

World Journal of *Clinical Cases*

World J Clin Cases 2019 October 26; 7(20): 3168-3383



OPINION REVIEW

- 3168 Clinical use of low-dose aspirin for elders and sensitive subjects
Zhang Y, Fang XM, Chen GX

ORIGINAL ARTICLE**Retrospective Study**

- 3175 Distribution and drug resistance of pathogenic bacteria in emergency patients
Huai W, Ma QB, Zheng JJ, Zhao Y, Zhai QR
- 3185 Comparative analysis of robotic vs laparoscopic radical hysterectomy for cervical cancer
Chen L, Liu LP, Wen N, Qiao X, Meng YG
- 3194 Feasibility of laparoscopic isolated caudate lobe resection for rare hepatic mesenchymal neoplasms
Li Y, Zeng KN, Ruan DY, Yao J, Yang Y, Chen GH, Wang GS
- 3202 Rh-incompatible hemolytic disease of the newborn in Hefei
Bi SH, Jiang LL, Dai LY, Zheng H, Zhang J, Wang LL, Wang C, Jiang Q, Liu Y, Zhang YL, Wang J, Zhu C, Liu GH, Teng RJ
- 3208 Soft tissue release combined with joint-sparing osteotomy for treatment of cavovarus foot deformity in older children: Analysis of 21 cases
Chen ZY, Wu ZY, An YH, Dong LF, He J, Chen R

Observational Study

- 3217 Clinical characteristics of sentinel polyps and their correlation with proximal colon cancer: A retrospective observational study
Wang M, Lu JJ, Kong WJ, Kang XJ, Gao F

Prospective Study

- 3226 Longitudinal observation of intraocular pressure variations with acute altitude changes
Xie Y, Sun YX, Han Y, Yang DY, Yang YQ, Cao K, Li SN, Li X, Lu XX, Wu SZ, Wang NL

Randomized Controlled Trial

- 3237 Combination of propofol and dezocine to improve safety and efficacy of anesthesia for gastroscopy and colonoscopy in adults: A randomized, double-blind, controlled trial
Li XT, Ma CQ, Qi SH, Zhang LM

META-ANALYSIS

- 3247 Prognostic significance of malignant ascites in gastric cancer patients with peritoneal metastasis: A systemic review and meta-analysis
Zheng LN, Wen F, Xu P, Zhang S

CASE REPORT

- 3259 Gonadotrophin-releasing hormone agonist-induced pituitary adenoma apoplexy and casual finding of a parathyroid carcinoma: A case report and review of literature
Triviño V, Fidalgo O, Juane A, Pombo J, Cordido F
- 3267 Constrictive pericarditis as a cause of refractory ascites after liver transplantation: A case report
Bezjak M, Kocman B, Jadrijević S, Gašparović H, Mrzljak A, Kanižaj TF, Vujanić D, Bubalo T, Mikulić D
- 3271 Endoluminal closure of an unrecognized penetrating stab wound of the duodenum with endoscopic band ligation: A case report
Kim DH, Choi H, Kim KB, Yun HY, Han JH
- 3276 Spontaneous superior mesenteric artery dissection following upper gastrointestinal panendoscopy: A case report and literature review
Ou Yang CM, Yen YT, Chua CH, Wu CC, Chu KE, Hung TI
- 3282 Hepatic amyloidosis leading to hepatic venular occlusive disease and Budd-Chiari syndrome: A case report
Li TT, Wu YF, Liu FQ, He FL
- 3296 De Winter syndrome and ST-segment elevation myocardial infarction can evolve into one another: Report of two cases
Lin YY, Wen YD, Wu GL, Xu XD
- 3303 Next generation sequencing reveals co-existence of hereditary spherocytosis and Dubin-Johnson syndrome in a Chinese girl: A case report
Li Y, Li Y, Yang Y, Yang WR, Li JP, Peng GX, Song L, Fan HH, Ye L, Xiong YZ, Wu ZJ, Zhou K, Zhao X, Jing LP, Zhang FK, Zhang L
- 3310 Recognizable type of pituitary, heart, kidney and skeletal dysplasia mostly caused by SEMA3A mutation: A case report
Hu F, Sun L
- 3322 Repeated lumps and infections: A case report on breast augmentation complications
Zhang MX, Li SY, Xu LL, Zhao BW, Cai XY, Wang GL
- 3329 Severe mental disorders following anti-retroviral treatment in a patient on peritoneal dialysis: A case report and literature review
He QE, Xia M, Ying GH, He XL, Chen JH, Yang Y

