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

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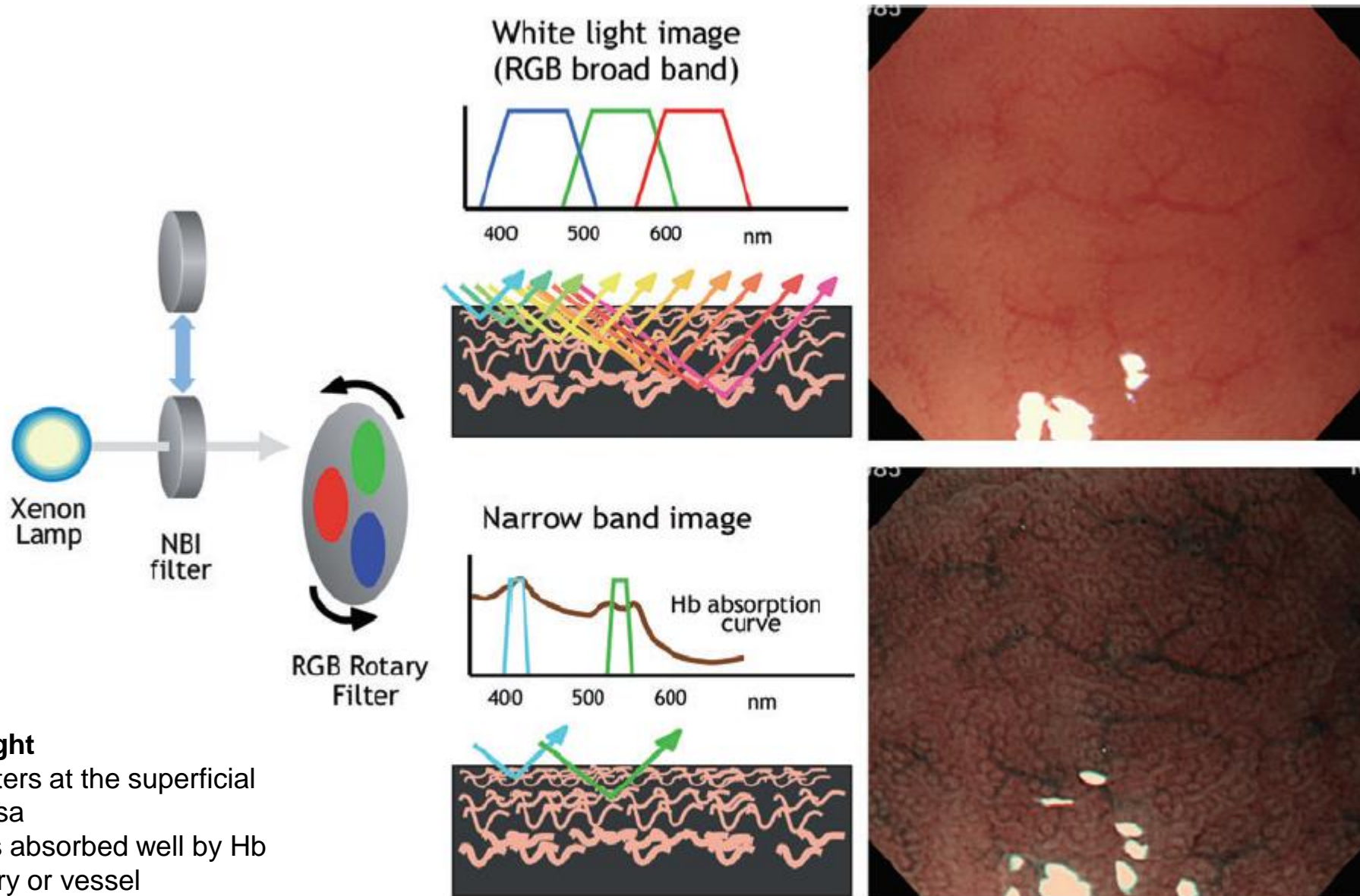2017.08.29

소화기내과 임상강사 이소정

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)

