# GASTRIC CANCER

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February 2022

# EPIDEMIOLOGY 1 : INCIDENCE

- Although it is **steadily declining** in incidence, GC remains one of the most common and deadly neoplasms in the world.
  - GC is the **third** leading cause of cancer deaths worldwide, following only lung and colorectal cancer in overall mortality.
  - GC has the **fifth** highest incidence among cancers (and the 7th most prevalent).
  - Over a **million** new cases of GC are diagnosed, worldwide, each year.
- GC is also one of the most behaviorally influenced, and thus preventable, of major cancers.

# EPIDEMIOLOGY 2:

- GC is more prevalent in males. In developed countries, GC is 2.2 times more likely to be diagnosed in males than females. In developing countries, this ratio is 1.83.
- GC are more frequently diagnosed in developed nations. The average incidence rate among high-middle Human Development Index (HDI) nations is 20 per 100,000 for males, while the average rate among low-middle HDI nations is 6.6 per 100,000.
- The incidence of GC is highly variable by region and culture.
  - Incidence rates are highest in Eastern and Central Asia and Latin America. In East Asia, the average incidence of GC is 32.1 per 100,000 among males and 13.2 among females.
  - In North America, this incidence is 5.6 per 100,000.
  - The rate is lowest in North and East Africa, with only 4.7 annual diagnoses per 100,000 males.
- The Republic of Korea has the highest national incidence with almost 60 per 100,000 new cases annually for males. While female incidence rates are lower (only 25 per 100,000 in Korea).

# EPIDEMIOLOGY 3

- Estimated new cases and deaths from gastric cancer (GC) during **2021** in the USA.

| | Male | Female | Both sex |
|---|---|---|---|
| New cases | 16160 | 10400 | 26560 |
| Deaths | 6740 | 4440 | 11180 |

# PATTERN OF GASTRIC CANCER IN JORDAN 1996-2017

| Year | Total No. of Cancer cases | | | Gastric Cancer-Male | | Gastric Cancer-Female | | Gastric Cancer-All | |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | All | Freq. | % | Freq. | % | Freq. | % |
| 1996 | 1704 | 1598 | 3302 | 79 | 4.6 | 49 | 3.0 | 128 | 3.9 |
| 1997 | 1699 | 1655 | 3354 | 83 | 4.9 | 51 | 3.0 | 134 | 4.0 |
| 1998 | 1777 | 1603 | 3380 | 81 | 4.5 | 53 | 3.3 | 134 | 4.0 |
| 1999 | 1560 | 1582 | 3142 | 78 | 5.0 | 47 | 3.0 | 125 | 4.0 |
| 2000 | 1680 | 1690 | 3370 | 82 | 4.8 | 51 | 3.0 | 133 | 3.9 |
| 2001 | 1740 | 1672 | 3412 | 84 | 4.8 | 35 | 2.1 | 119 | 3.5 |
| 2002 | 1760 | 1670 | 3430 | 106 | 6.0 | 47 | 2.8 | 153 | 4.5 |
| 2003 | 1743 | 1735 | 3478 | 76 | 4.4 | 46 | 2.7 | 122 | 3.5 |
| 2004 | 1763 | 1828 | 3591 | 78 | 4.4 | 38 | 2.1 | 116 | 3.2 |
| 2005 | 1818 | 1860 | 3678 | 67 | 3.7 | 45 | 2.4 | 112 | 3.0 |
| 2006 | 2047 | 2151 | 4198 | 79 | 3.9 | 64 | 3.0 | 143 | 3.4 |
| 2007 | 2048 | 2284 | 4332 | 96 | 4.7 | 55 | 2.4 | 151 | 3.5 |
| 2008 | 2274 | 2332 | 4606 | 95 | 4.2 | 73 | 3.1 | 168 | 3.6 |
| 2009 | 2280 | 2518 | 4798 | 68 | 3.0 | 77 | 3.1 | 145 | 3..0 |
| 2010 | 2330 | 2519 | 4849 | 90 | 3.9 | 62 | 2.5 | 152 | 3.1 |
| 2011 | 2194 | 2481 | 4675 | 81 | 3.7 | 49 | 2.0 | 130 | 2.8 |
| 2012 | 2346 | 2667 | 5013 | 86 | 3.7 | 50 | 1.9 | 136 | 2.7 |
| 2013 | 2564 | 2852 | 5416 | 100 | 3.9 | 75 | 2.6 | 175 | 3.2 |
| 2014 | 2718 | 2977 | 5695 | 99 | 3.6 | 53 | 1.8 | 152 | 2.7 |
| 2015 | 2668 | 2888 | 5556 | 101 | 3.8 | 56 | 1.9 | 157 | 2.8 |
| 2016 | 2815 | 3184 | 5999 | 91 | 3.2 | 58 | 1.8 | 149 | 2.5 |
| 2017 | 2990 | 3362 | 6352 | 127 | 4.2 | 84 | 2.5 | 211 | 3.3 |
| Total | 46518 | 49108 | **95626** | 1927 | **4.1** | 1218 | **2.5** | **3145** | 3.3 |

## Ten most common cancers among Jordanians both genders, 2017

| No | Site | Freq | % |
|---|---|---|---|
| 1 | Breast | 1302 | 20.5 |
| 2 | Colorectal | 678 | 10.7 |
| 3 | Lymphoma | 485 | 7.6 |
| 4 | Trachea, Bronchus, Lung | 473 | 7.5 |
| 5 | Thyroid | 293 | 4.6 |
| 6 | Bladder | 248 | 3.9 |
| 7 | Prostate | 236 | 3.7 |
| 8 | Leukemia | 233 | 3.6 |
| 9 | Stomach | 211 | 3.3 |
| 10 | Brain, Nervous system | 185 | 2.9 |
| | | | |

## Ten most common cancers among Jordanians, Males, 2017

| No | Site | Freq | % |
|---|---|---|---|
| 1 | Colorectal | 371 | 12.4 |
| 2 | Trachea, Bronchus, Lung | 366 | 12.2 |
| 3 | Prostate | 236 | 7.9 |
| 4 | Bladder | 215 | 7.2 |
| 5 | Non-Hodgkin lymphoma | 159 | 5.3 |
| 6 | Leukemia | 158 | 5.3 |
| 7 | Stomach | 127 | 4.2 |
| 8 | Kidney | 117 | 3.9 |
| 9 | Brain, Nervous system | 102 | 3.4 |
| 10 | Hodgkin disease | 97 | 3.2 |
| | | | |

## Ten most common cancers among Jordanian Females, 2017

| No | Site | Freq | % |
|---|---|---|---|
| 1 | Breast | 1292 | 38.4 |
| 2 | Colorectal | 307 | 9.1 |
| 3 | Thyroid | 223 | 6.6 |
| 4 | Corpus Uteri | 148 | 4.4 |
| 5 | Non-Hodgkin lymphoma | 136 | 4.0 |
| 6 | Ovary | 109 | 3.2 |
| 7 | Trachea, Bronchus, Lung | 107 | 3.2 |
| 8 | Hodgkin disease | 93 | 2.8 |
| 9 | Stomach | 84 | 2.5 |
| 10 | Brain, Nervous system | 83 | 2.5 |
| | | | |

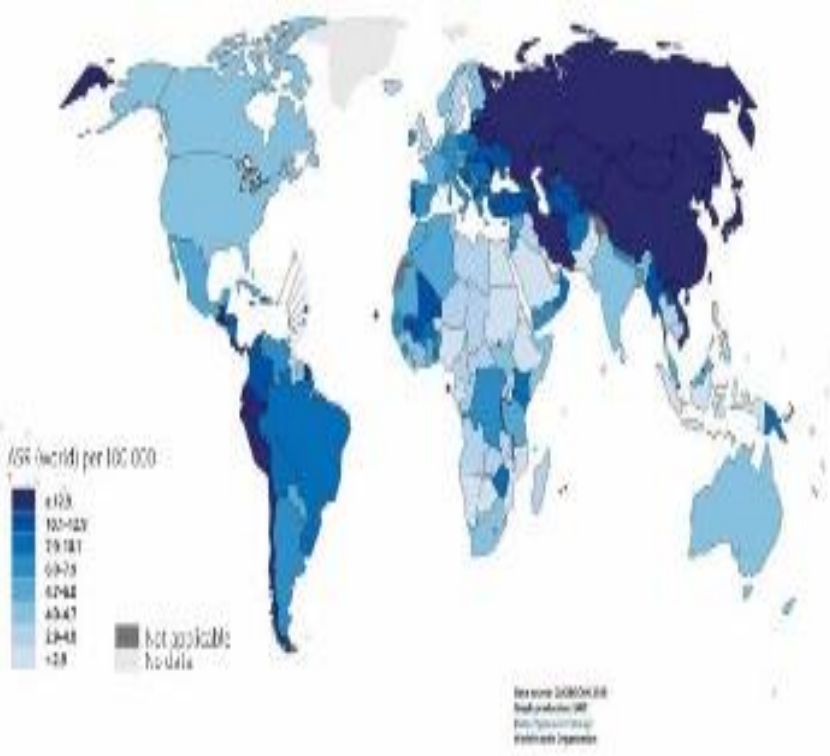
# PATTERN OF GASTRIC CANCER IN JORDAN 1996-2017

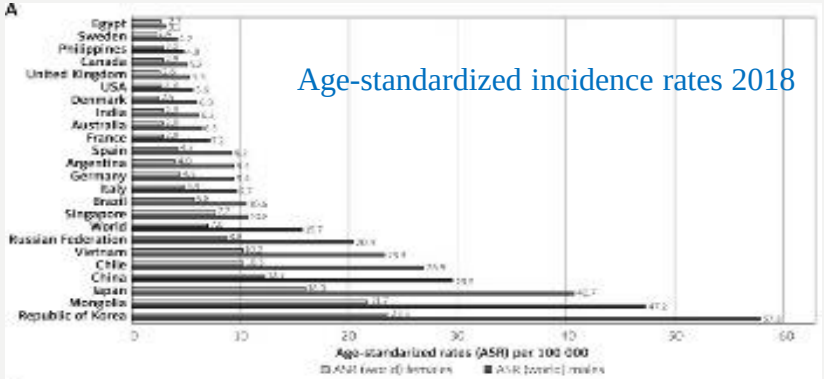
- Stomach cancer occurred more frequently in males than in females, with a male to female ratio of 1.6: 1.

- The overall ASR for stomach cancer was 3.9/100,000 (4.9/100,000 for males and 2.9/ 100,000 for females). The overall median age at diagnosis was 60 years (60 years for males and 61 years for females).

