“Resect & Discard” and “Diagnose & Leave”: What Should We Do in 2018?

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ASGE PIVI for Real-Time Assessment of Diminutive Polyp Histology

1. In order for colorectal polyps ≤ 5 mm in size to be resected and discarded without pathologic assessment, endoscopic technology (when used with high confidence) used to determine histology of polyps ≤ 5 mm in size, when combined with the histopathologic assessment of polyps > 5 mm in size, should provide a ≥90% agreement in assignment of post-polypectomy surveillance intervals when compared to decisions based on pathology assessment of all identified polyps.

2. In order for a technology to be used to guide the decision to leave suspected rectosigmoid hyperplastic polyps ≤ 5 mm in size in place (without resection), the technology should provide ≥90% negative predictive value (when used with high confidence) for adenomatous histology.

Prerequisites for Real-Time Assessment of Diminutive Polyp Histology

**Technology**
- Accurate
- Easy to learn
- Practical to use
- Economically viable (no large capital expense)

**Evidence**
Robust data from academic and community practice settings

**Training**
Formal training and evaluation programs

**Endorsement**
Endorsement of professional GI societies
Appropriate coding and reimbursement

*Rastogi A. Endoscopy 2012; 44: 889-91*
We Have The Technology!

Wide Field
- Dye-based Chromoendoscopy
- Electronic Chromoendoscopy (NBI, i-SCAN, FICE, BLI)
- Autofluorescence imaging (AFI)

Narrow Field
- Confocal laser endomicroscopy (CLE)
- Endocystoscopy
- Spectroscopy
# The NBI International Colorectal Endoscopic (NICE) Classification

<table>
<thead>
<tr>
<th>NICE Criterion</th>
<th>Type 1</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Same or lighter than background</td>
<td>Browner relative to background (verify color arises from vessels)</td>
</tr>
<tr>
<td>Vessels</td>
<td>None, or isolated lacy vessels coursing across the lesion</td>
<td>Brown vessels surrounding white structures</td>
</tr>
<tr>
<td>Surface pattern</td>
<td>Dark or white spots of uniform size, or homogeneous absence of pattern</td>
<td>Oval, tubular, or branched white structures surrounded by brown vessels</td>
</tr>
<tr>
<td>Most likely pathology</td>
<td>Hyperplastic</td>
<td>Adenoma</td>
</tr>
</tbody>
</table>

Workgroup serrAteD polyps and Polyposis (WASP) classification

- System utilizes NICE classification and 4 NBI criteria to distinguish SSP from HP
- 10 GI endoscopists reviewed 45 polyps < 10 mm and predicted histology, including levels of confidence
- Then underwent training and retested after 6 months using a different set of endoscopic images

RESULTS

- Accuracy of reading SSP vs non-SSP increased from 73% to 86% (high-confidence readings)
- Accuracy of reading neoplastic vs HP increased from 76% to 86%
- Performance sustained after 6 months

- Criteria promising, need prospective validation in real-time setting

WASP Classification

Colonic polyp

One of following features:
- Brown color?
- Brown vessels?
- Oval tubular or branched surface pattern?

NO

Type 1 polyp

Two of following features:
- Clouded surface?
- Indistinctive border?
- Irregular shape?
- Dark spots inside crypts?

NO

Hyperplastic polyp

YES

Sessile serrated adenoma/polyp

YES

Adenoma

YES

Type 2 polyp

Two of following features:
- Clouded surface?
- Indistinctive border?
- Irregular shape?
- Dark spots inside crypts?

NO

Adenoma

New Classification Systems

• Blue Light Imaging (BLI)
  - BASIC classification for colorectal polyp characterization
    
    *Bisschops et al. Endoscopy 2018;50:211–220*

• New I-Scan OE system
  - SIMPLE endoscopic classification
  - Accuracy of experts 94% after training
  - Trainee accuracy similar for NBI and SIMPLE (can be applied to NICE with similar accuracy)

“Valley sign” - Highly specific for adenoma in diminutive polyps

Agreement in assignment of postpolypectomy surveillance intervals based on NBI optical biopsy versus those based on histopathology

<table>
<thead>
<tr>
<th>10 studies, 3082 patients</th>
<th>Degree (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pooled agreement</strong></td>
<td></td>
</tr>
<tr>
<td>$I^2 = 93%$</td>
<td>89% (85-93)</td>
</tr>
<tr>
<td><strong>Practice</strong></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>91% (86-95)</td>
</tr>
<tr>
<td>Community</td>
<td>82% (74-90)</td>
</tr>
<tr>
<td><strong>Operator experience</strong></td>
<td></td>
</tr>
<tr>
<td>Expert</td>
<td>92% (88-96)</td>
</tr>
<tr>
<td>Novice</td>
<td>82% (75-88)</td>
</tr>
<tr>
<td><strong>Confidence level</strong></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>91% (88-95)</td>
</tr>
<tr>
<td>No information</td>
<td>79% (71-86)</td>
</tr>
<tr>
<td><strong>Experience + Confidence</strong></td>
<td></td>
</tr>
<tr>
<td>Expert + High confidence</td>
<td>93% (90-96)</td>
</tr>
<tr>
<td>Novice + High confidence</td>
<td>87% (82-93)</td>
</tr>
</tbody>
</table>

