

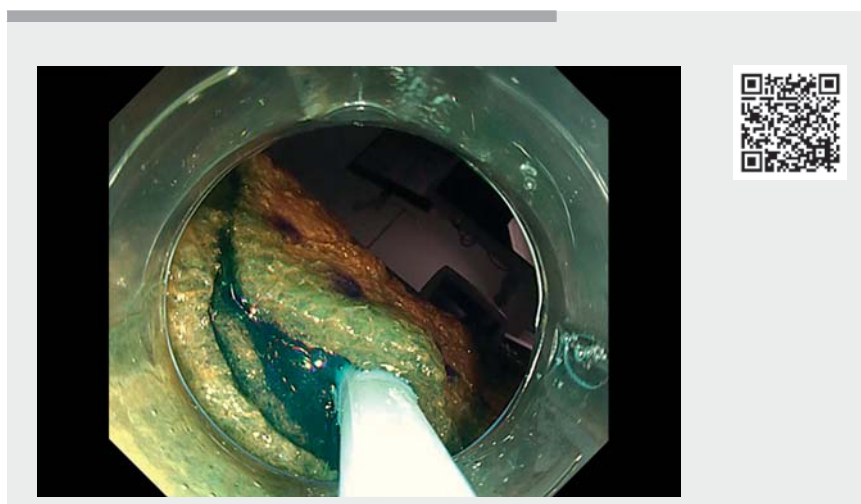
Development of a novel colorectal endoscopic submucosal dissection training model

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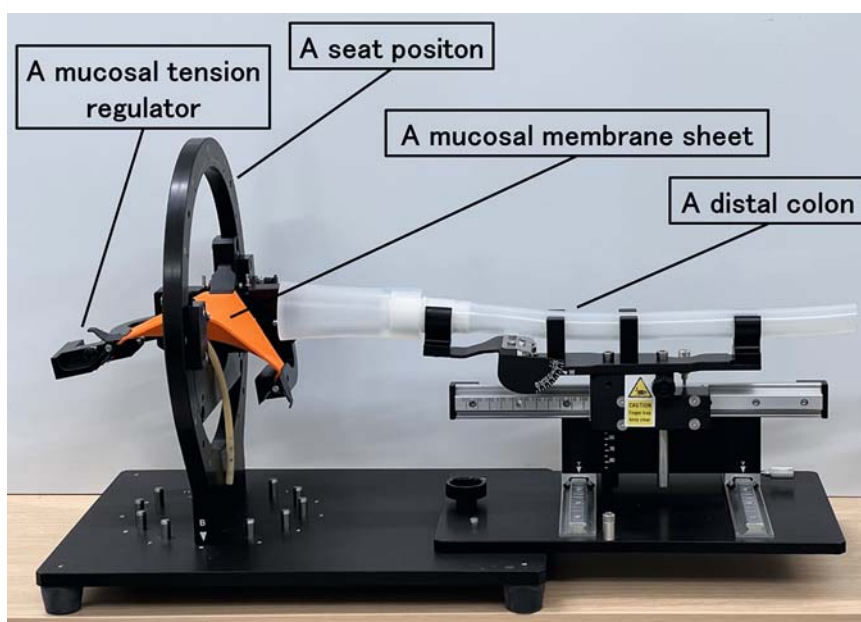
Colorectal endoscopic submucosal dissection (ESD) requires technically advanced endoscopic skill. To improve endoscopic skills, animals or their extracted digestive tracts are used for ESD training [1–3], which raises several issues regarding ethics, cost, and infection. Applying our previously developed gastric ESD model [4], we have developed a colorectal ESD training model using non-animal materials with KOTOBUKI Medical, Inc. (Saitama, Japan) to resolve these issues (► **Fig. 1**). This plant-derived model is superior to traditional animal models because training can occur at any time in an endoscopy room, using personal endoscopes and devices, without concern over infection risk. These advantages allow training to be performed multiple times, promoting muscle memory, which is essential for improving ESD skills [5]. The model modified for colorectal ESD allows for training on lesions at any wall location, basic scope movement, necessary strategies for colorectal ESD, changes in air volume in the colon, changes in gravity due to body posture changes, and scope movement with a retroflexed view (► **Fig. 2**).

In this study, the modified model was used and a specialized liquid (VTT-INJ; KOTOBUKI Medical, Inc.) was injected into the submucosal layer. Mucosal circumferential incision and trimming, and submucosal dissection were performed using a dual knife (► **Video 1**). After ESD, a questionnaire about the similarities in clinical practice between the conventional and new colorectal ESD model, and the usefulness of the new model for improving trainees' ESD skills was answered on a six-point scale (0–5) (► **Fig. 3**). Three colorectal ESD experts who were not involved in developing this training model and who had performed more than 100 clinical colorectal ESDs completed the questionnaire.

All responses for the similarities between the new model and conventional colo-



► **Video 1** Colonic endoscopic submucosal dissection was performed on this model.