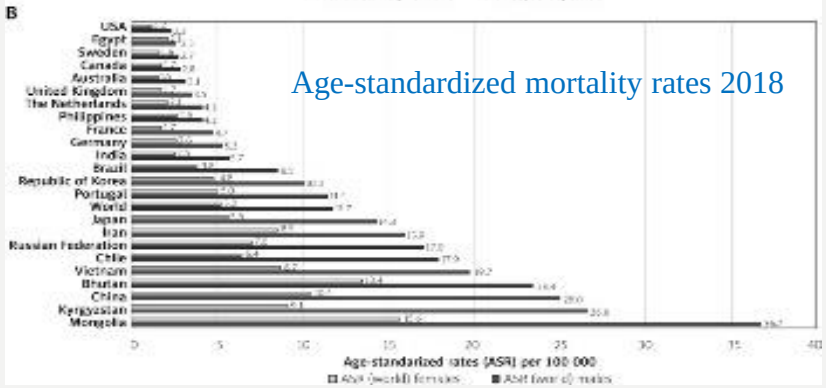
- The incidence of gastric cancer in Jordan is low (3-4/100,000) compared to regional estimates and remained relatively constant between 1996 and 2017.

# EPIDEMIOLOGY 4






Age-standardized incidence rates 2018




Age-standardized mortality rates 2018

# EPIDEMIOLOGY 5: SURVIVAL

- The 5-year survival rate for GC is 31% in the US. Average survival rates reflect the fact that most cases diagnosed are already metastatic.
- The 5-year survival rate for pre-metastatic diagnosis is 67%.
- Survival is highly variable based on stage during surgical intervention. The 5-year survival rates for stage IA and IB tumors treated with surgery are 94% and 88%, respectively. On the other hand, stage IIIC tumors treated with surgery had a 5-year survival rate of 18%.

# ETIOLOGY AND RISK FACTORS

| | | |
|---|---|---|
| 1 | **Sex** | M > F |
| 2 | **Age** | Advanced age |
| 3 | **Class** | Lower |
| 4 | **Environmental factors** | |
| 5 | **Diet and smoking** | High in salted, smoked, or preserved foods<br>Low in fruits and vegetables |
| 6 | **H. pylori** | 3-6 fold |
| 7 | **Chronic atrophic gastritis and Int. metaplasia** | |
| 8 | **Adenomatous gastric polyps and FAP** | 10-20% |
| 9 | **Previous gastric surgery** | 2-6 fold |
| 10 | **Pernicious anemia** | 10% |
| 11 | **Ménétrier's disease (Giant hypertrophic gastritis)** | 10% |
| 12 | **Family history of gastric cancer** | 10% |
| 13 | **Blood type A** | |
| 14 | **Hypogammaglobulinemia** | 47-fold |

# DIET

Appears to be correlated with a high intake of:

**(a) Preserved foods** (↑salt, nitrates, nitrites).

**(b) Pickled vegetables**

**(c) Salt**

- Nitrates and nitrites → **n-nitrosamines** (carcinogens)
- Free radical–induced injury by nitrosamines are potentially damaging.
- Ascorbic acid can prevent the conversion of nitrites to nitrosamines).
- Ascorbic acid and beta-carotene act as antioxidants.

# HELICOBACTER PYLORI

- Parallels between rates of GC and H. pylori infection.
- H. pylori infection rate is ↓ over time in the US, in parallel with the ↓ in GC.
- 3-6-fold ↑ risk of GC in individuals with H. pylori.
- Infection causes > 80% of chronic gastritis cases. → chronic atrophic gastritis → metaplasia → GC.
- Toxins such as ammonia and acetaldehyde are produced, which → inflammation and epithelial damage.
- It causes epithelial cell proliferation and production of growth regulatory peptides. Recruitment of inflammatory cells (neutrophils) are augmented. These neutrophils generate free radicals and chloramine, both of which cause direct DNA damage.

- 35-89% of GC could be prevented by eradication.

- Associated more with **intestinal** than the diffuse type. More with Ca of the antrum, fundus, and body than Ca of the cardia.

# ADENOMATOUS GASTRIC POLYPS

- $5^{th}$ – $7^{th}$ decades, and have few symptoms or signs.
- DX is usually made on barium meal or coincidentally during endoscopy
- Risk for malignant degeneration is 10-20% and ↑ for polyps ≥ 2 cm.
- Pedunculated polyps should be removed endoscopically for pathologic exam.
- Sessile polyps > 2 cm. treated with wedge resection + a margin of normal mucosa.
- Patients with multiple polyposis should be considered for gastrectomy.

# PREVIOUS GASTRIC SURGERY

- Gastric surgery for benign conditions ↑ the risk by 2-6 folds. Mostly 15-20 years after Billroth II
- Events analogous to H. pylori infection is present. Partial gastrectomy and vagotomy causes hypo- or achlorhydria, allowing bacterial overgrowth with ↑ conversion of nitrites to nitrosamines
- Ca in the gastric remnant have a poor prognosis (tend to present at a more advanced stage and in older patients)
- Surveillance in postgastrectomy patients may improve survival.

# HYPOGAMMAGLOBULINEMIA

- It is a disorder caused by low serum immunoglobulin or antibody levels.
- Igs are the main components of the humoral immune system and are able to recognize antigens to trigger a biological response and eradicate the infectious source.
- Hypogammaglobulinemia is the most common primary immunodeficiency and encompasses a majority of immune-compromised patients.
- This condition predisposes children and adults to recurrent infections, allergies, neoplasms, and autoimmunity.
- Hypogammaglobulinemia can be of primary or secondary origin.
  - **Primary immunodeficiencies** result from genetic disorders and/or chromosomal anomalies during the development of the immune system.
  - **Secondary causes** are usually induced by an external or acquired factor such as a corticosteroid or immunosuppressant drug, nutritional disorders, infections, chemotherapy, malignancy, nephrotic syndrome, other metabolic diseases, and hazardous environmental conditions.

# PATHOLOGY

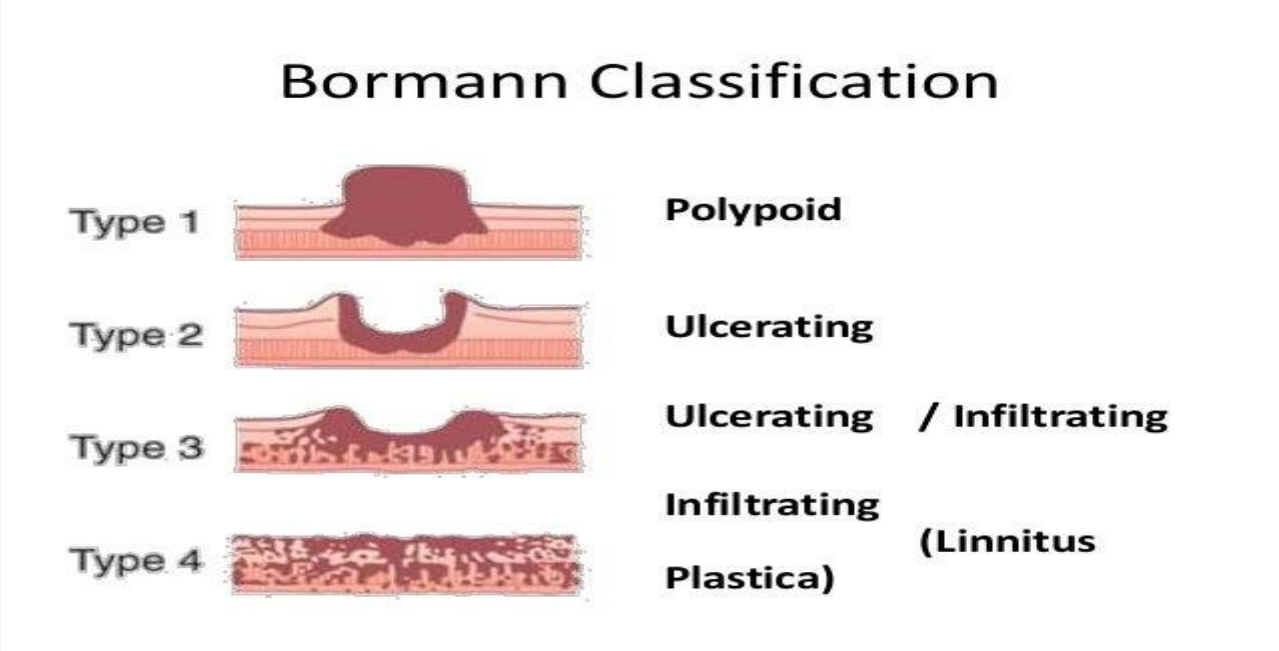
- **Site**
  - Formerly arose more in the antral and pyloric regions. Recently ↑ rate of involvement of the cardia and GEJ.
  - 10-15% of tumors are diffuse in character (linitis plastica).
  - Lesser curve is more commonly involved than the greater curve.
  - There is a much higher incidence of tumors of the cardia in smokers than of tumors elsewhere in the stomach.
- **Macroscopic**

  Adenocarcinomas can be divided into the following subtypes:

  1. Fungating or polypoid.
  2. Ulcerating.
  3. Superficial spreading.
  4. Diffusely spreading (linitis plastica).

# PATHOLOGY (CLASSIFICATION)

- Bormann classification
- Broeder's histologic grading system
- Ming's classification
- Lauren classification



# LAUREN CLASSIFICATION

| Intestinal-type tumors | Diffuse-type tumors |
|---|---|
| Glandular structure | Tiny clusters of small cells |
| Diffuse inflammatory cell infiltration and frequent intestinal metaplasia | Widespread through the mucosa, less inflammatory infiltration |
| Preceded by a pre-cancerous process and predominate in regions with ↑ incidence of gastric Ca | More often in women, in younger patients, and in regions where gastric cancer is less common |
| As regional gastric cancer risk is ↓, it experiences most of the reduction. | As the incidence of gastric Ca in the cardia ↑, it is seen with ↑ frequency. |
| | Frequent lymphatic invasion, intraperitoneal metastases, have a poorer prognosis. |