- 3335** Fish bone-induced myocardial injury leading to a misdiagnosis of acute myocardial infarction: A case report
Wang QQ, Hu Y, Zhu LF, Zhu WJ, Shen P
- 3341** Potentially fatal electrolyte imbalance caused by severe hydrofluoric acid burns combined with inhalation injury: A case report
Fang H, Wang GY, Wang X, He F, Su JD
- 3347** Ureter - an unusual site of breast cancer metastasis: A case report
Zhou ZH, Sun LJ, Zhang GM
- 3353** Alternative technique to save ischemic bowel segment in management of neonatal short bowel syndrome: A case report
Geng L, Zhou L, Ding GJ, Xu XL, Wu YM, Liu JJ, Fu TL
- 3358** Sister Mary Joseph's nodule in endometrial carcinoma: A case report
Li Y, Guo P, Wang B, Jia YT
- 3364** Synchronous quadruple primary malignancies of the cervix, endometrium, ovary, and stomach in a single patient: A case report and review of literature
Wang DD, Yang Q
- 3372** Ureteral Ewing's sarcoma in an elderly woman: A case report
Li XX, Bi JB
- 3377** Anaplastic lymphoma kinase-negative anaplastic large cell lymphoma masquerading as Behcet's disease: A case report and review of literature
Luo J, Jiang YH, Lei Z, Miao YL

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The *WJCC* is now indexed in PubMed, PubMed Central, Science Citation Index Expanded (also known as SciSearch®), and Journal Citation Reports/Science Edition. The 2019 Edition of Journal Citation Reports cites the 2018 impact factor for *WJCC* as 1.153 (5-year impact factor: N/A), ranking *WJCC* as 99 among 160 journals in Medicine, General and Internal (quartile in category Q3).

RESPONSIBLE EDITORS FOR THIS ISSUE

Responsible Electronic Editor: *Ji-Hong Liu*
 Proofing Production Department Director: *Yun-Xiaojuan Wu*

NAME OF JOURNAL
World Journal of Clinical Cases

ISSN
 ISSN 2307-8960 (online)

LAUNCH DATE
 April 16, 2013

FREQUENCY
 Semimonthly

EDITORS-IN-CHIEF
 Dennis A Bloomfield, Bao-Gan Peng, Sandro Vento

EDITORIAL BOARD MEMBERS
<https://www.wjnet.com/2307-8960/editorialboard.htm>

EDITORIAL OFFICE
 Jin-Lei Wang, Director

PUBLICATION DATE
 October 26, 2019

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PUBLICATION MISCONDUCT
<https://www.wjnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE
<https://www.wjnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS
<https://www.wjnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION
<https://www.f6publishing.com>

Endoluminal closure of an unrecognized penetrating stab wound of the duodenum with endoscopic band ligation: A case report

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Author contributions: Kim DH wrote the manuscript; Han JH revised the manuscript; Choi H did the case analysis; Kim KB and Yun HY did the data collection. All authors read and approved the final manuscript.

Informed consent statement: Informed written consent was obtained from the patient's parents for publication of this report and any accompanying images.

Conflict-of-interest statement: The authors declare that they have no conflict of interest.

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

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Abstract

BACKGROUND

A penetrating injury of a hollow viscus is an obvious indication for an exploratory laparotomy, but is not typically an indication for endoscopic treatment.

CASE SUMMARY

A 27-year-old man visited the emergency department with a self-inflicted abdominal stab wound. Injuries to the colon and ileum were detected, but an injury to the second portion of the duodenum was missed. On the day following admission to our institution, the patient became hemodynamically unstable with massive hematochezia, although there was no evidence of bleeding in the Levin tube or Jackson-Pratt drain. We thus performed an upper gastrointestinal endoscopy and discovered a missed duodenal injury that was actively bleeding. An endoscopic band ligation was performed for hemostasis and closure of the perforation. The patient was subsequently discharged without any complications.

CONCLUSION

A penetrating injury of the duodenum can be overlooked, so careful abdominal exploration is very important. If a missed duodenal injury is suspected, a cautious endoscopic approach may be helpful.

