

World Journal of *Gastrointestinal Endoscopy*

World J Gastrointest Endosc 2019 February 16; 11(2): 68-173





REVIEW

- 68 Role of endoscopy in acute gastrointestinal bleeding in real clinical practice: An evidence-based review
Jung K, Moon W

MINIREVIEWS

- 84 Role of endoscopy in the management of primary sclerosing cholangitis
Marya NB, Tabibian JH
- 95 Radiofrequency and malignant biliary strictures: An update
Auriemma F, De Luca L, Bianchetti M, Repici A, Mangiavillano B
- 103 Endoscopic ultrasound-guided drainage of the biliary system: Techniques, indications and future perspectives
Hindryckx P, Degroote H, Tate DJ, Deprez PH
- 115 Spectrum of gastrointestinal involvement in Stevens - Johnson syndrome
Jha AK, Suchismita A, Jha RK, Raj VK

ORIGINAL ARTICLE

Retrospective Cohort Study

- 124 No significant difference in clinically relevant findings between Pillcam® SB3 and Pillcam® SB2 capsules in a United States veteran population
Aasen TD, Wilhoite D, Rahman A, Devani K, Young M, Swenson J
- 133 Age, socioeconomic features, and clinical factors predict receipt of endoscopic retrograde cholangiopancreatography in pancreatic cancer
Rustgi SD, Amin SP, Kim MK, Nagula S, Kumta NA, DiMaio CJ, Boffetta P, Lucas AL

Observational Study

- 145 Narrow band imaging evaluation of duodenal villi in patients with and without celiac disease: A prospective study
Tabibian JH, Perrault JF, Murray JA, Papadakis KA, Enders FT, Gostout CJ

SYSTEMATIC REVIEWS

- 155 Role of pancreatoscopy in management of pancreatic disease: A systematic review
Kaura T, Willingham FF, Chawla S

CASE REPORT

- 168** Safety and efficacy of over-the-scope clip-assisted full thickness resection of duodenal subepithelial tumors:
A case report
Nassri AB, Alkhasawneh A, Scolapio JS, Malespin MH, Ribeiro BDS

ABOUT COVER

Editor-in-Chief of *World Journal of Gastrointestinal Endoscopy*, Anastasios Koulaouzidis, MD, Associate Specialist, Endoscopy Unit, The Royal Infirmary of Edinburgh, Edinburgh EH16 4SA, United Kingdom

AIMS AND SCOPE

World Journal of Gastrointestinal Endoscopy (*World J Gastrointest Endosc*, *WJGE*, online ISSN 1948-5190, DOI: 10.4253) is a peer-reviewed open access (OA) academic journal that aims to guide clinical practice and improve diagnostic and therapeutic skills of clinicians.

WJGE covers topics concerning gastroscopy, intestinal endoscopy, colonoscopy, capsule endoscopy, laparoscopy, interventional diagnosis and therapy, as well as advances in technology. Emphasis is placed on the clinical practice of treating gastrointestinal diseases with or under endoscopy.

We encourage authors to submit their manuscripts to *WJGE*. We will give priority to manuscripts that are supported by major national and international foundations and those that are of great clinical significance.

INDEXING/ABSTRACTING

The *WJGE* is now abstracted and indexed in Emerging Sources Citation Index (Web of Science), PubMed, PubMed Central, China National Knowledge Infrastructure (CNKI), and Superstar Journals Database.

RESPONSIBLE EDITORS FOR THIS ISSUE

Responsible Electronic Editor: *Wen-Wen Tan* Proofing Editorial Office Director: *Jin-Lei Wang*

NAME OF JOURNAL

World Journal of Gastrointestinal Endoscopy

ISSN

ISSN 1948-5190 (online)

LAUNCH DATE

October 15, 2009

FREQUENCY

Monthly

EDITORS-IN-CHIEF

Bing Hu, Anastasios Koulaouzidis, Sang Chul Lee

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/1948-5190/editorialboard.htm>

EDITORIAL OFFICE

Jin-Lei Wang, Director

PUBLICATION DATE

February 16, 2019

COPYRIGHT

© 2019 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Safety and efficacy of over-the-scope clip-assisted full thickness resection of duodenal subepithelial tumors: A case report

Ammar B Nassri, Ahmad Alkhasawneh, James S Scolapio, Miguel H Malespin, Bruno de Souza Ribeiro

ORCID number: Ammar B Nassri (0000-0002-2068-939X); Ahmad Alkhasawneh (0000-0002-1343-2035); James S Scolapio (0000-0001-8913-9970); Miguel H Malespin (0000-0002-7804-5773); Bruno de Souza Ribeiro (0000-0001-7205-0304).

