

Clinicopathological Feature of Adult Small Bowel Intussusception Diagnosed and Managed by Double-Balloon Enteroscopy : A Single Centre Study

Won Shik Kim

Korea University Guro Hospital <https://orcid.org/0000-0003-4431-6472>

Beom Jae Lee (✉ bel029ucsd@gmail.com)

Korea University Guro Hospital

Ah Young Yoo

Korea University Guro Hospital

Seong Min kim

Korea University Guro Hospital

Seung Han Kim

Korea University Guro Hospital

Moon Kyung Joo

Korea University Guro Hospital

Hyo Jung Kim

Korea University Guro Hospital

Jong-Jae Park

Korea University Guro Hospital

Research article

Keywords: Adult small bowel Intussusception, Balloon-assisted enteroscopy, low-grade small bowel obstruction

Posted Date: November 18th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-110279/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Adult small bowel intussusception usually has an aetiology that leads to small bowel obstruction. Here, we aimed to identify the clinicopathological features of adult small bowel intussusception managed with Balloon-Assisted Enteroscopy (BAE) and to explore the clinical usefulness of BAE for the management of small bowel intussusception.

Method: We retrospectively analysed the clinical data of 13 patients who were diagnosed with adult small bowel intussusception at Korea University Guro Hospital between 2010 and 2019.

Results: The type of intussusception was ileoileal in eight (61.5%) patients and jejunal-jejunal in five (38.5%) patients. Eight cases of small bowel intussusception (61.5%; five idiopathic causes, two Peutz-Jeghers polyps, and one Crohn's disease) were successfully managed with BAE. The remaining five patients underwent laparoscopic small bowel resection due to management of the primary aetiology (two diffuse large B-cell lymphoma, one lipomatosis, one Peutz-Jeghers polyps, and one angiomyolipoma).

Conclusions: In many cases, adult small bowel intussusception had a benign and idiopathic aetiology. The diagnosis and treatment of adult small bowel intussusception with BAE may reduce the requirement for small bowel resection in selected patients.

Background

Adult small bowel intussusception (ASI) is a relatively rare condition, with surgical resection usually performed for management or prevention of obstructive symptoms. Unlike intussusception in children, ASI has over 70% lead point lesions [1–4].

It is controversial whether preoperative reduction of intussusception should be performed. If intestinal strangulation or bowel necrosis occurs, emergent surgical resection is required. However, if low-grade obstruction is suspected a scheduled operation is preferred. Preoperative reduction of obstruction can prevent short bowel syndrome by minimising the length of small bowel resection [5–7].

With the introduction of balloon-assisted enteroscopy (BAE), the entire small bowel can be visually identified, which has led to the progression of research using BAE. BAE allows for examination of the entire small bowel, improving the ability to identify any bleeding, strictures, or small bowel tumours. It can also be used for a variety of therapeutic interventions, including haemostasis, endoscopic mucosal resection (EMR), balloon dilatation, and stent insertion.[8–10]

In this study, we evaluated the usefulness of BAE in the diagnosis and management of ASI by analysing the clinicopathological characteristics of 13 patients with systemic reviews.

Methods

Patients

Between January 2009 and May 2019, 13 patients with small bowel intussusception underwent BAE at Korea University Guro Hospital. We retrospectively analysed their medical records, abdominal pelvic computed tomography (APCT) and BAE findings, and pathological results. This study was approved by the ethics committee of Korea University Guro Hospital.

BAE procedures

BAE was performed using an EN-450T5 (Fujinon Toshiba ES Systems, Tokyo, Japan). Based on the abdominal CT findings, the BAE insertion route was selected. The BAE procedures were predominantly performed for tissue confirmation or therapeutic intervention, including EMR by a single endoscopist (BJL). For an oral approach, BAE was performed after overnight fasting. For an anal approach, the small bowel was carefully cleansed with a polyethylene glycol solution. All patients were sedated with intravenous midazolam and propofol under careful cardiopulmonary monitoring.

Results

Baseline characteristics of patients

Thirteen patients underwent BAE for the identification of the aetiology of ASI during the enrolment period. All patients were diagnosed with ASI using abdominal CT then underwent BAE. The majority (10, 77%) of patients diagnosed with ASI were male, and the median age at the time of diagnosis was 41.7 years (range, 19–75 years). The majority of patients (11 patients) complained of abdominal pain, one patient reported haematochezia, and abnormal abdominal CT findings were seen in one patient. (Table 1) The lead point was located in the ileum in 8 (61.5%) patients and jejunum in 5 (38.5%) patients.

