

# Therapeutic Gastrointestinal Endoscopy

A Comprehensive Atlas

Hoon Jai Chun  
Suk-Kyun Yang  
Myung-Gyu Choi  
*Editors*

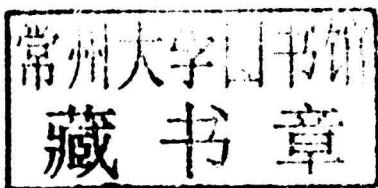
 Springer

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## Foreword

It has been over half a century since gastrointestinal endoscopy was introduced. Since then, the science of endoscopic technique has improved so dramatically that therapeutic procedures which we have only dreamed of are now possible. New breakthroughs in minimally invasive procedures such as endoscopic resection, hemostasis and dilation of strictures as well as natural orifice transluminal endoscopic surgery have reduced the need for surgical interventions. However, the success of such gastrointestinal therapeutic endoscopic procedures depends on the expertise and experience of the endoscopist.

The Korean Society of Gastrointestinal Endoscopy (KSGE) has made a remarkable contribution to the research, education and clinical advances in gastrointestinal endoscopy. The International Digestive Endoscopy Network, which is held every June, is representative of the KSGE's educational activity and has drawn great acclaim. The world-class expertise and fame of our Korean endoscopists as well as the enthusiastic responses from the teaching field have encouraged Korean endoscopists to publish our own textbooks. The KSGE received favorable reviews on the atlas of *Clinical Gastrointestinal Endoscopy* published last year. We are happy to announce that we are publishing a new atlas on therapeutic endoscopy this year.

This atlas contains the knowhow and tips which divide the novice from the expert. We have included over thousands of high-resolution pictures and procedures, all by masters in endoscopic therapy. The pictures are remarkably excellent, carefully selected and will provide step-by-step instructions in performing advanced endoscopic therapy. It is an honor to have the opportunity to present such expertise to the world.

We would like to thank all the experts who contributed to the production of this atlas. We especially express our appreciation to Dr. Hoon Jai Chun, Dr. Suk-Kyun Yang, Dr. Ki-Nam Shim, Dr. Jeong-Sik Byeon, Dr. Jae Myung Park, Dr. Jae Young Jang, and Dr. Bora Keum who organized and edited the manuscript. And finally, we respectfully dedicate this atlas, on his first death anniversary, to Dr. Chung In-Sik, a beloved mentor who did so much for the progress of Korean gastroenterology and endoscopy.

Seoul, Korea

M.G. Choi



## Preface

Therapeutic endoscopy was devised over 40 years ago, during the early years of endoscopy, in an attempt to control gastrointestinal bleeding or remove polyps. Since those early clinical needs, therapeutic endoscopy has evolved into an accepted and valuable area in gastroenterology, and has become important for the management of many gastrointestinal disorders.

Recently, gastrointestinal endoscopy has made revolutionary advances in the treatment of digestive diseases. New endoscopic procedures are developing and potential clinical indications are constantly expanding. Additionally, the technology is now progressing from a relatively simple procedure to a more interventional therapeutic role. Therapeutic endoscopy is now entering a new era in which the procedure is becoming available in community-based hospitals throughout the world. However, there are few atlases of therapeutic endoscopy. Although these are good, new atlases are needed for a comprehensive and practical approach to therapeutic endoscopy.

This book covers commonly performed therapeutic procedures. In planning this book, we generated a list of what we believed these to be: the realistic therapeutic capabilities of endoscopy in daily practice include hemostasis, tumor removal, dilation of strictures, nutritional support, therapeutic small bowel endoscopy, and therapeutic endoscopic ultrasonography. This atlas also introduces promising, far-advanced therapeutic procedures such as endoscopic submucosal dissection (ESD), and various endoscopic treatments for achalasia, including peroral endoscopic myotomy (POEM). With the increased unmet needs for these procedures, we included images of therapeutic small bowel endoscopy. This atlas is based on many years of professional endoscopic achievements, scientific studies, and personal experience, and reflects the current state of interventional gastrointestinal endoscopy and related areas. Each chapter covering a therapeutic procedure is subdivided into the following key elements: general definition of the clinical entity, indications, prerequisites, instruments, technique, and procedural limitations and complications.

