

A new traction device (S-O clip) facilitating the endoscopic submucosal dissection of tumors in the ileocecal valve region

Eine neue Traktionsvorrichtung (S-O-Clip) zur Erleichterung der endoskopischen Submukosa-Dissektion von Tumoren im Bereich der Ileozökalklappe



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Key words

new traction device, S-O clip, ESD, ileocecal

Schlüsselwörter

neues Traktionsgerät, S-O-Clip, ESD, ileozökal

received 10.03.2022

accepted 17.04.2022

published online 15.07.2022

Bibliography

Z Gastroenterol 2023; 61: 394–398

DOI 10.1055/a-1834-1776

ISSN 0044-2771

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ABSTRACT

Background Endoscopic submucosal dissection (ESD) is a method that can be used for en bloc resection, regardless of the size and form of the lesion. The special location of ileocecal tumors leads to insufficient counter-traction and poor field of vision, making ESD difficult. An S-O clip has been developed to simplify the attachment procedure, eliminating interference with the endoscope and improving accessibility.

Case presentation The patient was a 70-year-old man who presented with abdominal pain and bloating. A colonoscopy revealed a flat-elevated-type lesion on the ileocecal valve, with the oral side of the lesion having progressed to the terminal ileum. The traction direction was adjusted from distal to proximal during the procedure using the S-O clip. Finally, with the help of the S-O clip, the tumor was safely removed and collected.

Conclusion The S-O clip was successful in ESD of a colorectal tumor. By removing and re-anchoring the loaded ring, the S-O clips allowed the adjustment of traction direction from distal to proximal during ESD.

ZUSAMMENFASSUNG

Hintergrund Die endoskopische Submukosa-Dissektion (ESD) ist eine Methode, die für die En-bloc-Resektion verwendet werden kann, unabhängig von der Größe und Form der Läsion. Die besondere Lage von ileozökalen Tumoren führt zu unzureichender Gegentraktion und schlechtem Sichtfeld, was eine ESD erschwert. Ein S-O-Clip wurde entwickelt, um den Befestigungsvorgang zu vereinfachen, Interferenzen mit dem Endoskop zu vermeiden und die Zugänglichkeit zu verbessern.

Fallvorstellung Ein 70-jähriger männlicher Patient stellte sich mit Bauchschmerzen und Blähungen vor. Eine Koloskopie zeigte eine flach erhöhte Läsion an der Ileozökalklappe, wobei die orale Seite der Läsion zum terminalen Ileum fortgeschritten war. Die Traktionsrichtung wurde während des Eingriffs mit dem S-O-Clip von distal auf proximal eingestellt. Schließlich wurde der Tumor mithilfe des S-O-Clips sicher entfernt und entnommen.

Fazit Das Einsetzen des S-O-Clips war bei einer ESD eines kolorektalen Tumors erfolgreich. Durch das Entfernen und erneute Verankern des geladenen Rings ermöglichte der S-O-Clip die Anpassung der Traktionsrichtung von distal zu proximal während der ESD.

* These authors contributed equally.

Abbreviations

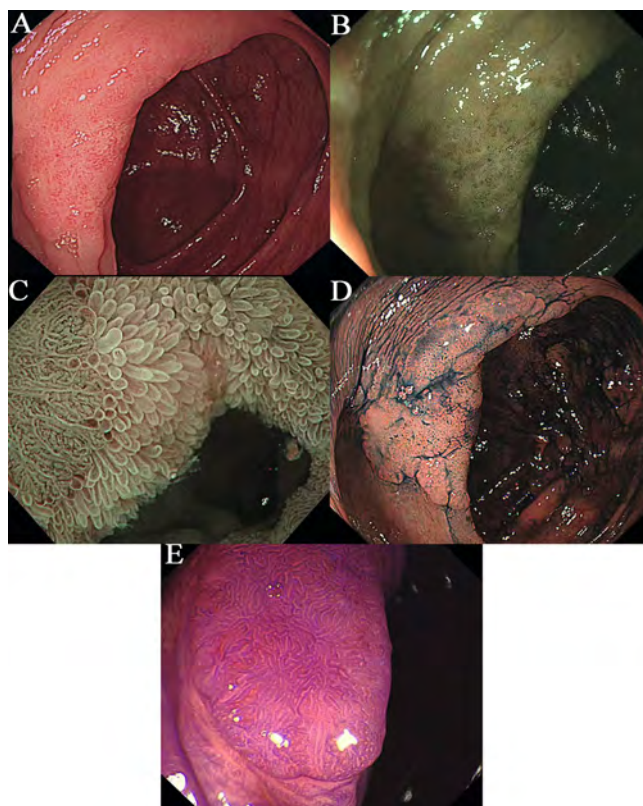
| | |
|-----|----------------------------------|
| ESD | Endoscopic submucosal dissection |
| CT | Computer Tomography |
| EMR | Endoscopic mucosal resection |
| cm | Centimetres |
| NBI | Narrow-band-imaging |

