Capsule endoscopy screening

Carlo SENORE
Possible conflicts of interest

- Medtronics provides CCE-2 devices to conduct a multicenter independent, non profit study, aimed to assess CCE-2 diagnostic accuracy (CCANDY study – P.I.: C. Senore – G. Costamagna)
CCE technology was recently implemented and a second generation capsule is now available.

It allows a minimally invasive, painless colonic investigation without requiring intubation, insufflation or sedation.

These features are making it a potentially promising tool for CRC screening.

But, although appealing, the role of CCE in CRC screening programs is basically unknown.
Sensitivity polyps ≥6 mm

<table>
<thead>
<tr>
<th>Study</th>
<th>Proportion</th>
<th>95%–CI</th>
<th>W(random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second generation CCE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romero et al 2015</td>
<td>0.88</td>
<td>[0.68; 0.97]</td>
<td>7.4%</td>
</tr>
<tr>
<td>Eliakim et al 2009</td>
<td>0.89</td>
<td>[0.65; 0.99]</td>
<td>6.5%</td>
</tr>
<tr>
<td>Spada et al 2011</td>
<td>0.84</td>
<td>[0.71; 0.94]</td>
<td>8.8%</td>
</tr>
<tr>
<td>Rex et al 2015</td>
<td>0.87</td>
<td>[0.81; 0.91]</td>
<td>9.9%</td>
</tr>
<tr>
<td>Suchanek et al 2015</td>
<td>0.79</td>
<td>[0.62; 0.91]</td>
<td>8.7%</td>
</tr>
<tr>
<td>Rondonotti et al 2014</td>
<td>0.88</td>
<td>[0.62; 0.98]</td>
<td>6.4%</td>
</tr>
<tr>
<td>Random effects model</td>
<td>0.86</td>
<td>[0.82; 0.89]</td>
<td>47.7%</td>
</tr>
</tbody>
</table>

Heterogeneity: I-squared = 0%, tau-squared = 0, P = .8963

Sensitivity polyps ≥10 mm

<table>
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<tr>
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</tr>
<tr>
<td>Eliakim et al 2009</td>
<td>0.88</td>
<td>[0.47; 1.00]</td>
<td>7.2%</td>
</tr>
<tr>
<td>Spada et al 2011</td>
<td>0.88</td>
<td>[0.71; 0.96]</td>
<td>11.6%</td>
</tr>
<tr>
<td>Holleran et al 2014</td>
<td>0.89</td>
<td>[0.65; 0.99]</td>
<td>9.6%</td>
</tr>
<tr>
<td>Rex et al 2015</td>
<td>0.85</td>
<td>[0.75; 0.92]</td>
<td>13.4%</td>
</tr>
<tr>
<td>Suchanek et al 2015</td>
<td>0.88</td>
<td>[0.62; 0.98]</td>
<td>9.6%</td>
</tr>
<tr>
<td>Rondonotti et al 2014</td>
<td>0.92</td>
<td>[0.64; 1.00]</td>
<td>7.4%</td>
</tr>
<tr>
<td>Random effects model</td>
<td>0.87</td>
<td>[0.81; 0.91]</td>
<td>68.3%</td>
</tr>
</tbody>
</table>

Heterogeneity: I-squared = 0%, tau-squared = 0, P = .9939
Specificity polyps ≥6 mm
ACCURACY

CCE performance for the detection of polyps was shown to be equal, or higher than TC colonography, a comparable non invasive test exploring the entire colon.

Spada et al Gut 2015
Rondonotti et al CGH 2014
Limitations

Most studies were small, single centre

22% of patients enrolled in the largest screening study were excluded from the analysis, mainly because of inadequate cleansing, or < 40 min capsule transit time through colon
Screening setting (FIT+ subjects)

Designed to assess
- sensitivity and specificity (overall and by colonic site)
- positive and negative predictive value

of CCE, compared to conventional colonoscopy (OC), in detecting CRC and advanced adenomas

using 2 different positivity thresholds for OC referral:
- at least one lesion ≥ 6 mm.
- at least one lesion ≥ 10 mm.
ORCA trial

Screening setting:
asymptomatic subjects aged 50 to 75

Target sample size: 1,000 subjects

Designed to assess CCE
• uptake
• diagnostic yield

Capsule administered at home

Courtesy
E. Kuipers
E. Schreuders
A Survey of Potential Adherence to Capsule Colonoscopy in Patients Who Have Accepted or Declined Conventional Colonoscopy

*Douglas K. Rex, MD and David A. Lieberman, MD*

**TABLE 7. Subjects’ Appraisal of Features of Capsule Colonoscopy Relative to Conventional Colonoscopy After Reviewing all Information (Appendix Question C 11, Part 2)**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>3.4*</td>
</tr>
<tr>
<td>Convenience</td>
<td>5.7</td>
</tr>
<tr>
<td>Invasiveness</td>
<td>5.8</td>
</tr>
<tr>
<td>Bowel preparation</td>
<td>4.0</td>
</tr>
<tr>
<td>Need for sedation</td>
<td>5.9</td>
</tr>
<tr>
<td>Safety</td>
<td>5.1</td>
</tr>
<tr>
<td>Need for a ride home</td>
<td>5.7</td>
</tr>
<tr>
<td>Boosters</td>
<td>3.4</td>
</tr>
<tr>
<td>Ability to screen and treat</td>
<td>2.8</td>
</tr>
<tr>
<td>Cutting edge technology</td>
<td>5.4</td>
</tr>
</tbody>
</table>

*Subjects’ selected rating between 1 and 7 (1 = much worse than colonoscopy; 4 = same, 7 = much better than colonoscopy).*
Uptake of Colon Capsule Endoscopy vs Colonoscopy for Screening Relatives of Patients With Colorectal Cancer

