Review Article

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Capsule Endoscopy and Small Bowel Enteroscopy: When to Use and Which to Choose?

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ABSTRACT

Capsule endoscopy and small bowel enteroscopy including double-balloon, single-balloon and spiral enteroscopy are recently-developed tools for the investigation and treatment of small bowel diseases. All modalities have both advantages and draw backs. This review focuses on their appropriate indications, the preferred choice in each indication and the state of the art of how to use them together in clinical practice.

Key words : capsule endoscopy, enteroscopy.

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INTRODUCTION

In the past, the investigations of small bowel diseases were limited and the available options were small bowel follow through, enteroclysis, push enteroscopy, Sonde (pull) enteroscopy and intraoperative enteroscopy. Over the last decade, there have been many inventions in the work-up of small bowel diseases, which are capsule endoscopy (CE) in 2000[1], double-balloon enteroscopy (DBE) in 2001[2], single-balloon enteroscopy (SBE) in 2008[3], and spiral enteroscopy in 2008[4]. In Thailand, CE and DBE/SBE are now available in many medical schools and large hospitals. Evidence from the literatures is now clear that both CE and DBE/SBE have their own advantages and disadvantages and their use are complimentary to each other. This review will summarize the appropriate indications and choice of the use of CE and DBE/SBE in Thailand.

Indications of CE and DBE/SBE

Indications of CE and DBE/SBE are shown in Table 1. In Thailand, the potential indications are similar except the roles in suspected or known patients of celiac disease may be limited due to the rarity of the disease.

Obscure gastrointestinal bleeding

Efficacy of CE and DBE/SBE

The diagnostic yield of CE to diagnose any potential cause of obscure gastrointestinal bleeding (OGIB) is 63%[5-7], which is superior to push enteroscopy (28%) and small bowel follow through (8%)[5] as shown in Table 2. However, for only significant lesions, the yield of CE is 56%[5]. The diagnostic yield is around 30% superior to other conventional modalities with the number needed to investigate of 3[8]. The negative predictive value of CE varies from 25-74%[7].

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Table 1. Indications of CE and DBE/SBE.

Indications	CE	DBE/SBE
Obscure overt GI bleeding	Yes	Yes
Obscure occult GI bleeding	Yes	Probably yes
Suspected small bowel Crohn's disease	Yes	Yes
Chronic abdominal pain	Probably yes	Probably no
Celiac disease	Yes	Yes
Chronic diarrhea & malabsorption	Probably yes	Probably yes
Polyp and small bowel tumor surveillance in high-risk groups	Yes	Probably yes

Thus, negative CE does not guarantee no further bleeding.

Most data of DBE/SBE for OGIB come from DBE. The diagnostic yield of DBE for OGIB is 57-65%[6, 9].

Most studies of CE or DBE/SBE in OGIB did not separately analyze obscure "overt" from obscure "occult" GIB (i.e. patients with iron deficiency anemia or positive fecal occult blood test). Studies focusing on patients with iron deficiency anemia only reported the diagnostic yield of CE to be 50-69%[10,11], compared to 12% by enteroclysis[10]. No study of DBE/SBE in patients with iron deficiency anemia is present to date.

Comparison between CE and DBE/SBE

Diagnostic yield of CE is higher than single-route DBE[12]. If combined antegrade and retrograde DBE can be performed, the yield of DBE is better than CE[12].

The advantages of CE is its non-invasiveness, 80% chance of total viewing of small bowel (in 20%, capsule may not reach caecum)[7], However, it lacks the ability to perform biopsy or interventions. Capsule retention occurs rarely (1%) of patients undergoing CE for OGIB[13].

DBE/SBE has advantage on the therapeutic opportunity. However, complete viewing of small bowel even by combined antegrade and retrograde approach was less than 30%[6]. DBE/SBE has complications (perforation and acute pancreatitis) of less than 1%[6], but carry significant morbidity and mortality.

