CARCINOMA STOMACH
INCIDENCE

- UK – 15/100,000
- USA – 10/100,000
- EUROPE – 40/100,000
- JAPAN – 70/100,000

- Environmental disease
- Men > women
- Increase with age
- Distal gastric cancer, low socioeconomic
• Cancer of OG junction higher socioeconomic groups
• H. Pylori – associated with body and distal stomach cancer

**ETIOLOGY**

- ✓ Multifactorial disease
- ✓ H. Pylori – as a cause not proved beyond doubt
  associated with gastric atrophy
  intestinal metaplasia
- ✓ Pernicious anemia
• Gastric polyps
• Reflux gastritis – bile – following gastric surgeries
• Smoking – industrial dust
• Diet – Japan, China
• Alcohol, excessive salt
• Deficiency of antioxidants
• N-nitroso compounds
• Genetic factors
Clinical features

Early cases

Dyspepsia – at 40 yrs of age – malignancy must be Ruled out

H2 blockers, proton pump inhibitors may improve Symptoms

Advanced Cancer

Bloating, distension, vomiting, epigastric fullness
• Gastric outlet obstruction
• Trousseau’s sign
• Thrombophlebitis DVT

SITE

- Western countries – proximal gastric cancer
- Adenocarcinoma
- Japan – distal cancer
PATHOLOGY

- Lauren Classification
- Intestinal gastric cancer
- Mixed morphology
- Intestinal type: polypod, ulcerative type
- Diffuse type: no mass lesion

infiltrating stomach wall widely

EARLY GASTRIC CANCER JAPANESE CLASSIFICATION

✓ Cancer limited to mucosa, sub mucosa with or without lymph node involvement, curable/5 yea survival 90 %
✓ Japan 1/3 of gastric cancer are early
Figure 62.28 Early gastric cancer, Japanese classification.
ADVANCED GASTRIC CANCER: INVOLVES MUSCULARIS

BOWMANN’S CLASSIFICATION
International Union Against Cancer (UICC) staging system

Carcinoma of the stomach

Table of the various modes by which carcinoma spreads

![Type I](image1)

![Type II](image2)

![Type III](image3)

![Type IV](image4)

Lymphatic spread

The tumour penetrates the muscularis, serosa and adjacent organs such as the pancreas, colon and liver.

This is by both permeation and emboli to the affected (below) of nodes. This may be extensive, the tumour

Cancer

common classification of advanced gastric cancer.
MOLECULAR PATHOLOGY

• MS1 – Microsatellite instability
  errors in DNA replication – 15% of cases
  acquired mutation
• P53 - Inactivation of tumour supressor gene – 30 %
• APC1 - Gene Mutation – 50 % / intestinal type of cancer
• β – catenin – 30 %
• BCL – 2 gene
• E- cadherin – diffuse type
• Growth Factors & receptors – factor α
CECT for Ca. Stomach

- Multi-detector CT with negative oral contrast – the so called *helical hydro CT*
- **Segmental or diffuse wall thickening** which enhances on arterial phase
- **Vs Lymphoma**
  - More likely to be of larger size (>4 cm), but unlikely to cause gastric outlet obstruction.
  - The lymphadenopathy is likely to extend below the renal hilum.
T2 lesion
High specificity & lower sensitivity for N PET CT – Improves accuracy of pre-op staging. Gastric cancers are GLUT 1 negative and are not PET avid. PET avid gastric cancers are associated with decreased overall survival.
Laparoscopy

- Detects low volume liver and peritoneal CT occult metastases.
- Separate procedure or pre incision laparoscopy
- Lap. Ultrasound and Extended laparoscopy
Laparoscopy
Biopsy

• 6 – 8 biopsies: If the numbers of biopsies approach seven, the diagnosis is clear 100% of the time.

• The biopsy must be taken at the edge of the lesion with the normal tissue
  – to denote invasion
  – To obtain tissue from non necrotic areas

• One must also obtain biopsy from the base of the ulcer.

• Obtaining tissues from both sites increases the yield of the biopsy
- EGF – EPIDERMAL GROWTH FACTOR
- VGEF – VASCULAR ENDOTHELIAL GROWTH FACTOR

STAGING OF GASTRIC CANCER

T1 - Tumour involves lamina propria
T2 - Tumour invades muscularis or subserosa
T3 - Tumour involves serosa
T4 - Tumour invades adjacent organs
N0 - No lymph nodes
N1 - Metastasis in 1-6 regional nodes
N2 - Metastasis in 7-15 regional nodes
N3 - Metastasis in more than 15 regional nodes
M0 – No distant metastasis
M1 – Distant metastasis (this includes peritoneum and distant lymph nodes)

