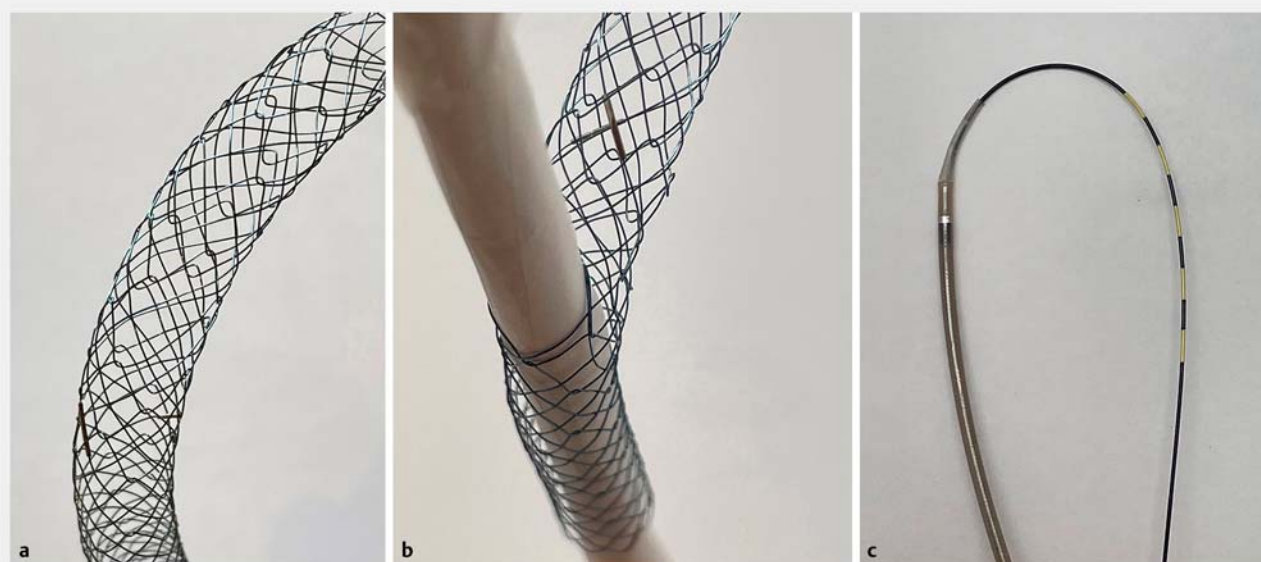
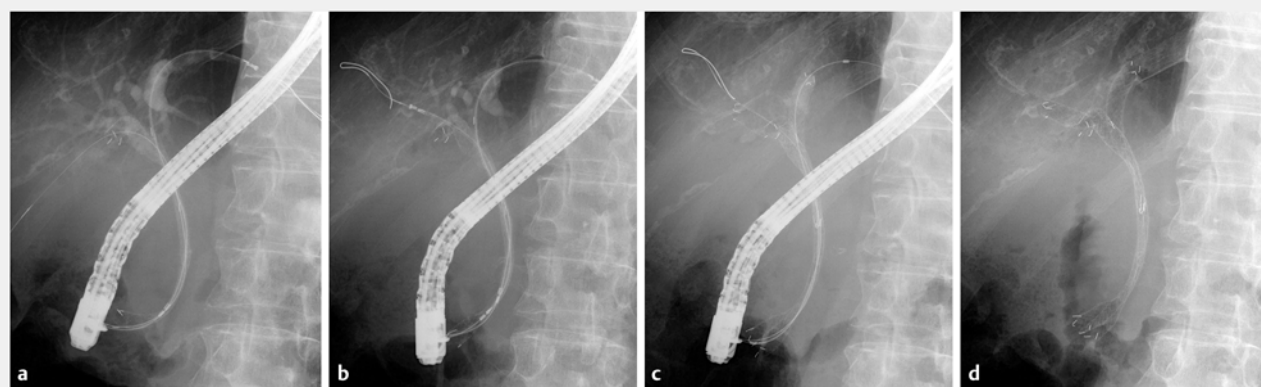


Combined stent-by-stent and stent-in-stent deployment for malignant hilar biliary obstruction using a novel metal stent with flexible cell and slim delivery

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► Fig. 1 **a, b** A novel uncovered metal stent (Niti-S Multi-Purpose Type; Taewoong Medical, Seoul, Korea) has a small size cell but it is flexible, can expand markedly, which can facilitate easy passage of the stent cell in the stent-in-stent method and preventing ingrowth as much as possible. **c** The stent is mounted on a 6F slim delivery system with an ultra-tapered tip, which enables the simultaneous stent-by-stent method.

