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Intraoperative Endoscopy Using Enterotomy is Used to Diagnose Obscure Gastrointestinal Bleeding

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Abstract
The difficult condition known as overt obscure gastrointestinal bleeding (OGIB) frequently requires intraoperative endoscopy (IOE), which has a significant risk of morbidity and death. The purpose of the study was to compare the various methods for carrying out IOE for overt OGIB. The data of 98 patients who had trans-enterotomy IOE (IOE-E) or other methods including peroral IOE (IOE-oral), trans-anal IOE (IOE-anal), or combined route (IOE- combo) were retrospectively evaluated. Analyses were conducted on patient characteristics, demographics, diagnostic test results, IOE findings and follow-up outcomes. Every one of the 98 patients had IOE. The IOE-E group comprises 31 patients, the IOE-oral group comprises 26, the IOE-anal group comprises 23 and the IOE-combo group has 18 individuals. In 72 patients, long-term follow-up data (>6 months) was successfully gathered. IOE-E has the shortest operation time (43.2±17.4 min, $P<0.05$), lowest post-operative morbidity rate (16%, $P<0.05$) and shortest recovery period. hospital length of stay (6.7±5.1 days, $P<0.05$), as compared to the other three approaches. For the treatment of overt OGIB, intraoperative endoscopy via enterotomy is a safer and better option.

INTRODUCTION

The gastrointestinal bleeding from an unidentified cause with negative first endoscopic (upper endoscopy or colonoscopy) results is termed as obscure gastrointestinal bleeding (OGIB)[1]. OGIB can be classified as either overt or occult, according to the American Gastroenterological Association (AGA)[2]. Overt OGIB is defined as persistent or recurrent visible bleeding in emesis or feces with negative endoscopic results, while occult OGIB is defined as persistently or recurrently positive FOBT (fecal occult blood testing) without visible gastrointestinal bleeding.

Patients with overt OGIB had increased morbidity and fatality rates related to ongoing bleeding when compared to those with occult OGIB. Even using video capsule endoscopy (VCE), pinpointing the precise cause of bleeding remains challenging and surgical treatment options are more limited in cases of overt OGIB.

The challenge in treating overt gastrointestinal bleeding is locating the bleeding sources prior to surgery, which are primarily in the small intestine. Nevertheless, there are a number of obscure or occult causes of gastrointestinal bleeding, such as diverticula, ulcerative colitis, ischemic colitis, tumors, vasculitis, leiomyosarcoma, leiomyoma, lymphomas, carcinoid tumors, etc[3].

Even using deep enteroscopy or VCE, the examination of the small bowel has proven difficult due to its relative inaccessibility with upper endoscopy or colonoscopy[4]. There isn't just one preoperative assessment. In the presurgical evaluation, enteroclysis, small bowel follow-through (SBFT), tagged RBC scan, and mesenteric angiography have limited effects. Repeat upper endoscopy, colonoscopy, VCE, push enteroscopy and deep enteroscopy-such as spiral enteroscopy[5], single-balloon[6], or double-balloon[7] are all included in the sequential work up. Intraoperative endoscopy (IOE) is therefore typically necessary[8].

The initial step in the extrinsic inspection of the colon (i.e., tumor, diverticulum, tattooing lesions) was abdominal exploration (open or laparoscopic surgery)[9]. In the event of a negative exploratory result, IOE would be carried out. Every patient in this research did not receive IOE. Various routes are depicted in (Fig. 2), which include IOE via enterotomy (IOE-E), IOE through peroral (IOE-oral), IOE through trans-anal (IOE-anal) and combined route (IOE-combo, peroral plus trans-anal)[10,11].

The trans-anal or peroral technique is helpful, but it has a number of drawbacks, such as a lengthier procedure duration and the need for a push enteroscope[9]. When the small bowel is typical in length and a regular endoscope may be used in a shorter amount of time, the trans-enterotomy technique (IOE-E) is appropriate. There aren't many studies that compare the effectiveness and safety of the various IOE strategies[12,13].

MATERIALS AND METHODS

Preoperative Diagnoses: Without a known bleeding source, every patient developed overt OGIB (melena, hematemesis, or hematochezia). Patients having criteria for sequential workups included those involving endoscopy, deep endoscopy, video capsule endoscopy, trans-abdominal ultrasonography, abdominal computed tomography, small-bowel follow-through, tagged RBC scan and/or mesenteric angiography.