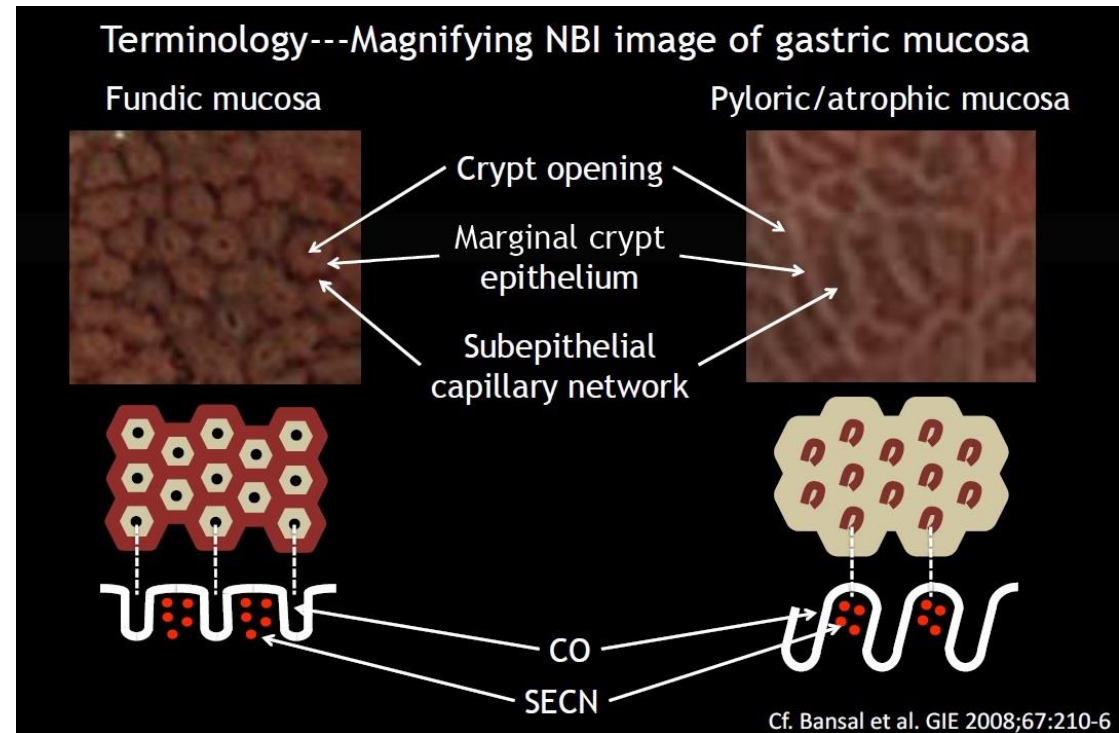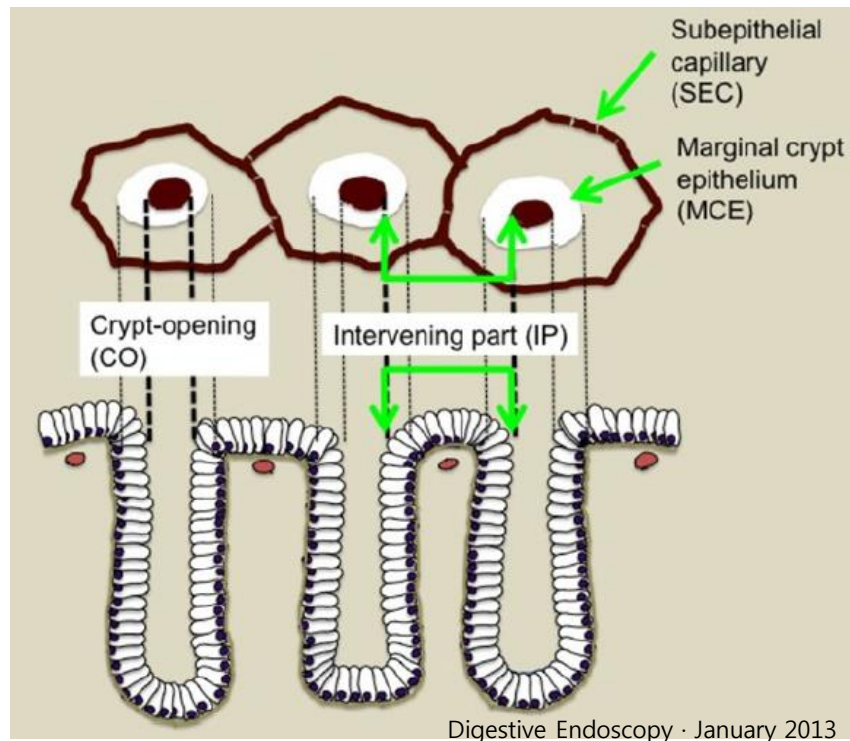# Principle of narrow band imaging(NBI) endoscopy system