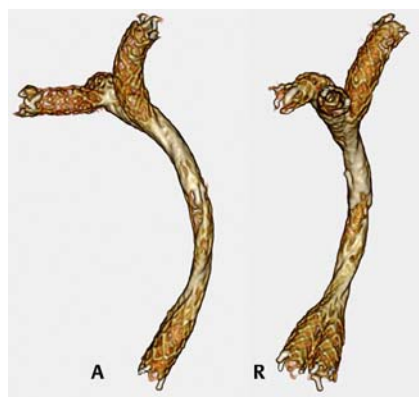


► Fig. 2 **a** After simultaneous delivery of two insertions into the right posterior and left hepatic ducts, the posterior stent (8 × 120 mm) was deployed. **b** The posterior guidewire was subsequently advanced to the right anterior hepatic duct through the stent cell, and an additional metal stent (8 × 80 mm) was inserted and deployed into the anterior duct using the stent-in-stent method. **c, d** Finally, the left stent (8 × 120 mm) was deployed in the stent-by-stent configuration with its distal end at the same level as that of the posterior stent.

A novel uncovered metal stent (Niti-S Multi-Purpose Type; Taewoong Medical, Seoul, Korea) designed specifically for multi-stenting in patients with malig-

nant hilar biliary obstruction recently has been developed. This stent has a small size cell; however, it is flexible, can expand markedly, and has a 6-F slim de-

livery system (►Fig. 1). Therefore, the stent makes passing stent cells easier in the stent-in-stent (SIS) method, while possibly preventing tumor ingrowth bet-



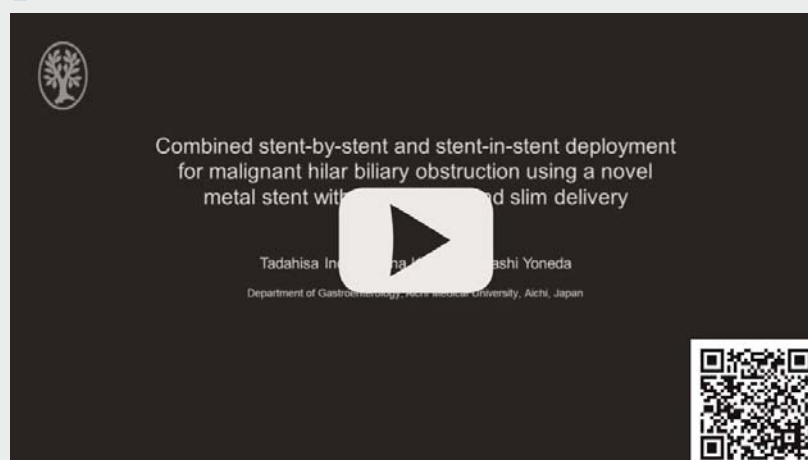
► **Fig. 3** Three-dimensional reconstruction after the combined stent-by-stent and stent-in-stent deployment.

ter than larger-cell stents. Moreover, the stent enables simultaneous insertion of two delivery systems, making the stent-by-stent (SBS) method straightforward [1]. Therefore, this novel stent is “multi-purpose,” i.e., it can be suitable for both SBS and SIS; thus, it can also be particularly useful for the combined SBS and SIS technique [2–5].

An 88-year-old man developed obstructive jaundice due to extrahepatic cholangiocarcinoma. Endoscopic retrograde cholangiography revealed severe Bismuth type IIIa stricture, which extended to the lower bile duct. After two guidewire placements into the right posterior and left hepatic ducts, two delivery systems of the novel stent were simultaneously inserted through the stricture. Subsequently, the posterior stent was deployed transpapillary across the stricture, and a catheter was progressively advanced over the posterior guidewire. The guidewire was inserted into the right anterior hepatic duct through the stent cell, and an additional stent was inserted and subsequently deployed in the SIS method. Finally, the left stent was deployed in the SBS configuration, with its distal end at the same level as that of the posterior stent (► **Fig. 2**, ► **Fig. 3**, ► **Video 1**). The patient’s symptoms improved without the occurrence of adverse events, and recurrent biliary obstruction was not observed during the follow-up period.

This study described the use of a multi-purpose metal stent for malignant hilar biliary obstruction. This novel stent can

VIDEO



► **Video 1** Combined stent-by-stent and stent-in-stent method using a novel multi-purpose metal stent for a patient with malignant hilar biliary obstruction.

serve as a useful option while using any multi-stenting method.

Competing interests

The authors declare that they have no conflict of interest.

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