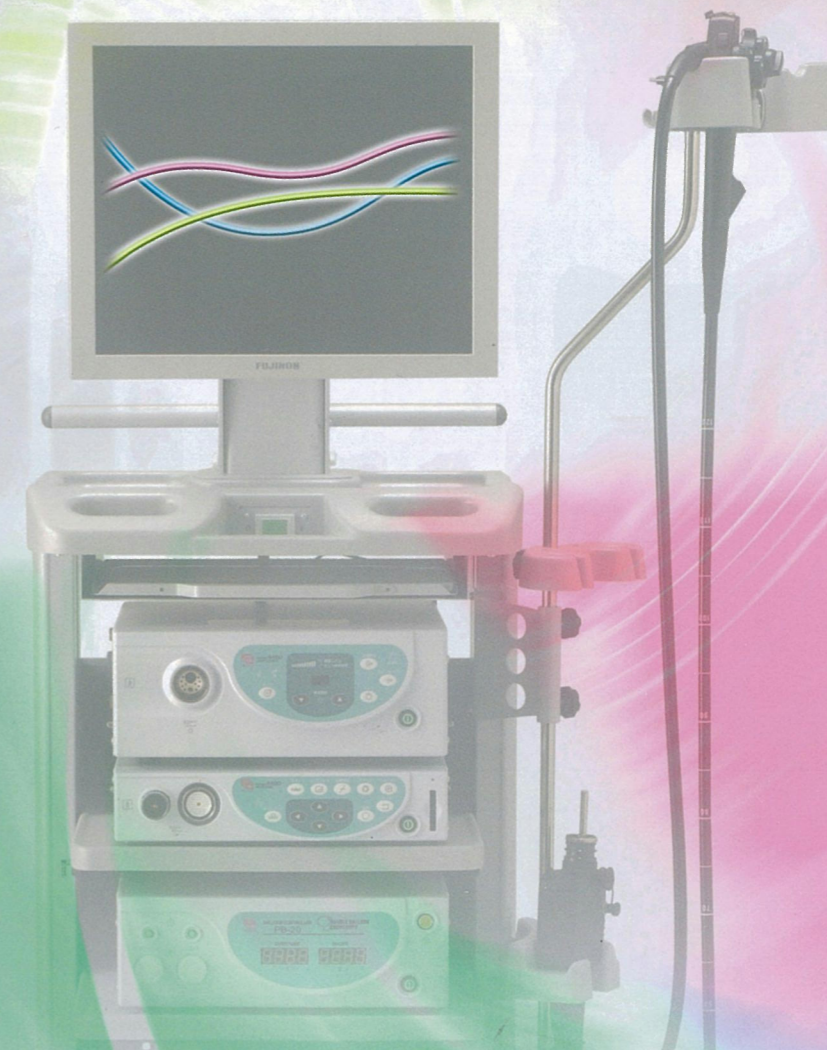




# FICE™

## Flexile spectral Imaging Color Enhancement



FUJIFILM Group

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## FUJINON FUJIFILM

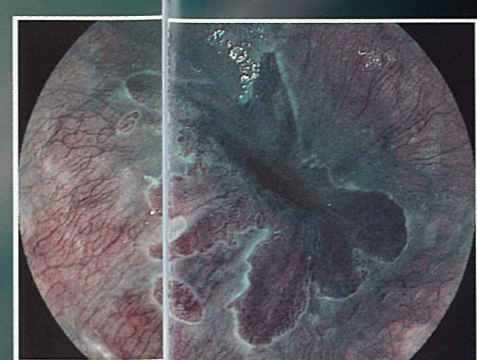
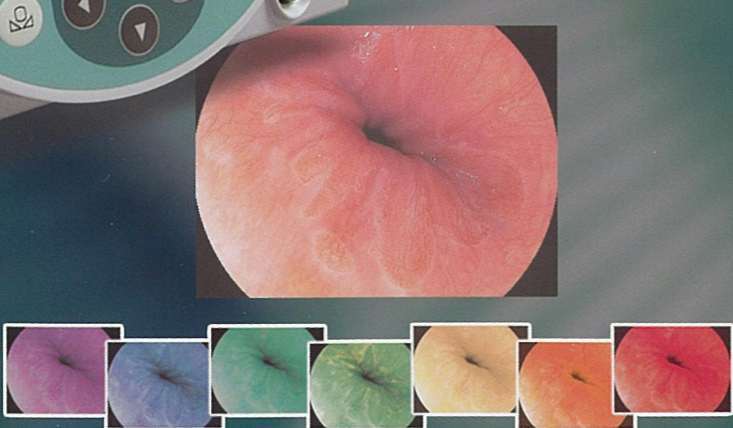
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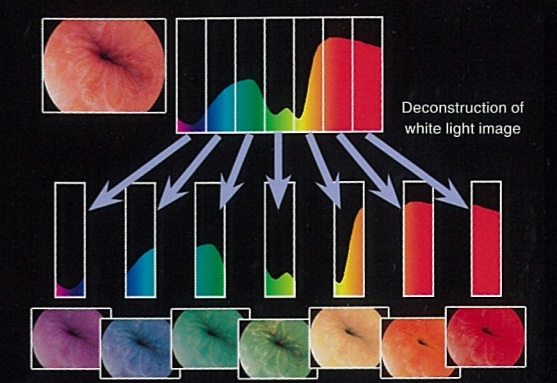
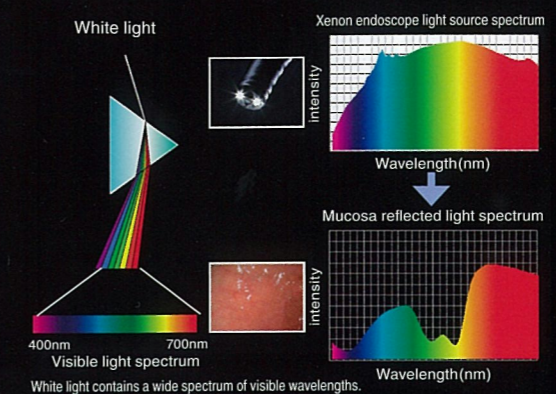
# FICE™ spectral image processing technology for High Contrast Imaging

Accurate and reliable endoscopic examination and diagnosis require detection of subtle structural and color changes such as elevation, depression, and superficial patterns of lesions. However, endoscopic images may differ significantly depending on the wavelength of light used for observation. Flexible spectral Imaging Color Enhancement (FICE) developed by FUJINON is a spectral image processing