White light image (RGB broad band)

Narrow band image

Hb absorption curve

Xenon Lamp

NBI filter

RGB Rotary Filter

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.
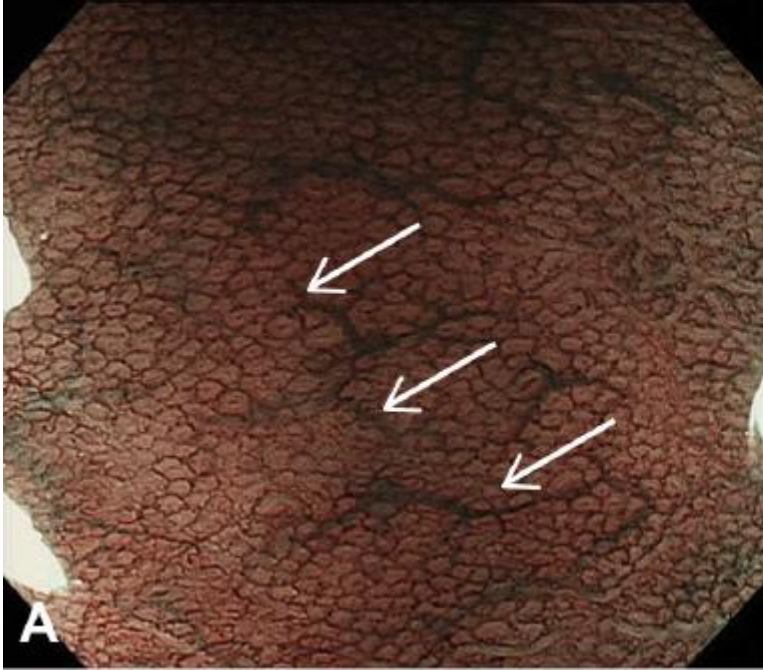
The use of M-NBI in the stomach

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)

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Terminology---Magnifying NBI image of gastric mucosa

Cf. Bansal et al. GIE 2008;67:210-6
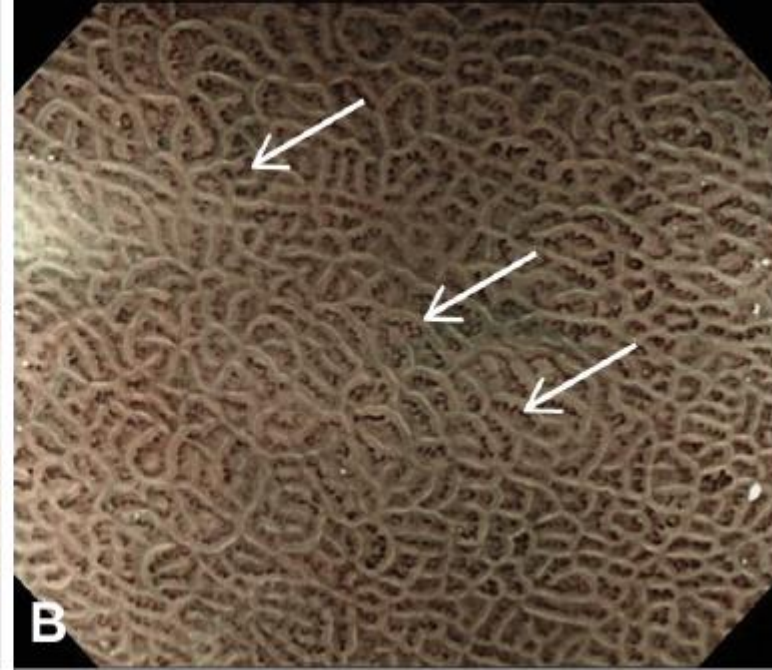
Normal or non-neoplastic change

