Proper Surgical Management of Gastric Cancer Patients

Yanghee Woo, MD FACS
Multidisciplinary Approaches to Cancer Symposium
Associate Professor; Director, GI Minimally Invasive Therapies Program; Vice Chair, International Surgery
Department of Surgery, City of Hope National Medical Center, USA
Disclosures

- Verb Surgical - Consultant
- Ethicon - Consultant
Introduction

• Surgery Residency at Columbia University Medical Center, NYP
• Research Fellowship at MSKCC, NYC
• Clinical Fellowship in Upper GI/Robotic Surgery at Yonsei University, Severance Hospital, S. Korea
• Assistant Professor/Director, Gastric Cancer Program at CUMC/NYP
• Joined City of Hope 3.5 years ago
Content

- Background
- Essential decision making for optimum surgical outcome
  - Importance of proper work-up and cTNM staging
  - Timing of surgical therapy
  - Extent of Resection/ Nodal Dissection
  - Selection of Approach
- Enhanced recovery after surgery protocols for gastric cancer
- The future of gastric cancer care
  - Standardization, evaluation, optimization, and dissemination
Background: Gastric Cancer (GC) Burden

3rd Leading Cancer Killer in World

<table>
<thead>
<tr>
<th>Country</th>
<th>Case/ 100,000</th>
<th>New dx/year</th>
<th>Deaths/year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td></td>
</tr>
<tr>
<td>U.S.A.</td>
<td>7.4</td>
<td>3.4</td>
<td>26,370</td>
</tr>
<tr>
<td>China</td>
<td>32.8</td>
<td>13.1</td>
<td>679,000</td>
</tr>
<tr>
<td>S. Korea</td>
<td>62.9</td>
<td>24.7</td>
<td>30,184</td>
</tr>
<tr>
<td>Japan</td>
<td>45.7</td>
<td>16.5</td>
<td>90,800</td>
</tr>
</tbody>
</table>
Background: GC Challenge in U.S.

- Incidence is low but more advanced than Japan and S. Korea and similar to China, Europe, and South America
  - Localized (28%)
  - Regional (27%)
  - Distant (35%)
  - Unknown (10%)
- Disease is heterogenous and perhaps more aggressive biology
- Patients are diverse, older & more obese
- Survival improving but outcomes are still not optimized

<table>
<thead>
<tr>
<th>STAGE</th>
<th>5 yr observed survival 2012</th>
<th>5 yr observed survival 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage IA</td>
<td>71%</td>
<td>94%</td>
</tr>
<tr>
<td>Stage IB</td>
<td>57%</td>
<td>88%</td>
</tr>
<tr>
<td>Stage IIA</td>
<td>45%</td>
<td>82%</td>
</tr>
<tr>
<td>Stage IIB</td>
<td>33%</td>
<td>68%</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>20%</td>
<td>54%</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>14%</td>
<td>36%</td>
</tr>
<tr>
<td>Stage IIIC</td>
<td>9%</td>
<td>18%</td>
</tr>
<tr>
<td>OVERALL</td>
<td>25%</td>
<td>30%</td>
</tr>
</tbody>
</table>
Early Detection is Difficult
  • No screening
  • No biomarker for early detection

Early Stages are Asymptomatic
  • No symptoms (80%), Atypical sx (15%)
  • Anemia, weight loss, & dysphagia (<5%)

Advanced Stages can also be Asx
  • Weight loss (60%)
  • Bloating, abdominal pain (50%)
  • Decreased appetite (30%), Nausea (30%)
  • Difficulty swallowing/ Acid reflux (20%)
  • Melena (20%), Early satiety (20%)

Duration of Symptoms at Diagnosis
  - Less than 3 months 40%
  - 3-12 months 40%
  - Greater than 12 months 20%
Background: Current Status of GC

- **Early Gastric Cancer** → resection is curative
  - Endoscopic Resection (EMR, ESD)
  - Surgical radical gastrectomy