technology to help endoscopic examination and diagnosis by utilizing high-resolution color discrimination technology. FICE converts images into spectral images with individual wavelengths and reconstructs them to generate fine High Contrast Images, thereby supporting advanced endoscopic examination and diagnosis.



## What is spectral endoscopy?

A xenon light source used for endoscopy produces white light similar to sunlight, which has a broad wavelength spectrum from 400 to 700 nm. The mucosa in human bodies generally looks rosy when illuminated with a xenon lamp. This is because blue and green wavelengths are absorbed and the red wavelength is mostly reflected by the mucosa. Thus, the color of the area observed varies depending on the distribution of wavelengths of the reflected light.

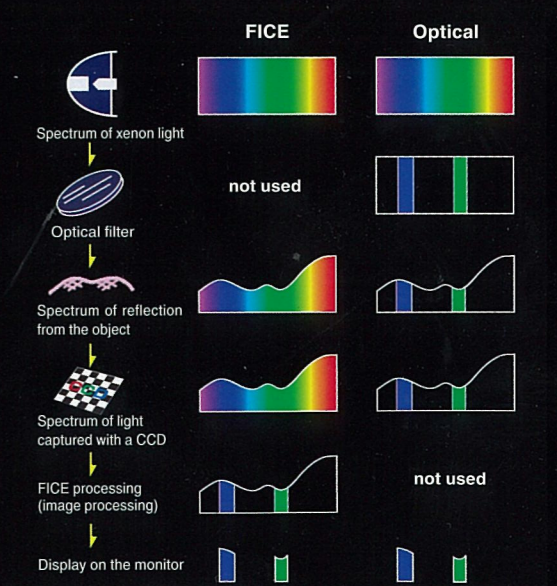
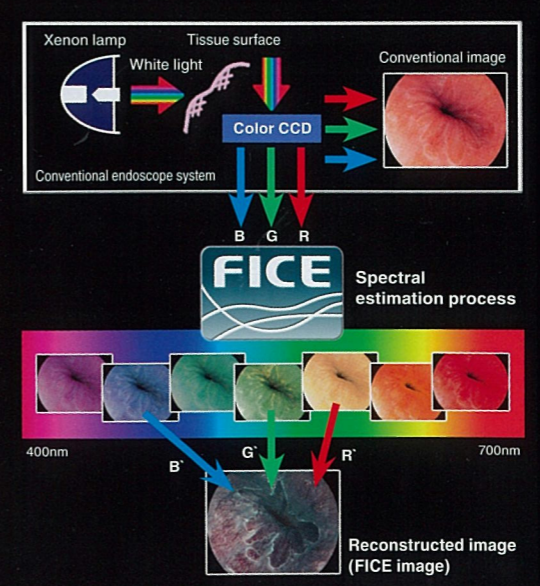