Surgical Procedures: In order to remove lesions or suspected malignant lesions that are still bleeding or are recurring following conservative treatment, the primary surgical procedure used is an exploratory laparotomy. The laparotomy procedure using IOE was carried out. Should the exploratory outcome be unfavourable A surgeon and an endoscopist performed the insertion, removal and inspection of the endoscope simultaneously. The IOE-E was carried out using a sterile plastic protective sheath that is sutured to the enterotomy's margins, as seen in (Fig. 3)[14]. The endoscopist meticulously examined the mucosa while the surgeon tenderly telescoped the intestines. It was easier to visualize endoscopically when the OR lights were dimmed. To identify the positive lesions, a suture would be placed on the intestinal serosa surface[15].

Furthermore, one side enteroscopy (oral or anal) might not be able to cover the entire small intestine because double-balloon enteroscopy can only detect 2-3m of the small intestine. Therefore, the endoscopist first determines whether the bleeding location is in the ileum or jejunum (proXimal or distal) and selects the appropriate technique (oral or anal) while doing double-balloon enteroscopy. Nevertheless, because the bleeding location might not be accessible using the one-side endoscope technique, a combination endoscopy (oral Anal) was carried out.

Outcome Measures and Follow-Up: Follow-up information was prospectively collected from the hospital database. Demographic and laboratory tests, diagnostic/therapeutic approaches and yields, duration of the procedure, hospital length of stay and complication rates were assessed and compared among all the groups. Rebleeding was defined as the following two situations 1. Persistent or recurrent melena, hematemesis or hematochezia., 2. A decrease of $\geq$2 g from baseline in haemoglobin.

RESULTS AND DISCUSSIONS

Among the four groups, the patients in IOE-oral had the lowest mean age, however there was no

discernible difference. Sixteen individuals utilized medications that may cause bleeding, such as antiplatelet medicines, anticoagulants and/or nonsteroidal anti-inflammatory drugs (NSAID). All patients had ceased taking their medications while they were in the hospital. The lowest Hb level did not differ between the four groups.

Compared to other traditional procedures, IOE-E was performed in a significantly shorter amount of time (P<0.05, Table 1). Compared to IOE-anal (P 0.025) or IOE-combo (P 0.017), IOE-E had a significantly shorter hospital length of stay (LOS) and there was a trend toward a shorter LOS when compared to IOE-oral (P 0.093).

There were several postoperative complications, including wound infection, chest infection, Urinary tract infection, temporary azotemia, anastomotic leakage and small-bowel adhesive obstruction[15]. The overall morbidity rate in IOE-E (5/31, 16%) group was the lowest as compared to the IOE-anal and IOE-combo approaches (P 0.028 and P 0.002, respectively) IOE-E had a trend toward decreased overall morbidity rate as compared to IOE-oral, without significant difference (P 0.22). Postoperative mortality was zero in all patients in this study. Long-time follow-up information (>6 months) was successfully obtained in 72 patients, including 23 patients for IOE-E, 21 for IOE-oral, 15 for IOE-anal and 13 for IOE-combo. The follow-up duration was 472 ± 892 days (range, 191-1975 days). Rebleeding was found in 20% (2/10) of patients with small bowel ulcers, 12.5% (3/24) of patients with vascular lesions and 20% (1/5) of patients with Crohn's disease. One patient with tuberculosis ileitis had a bowel obstruction 8 months later, conservatively treated. One patient with adenocarcinomas died 28 months later of the disease progression. The rebreeding rates were 4.3% (1/23) in the IOE-E group, 9.5% (2/21) in the IOE-oral group and 23% (3/13) in the IOE-combo group, respectively. No rebreeding patient was found in the IOE-anal group. There was no significant difference in rebreeding rates between open and laparoscopic surgery (P = 0.268).

IOE is a possible treatment and diagnostic strategy for overt OGIB. In around 80% of instances, IOE enables recurrence-free therapy of GI bleeding, complete bowel exploration in 60-100% of patients and the discovery of definite lesions for surgical resection in roughly 80% of cases[16]. IOE does, however, come with an increased risk of morbidity and mortality. Finding a somewhat optimal technique to carry out IOE is therefore required[17].

