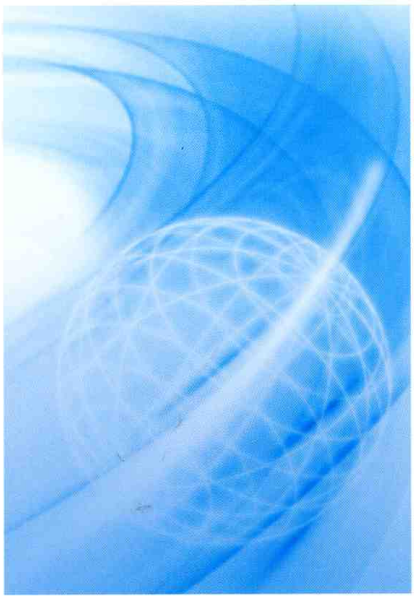
PRACTICE OF SINGLE BALLOON ENTEROSCOPY

Japanese Enteroscope Insertion Technique Study Group

Introduction



Until only a few years ago, the small bowel region was somewhat mysterious and impenetrable, sometimes likened to a "Dark Continent" of the human body. However, as recent technological advances in endoscopy have made total enteroscopy possible, it is expected that enteroscopy will become more widely used in the future.

In consideration of this trend, we reviewed the use of Single Balloon Enteroscope in total enteroscopic observation. By making the preparation and clinical procedure easier and simpler, we hope to encourage more hospitals to conduct small intestinal enteroscopic examinations. This in turn will, we believe, lead to overall improvement in diagnosis and treatment of small bowel diseases.

The purpose of this booklet is to assist physicians performing Single Balloon Enteroscope for the first time by providing tips on practical insertion methods applicable to various clinical settings. Accordingly, we describe various techniques and other insights we have gained through our own clinical experience in this field that will make it easy even for beginners to understand our tips on insertion. We hope this booklet can help increase understanding of small intestinal enteroscopic insertion using the Single Balloon Enteroscope and to improve diagnosis and treatment of small bowel diseases.

Note: This booklet was edited based on Japanese situation, therefore the practice should be adjusted according to each country's circumstances.

Japanese Enteroscope Insertion Technique Study Group
(hospital names in alphabetical order)

Kitasato University East Hospital — Kiyonori Kobayashi — Tomoe Katsumata
Kyoto Second Red Cross Hospital — Takuji Kawamura — Kenjiro Yasuda
Shiga University of Medical Science Hospital — Tomoyuki Tsujikawa — Yasuharu Saito
Showa University Northern Yokohama Hospital — Kazuo Ohtsuka — Shin-ei Kudo

Contents

1 Instruments ····· 3

2 Operator Qualifications ····· 3

3 Examination System
1 Need for Hospitalization ····· 4
2 Need for Fluoroscopy ····· 4

4 Indications and Contraindications
1 Indications ····· 4
2 Cases where Caution is Required when Assessing Indications ····· 4
3 Contraindications ····· 4

5 Pretreatment and Premedication
1 Pretreatment ····· 5
2 Premedication ····· 5
3 Vessel Securement ····· 5

6 Patient Position
1 Antegrade Approach Cases ····· 5
2 Retrograde Approach Cases ····· 5

7 Principles and Method of Insertion
1 Principles of Insertion ····· 6
2 Preparation for Insertion ····· 6
3 Method of Insertion
1 Inserting the scope ····· 7
2 Inserting the splinting tube ····· 8
3 Shortening the intestinal tract ····· 9
4 Passing through the stomach and duodenum ····· 10
5 Passing through the colon ····· 11
6 Insertion limit reference ····· 12
7 Caution for insertion ····· 12

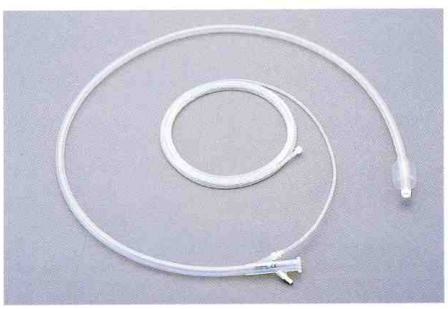
8 Equipment Layout ····· 13

9 Observation Method and Treatment
1 Observation Method ····· 14
2 Marking ····· 14
3 Treatment ····· 15
4 Endotherapy Accessories and Auxiliary Tools ····· 15

1 Instruments

EVIS LUCERA Small Intestinal Videoscope OLYMPUS SIF Type Q260

Optical System	Field of view	140°
	Direction of view	Forward viewing
	Depth of field	5-100 mm
	Illumination method	Light guide system
Distal End	Outer diameter	9.2 mm
Insertion Tube	Outer diameter	9.2 mm
Bending Section	Angulation range	Up 180°, Down 180°, Right 160°, Left 160°
Working Length		2,000 mm
Total Length		2,345 mm
Instrument Channel	Inner diameter	2.8 mm
	Minimum visible distance	3 mm from distal end
	Endotherapy accessory entrance/ exit position in field of view	8 o'clock direction



Single Use Splinting Tube ST-SB1

Insertion tube	Outer diameter	13.2 mm
	Inner diameter	11 mm
Working length		1,320 mm
Total length		1,400 mm
Material	Tube	Silicone rubber
	Balloon	Silicone rubber
Hydrophilic lubrication coating		YES

Balloon Control Unit OBCU

Power supply	100-240 V AC, 50/60 Hz
Power consumption	150 VA
Balloon setting pressure	5.4 kPa +2.6 kPa - 0.0 kPa
Dimensions (W x H x D)	374 x 151 x 486 mm (Maximum)
Weight	11 kg (Balloon Control Unit)
	0.4 kg (OBCU Remote Controller)

2 Operator Qualifications

- Ability to perform upper gastrointestinal endoscopic procedures.
- Ability to perform lower gastrointestinal endoscopic (total colonoscopic) procedures.

3 Examination System

3-1 Need for Hospitalization

■ Hospitalization should be recommended for antegrade approach cases because sedation is required.

■ Hospitalization is desirable for retrograde approach cases.

Supplement

The need for hospitalization depends on the sedative dosage. Antegrade approach cases require hospitalization because sedation is essential, while retrograde approach cases need consideration of hospitalization if sedation is required.

3-2 Need for Fluoroscopy

■ A fluoroscopic environment is absolutely necessary.

■ Fluoroscopy is useful at the following times.

① During insertion of the splinting tube
(→ See section 7-3-2, "Inserting the splinting tube" on page 8.)

② During shortening of the intestinal tract
(→See section 7-3-3, "Shortening the intestinal tract" on page 9.)

③ During scope-position check or loop-formation check

4 Indications and Contraindications

4-1 Indications

■ Patients suspected of having small bowel lesions

① Cases necessitating definitive diagnosis
Small intestinal bleeding, tumor, inflammatory bowel diseases, etc.