Author contributions: Nassri AB and Ribeiro BS were involved in conceptualization, literature review, writing original draft, revising, editing and final approval; Alkhasawneh A, Scolapio JS and Malespin MH were involved in drafting, revising, editing and final approval.

Informed consent statement: Informed consent was obtained from the patient.

Conflict-of-interest statement: All authors declare no conflict of interest.

CARE Checklist (2016) statement: The authors have read the CARE 2016 Checklist, and the manuscript was prepared and revised according to the CARE 2016 Checklist.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the

Ammar B Nassri, James S Scolapio, Miguel H Malespin, Bruno de Souza Ribeiro, Department of Medicine, Division of Gastroenterology and Hepatology, University of Florida Health at Jacksonville, Jacksonville, FL 32209, United States

Ahmad Alkhasawneh, Department of Pathology and Laboratory Medicine, University of Florida Health at Jacksonville, Jacksonville, FL 32209, United States

Corresponding author: Bruno de Souza Ribeiro, MD, Assistant Professor, Department of Medicine, Division of Gastroenterology and Hepatology, University of Florida Health at Jacksonville, 655 W 8th St, Jacksonville, FL 32209, United States.

bruno.desouzaribeiro@jax.ufl.edu

Telephone: +1-904-3831015

Abstract

BACKGROUND

Over-the-scope clip-assisted endoscopic full thickness resection (eFTR) of subepithelial tumors is a novel and promising endoscopic technique. Recently, there have been prospective studies investigating its use for colonic masses, but data regarding its use and efficacy in the duodenum are limited to a few reports.

CASE SUMMARY

A 65-year-old African American female presents for evaluation of persistent gastroesophageal reflux disease not responsive to medical treatment. A 1 cm nodule was incidentally found in the duodenum and biopsies revealed a low grade well differentiated neuroendocrine tumor. The nodule was removed using over-the-scope clip-assisted eFTR and pathology revealed clear margins. We review the available literature with a discussion on the efficacy and safety of clip-assisted eFTR s of subepithelial lesions in the duodenum.

CONCLUSION

Clip assisted eFTR appears to be a safe and efficacious treatment approach to duodenal subepithelial lesions. Further prospective studies are needed to investigate the long-term utility and safety of clip-assisted eFTR in the management of subepithelial duodenal lesions.

Key words: Case report; Duodenum; Carcinoid; Endoscopic full thickness resection

©The Author(s) 2019. Published by Baishideng Publishing Group Inc. All rights reserved.

original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Manuscript source: Unsolicited manuscript

Received: November 29, 2018

Peer-review started: November 29, 2018

First decision: January 4, 2019

Revised: January 15, 2019

Accepted: January 26, 2019

Article in press: January 26, 2019

Published online: February 16, 2019

Core tip: Over-the-scope clip-assisted endoscopic full thickness resection (eFTR) of subepithelial tumors is a novel endoscopic technique, but has not been extensively studied in duodenal tumors. We present a case of a duodenal carcinoid tumor resected with clip-assisted eFTR that was complicated by bleeding. We explore the safety and efficacy of this procedure in light of the available literature.

