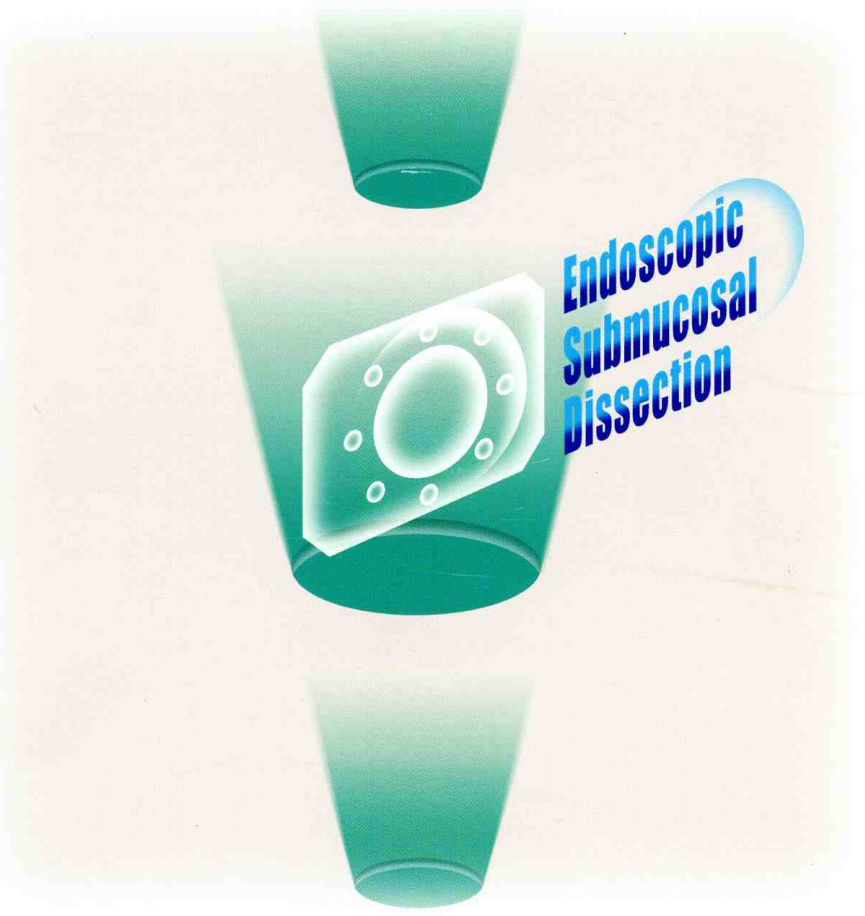
ESD
Endoscopic Submucosal Dissection
— Techniques —



Dr. Hiroyuki Ono Endoscopy and GI Oncology Division, Shizuoka Cancer Center
Dr. Takuji Gotoda Endoscopy Division, National Cancer Center Hospital, Tokyo
Dr. Tsuneo Oyama Department of Gastroenterology, Saku Central Hospital
Dr. Naohisa Yahagi Department of Gastroenterology and Digestive Endoscopy unit, Toranomon Hospital
Dr. Haruhiro Inoue Dr. Yoshitaka Sato Digestive Disease Center, Showa University Northern Yokohama Hospital
Dr. Toshihiko Doi Digestive Endoscopy and Gastrointestinal Oncology Division, National Cancer Center Hospital East

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Prologue

~Development of ESD Devices~

ITknife Technique <I>

Hiroyuki Ono Endoscopy and GI oncology Division, Shizuoka Cancer Center

The concept of the ITknife originated with Dr. Koichi Hosokawa, formerly of the National Cancer Center Hospital in Tokyo (and now at the Togariishi Clinic in Nagano). At the time, I was also working at the National Cancer Center Hospital and, together with Dr. Hosokawa, experimented with the ITknife on dogs. Our goal was to enable en-block resection by means of EMR and we looked for a knife that would perform horizontal cutting only without deep cutting. So we ordered an ITknife fabricated by attaching an insulating tip at the distal end of a needle knife. Once the knife had been developed, I worked in cooperation with Dr. Gotoda, a resident three years behind me, to establish an ITknife technique for clinical applications.

