Magnification narrow-band imaging for the diagnosis of early gastric cancer: a review of the Japanese literature for the Western endoscopist

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Background

• Narrow-band imaging (NBI)
  • Contrasts surface structure and vascular architecture of the superficial mucosa
  • Facilitate evaluation of mucosal morphology

• Combined use of magnification endoscopy
  • Correlate morphological feature and histology
  • Detect and differentiate non-neoplastic and neoplastic lesions
    • With a much greater degree of accuracy than standard white-light endoscopy (WLE)
Principle of narrow band imaging (NBI) endoscopy system

Short wavelength light
- Reflects and scatters at the superficial layer of the mucosa
- Blue/green light is absorbed well by Hb
- Represent capillary or vessel architecture in the superficial mucosa.
The use of M-NBI in the stomach
Normal appearances of the gastric mucosa

- With M-NBI
  - Microsurface (MS) pattern
    - Crypt opening (CO), marginal crypt epithelium (MCE),
  - Microvascular pattern
    - Subepithelial capillary network (SECN), collecting venules (CVs)
Normal or non-neoplastic change

MV: Polygonal or honeycomb-like appearance of SECN
Scattered visible CVs
MS: CO/MCE, Circular or oval shape

MV: Coil-spring appearance of SECN
Invisible CVs
MS: CO/MCE, Curved or linear polygonal
Gastritis, intestinal metaplasia

• 3 distinct patterns of gastritis
  • *Tahara et al*
  • To reflect severity: Type 1, 2, and 3

• Progressive changes
  • Enlargement of pits (ovoid shape)
  • Disappearance of SECN
  • Progression to villiform structures with coiled vessels contained within

• The presence of a regular arrangement of the CV (termed RAC)
  • Absence of *H pylori*
Gastritis, intestinal metaplasia

• Intestinal metaplasia
  • Type 3 gastritis: predictor of presence of intestinal metaplasia

• **Light-blue crest sign**
  • Indicator of Intestinal metaplasia
  • Global gastric atrophy
A line of demarcation indicates cancer until proven otherwise

- Presence of a line of demarcation
  - Indicative of cancer
  - Focal gastritis: can give this appearance
    - MS and MV structure was preserved
    - Vessels retain normal appearance

- Useful diagnostic criteria for early carcinoma, Kaise et al
  - Disappearance of the MS pattern
  - Change in vessel caliber
  - Heterogeneity in appearance
Close examination of the MS and MV structure within the line of demarcation
Adenoma versus carcinoma

- Adenoma (Borderline)
  - Ila lesion
    - WLE: Redness characteristics
    - M-NBI: Demarcation line and pattern of MV, regularity

- White opaque substance (WOS)
  - Completely obscured the SECN vessels
  - Regular
Adenoma versus carcinoma

- Carcinoma
  - White opaque substance (WOS)
    - Irregular
  - MV
    - Fine network: Well-differentiated cancer
    - Corkscrew: Undifferentiated cancer
Determining histological grade of adenocarcinoma, Yokoyama et al

**Well-differentiated adenocarcinoma**

- Preserved villous MS
- Abnormal vessels confined

**Poorly differentiated lesions**

- Disintegrated villous MS

**Intralobular loop (ILL) pattern 1**

**Fine network MV pattern**

**Intralobular loop (ILL) pattern 2**

- Disintegrated villous MS

**Corkscrew vessel**
<table>
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<th>M-NBI appearance</th>
<th>Clinical correlate</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
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<td>RAC&lt;sup&gt;24&lt;/sup&gt;</td>
<td>Hp-negative normal stomach</td>
<td>93.8</td>
<td>96.2</td>
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<td>Hp-negative in gastritis&lt;sup&gt;*&lt;/sup&gt;</td>
<td>99.4</td>
<td>50</td>
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<td>Villiform microsurface (Fujita type 3)&lt;sup&gt;23&lt;/sup&gt;</td>
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<td>73.3</td>
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<td>89</td>
<td>93</td>
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<td>Fundic gland polyp</td>
<td>94.7</td>
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<td>Regular vs irregular white opaque substance&lt;sup&gt;35&lt;/sup&gt;</td>
<td>Adenoma vs carcinoma&lt;sup&gt;j&lt;/sup&gt;</td>
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<td>Adenoma vs well-differentiated carcinoma&lt;sup&gt;*&lt;/sup&gt;</td>
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<td>94.7&lt;sup&gt;39,97.2&lt;sup&gt;40&lt;/sup&gt;</td>
<td>96&lt;sup&gt;39&lt;/sup&gt;/100&lt;sup&gt;40&lt;/sup&gt;</td>
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<tr>
<td>Intralobular loop pattern 1 vs 2&lt;sup&gt;40&lt;/sup&gt;</td>
<td></td>
<td>71.1</td>
<td>100</td>
</tr>
</tbody>
</table>

*M-NBI, Magnification narrow-band imaging; RAC, regular arrangement of collecting venules.
*Calculated from data published in relevant references where a sign was detectable.
†WOS was visible in 78% of adenomas and 43% of carcinomas.
‡Vascular pattern was classifiable in 54% of cancers (combined data from references 39 and 40) and intralobular loop pattern in 78% (from reference 40).
Epithelial lesion of interest

Protruded
(0-IIa or combination)

Flat
(0-IIb)

Depressed
(0-IIc)

1. Examine lesion on WLE (eg. indigo carmine recommended to delineate margins)

Large size, irregular surface contour, tethering, easy bleeding?

- Consider fundic gland or hyperplastic polypl (normal MS and MV)

- Pale
  - Suspect poorly-differentiated carcinoma

- Reddened
  - Suspect well-differentiated carcinoma

- No ulcer
- Ulcerated

2. Apply magnification to assess microsurface - MS (± acetic acid as adjunct)

Regularity of MS pattern?
- Regular
  - Likely adenoma

- Irregular
  - Possible carcinoma

Presence of line of demarcation?
- No (‘diffuse’)
  - Possible gastritis

- Yes (‘focal’)
  - Suspect carcinoma

Close examination of MS within line of demarcation

- Regular (preserved)
- Irregular or ‘micronodulation’ (‘destroyed’)

- Enlarged/oval pits ± SECN absent ± Tubuloid/tubiform change

- Gastritis
- Likely IM
- Likely carcinoma
3. **Apply NBI to assess microvasculature - MV** (in practice NBI is used concomitant to magnification)

- **WOS visible?**
  - No
    - Regular
    - Irregular
  - Yes
    - **LBC visible?**
      - Yes
        - **IM**
      - No

- **Close inspection of MV**
  - **MV changes indicating carcinoma**
    - Irregular caliber
    - Meandering path
    - Deranged shape
    - Heterogeneous appearance
    - Altered density

- **Further characterization**
  - ILL type 1/ fine network vessels: **differentiated carcinoma**
  - ILL type 2/ corkscrew vessels: **poorly-differentiated carcinoma**