Gastric body

Antrum

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

Type 1 gastritis

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
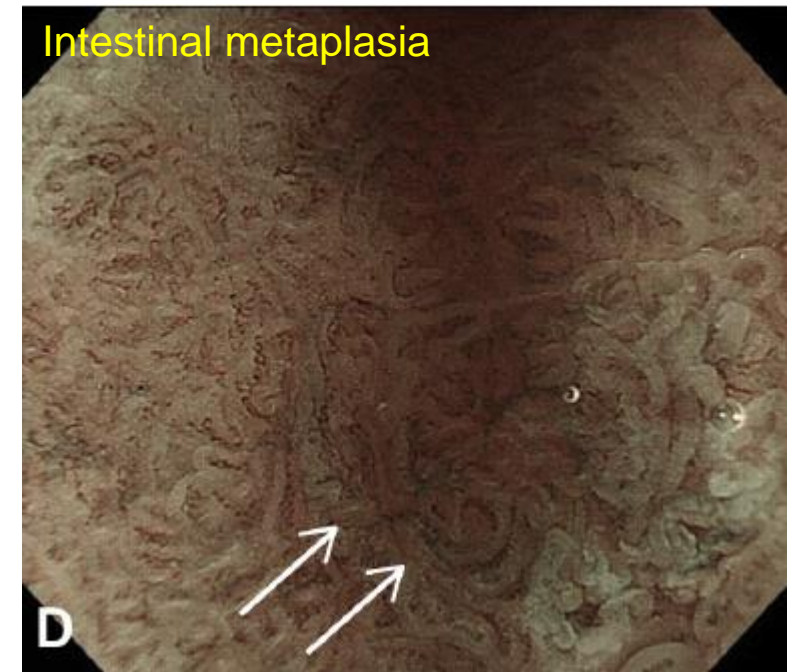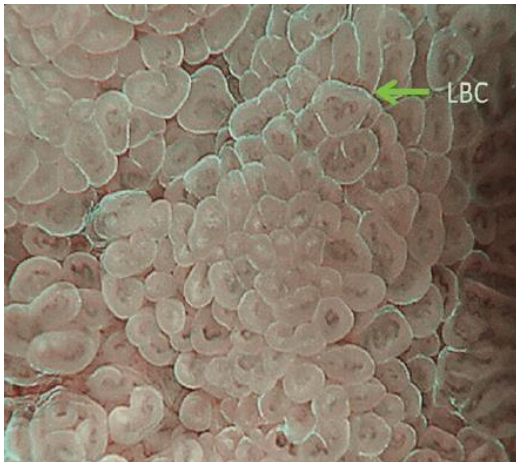
Light-blue crest sign of intestinal metaplasia
Villiform appearance of the microsurface

