

Duodenum mucosa denudation after gamma rays irradiation of rat small intestine.

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In order to understand the mechanism of denudation of intestine mucosa after irradiation stress with doses used in cancer radiotherapy, rats were whole body irradiated using ⁶⁰Co-gamma rays at three doses and two dose rates. Fragments of duodenum mucosa were take off 24 or 48 h after irradiation, and processed for microscopy observations. For each dose and dose rate, one thousand 2 micrometer-thick serial epon sections were pictured and digital images were imported into softwares, ImageJ and Reconstruct for 3d reconstruction. Morphological changes were observed within irradiated mucosa when compared to control that worst with dose and dose rate. Numerous lesions were noted as villous atrophy, crypts and villi branched, lamina propria vacuoles, large and numerous irregular villus pleats. Lost of large fragments of epithelial layer were observed. Ultrathin sections of irradiated mucosa revealed typical apoptotic lesions within columnar cells as chromatin condensation of irregular shape nuclei, nuclear fragmentation and swollen mitochondria. Apoptotic cells were detected at crypt bottom but not at villi tip as are usually reported. Apoptotic index increased with dose and post irradiation time. Detachment of two neighbour epithelial layers was detected at crypt stem cells site. Animation of mucosa after 3dr has show entire villi detachment from crypts that propagate longitudinally through mucosa. Apoptotic process induced by radiation and epithelial layer detachment occurred at same site (between villi bottom and crypt corresponding to stem cells position). Thus we established that mucosa denudation occur by entire villi detachment via lost of intercellular contacts of apoptotic stem cells. This study elucidates the enigma of the fast denudation of intestine mucosa following irradiation.