- **Advanced Gastric Cancer** → majority will recur within 3 years despite multimodality treatment
  - To offer best chance at life without cancer: must perform proper extent of surgery within multimodality treatment strategy:
    - Timing of radical gastrectomy (R0 resection)
    - Adequate extent of lymphadenectomy (D1+ or D2?)
    - Offer adequate perioperative chemotherapy or + neoadj/ adj radiation

- Also must keep in mind ways to minimize trauma to ensure postoperative short-term and long term QoL
Multimodality Management of Resectable GC

Refining the management of resectable esophagogastric cancer: FLOT4, CRITICS, OE05, MAGIC-B and the promise of molecular classification

PMID: 29998022

Jeremy Chuang¹, Jun Gong², Samuel J. Klepner³,⁴, Yanghee Woo⁵, Joseph Chao²

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Table 1 Phase III trials of adjuvant chemoradiation in resected gastric cancer

<table>
<thead>
<tr>
<th>Trial (region)</th>
<th>Trial (region)</th>
<th>Intervention</th>
<th>Experimental arm</th>
<th>Control arm</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT0116 (USA)</td>
<td>ACTS-GC (Japan)</td>
<td>MAGIC (United Kingdom)</td>
<td>Nivolumab</td>
<td>Placebo</td>
<td>Primary: OS, DFS</td>
</tr>
<tr>
<td>ARTIST (South Korea)</td>
<td>FNCCLC/FFCD (France)</td>
<td>CRITICS (Dutch)</td>
<td>Placebo</td>
<td></td>
<td>Secondary: OS rate at 1, 2, and 3 years</td>
</tr>
<tr>
<td>CALGB 80101 (USA)</td>
<td>CLASSIC (Korea, China, Taiwan)</td>
<td>MAGIC-B/ST03 (United Kingdom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAMIT (Japan)</td>
<td>FLOT4-AIO (Germany)</td>
<td>POET (Germany)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITACA-S (Italy)</td>
<td>EORTC 40954 (Germany)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OE05 (United Kingdom)</td>
<td></td>
<td>Neoadjuvant chemotherapy</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Phase III trials of adjuvant chemotherapy in resected gastric cancer

<table>
<thead>
<tr>
<th>Trial (region)</th>
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<th>Intervention</th>
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<th>Control arm</th>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 Phase III trials of perioperative and neoadjuvant chemotherapy in gastroesophageal cancer

<table>
<thead>
<tr>
<th>Trial (region)</th>
<th>Trial (region)</th>
<th>Intervention</th>
<th>Experimental arm</th>
<th>Control arm</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checkmate 577 (Global)</td>
<td>Adjuvant after neoadjuvant chemoRT and surgery for esophageal/GEJ</td>
<td>Nivolumab</td>
<td>Placebo</td>
<td>Primary: OS, DFS</td>
<td></td>
</tr>
<tr>
<td>KEYNOTE 585 (Global)</td>
<td>Perioperative for GEJ/gastric</td>
<td>XP or FP + Pembrolizumab</td>
<td>XP or FP + Placebo</td>
<td>Primary: OS, event-free survival, path CR rate</td>
<td></td>
</tr>
<tr>
<td>ATTRACTION-05 (Japan, South Korea, Taiwan, China)</td>
<td>Adjuvant for GEJ/gastric</td>
<td>S-1 or CapeOX + Nivolumab</td>
<td>S-1 or CapeOX + placebo</td>
<td>Secondary: DFS</td>
<td></td>
</tr>
<tr>
<td>RAMSES (Germany)</td>
<td>Perioperative for GEJ/gastric</td>
<td>FLOT + Ramucirumab</td>
<td>FLOT</td>
<td>Primary: RFS (central assessment)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 Phase III trials incorporating chemoradiation into perioperative or neoadjuvant chemotherapy for gastroesophageal cancer

