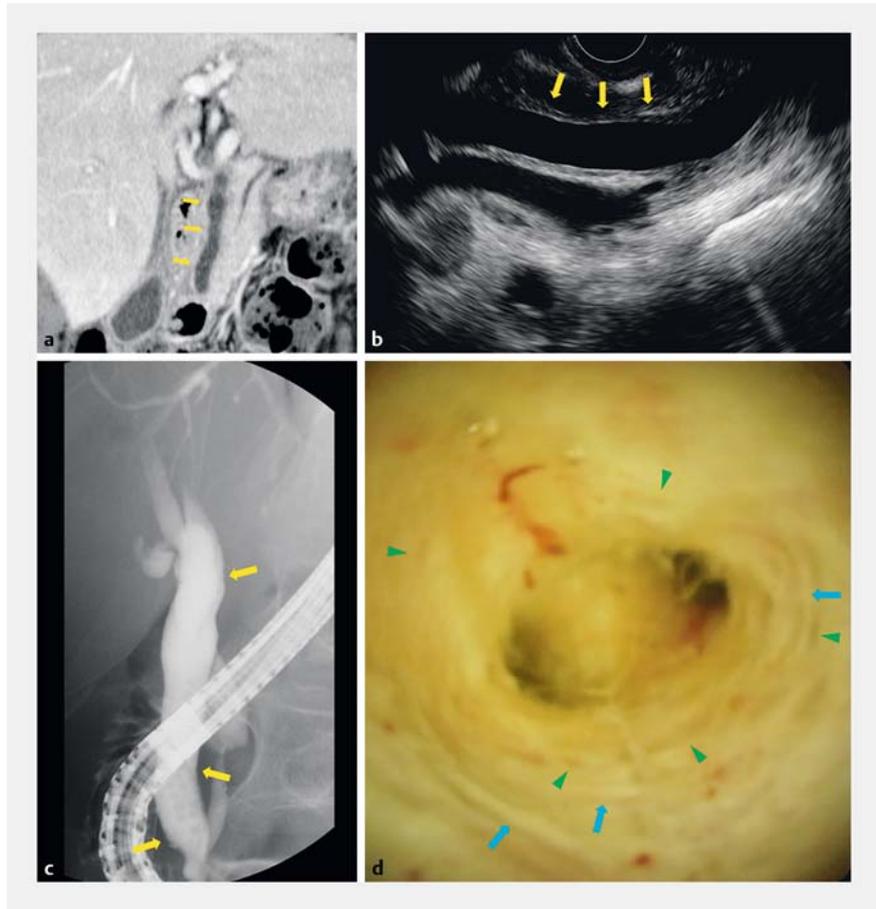


## Peroral cholangioscopy of programmed cell death-1 inhibitor-related sclerosing cholangitis: three case reports

Programmed cell death-1 (PD-1) inhibitor therapy is indicated for many types of malignancies, but can lead to immune-related adverse events [1,2]. Recently, PD-1 inhibitor-related cholangitis and its clinical features, including peroral cholangioscopy, were reported [3–5]. However, the diagnostic criteria of PD-1 inhibitor-related cholangitis are unclear. We herein report peroral cholangiography for three patients with suspected pembrolizumab-related sclerosing cholangitis.

Case #1 was a 61-year-old man with bladder cancer who had been treated with pembrolizumab as third-line chemotherapy. After his fifth course of pembrolizumab, he was admitted to our hospital complaining of pyrexia. Case #2 was an 89-year-old man with bladder cancer. After his fourth course of pembrolizumab as second-line chemotherapy, he was admitted to our hospital for examination of liver dysfunction. Case #3 was a 63-year-old man with lung cancer. After his seventh course of pembrolizumab as first-line chemotherapy, he was admitted to our hospital because of liver dysfunction.

Laboratory data from all three patients revealed increased liver and biliary enzymes. Computed tomography and endoscopic ultrasonography consistently showed diffuse symmetric wall thickening of extrahepatic bile ducts without any obstruction (► Fig. 1 a,b). Endoscopic retrograde cholangiopancreatography revealed an irregular bile duct wall in all three patients (► Fig. 1 c). Peroral cholangioscopy revealed band-like narrowing of the wall of the biliary tract in all three patients and diverticulum-like outpouching in patients #1 and #3 (► Fig. 1 d; ► Video 1).

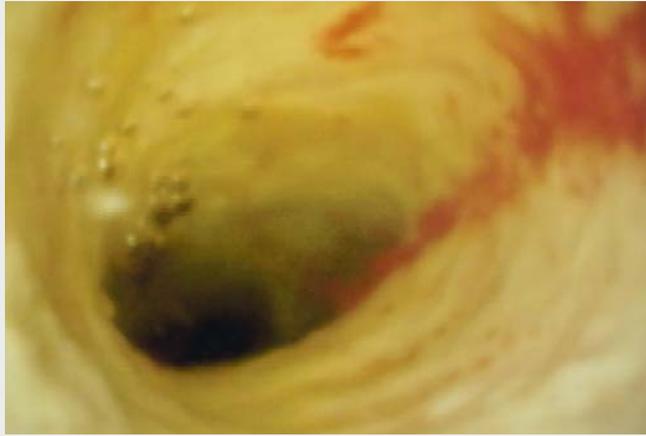


► **Fig. 1** Images from patient #3, a 63-year-old man receiving pembrolizumab for lung cancer. **a** Computed tomography image showing diffuse wall thickening (arrows) of the extrahepatic bile duct, but no obstruction or stenosis in the distal bile duct. **b** Endoscopic ultrasonography image showing diffuse wall thickening of extrahepatic bile duct (arrows). **c** Endoscopic retrograde cholangiopancreatography image showing an irregular bile duct wall (arrows). **d** Peroral cholangioscopy image showing areas of band-like narrowing of the wall of the biliary tract (arrows) and a diverticulum-like outpouching (arrowheads).

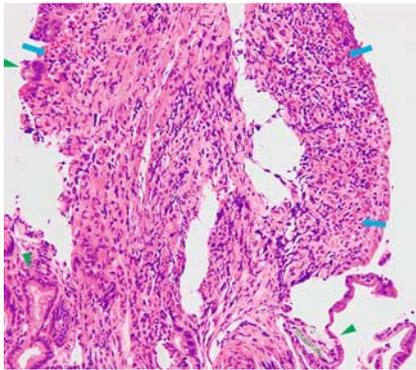
A biopsy of the lesions of the extrahepatic bile duct showed inflammatory cells in the bile duct epithelium (► Fig. 2). All patients received internal treatment with ursodeoxycholic acid. Patient #1 was also treated with oral prednisolone. Liver and biliary enzymes improved gra-

dually in all three patients, although normalization of enzyme activities was not achieved.

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**▶ Video 1** Peroral cholangioscopy showing multiple areas of band-like narrowing of the wall of the biliary tract, which was present in all patients, and a diverticulum-like out-pouching, which was present in patients #1 and #3.



**▶ Fig. 2** Histopathological appearance showing an infiltration of inflammatory cells (arrows), including neutrophils and lymphocytes, in the epithelium of the extrahepatic bile duct (arrowheads).

### Competing interests

None

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