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
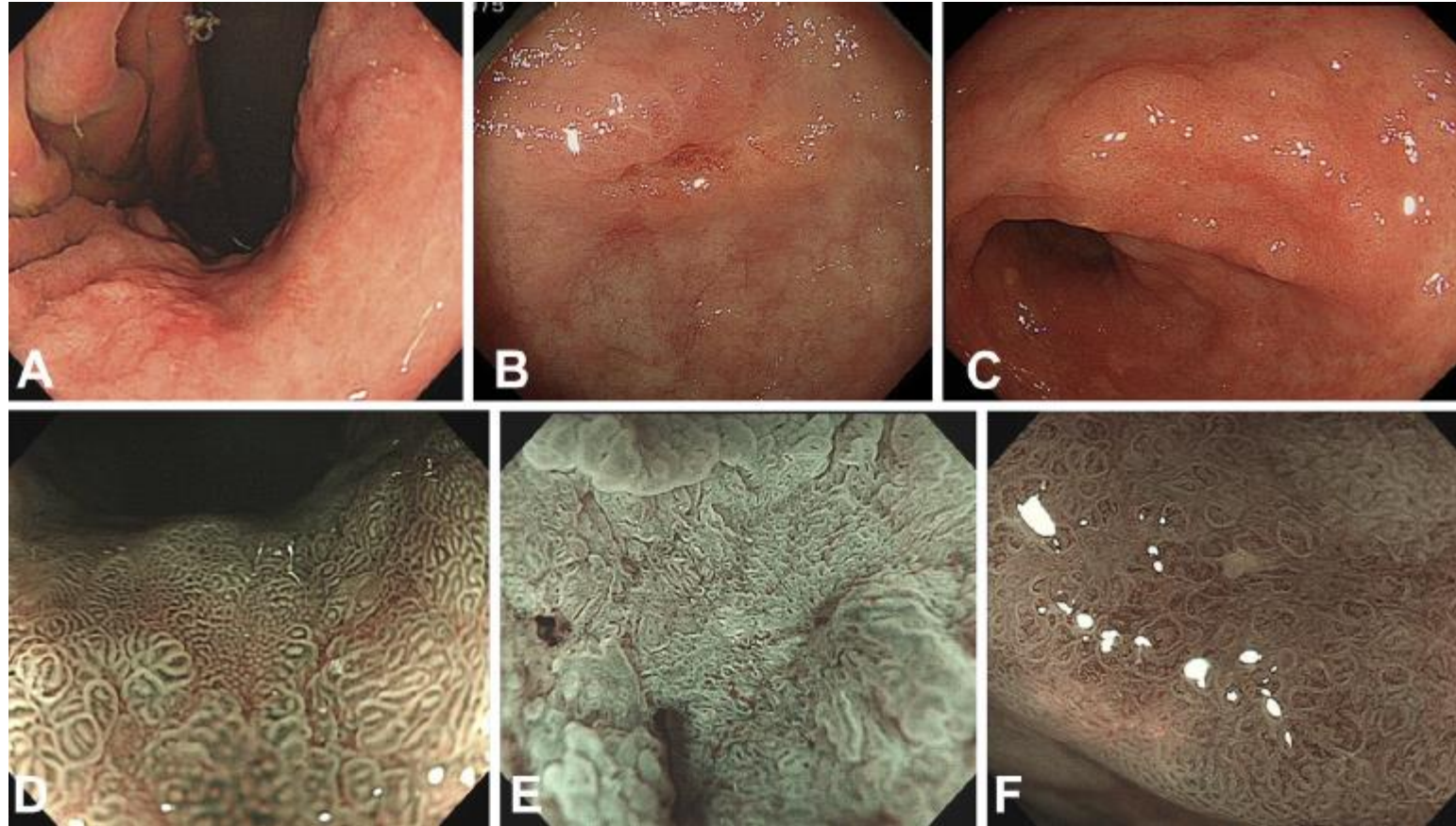
Adenoma versus carcinoma

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

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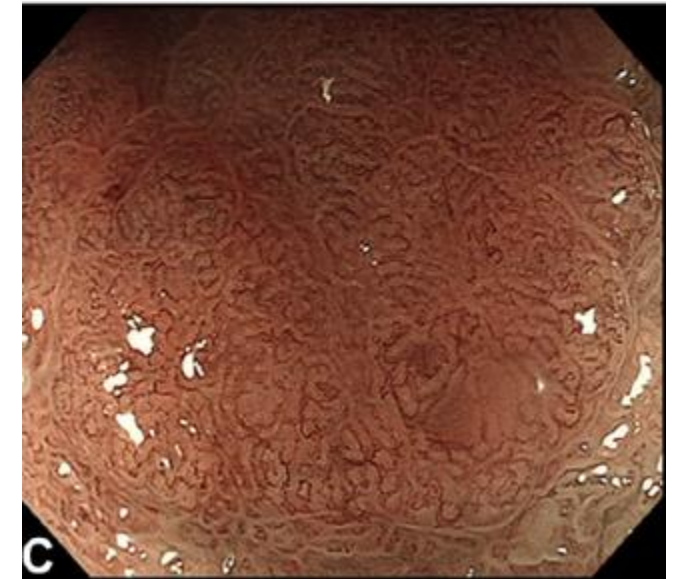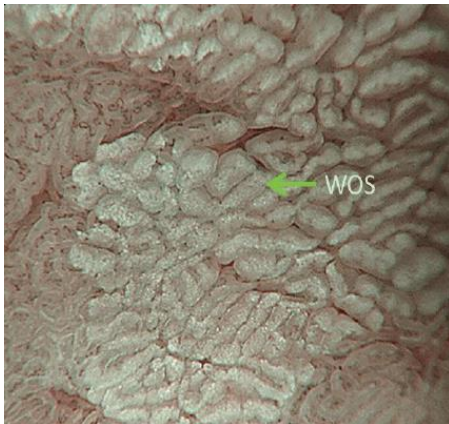
Adenoma versus carcinoma