Table 1. Baseline characteristics of enrolled patients

| Patient No. | Sex group | Age range | Chief complaint | Body mass index | Medical history |
|-------------|-----------|-----------|--------------------------|-----------------|-------------------------|
| 1 | 2 | 15~20 | Hematochezia | 21 | - |
| 2 | 1 | 65~70 | Recurrent abdominal pain | 14 | Advanced gastric cancer |
| 3 | 1 | 45~50 | Abdominal pain | 21 | DM |
| 4 | 1 | 25~30 | Obstructive symptoms | 27.1 | - |
| 5 | 1 | 20~25 | Abdominal pain | 17.6 | - |
| 6 | 1 | 40~45 | Abdominal pain | 24.4 | - |
| 7 | 1 | 35~40 | Abdominal pain | 27.2 | - |
| 8 | 1 | 45~50 | Abdominal pain | 24.5 | - |
| 9 | 1 | 50~55 | Abdominal pain | 24.9 | Acute myeloid leukemia |
| 10 | 2 | 45~50 | Abdominal pain | 23 | - |
| 11 | 1 | 25~30 | Abdominal pain | 18.3 | - |
| 12 | 1 | 75~80 | Abdominal pain | 28.5 | DM |
| 13 | 2 | 35~40 | Abnormal image | 18.1 | - |

DM : diabetes mellitus.

Diagnosis and BAE procedure

The insertion route was selected based on the abdominal CT findings. Antegrade, retrograde, and bidirectional approaches were used in six (46%) patients, six (46%) patients, and one (8%) patient, respectively. The mean procedure time was 65 min (range, 20–140 min). No major complications, such as bowel perforation, occurred during or after the study.[11, 12] Transient non-symptomatic elevation of serum amylase level was observed in seven patients who underwent the anterograde approach, but this normalised after 2 or 3 days (Table 2).

Table 2. DBE route, procedure time, etiology characteristics, and treatment modality

| Patient No. | Approach | Time | Location, type | Final histology | Treatment modality |
|-------------|----------|-------|----------------|---------------------|-----------------------|
| 1 | Oral | 83 m | Ileoileal | (-) | None |
| 2 | Anal | 105 m | Jejunojejunal | (-) | None |
| 3 | Anal | 61 m | Ileoileal | (-) | None |
| 4 | Oral | 40 m | Ileoileal | (-) | None |
| 5 | Oral | 80 m | Jejunojejunal | Peutz–Jeghers polyp | small bowel resection |
| 6 | Oral | 45 m | Jejunojejunal | Peutz–Jeghers polyp | EMR |
| 7 | Oral | 140 m | Ileoileal | Peutz–Jeghers polyp | EMR |
| | Anal | 40 m | | | |
| 8 | Anal | 52 m | Ileoileal | DLBCL | small bowel resection |
| 9 | Anal | 35m | Ileoileal | DLBCL | small bowel resection |
| 10 | Oral | 90 m | Jejunojejunal | Lipomatosis | small bowel resection |
| 11 | Anal | 20 m | Ileoileal | Chron’s disease | None |
| 12 | Anal | 50 m | Ileoileal | Angiolipoma | small bowel resection |
| 13 | Oral | 70 m | Jejunojejunal | (-) | None |

DLBCL: diffuse large B-cell lymphoma, EMR: endoscopic mucosal resection.

Management and clinical outcomes of small bowel intussusception

Laparoscopic small bowel resection was performed in five (38.5%) patients, of which two had malignant aetiologies such as diffuse large B-cell lymphoma (DLBCL) and three patients had benign aetiologies such as lipomatosis, angiolipoma, and Peutz-Jeghers syndrome (Fig. 1, 2). The remaining eight patients (61.5%) attained a reduction in intussusception without surgical resection. Two patients with Peutz-Jeghers syndrome underwent resection with EMR via an antegrade or bidirectional approach. Follow-up abdominal CT revealed no signs of intussusception. In five patients with idiopathic aetiology, we

examined the entire small bowel using the antegrade or retrograde approach and found no intraluminal pathologies. After the BAE procedure, resolved intussusception was confirmed by abdominal CT. The remaining one patient has a benign (Crohn's disease) aetiology. After the BAE procedure, resolved intussusception was confirmed by abdominal CT. Table 1 summarises the characteristics of all patients with ASI.