<table>
<thead>
<tr>
<th>Trial (region)</th>
<th>Timing, intervention, disease subset</th>
<th>Experimental arm</th>
<th>Control arm</th>
<th>Study endpoints</th>
<th>Study number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checkmate 577 (Global)</td>
<td>Adjuvant after neoadjuvant chemoRT and surgery for esophageal/GEJ</td>
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<td>Placebo</td>
<td>Primary: OS, DFS</td>
<td>NCT02743494</td>
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<tr>
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<td>XP or FP + Pembrolizumab</td>
<td>XP or FP + Placebo</td>
<td>Primary: OS, event-free survival, path CR rate</td>
<td>NCT03221426</td>
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<tr>
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<td>Adjuvant for GEJ/gastric</td>
<td>S-1 or CapeOX + Nivolumab</td>
<td>S-1 or CapeOX + placebo</td>
<td>Secondary: DFS</td>
<td>NCT03006705</td>
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<tr>
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<td>Perioperative for GEJ/gastric</td>
<td>FLOT + Ramucirumab</td>
<td>FLOT</td>
<td>Primary: RFS (central assessment)</td>
<td>NCT02861971</td>
</tr>
</tbody>
</table>
Trend Towards Personalized Therapies

Evidence that VEGF is associated with tumor aggressiveness and poor survival in GC patients

Discovery of HER2 amplifications in GCs sensitive to trastuzumab

NGS (i.e., exome sequencing and whole-genome sequencing) begins to revolutionize molecular characterization of GC

TCGA comprehensive molecular characterization of GC completed

ACRG molecular characterization of GC completed

Immunotherapy becomes promising

2002

ToGA trial: Trastuzumab in combination with chemotherapy improves survival in HER2-positive advanced GCs

2005

2010

2011

2014

REGARD trial: Ramucirumab prolongs overall survival in advanced GC patients who had progressed after first-line chemotherapy

2015

KEYNOTE-012 trial: Early encouraging results of antitumor activity of Pembrolizumab for PD-1 inhibition in advanced GC

2016

Precision clinical trials with patients selected based on molecular characterization of GC

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Cellular and Molecular Gastroenterology and Hepatology 2017 3, 348-358 DOI: (10.1016/j.jcmgh.2017.02.003)
Surgery Has Greatest Impact on Survival

- Surgical therapy for GC should also be personalized
- Greatest impact in the survival and QoL of patients with resectable gastric cancer

1. **Primary goal is oncologic**: radical resection with free-margin gastrectomy and proper extent of lymphadenectomy to achieve optimum long-term survival without cancer for our patients

2. **Secondary goal is functional**: preservation of patient’s quality of life by minimizing surgical trauma
Major Achievements in GC Surgery

- **Extent of Lymphadenectomy (D1+ vs D2)**
  - Decades of East vs West debate, clinical trials and ongoing studies
  - Proper Lymphadenectomy Improves Patient Survival

1. **International consensus on D2 lymphadenectomy for locally advanced gastric cancer**
   - Recommended by GC Societies
     - JapaneseRSGC, KoreanGCA, ChineseGCA, Brazilian GCA, GermanGCSG, BritishAUS&BASO, ESMO-ESSO
     - NCCN (≥ 16 LN, D1+ or modified D2 only by experienced surgeons at high volume centers)

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**Japanese Gastric Cancer Association 2002**

- **Dutch D1 vs D2**
  - Bonenkamp et al. NEJM, 1998
  - M&M: 28% vs 46%; 6.5% vs 13%

- **MRC ST01 D1 vs D2**
  - Cuschieri et al. BJC, 1998
  - M&M: 25% vs 43%; 4% vs 10%

- **IGCCSG-R01**
  - Degiuli et al. Br JSurg 2010
  - M&M: 12% vs 17%; 3% vs 2%

- **15 year Dutch trial**
  - Songun. Lancet Oncol 2010
  - OS: 37% vs 48%
Significance of LNs and LND

• Lymph node status, a powerful clinical indicator of survival
  • Extent of nodal dissection, total # LN: >15, >16 or more, optimum #?; location of +LN, all impact patient survival*
  • Extent of dissection is associated with retrieved # of LNs
    • Anatomic studies: DSG with D2 = 29.1 LNs; TG with D2 = 31
    • Clinical studies: mean 33-40 LNs when D2 LND is performed
  • D2 lymphadenectomy – technically demanding but can improve survival

*J. Surg Onc 2017 (USA); JCO 2005 (USA); Gastric Cancer 2012 (Canada); J Am Coll Surg. 2015 (USA); Ann Surg Onc 2017 (China); JACS 2017 (S. Korea & US); PLoS One 2017 (Korea & Japan)
A D2 dissection … in experienced hands should be considered standard of care for advanced resectable gastric cancer, both in Asian and in Western patients.  