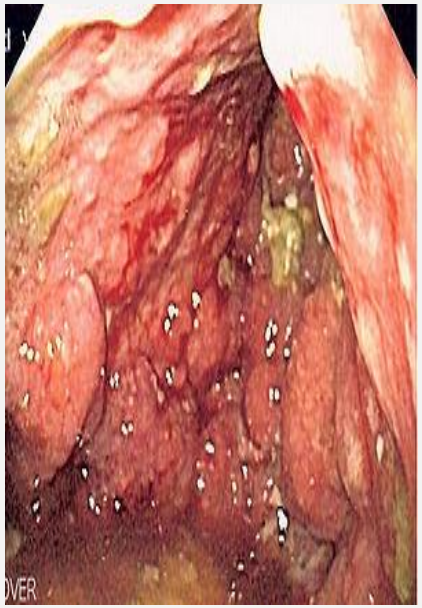
# HISTOPATHOLOGIC TYPES:

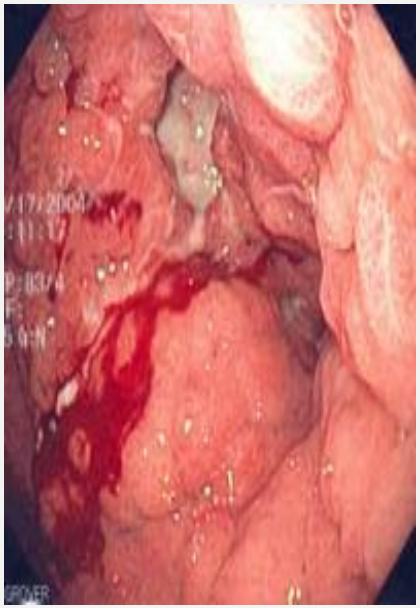
- Adenocarcinoma (intestinal, diffuse, and mixed).
- Papillary, tubular, or mucinous adenocarcinoma.
- Signet ring cell carcinoma
- Adenosquamous carcinoma
- Squamous cell carcinoma.
- Small cell carcinoma.
- Mixed adenocarcinoma and choriocarcinoma
- Undifferentiated carcinoma (Anaplastic).

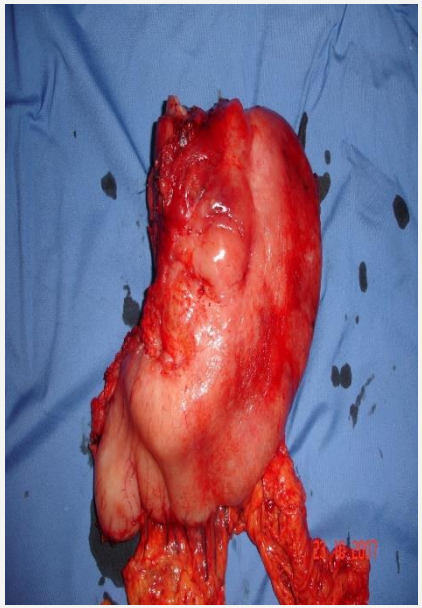
Grades : G1-G4 for well, moderately, poorly, and undifferentiated tumors.

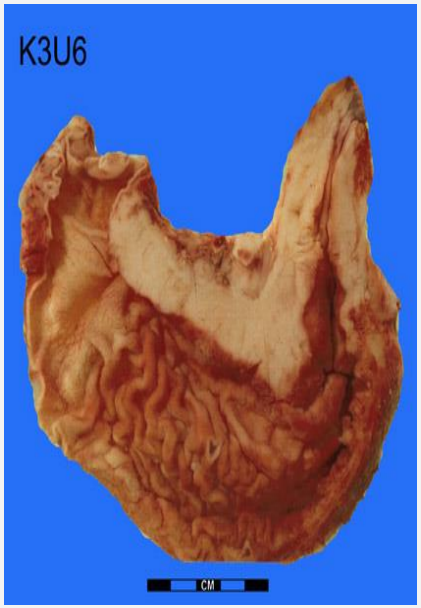
# LINITIS PLASTICA

- **Linitis plastica** (scirrhous gastric carcinoma) is a widely used term for **Brinton's disease** (also known as **leather bottle stomach**), a morphological variant of diffuse (or infiltrating) stomach cancer. In some texts, the term is also used to describe the condition of a rigid, non-distensible stomach, which may be caused, by a non-malignant condition such as a caustic injury to the stomach.
- Linitis plastica is a type of adenocarcinoma and accounts for 3–19% of gastric adenocarcinomas. Causes of cancerous linitis plastica are commonly primary gastric cancer, but in rarer cases could be metastatic infiltration of the stomach, particularly breast and lung carcinoma. It is not associated with H. pylori infection or chronic gastritis.
- The risk factors are undefined, except for rare inherited mutations in E-cadherin. The hereditary form of this cancer, Hereditary Diffuse Gastric Cancer, accounts for only 1–3% of gastric adenocarcinomas. Somatic mutations in this gene are found in about 50% of diffuse-type gastric carcinomas.
- Diffuse stomach cancer is characterized by the presence of poorly differentiated tumor cells. Under a microscope, these appear as signet ring cells, meaning that mucin droplets are visible that displace the nucleus to one side.
- Symptoms of linitis plastica do not usually present until the disease is in an advanced stage, making early diagnosis difficult. Symptoms are similar to those of stomach cancer including difficulty swallowing, weight loss, indigestion, and vomiting.
- Napoleon Bonaparte and many members of his family are thought to have died from this type of cancer, although it is believed by others that he may have died from arsenic poisoning.



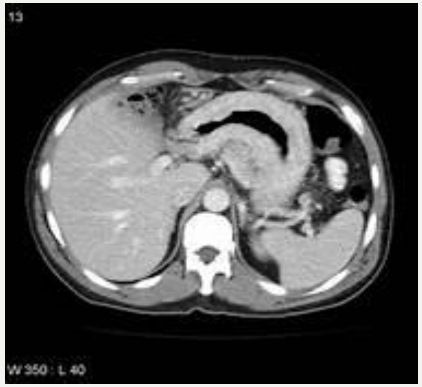


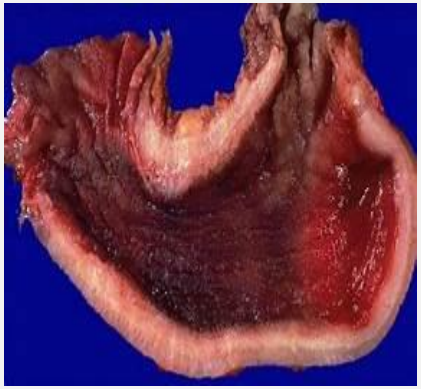





Endoscopic image of linitis plastica, where the entire stomach is invaded with stomach cancer, leading to a leather bottle like appearance.

Endoscopic image of linitis plastica, a diffuse type of stomach cancer characterized by a thickening and rigidity of the lining of the stomach, leading to a leather bottle-like appearance
with blood coming out of it.



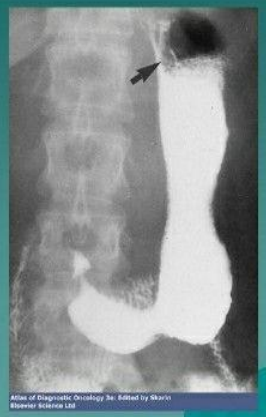


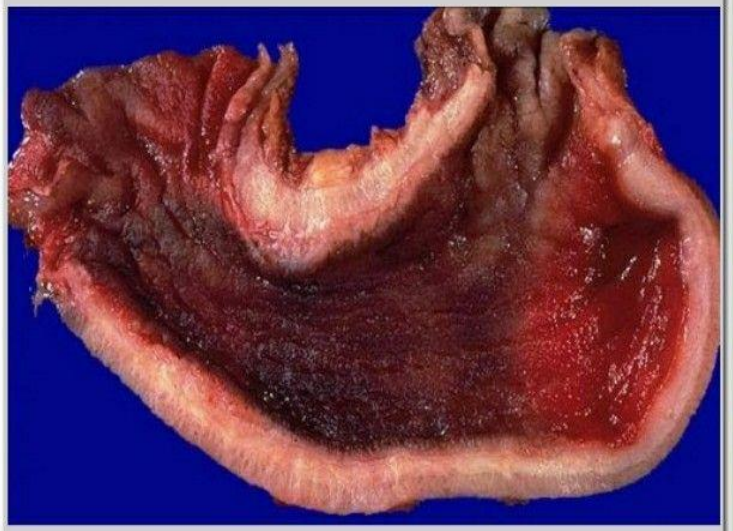
## Linitis plastica

-Barium meal and follow through single contrast shows tumor invasion of the
gastric wall
- diffuse irregular
narrowing and rigidity
of the stomach

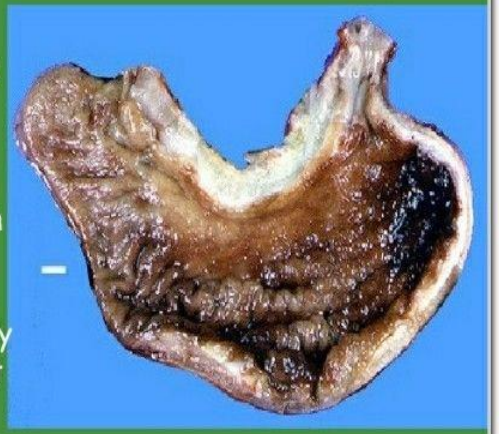
## Diffuse adenocarcinoma - linitis plastica

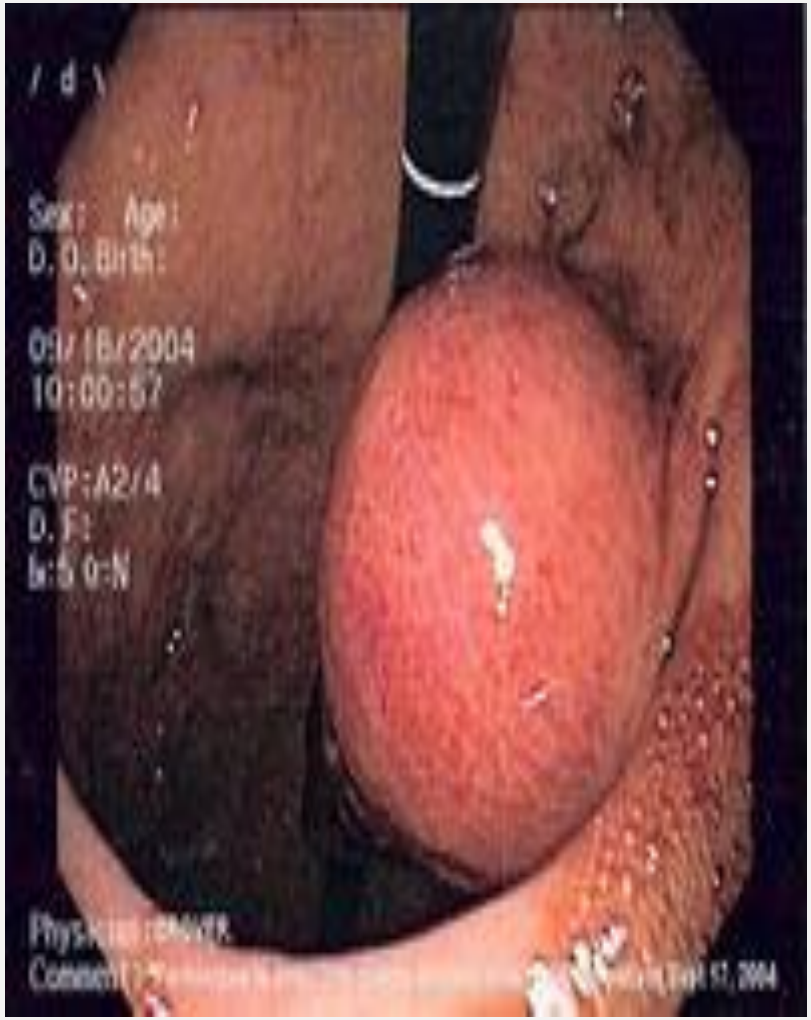
- Barium study shows the typical appearance of an extensive linitis plastica involving the entire stomach, which appears fixed and narrowed.
- No peristalsis was observed and barium flowed out of the stomach quickly.
- The mucosal edge is only slightly irregular; ulceration of the mucosa may be minimal or absent in this type of carcinoma.
- (Arrow indicates the gastric fundus.)