- Carcinoma
  - White opaque substance (WOS)
    - Irregular

  - MV
    - Fine network : Well-differentiated cancer
    - Corkscrew : Undifferentiated cancer
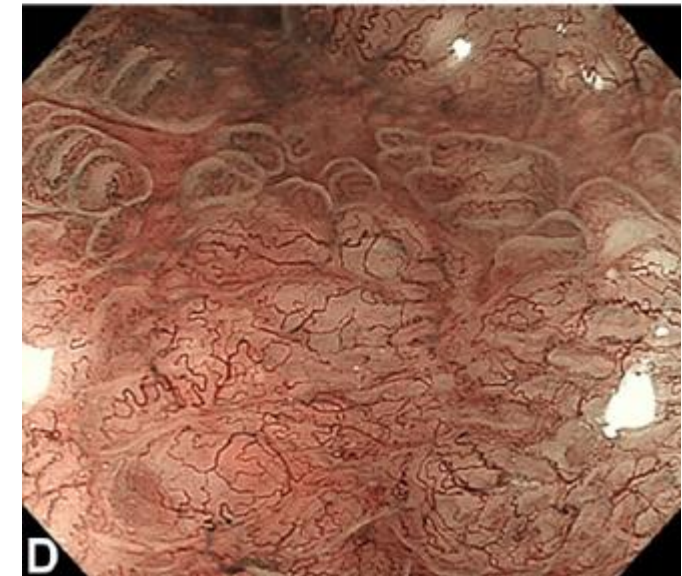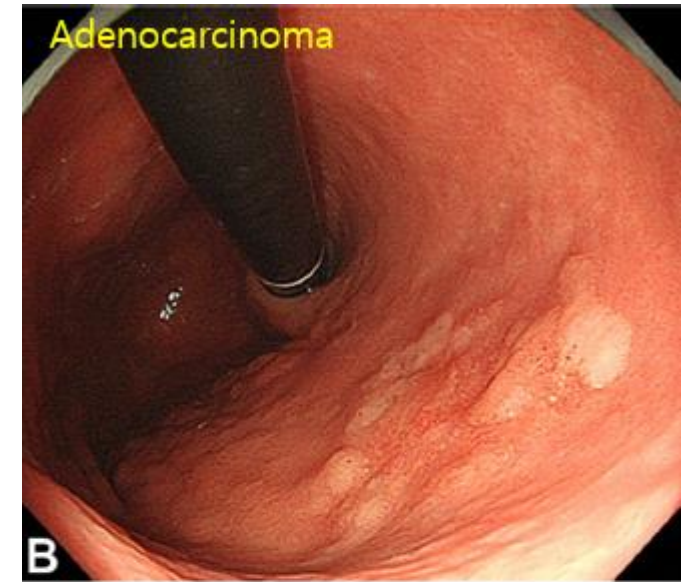
Determining histological grade of adenocarcinoma, *Yokoyama et al*

