Advances in Endoscopic Imaging

Michael B Wallace MD MPH
Professor of Medicine
Chief, Gastroenterology and Hepatology
Mayo Clinic Florida
Learning Objectives

• Identify methods of colonoscopy associated with increased adenoma detection rate

• Identify methods of upper endoscopy associated with higher dysplasia detection rates in Barrett’s

• Be able to distinguish hyperplastic, adenoma, and advanced neoplasia in colon polyps based on optical imaging without pathology
Some Simple Principals

- Eyes and hands are “best” technology
- More looking, less biopsy
- Broad field techniques to detect
- Small field techniques to characterize
- “Microscopy” to diagnose
Applications

• Polyp detection and classification
  • Polypectomy for only adenomas
  • Remove and discard tubular adenomas
  • Real time guide to Rx (EMR)

• Colitis dysplasia detection
  • Eliminating random biopsy
  • EMR for ALMs

• Barrett’s dysplasia detection and Rx
  • Eliminating random biopsy
  • Real time guide to Rx (ablation/EMR)
Can Advanced Imaging Replace Random Biopsy in IBD Surveillance?
Randomized Controlled Trial of Pan-Chromo vs Standard for CUC-C Surveillance

Kiesslich, Gastro, 2003, 124:880-888

165 patients CUC-C

84 Chromo

81 Standard

Random + Targeted Bx’s

32 Neoplastic sites

10 Neoplastic sites (p=0.003)
Yield of Chromo-targeted vs Random Biopsy

<table>
<thead>
<tr>
<th></th>
<th>Yield for Neoplasia on Biopsy</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromo group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-targeted</td>
<td>49/344 (8%)</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>-random</td>
<td>20/12,840 (0.16%)</td>
<td></td>
</tr>
<tr>
<td>Standard group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-random</td>
<td>18/12,484 (0.14%)</td>
<td>P&lt;0.001 vs chromo</td>
</tr>
</tbody>
</table>

Hurlstone Endoscopy. 2005;37:1186-92
Use of Indigocarmine (0.2%)

2 grams IC in 1 liter saline via water pump
Can Advanced Imaging Increase Adenoma Detection in Screening Colonoscopy?
### Chromoendoscopy: Meta-analysis of 4 Randomized Clinical Trials

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with any adenoma</td>
<td>1.61</td>
<td>1.24-2.09</td>
</tr>
<tr>
<td>3 or more adenomas</td>
<td>2.55</td>
<td>1.49-4.36</td>
</tr>
</tbody>
</table>

Brown; Cochrane DB Syst Rev, 2007;4:6439
Can Narrow Band Imaging Increase ADR?

White Light

NBI

Hyperplasia  Adenoma  Advanced
# NBI vs White Light Endoscopy for ADR

<table>
<thead>
<tr>
<th>Study (N)</th>
<th>HD WL ADR</th>
<th>NBI ADR</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rex 2007 (434)</td>
<td>67%</td>
<td>65%</td>
<td>1.02 (0.89-1.17)</td>
</tr>
<tr>
<td>Adler 2007 (398)</td>
<td>17%</td>
<td>23%</td>
<td>1.27 (.88-1.84)</td>
</tr>
<tr>
<td>Inoue 2008 (243)</td>
<td>34%</td>
<td>42%</td>
<td>1.55 (1.14-2.11)</td>
</tr>
<tr>
<td>Pooled</td>
<td>44%</td>
<td>41%</td>
<td>1.23 (0.93-1.61)</td>
</tr>
</tbody>
</table>
Adenoma Detection Rates

Buchner et al. Clin Gastro Hep 09
Can Advanced Imaging Predict Polyp Histology
And Guide Therapy:

Diagnose and Discard
Non resection of hyperplasia
EMR/ESD for advanced neoplasia
Advanced Imaging Options

- NBI
- FICE
- iScan
- Confocal
- Chromo
- AFI

Images of NBI, FICE, Confocal, and Histology.
On of the most studied questions in colonoscopy

<table>
<thead>
<tr>
<th>Method</th>
<th># pts/# studies</th>
<th>Sens</th>
<th>Spec</th>
<th>Acc</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBI</td>
<td>1615/10</td>
<td>91%</td>
<td>87%</td>
<td>90%</td>
</tr>
<tr>
<td>FICE</td>
<td>1416/7</td>
<td>91%</td>
<td>77%</td>
<td>89%</td>
</tr>
<tr>
<td>Chromo</td>
<td>8230/19</td>
<td>91%</td>
<td>80%</td>
<td>87%</td>
</tr>
<tr>
<td>Confocal</td>
<td>495/7</td>
<td>94%</td>
<td>92%</td>
<td>98%</td>
</tr>
<tr>
<td>AFI</td>
<td>333/3</td>
<td>95%</td>
<td>63%</td>
<td>69%</td>
</tr>
</tbody>
</table>

Rex, D [GIE PIVI 2011]
Endoscopic Imaging of Barrett’s Esophagus:
BE High Grade Dysplasia
Effect of NBI

HD White light

HD NBI
Prospective, controlled tandem endoscopy study of NBI for dysplasia detection

Wolfsen et al. Gastro 2008;135:24

EGD (SRE)

Same day procedures “back to back”

EGD (HRE + NBI)
NBI vs Standard EGD in Barrett’s

• NBI Detects More Patients with Dysplasia
  • NBI 57%
  • Standard 43%  \( p < 0.001 \)

• NBI Detects Higher Grade of Dysplasia
  • NBI 12/65
  • Standard 0/65  \( p < 0.001 \)

• Fewer Biopsies Required with NBI
  • NBI 4.7 bx/pt
  • Standard 8.4 bx/pt  \( p < 0.001 \)

Wolfsen et al, Gastro 2008
Endomicroscopy of Barrett’s Esophagus: Beyond Biopsy
Multicenter-double blind randomized trial of WL vs NBI vs pCLE:
Detection of Neoplastic Tissue in Barrett’s with In-vivO Probe-based Confocal Endomicroscopy (“DON’T BIOPCE”)

- 100 Patients
- 5 Centers
- Centralized Pathology
BE patients

Suspicious locations
4 quadrant locations
Marked with APC

HD-WLE

NBI

pCLE
### Results: Per patient

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLE</td>
<td>85%</td>
<td>71%</td>
</tr>
<tr>
<td>WLE + pCLE</td>
<td>93%*</td>
<td>67%*</td>
</tr>
<tr>
<td>WLE or NBI</td>
<td>97%</td>
<td>56%</td>
</tr>
<tr>
<td>WLE or NBI + pCLE</td>
<td>100%</td>
<td>56%</td>
</tr>
</tbody>
</table>

4 additional HGD/EC patients identified

1 additional HGD/EC patient identified
Clinical Scenario 1: Target + 4 Quadrant Biopsies

BE patient

WLE and NBI exam

Suspicious location

Target and 4 quadrant biopsies

No suspicious location

4 quadrant pCLE

Suspicious location

Target and 4 quadrant biopsies

Non suspicious location

No biopsies

39% biopsies avoided
No HGD/EC location/patient missed
Summary

• Good technique more important than good technology
• Advanced imaging has small effect on improved adenoma detect
• Chromoscopy significantly improves neoplasia detection in IBD
• Advanced imaging accurately predicts polyp histology in expert centers
  • Potential to replace pathology for small polyps
Thank You

wallace.michael@mayo.edu