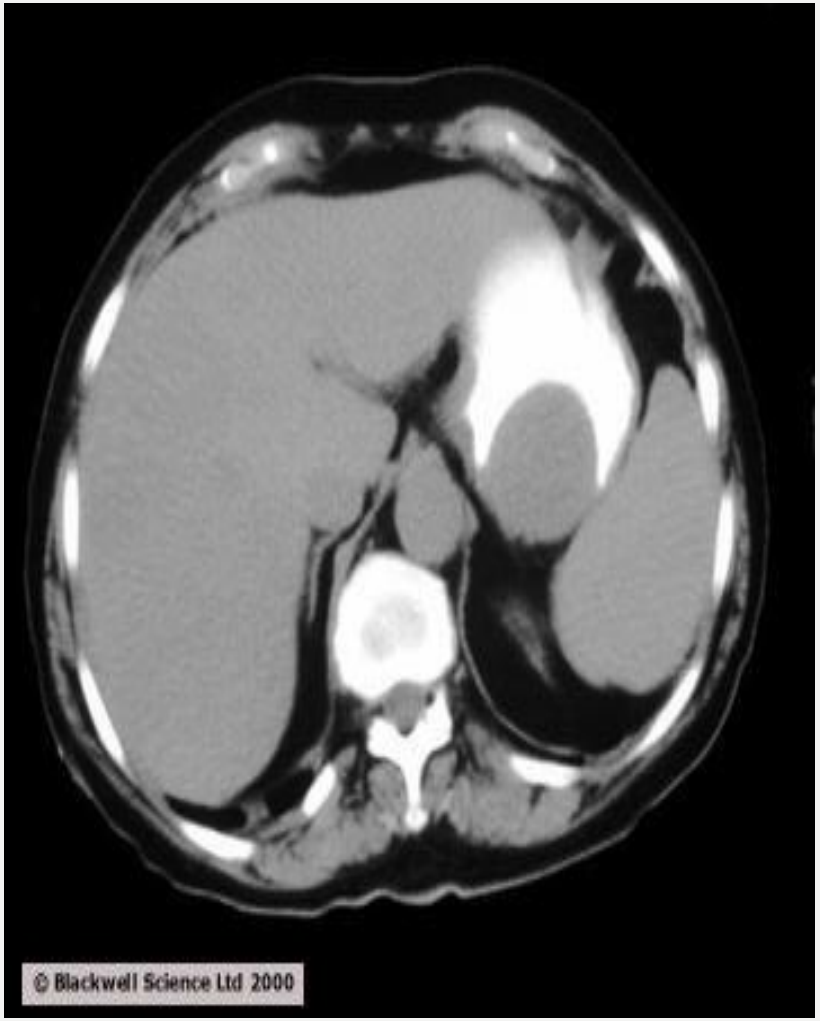


**Gross**: Linitis plastica carcinoma diffusely infiltrates the entire gastric wall without forming an intraluminal mass. The wall of the stomach is typically thickened to about 2-3 cm. and has a leathery, inelastic consistency.






GIST




Gastric Leiomyoma

# PATHOLOGY (METASTASIS)

1. Regional lymphatics.
2. Hematogenous (portal and systemic circulation)
3. Within the gastric wall
4. Direct invasion of adjacent organs.
5. Involved gastric serosa can seed metastases throughout the peritoneum.

Ovary (**Krukenberg's tumor**)
Pelvic cul-de-sac (**Bloomer's shelf**).
Umbilical adenopathy (**Sister Mary Joseph's node**).
Left supraclavicular adenopathy (**Virchow's node**).

# MOLECULAR GENETICS

- Molecular and chromosomal alterations → development of gastric Ca

- Deletion of p53 or expression of aberrant p53 protein is associated with transformation. LOH at the p53 locus is found in 68% of gastric tumors

- Overexpression of EGFR and C-erbB-2 are **early events**, whereas p53 mutation is a **late event** in gastric carcinogenesis

# STAGING (TNM CLASSIFICATION)

- Gastric cancer is staged according to the characteristics of the primary tumor (T), nodal metastases (N), and presence of metastatic disease (M)

- The most important **prognostic indicators** remain the **depth of penetration**, local regional **lymph nodes metastasis**, and involvement of **adjacent organs**.

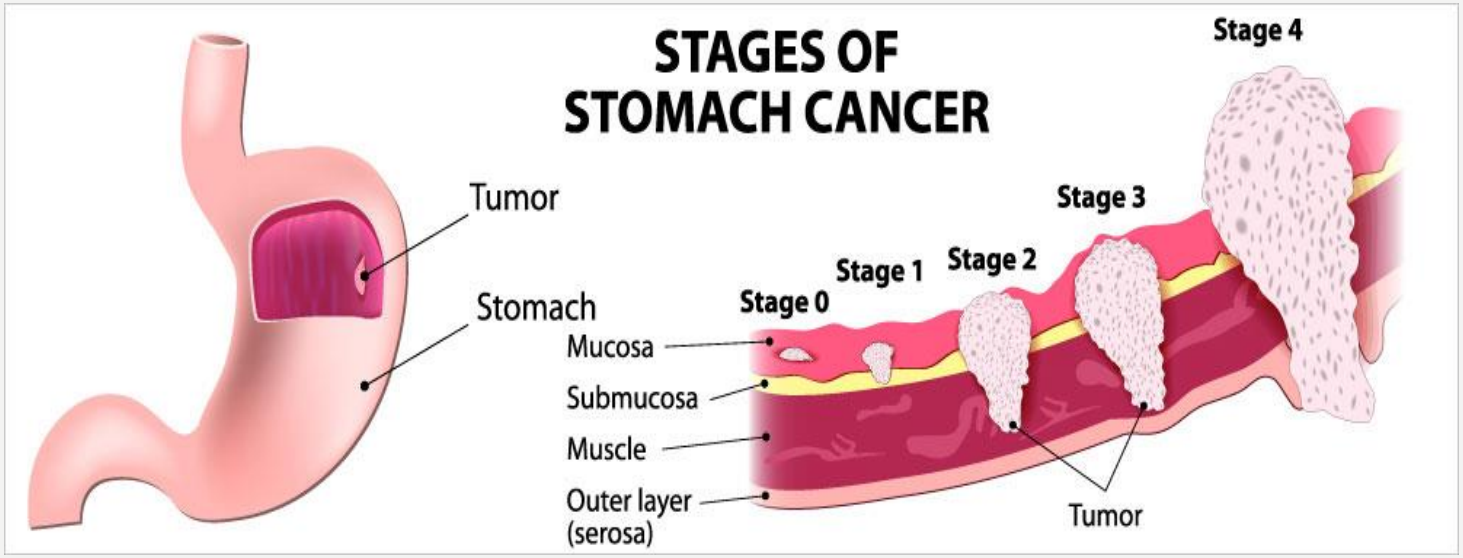
# PRIMARY TUMOR (T)

| | |
|---|---|
| **TX:** | Primary tumor cannot be assessed |
| **T0:** | No evidence of primary tumor |
| **Tis:** | •Carcinoma *in situ*: intraepithelial tumor without invasion of the lamina propria |
| **T1:** | •Tumor invades lamina propria or submucosa |
| **T2:**<br>**T2a:**<br>**T2b:** | <br>Tumor invades muscularis propria<br>Tumor invades subserosa |
| **T3:** | Tumor penetrates the serosa (visceral peritoneum) without invading adjacent structures |
| **T4:** | Tumor invade adjacent structures |