Citation: Nassri AB, Alkhasawneh A, Scolapio JS, Malespin MH, Ribeiro BDS. Safety and efficacy of over-the-scope clip-assisted full thickness resection of duodenal subepithelial tumors: A case report. *World J Gastrointest Endosc* 2019; 11(2): 168-173

URL: <https://www.wjgnet.com/1948-5190/full/v11/i2/168.htm>

DOI: <https://dx.doi.org/10.4253/wjge.v11.i2.168>

INTRODUCTION

Endoscopic full thickness resection (eFTR) is a promising endoscopic procedure useful for resection of masses arising from any layer of the gastrointestinal wall, particularly for subepithelial tumors. Increasingly, eFTR is being used with the assistance of over the scope (OTS) clips such as the OTSC® (OVESCO Endoscopy AG, Tübingen, Germany) and more recently, the Padlock Clip (Padlock Pro-Select®, Aponos Medical Corporation, Kingston NH, United States). Traditionally, endoscopic resection of duodenal lesions was *via* endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD), procedures which are technically challenging and associated with significant adverse events such as bleeding and perforation. However, several reports have demonstrated the efficacy of OTS clip-assisted eFTR. We report on a case of carcinoid tumor in the duodenum that was resected with an OTSC clip that was complicated by bleeding, and discuss the efficacy and safety of duodenal OTS clip-assisted eFTR in light of the available literature.

CASE PRESENTATION

Chief complaints

A 65-year-old African American female presents for evaluation of persistent gastroesophageal reflux disease (GERD) not responsive to medical treatment.

History of past illness

She had a medical history of a hiatal hernia, GERD and a benign peptic stricture. The patient was not on anticoagulation, antiplatelet agents or non-steroidal antiinflammatory drugs.

Personal and family history

There was no personal or family history of gastrointestinal cancer.

Physical examination upon admission

Physical examination was unremarkable and revealed a comfortable lady without any abdominal tenderness on examination.

Laboratory examinations

Complete blood count, complete metabolic panel and prothrombin time/international normalised ratio were all within normal limits.

Imaging examinations

An esophagogastroduodenoscopy (EGD) was performed which revealed a normal esophagus and mild gastritis in the antrum. A single large subepithelial nodule was found in the duodenal bulb and was biopsied.

FINAL DIAGNOSIS

Pathologic examination revealed nests of neuroendocrine cells diffusely positive for synaptophysin and chromogranin consistent with a low grade well-differentiated neuroendocrine tumor (WDNET)/carcinoid (Figure 1). After evaluation by

Hematology/Oncology and Surgery, the patient returned for endoscopic intervention.

TREATMENT

During endoscopy an approximately 1 cm subepithelial mass was seen (Figure 2) which was felt to be very superficial given the mucosal biopsies positive for carcinoid tumor on her previous endoscopy. The endoscope was mounted with the OTSC, the lesion was suctioned into the cap slowly and the clip was deployed at the base of the nodule leading to serosa-to-serosa apposition, mimicking a pseudo-polyp with the nodule above the closed clip. The nodule was subsequently resected en bloc using electrocautery with a flexible 13 mm snare resecting the tissue above the clip. Despite the presence of the OTSC, the patient started bleeding profusely with active spurting of blood, which was quickly controlled with a hot forceps biopsy. The mass was successfully removed.

OUTCOME AND FOLLOW-UP

Pathologic examination revealed a 9 mm submucosal WDNET with clear margins (R0). Immunohistochemistry confirmed an intermediate grade tumor (G2 with a Ki67 index of 3.5%). There was no lympho-vascular or perineural invasion identified. A subsequent follow up EGD two months later revealed the OTSC in place with hyperplastic mucosa protruding through the clip. Multiple biopsies were taken with no evidence of neuroendocrine tumor cells.