Overall, the concordance between CE and DBE is good. The most discordance lesions are small bowel tumors and polyps[14]. CE misses lesions that are detected by DBE around 5%[15-17], particularly small bowel tumors[18] and lesions near the duodenojejunal junction. Likewise, DBE miss 25% of lesions detected by CE[15-17], mostly due to the incomplete viewing of the small bowel.

Table 2. Diagnostic yields of various investigational modalities for OGIB[5,6,9].

Modalities	Diagnostic yields (%)
CE	56-63
DBE/SBE	57-65
Push enteroscopy	28
Small bowel follow through	8

Guideline of the use of CE and DBE/SBE

If both CE and DBE/SBE are available, most guidelines recommend starting with CE[6, 19] because of its non-invasiveness and most OGIB patients are usually have old age and multiple co-morbidities. In case DBE needs to be followed (e.g. for biopsy or intervention), findings on CE will help guiding the appropriate route of DBE/SBE to decrease the need of performing bidirectional DBE/SBE[20,21]. Studies showed that lesions found in the small bowel at the time index (time from pylorus to lesions / time from pylorus to caecum) of less than 0.75[20] or 0.6[21] suggested DBE/SBE via antegrade route whereas time index of more than 0.6 or 0.75 suggested retrograde route. On the balance, using the time index cutoff of 0.67 or 2/3 of small bowel transit seems to be appropriate.

Patients with indeterminate findings by CE should be followed by DBE. Recent study showed that DBE discovered lesions in 75% of patients with indeterminate CE[22]. The overall diagnostic yield of CE followed by DBE when CE is indeterminate is 89%[22].

In patients with negative CE, the decisions have to be made case by case according to the degree of

bleeding, first or recurrent episode, likelihood of small bowel tumors, and quality of small bowel visualization during CE, and patient's preference. The option can be either repeat CE, go on with DBE/SBE or wait and see and repeat CE/DBE/SBE when bleeding recurs[6].

Starting with DBE/SBE instead of CE may be appropriate if the bleeding is severe, thus therapeutic intervention is likely required or in the place where CE is unavailable. In this case, antegrade approach should be done first because most lesions of OGIB are usually within the reach of antegrade approach and it is technically easier than retrograde route[6]. The author's personal reason to prefer antegrade approach is to find the bleeding point by antegrade route (looking for the "first" blood) is much easier than by retrograde route (passing through the flood of blood to find the most proximal site of bleeding or "last" blood).

In patients with massive bleeding or unstable hemodynamics, angiography remains the investigation and treatment of choice. In case of negative angiogram, DBE/SBE should be followed after the patients become more stable. The algorithm for the use of CE and DBE/SBE in OGIB is shown in Figure 1.

Suspected small bowel Crohn's disease

Colonoscopy with ileoscopy with or without small bowel radiographs are the mainstay investigations for patients suspected to have small bowel Crohn's disease (CD). In case the above tests are all negative but the clinical settings are suggestive of CD (chronic abdominal pain or diarrhea with anemia, elevated ESR / C-reactive protein, recurrent aphthous ulcers or perianal diseases), CE or DBE/SBE are the appropriate investigations.

Diagnostic criteria of CD by CE and DBE/SBE

Generally, there is no gold standard diagnostic test for CD and the diagnosis is based on a constellation of findings including clinical, endoscopic, radiologic, serologic and pathologic findings. The most common findings of CD undetected by others but detected by CE or DBE/SBE are mucosal aphthae and ulcers. The challenging problem is up to 10% of normal persons and 75% of NSAID users had small bowel ulcers seen by CE[23,24]. Thus, the specificity of small bowel ulcers for diagnosis of CD is low. The most commonly used criteria for diagnosis of small bowel CD is ≥3 ulcers in patients without history of NSAID use[24].

Efficacy of CE and DBE/SBE

The diagnostic yield of CE to diagnose CD is 61-69%[25], which is superior to colonoscopy with ileoscopy (46%), CT enteroclysis (30%), small bowel follow through (23%) and push enteroscopy (8%), as shown in Table 3. The diagnostic yield is around 30% superior to other conventional modalities with the number needed to investigate of 3[25].