ITknife Technique <II>

Takuji Gotoda Endoscopy Division, National Cancer Center Hospital, Tokyo

I became a resident in the Endoscopy Division of the National Cancer Center Hospital in Tokyo in June 1995. Under the leadership of Dr. Koichi Hosokawa (now at the Togariishi Clinic in Nagano) who is a well-known idea man, I participated in a project aimed at improving the needle knife for use in the ERHSE technique. After trial development of the distal tip for prevention of perforation using various materials,we eventually came up with what is now known as the ITknife. When I completed the rotation, I returned to the Endoscopy Division in 1996 to find the chief resident, Dr. Hiroyuki Ono (now Director of the Endoscopy and GI Oncology Division, Shizuoka Cancer Center), working hard to apply the ITknife in actual EMR operations. As there were no residents who specialized in the upper gastrointestinal tract, I was lucky enough to attend Dr. Ono in this field and obtain experience in the use of the ITknife. I had originally become a National Cancer Center resident because I had wanted to perform colonoscopy, and it was only by chance and good luck that I encountered Dr. Hosokawa, Dr. Ono and the ITknife.

HookKnife Technique

Tsuneo Oyama Department of Gastroenterology, Saku Central Hospital

It started when I intentionally bent the distal end of a needle knife myself, thinking that I would be able to incise and dissect the mucosa more safely if the distal end of a needle knife were bent into an L-shape so that it could hook the mucosa before cutting. Later, I asked Olympus to create a similar prototype, which was later provided with a rotation function and eventually commercialized.

FlexKnife Technique

Naohisa Yahagi Department of Gastroenterology, Toranomon Hospital

In the beginning, we were looking for a knife that was flexible, easy to manipulate and had an adjustable distal end length. We noticed that the distal end of the thin snare (SD-7P) can be used to incise the mucosa and initially performed ESD as a thin snare technique. But this technique brings with it such problems as variation of the distal end length or splitting of the wire's distal end during a procedure. We therefore created the FlexKnife by increasing the wire strength and adding a stopper mechanism.

TriangleTipKnife Technique

Haruhiro Inoue / Yoshitaka Sato Digestive Disease Center, Showa University Northern Yokohama Hospital

A hook is also one of the basic surgical devices in endoscopic surgery (laparoscopic cholecystectomy). ESD also uses a hook, but axis alignment was often difficult with flexible scopes. So we designed the TriangleTipKnife which has three distal ends in three directions so to speak. This functions like a hook that does not need axis alignment.

ITknife Supporting Devices

Toshihiko Doi Digestive Endoscopy and Gastrointestinal Oncology Division, National Cancer Center Hospital East

ESD has proven that it can expand the indications and improve the curability of EMR. However, ESD's practice remains limited (due to accidents and complexity) and it is relegated to a minor position in the hierarchy of EMR procedures. When considering how to establish ESD as a more universal technique, keep in mind that the basic endoscopic treatment is biopsy. This led us to the idea that we should try to develop a mucosal incision technique that resembles biopsy. What usually throws off first-time users of the ITknife is that, while previous treatment devices are manipulated with a pulling action, the ITknife technique depends on advanced scope maneuvering except for the sections that can be cut by pulling the ITknife. In particular, the actions required to make introduction holes with a needle knife tend to be very unstable.
So, keeping in mind that biopsy-style manipulations are the cornerstone of any endoscopic treatment, I began to search for a way to perform ESD using similar manipulations. My first thought was that it would be safer if a hole could be made by grasping the mucosa via the introduction holes and then supplying current. We designed the HotClaw with as a tool for lifting the mucosa for incision and dissection. Our intention was to reduce the risk of perforation by applying an upward force instead of downward cutting force. For the Coagrasper, we focused on how to stop bleeding — one of the most critical complications associated with ESD — more quickly and more effectively.
Some hospitals still use the hot biopsy forceps for hemostasis, but as a device exclusively designed for hemostasis, the Coagrasper's shape and electrical characteristics are suitable for hemostasis. Our goal has always been to develop an ITknife technique that is safe and that can be easily performed by beginners.

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