Zaida Adrián-de-Ganzo, Onofre Alarcón-Fernández, Laura Ramos, Antonio Gimeno-García, Inmaculada Alonso-Abreu, Marta Carrillo, and Enrique Quintero

120 were eligible for CCE

- 52 (43.3%) declined to be screened
- 68 (56.6%) agreed to be screened

- 39 (32.5%) accepted colonoscopy, after declining CCE
- 29 (24.2%) accepted CCE
- 39 (32.5%) completed colonoscopy
- 28 (23.3%) completed CCE

113 were eligible for colonoscopy

- 50 (44.2%) declined to be screened
- 63 (55.8%) agreed to be screened

- 44 (38.9%) accepted colonoscopy
- 19 (16.8%) accepted CCE, after declining colonoscopy
- 42 (37.1%) completed colonoscopy
- 17 (15.0%) completed CCE
57.4% of subjects crossed over from the CCE group, 30.2% crossed over from the colonoscopy group

\[
\text{OR, 3.11; 95\% CI, 1.51-6.41.}
\]

Main reason for crossing over:

Unwillingness to repeat bowel preparation (CCE group)
Fear of colonoscopy (TC group)

Same DR of significant lesions
(11.7\%) in the CCE group
(11.5\%) in the colonoscopy group

\[
\text{OR, 1.02; 95\% CI, 0.45-2.26}
\]
# BOWEL PREPARATION

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day -2</strong></td>
<td></td>
</tr>
<tr>
<td>All Day</td>
<td>At least 10 glasses of water</td>
</tr>
<tr>
<td>Bedtime</td>
<td>Senna, 4 tb (48mg)</td>
</tr>
<tr>
<td><strong>Day -1</strong></td>
<td></td>
</tr>
<tr>
<td>All Day</td>
<td>Clear Liquid Diet</td>
</tr>
<tr>
<td>Evening (7-9 pm)</td>
<td>2 L PEG</td>
</tr>
<tr>
<td><strong>Exam Day</strong></td>
<td></td>
</tr>
<tr>
<td>Morning (6-7 am)</td>
<td>2 L PEG</td>
</tr>
<tr>
<td>~8 am (~1h after last intake of PEG)</td>
<td>Capsule Ingestion</td>
</tr>
<tr>
<td><strong>1st Boost</strong></td>
<td>30 ml NaP + 1 L water + 50 ml Gastrografin</td>
</tr>
<tr>
<td><em>after small bowel detection</em></td>
<td></td>
</tr>
<tr>
<td>**2nd Boost **</td>
<td>25 ml NaP + 0.5 L water + 50 ml Gastrografin</td>
</tr>
<tr>
<td><strong>2 hrs after 1st Boost</strong></td>
<td></td>
</tr>
<tr>
<td>Suppository **</td>
<td>10 mg Bisacodyl</td>
</tr>
<tr>
<td><strong>2 hrs after 2nd Boost</strong></td>
<td></td>
</tr>
</tbody>
</table>

** Only if capsule not excreted yet
Second-generation colon capsule endoscopy is feasible in the out-of-clinic setting

Samuel Nathan Adler · Cesare Hassan · Yoav Metzger · Yishai Sompolinsky · Cristiano Spada

• Results:

– 41/41 CCE feasible
– 16/41 called clinic (successful handled)
– 35/41 had complete study (excreted capsule)
– Significant findings were present in 10/41 (24%) patients
– Five patients subsequently underwent colonoscopy which confirmed the findings, including one colon carcinoma
**Costs and organisational impact**

The possibility to perform a colonoscopy immediately after CCE would offer the advantage to perform conventional colonoscopy using the same regimen of preparation recommended for CCE.

However, due to the time requirements for video download and reading, this scenario is generally unfeasible.

Shortening reading time, would reduce patient’s burden, but it would also result in a reduction of personnel costs.

The QuickView (a tool in the Rapid Software to decrease to reading time) may offer the chance to review the colonic video within few minutes, but the accuracy of this approach for significant findings was never evaluated.
CCANDY STUDY

• To assess sensitivity and specificity for polyps ≥ 10 mm of the QUICK view reading modality compared with OC

• To assess the feasibility and organizational impact of the QUICK view reading in the interval between capsule excretion and the start of the OC examination, when using capsule as a triage test for OC referral

• To assess accuracy and reproducibility of the reading when performed by nurses
Small bowel capsule reading by nurses

- The nurse overlooked 6% (4/64) of lesions detected by the physician.
- The physician overlooked 9% (6/68) of lesions detected by the nurse.

  NO clinical relevance.

- Time was longer with nurse than with physician, but the total cost was lower with the nurse

  Riphaus A et al. Z gastroenterol 2009

- The nurse evaluation was highly (95.6%) accurate in detecting small bowel lesions, with a 100% concordance with the gastroenterologist for the relevant findings.

- The absence of lesions was confirmed by the endoscopist in all cases classified as negative by the nurse.

  Guarini A et al. Gastroenterol Nursing 2015
CONCLUSIONS

NO TUBE  NO PAIN

Colon Capsule Endoscopy in Colorectal Cancer Screening: A Rude Awakening From a Beautiful Dream?
CONCLUSIONS

What is still missing?

Cost effectiveness data
Organisational impact
Patient’s acceptability
Bowel preparation
Logistics/setting
What is still missing?

Alternative/additional indications

- triage for subjects with positive screening test
- test offered to people
  - with incomplete OC
  - refusing OC
Acknowledgements

Cesare Hassan
Cristiano Spada
Marco Pennazio
Emanuele Rondonotti
Enrique Quintero
Nereo Segnan
Thank you for your attention