② Cases necessitating close examination and histopathological diagnosis of impaired digestive absorption
Protein-losing gastroenteropathy, malabsorption syndrome, etc.

③ Cases necessitating endoscopic therapy of small bowel disease
Polypectomy, hemostasis, dilatation, foreign body removal, etc.

4-2 Cases where Caution is Required when Assessing Indications

■ Advanced adhesion after operation, etc.

■ Extensive small intestinal disease such as Crohn's disease

■ Advanced esophageal varices (with antegrade approach cases)

4-3 Contraindications

■ Gastrointestinal tract perforation

■ Poor general condition (shock)

■ Absence of consent or cooperation from the patient

5 Pretreatment and Premedication

5-1 Pretreatment

■ The pretreatment for antegrade approach is the same as the one used for upper gastrointestinal endoscopy, while the one used for retrograde approach is the same as that used for lower gastrointestinal endoscopy.

5-2 Premedication

○Anticonvulsant

■ Butylscopolamine bromide injection may be used as required.

○Sedation (with antegrade approach cases)

■ For antegrade approach, use a sedative or analgesic similar to that used in ERCP or ESD.

Case Study

①Showa University Northern Yokohama Hospital: Conformance to ERCP.
Pentazocine injection (15 mg),
hydroxyzine hydrochloride injection (25 mg) or
midazolam injection (2 to 3 mg), etc.

②Shiga University of Medical Science Hospital: Conformance to ESD.
Pentazocine injection (15 mg) or
Propofol injection (3 mg/kg/hr), etc.

○Sedation (with retrograde approach)

■ For retrograde approach, use a sedative or analgesic similar to that used in ERCP or ESD.

5-3 Vessel Securement

■ It is absolutely essential to secure a blood vessel location for drug administration in case of problems with sedation or other emergencies.

6 Patient Position

6-1 Antegrade Approach Cases

■ In general, the prone position is most suitable considering the risk of aspiration and the ease of identification of X-ray shapes.

Technique

However, in the case of splinting tube insertion, it is sometimes more effective to use the dorsal position with manual compression, provided that sufficient care is taken against the risk of aspiration.

(→ See section 7-3-2, "Inserting the splinting tube" on page 8.)

6-2 Retrograde Approach Cases

■ The same as lower gastrointestinal endoscopy.

Technique

When using fluoroscopy, begin with the left lateral position and move to dorsal position as required.

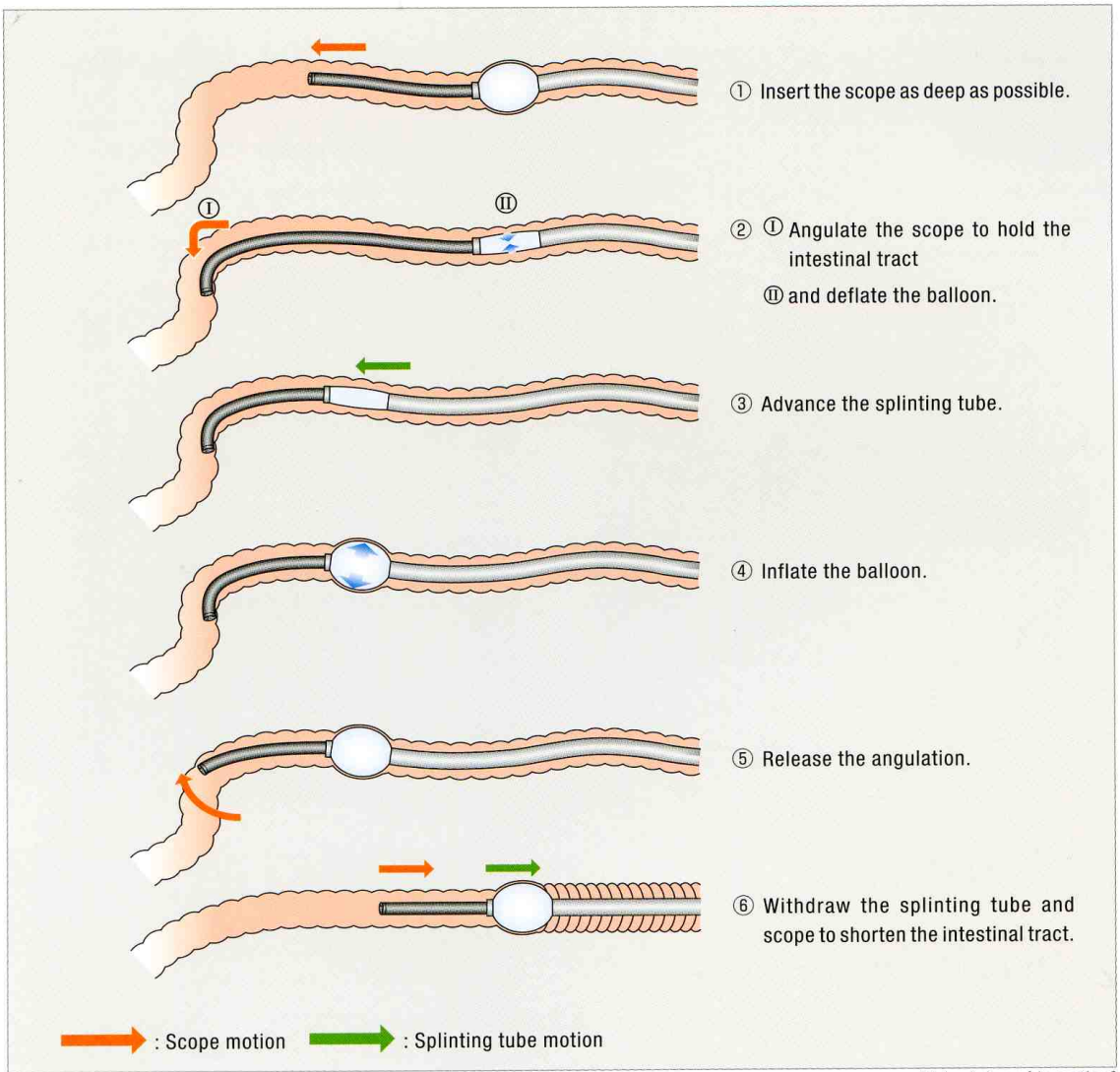
7 Principles and Method of Insertion

7-1 Principles of Insertion

■ The Single Balloon Enteroscope can be inserted into the deep small bowel by manipulating the balloon on the distal end of the splinting tube and the angulation mechanism of the scope.

■ First, insert the scope deeply and grasp the intestinal tract by angulating the bending section. Second, deflate the balloon on the distal end of the splinting tube, advance the splinting tube and then inflate the balloon. Next, release the angulation and withdraw both the scope and splinting tube to shorten the intestinal tract.