DISCUSSION

The optimal treatment for subepithelial tumors of the duodenum remains controversial, and the overall data on the safety of endoscopic resection of small bowel carcinoids are limited^[1]. If duodenal carcinoids are isolated lesions < 10 mm in size, are low grade, do not infiltrate the muscularis and do not show angioinvasion, EMR is considered by many to be the treatment of choice as they have a very low risk of metastasis, between 6%-10%^[2,3]. Current Consensus Guidelines recommend endoscopic removal for small duodenal SET < 10 mm, and consideration of surgical resection for tumors > 20 mm^[4]. Tumors between 10 mm-20 mm can be removed either endoscopically or surgically since the risk of metastases noticeably increases when tumor size is ≥ 2 cm^[2], and the approach is currently not standardized^[4]. However, surgical techniques for duodenal SET resection usually results in a Whipple's procedure or the more complex pylorus preserving pancreaticoduodenectomy, both associated with significant morbidity and mortality^[5]. Endoscopic resection of tumors in the duodenum is usually achieved by EMR or ESD, which is controversial in the duodenum due to the high incidence of adverse events and technical difficulty^[6]. Although ESD achieves a greater en bloc resection rate compared to a complete resection (R0) of only 50% with EMR, EMR is preferred over ESD since the risk of perforation is greater than 30% with ESD^[5]. The duodenum has a thin wall compared to other parts of the gastrointestinal tract rendering it more prone to perforation. Furthermore, the base of post-ESD ulcer is continually exposed to bile and pancreatic enzymes leading to an increase in delayed perforation^[6]. The duodenum is narrow, which along with its C-loop makes endoscopic procedures technically challenging. It has abundant blood vessels in the submucosal layer making it more prone to bleeding^[7], in part from the electrosurgical snaring which may cause deep coagulation necrosis and damage^[7] with a risk of delayed bleeding of 12%^[8]. Furthermore, many lesions cannot be lifted due to scarring from pre-procedural biopsy sampling^[9], rendering resection of non-lifting SET arising from layers deeper than the submucosa extremely challenging^[1-3,8,10].

Over the past several years eFTR, an endoscopic method allowing for full thickness resection has been described. The benefits of using eFTR over EMR and ESD include the ability to resect the entire lesion and achieve R0; avoiding immediate and delayed perforation and bleeding by placement of the OTS clip; and avoiding the technical difficulty of ESD in the duodenum.

There are two types of eFTR, "free-hand" or "exposed" eFTR where full thickness excision is carried out using usual ESD techniques and the GI wall defect is subsequently closed, typically via endoscopic wall suturing; and device assisted (*i.e.*, OTS clip-assisted) eFTR where an endoscopic clip is first deployed after which the full thickness excision is carried out^[11]. Recently, there has been increasing interest in over

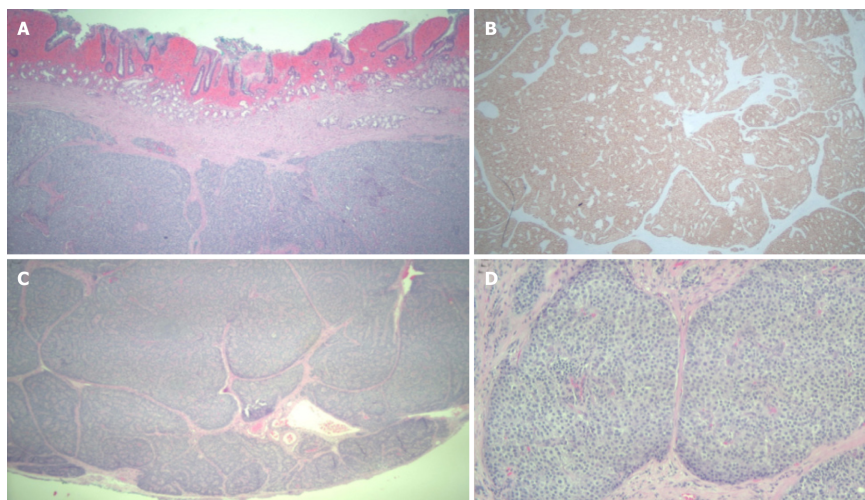


Figure 1 Pathology of duodenal mass. A: Well differentiated neuroendocrine tumor, hematoxylin and eosin (HE) stain, 25 ×; B: The tumor cells are immunoreactive for synaptophysin (immunohistochemical stain, 25 ×); C: Well differentiated neuroendocrine tumor with negative deep margin (R0, HE stain, 25 ×); D: Well differentiated neuroendocrine tumor (HE, 100 ×).

