Advanced Imaging and the Colon-
Which Technology Should I Adopt?

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Learning Objectives

• Identify imaging and education methods to increased adenoma detection rate
• Distinguish hyperplastic, adenoma, using optical imaging without pathology
• Improve recognition of sessile serrated polyps
Some Simple Principles

- Eyes and hands are our best technology
- More looking, less biopsy
- Broad field techniques to detect
- Small field techniques to characterize

Why Should We Bother?

- Improved Adenoma Detection Reduces Interval Colorectal Cancer
- Health Care Reform Will Demand Lower Costs (pathology, anesthesia), Better Outcomes (CRC Prevention)

Kaminski et al NEJM 2010;362:1795
Ketover et al. CGH 2013; 11:454
Lowering Costs with Optical Biopsy
Resect and Discard Small Colon Polyps

- Potential for > $1 billion in cost savings
- Small risk of incorrect assignment of surveillance
- Very small risk of missed diagnosis of cancer
  - $1/1000 cancer in small polyps x $1/50 incomplete removal
    = $1/50,000 of improperly treated cancer
- ASGE PIVI thresholds
  - ≥90% negative predictive value for hyperplastic in small distal polyps
  - ≥90% correct surveillance interval assignment

Disruptive Change

Bundled Payments
- Combined reimbursement for:
  Colonoscopy + Pathology + Sedation

Pay for Performance
- Do you really need pathology to confirm a resected small adenoma or hyperplastic polyp?

Kessler et al. Endoscopy 2011;43:683
Rex et al. GIE, 2011;73:419
Ketover et al. CGH 2013; 11:454
Advanced Imaging Options

- Standard Endoscopy
- High Def Endoscopy
- Chromo-NBI-FICE
- Zoom Endoscopy
- Confocal Endoscopy

Accuracy of NBI for Polyps: Meta-analysis of 6 Trials: Expert Centers, Offline Review

- Sensitivity: 92%
- Specificity 91%

Van den Broek et al. GIE;2009:69:124
NBI International Classification for Endoscopy (NICE)

Hewitt et al. Gastro 2012;143:599

**COLOR**
- HYPERPLASTIC: Same as background
- ADENOMA: Lighter than background

**VESSELS**
- HYPERPLASTIC: No vessels
- ADENOMA: Isolated tiny vessels coursing across the lesion

**PIT PATTERN**
- HYPERPLASTIC: Dark spots surrounded by white
- ADENOMA: Writhed, branched vessels surrounding white structures

**Accuracy of NBI for Polyps In Clinical Practice**

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>NPV</th>
<th>Surveillance prediction accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectosigmoid (&lt;6mm)</td>
<td>85%</td>
<td>78%</td>
<td>91%</td>
<td>80%</td>
</tr>
<tr>
<td>PIVI Threshold</td>
<td></td>
<td></td>
<td>90%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Ladabaum et al. Gastro 2013;144:81
Accuracy of in vivo colorectal polyp discrimination using dual focus high definition narrow band imaging colonoscopy

Michael B Wallace, Julia E Crook, Susan Coe, Vivian Ussui, Estela Staggs, Mihir K Patel, Ernest Bouras, John Cangemi, Andrew Keaveney, Michael Picco, Douglas Riegert-Johnson

DDW 2013

Methods

- Randomized controlled trial
- Olympus 190 Exera III system
  - Dual Focus lens
    - Short focal length for 1-2mm distance
    - Standard focal length for 10-100mm distance
    - Brighter NBI
- Standard 180 Exera II system
  - Olympus CF or PCF 180 colonoscope
Polyp Prediction Accuracy: Small (<6mm) rectosigmoid (PIVI polyps)
N= 224 polyps

Surveillance Interval Predication: for polyps ≤5mm with high confidence (PIVI)
Can Advanced Imaging Increase Adenoma Detection in Screening Colonoscopy?

NBI vs White Light Endoscopy for Adenoma Detection: A Meta-Analysis

<table>
<thead>
<tr>
<th>Study ID</th>
<th>RR (95% CI)</th>
<th>Events, Treatment</th>
<th>Events, Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rex et al (2007)</td>
<td>0.97 (0.84, 1.11)</td>
<td>141/217</td>
<td>146/217</td>
</tr>
<tr>
<td>Adler et al (2008)</td>
<td>1.36 (0.91, 2.04)</td>
<td>45/198</td>
<td>39/198</td>
</tr>
<tr>
<td>Inoue et al (2008)</td>
<td>1.23 (0.89, 1.71)</td>
<td>51/122</td>
<td>41/121</td>
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<tr>
<td>Kaltenbach et al (2008)</td>
<td>1.15 (0.89, 1.47)</td>
<td>68/135</td>
<td>62/141</td>
</tr>
<tr>
<td>Adler et al (2009)</td>
<td>1.02 (0.84, 1.27)</td>
<td>140/625</td>
<td>137/631</td>
</tr>
<tr>
<td>Fagg et al (2009)</td>
<td>0.98 (0.78, 1.24)</td>
<td>59/103</td>
<td>63/108</td>
</tr>
<tr>
<td>Overall (I $^2$ = 0.4%, p = 0.413)</td>
<td>1.06 (0.97, 1.16)</td>
<td>505/1400</td>
<td>482/1416</td>
</tr>
</tbody>
</table>

6% increase in adenoma detection (p=NS)

Dinesen et al. GIE 2012;75:604
High Definition Colonoscopy: A Meta-Analysis

<table>
<thead>
<tr>
<th>Study</th>
<th>N (std def)</th>
<th>N (HD)</th>
<th>ADR (total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East 2008</td>
<td>72</td>
<td>58</td>
<td>65%</td>
</tr>
<tr>
<td>Pellise 2008</td>
<td>310</td>
<td>310</td>
<td>26%</td>
</tr>
<tr>
<td>Burke 2010</td>
<td>426</td>
<td>426</td>
<td>23%</td>
</tr>
<tr>
<td>Buchner 2010</td>
<td>1226</td>
<td>1204</td>
<td>27%</td>
</tr>
<tr>
<td>Tribonias 2009</td>
<td>197</td>
<td>193</td>
<td>54%</td>
</tr>
</tbody>
</table>

Net effect of HD
3.5% increase in all ADR
-0.1% advanced ADR

Subramanian et al Endoscopy 2011;43:499

Mayo Endoscopic Quality Improvement Project
“EQUIP” Trial
Randomized Trial of Education Intervention

P<0.01

Coe et al Am J Gastro 2013;108.219
Detecting Serrated Polyps: The next frontier

- Easily missed
- Source of interval cancers
  - BRAF mutated, MSI-high
- Often incompletely resected

Pohl H, Gastro 2013;144:74
SSA/P with Indigocarmine chromo
Summary

• Multimodal advances in endoscopic imaging and training have improved adenoma detection
  ◦ Training/education >> Technology
• Current imaging systems allow accurate optical biopsy in expert hands
  ◦ New guidelines for “resect and discard” anticipated
• Training/education programs needed for widespread application and cost savings
• Need to recognize and completely remove sessile serrated polyps

Thank You

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