## Selection of images of various wavelengths and reconstruction of a new image

Endoscopes display images on the monitor by directing white light from a xenon lamp onto the tissue and capturing reflected light with a CCD device. FICE performs spectral estimation processing to produce spectral images, selects spectral images of given wavelengths, and assigns these spectral images to the Red, Green, and Blue monitor input channels.

## In contrast to optical processing, FICE can selectively vary the reflected wavelengths to display images

Optical processing uses optical filters that allow only certain wavelengths to pass through and be directed onto the tissue. Whatever reflected light is captured by the CCD is then displayed as the endoscopic image; therefore only wavelengths allowed by the filter can be observed. In contrast, FICE can select various combinations of wavelengths from all the light captured by the CCD and display a variety of different images.



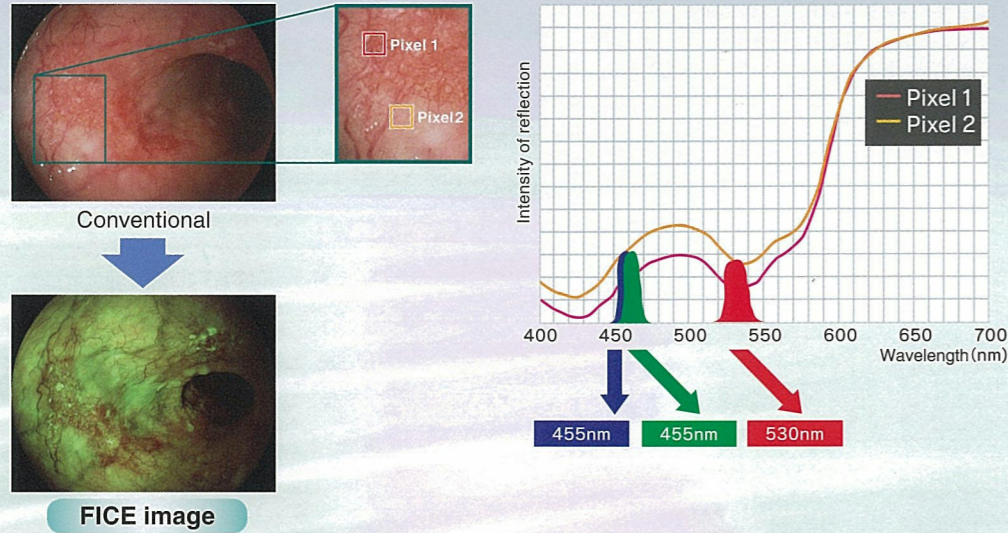


# Unique functions of FICE enhance the potential for endoscopic diagnosis and treatment



## Variable wavelength settings allow wide ranging applications

Fine mucosal images differ depending on the site in the body and the patient, and a fixed set of wavelengths does not always produce images with excellent visibility. However, FICE makes it possible to select spectral images with wavelengths corresponding to different tissue reflections. FICE allows you to select spectral images with appropriate wavelengths to maximize the difference in the reflection spectrum, thereby reconstructing high contrast images in a wide variety of tissues and sites within the body.



## Ten patterns of wavelengths can be preset

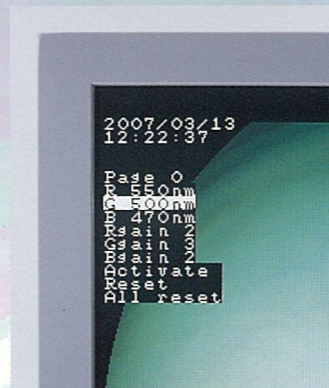
FICE has ten preset wavelength patterns that are ready for use in the clinical setting. Moreover, you can alter the preset wavelengths in 5-nm increments to use the technology in a variety of applications, not only for examination and diagnosis, but also for more elaborate research. FICE is Multi-Band Imaging™.