Discussion

ASI is not as common as paediatric intussusception. The exact mechanism of intussusception remains unknown. However, invagination is thought to occur when the bowel wall becomes irritable because of changes in the lumen and normal peristaltic activity [5]. Unlike most paediatric intussusceptions, most ASIs have aetiologies that cause intestinal lumen obstruction. Thus, diagnostic or therapeutic interventions for tissue confirmation are usually required.

VCE and BAE are widely used for the diagnosis and treatment of small bowel lesions [10, 13–16], including low-grade obstructive lesions. BAE allows for real-time examination of the whole small bowel, enabling the identification and diagnosis of variable small lesions, including bleeding lesions, strictures, and tumours.[17] Our clinical study included 13 patients who were preoperatively diagnosed with ASI using APCT and BAE. Although it included only a small number of cases, our study enrolled the most number of cases using BAE compared with other studies thus far.

In previous studies, the most common cause of ASI was benign (61, 50%) followed by malignant lesions (26, 28%). Idiopathic causes accounted for approximately 22% of the cases. Meckel's diverticulum was the most common benign cause (12, 20%), followed by postoperative intussusception (10, 16%). Metastatic cancer (8, 31%) was the most common malignant cause, followed by adenocarcinoma (4, 15%). The results of the previous studies are summarised in Table 3.[2, 18–25]

In our study, the causes of ASI were benign, idiopathic, and malignant in seven (54%), five (38%), and one (8%) patients, respectively. Compared with the proportion of cases with idiopathic causes in previous studies, the proportion in our study was much higher. Surgical resection was performed in only five patients (38.5%), indicating that surgical resection could be avoided in the majority of patients with ASI using the BAE procedure. Peutz-Jeghers syndrome is a therapeutic indication for endoscopic management with BAE. In the past, laparotomy bowel resection was mostly performed to prevent ASI caused by the recurrence of Peutz-Jeghers polyposis (PJP). With the development of BAE, EMR has substituted surgical resection for the management of PJP[26, 27]. In our study, three patients had Peutz-Jeghers syndrome, of which two were treated with polypectomy or EMR without surgical treatment. The remaining patient was first treated with BAE; however, as many polyps were not approachable with BAE, small bowel resection and intraoperative polypectomy were performed.

The symptoms of ASI vary. Subacute or chronic abdominal pain is the most common symptom, followed by bowel obstruction symptoms such as nausea, vomiting, constipation, and abdominal distention. For high-grade obstruction of the small bowel with strangulation, surgical treatment should be the first

treatment of choice. In our study, 11 (85%) patients complained of abdominal pain, including obstructive symptoms. All patients had low-grade obstruction without strangulation.

BAE in low-grade small bowel obstruction has the advantage of enabling histological confirmation of the aetiology and avoidance of surgical treatment. The BAE procedure requires repetitive bowel folding and shortening by using an overtube with a balloon; hence, it can lead to bowel reduction. But this presented study has a limitation in that it included only a small number of cases.

Conclusion

In conclusion, BAE is a useful diagnostic and therapeutic modality for ASI without strangulation and can be safely performed. Diagnosis and reduction using preoperative BAE have the advantage of avoiding surgical small bowel resection in over 50% of patients.

Abbreviations

VCE: Video Capsule Endoscopy

ASI: Adult Small bowel Intussusception

BAE : Balloon-Assisted Enteroscopy

DLBCL : Diffuse Large B-Cell Lymphoma

EMR : Endoscopic Mucosal Resection

APCT : Abdominal Pelvic Computed Tomography

PJP : Peutz-Jeghers Polyposis

Declarations

Ethics approval and consent to participate

The Ethics Committee of the Korea University Guro hospital approved the protocol (2019GR0002), and the study was carried out following the ethical guidelines of the Declaration of Helsinki.

Consent for publication

Not applicable

Availability of data and material

The datasets analyzed during the current study are not publicly available because they contain sensitive patient information, but may available from the corresponding author on reasonable request.

Competing Interests

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Funding

None

Author Contributions

Conceptualization: BJL .