By repeating the above operations, the small intestine can be folded and shortened so that the scope can reach the deep small bowel.



[Principles of insertion]

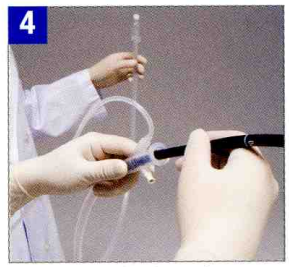
7-2 Preparation for Insertion

○Preparing the system

Connect the air flow tube between the balloon air flow connector on the splinting tube and the side connector on the reservoir tank of the balloon control unit.

Press the inflate/deflate button on the OBCU remote controller and confirm that the balloon on the splinting tube inflates or deflates accordingly.

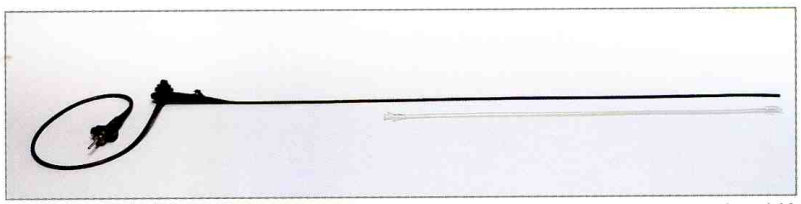
Inject sterile water in the splinting tube to moisten the grasping section and the interior of the insertion section, and then drain excess sterile water (which should be added as required during procedure).



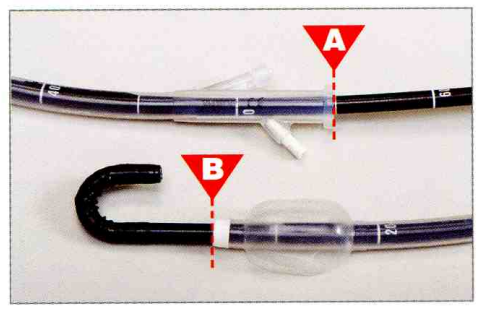
Attach the splinting tube on the scope and confirm that the tube moves smoothly along the insertion tube of the scope.

Cover the OBCU remote controller with the OBCU remote controller cover.

○Note



The single balloon endoscope has 200 cm working length and the splinting tube has 140 cm. There is the reference to check how far the splinting tube should be inserted along the endoscope.
When the splinting tube's proximal end is located at the155 cm point on the scope's insertion tube (A), the splinting tube's distal end comes slightly before the scope's bending section(B). This is the reference for the insertion limit of the splinting tube along the scope.

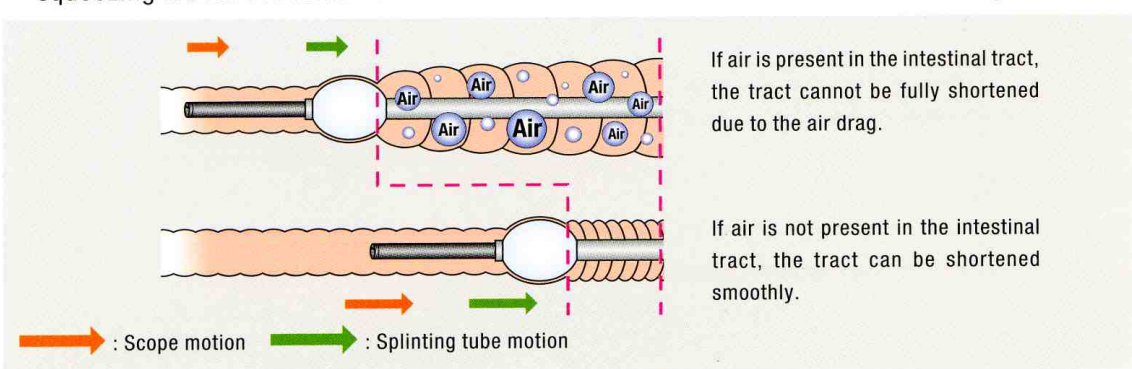


7-3 Method of Insertion

7-3-1 Inserting the scope

■ While holding the intestinal tract with the balloon on the splinting tube, insert the scope.

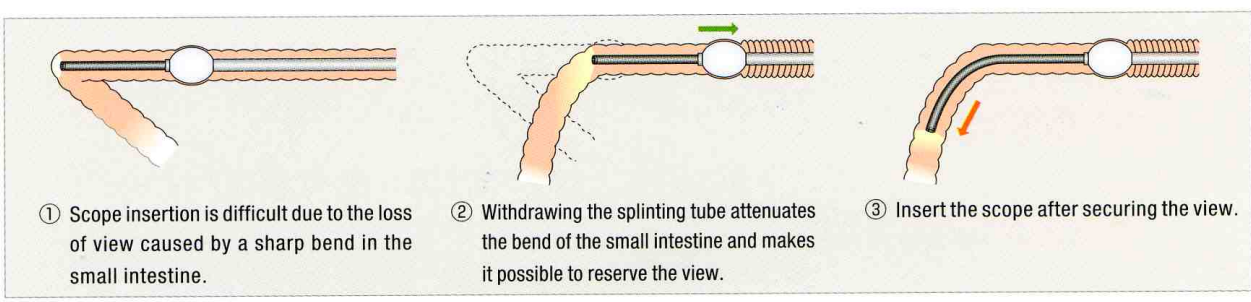
■ Feed the minimum required amount of air to facilitate folding of the intestinal tract, and insert the scope by squeezing it between folds. Take care not to extend the small intestine excessively.



[Difference depending presence of air in intestinal tract]

Technique

Where the intestinal tract is bent sharply and the lumen cannot be identified, inflate the balloon before the bend and withdraw the splinting tube slightly. This will attenuate the bend in the small intestine, facilitating observation and making scope insertion easier.



① Scope insertion is difficult due to the loss of view caused by a sharp bend in the small intestine.

② Withdrawing the splinting tube attenuates the bend of the small intestine and makes it possible to reserve the view.

③ Insert the scope after securing the view.

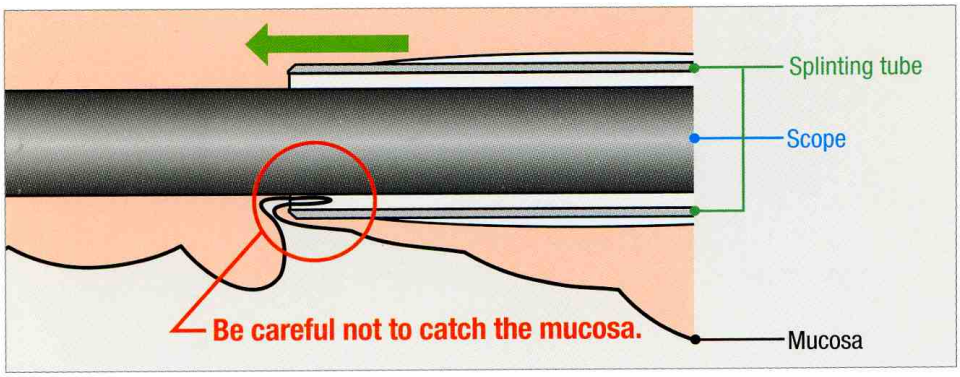
■ Attaching the distal attachment makes it easier to secure the view and helps the scope squeeze between the folds.

