Evolution of Surgery: Role of the Surgeon in the Molecular and Technology Age

Yuman Fong, MD
Memorial Sloan-Kettering Cancer Center
Rio 2010
- Molecular mechanisms for cancer
  - Prevention and screening
  - Molecular targeted therapies
Molecularly Targeted Therapies

- Cell proliferation
- Receptors
- Adhesion molecules
- Signal transduction
- Angiogenesis
- Cell differentiation

Will surgery become obsolete?
Evolution or Extinction

- Changes in surgery with more effective systemic therapies for cancer
- Changes in surgery with improving technologies
- Surgeons and operating rooms of the future
Gastrointestinal Stromal Tumor (GIST)

- GI sarcoma
- Before 2000, surgery was only effective therapy
- Standard chemotherapy ineffective: <5% response rate
- Survival < 2 yr for patients with metastatic disease
- Gleevec found in screen of molecules to target CML
- Responses seen in ~60% of GIST

- Median duration of response 9 m
Pre-treatment

6 months on STI-571

10 months on STI-571
Complication of Bleeding
Change in Role of Surgeon in Treatment of GIST

- Resection of down-staged patients
- Resection of bleeding patients
- Resection plus adjuvant therapy
Improved Drugs for Colorectal Cancer

- Fluorouracil
- Irinotecan
- Oxaliplatin
- Capecitabine
- Cetuximab
- Bevacizumab

Before 1995

1995

Fluorouracil

2010

- Fluorouracil
- Irinotecan
- Oxaliplatin
- Capecitabine
- Cetuximab
- Bevacizumab

After
Hepatic Colorectal Metastases
Improvements in Systemic Therapies

- Increasing number of patients suitable for surgery
  - 15% conversion to curatively resectable disease
  - Disappearing extrahepatic disease
  - Long term survivors with resectable hepatic and extrahepatic disease
  - Perforations on Avastin therapy
Role of Surgical Oncologist

- Predisposition
- Pre-malignant
- Stage I
- Stage II
- Stage III
- Stage IV

Traditional

Cure

Palliation
Role of Surgical Oncologist

- **Predisposition**
- **Pre-malignant**
- **Stage I**
- **Stage II**
- **Stage III**
- **Stage IV**

Traditional Cure

Downstaging And Better Adjuvant Rx Palliation

Cure Palliation
Role of Surgical Oncologist

- Predisposition
- Pre-malignant
- Stage I
- Stage II
- Stage III
- Stage IV
Influence of Molecular Biology on Surgical Oncologist

- Improve patient selection for resection
- Improve adjuvant therapies after potentially curative resections
- Down stage patients with advanced malignancies to surgically curable stage
- Allow removal of organs at risk in patients with high predisposition for cancer

Improved Outcome
Laparoscopic Hepatectomy

Obstacles

- Margins of tumor not always apparent
- Difficulties in retraction
- Risk of hemorrhage
- Risk of air-embolism
- Tedious parenchymal transection
- Difficulties removing specimen
Technical Advances
Laparoscopic Liver Resection

- **Until 2000**
  - Small series from select centers - FEASIBILITY

- **2000-2005**
  - Case-controlled series from many center - REFINEMENT OF PATIENT SELECTION

- **2005-present**
  - Increasing numbers of major resections - REFINEMENT OF TECHNIQUE
Laparoscopic Liver Resection
Summary of Studies

- Increased operative time
- Decreased blood loss
- Decreased post-operative narcotics
- Decreased length of stay
- Similar morbidity
- Similar rate of close margins
Consensus Conference

ORIGINAL ARTICLES

The International Position on Laparoscopic Liver Surgery

The Louisville Statement, 2008

Objective: To summarize the current world position on laparoscopic liver surgery.

Conclusions: Laparoscopic liver surgery is a safe and effective approach to the management of surgical liver disease in the hands of trained surgeons with experience in hepatobiliary and laparoscopic surgery. National and international societies, as well as governing boards, should become involved in the goal of establishing training standards and credentialing, to ensure consistent standards and clinical outcomes.


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- Define terms (standardization)
- Summarize data
- Define standard of care (billing)
- Define training (credentialing)
- Outline future studies
MIS Robotics
MiroSurge
Single Incision Laparoscopy

- Single port
- Curved instruments
- Increased cost
- Increased training
SILS Hepatectomy
Single Port Resection
SILS Hepatectomy

- Median hospital stay = 2 days (2-2)
- Median OR time 110 min (55-14)
- Median blood loss 50 cc (20-50)

Gaujoux et al., Surgical Endoscopy, 2010
OR of the Future

- Large
- Laparoscopy
- Central Controls
- Enhanced Communications
  - Pathology
  - Radiology
  - Each other

Big Fancy Wired
Non-White Light Laparoscopy

- Narrow band
  415nm and 540nm
- Near infrared
  800 nm to 2500 nm
- Auto-florescence
- Florescence
Narrow Band Imaging
Molecular-Guided Surgery
Green Fluorescent Protein

- Antibodies
- Metabolites
- Cancer-specific viruses
Fluorescent Detection of Bile

Stiles et al., Surgical Endoscopy, 2001
Imaging and Cancer Care

- XR
- Fluoroscopy
- Duplex Ultrasonography
- CT
- CT portography
- Magnetic resonance imaging
- MRCP
- MR spectroscopy
- Angiography
- ERCP
- Percutaneous transhepatic cholangiography
- Positron emission scanning
- Radioimmuno imaging
Intraoperative MRI and Image Guidance
O-Arm

2-D Fluoro with Memory Presets
3-D Reconstructions
Lateral patient access
Robotic positioning
Center for Image Guided Therapy

- Two 3-T MRI
- Two CT-Angiography Suites
- CT Fluoroscopy Suites
- CT PET
- RFA
- Cryoablation
- Microwave ablation
- HIFU
- Laparoscopy/ Thoracoscopy/ Cystoscopy
- Endoscopy
- Robotics
- Multi-modality Imaging
CT/Angiography Operative Suite

3-T Magnet
New Field of Advanced Image-guided Therapies

- Who should populate this field?
  - Surgeons, interventional radiologist, gastroenterologists

- Should surgeons perform percutaneous procedures

- How should these individuals be trained and credentialed?

- Who should start and control professional societies related to these novel therapies?
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