Key words: Penetrating abdominal injury; Endoluminal treatment; Unrecognized duodenal injury; Case report

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ses/by-nc/4.0/

Manuscript source: Unsolicited manuscript

Received: June 28, 2019

Peer-review started: June 29, 2019

First decision: July 31, 2019

Revised: September 18, 2019

Accepted: October 5, 2019

Article in press: October 5, 2019

Published online: October 26, 2019

P-Reviewer: Contini B, Garbuzenko DV, Velayos B

S-Editor: Dou Y

L-Editor: A

E-Editor: Liu JH



Core tip: Following a penetrating abdominal injury, it is very important for surgeons to find all associated lesions. Insufficient abdominal exploration can result in a missed injury, occasionally leading to the need for reoperation and possibly a fatal outcome. We successfully treated a rare case of perforation and bleeding in the third portion of the duodenum, which was not found by upper-abdominal exploration during the initial surgery. If a missed hollow viscus injury, particularly in the duodenum, remains despite such efforts, an endoscopic approach may be helpful in some cases.

Citation: Kim DH, Choi H, Kim KB, Yun HY, Han JH. Endoluminal closure of an unrecognized penetrating stab wound of the duodenum with endoscopic band ligation: A case report. *World J Clin Cases* 2019; 7(20): 3271-3275

URL: <https://www.wjgnet.com/2307-8960/full/v7/i20/3271.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v7.i20.3271>

INTRODUCTION

Hollow viscus perforations cause considerable mortality and usually require emergency surgery. Rapid diagnosis and treatment of these conditions are essential to reduce the high morbidity and mortality associated with a late-stage presentation^[1]. The majority of missed hollow viscus injuries result from blunt abdominal trauma, with those resulting from stab-penetrating abdominal trauma less prevalent^[2]. However, because the duodenum is a retroperitoneal organ, a penetrating duodenal injury can be overlooked. Injuries to the duodenum are associated with high mortality, often associated with a delayed diagnosis^[3]. A penetrating intestinal injury is an obvious indication for a laparotomy, but endoscopic treatment is extremely rare^[4,5]. Endoscopic treatment for a penetrating intestinal injury is rare because the endoscopic approach is difficult, peritonitis may be exacerbated during the procedure, and peritonitis cannot be resolved by endoscopic treatment^[6]. There has been one report of endoscopic treatment for a penetrating gastric injury^[7]. However, there have been no reports of endoscopic treatment for a penetrating duodenal injury. Herein, we present the first report of a case of a penetrating duodenal injury treated with endoscopy.

CASE PRESENTATION

Chief complaints

A 27-year-old male requested transfer for a self-inflicted abdominal stab wound.

History of the present illness

The patient had stabbed himself in his upper abdomen with a kitchen knife three times, in front of his family. He then visited the emergency room at another hospital, from which he was transferred to our emergency room. According to his family, he was uncontrollable when angry.

History of past illness

The patient denied a history of hypertension, diabetes mellitus, viral hepatitis, or tuberculosis. He had no known drug or food allergies. He also denied a history of operation, trauma, or blood transfusion.

Physical examination

The patient's vital signs upon arrival were as follows: Blood pressure 100/60 mmHg, heart rate 88 beats/min, respiratory rate 12 times/min, body temperature 37 °C, and oxygen saturation 98% on room air. He was awake, alert, and oriented. However, he complained of tenderness throughout the entire abdomen. We found three stab wounds in the upper-abdominal area. Two stab wounds had not penetrated the peritoneum, but the third had penetrated the peritoneum. There was a 3-cm longitudinal wound in the upper midline abdominal area, and the small bowel and transverse colon were eviscerated.

Laboratory examinations

A complete blood count was obtained showing a white blood cell count of 13.3 ×

$10^6/L$, hemoglobin 15.3 g/dL, and a platelet count of $229 \times 10^9/L$. Electrolyte, coagulation, and blood biochemical tests were all normal.

