè (2019)

Other sites of metastasis are the ovaries, local lymph nodes, bone structures, central nervous system and lung level. It is also possible to find paraneoplastic syndromes, which refers to the release of substances by cancer cells that damage nearby cells or tissues. However, it is important to note that this condition is rare (15). As the disease progresses, mild symptoms may arise. It is important to note that in senile patients who present a similar clinical picture, an upper and lower digestive endoscopy is warranted to rule out or confirm the presence of tumors in the digestive system (14).

### 3.7 Clinical Diagnosis

Diagnosing gastric cancer is difficult due to the absence of symptoms in the early stages. To achieve an accurate diagnosis, it is necessary for the doctor to perform an initial evaluation. In this case, he or she must consider the type of cancer he or she suspects as a professional, the clinical signs, age, general health of the patient and laboratory tests such as a blood test. In addition, a series of complementary tests are added to the physical examination to confirm the diagnosis (14).

Particularly effective tests for detecting gastric cancer and its spread are: esophagogastroduodenal series (EGD), endoscopy, endoscopic ultrasound (EUS) and computed tomography (CT). It is important to note that EGD is only used in cases where endoscopy is not feasible or when dysphagia is the initial symptom, since the use of double contrast improves its sensitivity. Endoscopy or gastroscopy with biopsy is the most effective method, since it allows the identification of the tumor, evaluation of its growth pattern, size and extension in different segments of the organ, and obtaining histological confirmation by taking samples. It is recommended to obtain a minimum of five biopsies, which guarantees a positive detection rate of 97% (16).

Endoscopic ultrasound (EUS) can determine tumor invasion in the different layers of the gastric wall and the degree of involvement of perigastric lymph nodes. Its effectiveness ranges from 60% to 90% in detecting tumor, and from 50% to 95% in detecting lymph nodes. However, its usefulness is limited in the evaluation of distant lymph nodes. Computed tomography (CT) is routinely used for preoperative staging of gastric cancer and has an accuracy ranging from 43% to 82% in determining tumor size and infiltration into adjacent organs. However, it is unreliable in assessing tumor depth and the presence of

lymph node metastasis. The sensitivity and specificity of CT in detecting hepatic dissemination are 72% and 85%, respectively (17).

On the other hand, it is important to carry out screening, which can be carried out by two methods: screening of large populations or focusing on patients at higher risk. This depends on the frequency of gastric cancer in the region. In the case of gastroscopy, screening should begin at age 50 and be repeated every 2 to 3 years, especially in high-risk populations, such as those with gastric atrophy or intestinal metaplasia. In turn, there are hormones that contribute to the diagnosis, such as serum ghrelin, in which reduced levels may indicate a high risk of neoplasia, since its production decreases in cases of atrophy and chronic inflammation (7, 18).

### 3.8 Cancer Classification

To differentiate the stages of GC, the Borrmann classification is used, a system that consists of observing the macroscopic characteristics of the lesion through endoscopy, each one is distinguished according to the affected gastric layers, as seen in *Figure 12* (19).

On the other hand, stage I : The tumor invades the deepest layer of the mucosa (lamina propria) or the submucosa without affecting the lymph nodes (stage IA), or with involvement of 1 to 6 nodes. It is also considered stage I when the tumor invades the muscular layer or the subserosa without affecting the lymph nodes. There is no presence of distant metastasis. After stage 0, this is the stage with the best prognosis. Stage II and Stage III are considered intermediate stages, considering that Stage II has a more favorable prognosis compared to Stage III. The classification of these stages is based on both the level of involvement of the stomach wall and the number of nodes affected by the tumor (19).

Stage IV, which represents the most advanced phase, shows the poorest prognosis, as the cancer has spread to organs such as the liver and lymph nodes distant from the stomach. It is crucial to note that the survival of patients with gastric cancer is closely linked to these stages. The survival rate exceeds 95% in stage 0 and decreases as the stage increases. Stage IV exhibits the lowest survival rate. Within gastric cancer, adenocarcinomas are predominantly common, approximately 70% of cases, around the age of 70, however, 5% of malignant tumors are gastric lymphomas (19).



Figure 12. Borrmann classification. Source: Sabistón , 21st edition (2022).

As mentioned above, adenocarcinomas are predominantly common, however, at least 5% of malignant neoplasms are considered gastric lymphomas. Lauren's histological classification establishes that there are two types: diffuse and intestinal. (20).