Wavelength Preset	R	G	B
0	500	445	415
1	500	470	420
2	550	500	470
3	540	480	420
4	520	500	405
5	500	480	420
6	580	520	460
7	520	450	400
8	540	415	415
9	550	500	400

FICE image



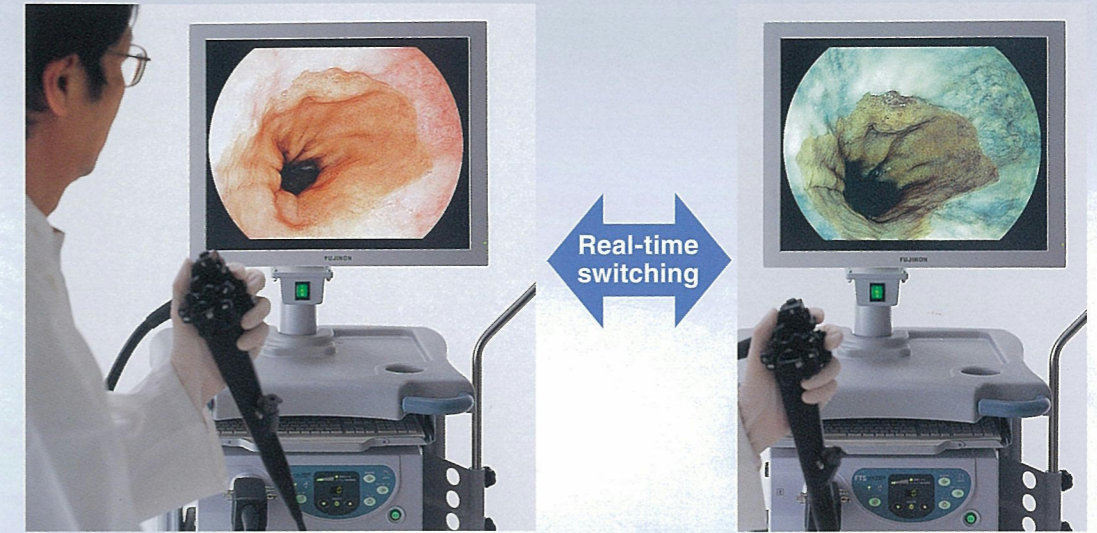
R G B  
550 500 470



FICE image setting mode

## FICE on demand switching

FICE allows individual physicians to instantaneously switch between conventional white-light and FICE-images and also between any of the 10 preset FICE images with the push of a button, as the technology is based on digital image processing. The front panel, scope switch, or foot switch allow the physician to switch images in a split second with other functions preserved, ensuring stress-free operation during examination.



Conventional

FICE image



Switched with the front panel



Switched with the scope switch



Switched with the foot switch

## Other functions

### Hyper-Sharpness

The contours of the object may be highlighted (three variable levels) to improve resolution. Hyper-Sharpness in combination with FICE allows construction of color enhanced images with greater contour detail.

### Color Emphasis

This function magnifies color components of conventional white-light images (three variable levels) to accentuate subtle color changes for greater visualization.

### Software Kit IP-4400

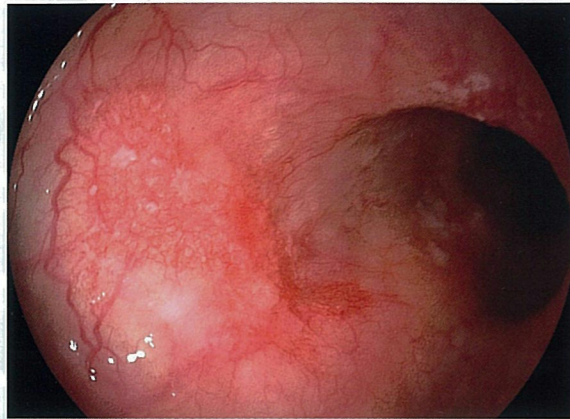
FICE may be added to the EPX-4400 video endoscopy system as an option at any time.