Well-differentiated adenocarcinoma
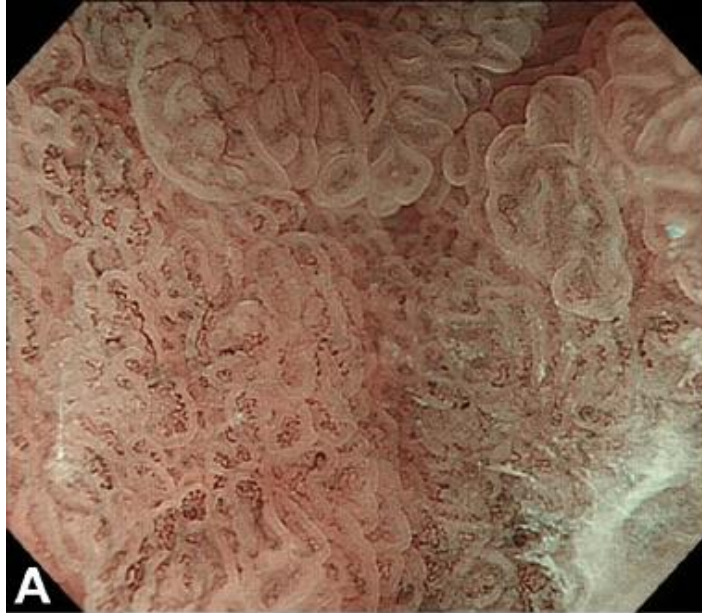
Poorly differentiated lesions

Intralobular loop(ILL) pattern 1
- Preserved villous MS
- Abnormal vessels confined

Intralobular loop(ILL) pattern 2
- Disintegrated villous MS

Fine network MV pattern
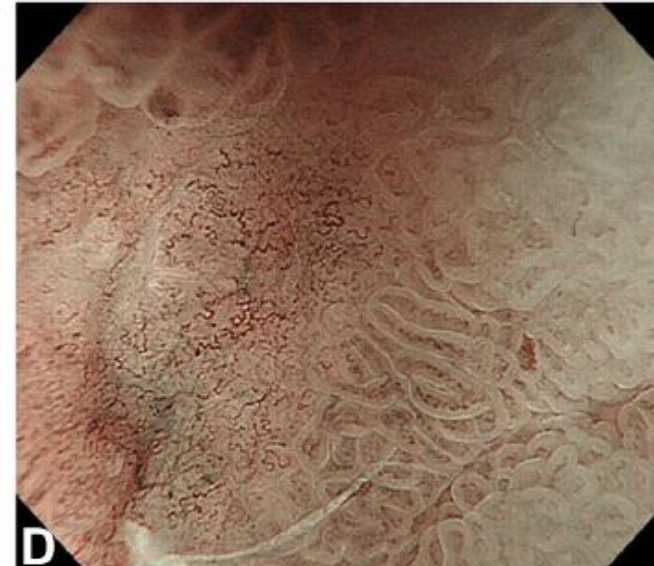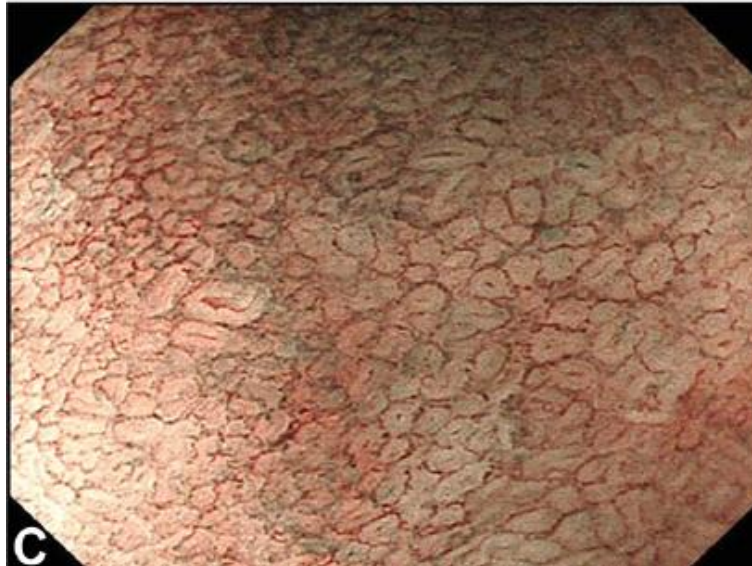
Corkscrew vessel