Formal analysis: WSK, AYA, SMK

Project administration: BJL

Case provide: JJP, HJK, MKJ, SHK

Supervision: BJL

Visualization: LBJ, MKJ, JJP

Writing – original draft: WSK, BJL

All authors have read and approved the manuscript

Acknowledgments

Not applicable

References

- [1] Hong KD, Kim J, Ji W, et al. Adult intussusception: a systematic review and meta-analysis. Tech Coloproctol. 2019;23(4):315-324
- [2] Barussaud M, Regenet N, Briennon X, et al. Clinical spectrum and surgical approach of adult intussusceptions: a multicentric study. Int J Colorectal Dis 2006;21(8):834-839.
- [3] Begos DG, Sandor A, Modlin IM. The diagnosis and management of adult intussusception. Am J Surg. 1997;173(2):88-94
- [4] Eisen LK, Cunningham JD, Aufses Jr AH. Intussusception in adults: institutional review. J Am Coll Surg. 1999;188(4):390-5
- [5] Zubaidi A, Al-Saif F, Silverman R. Adult intussusception: a retrospective review. Dis Colon Rectum. 2006;49(10):1546-51.

- [6] Reijnen HA, Joosten HJ, de Boer HH. Diagnosis and treatment of adult intussusception. *Am J Surg*. 1989;158(1):25-8.
- [7] Haas EM, Etter EL, Ellis S, et al. Adult intussusception. *Am J Surg*. 2003;186(1):75-6.
- [8] Kim ER. Roles of Capsule Endoscopy and Device-Assisted Enteroscopy in the Diagnosis and Treatment of Small-Bowel Tumors. *Clin Endosc*. 2020;53(4):410-416.
- [9] Huang Z, Liu X, Yang F, et al. Diagnostic efficacy of double-balloon enteroscopy in patients with suspected isolated small bowel Crohn's disease. *BMC Gastroenterol*. 2020;20(1):42.
- [10] Pasha SF, Leighton JA, Das A, et al. Double-balloon enteroscopy and capsule endoscopy have comparable diagnostic yield in small-bowel disease: a meta-analysis. *Clin Gastroenterol Hepatol*. 2008;6(6):671-6.
- [11] Heine GD, Hadithi M, Groenen MJ, et al. Double-balloon enteroscopy: indications, diagnostic yield, and complications in a series of 275 patients with suspected small-bowel disease. *Endoscopy* 2006;38(1):42-48.
- [12] Mensink PB, Haringsma J, Kucharzik T, et al. Complications of double balloon enteroscopy: a multicenter survey. *Endoscopy* 2007;39(7):613-615.
- [13] Marinis A, Yiallourou A, Samanides L, et al. Intussusception of the bowel in adults: a review. *World J Gastroenterol* 2009;15(4):407-411.
- [14] May A, Nachbar L, Ell C. Double-balloon enteroscopy (push-and-pull enteroscopy) of the small bowel: feasibility and diagnostic and therapeutic yield in patients with suspected small bowel disease. *Gastrointest Endosc*. 2005;62(1):62-70.
- [15] Di Caro S, May A, Heine DG, et al. The European experience with double-balloon enteroscopy: indications, methodology, safety, and clinical impact. *Gastrointest Endosc*. 2005;62(4):545-50.
- [16] Hadithi M, Heine GDN, Jacobs MA, et al. A prospective study comparing video capsule endoscopy with double-balloon enteroscopy in patients with obscure gastrointestinal bleeding. *Am J Gastroenterol*. 2006;101(1):52-7.
- [17] Yoo AY, Lee BJ, Kim WS, et al. Clinicopathological Features of Small Bowel Tumors Diagnosed by Video Capsule Endoscopy and Balloon-Assisted Enteroscopy: A Single Center Experience. *Clin Endosc*. 2020;Epub ahead of print.
- [18] Shenoy S. Adult intussusception: A case series and review. *World J Gastrointest Endosc*. 2017 May;9(5):220-227.