Background

Endoscopic submucosal dissection (ESD) of large, superficial, pre-cancerous and cancerous lesions of the colon is technically challenging [1]. The thinness of the submucosal space in the colon, the presence of colon loops, bowel and respiratory movements, and postural changes caused by inflation all increase the difficulty of performing ESD in this location [2]. Tumors located in the ileocecal region are especially difficult to remove, as the occurrence of deep submucosal infiltration or severe fibrosis can make ESD surgery riskier and more difficult [3, 4]. This report describes a patient who underwent successful ESD of an ileocecal tumor with an S-O clip, as well as reviewing the literature on this topic.

Case presentation

A 70-year-old man presented with a 6-month history of progressive abdominal pain and bloating. A colonoscopy revealed a tumor in the ileocecal valve. Evaluation by a multidisciplinary team resulted in a decision to remove the tumor through ESD. However, due to the anatomical structure surrounding the tumor, the risk of removal was extremely high. Before the operation, the lesion was examined by colonoscopy and enhanced abdominal computed tomography (CT). The lesion area and microstructure were evaluated by staining with indigo carmine and crystal violet, followed by narrow-band imaging (NBI) mode observation (► Fig. 1). Endoscopic procedures were performed by applying S-O clips. Briefly, after separating the tumor from surrounding normal mucosa, the first spring S-O clip was attached to the edge of the exfoliated mucosa (► Fig. 2A, B). Immediately thereafter, the distal elastic loop attached to the S-O clip was grasped with a second S-O clip, inserted into the colon, and attached to a site on the colon wall opposite the lesion, enabling traction and thereby opening the resection margin (► Fig. 2C, D). The traction applied by the clip pulled on the edge of the lesion, allowing the cutting line in the submucosal layer tissue to be visualized and resulting in a safe and successful dissection (► Fig. 2E, F). After dissection, the nylon loop was cut with a loop cutter (► Fig. 3), and the specimen was removed with snares (► Fig. 4). The endoscope was not withdrawn during the entire procedure. Hematoxylin and eosin staining and immunohistochemical staining of the tissue sample yielded results consistent with the sample being from the ileocecal valve region. The lesions were pathologically diagnosed as tubular adenomas with high-grade atypia (► Fig. 5). Use of the spring S-O clip traction device described here simplified the visibility of the submucosal layer cutting line and may reduce the time required for similar ESD procedures.



► **Fig. 1** (A) A laterally spreading tumor in the ileocecal valve, (B, C) Disordered vessel and surface patterns, classified as Japan narrow-band-imaging (NBI) Expert Team (JNET) type 2B, (D, E) Staining of the lesion with sterile indigo carmine and crystal violet.

