

# **Liver Metastasis from Colon Cancer**

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# Case Presentation

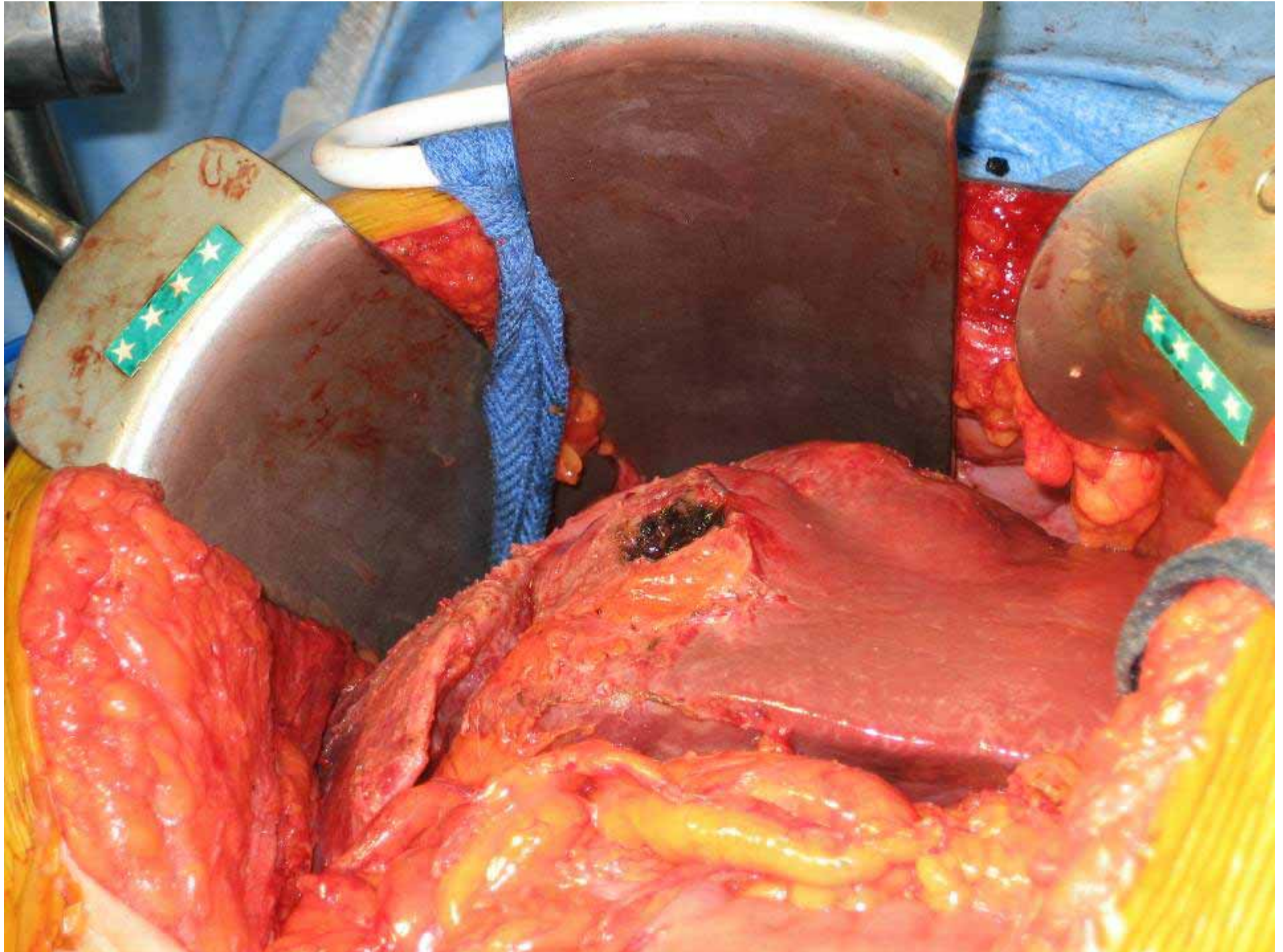
- 57 y/o female with no PMH presents with complaints of nausea, abdominal discomfort, and constipation
- PE showed a distended, tympanitic, mildly tender abdomen, no guarding or rebound, guaiac (+)
- Labs showed mild anemia