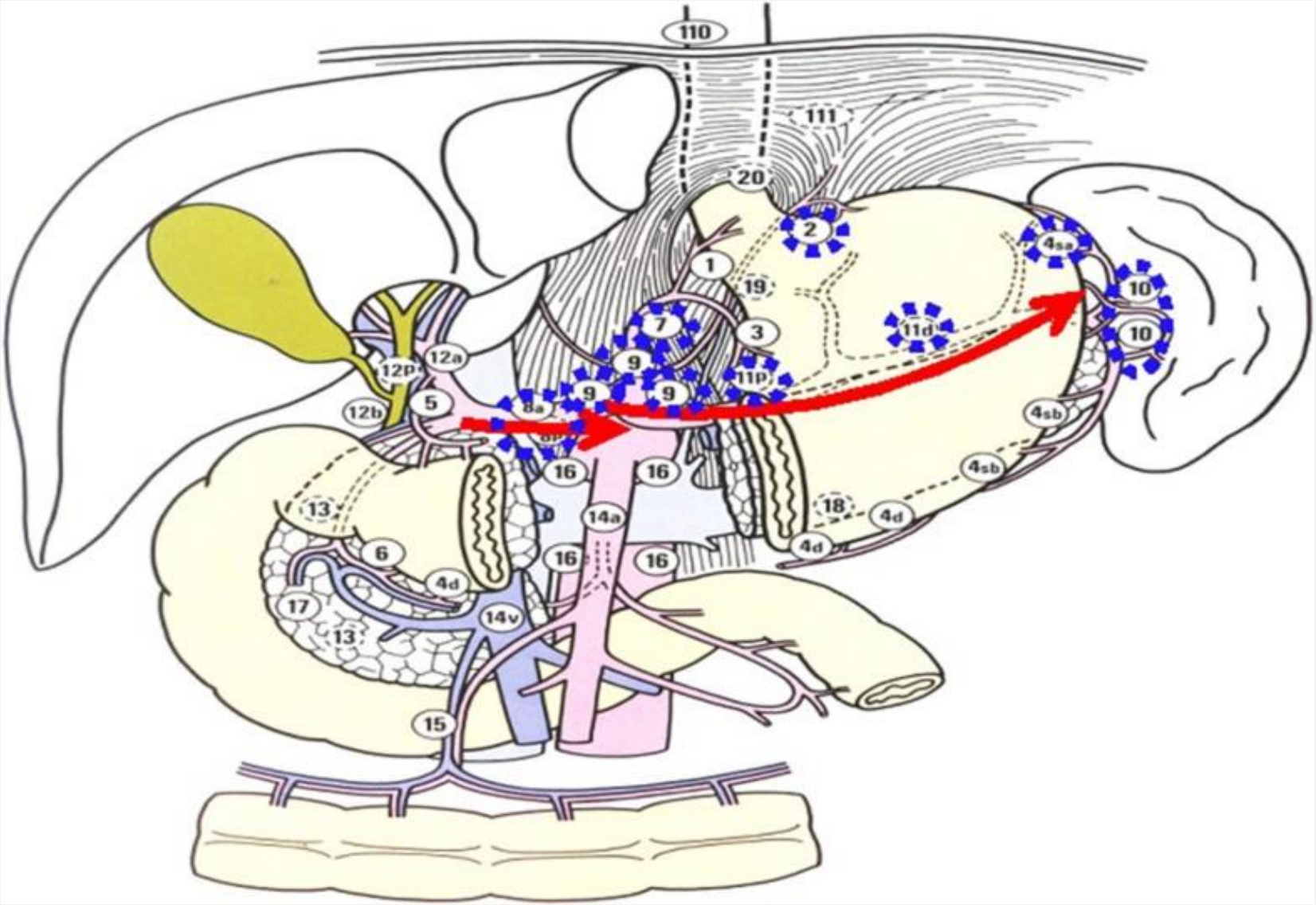
# NODAL INVOLVEMENT (N)

- The regional lymph nodes are the perigastric nodes, found along the lesser and greater curvatures, and the nodes located along the left gastric, common hepatic, splenic, and celiac arteries

- Involvement of other intra-abdominal lymph nodes, such as the hepatoduodenal, retropancreatic, mesenteric, and para-aortic, is classified as **distant metastasis**.



# LYMPH NODE STATIONS



# NODAL INVOLVEMENT (N)

| | |
|---|---|
| **NX:** | Regional lymph node (s) cannot be assessed |
| **N0:** | No regional lymph node metastasis |
| **N1:** | Metastasis in 1-6 regional lymph nodes |
| **N2:** | Metastasis in 7-15 regional lymph nodes |
| **N3:** | •Metastasis in > 15 regional lymph nodes |

# DISTANT METASTASIS (M)

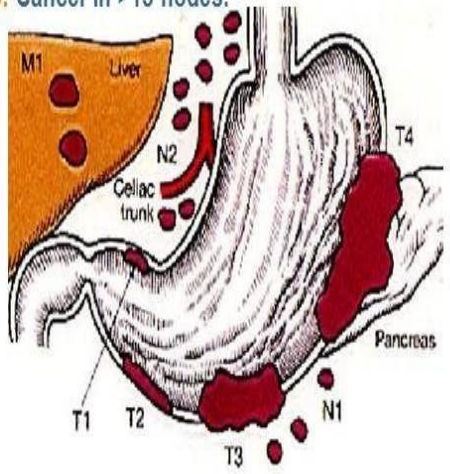
| | |
|---|---|
| **MX:** | Distant metastasis cannot be assessed |
| **M0:** | No distant metastasis |
| **M1:** | Distant metastasis |

# AJCC STAGE GROUPINGS

| | |
|---|---|
| **Stage 0** | Tis, N0, M0 |
| **Stage IA** | T1, N0, M0 |
| **Stage IB** | T1, N1, M0<br>T2a, N0, M0<br>T2b, N0, M0 |
| **Stage II** | T1, N2, M0<br>T2a, N1, M0<br>T2b, N1, M0<br>T3, N0, M0 |
| **Stage IIIA** | T2a, N2, M0<br>T2b, N2, M0<br>T3, N1, M0<br>T4, N0, M0 |
| **Stage IIIB** | T3, N2, M0 |
| **Stage IV** | T4, N1, M0<br>T4, N2, M0<br>T4, N3, M0<br>T1, N3, M0<br>T2, N3, M0<br>T3, N3, M0<br>Any T, any N, M1 |

## TNM Staging Classification

| T (Tumor size and penetration) | N (Cancer spread to nearby lymph nodes) | M (Spread to other parts of the body—metastasis) |
|---|---|---|
| Tis: Tumor "in situ:" caught very early and has not grown beyond stomach lining. | N0: Cancer has not spread to nodes. | M0: No metastasis |
| T1: Tumor has grown through lining and into connective tissue. | N1: Cancer in 1 to 6 nodes. | M1: Metastasis |
| T2: Tumor has grown into thick inner muscle. | N2: Cancer in 7 to 15 nodes. | |
| T3: Tumor has spread through outer lining but not to any nearby organs or tissues. | N3: Cancer in >15 nodes. | |
| T4: Tumor has spread into nearby tissues or organs. | | |




NCCN Guidelines Gastric Cancer v.1.2009.

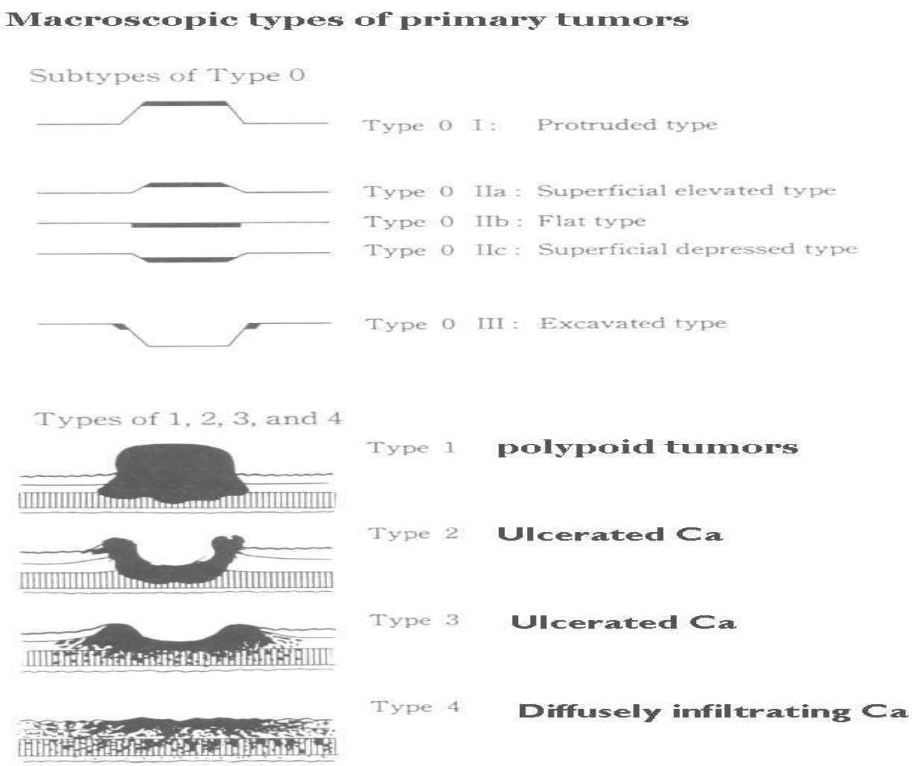
# EARLY GASTRIC CANCER

- 5.2 million screened→6414 have Ca, and 98.7% had operations. (54% of detected cases, 62% of which were early Ca).
- Defined as disease involving the **mucosa** or **submucosa** (may be fairly large).
- 5-6% of mucosal and 15 -20% of submucosal early Ca are accompanied by positive lymph nodes.

# EARLY GASTRIC CANCER 1

- Three types of macroscopic lesions are described:
  - **(a) Protruded (Type I).**
  - **(b) Superficial (Type II).**
  - **(c) Excavated (Type III).**
- It represents only 10-15% of diagnosed cases in the west.
- Five-year survival after resection ranges from 70-95%, depending on the presence of nodal involvement.