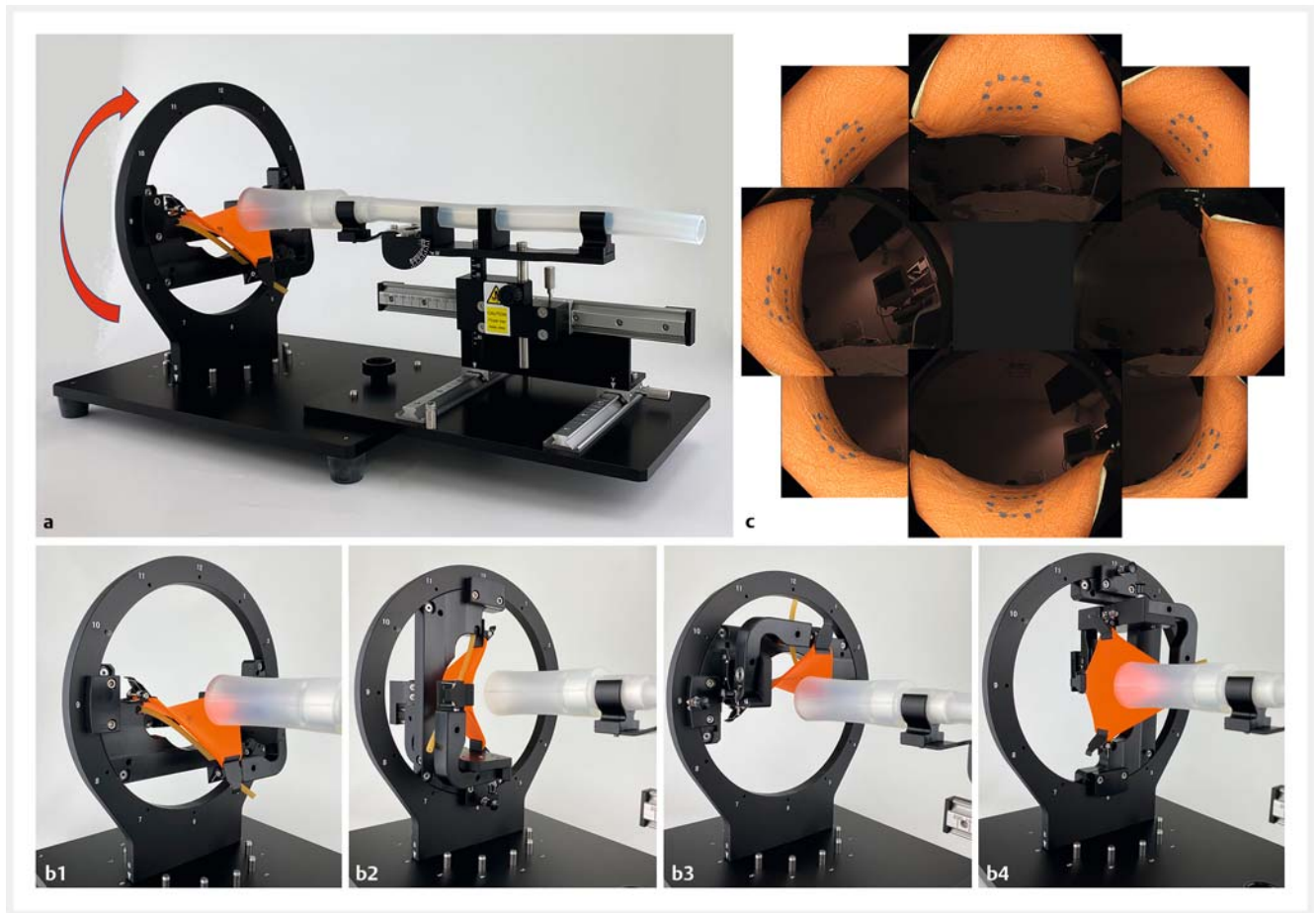


► **Fig. 1** The model consists of a seat position with a two-axis gimbal structure, mucosal tension regulator that can reproduce the change in air volume in the colon during endoscopic submucosal dissection and adjust the tension on demand, mucosal membrane sheet, and distal colon.

rectal ESD (► **Fig. 4 a**) and the acceptability of the new model (► **Fig. 4 b**) scored ≥ 4 and 5 points, respectively. ESD training using the novel model is similar to

the sensation of clinical colorectal ESD and is useful for trainees.

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► **Fig. 2** Use of the model in training. **a** The model allows colonic endoscopic submucosal dissection of lesions at any wall location by revolving the setting frame. **b-1** Lesion below the lumen. **b-2** Lesion to the left of the lumen. **b-3** Lesion above the lumen. **b-4** Lesion to the right of the lumen. **c** Endoscopic imaging of the lesion at any wall location.

