

学位論文

「Roles of Capsule Endoscopy and Single-Balloon Enteroscopy in Diagnosing Unexplained
Gastrointestinal Bleeding.」

(原因不明の消化管出血におけるカプセル内視鏡およびシングルバルーン内視鏡の役割)

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著者の宣言

本学位論文は、著者の責任において実験を遂行し、得られた真実の結果に基づいて正確に作成したものに相違ないことをここに宣言する。

論文要旨

1. 序論

消化管出血は日常診療の中でよく遭遇する疾患である。消化管出血の 10~20%は初回の出血源検査では出血源が同定できない。これらの患者の約半数は出血を繰り返すとされ、入院の反復や多量の輸血を必要とする。

これら出血源が特定できない消化管出血を *obscure gastrointestinal Bleeding* (OGIB) と称している。

上下部内視鏡検査で出血源が特定できない病変が多いことから、OGIB 患者の出血源は小腸が疑われる。

2000 年に開発されたカプセル内視鏡 (CE) は小腸出血を疑う患者の診断のオプションとなった。身体的な負担が少なく、状況にとらわれず全小腸の観察が可能になった。

一方、シングルバルーン小腸内視鏡 (SBE) は、オーバーチューブと組み合わせたバルーンを使用し小腸内に深く挿入することができ、経口、経肛門からのアプローチを組み合わせることで全小腸の観察が可能である。この方法によれば、生検標本をとったり、ポリープを切除したり、小腸全体の内視鏡的止血手技を実施することを可能である。

OGIB の病態に応じた CE および SBE の選択基準などの診断アルゴリズムは施設により異なり、一定の見解が示されていないのが現状である。

本研究では、OGIB の病態別の CE および SBE の診断成績を比較することで、OGIB の病態に応じた両検査法の選択基準を明確にすることを目的とする。

2. 方法

2.1. 患者背景

単施設による後ろ向きデータ収集による症例集積研究である。

2005 年 1 月から 2014 年 12 月までに、北里大学東病院、北里大学病院で OGIB の原因検索のために CE または BE を行った 194 例。CE、SBE での有所見率、所見の詳細、偶発症、止血処置を調べた。

OGIB は顕性出血と不顕性出血に分類される。

また顕性出血において出血後 48 時間以内に検査施行されたものを “ongoing” 48 時間以降を “previous” と定義した。

3. 結果 194 人の患者が CE、SBE もしくは CE と SBE の両者を OGIB の原因検索の為に施行された。CE が 103 人 SBE が 91 人 CE と SBE の両方が施行されたのは 26 人だった。

3.1 CE の成績

103 人（顕性出血が 65 人、不顕性出血が 38 人）全員カプセルを飲むことが可能であった。検査中に異常訴えた患者はいなかった。胃を通過する平均時間は 47.6 ± 47.0 分であり、そして小腸を通過するまでの平均時間は 390 ± 150 分であった。カプセル記録可能時間内での盲腸到達率は 79% で 22 例 (21%) は時間内に全小腸を観察することができなかった。カプセルを排出できなかった患者はいなかった。所見を有したのは 49 例 (47.5%) であった。所見の内訳は血管性病変が 34 例 (69.4%)、潰瘍性病変が 10 例 (20.4%) tumor が 3 例 (6.1%) 憩室が 2 例 (4.1%) に認められた。Table3

3.2 SBE の成績

91 例に SBE が行われた。経口が 43 例、経肛門が 48 例だった。検査に要した時間は平均 89 分 (range 18-197 分)。偶発症は消化管穿孔はいなかった。経口小腸鏡で検査後に軽度の肺炎を 3 例に認めた。所見があったのは 67 例 (73%) であった。所見の内訳は血管性病変が 34 例 (50.7%)、潰瘍性病変が 28 例 (41.8%) tumor が 2 (3%)、憩室が 3 例 (4.5%) であった。Table3 内視鏡的処置は 51 例 (76.1%) に施行され内訳は clip を 28 例、APC を 16 例、HSE の局注を 6 例、ポリペクトミーを 1 例に行った。内視鏡的に伴う偶発症は 1 例も認めなかった。

出血状態による検討では Overt で検査が行われたのは 133 例 (68.6%)、occult で検査が行われたのは 61 例 (31.5%) であった。Table4