This book includes about thousands of pictures on procedures and illustrations of newer technologies. There are high-resolution pictures of numerous cases, and brief manuscripts to explain detailed tips for each step toward an accurate and successful procedure; these are notably excellent, carefully selected, and displayed along with the corresponding illustrations of each procedure. We used original endoscopic illustrations, which are didactically more informative than photographs, to portray the technical concepts and details of the procedure. We believe that this book will clarify the techniques, advantages, and overlap of procedures, and that our images and illustrations will serve as a guide that will become a well-worn companion on a shelf near the endoscopy unit.

Our hope is that this book improves the training and dissemination of therapeutic endoscopy. We expect this atlas to facilitate a complete and thorough understanding of the current state of therapeutic endoscopy, and help guide the reader in learning both basic and advanced techniques. This book will be of interest to all gastroenterologists and trainees wishing to know more about therapeutic endoscopy and its role in managing gastrointestinal disorders.

The experts who contributed to this book have provided up-to-date references in their chapters; more importantly, they have included their own particular styles, practices, and opinions as to how therapeutic procedures should be performed. This masterful compendium of

experience, which provides unique insight into highly technical and clinically useful methods, is being published at a critical time in the evolution of therapeutic endoscopy. This book will provide gastroenterologists with an accurate and fascinating resource for learning what they need to know about therapeutic endoscopy.

For this atlas, a board of experts convened as authors, guaranteeing a state-of-the-art presentation of the different aspects of therapeutic endoscopy. A tremendous amount of effort on the part of each author led to this book. They are true masters of gastrointestinal endoscopy. This work could be accomplished only through the generous help of numerous colleagues, who provide us with their own images. They are all listed in the book, and we gratefully acknowledge their contributions.

Thanks to Dr. Ki-Nam Shim, Dr. Jeong-Sik Byeon, Dr. Jae Myung Park, Dr. Jae Young Jang, and Dr. Bora Keum for their outstanding services in organizing and editing the manuscript of this atlas. Their enthusiasm in publishing is appreciated. We also thank all our colleagues for their skillful reviewing and supervision of this atlas. They had the vision and conviction that producing a teaching atlas of high educational quality would be immensely helpful in increasing awareness and gaining experience with therapeutic procedures.

We thank all the authors who participated in publishing this book and the contributors who collected endoscopic images. Through their participation and contribution, we have created a comprehensive text. We hope this atlas will become a remarkable reference for therapeutic endoscopy.

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# Endoscopic Treatment of Esophageal Varices

1

Young Hoon Youn

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## Key Summary

- The most effective endoscopic treatment for esophageal variceal bleeding is band ligation, known as endoscopic variceal ligation (EVL).
- Endoscopic sclerotherapy (EST) by injection of sclerosant is a viable treatment option, but not recommended as a modality of primary and secondary prophylaxis for bleeding due to its relatively high complication rate.
- In patients with current or prior bleeding from esophageal varices, EVL is the preferred endoscopic treatment and is superior to EST.
- EVL is also effective for primary prophylaxis, but in most cases should be reserved for patients who cannot tolerate or who have contraindications to beta-blocker therapy.
- Following an episode of bleeding from esophageal varices, EVL should be performed every 2–4 weeks until the varices are eradicated.

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## 1.1 General Information

Esophageal varices are portosystemic collaterals, which are formed as a consequence of portal hypertension. The portosystemic collaterals are preferentially formed in the submucosa of the lower esophagus, and rupture and bleeding from esophageal varices are the most severe complications of liver cirrhosis and are the second most common causes of mortality in such patients.

Approximately 30 % of cirrhotic patients are shown to have esophageal varices upon diagnosis of liver cirrhosis, reaching approximately 90 % after 10 years, and 30 % of them experience bleeding. However, there are no reliable methods of predicting which cirrhotic patients will have esophageal varices other than endoscopy. Therefore, patients with Child-Pugh class A liver cirrhosis with signs of portal hypertension, or those classified as class B or C at diagnosis, should have screening endoscopy [1].

Once developed, variceal vessels increase in size before they eventually rupture and bleed. The factors associated with rapid progression from small to large varices include decompensated cirrhosis (Child class B or C), alcoholic etiology of cirrhosis, hepatic venous pressure gradient (HVPG), and the presence of red color signs on the esophageal varices [2].