7-3-2 Inserting the splinting tube

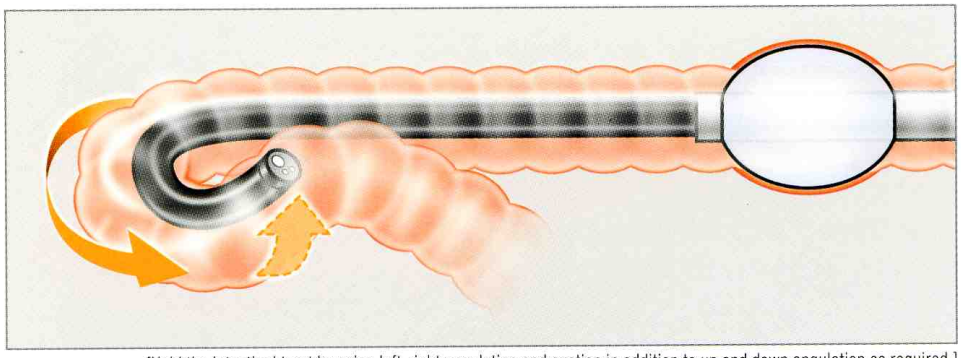
■ For safe operation, it is recommended to check the position of the distal end of the splinting tube with fluoroscopy.

■ Advance the splinting tube slowly and cautiously, withdrawing the scope slightly.

■ If a strong drag is felt, it could mean that the mucosa is caught in the space between the splinting tube and scope. Advance the splinting tube very cautiously without forcing it with an excessive force.



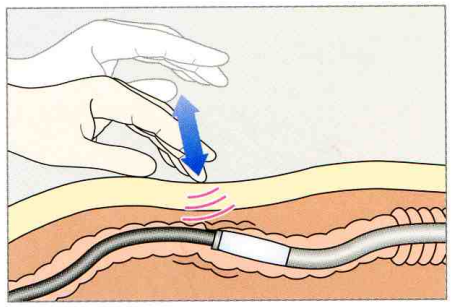
■ In general, hold the intestinal tract by means of the scope tip's up- and down- angulation feature and advance the splinting tube so that the distal end of the tube does not go past the scope tip. In some cases, also use the left-right angulation and suction to hold the intestinal tract during advancement of the splinting tube (see figure below).



[Hold the intestinal tract by using left-right angulation and suction in addition to up and down angulation as required.]

Technique

- When passing a fold while advancing the splinting tube, it can be helpful to jiggle the scope.
- If drag is encountered during insertion of the splinting tube, it can be helpful to tap the abdominal wall gently to release any folds that have been caught (see figure on the right).



■ The inner side of the splinting tube is treated with hydrophilic lubrication. Add some water to advance the splinting tube more smoothly.

(→ See photographs 3 in section 7-2, "Preparation for Insertion" on page 7.)

Caution

- If drag is felt or if the patient complains of pain during insertion of the splinting tube, it is possible that mucosa is caught in the space between the splinting tube and scope. Special care is required in such a case.
- If there is a lesion midway, use special care when passing it.
- If there is a lesion at the point held by angulation, take special care against bleeding and perforation.

7-3-3 Shortening the intestinal tract

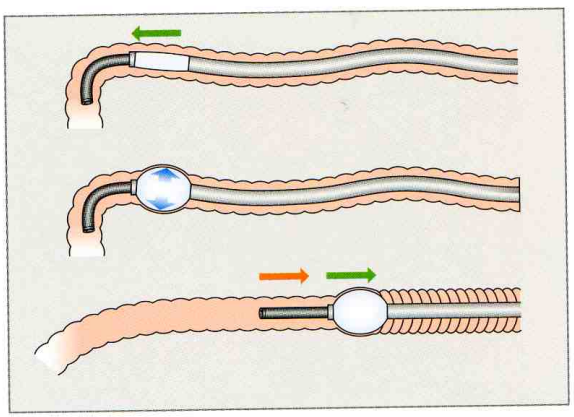
■ Release angulation before shortening the intestinal tract. (→See section 7-1, "Principles of Insertion" on page 6.)

■ To shorten the intestinal tract, withdraw the splinting tube and scope slowly without using excessive force.

■ The reference limit for shortening can be confirmed as the point where the operator feels a sudden increase in drag. If necessary, also use fluoroscopy for confirmation.

Technique

To shorten the intestinal tract efficiently, advance the splinting tube until the distal end of the splinting tube goes closest to the scope's distal end.



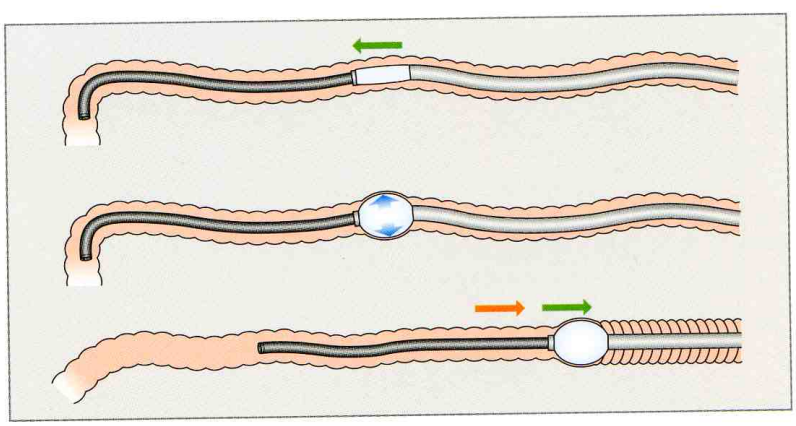
→ : Scope motion

→ : Splinting tube motion

Supplement

Even if the scope is inserted beyond the advancement limit of the splinting tube, the portion of the intestinal tract that has been exceeded cannot be shortened.