# Case Presentation

- During hospital stay pt developed s&s of obstruction; surgery consulted; pt resuscitated, NGT and Foley inserted
- AXR showed distended colon and small bowel loops
- CT showed large mass at sigmoid colon and multiple liver lesions

# Case Presentation

- At laparotomy biopsy of liver lesion showed metastatic colorectal CA
- Sigmoidectomy with Hartmann's procedure performed
- Pt did well initially, but developed a wound infection and colocutaneous fistula







# Epidemiology

- 25% of pts present with liver metastasis when diagnosed with colorectal CA
- 50% of remaining pts develop liver recurrence (85% in 2.5 yrs, 100% in 5 yrs)
- First resections for metastatic colorectal CA performed by 1940s

# Natural History of Colorectal Liver Metastases

- Retrospective reviews show that pts with potentially resectable liver mets left untreated had median survival of 19 mos and 0% 5-yr survival compared to median survival of 36 mos and 25-28% 5-yr survival in treated pts
- Prognostic variables include age > 70, poor performance status, primary tumor stage and location, extent of hepatic and extrahepatic involvement

Wanebo HJ et al. Arch Surg 1996 ;131(3):322-329

Wilson et al. Arch Surg 1976; 111: 330-334

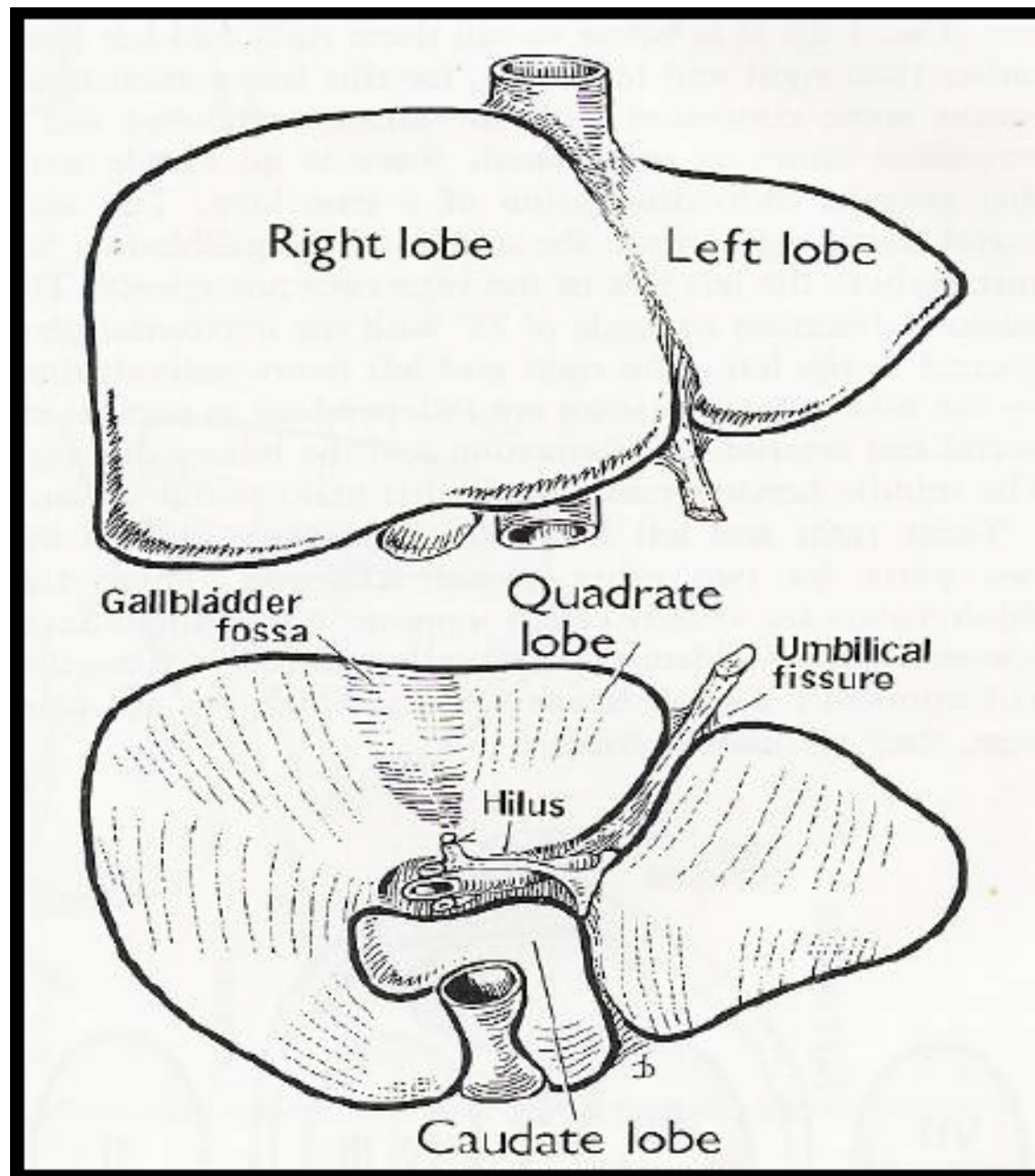


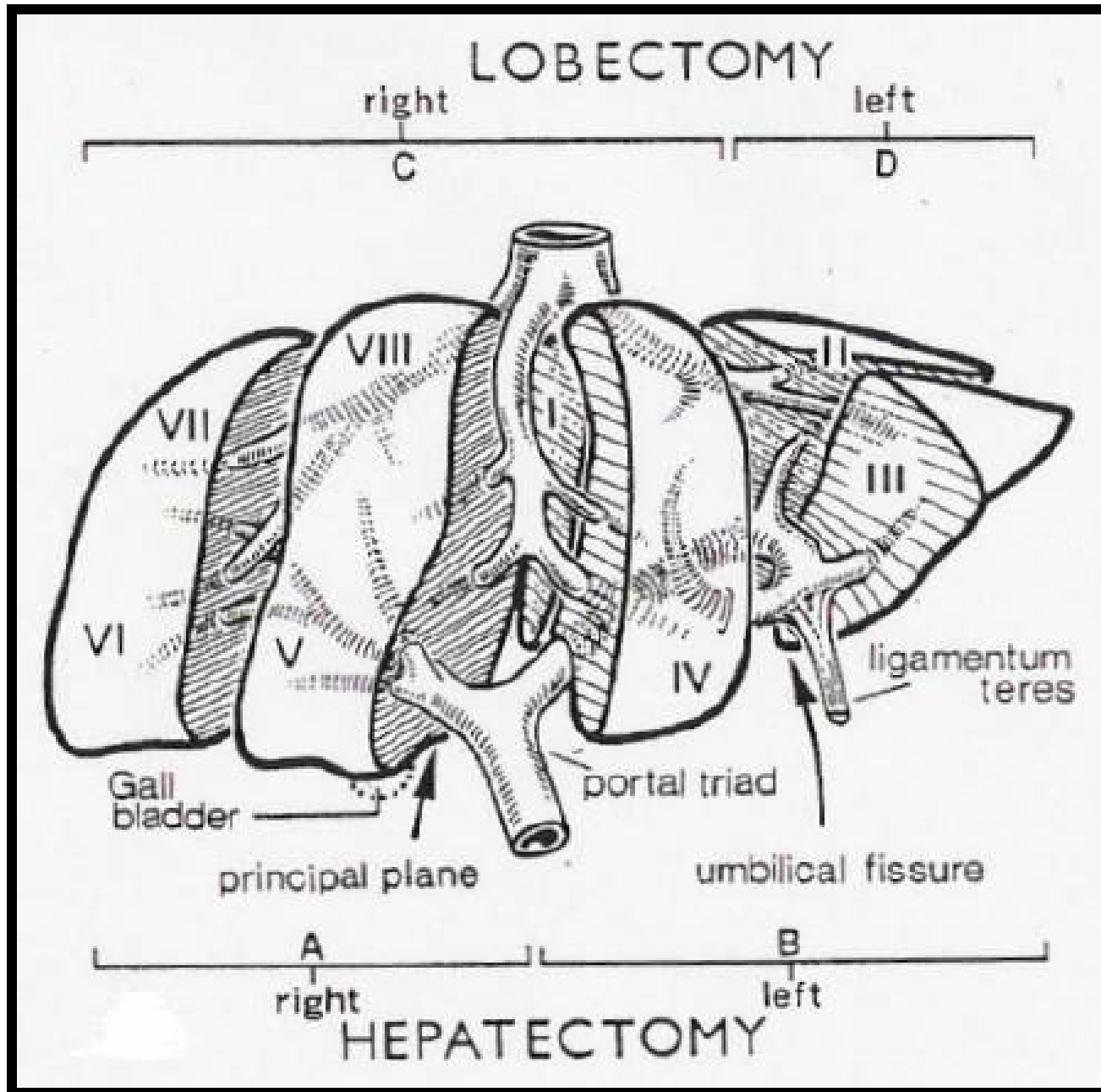
# Treatment Options

- Surgical resection (only potential cure)