Only few reports of DBE for CD have been published. The yield of DBE for diagnosing CD was

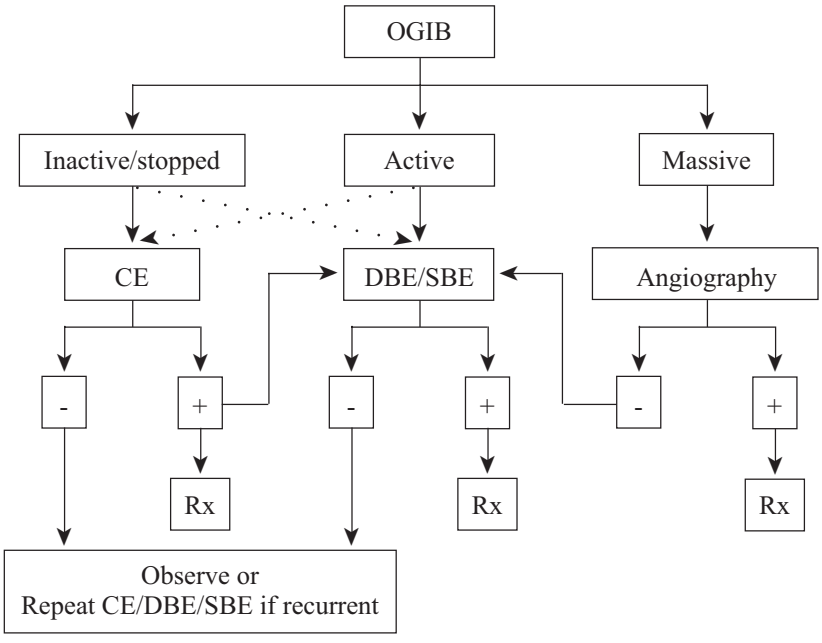

Figure 1. Algorithm for the use of CE and DBE/SBE in OGIB.

50%[26] and for evaluation of disease activity was 60%[27].

Comparison between CE and DBE/SBE

There is currently no study comparing CE and DBE/SBE for the evaluation of small bowel CD but the diagnostic yields seem to be similar (Table 3). The drawback of CE is the high incidence (1-2%) of capsule retention in suspected CD cases, whereas DBE/SBE is perforation (rare) and failure to enter ileocaecal valve in 50% of cases by retrograde route[26].

Guideline of the use of CE and DBE/SBE

Guideline of the use of CE and DBE/SBE in patients suspected to have CD is shown in Figure 2. Patients suspected to have CD are those with chronic abdominal pain and/or diarrhea with any of the followings: weight loss, anemia, elevated ESR / C-reactive protein, hypoalbuminemia, since these will increase the yield to diagnose CD[28,29]. Other clues which may be useful (but no supporting evidence) are recurrent aphthous ulcers or perianal diseases. CE or DBE/SBE is not recommended in patients with abdominal pain or diarrhea alone without any of the above clues since the yield will be low (9%) and most of them usually have irritable bowel syndrome.

Table 3. Diagnostic yields of various investigational modalities for suspected CD[25,26].

Modalities	Diagnostic yields (%)
CE	61-69
DBE/SBE	50
Colonoscopy with ileoscopy	46
Push enteroscopy	8
CT enteroclysis	30
Small bowel follow through	23