Guys	Subtypes	
	Tubular adenocarcinoma	
Intestinal	Papillary adenocarcinoma	
	Signet ring cell adenocarcinoma	
Diffuse	Undifferentiated carcinoma	
	Mucinous carcinoma	

Source : Martínez, et al. (2021).

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#### 3.9 Staging and risk assessment

The prediction of adenocarcinoma is related to the tumor stage determined during diagnosis. To determine the staging of GC, the TNM classification is used, which is based on the extent of tumor invasion (T), the involvement of lymph nodes (N) and the presence of metastasis (M) ( see table 7) . In addition, this disease is generally divided into two categories: early gastric cancer and advanced gastric cancer (AGC). When we talk about early GC, we refer to damage to the mucosa and also to the submucosa (T1), regardless of the size of the tumor or the involvement at the lymph node level. Survival is higher than 90% in most cases. While, advanced GC directly affects the innermost layers (T2 and T4) and has a survival rate of 7-27% (21).

	Primary Tumor
ТХ	The primary tumor cannot be assessed.
ТО	There is no evidence of primary tumor in the stomach
TiS	Carcinoma in situ: Found only in cells on the surface of the stomach's inner lining.
T1	Large tumor in the lamina propria, muscularis mucosae, or submucosa.
T2	The tumor has grown into the muscularis propria.
Τ3	The tumor has grown through all the muscle layers to the connective tissue outside the stomach, without affecting the serosa.
T4	The tumor invades the serosa and peritoneum.
Regional Lym	ph Nodes (N)
Nx	Regional lymph nodes cannot be assessed.
NO	The cancer has not spread to regional lymph nodes.
N1	The cancer has spread to 1 to 2 regional lymph nodes.
N2	The cancer has spread to 3 to 6 regional lymph nodes.

**Table 7.** TNM staging for gastric cancer.

N3	The cancer has spread from 7 or more regional lymph nodes.
Metastasis Dis	stance (M)
Mx	Distant metastasis cannot be assessed.
MO	The cancer has not spread to other parts of the body.
M1	The cancer has spread to other parts of the body.

Source : Villagrán R, et al. (2021).

It is worth mentioning that in computed tomography (CT), the positivity of lymph nodes is determined based on their size, shape and enhancement pattern. Lymph nodes with a size between 8 and 10 mm in their shortest dimension, a round shape, presence of central necrosis and marked or heterogeneous enhancement will be considered positive (22).

### 3.10 Dissemination Patterns

Metastases to solid organs In early diagnosis they are rare, but it is crucial to detect them in order to plan the appropriate treatment. The most common hematogenous metastases occur in the liver, less common are the lungs, adrenal glands, bones, ovaries or peritoneum due to continuity (23).

Computed tomography (CT) remains the technique of choice for the preoperative diagnosis of peritoneal carcinomatosis. However, in many cases, peritoneal carcinomatosis is only identified during surgery due to the limitations of CT in its detection (23).

### 3.11 Treatment Plan

In summary, GC staging focuses on a neoplasm that may be localized, locally advanced, or metastatic, which are a key point for treatment options as visualized in *Figure 13*.

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Figure 13. Management algorithm for the diagnosis of gastric neoplasia.

**Note. CT:** computed tomography, MRI: nuclear magnetic resonance, PET: positron emission tomography, Qt: chemotherapy , Qt Rt : concomitant chemo-radiotherapy . **Source:** Rojas V, Montagné N (2019)

In the case of metastatic disease, the patient is a non-surgical candidate, who is only suitable for palliative care, since the cancer is in stage IV (24).

On the other hand, the neoadjuvant chemotherapy regimen has not yet been established, however, it should be administered prior to surgery in patients with resectable tumor T2 N0 or more and varies according to the functional status and comorbidities. While, adjuvant treatment is given in cases of T3 and T4 N0 after surgery, for those people who did not have an adequate lymphadenectomy, otherwise radiotherapy is omitted. On the other hand, patients with a good prognosis of localized pTis or pT1, N0 disease are not recommended postoperative chemotherapy (24). In another instance, surgical resections are directed at early stage cancer (stage II or less) with the goal of removing the malignancy. These procedures include endoscopic mucosal resection, distal esophagectomy, subtotal gastrectomy (distal tumors) or total (proximal or extensive tumors), the surgery can be an open or laparoscopic approach, it will depend on the operator's ability and the hospital's supplies (25).

