Optimizing Colonoscopy: Improving Adenoma Detection Rate

George Adel Cortas, M.D.
University of Balamand Faculty of Medicine
LSGE 2015 Congress
Beirut, November 21, 2015
As a 50-year-old gastroenterologist, you are planning to undergo colon cancer screening at your ambulatory surgical center by one of your 4 partners.

Whom should you pick to do your colon cancer screening?

A. One who can perform 16 colonoscopies in 4 hours
B. One who can perform piecemeal resection of large polyps
C. One who has never had a perforation during his career
D. One who can detect more adenomas per colonoscopy
Objectives

- Introduction
- Definition of Adenoma detection rate (ADR)
- Discuss how Adenoma detection rate (ADR) became an important quality indicator
- Techniques to optimize colonic mucosal visualization
- Conclusion
Introduction

- 136,830 new cases CRC per year
- 50,310 American deaths from CRC per year
- 9% of all cancer related deaths
- 2-3% decrease per year over the last 15 years
- Increase incidence rates from age 40-44
- Gradual shift toward right sided CRC

Davis DM J Am Coll Surg. 2011
Jemal A J Natl Cancer Inst. 2013
Introduction

- Colonoscopy is the diagnostic modality of choice --- **Gold standard**!
- Colonoscopy with polypectomy has been shown to reduce both the incidence and mortality of subsequent CRC.
- However, **not a perfect test**.
- Back-to-back colonoscopy studies, up to 25% of polyps are missed during colonoscopy.

Van Rijn JC Am J Gastroenterol 2006
Leufkens AM Endoscopy 2012
Introduction

- Preventive effect of colonoscopy is most prominent for distal CRCs vs. proximal CRCs.
- Finally, up to 8% of CRCs occur within 3 years after a previous colonoscopy---- "Interval CRC"
- Screening programs for CRC- FOB/FIT/Colonoscopy
- Urgent need for "High Quality Colonoscopy"

Lakoff J Clin Gastroenterol Hepatol 2008
Baxter NN Ann Intern Med 2009
Rex DK Gastroenterology 1997
Bressler B Gastroenterology 2007
Bressler B Gastroenterology 2004
Hosokawa O Endoscopy 2003
Singh H Am J Gastroenterol 2010
Pullens HJ Clin Gastroenterol Hepatol 2014
Quality indicators

- Bowel preparation
- Cecal incubation rate
- Withdrawal time
- **Adenoma detection rate**
- Patient comfort and sedation
- Complication rate
ADENOMA DETECTION RATE

- The adenoma detection rate (ADR) is defined as the proportion of screened subjects in whom at least one adenomatous lesion is identified.

- **Asymptomatic screening population:**

  **American screening guidelines:**
  ADR of $\geq 25\%$ in men and of $\geq 15\%$ in women over 50 years

  **British Quality Assurance Guidelines for Colonoscopy:**
  ADR at $\geq 35\%$ of all screening colonoscopies in patients who had a positive FOBT.

Rex DK  Gastrointest Endosc 2006
Chilton A. NHS Cancer Screening Programmes, 2011
Kaminski MF. N Engl J Med 2010
ADR according to Withdrawal times

rs = 0.90, P < 0.001

3 Gastroenterological societies (AGA, ACG and ASGE) support an average of 6 minute minimum withdrawal

Barclay et al; NEJM 2006
Variation in polyp detection rates at screening colonoscopy

ADR range = 7% to 44% (P< 0.001)

6-FOLD DIFFERENCE

Imperiale TF Gastrointestinal Endoscopy 2009
Risk of Interval Colorectal Cancer, According to the Endoscopist’s Adenoma Detection Rate (ADR)

Kaminski et al; NEJM 2010
Each 1.0% increase in the adenoma detection rate was associated with a 3.0% decrease in the risk of Interval Colorectal Cancer.
TECHNIQUES TO OPTIMIZE COLONIC MUCOSAL VISUALIZATION
Withdrawal Techniques

- Blinded video review withdrawal technique

- 2 experienced operators with different miss rates for adenomas:
  
  - 48% miss rate *versus* 17% miss rate

1. Examining the proximal sides of flexures & folds
2. Cleaning and suctioning
3. Adequacy of distension
4. Adequacy of time spent viewing