TABLE 2. Diagnostic value of M-NBI appearance in diagnosis

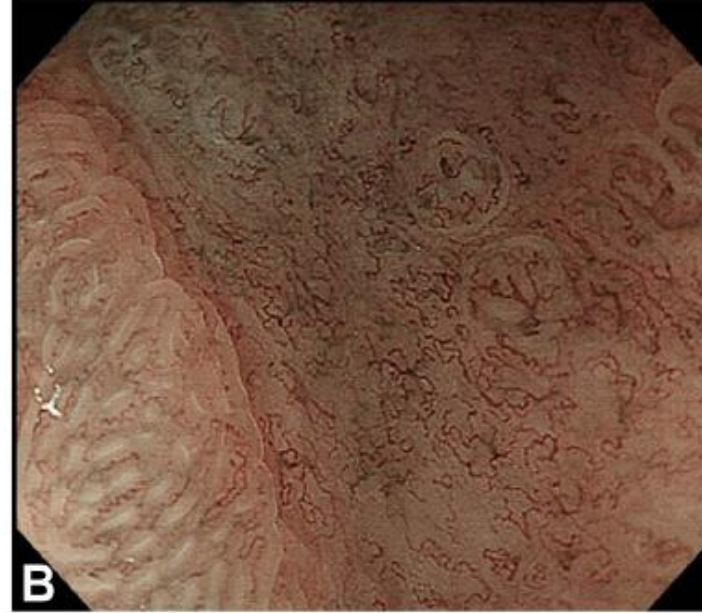| M-NBI appearance	Clinical correlate	Sensitivity, %	Specificity, %
RAC[24]	Hp-negative normal stomach	93.8	96.2
	Hp-negative in gastritis*	99.4	50
Villiform microsurface (Fujita type 3)[23]	Intestinal metaplasia	73.3	95.6
Light-blue crest[26]	Intestinal metaplasia	89	93
Protruded lesion with small round pits/honeycomb microvasculature pattern[48]	Fundic gland polyp	94.7	93.4
Regular vs irregular white opaque substance[36]	Adenoma vs carcinoma†	94	96
Saitama types I/II vs types III/IV/V[38]	Adenoma vs well-differentiated carcinoma*	90.1	84.6
Fine network vs corkscrew vessels[39,40]	Well- vs poorly differentiated carcinoma*,‡	94.7[39]/97.2[40]	96,[39]/100[40]
Intralobular loop pattern 1 vs 2[40]		71.1	100

M-NIB, 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?

Pale   *Reddened*

Considerfundic gland or hyperplastic polyp (normal MS and MV)

No ulcer   Ulcerated

Suspect poorly-differentiated carcinoma

Suspect well-differentiated carcinoma

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

Regularity of MS pattern?   Presence of line of demarcation?

Regular   Irregular   No ('diffuse')   Yes ('focal')

Likely adenoma

Possible carcinoma

Possible gastritis

Suspect carcinoma

Close examination of MS within line of demarcation

Regular ('preserved')   Irregular or 'micrification' ('destroyed')

Enlarged/oval pits ± SECN absent± Tubulovilliform change

Gastritis   Likely IM   Likely carcinoma

Likely adenoma **Possible carcinoma**   **Gastritis**   **Likely IM**   **Likely carcinoma**

3 **Apply NBI to assess microvasculature – MV** (in practice NBI is used concomitant to magnification)

LBC visible?

WOS visible?

Yes   No

No   Regular   Irregular

IM

Target biopsy
Guided by M-NBI assessment of MS/MV

Close inspection of MV

MV Regular   MV Irregular   MV normal   MV abnormal   MV unclear

Likely adenoma   Likely carcinoma   IM   Likely carcinoma

← *MV changes indicating carcinoma*
- *Irregular caliber*
- *Meandering path*
- *Deranged shape*
- *Heterogeneic appearance*
- *Altered density*

Further characterization

ILL type 1/ fine network vessels: **differentiated carcinoma**

ILL type 2/ corkscrew vessels: **poorly-differentiated carcinoma**