The Following is a List of IOE Indications: First off, a presurgical work-up has identified the source after a thorough evaluation and the risk of surgery is outweighed by the risk of continued bleeding[14]. Thirdly, the lesions cannot be located by exploratory surgery alone (no obvious serosal lesions or noticeable tattoos)., secondly, the lesions cannot be treated by endoscopy and/or angiographic embolization[17,18].

As our study compared several methods of doing IOE for overt OGIB, we discovered that the following conditions were the primary causes of bleeding: vascular lesions (29.5%), tumors (24.5%), ulcers /erosion/IBD (22.4%), diverticular (18.4%) and other reasons (5.1%). As a result, angiography/embolization, sutures, bleeding site excision and careful observation were used in the therapy of the bleeding site[19].

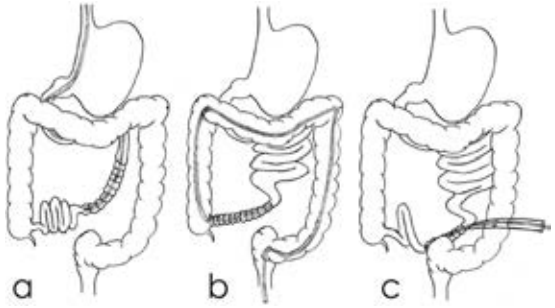

Fig. 1. Different approaches to perform intraoperative endoscopy.
a Peroral. b. Trans-anal. c. Trans-enterotomy. Approach a and b will be combined whenever indicated

Fig. 2 **Intraoperative endoscopy:** a. IOE through enterotomy. The endoscope is intro- duced in a mid-small bowel enterotomy through a sterile laparoscopic plastic sheath temporarily su- tured to the borders of the enterotomy. b. Laparoscopy-assisted IOE. Dimming the laparoscopic lights facilitates endoscopic visualization, as well as extrinsic examination of the bowel by the surgeon. Lesions identified endoscopically can be marked with a suture on the serosal side of the bowel.

According to reports, the rate of problems related to IOE ranges from 1-50%[17]. 17% of patients experience morbidity overall, of which 4% experience medical morbidity and 13% experience surgical morbidity[19]. In our investigation.

With the exception of the extended ileus, the problems associated with IOE included anastomotic leakage, wound infection, lung infection, urinary tract infection, mesenteric lacerations, mucosal lacerations, transient azotemia, and small-bowel sticky blockage. Certain case studies have reported on IOE helped by laparoscopy[20-25]. When compared to trans-enterotomy IOE (IOE-E), conventional IOE did not significantly outperform it in this retrospective cohort research. The morbidity of traditional IOE was much higher than that of IOE-E, which exceeded our expectations. Our data indicates that the patients who received IOE-E had favorable comparisons in terms of operation duration, hospital length of stay, and surgical complications with those of the who used alternative IOE methods.

Three key factors can be used to describe the primary benefits of IOE-E over other IOE approaches: 1. Peroral or trans-anal IOE may be difficult to conduct if there is over distension of the bowels. 2. Only IOE-E is able to offer simultaneous visual and tactile evaluations. 3. IOE-E has the ability to accelerate telescoping while lowering mucosal damage and mesentery laceration[26].

In addition to being time-consuming, the conventional techniques, peroral and trans-anal IOE, are thought to be the cause of intestinal dilatation. Despite being the least invasive treatment, the transoral IOE barely reaches the terminal ileum[10]. To expedite the procedure and prevent mesenteric over distension and laceration, one or more surgical enterotomies may be carried out[11,27]. Mini-laparotomy is another method for exploring and extracting small intestines that may combine the benefits of minimally invasive surgery and standard operation[28], but more research is needed.

The study's retrospective design and potential for bias in information selection are among its drawbacks. On the other hand, we gathered follow-up data from a prospectively kept database in order to enroll every consecutive patient.

CONCLUSIONS

For the treatment of overt OGIB, intraoperative endoscopy via enterotomy is a safer and better option. The exact location of the bleeding source, shorter operating times and lower surgical morbidity are among its advantages.

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