Rex DK. Gastrointest Endosc 2000
Retroflexion in the Right Colon

Missed adenomas: 9.8% - per patient: 4.4%

<table>
<thead>
<tr>
<th>Adenomas found on forward examination</th>
<th>Adenomas found on Retroflexion</th>
<th>Miss rate* (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>497</td>
<td>54</td>
</tr>
<tr>
<td>1-5 mm</td>
<td>410</td>
<td>48</td>
</tr>
<tr>
<td>6-9 mm</td>
<td>65</td>
<td>3</td>
</tr>
<tr>
<td>≥10 mm</td>
<td>22</td>
<td>3</td>
</tr>
</tbody>
</table>

Hewett B Gastrointest Endosc 2011
Use of Antispasmodic Agents on Colonic Surface Area Visualization

### Adenoma detection rate (ADR)

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Events</th>
<th>Total</th>
<th>Events</th>
<th>Total</th>
<th>Weight</th>
<th>Odds Ratio M-H, Fixed, 95% CI</th>
<th>Odds Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>de Brouwer et al 2012</td>
<td>101</td>
<td>340</td>
<td>105</td>
<td>334</td>
<td>41.3%</td>
<td>0.92 [0.66, 1.28]</td>
<td></td>
</tr>
<tr>
<td>Rondonotti et al 2013</td>
<td>64</td>
<td>202</td>
<td>56</td>
<td>200</td>
<td>21.3%</td>
<td>1.19 [0.78, 1.83]</td>
<td></td>
</tr>
<tr>
<td>Byun et al 2009</td>
<td>36</td>
<td>103</td>
<td>30</td>
<td>102</td>
<td>10.9%</td>
<td>1.29 [0.72, 2.32]</td>
<td></td>
</tr>
<tr>
<td>Corte et al 2012</td>
<td>82</td>
<td>303</td>
<td>65</td>
<td>298</td>
<td>26.5%</td>
<td>1.33 [0.92, 1.93]</td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td>948</td>
<td>934</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
<td><strong>1.13 [0.92, 1.38]</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total events</strong></td>
<td>283</td>
<td>256</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: Chi² = 2.47, df = 3 (P = .48); I² = 0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: Z = 1.18 (P = .24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ADR 1.13 (0.92-1.38)

HBB = Hyoscine-N-butylbromide (Buscopan)

Rondonotti E Gastrointest Endosc 2014
Barium Enema

Left Lateral

Right lateral

Rubesin SE  Radiology 2000
Dynamic Position Changes

Patients with ≥1 adenoma

- Left lateral: 34%
- Position changes: 23%

P = 0.01

Transverse - descending

East JE Gastrointest Endosc 2011
Luminal Distension

16%

Improved with dynamic position changes

Table 4: Comparison of adenoma and polyp detection related to distension score

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Detection</th>
<th>Score 1-3, n (%)</th>
<th>Score 4-5, n (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenoma</td>
<td>No</td>
<td>233 (93)</td>
<td>1097 (84)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>18 (7)</td>
<td>208 (16)</td>
<td></td>
</tr>
<tr>
<td>Polyp</td>
<td>No</td>
<td>228 (91)</td>
<td>995 (76)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>23 (9)</td>
<td>313 (24)</td>
<td></td>
</tr>
</tbody>
</table>

East JE Gastrointest Endosc 2011
## Endoscopy nurse participation

Detection rates according to observation type

<table>
<thead>
<tr>
<th></th>
<th>Single observation (n = 384), no. (%)</th>
<th>Dual observation (n = 407), no. (%)</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Polyp detection rate</strong></td>
<td>210 (54.7)</td>
<td>236 (58.0)</td>
<td>.350</td>
</tr>
<tr>
<td><strong>Adenoma detection rate</strong></td>
<td>166 (43.2)</td>
<td>196 (48.2)</td>
<td>.164</td>
</tr>
<tr>
<td><strong>Advanced adenoma or cancer detection</strong>*</td>
<td>31 (8.1)</td>
<td>40 (9.8)</td>
<td>.388</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Nurse’s experience &lt;2 y (n = 223)</th>
<th>Nurse’s experience $\geq$2 y (n = 184)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Polyp detection rate, no. (%)</strong></td>
<td>210 (54.7)</td>
<td>120 (65.2)</td>
</tr>
<tr>
<td><strong>Adenoma detection rate, no. (%)</strong></td>
<td>166 (43.2)</td>
<td>98 (53.3)</td>
</tr>
<tr>
<td><strong>Advanced adenoma or cancer detection, no. (%)</strong>*</td>
<td>31 (8.1)</td>
<td>23 (12.5)</td>
</tr>
</tbody>
</table>