Mortality from variceal bleeding has greatly decreased in the last two decades from about 40 % in 1980s to 6–12 % in 2000s [3]. This decrease is attributable to the implementation of effective treatment options, such as endoscopic and pharmacological therapies and transjugular intrahepatic portosystemic shunt (TIPS), as well as improved general medical care.

## 1.2 Indication

- Urgent endoscopy is indicated for most patients with gastrointestinal hemorrhage, and immediate endoscopic hemostatic treatment should be performed if endoscopy shows evident acute variceal bleeding.
- After endoscopic hemostasis of acute bleeding from esophageal varices, elective endoscopic treatments should be repeated until the eradication of esophageal varices in order to prevent rebleeding (secondary prophylaxis).
- Prophylactic endoscopic treatment for varices which never have bled before, i.e., primary prophylaxis, can be also effective. But in most cases it should be reserved for patients who cannot tolerate or ~~who~~ have contraindications to prophylactic treatment with beta-blockers. However, primary prophylactic endoscopic treatment can be considered when the risk of bleeding is very high (large, tense varices with red spots).

### What You Should Know Here: Indications of Endoscopic Management of Esophageal Varices

- Immediate endoscopic hemostasis is indicated if endoscopy shows evident acute variceal bleeding.
- Prophylactic endoscopic treatment for varices can be considered when the risk of bleeding is very high (large, tense varices with red spots).

1.3 Prerequisite

1.3.1 Endoscopic Features and Grading of Esophageal Varices

Esophageal varices are long columns of dilated veins, usually occurring within the lower third of the esophagus, immediately above the gastroesophageal junction (GEJ). Esophageal varices can be graded endoscopically according to their size (Table 1.1, Figs. 1.1 and 1.2).

Table 1.1 Grading of esophageal varices size

Size of varix	Two-size classification (AASLD)	Three-size classification (Italian liver cirrhosis project)
Small (grade 1)	<5 mm	Minimally elevated, small straight varices
Medium (grade 2)	–	Enlarged tortuous varices occupying less than one-third of the esophageal lumen
Large (grade 3)	>5 mm	Large coil-shaped varices occupying more than one-third of the esophageal lumen

