Altered organization of collagen fibers in the uninvolved human colon mucosa 10 cm and 20 cm away from the malignant tumor

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The aim of our study was to quantify morphological parameters and organization of collagen fibers and to investigate possible causes of collagen remodeling (change in syntheses, degradation and collagen cross-linking) in the colon mucosa 10 cm and 20 cm away from the cancer in comparison with healthy mucosa.

Using SHG imaging, electron microscopy and specialized softwares (CT-FIRE, CurveAlign and FiberFit), we objectively visualized and quantifed changes in morphology and organization of collagen fibers and investigated possible causes of collagen remodelling (change in syntheses, degradation and collagen cross-linking) in the colon mucosa 10 cm and 20 cm away from the cancer in comparison with healthy mucosa.

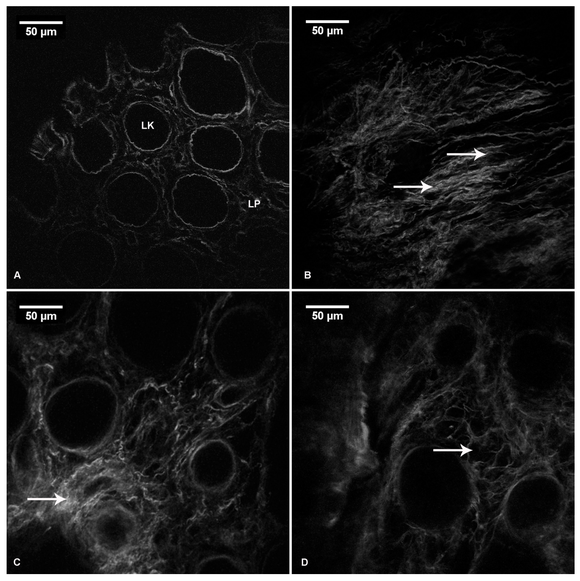

Fig 1. SHG images of collagen fibers in the lamina propia of colon mucosa in healthy patients (a), 10 cm away from the cancer (b,c) and 20 cm away from the cancer (d). Arrows are showing parallel collagen fibers (b), dense fibers (c) and region with large pores (d)

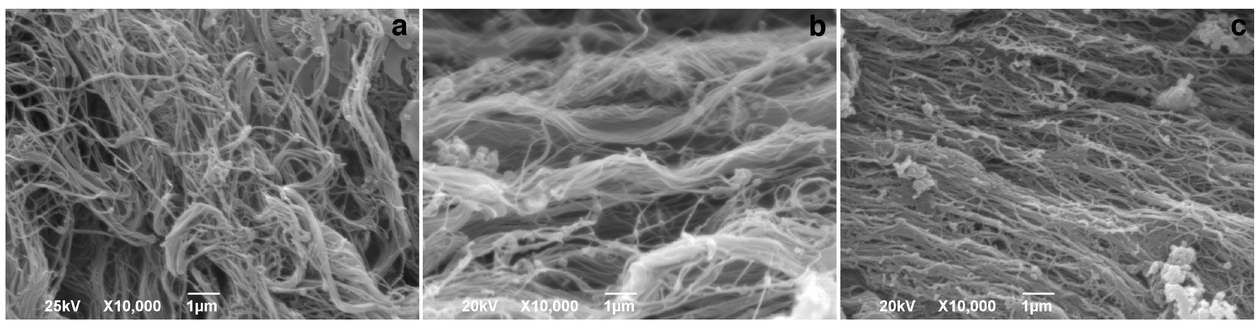

Fig 2. SEM images of collagen fibers in the lamina propria of colon mucosa in the healthy patients (a) and 10 cm (c) and 20 cm (b) away from the malignant tumor. x10 000

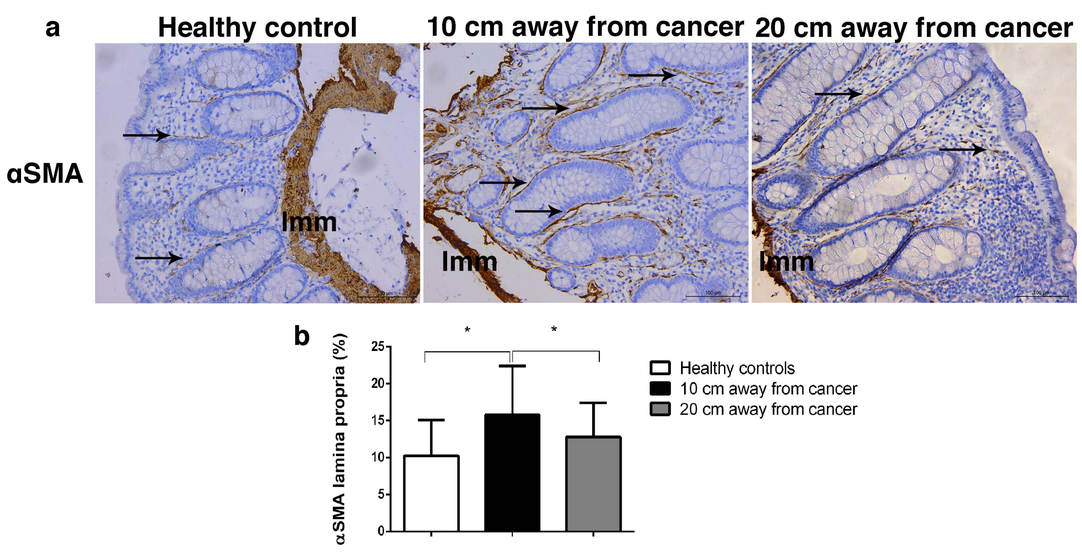

Fig 4. αSMA-staining. Arrows are showing αSMA-positive myofibroblasts; Graphs are showing increased representation of αSMA-positive cells 10 and 20 cm away from the cancer compared with healthy patients; *p<0.05