the clip assisted eFTR. It has successfully been used in the stomach for gastric epithelial lesions^[12], as well as lesions in the colon^[13], particularly after the approval of a dedicated full thickness resection device (FTRD®; OVESCO Endoscopy AG, Tübingen, Germany) for lower gastrointestinal use^[14,15]. However, as of now there are only a handful of reports describing clip-assisted eFTR of duodenal lesions (Table 1)^[8,13,16-19]. In our review, out of all cases of duodenal OTC clip-assisted eFTR, 85% achieved R0 resection (17/20). In comparison, one series of eFTR of colonic masses demonstrated an R0 of 76.9% of cases^[15]. The majority of cases used a curved clip, the OTSC mounted on a flexible endoscope, similar to what was used in our patient. In these cases, the authors reported R0 in 8/10 of all cases, and technical success in all. There were no reported side effects, including bleeding. One study by Schmidt *et al* attempted to perform duodenal nodule resections using the new FTRD that was approved for lower gastrointestinal tumors^[8]. The authors reported only two episodes of minor bleeding and an R0 in 3/4 of the patients. Most recently, Kappelle *et al*^[5] published a case series of 6 patients with SET where they attempted to perform device assisted eFTR with a new flat clip (Padlock Pro-Select®, Aponos Medical Corporation, Kingston NH, United States). Of the 6 patients, 4 of them had micro-perforation or perforation, and one had significant gastrointestinal hemorrhage, although R0 was achieved in all^[5].

In our case although we used the OTSC, there was a spurting arterial bleed during the resection which was quickly controlled with a hot biopsy forceps. Although OTSC is commonly used to stop bleeding and has been used as first line and salvage therapy in gastric and duodenal ulcers^[20,21], the technical difficulties of endoscopic therapies in the duodenum remain, and endoscopists should keep in mind the anatomical considerations as well as the extensive blood supply in the duodenum and its proclivity for bleeding. However, in our opinion, despite the possibility of bleeding the use of OTSC before endoscopic resections appears to be a good option for duodenal SET, particularly given the high incidence of clinically significant bleeding with alternate techniques.

CONCLUSION

Based on the available data, clip assisted eFTR appears to be a safe and efficacious treatment approach to duodenal SET. Further prospective studies are needed to investigate the long-term utility and safety of clip-assisted eFTR in the management of subepithelial duodenal lesions, as well as the safety profile of different clips used.

Table 1 Duodenal lesions resected with over the scope clip assisted endoscopic full thickness resection

Ref.	Year	n	Age	Sex	Location	Histology	Complication	R0	Size (mm)	Clip
Kappelle <i>et al</i> ^[5]	2018	6	51	M	Bulb	Brunneroma	No	Yes	13	Padlock Pro
			44	M	D2	NET	Microperforation	Yes	4	Padlock Pro
			60	M	D2	Ectopic Pancreas	Hemorrhage	Yes	10	Padlock Pro
			44	M	D2	NET	Microperforation	Yes	9	Padlock Pro
			40	M	D2	NET	Perforation	Yes	10	Padlock Pro
			61	F	D2	NET	Microperforation	-	5	Padlock Pro
Al-Bawardy <i>et al</i> ^[17]	2017	4	66	M	Bulb	NET	No	Yes	9	Padlock
			78	M	Bulb	NET	No	Yes	9	OTSC
			76	M	Bulb	NET	No	Yes	10	OTSC
			59	M	D2	Pancreatic Heterotopia	No	Yes	18	OTSC
Milano <i>et al</i> ^[19]	2016	1	49	M	Bulb	NET	No	Yes	10	OTSC
Schmidt <i>et al</i> ^[8]	2015	4	74	F	Bulb	Inflammatory polyp	No	Yes	22	OTSC
			77	M	D3	Adenoma HGD	Minor bleed	Yes	15	OTSC
			35	F	D2	NET	No	Yes	10	OTSC
			57	F	D2	Adenoma HGD	Minor bleed	No	30	OTSC
Fähndrich <i>et al</i> ^[13]	2015	1	68	F	D	NET	No	Yes	20	OTSC
Sarker <i>et al</i> ^[16]	2014	4	71	F	D2	NET	No	Yes	18	OTSC
			66	M	D	NET	No	Yes	9	OTSC
			58	M	D	NET	No	Yes	10	OTSC
			66	M	D	NET	No	Yes	15	OTSC
Mönkemüller <i>et al</i> ^[18]	2014	1	71	F	D2	NET	No	No	30	OTSC

Bulb: Duodenal bulb; D: Duodenum, unspecified location; D2: Second part of duodenum; D3: Third part of duodenum; EFTR: Endoscopic full thickness resection; F: Female; HGD: High grade dysplasia; M: Male; NET: Neuroendocrine tumor; OTSC: Over the scope clip (OVESCO®); R0: Microscopic tumor-free vertical and horizontal margins in specimen.