Image examination

The three wounds in the middle of the upper abdomen were inspected. An exploratory laparotomy detected two perforations in the ileum and mid-transverse colon, which were repaired primarily (Figure 1A). One day after the surgery, the patient became hemodynamically unstable with massive hematochezia, although there was no evidence of bleeding in the Levin tube or Jackson-Pratt (JP) drain. Eight pints of packed red blood cells were transfused, but his hemoglobin value decreased from 10 to 8 mg/dL. Systolic blood pressure was < 80 mmHg and the patient's consciousness became unclear. The patient was intubated and transferred to the intensive care unit. An abdominopelvic computed tomography (CT) scan revealed extravasation of contrast medium in the third duodenal portion (Figure 1B). An endoluminal approach for the endoscopic examination was performed in the intensive care unit to identify the bleeding lesions during preparation for the second operation. It showed a large blood clot on the third duodenum; a perforation 0.3 cm in diameter with active bleeding medially into the third duodenal portion was detected (Figure 2).

FINAL DIAGNOSIS

An unrecognized penetrating stab wound in the third portion of the duodenum.

TREATMENT

Several attempts to seal the perforation and stop the bleeding with endoclips failed due to the tangential angle. Next, an endoscopic band ligation (EBL) technique was used to obtain hemostasis and closure of the lesion using a pneumo-active single-band ligator (MD-48709; Akita Sumitomo Bakelite, Tokyo, Japan) (Figure 3A). After EBL, the patient's hemodynamics stabilized, and no adverse events occurred. Endoscopy 9 d later showed a healing ulcer at the perforation site closed by EBL (Figure 3B).

OUTCOME AND FOLLOW-UP

After EBL, the patient was hemodynamically stable, and there was no evidence of peritonitis or bleeding. He resumed a normal diet 5 d after EBL and was discharged 9 d after surgery.

DISCUSSION

Duodenal injuries are relatively infrequent compared to injuries to other intra-abdominal organs, and most duodenal injuries are penetrating injuries. However, a duodenal injury is often diagnosed late because part of the duodenum is retroperitoneal. In addition, a duodenal injury can be missed, resulting in delayed treatment and increased mortality and morbidity^[3,8]. In the present case, the small bowel and transverse colon were eviscerated at the time the patient arrived at the emergency department. Penetrating injuries to the terminal ileum and transverse colon were detected, and there was no active bleeding into the abdominal cavity. However, the patient became hemodynamically unstable on the day after surgery. The Levin tube and JP drain were clear, but he defecated massive hematochezia. We performed an upper gastrointestinal endoscopy and discovered a missed duodenal injury with active bleeding in the third portion of the duodenum. After endoscopic treatment, we reviewed the initial abdominal pelvic CT scan and detected intraluminal bleeding in the third portion of the duodenum. We missed the duodenal injury because there was no bile contamination or bleeding into the abdominal cavity during the operation. A hollow viscus injury manifesting with intra-luminal bleeding but no peritonitis or hemoperitoneum is an extremely rare condition. Retroperitoneal organ injuries resulting from a penetrating abdominal injury tend to be overlooked, as occurred in our case. This is why in the event of penetrating abdominal injuries it is important to perform a very careful abdominal exploration, including the Kocher maneuver.

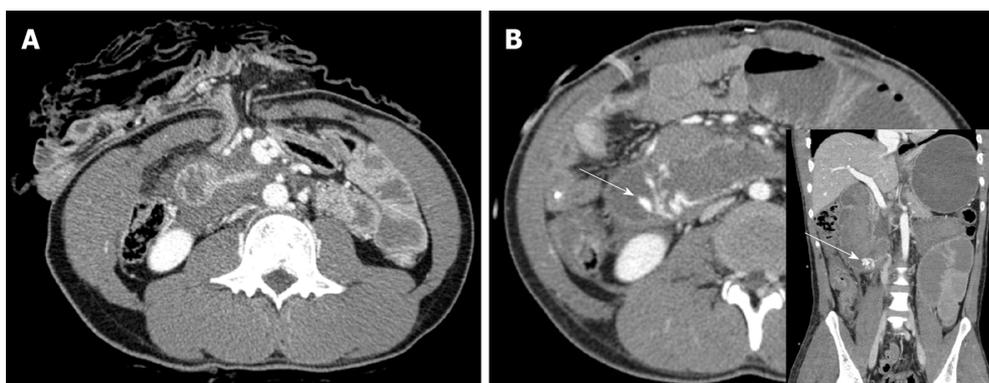


Figure 1 Abdominal computed tomography. A: Preoperative abdominal computed tomography (CT) shows paraduodenal fluid collection and transverse colon and small bowel herniation from the abdominal stab wound; B: Postoperative abdominopelvic CT shows extravasation of the contrast medium in the third portion of the duodenum (arrow).