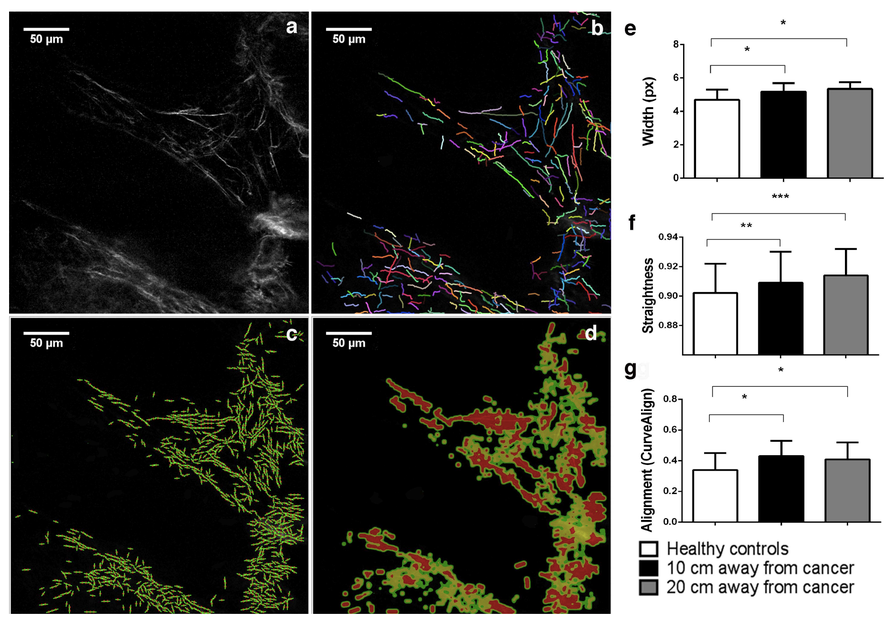

Fig 3. Graphical output from CT FIRE showing automatic extraction of collagen fibers; Graphs are showing increased width (e), straightness (f) and alignment (g) of collagen fibers 10 cm and 20 cm away from the cancer.

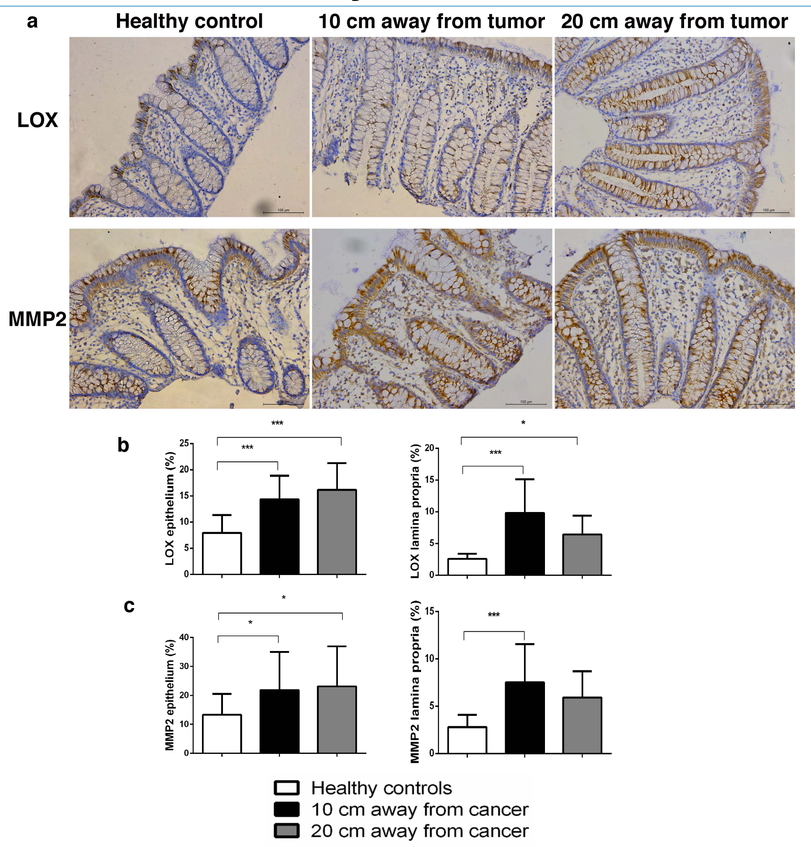

Fig 5. LOX and MMP2 staining Graphs are showing increased representation of LOX (%) and MMP2-positive cells 10 cm and 20 cm away from the cancer compared with healthy patients. *p<0.05, ***p<0.0001