Proper Extent of Surgery Improves Survival

Lymph node dissection in resectable advanced gastric cancer.
de Steur WO, Dikken JL, Hartgrink HH.
Department of Surgery, Leiden University Medical Center, Leiden, The Netherlands. w.o.de_steur@lumc.nl

“A D2 dissection … in experienced hands should be considered standard of care for advanced resectable gastric cancer, both in Asian and in Western patients.”

Proper Surgical Management of Gastric Cancer Patients
Major Achievements in GC Surgery

- Minimally invasive surgery and advancements in surgical technology has been improving patient outcome and QoL.
Minimally Invasive Surgery Improves Recovery

- MIS has become the preferred surgical approach for ECG by a growing number of surgeons worldwide.

- **Lap ADVANTAGES over Open**
  - Shorter hospital stay
  - Less blood loss
  - Less pain medicine
  - Decrease complications
  - No increase in operative complications

- **Lap DISADVANTAGES over Open**
  - Lap D2 lymphadenectomy is technically difficult to perform
  - Learning curve >50 cases
  - Longer operative times
  - ? Less LN retrieval
  - More costly
  - Mostly studied in EGC pts
  - Studies on-going in AGC with D2

- Long term outcome of RCT in EGC and AGC
  - JLSSG091 (ACG), Klass I (EGC), Klass II (ACG), REALIZATION (AGC), LOGICA
  - CLASS01 (AGC)
**Robotics Capitalizes on Surgical Technology**

<table>
<thead>
<tr>
<th>Case Series</th>
<th>2016 Quijano (Spain) n= 17</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Barchi (Brazil) n= 6</td>
</tr>
<tr>
<td></td>
<td>Herrera (US)</td>
</tr>
<tr>
<td></td>
<td>2015 Zheng (China)</td>
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<tr>
<td></td>
<td>Zhou (China)</td>
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<tr>
<td></td>
<td>Parisi (Italy)</td>
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<tr>
<td></td>
<td>Kakeji (Japan)</td>
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<tr>
<td></td>
<td>Harrison (US)</td>
</tr>
<tr>
<td></td>
<td>Coratti (US)</td>
</tr>
<tr>
<td></td>
<td>2014 Park (Korea)</td>
</tr>
</tbody>
</table>

**Multiinstitutional Prospective Study of Robotic vs Lap Gastrectomy for Gastric Cancer**

No difference between robotic versus laparoscopy except **D2 less blood loss in robotic arm**

- EBL (50 vs 60cc median), Open conversion, LOS (6 days median R&L), Complication Rates (~11.9 vs 10.3%)
- Major complication 1.1% for robotic and no other differences

**Robotic D2 Lymph Node Dissection During Distal Subtotal Gastrectomy for Gastric Cancer: Toward Procedural Standardization.**

Kim YM, Son T, Kim H, Noh SH, Hyung WJ

**Surgeon Skills**

- **Conducted in S. Korea by expert (have 50-1000 laparoscopic and 4-450 robotic cases; 9 had less than 30 robotic operations)**

**Patients had average BMI 23.6, Age 53 vs 56 (0.024)**

- >80% EGC in both arms

**Publications on Robotic Surgery for Gastric Cancer**

- Yang (China) 173/511/241
- 2012 Kim (Korea) 43/ 861/4542
- 2010 Kim (Korea) 16 / 11 /12
- Huang (Taiwan) 39 / 64 / 586

**Robot vs Lap**

<table>
<thead>
<tr>
<th>2016 Cianchi (Italy)</th>
<th>41/30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim (Korea)</td>
<td>87/437</td>
</tr>
</tbody>
</table>