Competing interests

S. Takayama is a shareholder of KOTOBUKI Medical Inc., which had no role in the study design, data collection and analysis, decision to publish, or manuscript preparation. T. Yano received a research grant from KOTOBUKI Medical Inc. KOTOBUKI Medical Limited provided the development of this model. This does not alter our adherence to policies on sharing data and materials. Under the joint research agreement, T. Mitsui, H. Sunakawa, S. Takayama, and T. Yano jointly applied for the findings obtained from this study as a Japanese patent (2021-005642). K. Shimura, T. Murano, and H. Ikematsu declare that they have no conflict of interest.

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References

- [1] Berr F, Ponchon T, Neureiter D et al. Experimental endoscopic submucosal dissection training in a porcine model: learning experience of skilled Western endoscopists. *Dig Endosc* 2011; 23: 281–289
- [2] Vázquez-Sequeiros E, de Miquel DB, Olcina JR et al. Training model for teaching endoscopic submucosal dissection of gastric tumors. *Rev Esp Enferm Dig* 2009; 101: 546–552

Questionnaire

Similarity of colonic ESD

- Endoscopic view
- Endoscopic movement
- Protruding after local injection
- Mucosal incision
- Submucosal dissection
- Gravity changes (Body posture changes)
- Mucosal tension changes (Adjustment of the amount of air in the stomach)

Similarity of colonic ESD

- Trainee should use this model to improve their colonic ESD skills
- Trainee should train on this model before performing colonic ESD for the first time

Low rating 0 1 2 3 4 5 High rating

Fig. 3 The questionnaire responses were scored on a six-point scale (0–5). Participants subjectively scored for similarity to conventional colonic endoscopic submucosal dissection (ESD) regarding a) endoscopic view, b) endoscopic movement, c) protrusion after local injection, d) mucosal incision, e) submucosal dissection, f) gravity changes due to body posture changes, and g) mucosal tension changes, reproducing the change in air volume in the colon during ESD, and adjusting the sheet for the tension or to loosen it on demand. Participants also scored for whether trainees should use this model to h) improve their colonic ESD skills and i) train before performing colonic ESD for the first time.

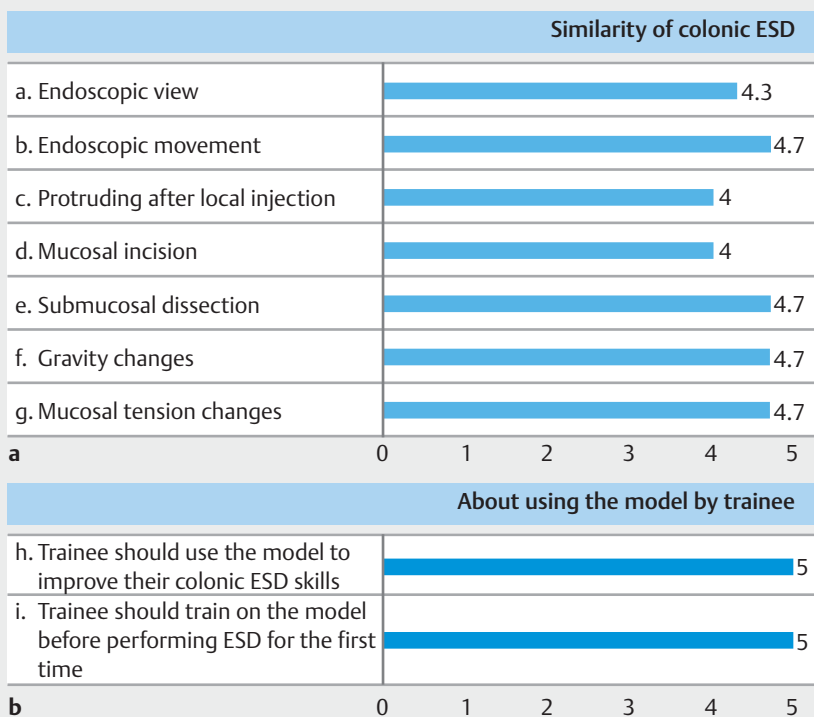


Fig. 4 Questionnaire responses. **a** The question about the similarity to conventional colonic endoscopic submucosal dissection scored 4 points or higher. **b** The question about whether trainees should use this model scored 5 points.

- Parra-Blanco A, Arnau MR, Nicolás-Pérez D et al. Endoscopic submucosal dissection training with pig models in a Western country. *World J Gastroenterol* 2010; 16: 2895–2900
- Mitsui T, Yoda Y, Sunakawa H et al. Development of new gastric endoscopic submucosal dissection training model: a reproducibility evaluation study. *Endosc Int Open* 2022; 10: E1261–E1267
- Papanikolaou IG, Haidopoulos D, Paschopoulos M et al. Changing the way we train surgeons in the 21st century: a narrative comparative review focused on box trainers and virtual reality simulators. *Eur J Obstet Gynecol Reprod Biol* 2019; 235: 13–18

Bibliography

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