- Radiofrequency ablation (RFA)
- Cryotherapy
- Hepatic artery chemotherapy
- Immunotherapy
- Selective internal radiotherapy (SIRT)

# Liver Anatomy

- Divided into R and L lobes morphologically by falciform ligament in umbilical fissure
- Divided functionally into segments based on distribution of interdigitating portal veins and hepatic arteries and hepatic veins
- Description noted first by Cantlie (1898), and modified by McIndoe and Counseller (1927), Ton That Tung (1939), Goldsmith and Woodburne (1957), and Couinaud (1957)

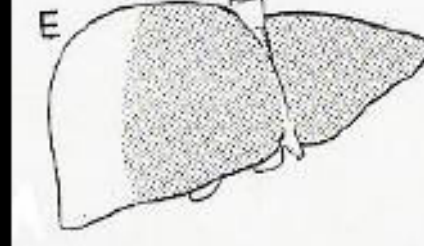
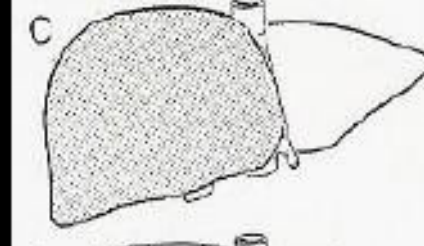
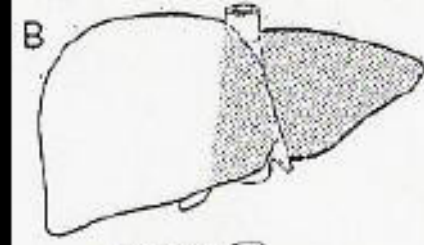
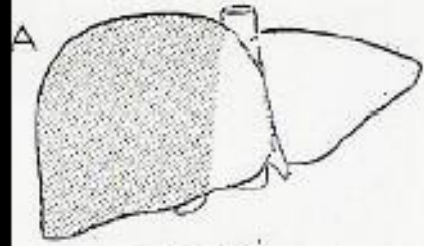