有所見率は CE、SBE どちらにおいても不顕性出血時よりも顕性出血時のほうが高かった。

顕性出血時のうち previous bleeding case よりも ongoing bleeding case のほうが有所見率は高かった。SBE 施行前に CE が施行されたのは 26 例で SBE 時の有所見率は 20 例 (76.9%) であった。SBE 施行前に CE が施行されていないのは 65 例で SBE 時の有所見率は 41 例 (63.1%) であった。SBE 施行前に CE を施行するほうが有意に有所見率が高かった。(p<0.01)

4. 考察

CE と SBE の有所見率は CE で 47.5%、SBE で 73.6% であり OBIB における原因検索の精度は SBE のほうが優れていた。さらに、顕性出血時のほうが不顕性出血時よりも CE、SBE ともに有所見率は高かった。同様に previous case よりも ongoing case のほうが有所見率は高かった。

CE と SBE は、小腸精査のための新しい検査法として 2000 年頃に開発された。従来の小腸検査の欠点を克服する可能性を有した。Push endoscopy および内視鏡手術は、以前

は一般的な、小腸を検査法であった。Push endoscopy の利点は上部消化管内視鏡と同様に、内視鏡処置を可能にすることであるが一方、その範囲が空腸内に制限されることである。術中内視鏡検査では、全小腸検査の可能性はいちばん高いが、小腸内のすべての検査法の中で最も侵襲が大きい。一方 CE は侵襲が少なく全小腸が観察可能であり、(8 今回の検討でも全小腸観察率は 79%で所見発見率は 47.5%であった。CE の診断率は 38-75%と幅が広く報告された。9) 10) 11) 理由として OGIB を診断している精度に差があることが予想される。近年の OGIB の 227 論文の集計では OGIB 診断率は 60.5%と計算されているがやや高すぎる印象がある。なぜなら中には微小な発赤や小びらんを出血源と診断している報告が含まれているからである。12 ゆえに当院の CE の診断率 47.5%も OGIB の診断検査法として妥当なものと考えられる。OGIB の原因は欧米では vascular lesion が最も多く診断されている。18) この病変は小さく平坦であることが多く CE 以外のモダリティでの検出は難しい。12) 今回指摘された所見のなかでも vascular lesion は 34/67 (50.7%) と約半数をしめていた。一方、CE はサイズの大きな腫瘍性病変や粘膜変化のない SMT などの診断は難しく他の検査との組み合わせが必要である。最新の CE も開発されておりさらに病変検出率の向上が期待される。

これまでにいくつかの小腸出血診療に対するアルゴリズムが報告されている。BE は治療に CE に比べて患者負担を要すこともあり、治療に比較的重点がおかれ診断には CE が第一選択となっていることが多い。5)、12)、13) より短期間に医療資源を効率的に用いるための検査戦略については不明な点も多い。重要なのは CE では診断は可能であるが治療は出来ない。一方、BE は内視鏡診断と治療を一期的に完結できることや確定診断に向けての生検処置が可能なことなど利点も多い。

また OGIB の診断には検査方法の選択に加えて出血が認められている時の検査が出血源同定に大きく寄与するという点がある。15)OGIB 原因診断において出血後 24 時間以内に緊急 SBE を行った際の診断率は 93.3%、出血後 24 時間以降に待機的に SBE を行った際の診断率 (64.3%) (Fisher 比 $p<0.038$) で有意に優れていた。

また CE と SBE の両者を行うのも OGIB 診断に有用な可能性がある。本研究においても有所見率は CE では 47.5%であったが SBE と CE を組み合わせると 73.6%であった。加えて CE、SBE のどちらにおいても顕性出血時のほうが不顕性出血時よりも有所見率が高かった。顕性出血時には特に急性期には SBE が良いかもしれない。なぜなら内視鏡診断と治療が一回で完了できるかもしれないからである。

不顕性出血時もしくは臨床症状や他の検査で SBE のルート決めることができない症例では第一 CE を行うのが良いかもしれない

加えて SBE 前に CE を行うと有所見率は向上する。OGIB に対する小腸の画僧診断は CE や BE の開発により飛躍的な進歩をとげた。診断には検査時期や検査方法の選択が成功の鍵を握っているがその判断には明確な基準はない。

Limitation ; 単一施設での後ろ向き研究である

5. 結論

CE も SBE も OGIB 診断には有用である。顕性出血時の ongoing は診断と治療が一括で行える SBE のほうが CE よりも有用であるかもしれない・