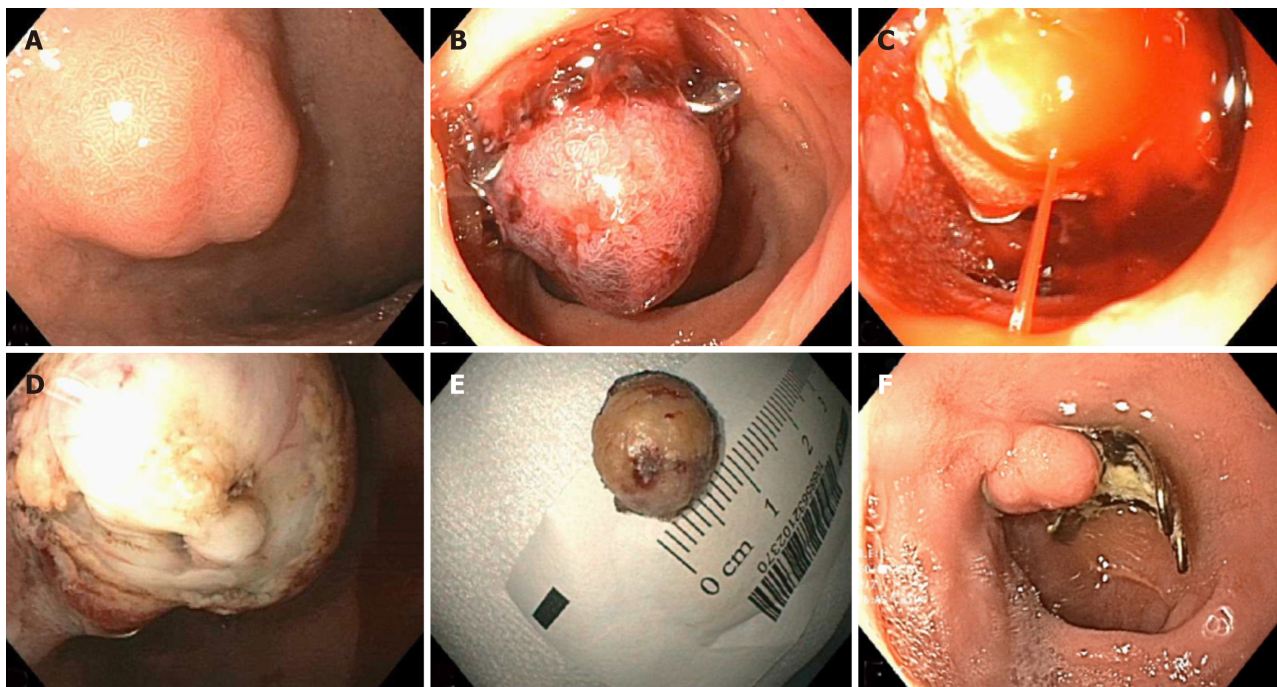


Figure 2 Endoscopic view of duodenal lesion. A: Duodenal nodule prior to intervention; B: Pseudopolyp lesion after deployment of over the scope clip; C: Arterial spurting of blood from the lesion during resection; D: Post-resection defect; E: *En bloc* resected specimen; F: Follow up upper endoscopy revealing over the scope (OVESCO®) clip, scar and granulation tissue.