**Single Institution RCT Wang G (China) n= R158/ O153**

**Robot vs Open**

- 2016: Okumura (Japan) 49/132
- 2011: Procopiuc (Romania) 18/29
- 2011: Caruso (Italy) 29 / 120
- 2015: Han (Korea) 68/69
- 2014: Hyun (Korea) 121/ 81
- 2013: Kang (Korea) 100 /282
- 2012: Eom (Korea) 30/ 62
- 2010: Hur (Korea) 7/ 11

- **2016: Parisi (Italy+) 151/151/302**
- 2012: Kim (Korea) 43/ 861/4542
- 2010: Kim (Korea) 16 / 11 /12

**EBL (50 vs 60cc median), Open conversion, LOS (6 days median R&L), Complication Rates (~11.9 vs 10.3%)**

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**Robot vs Lap vs Open**

- 2017: Parisi (Italy+) 151/151/302
- 2012: Kim (Korea) 43/ 861/4542
- 2010: Kim (Korea) 16 / 11 /12

**Huang (Taiwan) 39 / 64 / 586**

**Proper Surgical Management of Gastric Cancer Patients**
Practice of Gastric Cancer Surgery in US

<table>
<thead>
<tr>
<th>Approach</th>
<th>Open</th>
<th>Laparoscopic</th>
<th>Robotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Performed</td>
<td>&gt; 80%</td>
<td>8.2% to 9.1%</td>
<td>1.8% - 6.7%</td>
</tr>
</tbody>
</table>

National Inpatient Sample

- **ROBOTIC DISADVANTAGES**
  - Highest $$ (P = 0.017)
  - Higher DVT Rate (P = 0.038)

- **LAP DISADVANTAGES**
  - More Superficial Infection (P = 0.013)

(n=8314) US academic medical centers (2008-2013), Glen AJ. Surgery 2015; (n=8128) National Inpatient Sample (data under analysis 2017)
(n=6427) in the ACS and American Cancer Society National Data Base (2010-12), Greenleaf. Gastric Cancer 2016
Practice of GC Surgery in US

>15 LN retrieved
Community 26.2%
Comprehensive 30.2%
Teaching 39.6%

Multimodality?
Surgery Alone 55-58%

Adequate LN assessment in less than 50% in US versus 97.6% in S. Korea

Recurrence is high
Locoregional recurrence – up to 38%

Western Validation of a Novel Gastric Cancer Prognosis Prediction Model in US Gastric Cancer Patients

Yanghee Woo, MD, FACS, Bryan Goldner, DO, Taeil Son, MD, Kijun Song, PhD, Sung Hoon Noh, MD, PhD, Yuman Fong, MD, FACS, Woo Jin Hyung, MD, PhD

<table>
<thead>
<tr>
<th>Type of Resection</th>
<th>Subtype</th>
<th>Node Count</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodal dissection</td>
<td>Total</td>
<td>16.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Adequate nodal dissection</td>
<td>Total</td>
<td>40.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&lt;15 nodes</td>
<td>Total</td>
<td>7,257 (52.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≥ 15 nodes</td>
<td>Total</td>
<td>6,675 (47.9)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Our Practice at City of Hope NCCC

- An independent, biomedical research institution since 1913 dedicated to the prevention, treatment and cure of cancer
- Founding member and one of the NCI designated National Comprehensive Cancer Centers in the United States setting national standards for cancer care
- More than 300 clinical studies per year enrolling about 5,000 patients
- Over 100 gastric cancer patients treated at COH per year; ~60 undergo radical resection (1/3 white, 1/3 Asian, 1/3 Hispanic and other)
Multidisciplinary Care for Optimal Outcome

**GI**
- Diagnostic endoscopy/biopsy
- Staging Endoscopy/EUS
- EMR/ESD
- Palliative interventions

**Surgical Oncologist**
- Standardized Surgical Options
- Open, Lap vs Robotic Surgery
- Proper extent of lymph node dissection
- Selective palliative surgical strategy
- Clinical Trials (Radiolabeled-antibody imaging)

**Medical Oncologist**
- Neoadjuvant chemotherapy
- Periop/Adjuvant chemotherapy
- Hormone receptor therapy
- Clinical Trials (check point inhibitors)