### 3.12 Postoperative complications

Gastrectomy can cause several postoperative complications, either during or after surgery. Among the immediate complications we can consider those related to the procedure such as pneumonia, pulmonary thromboembolism, acute coronary syndrome, among others. Meanwhile, those related to surgery include anastomotic leakage, intestinal hemorrhage, duodenal stump dehiscence, peritonitis, abscesses, and even sepsis and death; all of these contribute to an important cause of morbidity and mortality in these patients. That is why the treatment to be chosen should always be focused on appropriate palliative care, trying to achieve low morbidity rates (11,26).

In individuals with a short life expectancy, a limited resection should be performed; in the case of localized disease, a more aggressive gastric resection could be performed. Other complications may include the risk of contracting surgical wound infections, in which case these are treated with antibiotics; central line infections (venous catheter), and urinary tract infections (27).

#### 3.13 Nutrition

The nutritional support requirement in patients undergoing gastrectomy is divided into three stages: before surgery or pre-surgical, during the perioperative period by implementing the ERAS (Enhanced Recovery After Surgery) protocol and after surgery or postoperative. It is advisable to start nutritional support immediately in patients who present malnutrition and in those who do not meet their nutritional needs. The period of time required for nutritional support is 7-14 days in the pre-surgical stage. The use of oral food supplements in patients with severe malnutrition in the perioperative period has been shown to reduce the frequency, severity and permanence of post-surgical complications (28).

After gastrectomy and applying the ERAS protocol, it is suggested to start oral intake early with clear liquids, after 6-8 hours after the operation, gradually advancing and according to tolerance, on the first postoperative day, a liquid diet is started and then a diet with soft foods is started. It has been proven that early tolerance after gastric cancer surgery allows a rapid recovery of intestinal function and reduces the length of hospitalization without increasing complications (28).

## 3.14 Palliative Care

Palliative care focuses on improving well-being during treatment by managing symptoms and providing support to patients and their loved ones. It is important to note that anyone suffering from cancer, regardless of the type or stage of cancer, can access this care, and favorable results are obtained when it is started after the diagnosis is confirmed. It has been shown that patients who receive this type of care accompanied by treatment to treat this disease experience less severe symptoms and their lifestyle will improve (29).

# 4. Discussion

To date, cancer incidence has decreased worldwide; however, it remains among the leading causes of death, given that most reports are diagnosed at a late stage, once the patient shows the first symptoms. It has been shown that the most frequent risk factor for the development of GC is the presence of Helicobacter pylori, which, if not treated properly, triggers a series of alterations in the gastric epithelium, from simple atrophy to dysplasia, which evolves into a malignant neoplasia.

Based on the case presented, it was an elderly patient who presented with torpid symptoms of several months of evolution. The striking thing was his state of malnutrition. The data that called attention from the physical examination was the body mass index that indicates malnutrition, in addition to finding a soft, depressible abdomen, painful in the epigastrium with increased RHA. For this reason, laboratory tests were required, which did not show any alteration, even the gastric tumor markers were negative. The EDA confirmed the clinical suspicion of gastric neoplasia, once the sample was sent to pathology (18, 25), data that are corroborated by Cárdenas M, et al. who indicate that in the initial stages this pathology does not present symptoms until the advanced stages (14).

Once the diagnosis of Borrmann IV type diffuse gastric adenocarcinoma was given, a total gastrectomy was performed. It should be noted that a CT scan was performed to identify the presence of metastasis, despite this, no other alterations were evident other than the malignant tumor; however, during the surgical procedure the important finding of peritoneal metastasis was obtained, even so, the surgical procedure continued, the literature indicates that patients with peritoneal metastasis survival is low at 6 months and zero at 5 years, this is the case of the patient who survived 6 months after and increased the comorbidities typical of the surgery (32). Although the management of imaging studies useful for the diagnosis of gastric cancer are abdominal, pelvic and thoracic CT scans; there is another method such as positron emission tomography that is advantageous in specific cases such as malignant tumors that histologically present poorly differentiated signet ring cells (30).