Endoscopic closure of acute iatrogenic perforations using endoclips or a band ligator has been suggested^[4,5]. Per our previous report, EBL for an iatrogenic colon injury is a feasible and safe method *in vivo*, and endoscopic EBL is an acceptable method to manage variceal bleeding^[9]. Endoscopic clipping for a hollow viscus perforation can be limited in cases with a large perforation or in those with tangential angles^[4]. In our case, the missed duodenal injury was accompanied by bleeding, and we closed the missed duodenal injury using EBL.

If a missed duodenal injury has already caused peritonitis, a surgical approach is required because a penetrating abdominal injury that accompanies a hollow viscus injury is an obvious surgical indication^[10]. In this case, a Levin tube was inserted to drain gastric and bile juice and to detect internal bleeding, and two JP drains were inserted in the paracolic gutter and pelvic cavity during the first operation to detect leakage or intra-abdominal bleeding. There was no evidence of internal or intra-abdominal bleeding or leakage *via* the Levin tube or JP drain, and there was no evidence of peritonitis. Thus, we attempted an endoscopic approach to diagnose the bleeding detected on the abdominal CT scan.

There has only been one previous report of endoscopic treatment of a penetrating abdominal injury, and that case was a penetrating gastric injury^[7]. There have been no reports on the endoscopic treatment of a traumatic duodenal perforation. Although our case is very rare and limited, it is the first successful endoscopic treatment for a missed duodenal injury found more than 24 h after surgery.

CONCLUSION

A penetrating hollow viscus injury is an indication for surgical treatment^[11]. Generally, endoscopic treatment is not indicated for hollow viscus injuries because of peritonitis, leakage, bleeding, and the length of endoscopy. In our experience, an endoscopic approach may be helpful in the event of a suspected duodenal injury. A very careful abdominal exploration, including the Kocher maneuver, is very important for an upper abdominal penetrating injury.

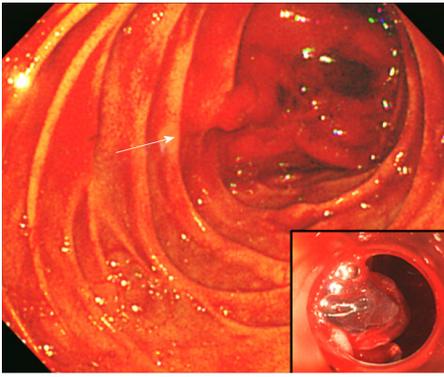


Figure 2 Endoscopy showed active bleeding with a perforation in the third portion of the duodenum. The cap-fitted endoscopy enabled closer observation of the bleeding site.

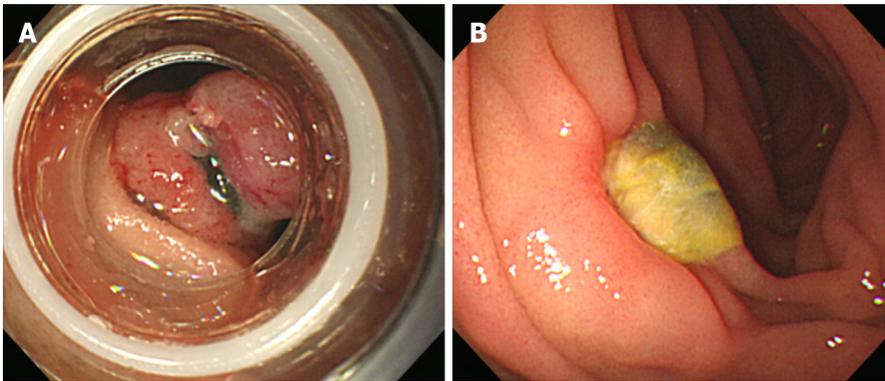


Figure 3 Endoscopy results. A: Endoscopic band ligation was used to make a mushroom-like area of mucosa to obtain complete closure. Additional band ligation was performed to get a more stable anchor; B: Follow-up endoscopy 9 d later showed a healing ulcer at the previous site of bleeding.

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