- [19] Wang N, Cui XY, Liu Y, et al. Adult intussusception: a retrospective review of 41 cases. *World J Gastroenterol*. 2009;15(26):3303-8.
- [20] Erkan N, Hacıyanlı M, Yildirim M, et al. Intussusception in adults: an unusual and challenging condition for surgeons. *Int J Colorectal Dis*. 2005;20(5):452-6.
- [21] Yang JD, Lee MR, Kim JH. Adult Intussusception: Diagnosis and Treatment. *Ann Coloproctol*. 2007;23(6):416-419
- [22] Takeuchi K, Tsuzuki Y, Ando T, et al. The diagnosis and treatment of adult intussusception. *J Clin Gastroenterol*. 2003;36(1):18-21.
- [23] Catalano O: Transient small bowel intussusception: CT findings in adults. *Br J Radiol*. 1997;70(836):805-8.
- [24] Napora TE, Henry KE, Lovett TJ, et al. Transient adult jejunal intussusception. *J Emerg Med*. 2003;24(4):395-400.
- [25] Guillén-Paredes M, Campillo-Soto A, Martín-Lorenzo J, et al. Adult intussusception—14 case reports and their outcomes. *Rev Esp Enferm Dig*. 2010;102(1):32-40.
- [26] Ohmiya N, Taguchi A, Shirai K, et al. Endoscopic resection of Peutz-Jeghers polyps throughout the small intestine at double-balloon enteroscopy without laparotomy. *Gastrointest Endosc*. 2005;61(1):140-7.
- [27] Mönkemüller K, Weigt J, Treiber G, et al. Diagnostic and therapeutic impact of double-balloon enteroscopy. *Endoscopy*. 2006;38(1):67-72.