# Liver Resection

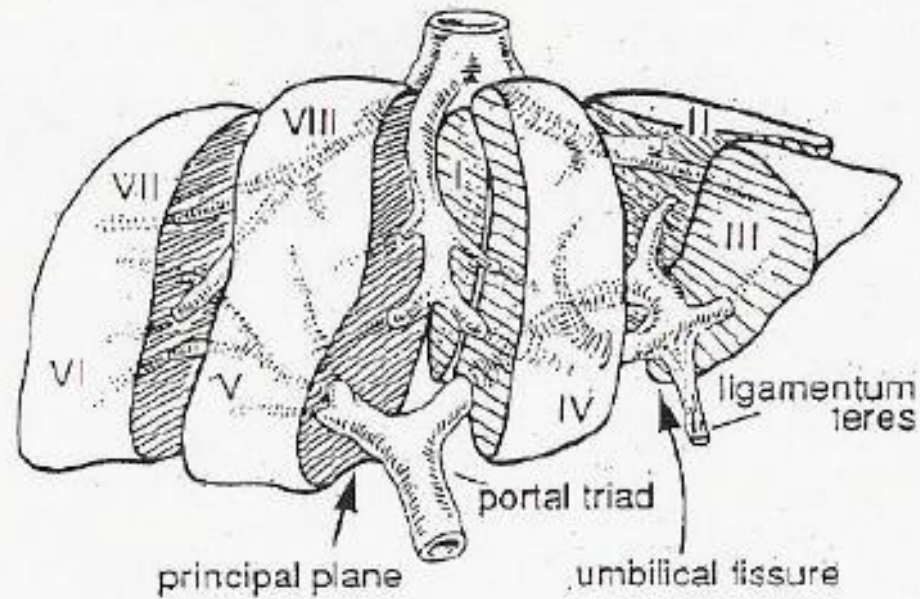
- Anatomic resection
  - R hepatectomy
  - L hepatectomy
  - Extended R hepatectomy (R trisegmentectomy)
  - Extended L hepatectomy (L trisegmentectomy)
  - L lateral segmentectomy
  - Transverse hepatectomy
- Nonanatomic resection
- Enucleation





Extended right lobectomy  
Right lobectomy  
Right Trisegmentectomy

Right lobectomy  
Right hepatectomy



Left lobectomy  
Left hepatectomy

Extended left lobectomy  
Extended left hepatectomy  
Left Trisegmentectomy

# Predicting Outcome of Liver Resection

1001 consecutive pts undergoing liver resection for metastatic colorectal at Memorial Sloan-Kettering Cancer Center cancer between 1985-1998

237 trisegmentectomies, 394 lobectomies, and 370 resections less than a lobe

5-yr survival 37%, 10-yr survival 22%, surgical mortality rate 2.8%

# Predicting Outcome of Liver Resection

Significant independent predictors of poor long-term outcome

1. positive margin
2. extrahepatic disease
3. node-positive primary
4. mets <12 months of colon resection
5. multiple hepatic tumors (>1)
6. largest hepatic tumor >5 cm
7. CEA >200 ng/ml

Preop scoring system using these variables highly predictive of outcome

# OncoSurge Decision Model

- Computer program developed to guide treatment algorithm
- Appropriateness method (RAM) integrates comprehensive literature review of clinical evidence with a subsequent consensus-based categorization of therapeutic options
  - Resection always preferred over local ablation strategies
  - Resection absolutely contraindicated with unresectable extrahepatic disease, extensive liver involvement (> 70 percent, more than 6 segments, or involvement of all three hepatic veins), major liver insufficiency, or poor physiologic reserve
  - Immediate resection appropriate if adequate margins could be radiographically defined, no portal lymph node involvement, and 4 or fewer lesions
  - Resection could be considered for >4 lesions, if localized to a single lobe