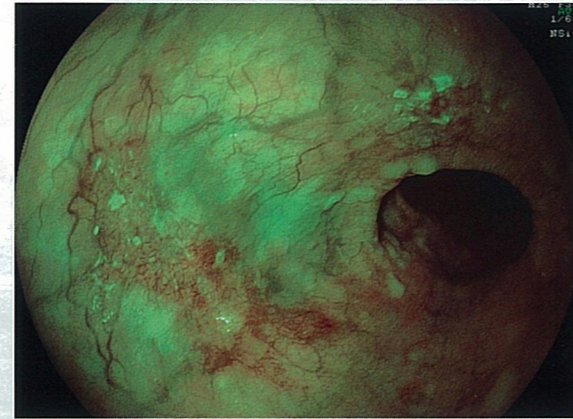


CLINICAL IMAGES

Upper G.I. Tract



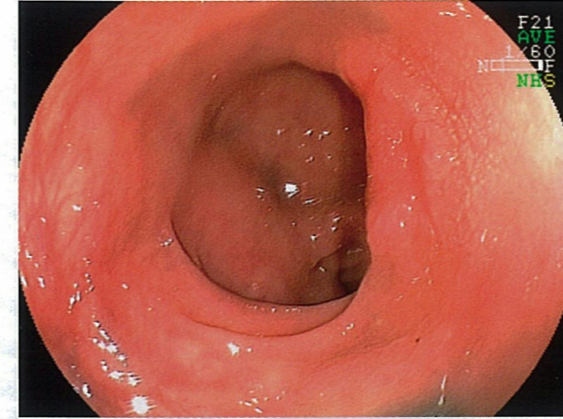
Conventional



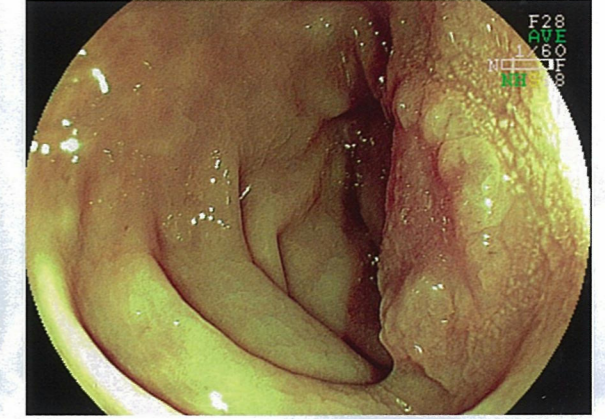
FICE image  
R G B  
 530 455 455

CLINICAL IMAGES

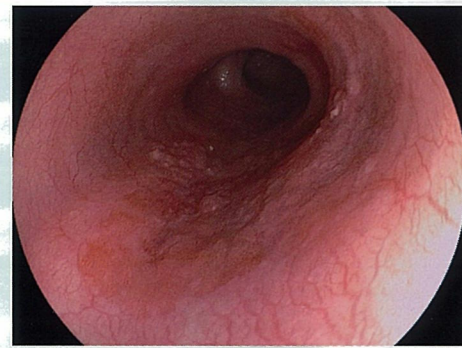
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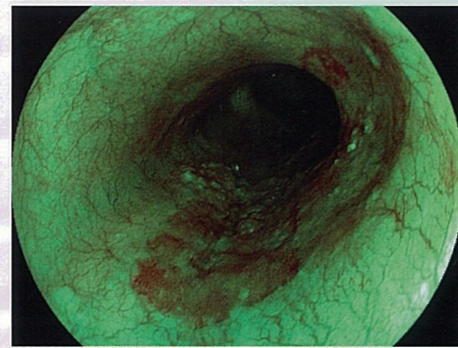
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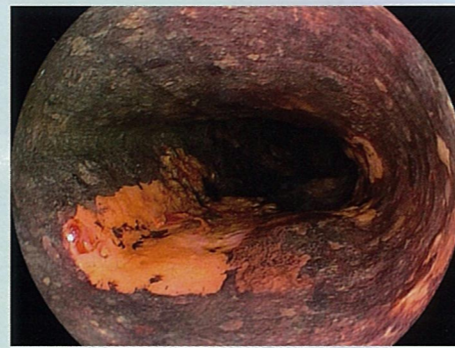
FICE image  
R G B  
 540 490 420



