Gastroduodenal ulceration after selective internal radiation therapy of liver tumor

Image-guided interstitial brachytherapy is used for the treatment of primary and secondary liver tumors. Millions of non-biodegradable yttrium-90 (\(^{90}\)Y)-imprint-ed microspheres with a diameter of 29–35 \(\mu\)m are selectively infused by a catheter into the branch of the hepatic artery supplying the tumor. Thereby, a radiation dose of 30–60Gy can be applied to the tumor tissue. \(^{90}\)Y is a beta-emitter with an average tissue penetration depth of approximately 2.5 mm and a physical half-life of 2.67 days (64.2 hours) [1, 2].

Gastroduodenal ulceration occurs in less than 5% after selective internal radiation therapy (SIRT) [2–4]. We present a case of radiation-induced gastric ulceration after SIRT for the treatment of hepatic metastases from breast cancer in a 54-year-old female patient (\(\textcircled{1}\) Fig. 1). At 2 months after SIRT, the patient presented with epigastric pain and was diagnosed as having anemia. Upper gastrointestinal endoscopy revealed a single, flat ulcer in the gastric antrum (\(\textcircled{2}\) Fig. 2) and histological examination of two forceps biopsy specimens demonstrated chemical-reactive inflammation and ulceration without \textit{Helicobacter} infection. Proton pump inhibitor (PPI) was prescribed as an oral medication. A repeat endoscopy after 2 months revealed the ulceration was unchanged (\(\textcircled{3}\) Fig. 3). Upper endoscopic ultrasound showed the antral ulcer, but no tumor of the stomach (\(\textcircled{4}\) Fig. 4). At the same time, nearly 4 months after SIRT, 16 forceps biopsy samples were taken and histological examination revealed microspheres in the gastric tissue, with inflammation and ulceration (\(\textcircled{5}\) Fig. 5). Retrospectively, the ulcer was caused by reflux of \(^{90}\)Y-microspheres into aberrant branches of the left and right hepatic arteries extending to the stomach (\(\textcircled{1}\) Fig. 1). Because of the presence of severe anemia, the patient underwent distal gastric resection. SIRT-associated gastrointestinal side effects are mainly diagnosed with the help of biopsies revealing pathognomonic microspheres. Endoscopists and pathologists should be aware of the findings in connection with this new therapy as well as its complications.

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Fig. 4 Endosono- 
graphic image of the antral ulceration with a hyperechogenic line on the ulcer base (white arrow) and hypoechogenic tissue in the thickened submucosal layer (black arrow) 4 months after selective internal radiation therapy (SIRT).

Fig. 5 Biopsy showing two round black 90Y-microspheres within the capillaries at the ulcer base and associated regenerative mucosal changes of chemical-reactive type (hematoxylin and eosin stain).