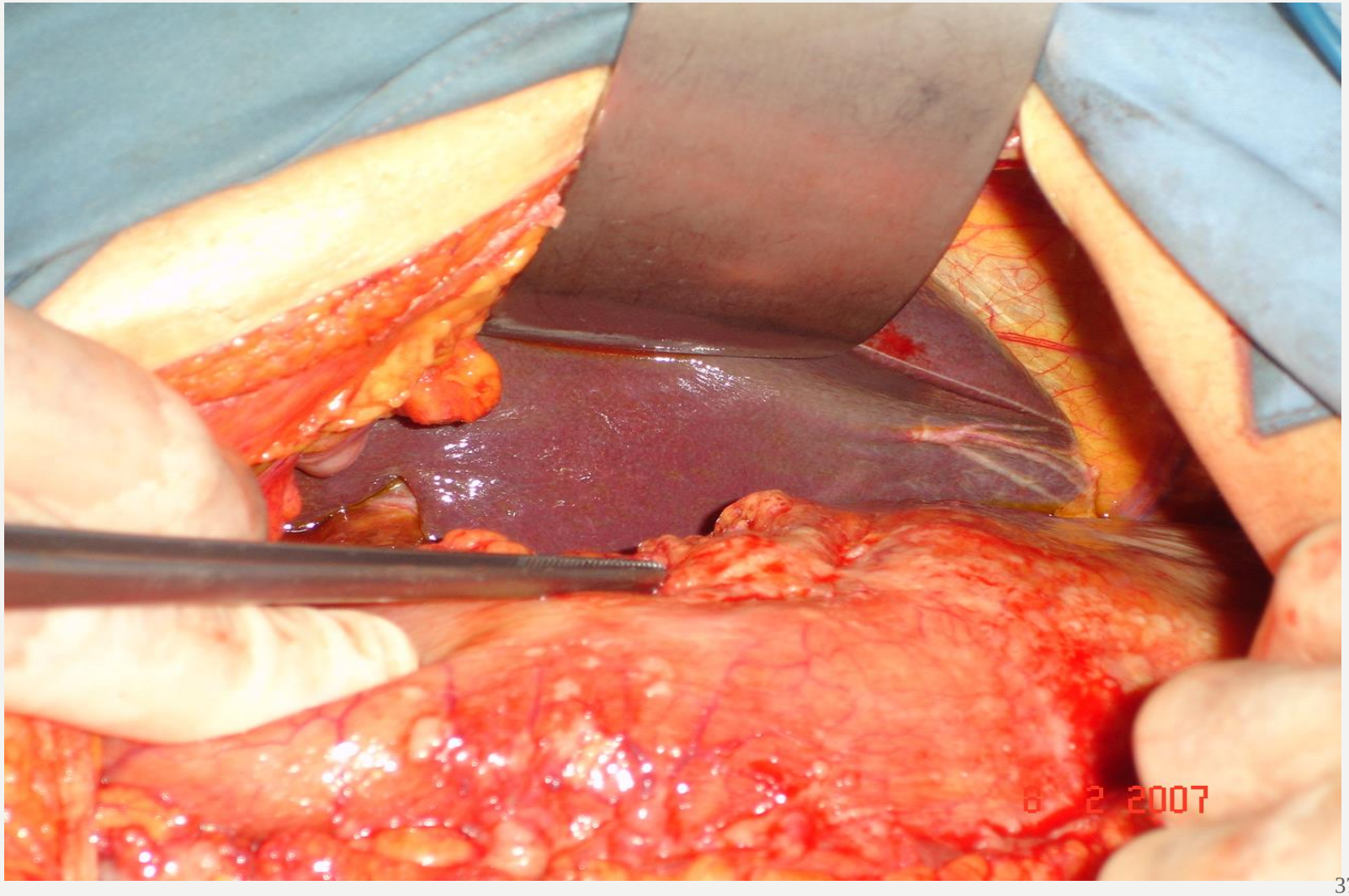
# EARLY GASTRIC CANCER 2



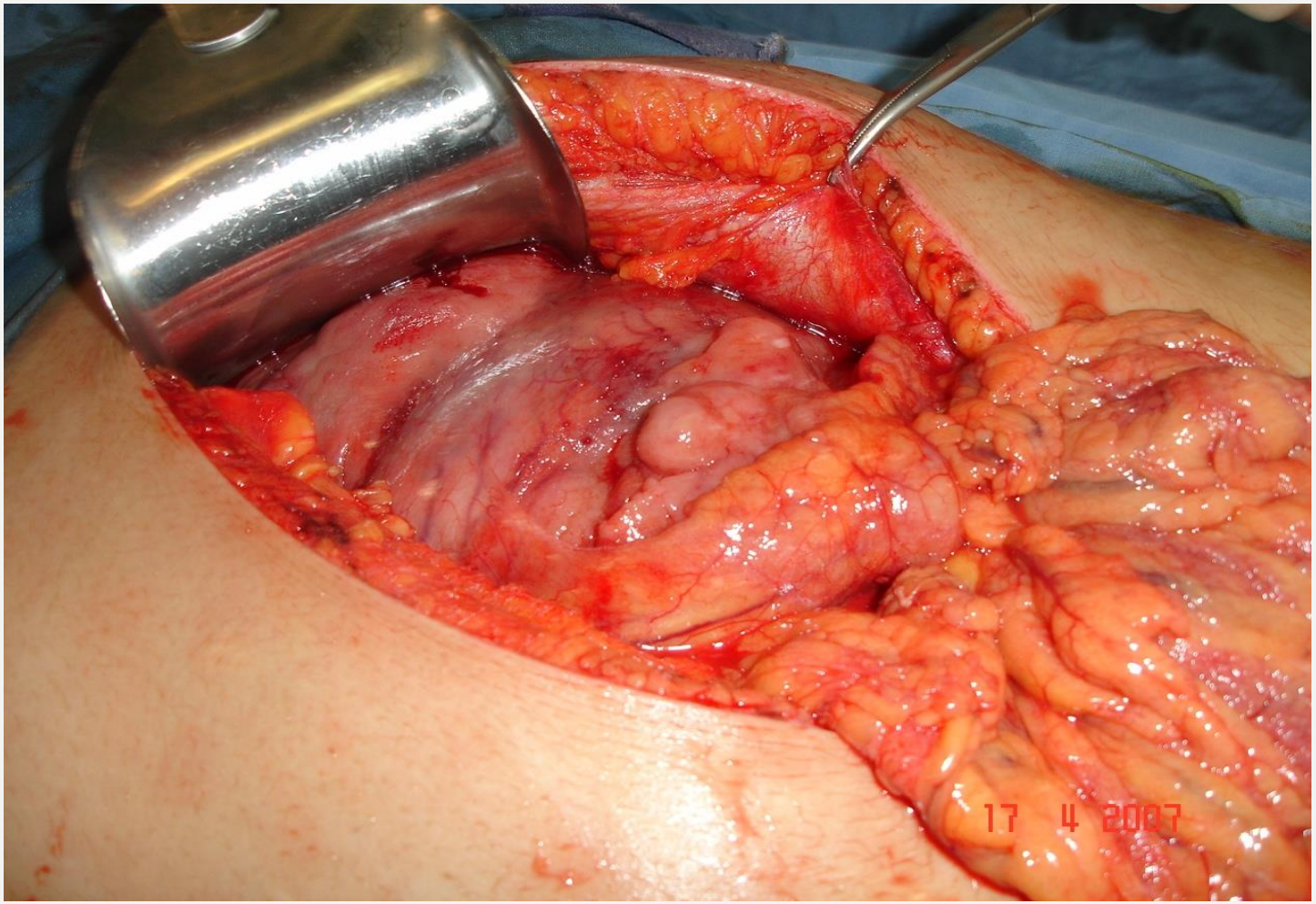
# ADVANCED GASTRIC CANCER 1

- Suggests invasion of the muscularis or beyond
- Frequently associated with distant or contiguous spread, have a higher stage
- It represents < 50% of cases in Japan
- > 80% of cases in US are advanced gastric Ca at the time of diagnosis.

# ADVANCED GASTRIC CANCER 2



# ADVANCED GASTRIC LYMPHOMA



# SYMPTOMS & DIAGNOSIS 1

- Symptoms of early gastric cancer are vague and unspecific. They may mimic symptoms of benign gastric ulcer

- Symptoms may not be evident until a tumor is of sufficient size to interfere with gastric motor activity, cause **obstruction**, or cause **bleeding** from an ulcerated tumor

- Family history of gastric cancer in 10% of patients

# SYMPTOMS & DIAGNOSIS 2

1. Indigestion
2. Anorexia
3. Early satiety
4. Weight loss
5. Abdominal pain or discomfort and ulcer-type pain
6. Bloating of the stomach after meals
7. Nausea and vomiting
8. Hematemesis and melena
9. Dysphasia
10. Weakness and fatigue / Asthenia
11. Signs or symptoms of dissemination

# ROUTINE LABORATORY TESTS

- Hematocrit, CBC, liver function tests, and stool guaiac (A stool test is positive for blood)
- In advanced disease, laboratory evidence of anemia develops
- Liver function tests are usually abnormal with hepatic metastasis.

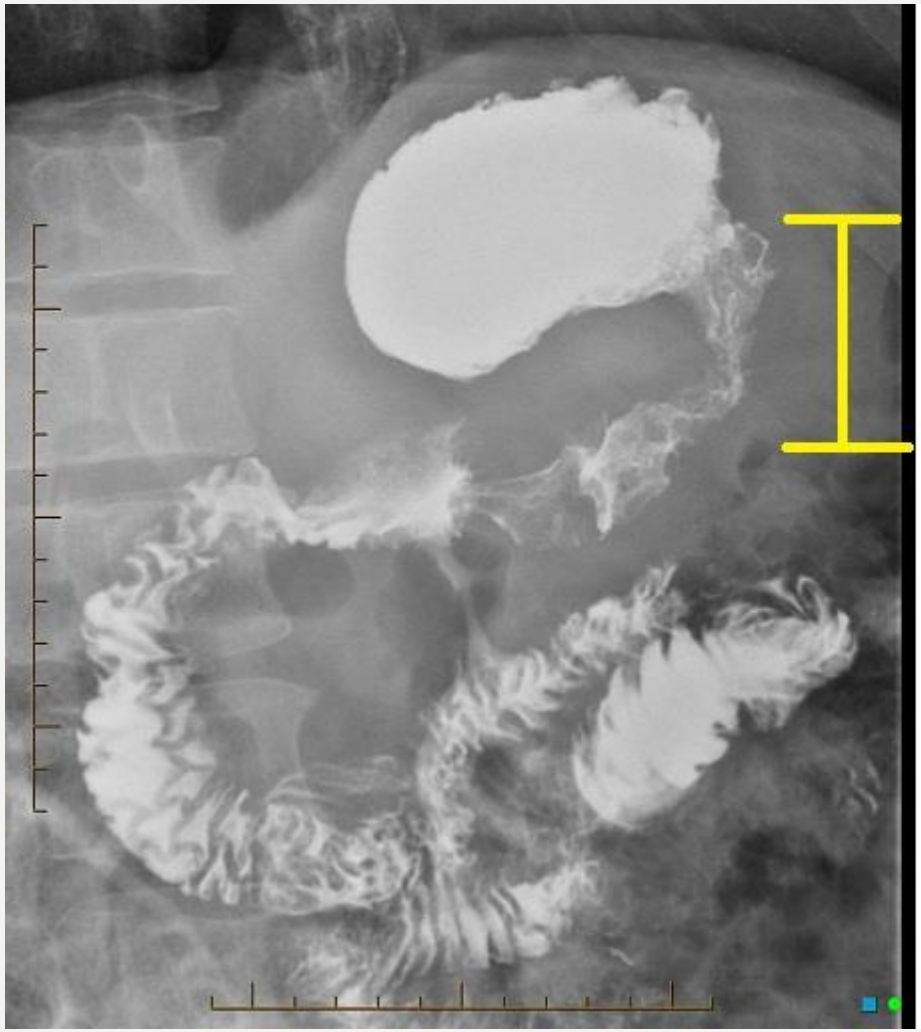
# DOUBLE-CONTRAST BARIUM MEAL

- In Japan screening program, using this technique, 87% of initial subjects are cleared, and 13% are subjected to further examinations.
- Appearance:

  (a) Polypoid mass.

  (b) Ulcer crater lies in a mass and does not extend outside the boundary of the gastric wall. Mucosal folds do not radiate toward the centre of the crater, usually > 1 cm. and are surrounded by rigid gastric wall on fluoroscopy.

