J Acute Care Surg 2024;14(2):41-44

Review Article

Difficult Small Bowel Bleeding in Surgical View

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Introduction

Small bowel bleeding (SBB) accounts for 5%-10% of all gastrointestinal bleeding (GIB) cases [1]. Most GIB cases (except SBB) are detected by esophago-gastro-duodenoscopy and colonoscopy.

In principle, SBB is defined as bleeding that occurs distal to the ampulla of Vater and proximal to the ileocaecal valve [2]. In practice, several diagnostic modalities in SBB are performed. However, the small bowel is beyond the reach of these diagnostic modalities in most cases. Obscure focus is very common in SBB. For overt and obscure SBB, the treatment is conservative. For overt and obscure SBB, surgical decision making, diagnosis, and treatment are inevitable and very important. This review summarizes surgical practice and difficulty in SBB.

Surgical decision making and acute care surgeon’s role

A large amount of bleeding in GIB is a key factor leading to a poor prognosis. Therefore, before a large amount of bleeding, appropriate and prompt diagnostic and treatment strategies are needed. Except for chronic and occult GIB, GIB patients with melena or hematochezia should be closely monitored. Especially, obscure focus bleeding in GIB after emergent endoscopy and computed tomography should consider SBB. In this stage, the expertise of endoscopist and radiologist is very important. Because of frequently developed post-operative morbidity and mortality, post-operative critical care is perfectly fit for an acute care surgeon’s role. Therefore, in the entire management process, an interprofessional team or multidisciplinary approach is critical for improving the quality of care of SBB and decreasing mistakes.

Keywords: small bowel bleeding, intra-operative enteroscopy, gastro-intestinal bleeding

ABSTRACT

Small bowel bleeding (SBB) accounts for 5%-10% of all gastrointestinal bleeding (GIB) cases. Several diagnostic modalities in SBB are performed. However, the small bowel is beyond the reach of these diagnostic modalities. A large amount of bleeding in GIB is a key factor leading to a poor prognosis. Appropriate and prompt diagnostic and treatment strategies are needed. Several diagnostic and management algorithms have been proposed. However, the processing of algorithm is complex and frequent mistakes are happened. Because of surgical aspects and sudden or gradual development of hemodynamic instability in SBB, algorithms considering surgical role and treatment have been published. The intra-operative enteroscopy (IOE) is a gold-standard method for detecting lesions in SBB. The primary goal of IOE is to detect specific bleeding focus in SBB. The determining the resection range is the secondary goal. In most cases in SBB, segmental resection is treatment of choice. However, in bleeding distal duodenum from distal to the ampulla of Vater to Treitz ligament, pancreas preserving distal duodenectomy could be performed. In terminal ileum bleeding, after resection of pathologic bowel, the reconstruction option is ileo-colic anastomosis or end enterostomy. Because of frequently developed post-operative morbidity and mortality, post-operative critical care is perfectly fit for an acute care surgeon’s role. Therefore, in the entire management process, an interprofessional team or multidisciplinary approach is critical for improving the quality of care of SBB and decreasing mistakes.
and focused on diverse endoscopic modalities without essential treatment. One characteristic of these algorithms focused on medical options is that 'Many treatment options are proposed, but treatment of choice is not'. In the medical or diagnostic process, several mistakes are frequently detected (Table 1) [8]. Therefore, patient safety and better clinical outcome should be prioritized by decreasing mistakes during the diagnostic and treatment processes using algorithms [5].

Practically, when SBB occurs, diverse endoscopic evaluations and backup of emergency surgical treatment are needed. Occasionally, the margin between occult and overt SBB is ambiguous. Post-procedure related complications may happen after endoscopic treatment or radiologic embolization. Because of these surgical aspects and sudden or gradual development of hemodynamic instability due to ongoing bleeding, the surgeon’s role in SBB is very important in every processing stage of diagnostic modality. Surgical consideration, view, or opinion is poor in previously described or published algorithms [4-7]. Algorithms considering surgical role and treatment have been published in several studies [9,10].

Indication of surgical treatment in GIB has been described in a widely read textbook [11]. However, the surgeon's role and treatment description about SBB are poorly described in the widely read textbook [11,12]. In emergency general surgery for peritonitis, GIB, and so on, an acute care surgery system has advantages in expert care for GIB [13,14]. Additionally, during the post-operative period, critical care is needed for cardiovascular events, acute kidney injury, pulmonary complications, and other critical illnesses [3,10,15]. Post-operative critical care is perfectly fit for an acute care surgeon's role. Therefore, in the entire management process, collaboration between gastro-enterologist, endoscopist, radiologist and acute care surgeon is needed [16]. An interprofessional team or multidisciplinary approach is critical for improving the quality of care of SBB and decreasing mistakes [8,16,17].