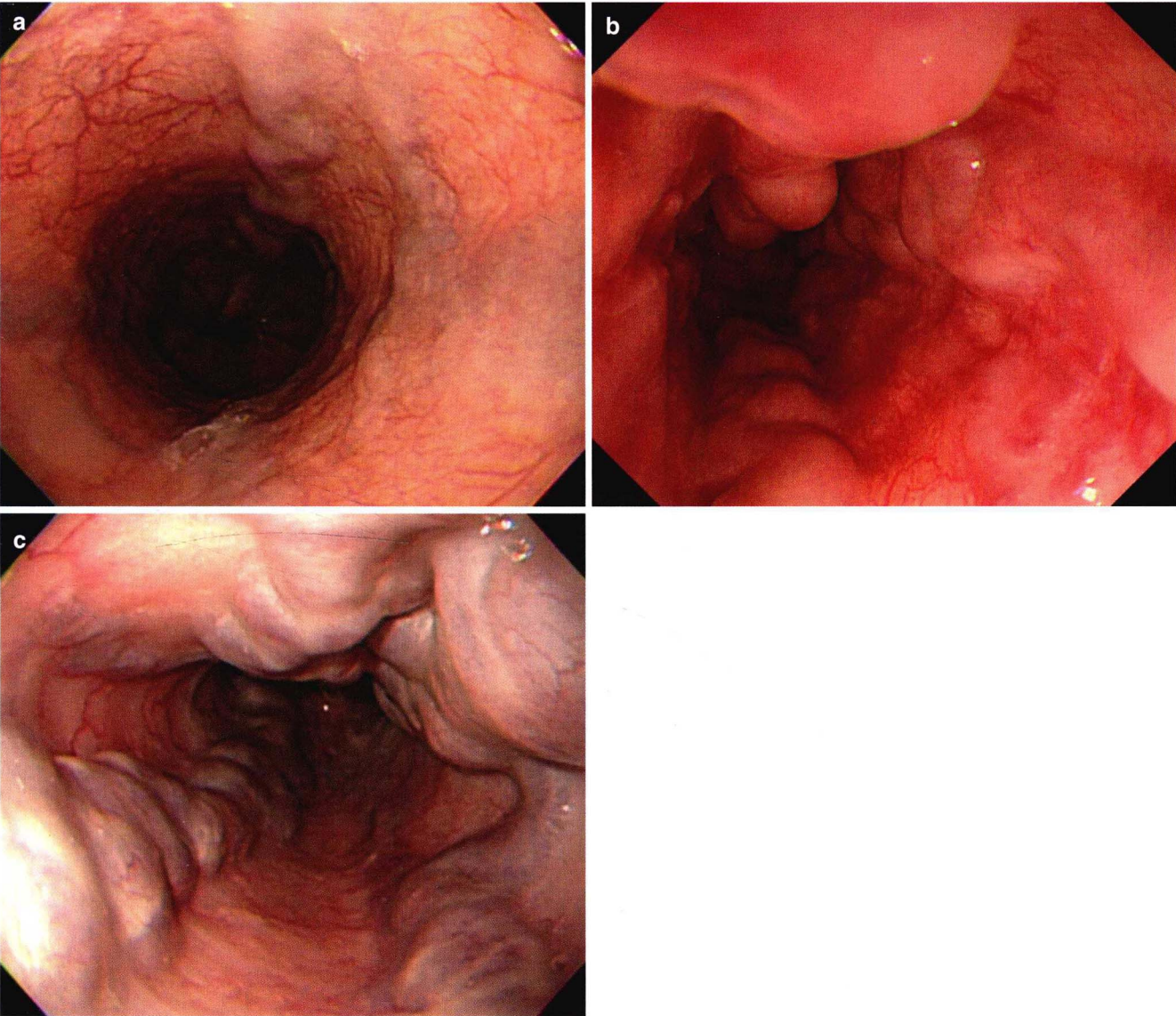
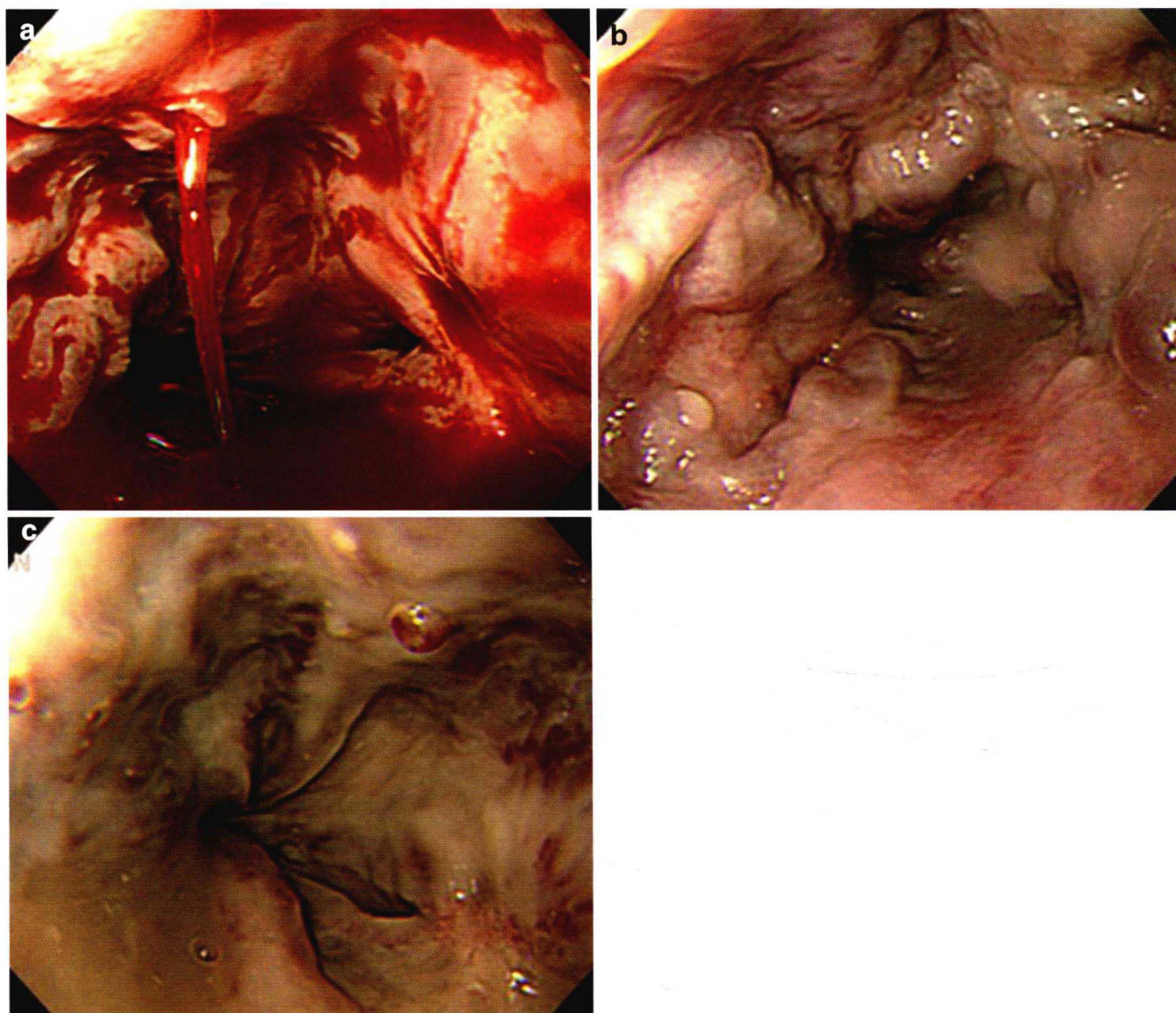