**Radiation Oncologist**
- Neoadjuvant Treatment
- Adjuvant Treatment
- Palliative Options
- Clinical Trials

**Pathologist**
- Gastric Cancer Patient Registry

**Radiologist**
- Coordinated Cancer Care

**Family, Friends, Supportive Medicine, Nutritionists, Physical therapy, Prayer**

Proper Surgical Management of Gastric Cancer Patients
Clinical Staging Guide Timing of Surgery

- **EUS** (accuracy)
  - cT (~65-92%); cN (~30-90%)

- **CT scan** of Chest/Abdomen/Pelvis
  - cN (51-84%, 90%)

- **PET scan** if distant metastases suspected
  - Accuracy 30% in distal tumors vs 80% in proximal tumors

- **Staging laparoscopy**: 10% - 23% AGC have occult peritoneal disease at
  - MSKCC 1993-2002 – 657 staging laparoscopies in non-T1 tumors found M1 disease in 23%
  - 72% peritoneum, 8% liver, 8% para-aortic LNs
  - Higher rate in patients <70 (34%), GE junction and whole stomach tumors (68%), and poor differentiation (36%), T3/4 tumors (63%), patients with +LNs (66%)
Proper staging helps determine treatment options and prognosis
Accurate clinical staging is essential to plan extent of surgery (extent of resection, extent of LND)

Clinical T-Stage Guides Extent of Surgery

<table>
<thead>
<tr>
<th>T stage</th>
<th>% positive LN</th>
</tr>
</thead>
<tbody>
<tr>
<td>cT1a</td>
<td>~ 5%</td>
</tr>
<tr>
<td>cT1b</td>
<td>~ 24%</td>
</tr>
<tr>
<td>cT2</td>
<td>~ 52%</td>
</tr>
<tr>
<td>cT3</td>
<td>~ 67%</td>
</tr>
<tr>
<td>cT4a</td>
<td>~74%</td>
</tr>
<tr>
<td>cT4b</td>
<td>~82%</td>
</tr>
</tbody>
</table>

- Least likely to have LN involvement if <2cm, well differentiated, non-ulcerated (1.7%)
- More likely in
  - larger tumors >4cm
  - poorly differentiated
  - proximal location
  - presence of lymphovascular invasion
Treatment Algorism for Resectable GC

M0
- cT1ab
- cT2
- cT4b
- or cN2+

M1

cN0
- Well Differentiated ≤ 2cm, UL (-)
- Endoscopic resection
- Ideal for MIS → Lap or Robotic
- → Robotic
- → Open
- → Lap

cN+
- Well Differentiated ≤ 1.5, UL (-)

+/- Neoadjuvant Therapy

+/- Adjuvant Therapy

Clinical Trials

Chemotherapy, radiation, surgery, Herceptin, immune checkpoint inhibitors

Proper Surgical Management of Gastric Cancer Patients
1. Decision for D2 guided by disease and selection of approach is the surgeon’s choice
2. Based on pt factors, tumor characteristics, surgeon training and experience, resources
3. I prefer ROBOTIC as my MIS approach of choice for medically fit patients, cEGC (D1+,D2), cAGC (D2) w curative intent
   • Robotic radical gastrectomy with D2 easier to perform than lap
   • Robot-assistance very useful in the absence of a skilled human assistant
4. Prefer OPEN approach for all T4ab or bulky LNs or patients who are at high medical risk
## Robotic Surgery is My MIS of Choice

### For the Surgeon

Advantages of robotic technology
- Better learning curve
- Improved operative view
- Precision of dissection
- Reliable assistant with control of four instruments
- Better ergonomics

### For Our Patients

Advantages of MIS
- Less blood loss
- Decreased pain
- Decreased hospitalization time
- Earlier return to diet
- Overall quicker recovery
- Comparable complication rates
Case Presentation I (2014)

- 41 yo Armenian-American woman with poorly differentiated adenocarcinoma, diffuse type, SRC
  - Abdominal pain, PUD, H. pylori positive
  - BMI: 24.3 m²/kg