### Table 1. Frequent Mistakes in Made in the Investigation and Management of SBB

| Mistake 1 | Incorrect definition |
| Mistake 2 | Delaying or not considering transfer to a dedicated tertiary referral centre |
| Mistake 3 | Overlooking pathology within the upper and/or lower gastrointestinal tract |
| Mistake 4 | Overlooking the need for dedicated radiological evaluation |
| Mistake 5 | Delaying investigation |
| Mistake 6 | Not choosing the right investigation or treatment strategy |
| Mistake 7 | Not achieving adequate mucosal visualisation |
| Mistake 8 | Inadequate reporting |
| Mistake 9 | Having an incorrect strategy for endotherapy at DAE |
| Mistake 10 | Relying on false-negative investigations and not persevering with repeat investigation and endotherapy |

**Practice in surgical treatment and intra-operative enteroscopy: bleeding focus or resection range**

Surgical treatment of SBB or obscure GIB is composed of 2 stages. The first stage is confirmation of bleeding focus. The second stage is resolution of bleeding focus.

Confirmation of bleeding focus in operation room is performed through intra-operative enteroscopy (IOE) in most cases. The IOE is a gold standard for detecting lesions in SBB during operation [3]. The detection rate is about 70%-100% [3,10,15].

The IOE was first described in the late 1960s [18]. Based on the author’s experience, clinical cases and experiences about IOE have been published [19,20]. For about 10 years, the author has experienced about 60 cases of SBB and IOE. The method of IOE has been precisely described in several published studies [3,9,10,19,20]. Most researchers’ methods were similar.

Prompt detection of bleeding focus in IOE is important. For promptancy, collaboration between surgeons, gastroenterologists, and endoscopists and their expertise are very important [6,9,10,17].

Based on the present author's experience, the primary goal of IOE is to detect specific bleeding focus in SBB. However, if specific bleeding focus is ambiguous or if there is only blood-oozing like appearance in small bowel lumen, determining the resection level in small bowel is the secondary goal. If the length and function of remnant small bowel are expected to not cause short bowel syndrome, the resection range of small bowel should be as adequately long as possible, including small bowel with an oozing-like appearance.

In the author's opinion, incomplete or immature small bowel resection may be related to rebleeding of remnant SBB lesions or surgical procedure (for example, segmental small bowel resection and IOE). Re-operation induced clinical outcome due to rebleeding is poor [3,15].

Although segmental small bowel resection and anastomosis method in SBB is not unique, resection and reconstruction in distal duodenum and terminal ileum bleeding should be carefully performed.

In bleeding distal duodenum from distal to the ampulla of Vater to Treitz ligament, pancreas preserving distal duodenectomy could be performed. In pancreas preserving distal duodenectomy, meticulous procedure is needed when the distal duodenum takes off its short vessels from the pancreas (Figure 1) [21]. The reconstruction method is duodeno-jejunostomy or gastro-jejunostomy. Although duodeno-jejunostomy is physiologic, gastro-jejunostomy is not. Gastro-jejunostomy is technically easier than duodeno-jejunostomy. Although blind loop of remnant proximal duodenum is a concern in gastro-jejunostomy, a blind loop of proximal duodenum is previously permitted through gastro-jejunostomy...
in superior mesenteric artery syndrome.

In terminal ileum bleeding, after resection of pathologic bowel, the reconstruction option is ileo-colic anastomosis or end enterostomy [22]. Considering bowel state, hemodynamic state, anastomotic condition, and so on, the surgeon may select one of these options.

After IOE and small bowel surgery, rebleeding rate is 0%-52.3% [3,15,23]. Mortality after IOE and small bowel surgery ranges from 0% to 40% [3,15,23]. In most cases of SBB, the patient's condition is poor because of bleeding and comorbidities [3,15,23]. Mortality and morbidity in published literature show mixed results according to IOE, patient's condition, and comorbidity. Therefore, precise calculation of mortality or morbidity related to only IOE is difficult. In the author's opinion, unnecessary surgery including IOE should be avoided. Delay of diagnostic process, inadequate medical strategy, and frequent mistakes should be prevented.

Conclusion

Despite diverse diagnostic modalities and algorithms in SBB, the processing of algorithm is complex and frequent mistakes are happened. Because of surgical aspects and sudden or gradual development of hemodynamic instability, surgical role and treatment is very important. The IOE is a gold-standard method for detecting lesions in SBB. The surgeon's skilful operative techniques and expertise should be needed in difficult clinical settings. Because of frequently developed post-operative morbidity and mortality, post-operative critical care is perfectly fit for an acute care surgeon's role. An interprofessional team or multidisciplinary approach is critical for improving the quality of care of SBB and decreasing mistakes.

Acknowledgment

This summary of review was presented in the 50th KSACS conference, July 2024.

Conflicts of Interest

No potential conflicts of interest relevant to this article were reported.

Funding

None.

Ethical Statement

This review did not involve any human or animal experiments.

Data Availability

All relevant data are included in this manuscript.

References