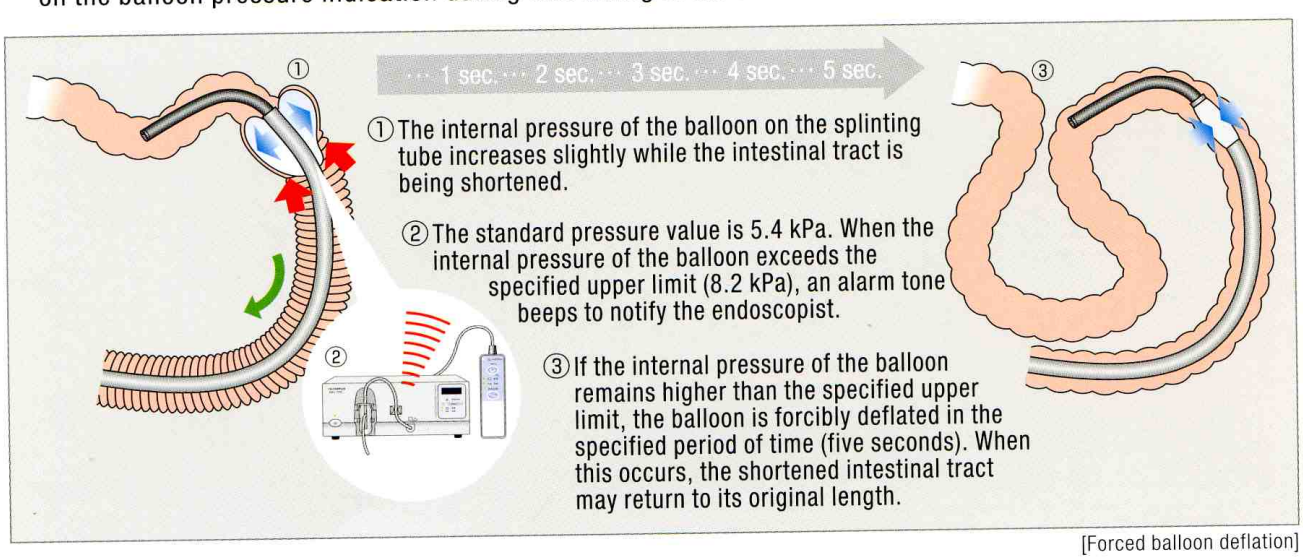
(→ See "Note" in section 7.2," Preparation for Insertion" on page 7.)



→ : Scope motion

→ : Splinting tube motion

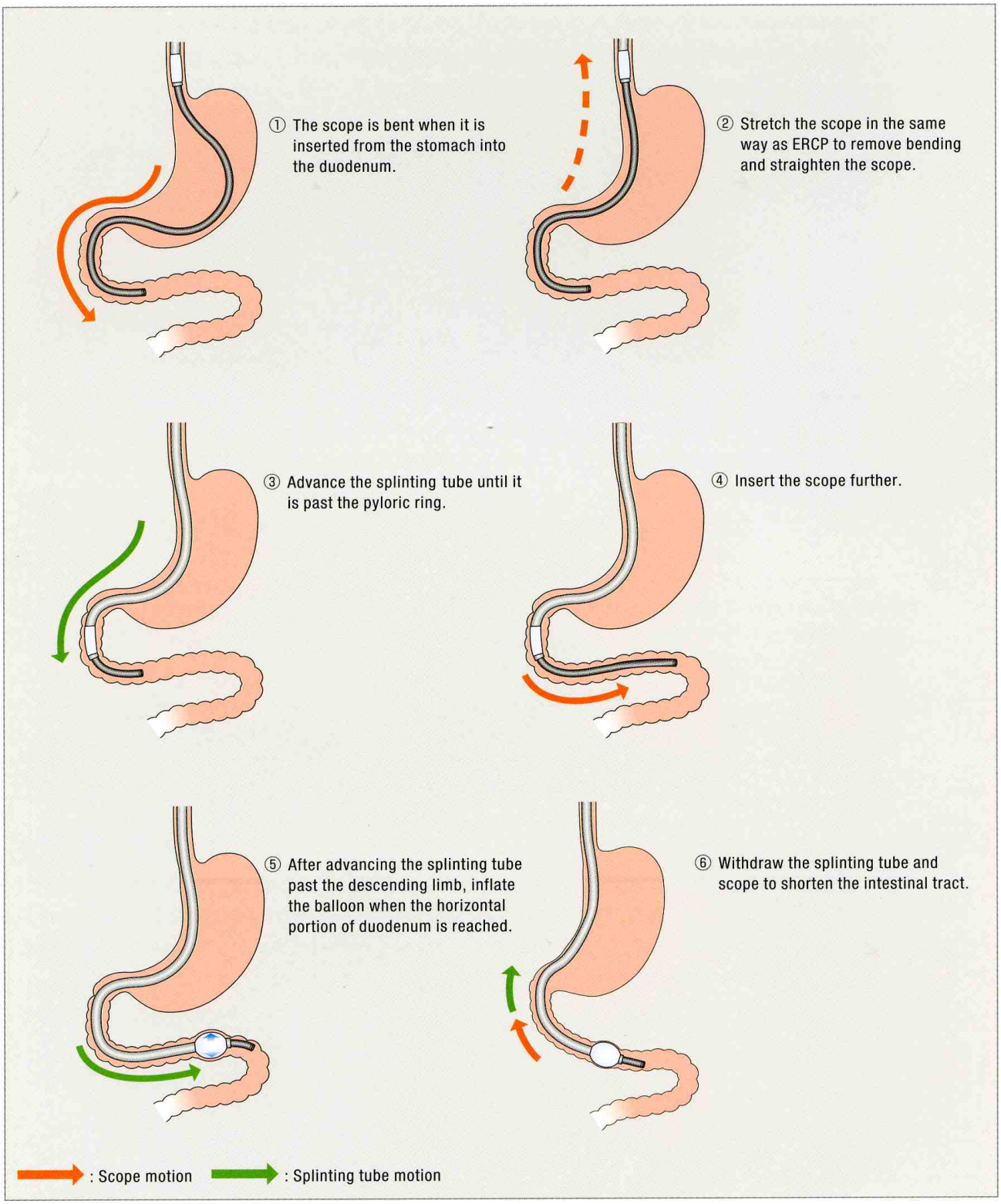
■ When the internal pressure of the balloon exceeds the specified upper limit (8.2 kPa), an alarm buzzer beeps. If the pressure is not decreased, the balloon will be deflated in the specified period of time (five seconds). As the shortened intestinal tract may return to its original length when the balloon is deflated, keep an eye on the balloon pressure indication during shortening of the intestinal tract.



[Forced balloon deflation]

7-3-4 Passing through the stomach and duodenum

■ When the splinting tube is past the pyloric ring, stretch the scope by removing any bends from the scope and advance the splinting tube straight through the scope.