REFERENCES

- 1 **Gaspar JP**, Stelow EB, Wang AY. Approach to the endoscopic resection of duodenal lesions. *World J Gastroenterol* 2016; **22**: 600-617 [PMID: [26811610](#) DOI: [10.3748/wjg.v22.i2.600](#)]
- 2 **Scherübl H**, Cadiot G. Early Gastroenteropancreatic Neuroendocrine Tumors: Endoscopic Therapy and Surveillance. *Visc Med* 2017; **33**: 332-338 [PMID: [29177161](#) DOI: [10.1159/000459404](#)]
- 3 **Kim GH**, Kim JI, Jeon SW, Moon JS, Chung IK, Jee SR, Kim HU, Seo GS, Baik GH, Lee YC; Korean College of Helicobacter and Upper Gastrointestinal Research. Endoscopic resection for duodenal carcinoid tumors: a multicenter, retrospective study. *J Gastroenterol Hepatol* 2014; **29**: 318-324 [PMID: [24117946](#) DOI: [10.1111/jgh.12390](#)]
- 4 **Delle Fave G**, O'Toole D, Sundin A, Taal B, Ferolla P, Ramage JK, Ferone D, Ito T, Weber W, Zheng-Pei Z, De Herder WW, Pascher A, Ruszniewski P; Vienna Consensus Conference participants. ENETS Consensus Guidelines Update for Gastroduodenal Neuroendocrine Neoplasms. *Neuroendocrinology* 2016; **103**: 119-124 [PMID: [26784901](#) DOI: [10.1159/000443168](#)]
- 5 **Kappelle WFW**, Backes Y, Valk GD, Moons LMG, Vleggaar FP. Endoscopic full-thickness resection of gastric and duodenal subepithelial lesions using a new, flat-based over-the-scope clip. *Surg Endosc* 2018; **32**: 2839-2846 [PMID: [29282573](#) DOI: [10.1007/s00464-017-5989-8](#)]
- 6 **Kobara H**, Mori H, Fujihara S, Nishiyama N, Ayaki M, Oryu M, Masaki T. A novel strategy for complete duodenal endoscopic submucosal dissection involving prophylactic defect closure with over-the-scope clips. *Endoscopy* 2016; **48** Suppl 1: E190-E191 [PMID: [27213975](#) DOI: [10.1055/s-0042-107596](#)]
- 7 **Fujihara S**, Mori H, Kobara H, Nishiyama N, Matsunaga T, Ayaki M, Yachida T, Masaki T. Management of a large mucosal defect after duodenal endoscopic resection. *World J Gastroenterol* 2016; **22**: 6595-6609 [PMID: [27547003](#) DOI: [10.3748/wjg.v22.i29.6595](#)]
- 8 **Schmidt A**, Meier B, Cahyadi O, Caca K. Duodenal endoscopic full-thickness resection (with video). *Gastrointest Endosc* 2015; **82**: 728-733 [PMID: [26077454](#) DOI: [10.1016/j.gie.2015.04.031](#)]
- 9 **Tashima T**, Nonaka K, Ryozaawa S, Nagata K. EMR with an over-the-scope clip for superficial nonampullary duodenal epithelial tumor with fibrosis. *VideoGIE* 2018; **3**: 83-84 [PMID: [29916477](#) DOI: [10.1016/j.vgie.2017.11.010](#)]
- 10 **Dogeas E**, Cameron JL, Wolfgang CL, Hirose K, Hruban RH, Makary MA, Pawlik TA, Choti MA. Duodenal and Ampullary Carcinoid Tumors: Size Predicts Necessity for Lymphadenectomy. *J Gastrointest Surg* 2017; **21**: 1262-1269 [PMID: [28516311](#) DOI: [10.1007/s11605-017-3448-4](#)]
- 11 **Cai MY**, Martin Carreras-Presas F, Zhou PH. Endoscopic full-thickness resection for gastrointestinal submucosal tumors. *Dig Endosc* 2018; **30** Suppl 1: 17-24 [PMID: [29658639](#) DOI: [10.1111/den.13003](#)]
- 12 **Guo J**, Liu Z, Sun S, Liu X, Wang S, Ge N, Wang G, Qi Y. Endoscopic full-thickness resection with defect closure using an over-the-scope clip for gastric subepithelial tumors originating from the muscularis propria. *Surg Endosc* 2015; **29**: 3356-3362 [PMID: [25701060](#) DOI: [10.1007/s00464-015-4076-2](#)]