Fig. 1.1 Endoscopic grading of esophageal varices according to their size. (a) Esophageal varices grade 1 (small), (b) esophageal varices grade 2 (medium), (c) esophageal varices grade 3 (large)





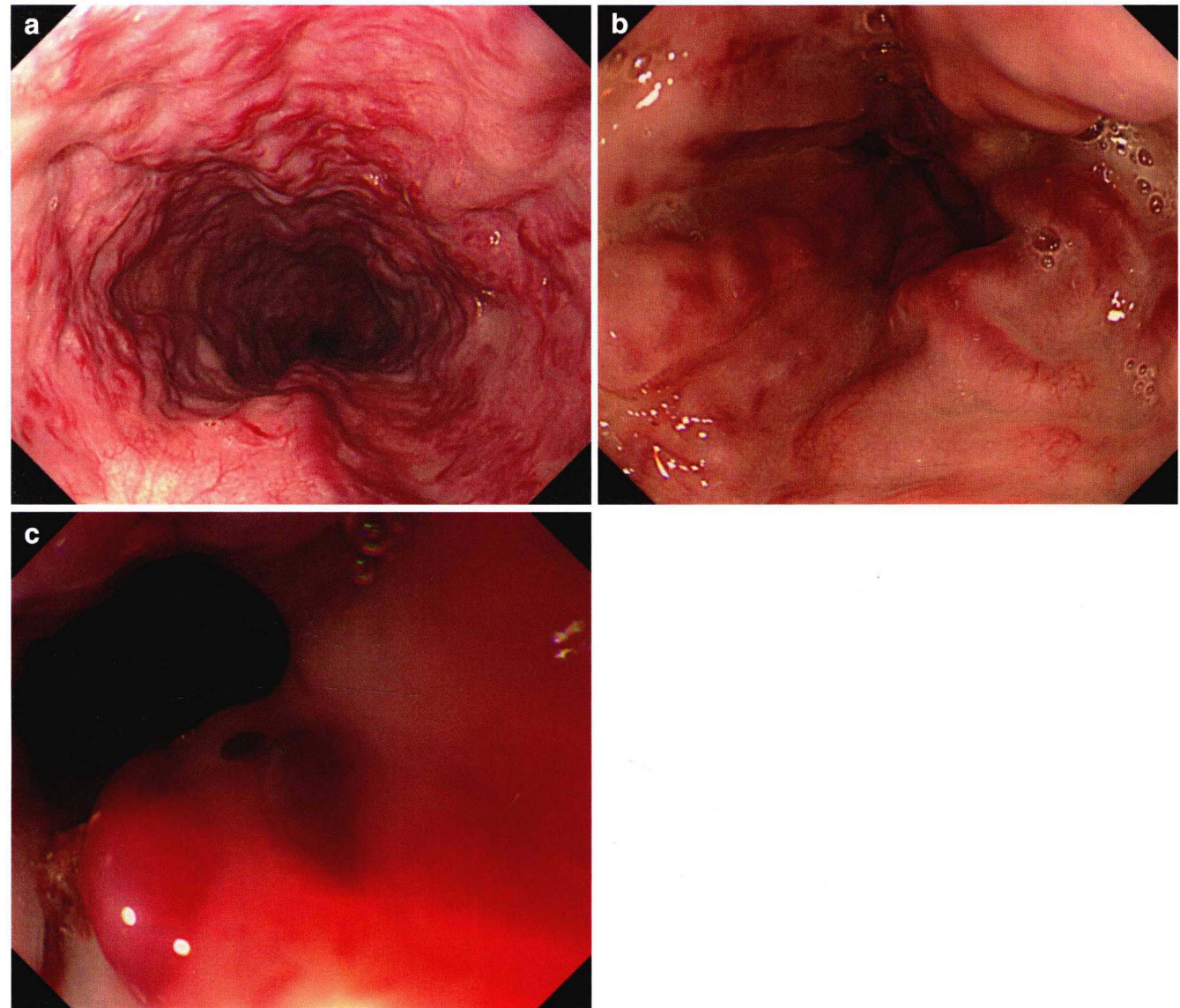
**Fig. 1.2** Endoscopic features of esophageal variceal bleeding. (a) Active spurting bleeding from varices, (b) white plug on esophageal varix, which is a fibrin clot and the stigmata of a recent bleeding point, (c) red plug on esophageal varix, which is a blood clot and also the stigmata of a recent bleeding