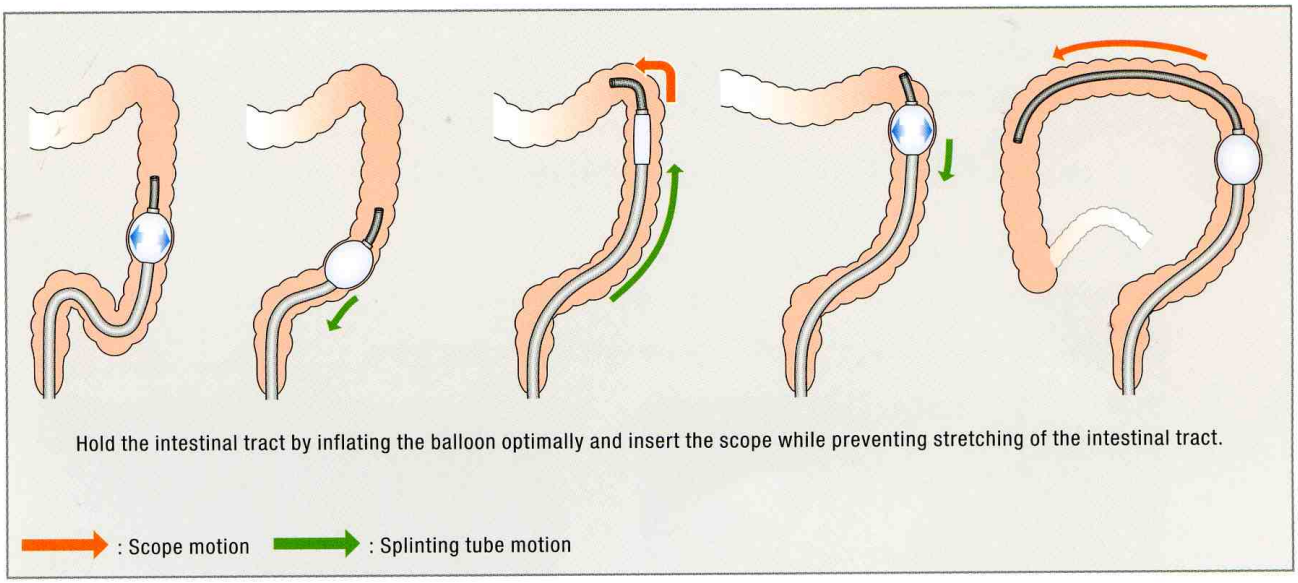
Caution

· Avoid inflating the balloon near the papilla, for this may induce pancreatitis. Be sure to advance the splinting tube past the descending limb as far as the horizontal portion of duodenum before inflating the balloon.

7-3-5 Passing through the colon

■ When passing through the colon, secure the intestinal tract by inflating the balloon on the splinting tube to prevent stretching of the intestinal tract during insertion of the scope.

■ The Single Balloon Enteroscope is more flexible than an ordinary colonoscope. When inserting the scope, the objective is to prevent the intestinal tract from being stretched by effectively manipulating the balloon.

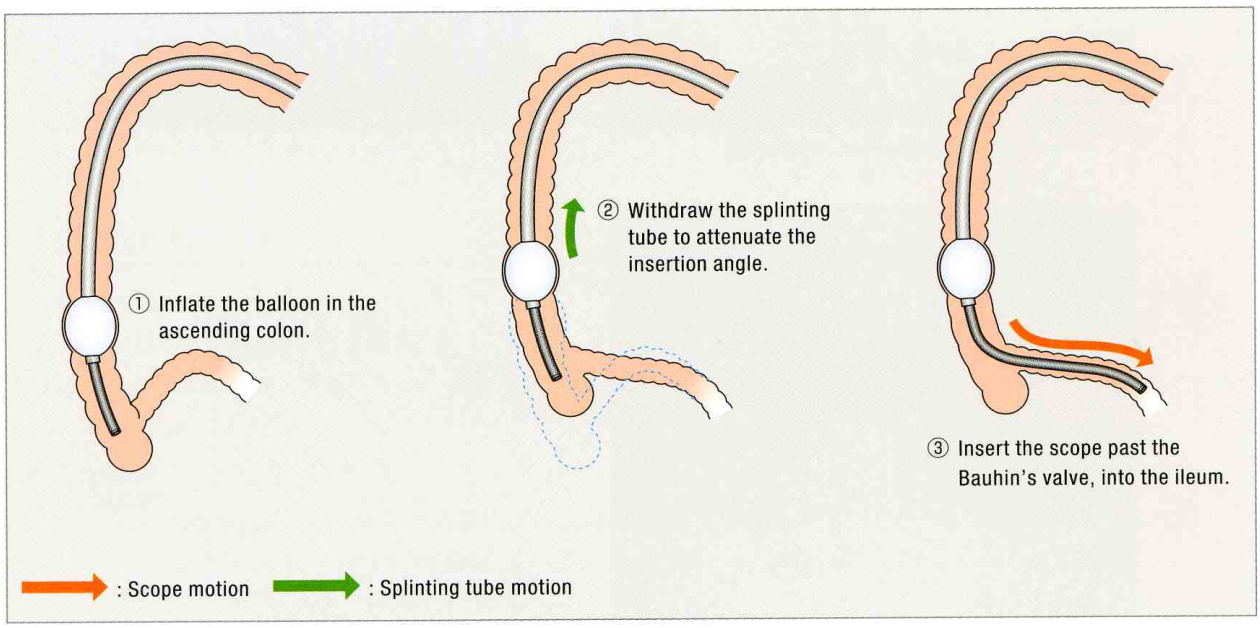


Hold the intestinal tract by inflating the balloon optimally and insert the scope while preventing stretching of the intestinal tract.

: Scope motion : Splinting tube motion

Technique

When it is difficult to insert the scope into the ileum, inflate the balloon on the splinting tube in the ascending colon and then withdraw it to attenuate the angle of insertion into the ileum. This will facilitate passage through the Bauhin's valve.



■ If insertion into the ileum is difficult even when the balloon is dilated in the ascending colon and the splinting tube is withdrawn, manual compression and left lateral position may be effective.

7-3-6 Insertion limit reference

■ When inserting the scope, it is important to accurately identify the limit of insertion in order to minimize patient discomfort.

■ Specifically, the limit can be determined in the following ways:

① When images that seem to show the same position are displayed repeatedly. To check if they show the same position, crystal violet marking is effective.

② When more than one hour has elapsed since the start of insertion. The total procedure time should be less than two hours including observation and treatment.

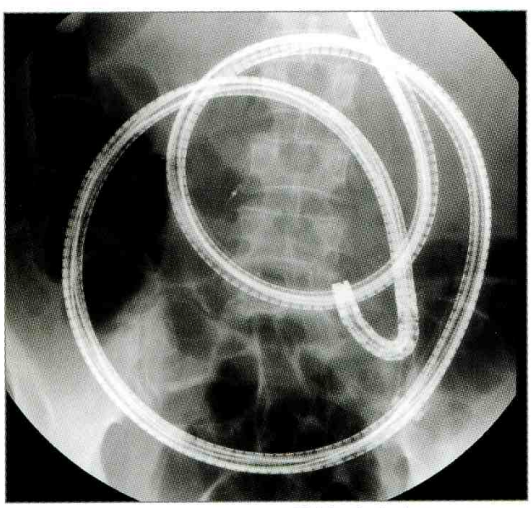
③ When the intestinal tract has been shortened a few times after the splinting tube has been inserted to the limit.