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Roles of Capsule Endoscopy and Single-Balloon Enteroscopy in Diagnosing Unexplained Gastrointestinal Bleeding

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1.INTRODUCTION

Gastrointestinal bleeding is commonly encountered in clinical practice. In 10% to 20% of gastrointestinal bleeding cases, the bleeding source may not be evident on initial evaluation. Moreover, repeated bleeding has been reported in approximately half of these patients, resulting in recurrent hospitalizations and massive transfusions.¹

Gastrointestinal bleeding with an unidentified bleeding source is defined as obscure gastrointestinal bleeding (OGIB). As endoscopy of the upper and lower gastrointestinal tract cannot identify the bleeding source in many patients with OGIB, the small bowel is generally suspected as the bleeding source in these patients. Although intraoperative enteroscopy and push enteroscopy have been routinely performed to detect the bleeding source since approximately 2000, these approaches are invasive, and it is difficult to evaluate the entire small bowel.² Capsule endoscopy (CE), first described in 2000, has become a useful option to diagnose patients suspected of small-bowel bleeding. CE reduces the patient's physical burden and allows the evaluation of the entire small-bowel, irrespective of its condition.³ On the other hand, single balloon-assisted enteroscopy (SBE), consisting of a balloon and an overtube, enables deep intubation of the small bowel. The combination of oral and rectal approaches enables the examiner to simultaneously evaluate the small bowel, collect biopsy samples, remove polyps, and perform endoscopic hemostasis for the entire small bowel.^{4,5}

Currently, diagnostic algorithms, such as those used to select patients with OGIB for CE or balloon-assisted enteroscopy (BE), vary among facilities. In this study, we aimed to demonstrate the appropriate selection criteria of CE and SBE for patients with OGIB according to their conditions, by retrospectively comparing the diagnostic performances of CE and BE for detecting the source of OGIB.

2.MATERIALS AND METHODS

2-1. Patients This is a retrospective case series study from a single institution. A total of 194 patients underwent CE and/or BE to detect the source of OGIB at Kitasato University East Hospital and Kitasato University Hospital between January 2005 and December 2014 (Table 1).

The rate of positive findings, details of the findings, accidental symptoms, and hemostasis methods were examined in the patients who underwent CE, SBE, or both. OGIB was classified as overt or occult according to its bleeding behavior.^{5,6} In the present study, among the overt bleeding cases, those that underwent the examination within 48 hours after bleeding were defined as “ongoing,” whereas those that underwent the examination 48 hours or later after bleeding were defined as “previous.” The physician in charge determined whether to perform CE or SBE based on the clinical condition of the patient, contrast-enhanced computed tomography (CT) findings, and/or radiological enteroclysis results.

This study was approved by the Institutional Review Board of Kitasato University. All patients received information about the procedure before the examination, and written informed consent was obtained from the patients.

2-2. Capsule endoscopy method

Small-bowel video capsule endoscopy (VCE) is an endoluminal examination of the small bowel that involves the use of a wireless disposable capsule-shaped device that is swallowed. The device is then propelled by gut motility through the gastrointestinal tract. From the gastrointestinal tract, it transmits images wirelessly to a data recorder worn by the patient.

The VCE systems used in the present study (PillCam, Covidien plc, Dublin, Ireland; Endocapsule, Olympus Optical Co. Ltd., Tokyo, Japan) consist of the following three main components: a capsule endoscope, a sensing system with a data recorder, and a personal computer workstation with proprietary software for image review and interpretation. These systems allow real-time review of images during VCE examinations.

The patients were instructed to fast for 12 hours before the examination and were administered 800 mL of magnesium citrate solution after capsule ingestion. The captured images were later downloaded to the personal computer workstation.³ An experienced gastroenterologist interpreted all videos.

2-3. Single balloon-assisted enteroscopy method

A high-resolution endoscope (Olympus SIF-Q260Y; Olympus; working length 200 cm, external diameter 9.2 mm, forceps diameter 2.8 mm) was used for SBE. A silicone balloon was attached to the tip of a flexible silicon overtube (XST-SB1; Olympus; external diameter 13.2 mm, working length 140 cm) and was dilated/contracted using a pressure-

controlled pump system (XMAJ-1725; Olympus; pressure settings -6.0 to +6.0 mm Hg). The overtube has a hydrophilic inner surface moisturized with 10 to 20 mL of physiological saline to reduce friction between the endoscope and overtube.