Figures

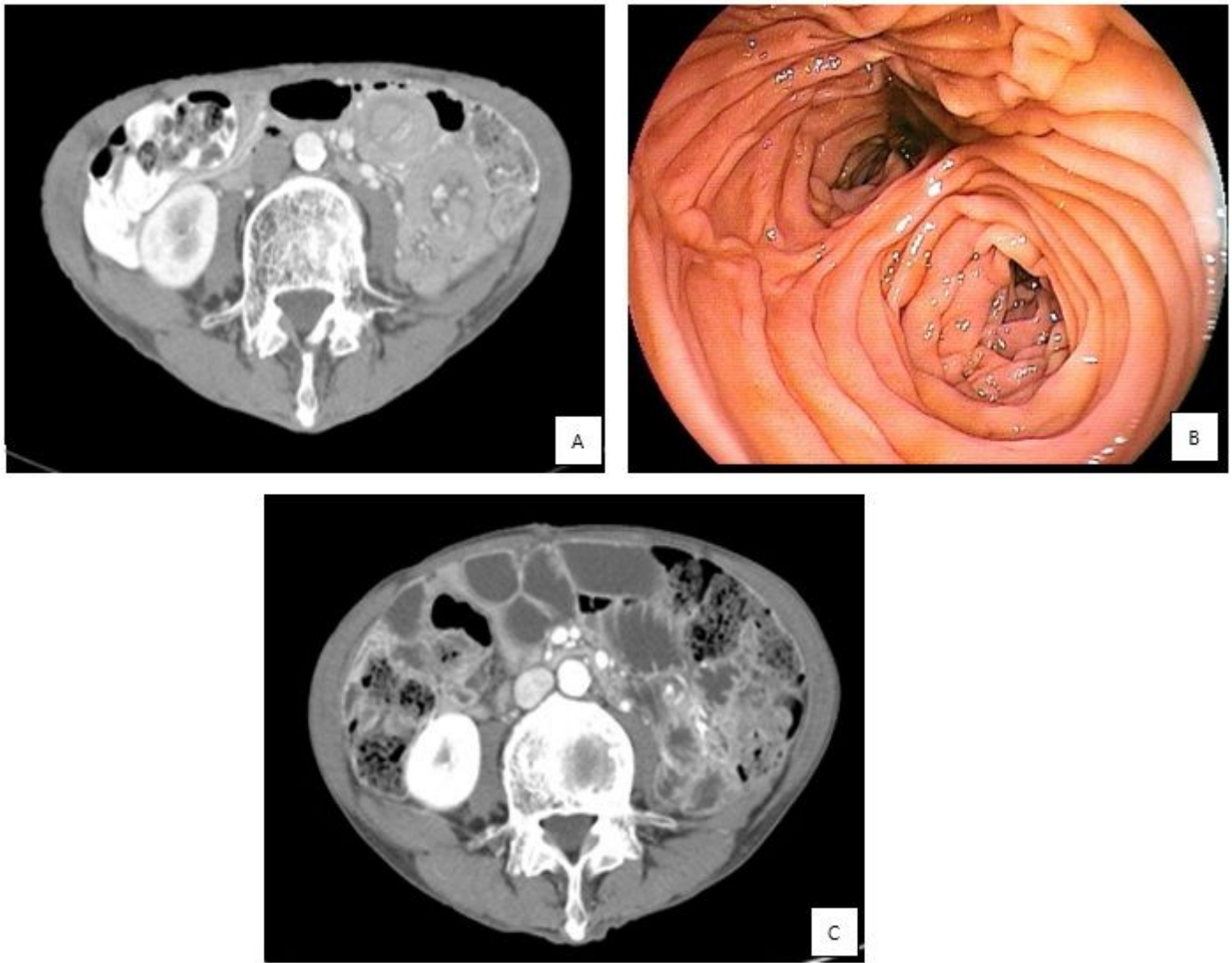


Figure 1

(A) Abdominal computed tomography (CT) showing the target lesion with alternating densities (B) DBE finding (C) Abd CT findings after DBE procedure

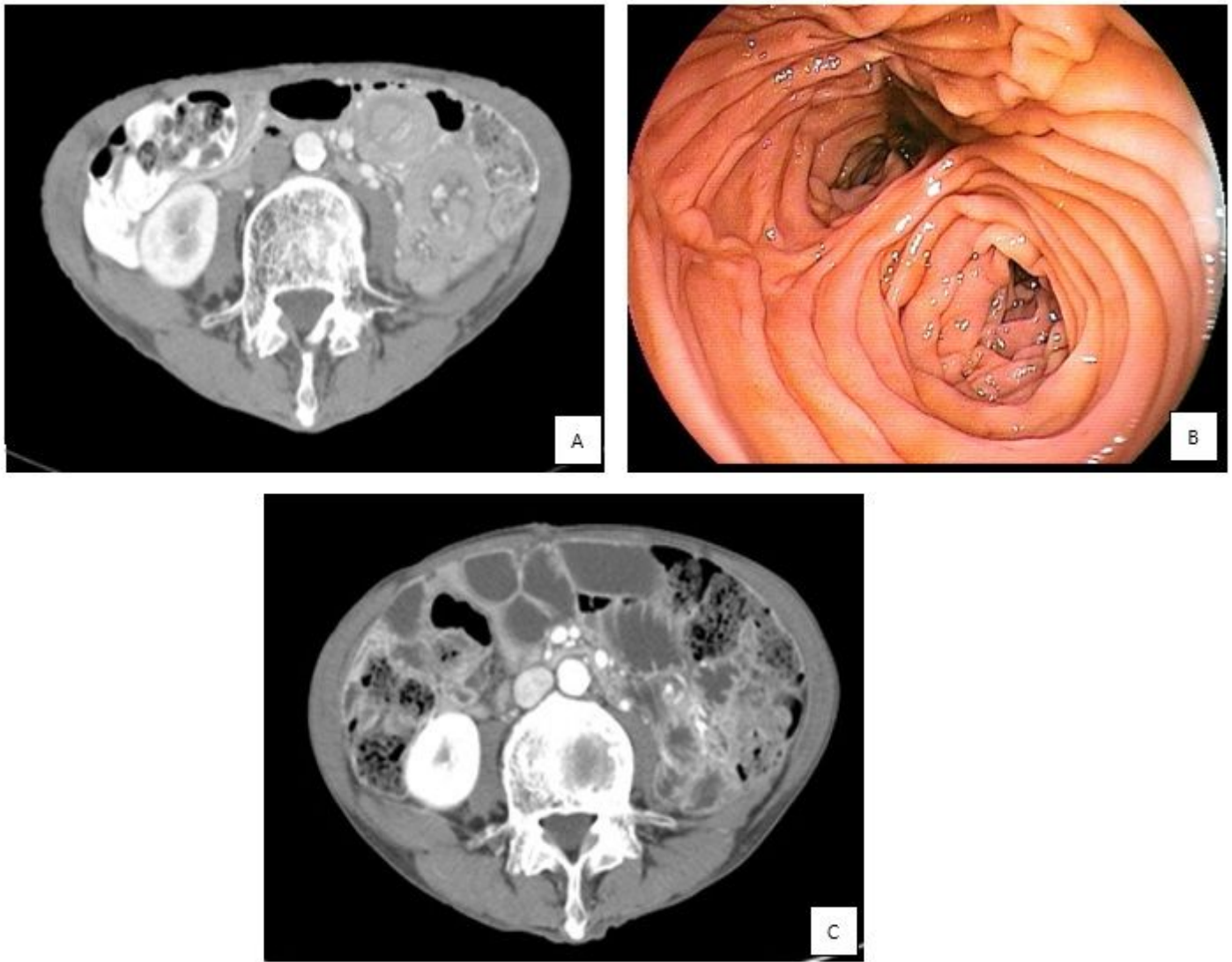


Figure 1

(A) Abdominal computed tomography (CT) showing the target lesion with alternating densities (B) DBE finding (C) Abd CT findings after DBE procedure