<table>
<thead>
<tr>
<th>STAGING</th>
<th>T1</th>
<th>N0</th>
<th>M0</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IB</td>
<td>T1</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>II</td>
<td>T1</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T3</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>III A</td>
<td>T2</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T3</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td>Stage</td>
<td>T</td>
<td>N</td>
<td>M</td>
</tr>
<tr>
<td>-------</td>
<td>---</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>III B</td>
<td>T4</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>I V</td>
<td>T3</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td>I V</td>
<td>T4</td>
<td>N1-3</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T1-3</td>
<td>N3</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>Any T</td>
<td>Any N</td>
<td>M1</td>
</tr>
</tbody>
</table>

**SPREAD OF CARCINOMA STOMACH**

First to nodes – distant metastasis

Sub mucosa, sub serosal lymphatic plexus
Table 1. American Joint Committee on Cancer staging system for gastric cancer

<table>
<thead>
<tr>
<th>Primary tumor (T)</th>
<th>Distant metastasis (M)</th>
<th>Stage grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX Primary tumor cannot be assessed</td>
<td>MX Distant metastasis cannot be assessed</td>
<td>0 Tis, N0, M0</td>
</tr>
<tr>
<td>T0 No evidence of primary tumor</td>
<td>M0 No distant metastasis</td>
<td>IA T1, N0, M0</td>
</tr>
<tr>
<td>Tis Carcinoma in situ: intraepithelial tumor without invasion of the lamina propria</td>
<td>M1 Distant metastasis</td>
<td>IB T1, N1, M0</td>
</tr>
<tr>
<td>T1 Tumor invades lamina propria or submucosa</td>
<td></td>
<td>II T1, N2, M0</td>
</tr>
<tr>
<td>T2 Tumor invades muscularis propria or subserosa*</td>
<td></td>
<td>III T2a/b, N0, M0</td>
</tr>
<tr>
<td>T2a Tumor invades muscularis propria</td>
<td></td>
<td>IIIA T2a/b, N2, M0</td>
</tr>
<tr>
<td>T2b Tumor invades subserosa</td>
<td></td>
<td>IIIB T3, N2, M0</td>
</tr>
<tr>
<td>T3 Tumor penetrates serosa (visceral peritoneum)</td>
<td></td>
<td>IV T4, N1–3, M0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4 Tumor invades adjacent structures†‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional lymph nodes (N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NX Regional lymph node(s) cannot be assessed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N0 No regional lymph node metastasis§</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N1 Metastasis in 1 to 6 regional lymph nodes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N2 Metastasis in 7 to 15 regional lymph nodes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N3 Metastasis in more than 15 regional lymph nodes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DIRECT SPREAD
- Tumour invades
- Muscularis, serosa, adjacent organs, pancreas, colon and liver

LYMPHATIC SPREAD
- Permeation and emboli
  TROISIER’S SIGN – LT. Supraclanicular nodes

BLOOD BORNE METASTASIS
Liver, lung, bone
TRANSPERITONEAL SPREAD
After serosal spread
Peritoneal deposit, ascites
Blumer’s shelf – recto vesical pouch
Krukenberg’s tumour
Sister joseph – nodules- umbilicus
Laparoscopy – cytology
Lymphatic drainage of stomach
Atrium : RT.Gastric nodes
    RT. Gastroepiploic sub pyloric
• Pylorus: RT. Gastric
  Supra Pyloric Nodes
  Along Gastroduodenal artery
  Efferent Lymphatic drain to coelic axis and
  origin of sup. Mesentric artery

Japanese Lymph node dissection
Lymph node station 1-18

Operability
Absence of
1. N3, N4 Disease
Lymph node stations in gastric cancer
Japanese staging system: 1998

- The T staging is the same as the UICC/ AJCC TNM classification.

- **The main differences:**
  - *Lymph node grouping* – Station 1- 6 = Group 1. the involvement of LN in different groups is reflected in the staging system.
  - *Macroscopic description* of the tumour, description of the extent of peritoneal mets, presence or absence of positive cytology
2. Distant metastasis – liver, lung, bone
3. Wide spread peritoneal deposit
4. Fixation to adjacent organs that cannot be removed

SURGICAL MANAGEMENT
TOTAL GASTRECTOMY
- Upper midline incision
- Roof top incision
- Duodenum divided at 1st part
Principles of surgery in gastric cancer: NCCN guidelines

- For **proximal gastric cancer**, the goal should be R0 resection
- preferably with 5 cm of grossly normal in situ proximal esophagus.
- At least **15 lymph nodes** must be harvested for adequate pathological analysis
- Ligation of vessels
  - RT. Gastric A
  - RT. Gastro epiploic A
  - LT. Gastric A
  - LT. Gastric Epiploica
  - Short Gastric arteries
- Stomach with greater omentum
- Lower end of oesophagus
- Gastro intestinal continuity restored by roux-N-Y loop 50 cms to avoid bile reflux
Figure 62.33 (a–f) Radical total gastrectomy. (a) Dissection of amentum of the transverse colon. (b) Exposure of the lesser sac. (c) Splenectomy. (d) Division and oversewing of the duodenum. (e) Division of the inferior mesenteric artery. (f) Division of the pancreas. (g) Division of the spleen.
Figure 62.34 Oesophagojejunostomy Roux-en-Y.
Antral Growth
Proximal Stomach
Anastamosis – End to end
  Hand sewing or
circular stapler