The patients were administered 1,000 to 2,000 mL of polyethylene glycol before endoscope insertion. The insertion approach (oral/rectal) was selected based on clinical findings and preoperative test results (e.g., BE, contrast-enhanced CT, radiological enteroclysis). The endoscope was inserted under general anesthesia with pethidine hydrochloride or diazepam.

If an approach failed to detect the bleeding source, tattooing to mark the extent of examination was performed at the deepest point during the session. An experienced gastroenterologist performed all examinations. Argon plasma coagulation or clip placement was performed when the bleeding source was identified, and a standard polypectomy snare (Olympus) was used for endoscopic management of vascular lesions, ulcerative lesions, polyps, and diverticula

2-4. Statistical analysis

We compared continuous variables using Student t-test and frequencies using the chi-square test and Fisher exact test. All statistical analyses were performed using SPSS version 18 (SPSS Inc., Chicago, IL, USA). The significance level was set at $p < 0.05$.

3. RESULTS

Patients

The study included 194 patients who underwent CE and/or BE to detect the source of OGIB. CE and SBE were performed in 103 and 91 patients, respectively, and 26 patients underwent both examinations. The patient characteristics are presented in Table 1.

3-1. Capsule endoscopy results

All 103 patients (65 overt and 38 occult bleeding cases) who underwent CE successfully swallowed the capsules, and there was no complaint or abnormality during the examination. The mean times to pass through the stomach and small bowel were 47.6 ± 47.0 minutes and 390 ± 150 minutes, respectively. The capsule reached the cecum within the capsule recording time in 81 patients (79%), while evaluation of the entire small bowel failed in 22 patients (21%). All the patients successfully egested the capsule. Positive findings were noted in 49 patients (47.5%) (Table 2), and the findings were vascular lesions in 34 patients (69.4%), ulcers in 10 (20.4%), tumors in three (6.1%), and

diverticula in two (4.1%) (Table 3).

3-2. Single balloon-assisted enteroscopy results

SBE was performed in 91 patients. The enteroscope was orally and rectally inserted in 43 and 48 patients, respectively. The mean procedure time was 89 minutes (range, 18 to 197). Mild pancreatitis was observed as an accidental symptom in three patients after oral enteroscopy. No perforation of the digestive tract was observed. Positive findings were noted in 67 patients (73%) (Table 2), and the findings were vascular lesions in 34 patients (50.7%), ulcers in 28 (41.8%), tumors in two (3%), and diverticula in three (4.5%) (Table 3). The rate of positive findings was higher using SBE (73.6%) than using CE (47.5%; $p < 0.01$, chi-square test) (Table 2).

Endoscopic management was performed in 51 patients (76.1%), and clip placement, argon plasma coagulation, local injection of hypertonic saline-epinephrine, and polypectomy were performed in 28, 16, 6, and 1 patient, respectively (Table 4). No accidental symptom caused by endoscopy was observed.

The rate of positive findings was higher in overt bleeding cases than in occult bleeding cases for both CE and SBE. Among the overt bleeding cases, the rate of positive findings was higher in ongoing bleeding cases than in previous bleeding cases (Table 5). CE had been performed before SBE in 26 patients, and positive findings were observed in 20 (76.9%) of these patients. CE had not been performed before SBE in 65 patients, and positive findings were observed in 41 (63.1%) of these patients. These results indicated that CE performed before SBE significantly contributed to the rate of positive findings ($p < 0.01$).

4. DISCUSSION

The rates of positive findings on CE and SBE in the diagnostic evaluation of OGIB were 47.5% and 73.6%, respectively, indicating the superiority of SBE in the detecting of the source of OGIB. Furthermore, the rate of positive findings was higher in overt bleeding cases than in occult bleeding cases for both CE and SBE, and among the overt bleeding cases, the rate of positive findings was higher in ongoing bleeding cases than in previous bleeding cases.

CE and SBE were developed in 2000 as novel approaches allowing detailed examination of the small bowel. These methods may overcome the drawbacks of conventional methods for small-bowel examination, such as push endoscopy and endoscopic surgery, which are traditionally the most common methods for evaluating the

small bowel. Similar to esophagogastroduodenoscopy, push endoscopy enables endoscopic management; however, its working area is limited to the jejunum. Intraoperative endoscopy is most commonly used to evaluate the entire small bowel but it is the most invasive among all the methods. On the otherhand, CE is less invasive and enables evaluation of the entire small bowel.⁷ In the present study, using CE, the successful evaluation rate of the entire small bowel was 79%, and the rate of positive findings was 47.5%.