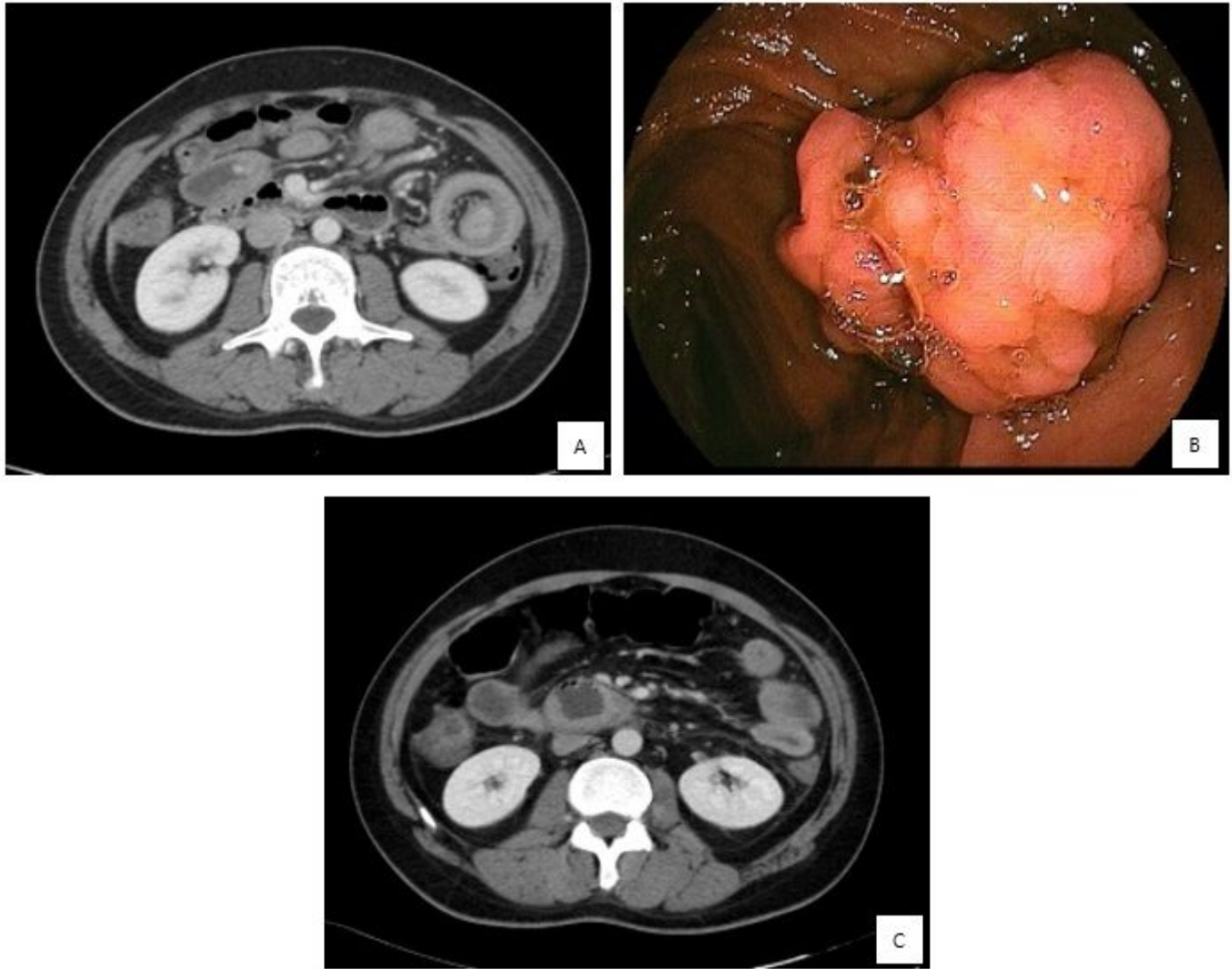


Figure 2

(A) Abdominal computed tomography (CT) showing the target lesion with alternating densities, which were the intussusceptum (inner layer) and intussuscepien (B) Giant polyp which was located Jejunum (C) Abd CT findings after DBE procedure