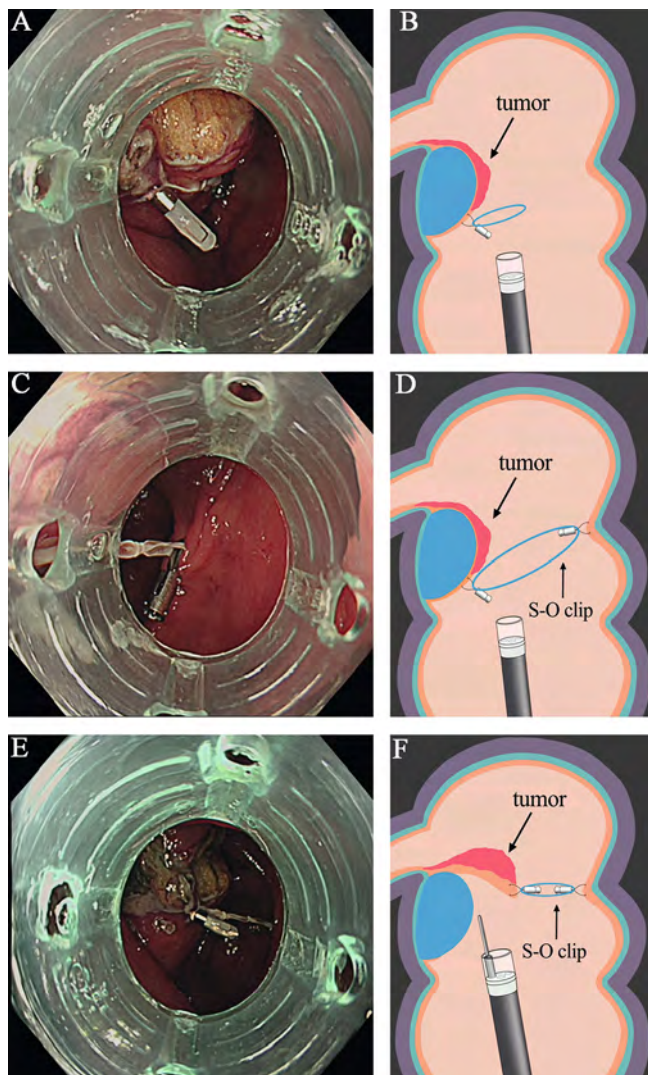
Discussion

Endoscopic mucosal resection (EMR) is a minimally invasive procedure for the removal of superficial gastrointestinal tumors [5, 6, 7]. However, en bloc resection of lesions measuring ≥ 2 cm in size is more difficult, making ESD the preferred method of removing intestinal neoplasms [8]. Compared with EMR, however, ESD is more difficult technically, requires a longer procedure time, and carries a higher risk of adverse events, requiring more highly skilled operators [9]. A good field of view and effective traction of the lesion are necessary for safer and more reliable colorectal ESD.

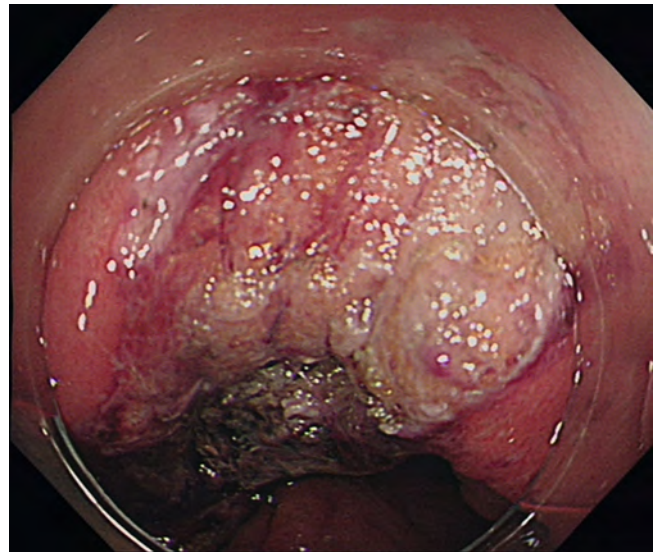
The S-O clip was recently developed to facilitate ESD procedures. Its major advantage is its ability to enable and maintain good visualization of the submucosa, with the submucosa remaining in the visible endoscopic field of view during the dissection [10, 11, 12]. In addition, the blood vessels and muscle layer could be clearly visualized, reducing intraoperative bleeding or perforation [11, 13]. Installation of an S-O clip on the anal side of the lesion after the semicircular mucosal incision, thereby fixing one end of the lesion onto the opposite colon wall, reduced the interference of colorectal wall movement caused by breathing or arterial pulsation. Moreover, good traction reduced the area of contact between the dissection site and the dual knife [11, 12]. The reduction in contact area resulted in an increase in current density, thereby enabling more effective dissection and increas-

ing dissection speed [14]. The S-O clip is also inexpensive and its use does not require any special equipment. But they are not used extensively because of their limitations [16]. S-O clip are unable to control the traction force and decrease the movement of the colorectal wall [14]. As the dissection proceeds, the traction force is likely to become weak and additional devices are needed in some cases [11, 16].