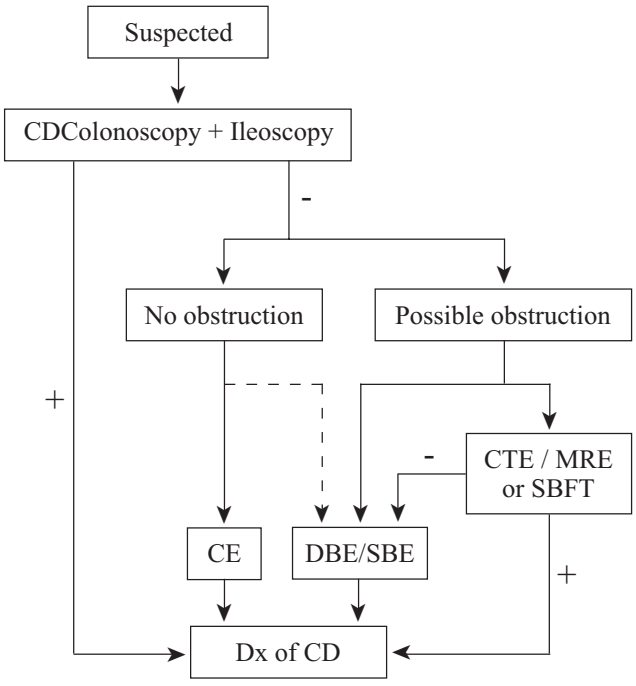

Figure 2. Algorithm for the use of CE and DBE/SBE for suspected CD.

Chronic diarrhea and malabsorption

Efficacy of CE and DBE/SBE

Diagnostic yield of CE in patients with chronic diarrhea or malabsorption after negative standard workups (including EGD and colonoscopy with biopsy) is low (9%)[29]. Nevertheless, the yield became higher (30%) in patients with additional features, including weight loss, anemia, elevated ESR/C-reactive protein, or hypoalbuminemia[30]. The most common diagnosis found in CE studies is small bowel Crohn's disease.

There is one small studies of DBE in patients with malabsorption[31]. The diagnostic yield was 67% and new diagnosis was achieved in 33%.

Comparison between CE and DBE/SBE

There is no study comparing CE and DBE/SBE for the evaluation of chronic diarrhea or malabsorption.

The advantages of CE are the ability to guide the route of DBE/SBE to take the biopsy and CE is the most sensitive test to detect small bowel mucosal diseases, therefore negative CE almost precludes the need of further DBE/SBE.

The advantages of DBE/SBE are most cases of chronic diarrhea or malabsorption have diffuse or multifocal involvement of the small bowel and biopsy is almost always required. Thus, DBE/SBE (via antegrade route) usually finds the lesions and makes the diagnosis.

Guideline of the use of CE and DBE/SBE

CE or DBE/SBE should be performed after negative EGD/colonoscopy in patients with chronic diarrhea accompanying with weight loss, anemia, elevated ESR / C-reactive protein, or signs of malabsorption[30]. Either CE or DBE/SBE can be initially used. Patients without the other signs above often have irritable bowel syndrome and CE or DBE/SBE have low yields and should not be performed.

Polyp and small bowel tumor surveillance in high-risk patients

High-risk patients who need surveillance of small bowel polyps or tumors are Peutz-Jeghers syndrome (PJS), familial adenomatous polyposis (FAP) and Cronkite-Canada syndrome.

Efficacy of CE and DBE/SBE

Many studies used CE for the surveillance of small bowel polyps and tumors in patients with FAP and PJS. Most confirmed the more sensitivity of CE than duodenoscopy and small bowel follow through[7].

Many small studies found good results of DBE/SBE for the surveillance of patients with PJS or FAP[15,32-37].

Comparison between CE and DBE/SBE

No study compared CE to DBE/SBE for the surveillance of small bowel tumor.

Guideline of the use of CE and DBE/SBE

Since patients with FAP and PJS require regular long-term surveillance of small bowel tumors and complete viewing of small bowel is essential, CE should be preferred to DBE/SBE due to the noninvasiveness and the higher ability of total enteroscopy. DBE/SBE should be spared for patients with polyps or tumors detected by CE and intervention is required.

CONCLUSION

The well-established indications of CE and DBE/SBE are patients with OGIB and suspected small bowel Crohn's disease whose standard work-up including EGD and colonoscopy are negative. Other indications e.g. abdominal pain, chronic diarrhea, malabsorption and small bowel tumor surveillance are potential indications but more information is required. The best use of CE and small bowel enteroscopy are the use in combination.

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