# OncoSurge Decision Model

Factors not influencing treatment strategy

- age
  - primary tumor stage
  - timing of mets detection
  - liver resection type
  - preop CEA
  - previous hepatectomy
- 
- For patients with >4 mets, or bilobar involvement, resection was considered appropriate only after tumor shrinkage using neoadjuvant chemotherapy (5-FU/oxaliplatin)
  - Postoperative chemotherapy appropriate for pts who received preoperative chemotherapy

Poston GJ et al. J Clin Oncol 2005;23(28):7125-7134



# Contraindications to Hepatectomy

- Total hepatic involvement
- Advanced cirrhosis
- Jaundice (except from extrinsic ductal obstruction)
- Invasion of IVC or main portal vein
- Extrahepatic tumor involvement (except for lung)

# Timing of Hepatectomy

- Synchronous Vs. metachronous Resection
- Potential disadvantages of synchronous resection include intraoperative contamination of cut liver surface, potential poor healing and anastomotic leak due to impairment of liver function, potential for higher recurrence rates due to tumor seeding
- Simultaneous resection not recommended for age >70 yrs, >1 liver section to remove, poorly differentiated or mucinous adenocarcinoma as primary lesion

**National Comprehensive Cancer Network (NCCN) clinical practice guidelines  
accessed at [www.nccn.org](http://www.nccn.org)**

# Complications of Surgery

- Operative mortality ranges from 0-7%  
(hemorrhage most common)
- Liver failure (3-8%)
- Perihepatic abscess (2-10%)
- Pneumonia (5-22%)
- Biliary leak or fistula (4%)
- Pleural effusion (5-10%)
- Pulmonary embolism (1%)

# Rescue Surgery for Unresectable Liver Mets

- Prospective study of 1439 pts with colorectal liver mets between 1988-1999
- 1104 pts (77%) initially unresectable treated with neoadjuvant chemotherapy, 138 (12.5%) were good responders undergoing secondary hepatic resection (most had >50% reduction in tumor size)
- Techniques used to achieve resectability included preop portal embolization, RFA, cryotherapy, and staged hepatectomy

# Radiofrequency Ablation

- High frequency current (100-500 kHz) causing ionic vibration and frictional heat
- Coagulative necrosis
- Abundant portal venous blood flow to normal hepatic parenchyma protects against thermal injury
- Can be done percutaneously or open
- No mortality, better pt tolerance, fewer local recurrences



# Complications of RFA

- Pain
- Liver failure
- Hepatic abscess
- Bile duct injury
- Hemorrhage
- Diaphragm necrosis
- Ventricular fibrillation
- Fever
- Renal failure
- Hepatic artery injury
- Skin burns
- Coagulopathy

# Cryotherapy

- Freezing and thawing of liver tumors leading to tumor destruction (iceball)
- Must be done through open approach
- Complications include biliary fistula, liver abscess, cryoshock with MOF and DIC, thrombocytopenia, myoglobinuria, renal failure, hemorrhage, pleural effusion, and cardiac arrhythmias
- Mortality ranges from 0-8%

# Hepatic Artery Chemotherapy

- Rationale based on selective hepatic artery blood supply of liver metastases > 1 cm
- High local drug concentration reduces systemic toxicity
- 5-FU and fluorodeoxyuride (FUDR)
- Higher response rates and longer survival compared with systemic chemotherapy

# Immunotherapy

- Mainly used in advanced disease following failed conventional therapy
- Levamisole, an immune stimulant, used in adjunctive treatment with 5-FU
- Monoclonal antibody 17-1A effective in clinical trials in increasing survival following resection

# Selective Internal Radiotherapy

- Traditional external beam radiation obsolete due to radiosensitivity of normal liver
- Allows high doses of RT (200-300 Gy)
- Single dose microspheres delivered into hepatic artery causing selective tumor uptake and irradiation



# Conclusions

- Indications for resection of liver metastases broaden but basic principles persist
- Minimally invasive surgical techniques allow for greater pool of treatable pts
- Death from liver metastasis of colorectal cancer is preventable