The diagnostic yield of CE has been reported to be 38% to 75%,⁸⁻¹⁰ and we speculate that differences in the diagnostic accuracy of various causes of OGIB may explain this wide range. The diagnostic yield for OGIB was 60.5% in a recent pooled analysis of 227 studies on OGIB; however, we believe that this rate may be too high, as some studies considered minor redness or small erosions as the bleeding source.¹¹ Our results indicate that CE, with a diagnostic yield of 47.5%, may represent an appropriate diagnostic examination for OGIB.

In Western countries, vascular lesions are most commonly identified as the source of OGIB.¹ Detection of vascular lesions is challenging using modalities other than CE, because they are small and flat.¹¹ In this study, vascular lesions were found in 34 of 49 patients (69.4%), accounting for more than half of the positive findings. Detection of large tumor lesions or submucosal tumors without mucosal change is challenging when using CE; therefore, CE should be used in combination with other examinations. The presence of massive lesions, such as neoplastic lesions, should be confirmed using CT or radiological enteroclysis before performing CE, if possible.³

Some algorithms on the management of small-bowel bleeding have been previously reported. Because the burden on patients is higher with BE than with CE, CE is the first choice for the diagnosis of bleeding in most cases.^{5,12,13} However, many questions remain regarding the most appropriate evaluation strategy in terms of using medical resources effectively in the short-term.¹⁴ Importantly, CE can be used for diagnosis but not for treatment, whereas with BE, endoscopic diagnosis and treatment can be completed simultaneously, and a biopsy can be obtained for definitive diagnosis. Performing these examinations during bleeding contributes greatly to the detection of the bleeding source and to the selection of the method for the diagnostic evaluation of OGIB.¹⁵

In a previous study, in patients with OGIB, the diagnostic yield of emergent SBE (93.3%) performed within 24 hours after overt bleeding was significantly higher than that of elective SBE (64.3%) performed 24 hours or more after bleeding (Fisher exact test, $p < 0.038$).¹⁶ Although both CE and SBE may be useful for the diagnosis of OGIB, the

rate of positive findings was higher with SBE (73.6%) than with CE (47.5%) in this study. Additionally, the rate of positive findings was higher in overt bleeding cases than in occult bleeding cases for both CE and SBE. Moreover, among overt bleeding cases, the rate of positive findings was significantly higher in ongoing bleeding cases than in previous bleeding cases. Thus, when overt bleeding is observed, especially during the acute phase, SBE should be considered, because endoscopic diagnosis and treatment can be completed simultaneously. CE may be more appropriate than SBE for occult bleeding cases or cases in which the SBE route cannot be determined based on the clinical symptoms or the results of other examinations. Additionally, performing CE before SBE significantly contributes to the rate of positive findings.

The development of CE and BE has resulted in progressive improvements in the diagnostic imaging of the small bowel in patients with OGIB. The timing of performing the examination and the selection of the method are important for a successful diagnosis; however, there are currently no clear criteria for determining these factors.

The present study has some limitations. First, this study was a retrospective study. Second, the study was performed at a single institution. Our findings should be interpreted keeping these limitations in mind.

5. Conclusion

In conclusion, both CE and SBE are useful to diagnose OGIB. For overt bleeding cases and ongoing bleeding cases, SBE may be more appropriate than CE, as endoscopic diagnosis and treatment can be completed simultaneously.

6. Conflicts of Interest

The authors have no financial conflicts of interest.

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Characteristic	Total	CE	SBE	p-value
Patients with OGIB	194	103	91 (oral/rectal,43/48)	
Sex, male/female	100/94	55/48	45/46	
Age, yr	67±17	63±16	68±17	
Lowest hemoglobin level, g/dL	7.7± 2.0	7.8±2.1	7.6±1.9	<0.01 ^{a)}
Transfusion, yes/no	70/124	30/73	40/54	<0.01 ^{b)}
Comorbidity, yes/no ^{c)}	114/80	61/42	53/38	NS ^{b)}
Anticoagulation, yes/no	68/126	37/66	31/60	NS ^{b)}

Table 1. Characteristics of the Study Patients

Values are presented as number or mean±SD.