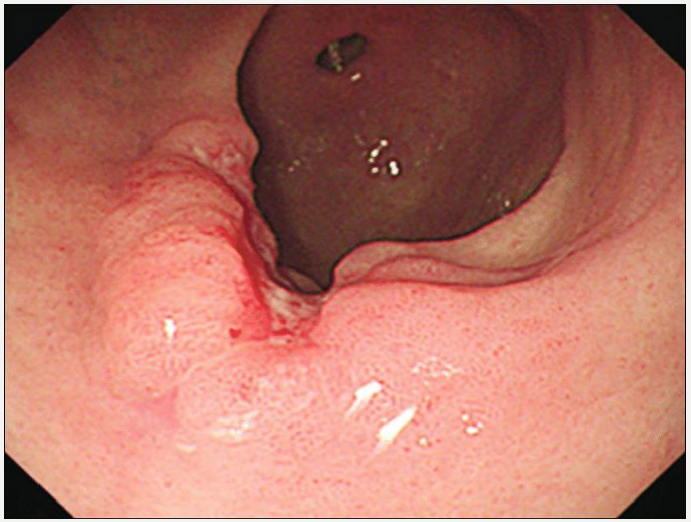
  (c) Nondistensible stomach.



Narrow and indistensible stomach lumen

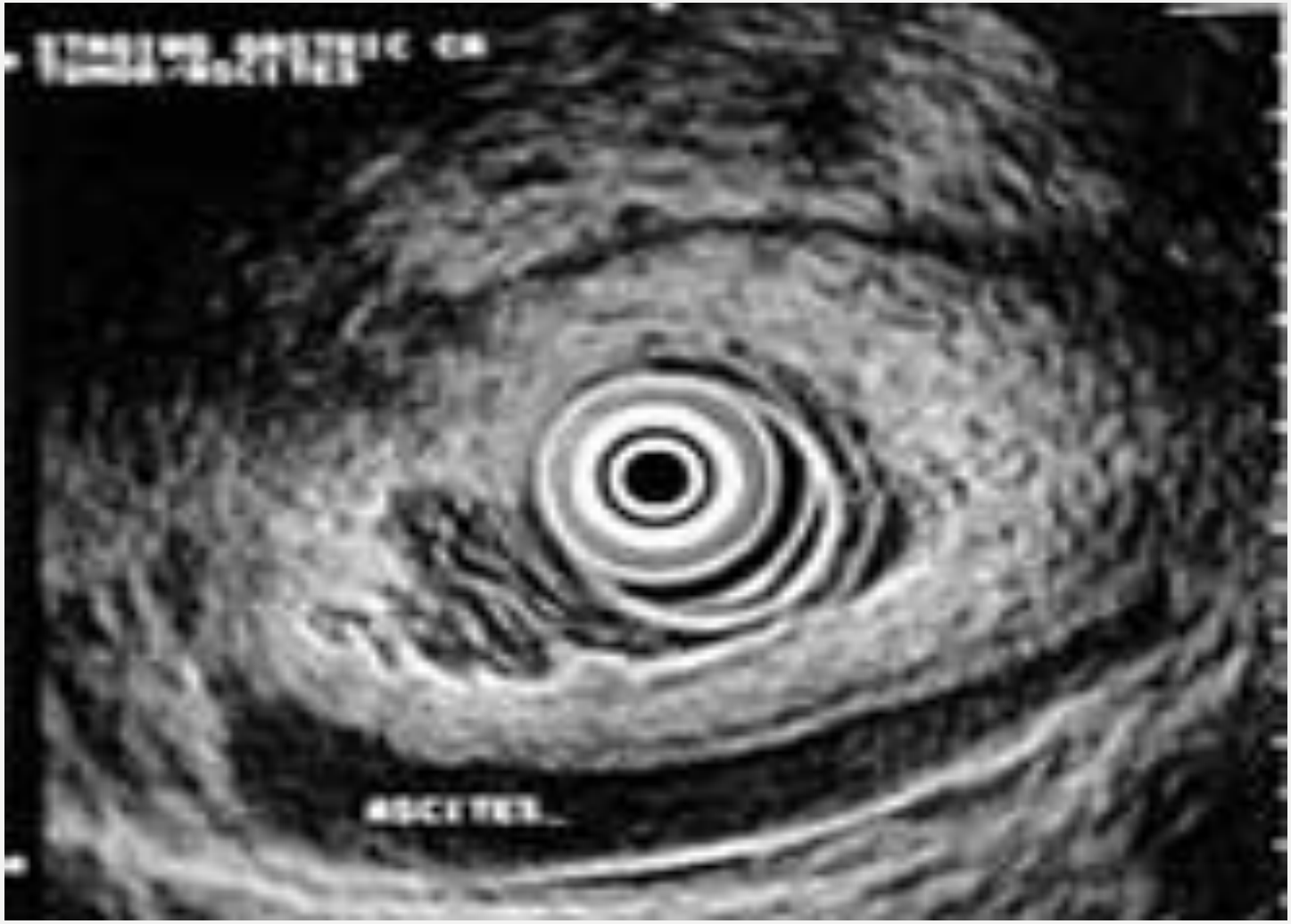
**Linitis plastica**

# ENDOSCOPY AND BIOPSY/CYTOLOGY



- Gastritis-like malignant lesions
- Small, plaquelike lesions.
- Polyps or small ulcers.
- Ulcerated lesions have elevated margins with shaggy necrotic centres.
- Extensive tumor plaque or large polypoid mass.
- Linitis plastica is typified by a nondistensible stomach.

# ENDOSCOPIC ULTRASONOGRAPHY



# COMPUTED TOMOGRAPHY SCAN

- Gastric wall thickening (0.5-4 cm. and correlates with tumor penetration)
- Gastric ulceration (polypoid or sessile lesions)
- Invasion of the gastrohepatic ligament, spleen, or diaphragm
- Distal metastases.

# OTHER DIAGNOSTIC MODALITIES.

- **Gastric acid analysis** can diagnose patients with hypo- and achlorhydria, which are associated with ↑ risk for gastric Ca (should be screened)

- **Molecular biologic techniques**, (e.g. cytologic evaluation for p53 or p21 protein)

# TREATMENT 1

- Patients must be evaluated for comorbid conditions.
- Patients with profound weight loss and metabolic complications of their cancer should be treated.
- Patients **without** obstruction or bleeding but who have distal metastases should **not** be explored
- Patients **with** obstruction or bleeding should still be considered for exploration, as palliative resection is better than palliative bypass)
- In patients with metastatic obstructing proximal gastric tumors, prosthetic endoesophageal tubes or endoscopic laser therapy can be used

# TREATMENT 2

- Surgical resection is the only potentially curative therapy.
- The extent of gastric resection should be tailored to the proximal extent of the primary lesion and geared toward obtaining negative proximal and distal margins.
- Different resections for distal, middle, and proximal lesions. In diffuse tumors, total gastrectomy may be the only option available to achieve adequate margins.

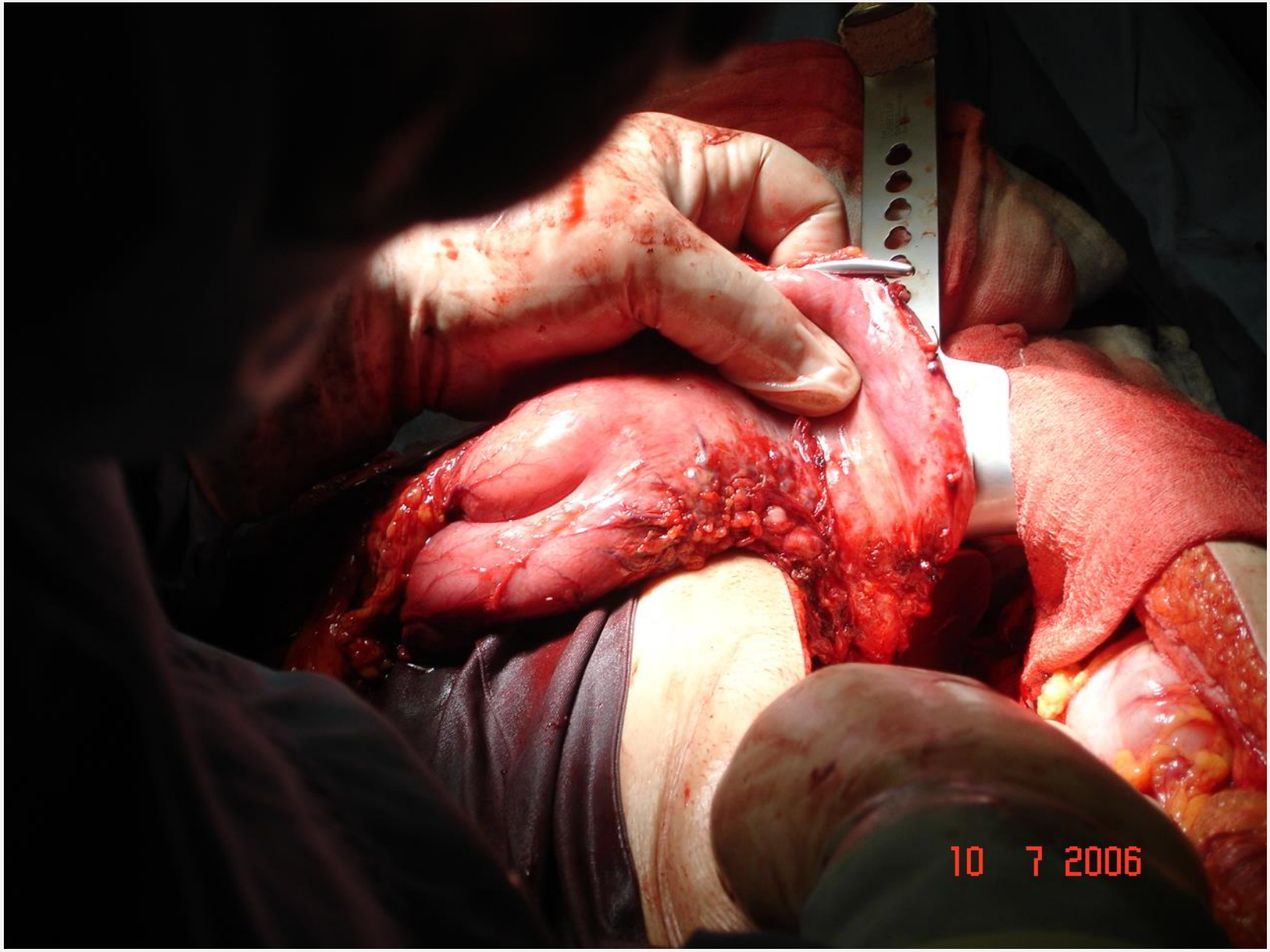
# TREATMENT 3

- Surgical resection and lymphadenectomy can be described as follows:

  - **D0 resection** = incomplete removal of perigastric LN.
  - **D1 resection** = complete removal of perigastric nodes.
  - **D2 resection** = D1 **+LN** along the named arteries of the stomach.
  - **D3 resection** = D2 **+** removal of the nodes of the celiac axis.
  - **D4 resection** = D3 **+** para-aortic nodes.

