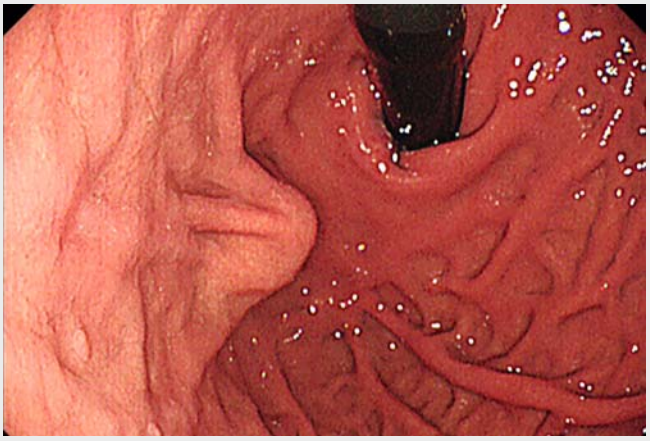
Flexible traction method for endoscopic resection by using an endoscopic hand suturing technique

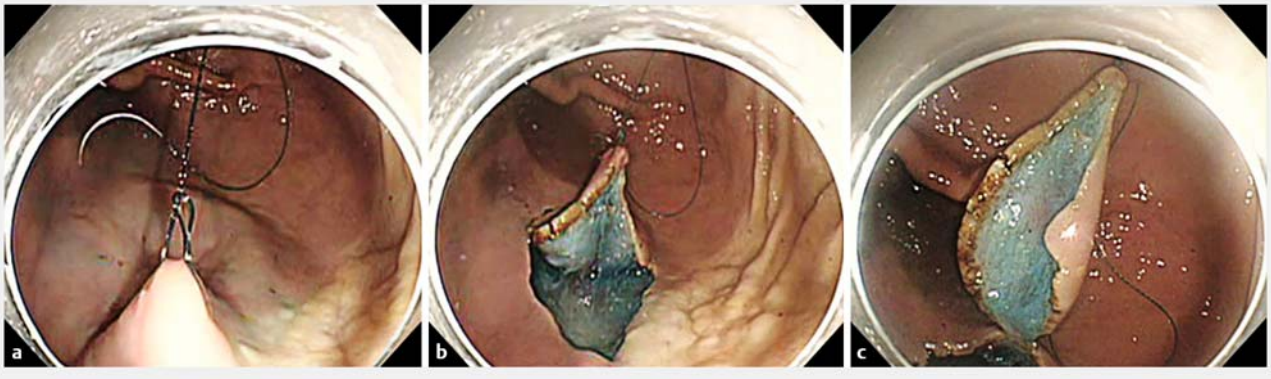
In endoscopic resection, for example endoscopic submucosal dissection (ESD), optimal traction of the target lesion facilitates the subsequent procedure [1]. We devised a new traction method by using an endoscopic hand suturing (EHS) technique [2], in which a lesion is suspended by attaching it to the contralateral side using a barbed suture, and maintaining the traction force by inflating the tract or by pulling the needle side of the suture thread.

First, we demonstrated that this traction method was feasible in an ex vivo ESD case. After creating a submucosal fluid cushion and connecting the proximal mucosa of the lesion to the contralateral side of the wall with a barbed suture by EHS, a circumferential mucosal incision was performed. Subsequently, submucosal dissection was started by lifting up the lesion with insufflation (▶ **Fig. 1 a**, ▶ **Video 1**). When the suture loosened as the submucosal dissection proceeded, the needle side of the suture thread was pulled using the flexible needle holder in order to maintain optimal traction (▶ **Fig. 1 b, c**). Finally, the lesion was easily and quickly resected, and was removed by cutting the lesion side of the suture thread. The needle and suture thread were retrieved by grasping the thread close to the needle tail with the needle holder.

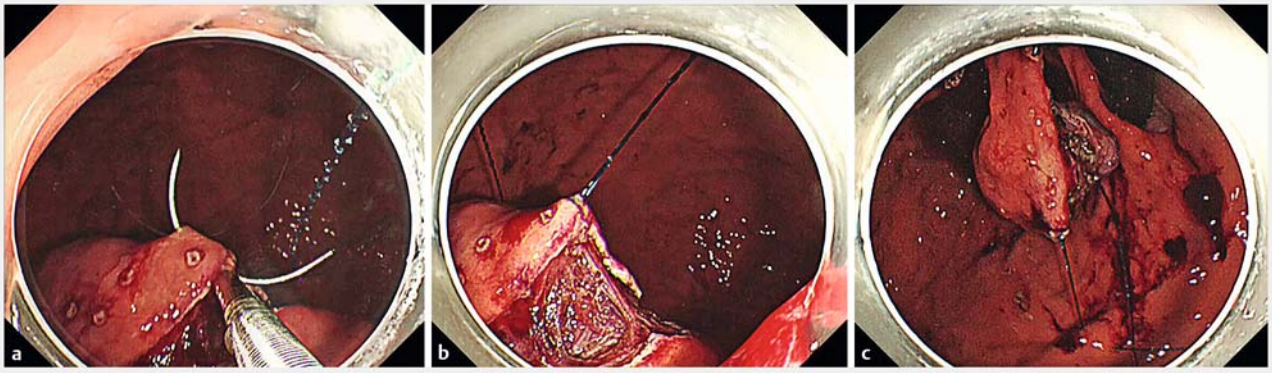


Video 1 Flexible traction method in ex vivo and clinical cases. A new traction method that uses an endoscopic hand suturing technique is useful for endoscopic resection of gastrointestinal tumors by providing a continuous traction force to the target lesion. By adjusting the length of the suture that suspends the lesion, optimal traction is maintained.

Next, we applied this technique clinically to nonexposed endoscopic wall inversion surgery (a nonexposure technique of laparoscopic and endoscopic cooperative surgery) [3]. A 2 cm submucosal tumor located on the posterior wall was successfully suspended by connecting the mucosal part of the lesion to the anterior wall using a barbed suture (▶ **Fig. 2 a**). Although the traction force decreased as the resection proceeded, the lesion was tightly held in suspension by pulling



▶ **Fig. 1** Flexible traction method for endoscopic submucosal dissection in an ex vivo model. **a** The proximal side of the lesion is connected to the contralateral side of the gastric wall using a barbed suture and endoscopic hand suturing technique. **b** The lesion is suspended by pulling the needle side of the suture after the circumferential mucosal incision and partial submucosal dissection. **c** The traction is still effective even at the final step.



▶ **Fig. 2** Flexible traction method for nonexposed endoscopic wall inversion surgery. **a** A gastric submucosal tumor inverted by laparoscopic seromuscular incision and suturing followed by endoscopic circumferential mucosal incision is suspended by connecting the mucosa to the contralateral side of the wall using a barbed suture. **b** A submucosal incision is smoothly continued thanks to the optimal traction of the lesion. **c** At the final step, the lesion is almost floating in the stomach.

the needle side of the suture thread (▶ **Fig. 2 b**), which resulted in a successful resection (▶ **Fig. 2 c**).
This traction method may be useful for various endoluminal surgeries.

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Competing interests

None

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