- Work-up
  - EGD: prepyloric ulcer with partial pyloric obstruction
  - EUS: 2.1x2.9 hypoechoic mass invading the subserosa with enlarged peritumoral lymph node
  - CTCAP: Negative for distant metastases, two enlarged lymph nodes in LN station #6

- Clinical Stage: cT3N1M0

- Therapeutic Plan: Robotic subtotal distal gastrectomy, D2 lymphadenectomy, followed by chemoradiation therapy
Robotic Distal Gastrectomy with D2 LND
Optimize Surgical Outcomes with ERAS

Before Surgery
- Patient & Family Education
- Nutritional Optimization
- Prehabilitation
- Carbohydrate loading and elimination of NPO

During Operation
- Opioid sparing, multimodal analgesia
- Goal directed fluid therapy
- N/V prophylaxis
- Normothermia
- Normoglycemia
- Avoid tubes, drains and lines

After Surgery
- Early PO intake / nutrition
- Early mobilization
- Multimodal analgesia
- Nausea/vomiting treatment
- Judicious IV fluid management
- Defined discharge criteria
- Patient education
Standardized Postop Care

• **Subtotal Distal Gastrectomy**
  - No NGT
  - No drains
  - Water
  - PCA
  - OOB/DVT Prophyl
  - Regular diet
  - PCA/NSAID/Tylenol
  - OOB/DVT Prophyl
  - DC Foley
  - Discharge planning

POD#1 | POD#2 | POD#3 | POD#4-6
--- | --- | --- | ---

• **Total gastrectomy**
  - NPO >24hrs
  - PCA
  - OOB
  - JP Drain
  - Sips of Water
  - PCA/NSAIDS/Tylenol
  - OOB/DVT Prophyl
  - JP Drain
  - Regular small portions
  - PCA/NSAIDS/Tylenol
  - OOB/DVT Prophyl
  - DC JP Drain

POD#1 | POD#2 | POD#3 | POD#4 | POD#5-7
--- | --- | --- | --- | ---
ERAS Improves Clinical Outcomes

ERAS (n=20) Dedicated management of gastric cancer patients

Matched CONTROL (n=40) Each Surgeon’s conventional surgical management

Propensity Score Matching Analysis: Age; Sex; Comorbidities; BMI; Stage

ERAS GC GROUP compared to historical controls had:
- Faster resumption of diet (Clears by 2.3d vs 5.6d, p<0.01)
- Shorter hospital length of stay (5.5d vs 8.0, p<0.004)
- No difference in complications and 30 day readmission rate

Prospective clinical trial evaluating ERAS for GC will start January 2019 at COH
**Case I Patient Operative Outcome**

**IntraOperative:**
- EBL: 50cc
- Operative time: 4hrs 50 min

**Postoperative Course on ERAS:**
- Uneventful, Dc home on POD#6
- 12% weight loss

**Pathology:** pT3N3M0, 8/74 LNs (Stage IIIB)
- 6.2cm x 4cm circumferential, antral mass,
- poorly differentiated adenocarcinoma, signet ring cells

<table>
<thead>
<tr>
<th>LN Station</th>
<th>Total #LN</th>
<th>+ #LN</th>
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<tr>
<td>#1</td>
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<td>0</td>
</tr>
<tr>
<td>#3</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>#4</td>
<td>21</td>
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<td>#5</td>
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<td>#6</td>
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<td>#7</td>
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<td>#9</td>
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<tr>
<td>#12a</td>
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<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>
Case Presentation II (2017)

- 59 yo surgeon with moderately differentiated gastric adenocarcinoma
  - 13yr history of reflux symptoms, H. pylori positive
  - BMI 30.4m²/kg

- Staging Work-up
  - Endoscopy/ EUS
    - Located in the distal body, proximal antrum, 4cm ulcerated
    - cT3N1 (two nodes enlarged)
  - CTCHAP – negative for distant metastatic disease
  - PET avid primary lesion with no nodal disease