ASGE Technology Committee Gastrointest Endosc 2015;81:502-16.
### NBI studies evaluating NPV for adenomatous polyp histology

<table>
<thead>
<tr>
<th>19 studies, 4013 polyps</th>
<th>NPV (95% CI)</th>
</tr>
</thead>
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<td><strong>Pooled NPV</strong></td>
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<td>$I^2 = 89%$</td>
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ASGE Technology Committee Gastrointest Endosc 2015;81:502-16.
Real-time Histology in Community Practice: Not quite ready for prime time

- 13 endoscopists in community practice in Michigan
  - **Ex vivo phase:** Computerized module (polyp image library)
  - **In vivo phase:** Real-time optical diagnosis with NBI, comparison to final pathology diagnosis, and confidential feedback on individual performance every 1-2 weeks

- Twelve of 13 subjects identified adenomas with 90% accuracy at the end of the computer study, but only 3 of 12 reached 90% in vivo
- The agreement between surveillance recommendations (high-confidence NBI analysis vs. histopathology) was 80% (95% CI, 77%–82%)
- For diminutive rectosigmoid polyps assessed with high confidence, adenomas were identified with NPV 91% (86%–97%)
- The OR for high confidence as a predictor of accuracy = 1.8 (95% CI, 1.3–2.5)

Real-time Histology in Community Practice: Not quite ready for prime time

- DISCARD 2 study
- NBI-assisted optical diagnosis compared to pathology in 6 general hospitals in the UK
- 28 colonoscopists trained in NICE with 90% accuracy
- Accuracy of identification of adenomatous polyps < 10 mm
  - Polyp-level analysis: Sensitivity for adenoma was 76% (73%-79%)
  - Two or more NICE criteria: Sensitivity 99.4%
  - Expertise, confidence level and HD not associated with accuracy

## Impact of Training Interventions

<table>
<thead>
<tr>
<th>Author (yr)</th>
<th>N</th>
<th>Training method</th>
<th>N polyps</th>
<th>High-confidence</th>
<th>S.I. agreement</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coe (2012)</td>
<td>8</td>
<td>Image/video library (EQUIP study)</td>
<td>317</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paggi (2012)</td>
<td>6</td>
<td>Re-training, image library</td>
<td>511 &lt; 10 mm</td>
<td>86%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Kuiper (2012)</td>
<td>3</td>
<td>Image library</td>
<td>281 &lt; 10 mm</td>
<td>63%</td>
<td>81%</td>
<td></td>
</tr>
<tr>
<td>Repici (2013)</td>
<td>5</td>
<td>Image/video library</td>
<td>574 &lt; 10 mm</td>
<td>88%</td>
<td>92%</td>
<td>92%</td>
</tr>
<tr>
<td>Ladabaum (2013)</td>
<td>12</td>
<td>Image library, pre/post test</td>
<td>2596 (1858 ≤ 5 mm)</td>
<td>80%</td>
<td>80%</td>
<td>91%</td>
</tr>
<tr>
<td>Schaschal (2014)</td>
<td>10</td>
<td>Image library i-SCAN</td>
<td>675</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vu (2015)</td>
<td>6</td>
<td>Image library, training session</td>
<td>606 ≤ 5 mm</td>
<td>96%</td>
<td>82%</td>
<td></td>
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Novel training method: Promising

- **Ex vivo phase:**
  - 20-minute audiovisual tool, then 80 video clips of diminutive polyps in HDWL and HD NBI
  - Endoscopists recorded predicted histology, feedback given after each video

- **In vivo phase:**
  - Orientation to PIVI and high/low confidence diagnoses
  - Real-time predictions in routine colonoscopies
  - Endoscopy photos returned to endoscopists with actual histology every 10 procedures or 2 months
  - Monthly summative reports distributed anonymously to each endoscopist, showing accuracy compared to rest of the group

- 26 endoscopists with no NBI training or experience
- 3012 diminutive polyps, 74.3% high-confidence
- S.I. agreement 91.2% (89.7-92.7%), NPV 94.7% (92.6-96.8%)
- Most endoscopists require ongoing observation and auditing--only 7/26 identified adenomas with sufficient sensitivity to be considered competent.

Barriers to Implementation
(Hint: It’s Not Technology)

• Ex vivo-In vivo gap
• Expert-Non expert gap

• Everything else!
  1. Training and credentialing
     - Best training method unclear (competency-based)
     - Quality monitoring and interventions
     - Maintenance of skills/CME

  2. Photo-documentation storage to enable future audits
  3. Medical-legal coverage as part of standard practice
  4. FDA labeling
  5. CPT codes and reimbursement
  6. Patient acceptance
  7. Resistance to change in the medical community

Guidelines/position statements from medical societies

Manufacturers obtain FDA labeling

Creation of training programs by medical societies and/or manufacturers

Financial motivation through new payment models from payors

Patient acceptance

Endoscopist desires to utilize endoscopic image enhancement technology

Obtains training in endoscopic imaging technology through a variety of training methods

Ensures competency in achieving pre-established thresholds using the technology for each potential clinical application

Conducts ongoing quality monitoring