Benefits and limitations of using CADx in colonoscopy: learning from the first comparative clinical trial

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Artificial Intelligence for Real-Time Optical Diagnosis of Neoplastic Polyps during Colonoscopy

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Background

- Current practice: Removal of precancerous polyps during colorectal cancer screening
  - Optical diagnosis - remove or not remove?
  - Artificial intelligence (AI) or computer-aided diagnosis for classification (CADx)
    - AI-based systems may reduce costs, resources, overtreatment
      - Lack of high-quality clinical trials
# 8 prospective studies

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Modality</th>
<th>No. of Subjects</th>
</tr>
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<tbody>
<tr>
<td>Aihara et al.¹</td>
<td>2013</td>
<td>AFI</td>
<td>32</td>
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<tr>
<td>Kuiper et al.²</td>
<td>2015</td>
<td>WavStat4</td>
<td>87</td>
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<tr>
<td>Rath et al.³</td>
<td>2016</td>
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<td>27</td>
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<tr>
<td>Kominami et al.⁴</td>
<td>2016</td>
<td>Magnifying NBI</td>
<td>41</td>
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<tr>
<td>Mori et al.⁵</td>
<td>2018</td>
<td>Endocytoscopy</td>
<td>791</td>
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<tr>
<td>Horiuchi et al.⁶</td>
<td>2019</td>
<td>AFI</td>
<td>95</td>
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<tr>
<td>Barua et al.⁷</td>
<td>2022</td>
<td>Endocytoscopy</td>
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<tr>
<td>Minegishi et al.⁸</td>
<td>2022</td>
<td>NBI</td>
<td>186</td>
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Only comparative study
Methods

- Multicenter, prospective clinical trial
  - Interventions: Standard method vs. Standard method with CADx
  - Primary endpoint: Sensitivity for small (\(\leq 5\text{ mm}\)) neoplastic rectosigmoid polyps during colonoscopy
  - Secondary endpoints: Specificity and rate of high-confidence

![Standard method](image1)

![Standard method with CADx](image2)

![Histopathology](image3)
Two roles of AI in colonoscopy

1. Computer-aided detection (CADe)

2. Computer-aided diagnosis (CADx)
Results

1289 patients were assessed for eligibility

625 had no rectosigmoid polyps ≤5 mm
- 47 withdrew their consent
- 51 had incomplete colonoscopy
- 37 did not meet other criteria

529 patients had 913 rectosigmoid polyps ≤5 mm

21 polyps were ineligible

518 patients had 892 eligible polyps
(359 neoplastic and 533 non-neoplastic)
**Results**

<table>
<thead>
<tr>
<th>Standard diagnosis</th>
<th>CADx diagnosis</th>
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<tr>
<td>Sensitivity - % (95% CI)</td>
<td>88.4 (84.3-91.5)</td>
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</table>

p = 0.33
Conclusions

• CADx may not reduce overlooking adenomas during visual inspection of polyps. However, our study showed a potential improvement in specificity for neoplastic polyps, and there was also a trend toward improved confidence in optical diagnosis of polyps.

• Our study suggests that use of CADx helped the provider have higher confidence in optical diagnosis. If this can be replicated, it could contribute to cost reduction because more polyps could be left in situ.

Acknowledgements

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