- Clinical Stage: cT3N1M0
- Therapeutic Plan: Preoperative FLOT: 6 cycles (vs. 4 preop)
- OR for dx lap, robotic subtotal gastrectomy, D2 LND, partial omentectomy, Roux-en-Y reconstruction
Operative Outcome

IntraOperative:
- EBL: 250 cc; Operative Time: 5 hrs 10 min
- Complications: staple line rupture on LGA stump

Postoperative Course
- POD#1 clears, POD#2 clears - solid, POD#3 regular diet; DC’d on POD#3
- Back to work 2 weeks postop; 3 and 6 month follow-up back to normal weight

Pathology: ypT1bN0 (Stage I)
- Rare
  - LN station: 1 3 4 5 6 7 8a 9 11p 12a total
  - Total LN#: 4 6 10 2 10 3 1 4 3 3 46
  - #LN +: 0 0 0 0 0 0 0 0 0 0 0
- ypT1bN0
Case Presentation III (2013)

- 59 yo Indian American man with poorly differentiated gastric adenocarcinoma, diffuse type located in the cardia of the stomach
  - Endoscopy/ EUS
    - Located in the cardia 4cm extending proximally to involve the EGJ
    - cT3N1 (one enlarge celiac/left gastric artery)
  - CTCHAP – negative for distant metastatic disease
  - PET avid primary lesion with pericardial nodal disease
- Clinical Stage: cT3N1M0
- Therapeutic Plan: Preoperative CROSS regimen (preop chemoXRT)
- OR for dx lap, robotic extended total gastrectomy, D2 LND, partial omentectomy, Roux-en-Y EJ reconstruction
- R0: ypT2N2M0, locoregional + peritoneal recurrence found at 2 year follow-up with preceding symptoms for several weeks
Case Presentation IV (2018)

- 43 yo non-Hispanic white man with poorly differentiated gastric adenocarcinoma, diffuse type SRC located in the cardia of the stomach extending to involve the distal esophagus (3cm)
  - Endoscopy/ EUS
    - Located in the cardia 4cm extending proximally to involve the EGJ
    - cT3N1 (one enlarge celiac/left gastric artery)
  - CTCHAP – negative for distant metastatic disease
  - PET avid primary lesion with suprapancreatic nodal disease
  - Staging laparoscopy
- Clinical Stage: cT2N1M0
- Therapeutic Plan: **Perioperative FLOT regimen**
- OR for dx lap, robotic esophagogastrectomy, D2 LND in the abdomen minus some #6 and #4, partial omentectomy, gastric pull-up, feeding jejunostomy
- R0: ypT0N0M0, no evidence of disease at 6 months
Single Surgeon Robotic Surgery Experience

• First 100 robotic GC cases (total, distal, D1+, D2)
  – Age=60.2 yrs, BMI=26.7m²/kg; EBL = 188.8 cc; Op Time = 339.2 min
  – Average # of LN retrieved = 34.8
  – Major complications: No 90 day mortality; 3 emergent reoperations:
    1. Heat injury to the duodenal stump → 2mm perforation → leak → sepsis (POD 3)
    2. Perijejunoojejunostomy perforation <5mm perforation in the jejunum → leak → sepsis (POD 5)
    3. Early postop obstruction (After discharge on POD 14)
  – Other Complications: 3 EJ leaks s/p total gastrectomy (1 stented, 1 managed without intervention)
    – LOS = 5.8 days

• Over 200 robotic operations including gastrectomies, cholecystectomies, pancreatectomies (whipple and distal), hernia repairs
Conclusion: Practice the Highest Standards

• Provide patient-tailored individualized therapy based on best-available evidence and guidelines
  – Build your multidisciplinary gastric cancer care team
  – Institute guideline based standards for GC patient care and optimize each point of care for quality improvement

• Surgery for locally advanced GC should be performed within comprehensive multimodality strategy that ensures optimum DFS and QoL.
  – Timing, proper extent, and approach are essential to optimizing patient outcomes

• Work together to decrease the number of deaths due to gastric cancer in the United States and worldwide.
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And Growing…

Proper Surgical Management of Gastric Cancer Patients
Thank you for your attention!

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