

# **Application of Whole Tissue Imaging by Micro-Computed Tomography for the Evaluation of Endoscopic Submucosal Dissection Specimens**

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## **Background**

The precise pathological diagnosis of endoscopic submucosal dissection (ESD) specimens is essential in determining subsequent therapy. However, the current pathological diagnosis involves the evaluation of two-dimensional images of cross-sections of resected specimens, which only evaluates a small part of the tumor. Micro-computed tomography (micro-CT) can non-destructively provide three-dimensional reconstructed whole specimen imaging. The aim of this study was to clarify whether micro-CT was able to provide sufficient pathological information in the evaluation of ESD specimens.

## **Methods**

We scanned fresh or formalin-fixed ESD specimens for 10 to 15 minutes using a custom-made micro-CT scanner (Nikon Metrology NV, Leuven, Belgium) after staining them with 10% iodine for 60 to 180 seconds. All paraffin blocks after making slides stained with hematoxylin-and-eosin were also subjected to micro-CT scanning. Reconstructed imaging data were visualized and analyzed using Dragonfly (Object Research Systems Inc, Montreal, Quebec, Canada). We evaluated the extent of the lesion and the presence of the lesion at the resection margin by correlating the reconstructed images obtained from fresh or formalin-fixed specimens with those from Whole Block Imaging (WBI) and whole slide imaging (WSI).

## **Results**

A total of 9 ESD specimens [1 gastric intramucosal cancer, 3 colorectal (1 intramucosal, 2 submucosal) cancer, and 5 colorectal adenomas] were scanned by micro-CT. The matching cross-section slices between the WSI, the fresh specimen, and the WBI are shown in Figure 1. All reconstructed micro-CT images allowed for clear visualization of tissue structure, differentiation between tumor and non-tumor tissue, and the presence of the lesion at the resection margin with the same findings observed on the WSI. However, the micro-CT image of the fresh specimen failed to detect the site of submucosal invasion in one case of submucosal-invasive cancer. The WBIs were able to detect the extent of submucosal invasion in more detail and three-dimensional than WSI.

## **Conclusions**

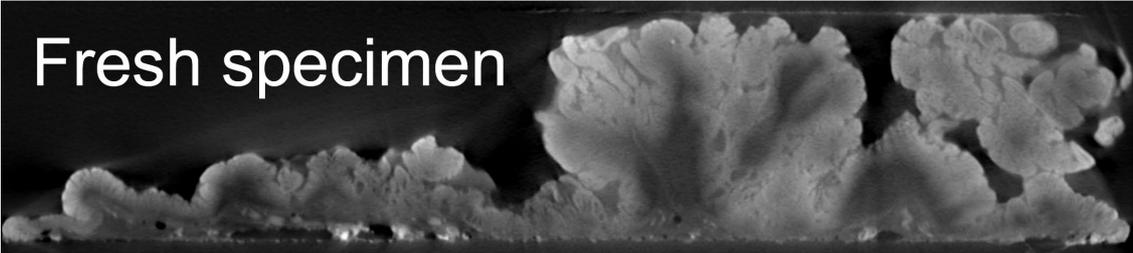
Our results suggest that a combination of whole tissue imaging by micro-CT and conventional histology could provide a more accurate diagnosis of ESD specimens. For clinical application, it is desirable to improve the visibility of fresh and formalin-fixed specimens.

Figure 1

H&E slide



Fresh specimen



Paraffin block