④ When the patient condition has changed and continuing with insertion seems to be difficult.

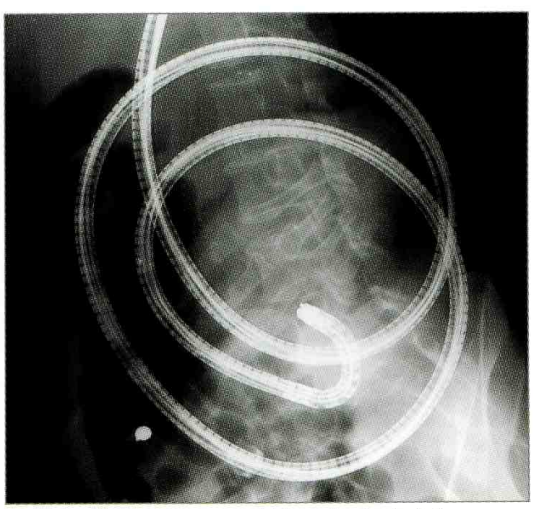
7-3-7 Caution for insertion

■ Insert as if drawing concentric circles.

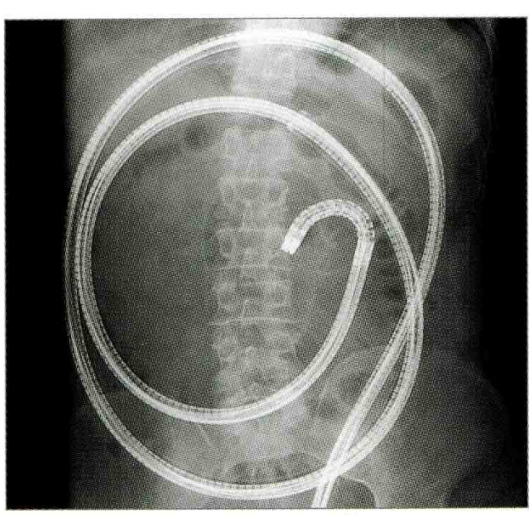
■ The sizes of the concentric circles are variable between patients.



[Antegrade approach] (clockwise)



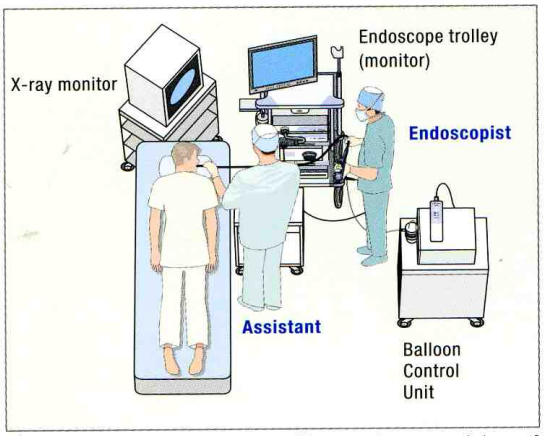
[Antegrade approach] (counterclockwise)



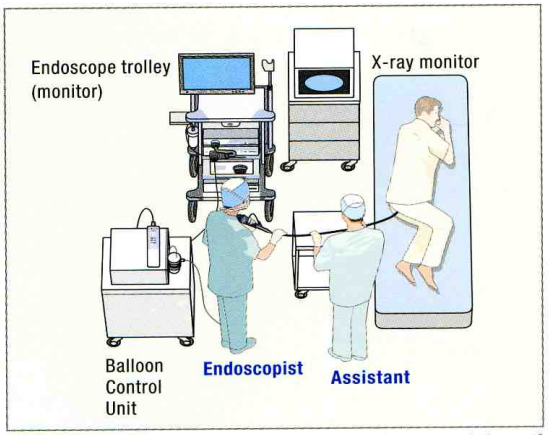
[Retrograde approach]

8 Equipment Layout

- The layout for antegrade approach is the same as that for upper gastrointestinal endoscopy.
- The layout for retrograde approach is the same as that for lower gastrointestinal endoscopy.
- Perform procedure basically using the two-person method.
- To facilitate insertion, it is recommended to install a trolley with the same height as the examination table in front of the assistant and place the splinting tube on the trolley.



[Antegrade approach layout]



[Retrograde approach layout]

Close-up

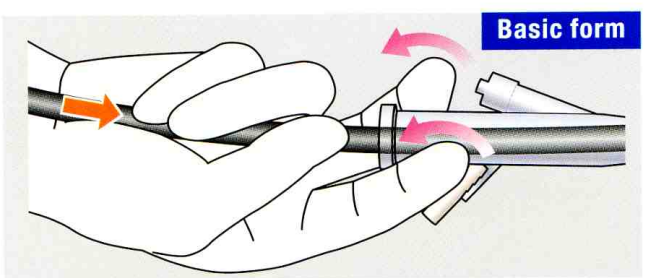
1 One-person technique (Dr. Kazuo Ohtsuka, Showa University Northern Yokohama Hospital)

○Basic one-person operation

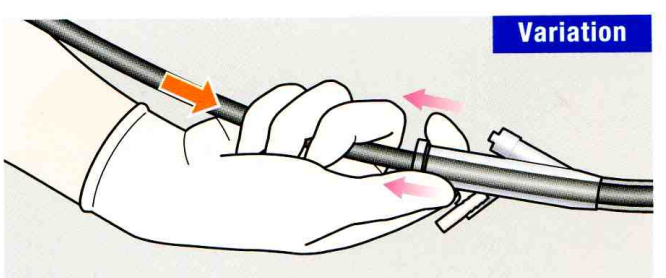
- With the one-person method, hold the scope's control section with the left hand, hold the scope and splinting tube with the right hand, and perform various operations using the left and right hands.

○Inserting the scope

- Control the angle with the left hand, hold the splinting tube and scope with the right hand, and insert the scope by manipulating it with the right hand.
- The operation of the right hand during scope insertion includes the basic form in which the index and middle fingers grasp the splinting tube as well as a variation of this, including one in which the thumb and index finger grasp the splinting tube. Use these forms as required during insertion.
  Note: The splinting tube has a tab so that the tube can be withdrawn by hooking a finger on the tab.



Grasp the scope with the thumb, ring finger, little finger and palm, and withdraw the splinting tube by hooking the index and middle fingers on its tab to insert the scope.



Grasp the scope with the middle finger, ring finger, little finger and palm, and withdraw the splinting tube by hooking the thumb and index finger to insert the scope.

○Advantage of one-person method

- The biggest advantage of the one-person method is that the endoscopist has full control of the scope, its angle, and the splinting tube.