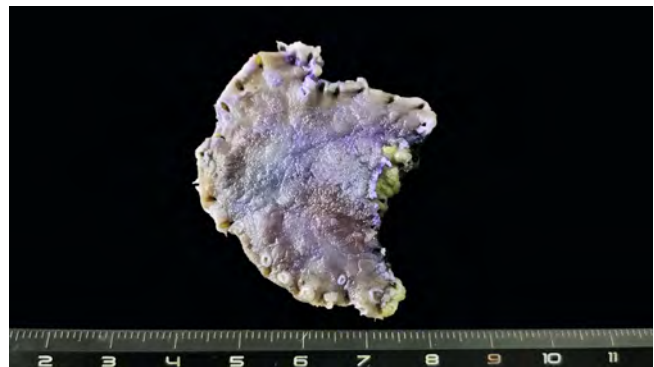
The ileocecal area is located at the junction of the large intestine and the terminal ileum. Owing to the thinness of the submucosal space in the colon, bowel and respiratory movements caused by inflation increase the difficulty of performing ESD at this location. The oral side of the lesion in the present patient had progressed to the terminal ileum, further increasing the difficulty of performing ESD and increasing the risks of intraoperative



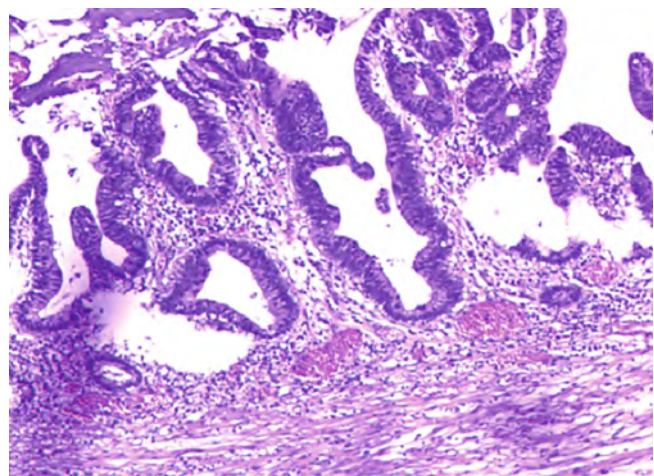
► **Fig. 2** (A, B) After separating the tumor from surrounding normal mucosa, the first spring S-O clip was attached to the edge of the exfoliated mucosa. (C, D) The distal elastic loop attached to the S-O clip was grasped with a second S-O clip, and attached to a site on the colon wall opposite the lesion, enabling traction and thereby opening the resection margin. (E, F) The traction applied by the clip pulled on the edge of the lesion, allowing the cutting line in the submucosal layer tissue to be visualized.



► **Fig. 3** View after successful removal of the entire tumor at the entrance of the ileocecal valve, showing maintenance of normal anatomy.



► **Fig. 4** Ileocecal valve disease resection.



► **Fig. 5** Histopathological diagnosis, showing tubular adenomas with high-grade atypia (hematoxylin and eosin staining, X).

▶ OP-VIDEO



▶ **Video 1** Traction of the lesion by the S-O clip facilitated correct visualization and easier dissection.

bleeding and perforation. Application of the S-O clip exposed the submucosal structure fully, reducing the interference of colorectal wall motions during ESD procedures. The use of S-O clips improved the field of vision under the endoscope, enabled more difficult ESD in the ileocecal area, and shortened the time required for ESD (▶ **Video 1**).

Conclusion

Installation of an S-O clip facilitated the visualization of the submucosal layer during ESD in the ileocecal area. The ability of this device to reduce procedure time and complications may result in its more widespread use in endoscopic procedures.

Consent for publication and Informed consent

Written informed consent for publication of personal/clinical details and images was obtained from the patient. Informed consent was obtained from all individual participants included in the study.

Availability of data and materials

All data generated or analyzed during this study are included in this article and its additional files.

Ethical approval

All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable, ethical standards.

Contributors' Statment

Conception and design: S.Y., P.W., Y.F.; Review and data collection: S.Y., P.W.; Draft of the article, provision of table and figures: S.Y., P.W.; Study supervision and final approval of the version: Y.F. All authors contributed important intellectual content and approved the final version of the manuscript. All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest.

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