Lee CK Gastrointest Endosc 2011
Rectal Retroflexion

Flexiscope trial (480 patients)

12 (2.5%) polyps seen only on Retroflexion
4 adenomas (3 TAs <5mm, 1 x 15mm TVA)

Large colonoscopy series (1502 cases)

40 (2.7%) had a distal rectal polyp
8 (0.5%) retroflexed view only
1 x 4mm tubular adenoma

Multi-centre series, 4+ endoscopists (934 pt)

10 (1%) lesions Retroflexion only, all clinically relevant
8 polyps 5-10mm, 5 adenomas

Hanson J  Dis Colon Rectum 2001
Saad A World J Gastroenterol 2008
Téllez-Ávila F Clin Endosc 2014
Quality Improvement in Colonoscopy (QIC) study

- Evidence-based “bundle” to improve ADR included the following:

1) Withdrawal time ≥6 minutes
2) Use of hyoscine butylbromide (Buscopan)
3) Use of supine patient position for examination of the transverse colon
4) Performance of rectal retroflexion
## Quality Improvement in Colonoscopy (QIC) study

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Before</th>
<th></th>
<th>After</th>
<th></th>
<th>Ratio</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N procedures</td>
<td>Patients with adenomas</td>
<td>ADR (%) [CI]</td>
<td>N procedures</td>
<td>Patients with adenomas</td>
<td>ADR (%) [CI]</td>
</tr>
<tr>
<td>Upper</td>
<td>785</td>
<td>215</td>
<td>27.4 [24.4-30.6]</td>
<td>2508</td>
<td>538</td>
<td>21.5 [19.9-23.1]</td>
</tr>
<tr>
<td>Upper</td>
<td>1116</td>
<td>195</td>
<td>17.5 [15.4-19.8]</td>
<td>3119</td>
<td>599</td>
<td>19.2 [17.9-20.6]</td>
</tr>
<tr>
<td>Middle</td>
<td>785</td>
<td>104</td>
<td>13.3 [11.1-15.8]</td>
<td>2539</td>
<td>490</td>
<td>19.3 [18.8-22.0]</td>
</tr>
<tr>
<td>Lower</td>
<td>936</td>
<td>68</td>
<td>7.3 [5.8-9.8]</td>
<td>2405</td>
<td>334</td>
<td>13.9 [12.6-15.3]</td>
</tr>
</tbody>
</table>

Rajasekhar PT Endoscopy 2015
# Third eye Retroscopy

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>% Increase in Adenomas with 3&lt;sup&gt;rd&lt;/sup&gt; eye Retroscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Marco</td>
<td>298</td>
<td>16%</td>
</tr>
<tr>
<td>Waye</td>
<td>249</td>
<td>11%</td>
</tr>
<tr>
<td>Leufkens</td>
<td>448</td>
<td>23%</td>
</tr>
</tbody>
</table>

De Marco DC et al. Gastrointest Endosc 2010
Waye JD et al. Gastrointest Endosc 2010
Leufkens A et al. Gastrointest Endosc 2011
# Wide-Angle Colonoscopy

170° field of view

<table>
<thead>
<tr>
<th>Adenomas detected with standard forward-viewing colonoscopy</th>
<th>Adenomas detected with full-spectrum colonoscopy</th>
<th>Total number of adenomas identified</th>
<th>Adenoma miss rate with standard forward-viewing colonoscopy*</th>
<th>Adenoma miss rate with full-spectrum colonoscopy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard forward-viewing colonoscopy first (n=88)</td>
<td>29</td>
<td>20</td>
<td>49</td>
<td>20/49 (41%); 27.0-56.0</td>
</tr>
<tr>
<td>Full-spectrum colonoscopy first (n=97)</td>
<td>5</td>
<td>62‡</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Adenoma Miss Rate =**

- 41% for standard forward-viewing colonoscopy
- 7% for full-spectrum colonoscopy