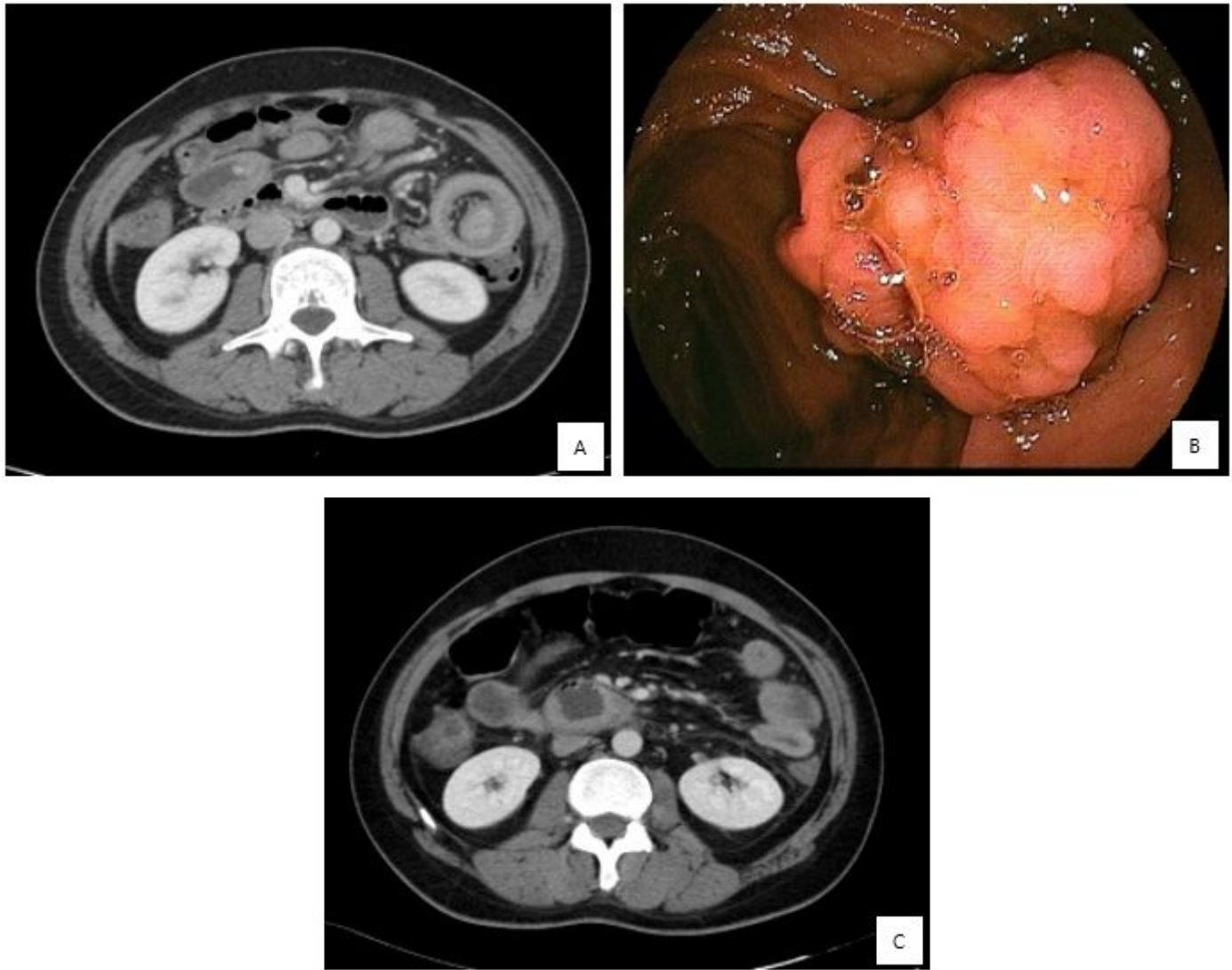


Figure 2

(A) Abdominal computed tomography (CT) showing the target lesion with alternating densities, which were the intussusceptum (inner layer) and intussuscepien (B) Giant polyp which was located Jejunum (C) Abd CT findings after DBE procedure