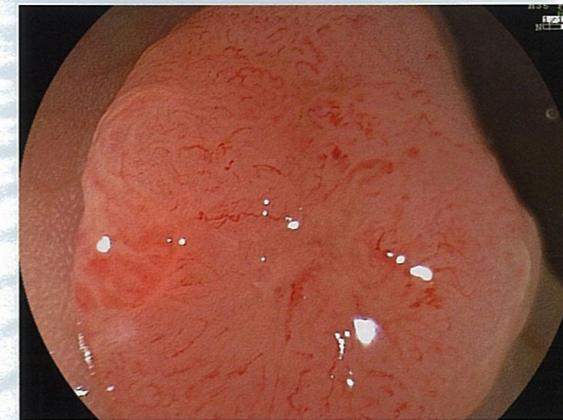
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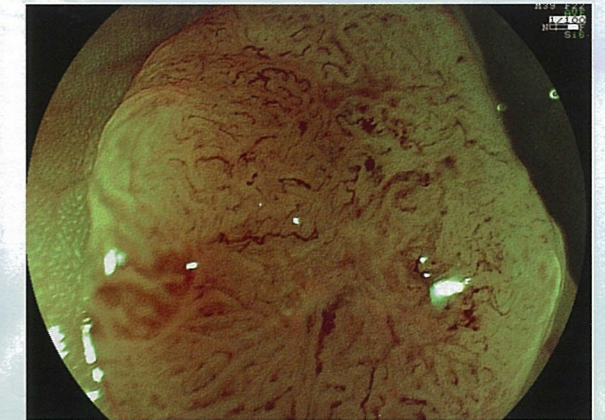
FICE image  
R G B  
 530 455 455



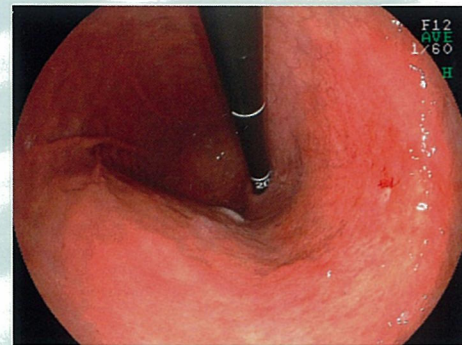
Conventional Chromoendoscopy  
 (Iodine)



Conventional (Magnification)



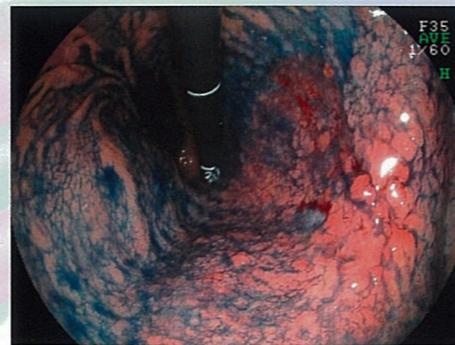
FICE image  
 (Magnification)  
R G B  
 530 455 455



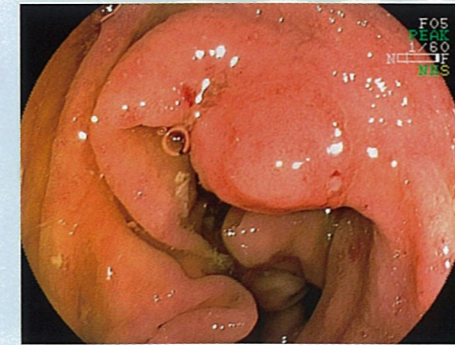
Conventional



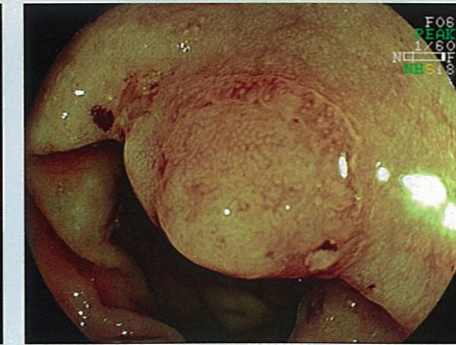
FICE image  
R G B  
 560 500 475



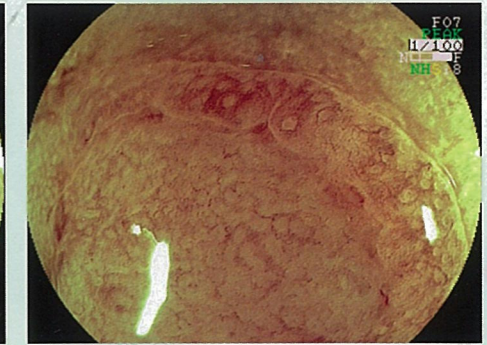
Conventional Chromoendoscopy  
 (Indigocarmine)



Conventional



FICE image  
R G B  
 540 490 420



FICE image  
 (Magnification)  
R G B  
 540 490 420