- 13 **Fähndrich M**, Sandmann M. Endoscopic full-thickness resection for gastrointestinal lesions using the over-the-scope clip system: a case series. *Endoscopy* 2015; **47**: 76-79 [PMID: [25221859](#) DOI: [10.1055/s-0034-1377975](#)]
- 14 **Aepli P**, Cribiez D, Baumeler S, Borovicka J, Frei R. Endoscopic full thickness resection (EFTR) of colorectal neoplasms with the Full Thickness Resection Device (FTRD): Clinical experience from two tertiary referral centers in Switzerland. *United European Gastroenterol J* 2018; **6**: 463-470 [PMID: [29774161](#) DOI: [10.1177/2050640617728001](#)]
- 15 **Schmidt A**, Beyna T, Schumacher B, Meining A, Richter-Schrag HJ, Messmann H, Neuhaus H, Albers D, Birk M, Thimme R, Probst A, Faehndrich M, Frieling T, Goetz M, Riecken B, Caca K. Colonoscopic full-thickness resection using an over-the-scope device: a prospective multicentre study in various indications. *Gut* 2018; **67**: 1280-1289 [PMID: [28798042](#) DOI: [10.1136/gutjnl-2016-313677](#)]
- 16 **Sarker S**, Gutierrez JP, Council L, Brazelton JD, Kyanam Kabir Baig KR, Mönkemüller K. Over-the-scope clip-assisted method for resection of full-thickness submucosal lesions of the gastrointestinal tract. *Endoscopy* 2014; **46**: 758-761 [PMID: [24830398](#) DOI: [10.1055/s-0034-1365513](#)]
- 17 **Al-Bawardy B**, Rajan E, Wong Kee Song LM. Over-the-scope clip-assisted endoscopic full-thickness resection of epithelial and subepithelial GI lesions. *Gastrointest Endosc* 2017; **85**: 1087-1092 [PMID: [27569858](#) DOI: [10.1016/j.gie.2016.08.019](#)]
- 18 **Mönkemüller K**, Peter S, Toshniwal J, Popa D, Zabielski M, Stahl RD, Ramesh J, Wilcox CM. Multipurpose use of the 'bear claw' (over-the-scope-clip system) to treat endoluminal gastrointestinal disorders. *Dig Endosc* 2014; **26**: 350-357 [PMID: [23855514](#) DOI: [10.1111/den.12145](#)]
- 19 **Milano RV**, Bartel MJ, Brahmabhatt B, Woodward TA. Deep tissue en bloc resection of duodenal carcinoid with combined banding device and over-the-scope clip. *Gastrointest Endosc* 2016; **84**: 1065 [PMID: [27343416](#) DOI: [10.1016/j.gie.2016.06.029](#)]
- 20 **Richter-Schrag HJ**, Glatz T, Walker C, Fischer A, Thimme R. First-line endoscopic treatment with over-the-scope clips significantly improves the primary failure and rebleeding rates in high-risk gastrointestinal bleeding: A single-center experience with 100 cases. *World J Gastroenterol* 2016; **22**: 9162-9171 [PMID: [27895403](#) DOI: [10.3748/wjg.v22.i41.9162](#)]
- 21 **Manno M**, Mangiafico S, Caruso A, Barbera C, Bertani H, Mirante VG, Pigò F, Amardeep K, Conigliaro R. First-line endoscopic treatment with OTSC in patients with high-risk non-variceal upper gastrointestinal bleeding: preliminary experience in 40 cases. *Surg Endosc* 2016; **30**: 2026-2029 [PMID: [26201415](#) DOI: [10.1007/s00464-015-4436-y](#)]

P- Reviewer: Barret M, El-Atrebi KEAR, Hosoe N, Roy PK, Zhang QS

S- Editor: Ji FF **L- Editor:** A **E- Editor:** Tan WW





Published By Baishideng Publishing Group Inc
7901 Stoneridge Drive, Suite 501, Pleasanton, CA 94588, USA
Telephone: +1-925-2238242
Fax: +1-925-2238243
E-mail: bpgoffice@wjgnet.com
Help Desk: <https://www.f6publishing.com/helpdesk>
<https://www.wjgnet.com>

