

The existence of an endoscopically observable capillary plexus in the deep colonic mucosa

Colonoscopy allows microvascular observation on the luminal surface; however, the precise depth of the blood vessels being observed is unknown. We successfully generated 3D reconstructed images of the microvessels of the crypts and associated mucosa from tissue slides using Synapse VINCENT [1,2]. Colonoscopic images of a normal colon were compared with the histological preparation of the colon microvasculature to clarify the depth of the vascular structures being observed by colonoscopy.

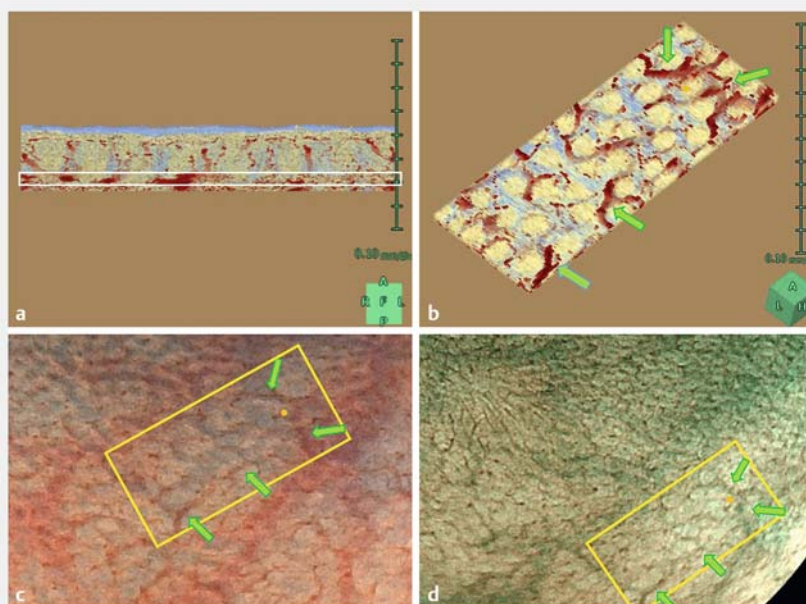
We present colonoscopic images of a 51-year-old man with normal mucosa; he had provided written informed consent. The sigmoid colon was observed with the white light and blue laser imaging (BLI) modes of the LASEREO endoscope system of an EC-L590ZW colonoscope (Fujifilm, Tokyo, Japan).

► **Video 1** shows the two plexuses of the colonic mucosal capillary network and their connections. One plexus was present at the subepithelial level; the other was at the crypt bottom, just above the muscularis mucosa. The two plexuses were connected via capillaries that ran along the crypts. We reconstructed a 3D histological image from the 2D tissue section images acquired by digital microscopy and compared this with the endoscopy images (► **Fig. 1**); the capillary plexus in the deep mucosa could be observed with both white light and BLI at low magnification.

It is believed that the arteries that enter the colon wall form a submucosal plexus with repeated bifurcations, and then rise through the muscularis mucosa to form a polygonal capillary plexus below the epithelium [3,4]. However, our results revealed that the colonic mucosa had capillary plexuses not only at the subepithelial level but also at the crypt bottom level. By providing crypt stem cells with oxygen and nutrients, a deep mucosal capillary plexus can be formed. This is the first report showing the existence of an endo-



► **Video 1** The creation of 3D reconstructed images of the crypts and microvessels extracted from serial sections of normal colonic mucosal tissue using the Synapse VINCENT software program (Fujifilm Co., Tokyo, Japan).



► **Fig. 1** Comparison between: **a, b** the histological images obtained with digital microscopy and; **c, d** the horizontal plane endoscopic images showing: **a** in the 2D reconstructed image of the colonic mucosa viewed from the lateral side, the deep mucosal capillary plexus (white rectangle), which exists at a depth of approximately 200 μm from the surface; **b** in the reconstructed horizontal 3D image, the capillary plexus in the deep mucosa; **c** the same area on low magnification endoscopic view after indigo carmine staining; **d** the same area on low magnification imaging with blue light imaging (BLI). The yellow squares show the same area, the green arrows show identical capillaries, and the orange dots show the identical pit.

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Competing interests

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