### 1.3.2 Risk Factors of Variceal Bleeding

The most important predictive factor for bleeding is variceal size, as predicted by Laplace's law, whereby wall tension increases with variceal radius and transmural variceal pressure. The mean risk of bleeding from larger varices

(>5 mm) is 30 % at 2 years, compared to 10 % from small varices at 2 years. The other predictive factors are severity of liver dysfunction defined by the Child-Pugh classification and red color signs [4]. The red color signs include cherry red spots, red wale marks, and hematocystic spots (Fig. 1.3).



**Fig. 1.3** Red color signs in esophageal varices. (a) Cherry red spots, which means another small, about 2 mm sized veins on varix, (b) red wale mark, which means another longitudinal veins on varix, (c) hematocystic spot, which means reddish elevated bloody cyst on varix



## 1.4 Instruments

The adequate basic instruments for hemostatic procedures include a large-channel endoscope with *the* water-jet function, an additional suction unit, and a water irrigation pump.

Variceal band ligation devices consist of a transparent, hollow chamber, friction-fit adapter affixed to the tip of the endoscope, preloaded elastic band(s), and a release mechanism. The target tissue is suctioned into the hollow chamber of the friction-fit adapter. A trigger mechanism deploys an elastic band, ligating the target tissue.

### 1.4.1 The Original Single-Shot Ligator

The original (and still available) banding device (Stiegmann-Goff ligator) usually requires the use of an overtube because the endoscope should be removed, reloaded, and repassed after each band is applied (Fig. 1.4a).

### 1.4.2 Multiple Ligating Devices

Multi-band ligating devices have largely replaced the original single-shot ligators, since the procedure is much simpler and faster. The multi-band band ligating systems have rendered overtubes largely obsolete, since 4–10 bands can be deployed without having to remove the endoscope. However, since longer length of multi-band ligating devices increases the non-flexible tip length, the passage into the esophagus may become more difficult in some patients. Overtubes can be helpful in such situations. The overtube also still offers advantages in acutely bleeding patients, even with multi-band ligating devices, when it comes to protection against aspiration pneumonia. Currently, several companies are producing multi-band ligating devices for treating esophageal varices (Fig. 1.4b–f).

### 1.4.3 The Sclerotherapy Needle

The regular sclerotherapy injection needle should have the smallest possible diameter to minimize the risk of back-bleeding from the injection site. An outer diameter of 0.5 mm is sufficient for liquid sclerosants. The length of the needle should not exceed 5 mm, and its bevel should be short.