Anti or retro colic
End to side jejuno – jejunostomy

LYMPH NODE RESECTION
D1 RESECTION – Peri Gastric Nodes N1 Nodes
D2 RESECTION – Nodes along arterial trunks, N2 nodes
  preserves spleen, distal pancreas
THE LYMPH NODE STATIONS THAT NEED TO BE REMOVED OR A D2(N2 ODES )RESECTION

<table>
<thead>
<tr>
<th>LN NUMBER</th>
<th>SITE OF CANCER</th>
<th>ANTRUM</th>
<th>MIDDLE</th>
<th>CARDIA</th>
<th>CARDIA &amp; OESO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Right cardia</td>
<td>N2</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
</tr>
<tr>
<td>2.</td>
<td>Left cardial</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
</tr>
<tr>
<td>3.</td>
<td>Lesser curve</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
</tr>
<tr>
<td>4sa</td>
<td>Short gastric</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
</tr>
<tr>
<td>4sb</td>
<td>Left gastroepiploic</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
<td>N1</td>
</tr>
<tr>
<td>4d</td>
<td>Right gastroepiploic</td>
<td>N1</td>
<td>N1</td>
<td>N2</td>
<td>N2</td>
</tr>
<tr>
<td>5</td>
<td>Suprapyloric</td>
<td>N1</td>
<td>N1</td>
<td>N2</td>
<td>N2</td>
</tr>
<tr>
<td>6</td>
<td>Infrapyloric</td>
<td>N1</td>
<td>N1</td>
<td>N2</td>
<td>N2</td>
</tr>
<tr>
<td>7</td>
<td>Left gastric artery</td>
<td>N2</td>
<td>N2</td>
<td>N2</td>
<td>N2</td>
</tr>
</tbody>
</table>
8a. Anterior hepatic artery   N2     N2     N2     N2
9. Coeliac artery              N2     N2     N2     N2
10. Splenic Hilum              N2     N2     N2     N2
11. Splenic artery             N2     N2     N2     N2
19. Infradiaphragmatic         N2
20. Oesophageal hiatus         N2     N2     N1
110. Lower oesophagus          N2
111. Supradiaphragmatic        N2

The nodes in section 12-18 are not routinely removed in a D1 or D2 gastrectomy
SUB TOTAL GASTRECTOMY
• For distally placed tumours
• Billroth 2 gastrectomy with roux-N-Y Loop
• Reconstruction

PALLIATIVE SURGERY
• Obstruction/bleeding
• Palliative resection of tumour – Roux-N-Y
• Gastric exclusion – oesophago- jejunostomy
Stage II and Stage III disease

- Surgery is **necessary but not sufficient** for cure.
- The goal of the surgery is achieving a curative resection with negative margins.
• Tumours of cardia – Intubation
  Stenting
  Recanalisation

POST OPERATIVE COMPLICATIONS

- Leak – Fistula – Duodenum, jejuvenal anastamosis
- Biliary peritonitis
- Laparotomy – controlled fistula with Foley’s catheter
- Secondary Haemorrhage following
- Septic collection

LONG TERM

Reduced gastric capacity
small feeds
B12 Deficiency
Adjuvant Treatment
Radiotherapy – Painful bone metastasis

Chemotherapy –
Epirubicin, cis – platinum, 5-FU infusion
Mitomycin C in charcoal intraperitoneal route
Neo- adjuvant chemotherapy
Pre op down staging
Adjuvant Chemo in gastric cancer

<table>
<thead>
<tr>
<th>Study</th>
<th>Drugs used</th>
<th>Effect on survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mc Donald</td>
<td>FAM Vs control</td>
<td>No difference</td>
</tr>
<tr>
<td>Thavaris</td>
<td>Epirubicin – Mito - FU</td>
<td>No difference</td>
</tr>
<tr>
<td>Devita</td>
<td>ELFE Vs Control</td>
<td>No difference</td>
</tr>
<tr>
<td>Bajetta</td>
<td>EAP – FU-LV</td>
<td>No difference</td>
</tr>
</tbody>
</table>

- Still being investigated
- Post operative adjuvant therapy has not shown significant improvement over surgery alone in gastric cancer as of yet.
Post operative Treatment

- May receive chemo radiation - R0 resec.
- R0 with T1 or T2 – observe /
- T2 N0 poorly dif., lympho vascular invasion, < 50 yrs. - post op chemo radiation
- T3, T4, N positive, R1 resec. – Rt & Chemo
- Supportive care.
THANK YOU