Gralnek IM Lancet Oncol 2014
Cap-Assisted Colonoscopy

Forest plot on the proportion of patients with adenomas detected

CAC = Cap-assisted colonoscopy
SC = Standard colonoscopy

Ng SC Am J Gastroenterol 2012
Endocuff

- A randomized controlled study
- 498 patients
- Standard forward-viewing colonoscopy with or without Endocuff

- Overall 14% increase in ADR with the Endocuff

(ADR, 42% vs 56%)

Moons LMG Gastrointest Endoscopy Clin N America 2015
## EndoRings

Multicenter, tandem colonoscopy, crossover study

Standard colonoscopy vs. EndoRings-assisted colonoscopy

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Adenoma Miss Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endo Rings-assisted colonoscopy</td>
<td>10% (7 of 69 adenomas)</td>
</tr>
<tr>
<td>Standard colonoscopy</td>
<td>48% (28 of 58 adenomas)</td>
</tr>
</tbody>
</table>

Dik VK Gastroenterology 2014
High-Definition Meta-Analysis

Pooled incremental yield of HD over SD for the detection of ADENOMATOUS polyps

HD = High Definition Colonoscopy
SVE = Standard Video Endoscopy
###SD versus HD versus NBI

**Prospective randomized study**
High definition (HD), Standard definition (SD) and NBI colonoscopy

<table>
<thead>
<tr>
<th></th>
<th>SD-WL (n = 210)</th>
<th>HD-WL (n = 210)</th>
<th>NBI (n = 210)</th>
<th>P values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects with adenomas, no. (%)</td>
<td>81 (38.6)</td>
<td>96 (45.7)</td>
<td>97 (46.2)</td>
<td>HD-WL vs. SD-WL: 0.166; NBI vs. SD-WL: 0.138</td>
</tr>
<tr>
<td>Total no. of adenomas</td>
<td>145</td>
<td>235</td>
<td>237</td>
<td></td>
</tr>
<tr>
<td>Adenomas per subject</td>
<td>0.69</td>
<td>1.12</td>
<td>1.13</td>
<td>HD-WL vs. SD-WL: 0.016; NBI vs. SD-WL: 0.014</td>
</tr>
</tbody>
</table>

HD and NBI identified **more flat and right side adenomas** compared to SD

Rastogi A Gastrointest Endosc 2011
Quality improvement: “Report card” Intervention

The study time frame:

Before intervention = July 2008 to December 2008

Intervention = April 2009 to March 2011

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-Intervention</th>
<th>Intervention</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rate (95% C.I.)</td>
<td>Rate (95% C.I.)</td>
<td></td>
</tr>
<tr>
<td>Adenoma Detection</td>
<td>44.7% (39.1% - 50.4%)</td>
<td>53.9% (49.7% - 58.1%)</td>
<td>0.013</td>
</tr>
<tr>
<td>Advanced Neoplasm Detection</td>
<td>11.5% (8.4% - 15.5%)</td>
<td>13.3% (10.8% - 16.4%)</td>
<td>0.441</td>
</tr>
<tr>
<td>Serrated Polyp Detection</td>
<td>33.8% (28.5% - 39.5%)</td>
<td>32.7% (28.7% - 36.9%)</td>
<td>0.741</td>
</tr>
<tr>
<td>Cecal Intubation</td>
<td>95.6% (92.5% - 97.5%)</td>
<td>98.1% (96.7% - 99.0%)</td>
<td>0.027</td>
</tr>
</tbody>
</table>
As a 50-year-old gastroenterologist, you are planning to undergo colon cancer screening at your ambulatory surgical center by one of your 4 partners.

Whom should you pick to do your colon cancer screening?

A. One who can perform 16 colonoscopies in 4 hours
B. One who can perform piecemeal resection of large polyps
C. One who has never had a perforation during his career
D. One who can detect more adenomas per colonoscopy
Conclusion

- If each **1.0% increase in ADR** was associated with a **3.0% decrease in the risk of cancer**
  

- Indication
- Bowel Preparation
- Withdrawal time
- Withdrawal technique
- Right colon & Rectal Retroflexion
- Use of Antispasmodic Agents
- Dynamic Position Changes
- Endoscopy nurse participation
- Use of ( Caps, Endorings etc...)
- NBI/HD Endoscopy