CE, capsule endoscopy; SBE, single balloon-assisted enteroscopy; OGIB, obscure gastrointestinal bleeding; NS, not significant. ^{a)}Student t-test; ^{b)}Chi-square test; ^{c)}Including cardiovascular, renal, pulmonary, autoimmune (e.g., rheumatoid arthritis), and endocrine diseases.

Variable	CE (n=103)	SBE (n=91)	p-value
Total	49 (47.5)	67 (73.6)	<0.01 ^{a)}
Overt	38/65 (58.4)	55/68 (80.8)	
Occult	11/38 (23.9)	12/23 (52.2)	<0.01 ^{a)}

Table 2. Rates of Positive Findings on CE and SBE according to the Bleeding Type

Values are presented as number (%). CE, capsule endoscopy; SBE, single balloon-assisted enteroscopy. ^{a)}Chi-square test.

Variable	CE (n=49)	SBE (n=67)	p-value
Vascular lesion	34 (69.4)	34 (50.7)	NSa)
Ulcer	10 (20.4)	28 (41.8)	NSa)
Tumor	3 (6.1)	2 (3.0)	NSa)
Diverticulum	2 (4.1)	3 (4.5)	NSa)

Table 3. Rates of Positive Findings on CE and SBE according to the Finding

Values are presented as number (%). CE, capsule endoscopy; SBE, single balloon-assisted enteroscopy; NS, not significant. ^{a)}Chi-square test.

Variable	Value
Total no. (%)	51/67 (76.1)
Clip placement	28
Argon plasma coagulation	16
Hypertonic saline-epinephrine	6
Polypectomy	1

Table 4. Rates of Positive Findings according to Endoscopic Management

Variable	Overt (ongoing)	Overt (previous)	Occult	p-value
CE	10/11 (90.9)	28/54 (51.8)	11/38 (23.9)	<0.01 ^{a)}
SBE	27/27 (100)	28/41 (68.2)	12/23 (52.2)	<0.01 ^{a)}

Table 5. Rates of Bleeding on CE and SBE

Values are presented as number (%). CE, capsule endoscopy; SBE, single balloon-assisted enteroscopy. ^{a)}Chi-square test.

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(I) 原 著

1. Roles of Capsule Endoscopy and Single-Balloon Enteroscopy in Diagnosing Unexplained Gastrointestinal Bleeding.

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(II) 著 書

1. 消化器最新の治療 2013-2014 南江堂 放射線性腸炎

(III) 総説・講座

1. 【消化管 EUS 診断の現状と新たな展開】 上部消化管粘膜下腫瘍の EUS 診断(解説/特集)

Author: 木田 光広(北里大学東病院 消化器内科), 徳永 周子, 山内 浩史, 奥脇 興介, 大岡 正平, 山本 創, 宮澤 志朗, 池田 弘子, 岩井 知久, 菊地 秀彦, 荒木 正雄, 渡辺 摩也, 今泉 弘, 山田 至人, 坂口 哲章, 小泉 和三郎

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2. 【胆膵治療内視鏡のエキスパートテクニック】 EUS 関連手技 EUS-FNA 穿刺針、超音波内視鏡機器の進歩(解説/特集)

Author: 木田 光広(北里大学東病院 消化器内科), 荒木 正雄, 宮澤 志朗, 大岡 正平, 山本 創, 佐東 丈仁, 岩井 知久, 池田 弘子, 竹澤 三代子, 菊地 秀彦, 渡辺 摩也, 今泉 弘, 西元寺 克禮

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4. 【膵癌に対する Chemotherapy & Intervention 最新情報を臨床に生かす】 膵癌 Chemotherapy 症例に対する胆道ドレナージ(解説/特集)

Author: 木田 光広(北里大学東病院 消化器内科), 岩井 知久, 宮澤 志朗, 大岡 正平, 中目 哲平, 佐東 丈仁, 池田 弘子, 安藤 豪, 山崎 好喜, 竹澤 三代子, 菊地 秀彦, 荒木 正雄, 渡辺 摩也, 木田 芳樹, 今泉 弘, 西元寺 克禮

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5. 【非切除悪性胆道閉塞に対するステンティング 病態に応じた治療戦略を考える】 Metallic stenting 閉塞例に対する胆道 stenting(解説/特集)

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6. 【一般医、消化器科医が知っておきたい肝胆膵疾患診療のエビデンス】 胆道疾患の診断と治療 総胆管胆石に対する内視鏡治療 EST or EPBD(解説/特集)

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