○Note

- If it is difficult to perform all of these tasks, an assistant may be necessary to hold the splinting tube.

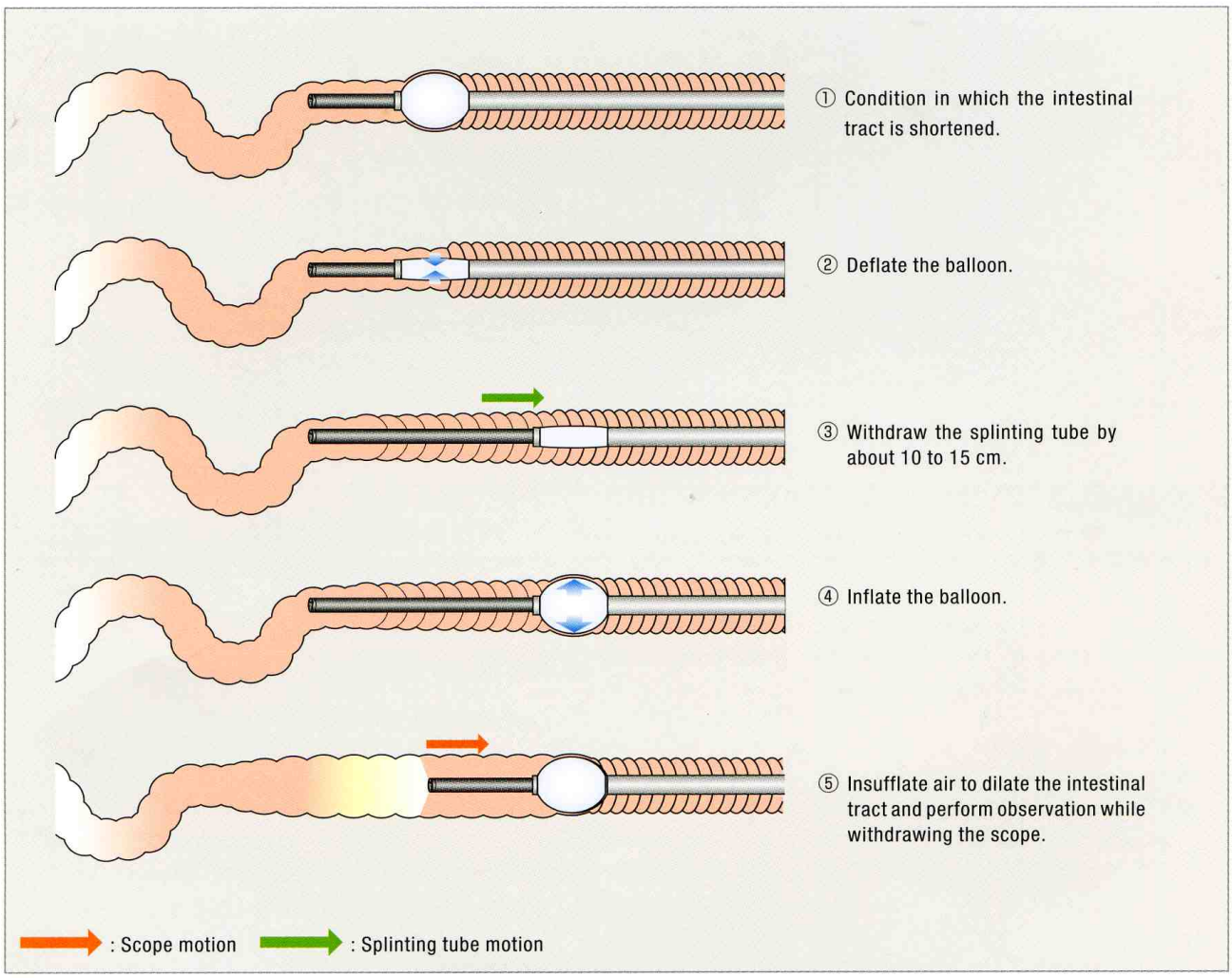
→ : Finger motion → : Scope motion

9 Observation Method and Treatment

9-1 Observation Method

■ In principle, observe the region during withdrawal while insufflating air to dilate the intestinal tract.

■ Inflate the balloon on the splinting tube at optimal intervals and perform observation while withdrawing the scope, taking care not to withdraw it suddenly.



9-2 Marking

■ Marking is applied to the deepest point reached by insertion.

■ Due to the narrowness of the lumen, it is important to prevent the marking ink from leaking. Otherwise, there would be a risk of deterioration of the field of view.

Technique

① Lift the mucosa with a localized saline injection.

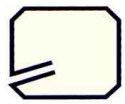
② Replace the saline container with the injection tube filled with marking ink, and perform marking (0.05 to 0.2 ml).

③ Replace the injection tube with the saline container, inject saline again and make sure that the ink remaining in the needle has been injected completely into the mucosa.

9-3 Treatment

■ Indications

①Polypectomy
②Hemostasis
③Dilatation
④Foreign body removal

■ The forceps outlet is in the 8 o'clock position.  [View of forceps in the field of view]

Caution

- In polypectomy, take extra care to prevent perforations in the thin small-intestinal wall, and inject saline locally into the polyp base to ensure lifting of the submucosa.
- To expand the stricture, increase the dilatation of balloon diameter little by little.
- The action of the EndoTherapy accessory may be slowed in regions with sharp bends or depending on the scope insertion style.

9-4 Endotherapy Accessories and Auxiliary Tools

■ The scope has an outer diameter of 9.2 mm and the instrument channel has an inner diameter of 2.8 mm. Consequently, the following Endotherapy accessories and supporting devices are available.

Single Use
Biopsy Forceps

FB-210U

FB-220U

FB-230U

FB-240U

Reusable
Biopsy Forceps

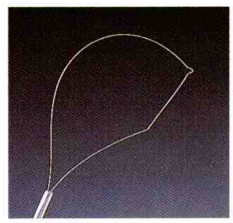
FB-28Y-1 / FB-28Z-1

Single Use
Hot Biopsy Forceps

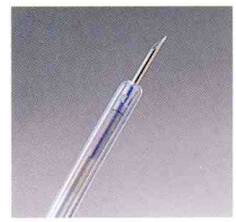
FD-210U

FD-230U

Single Use
Electrosurgical Snare


SD-221U-25

Single Use
Injection Needle


NM-200U-0423

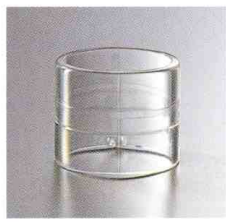
Reusable
Washing Pipe

PW-1V-1

Reusable
Spray Catheter

PW-5V-1

Single Use
Distal Attachment


D-201-10704

Published in collaboration with Olympus Medical Systems Corp.

F1233UT-1007