According to Ajaní A, D'Amico T, Bentrem D, et al; (24), they express that, in the Japanese guidelines this type of cancer is considered as an unresectable condition, which should be treated only palliatively based on the classification of the functional status (ECOG) as a way to decide whether to administer monodrug or polychemotherapies (fluoropyrimidines), without the possibility of a complete recovery, since the objectives of the treatment are aimed at controlling the symptoms, the disease and prolonging the quality of life of the patient, in addition to this, supportive care and moral support should be given. That said, the life expectancy with advanced GC is 6%. (30). Although a treatment was chosen for the patient, other factors also influenced, such as age and alcoholism to which he was exposed for years; this could be the main factor for the development of GC.

We consider some recommendations from the Japanese guidelines on the management of gastric cancer in Japan (31):

- It is weakly recommended not to perform PET-CT scanning for staging of gastric cancer (consensus rate 100%, 8/8, level of evidence C).
- Endoscopic management of differentiated adenocarcinoma without ulceration (T1a) and diameter  $\leq 2$  cm.
- Endoscopic management of differentiated adenocarcinoma with ulceration, but the depth of invasion is T1a and the diameter is  $\leq 3$  cm.

- Or if the adenocarcinoma is undifferentiated without ulcerative findings in el que la profundidad de la invasión se diagnostica clínicamente como T1a y el diámetro es ≤ 2 cm.
- Following endoscopic resection, the following are recommended: annual endoscopic check-ups or every 6 months, computed tomography, to identify the presence of Helicobacter Pylori in order to eradicate them.
- When there are lesions larger than 3 cm with invasion of the submucosa, gastrectomy with lymphadenectomy should be recommended, provided there is no distant metastasis.
- Laparoscopic distal gastrectomy is recommended for stage I as standard treatment (consensus rate 100%, 8/8, level of evidence A), laparoscopic total gastrectomy or proximal gastrectomy is weakly recommended (consensus rate 100%, 8/8, level of evidence C). The procedure should be performed by a qualified surgeon.
- There are no precise recommendations for applying laparoscopic surgery for stage II/III (consensus rate 71.4%, 5/7, strength of evidence C).
- Splenectomy or splenic hilar lymph node dissection is strongly not recommended for tumors without invasion of the greater curvature (consensus rate 100%, 8/8, level of evidence A). Splenectomy or splenic hilar lymph node dissection is weakly recommended for tumors with invasion of the greater curvature (consensus rate 87.5%, 7/8, level of evidence C).
- Diagnostic and staging laparoscopy is weakly recommended to evaluate the treatment strategy for those with advanced gastric cancer likely to have peritoneal metastasis (consensus rate 100%, 8/8, strength of evidence C).
- The ERAS protocol is strongly recommended for perioperative treatment of gastric cancer (100% consensus rate, 8/8, level of evidence A) (30).

# 5. Conclusions

In 80% of patients, gastric cancer presents in the final stages, when the patient already has metastasis and the therapeutic arsenal is very limited.

The symptoms in the early stages of gastric cancer are torpid, which is why screening in these patients is very important for early detection.

When there is a gastric tumor in stage III, as well as stage IV, each of these has a specific treatment, in the case of the first, it is based on adjuvant therapies, while, in the case of the one in stage IV, palliative care is applied, despite this, the survival of patients at 5 years is less than 20 percent in stage III and zero in stage IV.

Eliminating risk factors such as the presence of H. Pylori, a high-fat diet, and smoked meats help prevent the onset of gastric cancer.

In patients with total gastrectomy for advanced gastric cancer, it negatively affects clinical improvement and does not change patient survival .

# 6. Abbreviations

Adenocarcinoma: tumor of epithelial cells that internally cover a tissue Gastrectomy: resection and removal of part or all of the stomach Helicobacter Pylori: large negative helical bacillus type bacteria

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# 9. Ethical Approval And Consent To Participate

The data from the medical history for the preparation of this research were obtained with the authorization of the relatives and are kept maintaining the confidentiality of the patient.

# 10. Conflicts of interest

The authors report no conflict of interest.

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# 12. Authors' contribution

DDCC: Selection of articles, research, writing of the review, discussion.
SGPM: Writing of the clinical case, research, writing of the review, discussion.
LFMO: Selection of articles, research, writing of the review, conclusions.
JMRO: Theoretical Framework, images, bibliography
MVUR: Review, correction of errors, contribution of ideas for writing

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