# TREATMENT: EARLY GASTRIC CANCER

- D1 resection is usually curative (survival rates of 95%)
- Endoscopic treatment using cauterization, local injection of drugs, and laser therapy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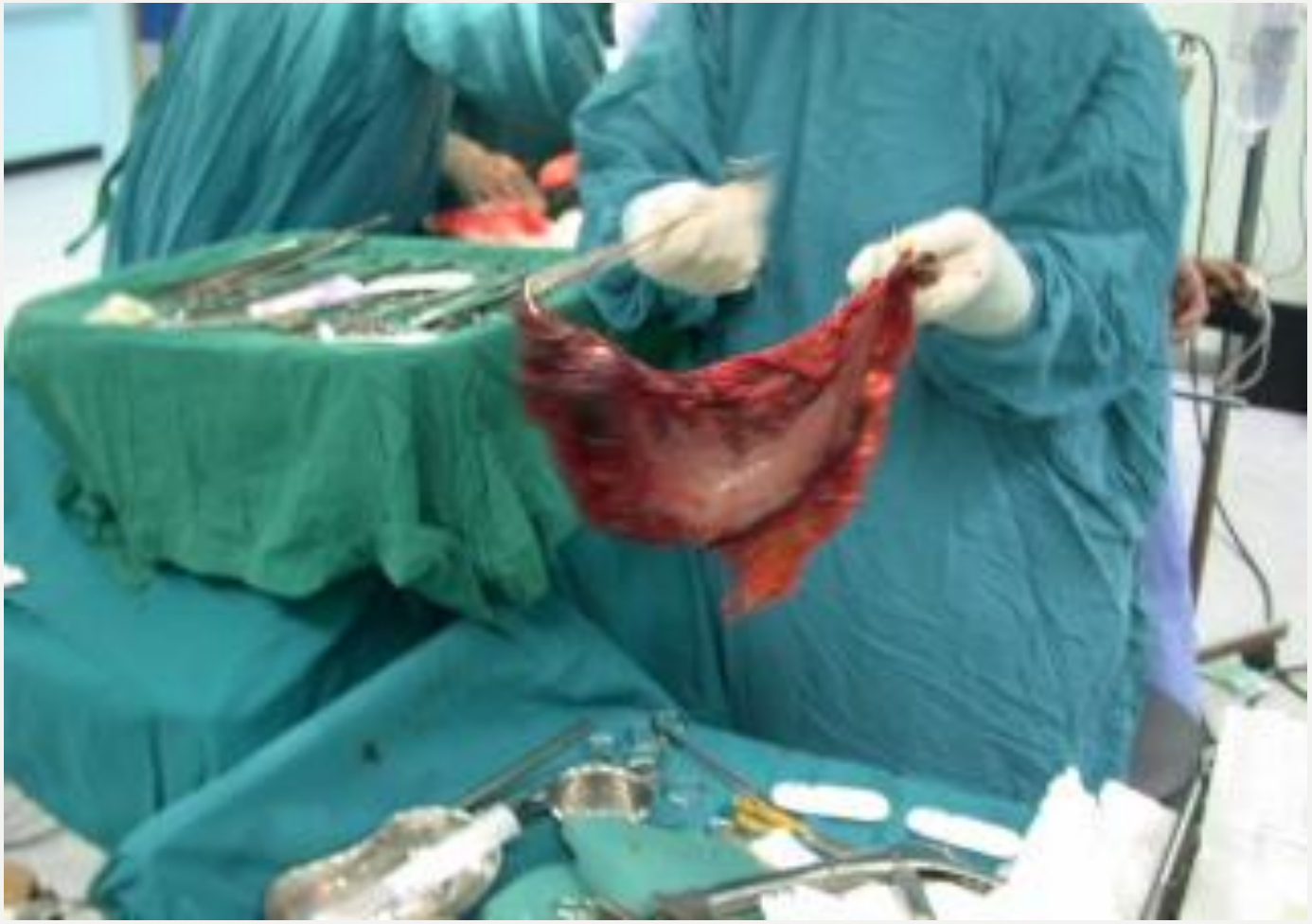
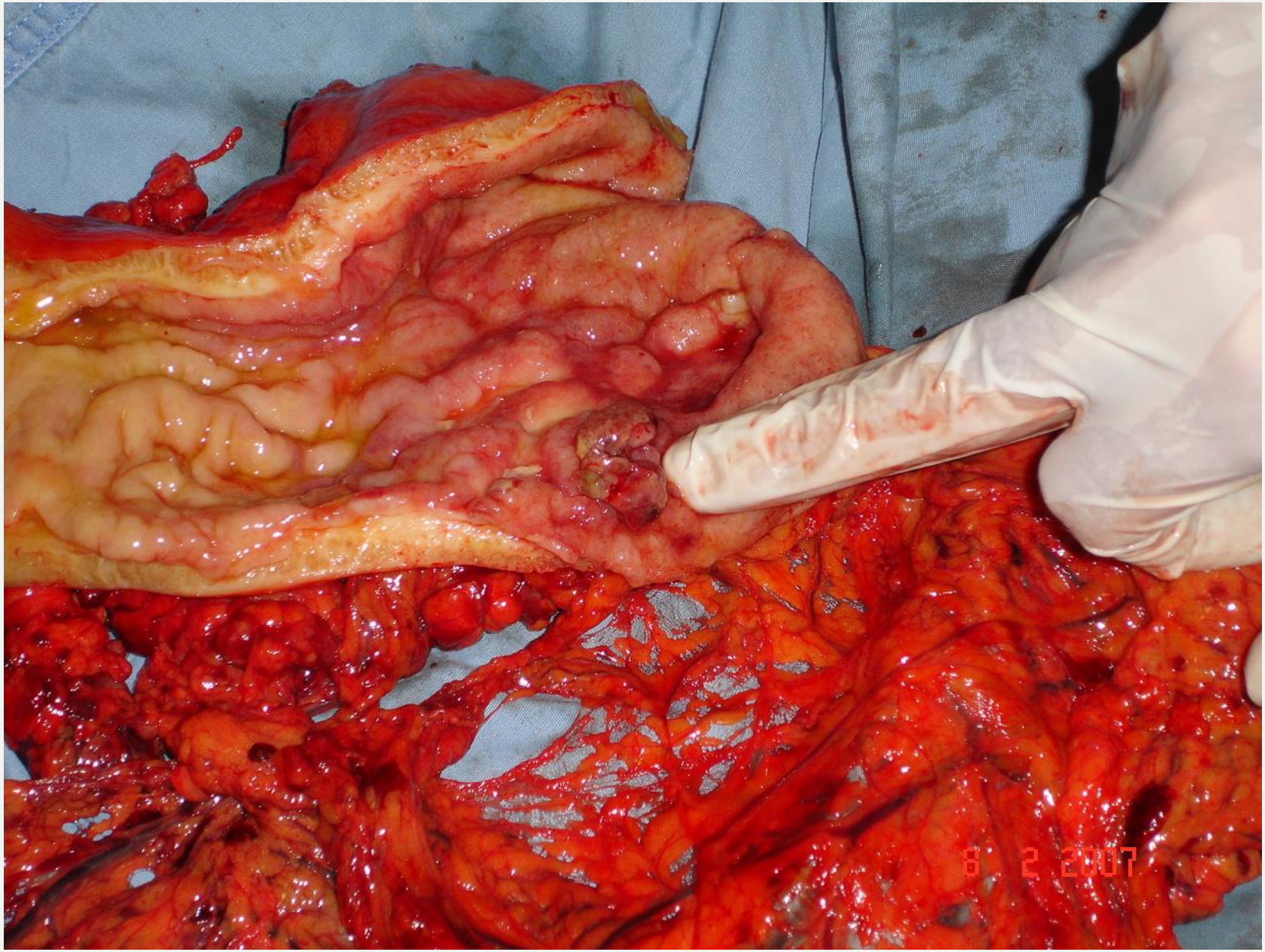
# TOTAL GASTRECTOMY

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# TREATMENT: ADVANCED CANCER

- Gastric resection includes:

  (a)Subtotal gastrectomy for antral or pyloric lesions.

  (b)Subtotal or total gastrectomy for middle-third lesions).

  (c)Total gastrectomy with esophagojejunostomy for proximal-third, GEJ, or extensive middle-third lesions.

- In addition, the perigastric lymph nodes along the lesser and greater curvatures and the lymph nodes along the left gastric artery are typically removed. The lesser and greater omenta are resected.

# TREATMENT (JAPANESE EXPERIENCE)

- Using a systematic approach, the standard operation in Japan for advanced cancer is the D2 dissection with removal of N 1 and N 2
- Using this standard operation, they reported a postoperative mortality rate of 0.4% for D2 and D3 resections
- The survival rates over the past 30 years have risen from 71% to 76% in Stage II, from 39% to 63% in Stage IIIA, from 28% to 39% in Stage IIIB, and from 2% to 10% in Stage IV disease

# TREATMENT: GEJ CA

- Ca of the cardia and GEJ is becoming more prevalent, roughly doubling in incidence over the last 20 years
- The disease occurs in an older patient population with a high percentage of advanced tumors (50 to 74%)
- Treatment is by a radical operation, usually through a thoracoabdominal approach.

# ADJUVANT THERAPY

- **Chemotherapy**
  - Randomized trials showed a survival benefit for the treatment group
  - There is a survival benefit for mitomycin C alone or futrafur and mitomycin C.
- **Chemoradiotherapy**
  - Results are mixed.
- **Chemoimmunotherapy**
  - The immune depression encourages the growth of tumor cells in certain patients.
  - Numerous immunomodulators have been found to enhance T-cell function and stimulate natural killer cells.
  - Immunotherapy alone has rarely been shown to be effective against residual tumors.
  - The advantages are greatest in patients with Stage III and IV disease or patients who underwent R0 resection.