Stories of ESD Device Development

ITknife Technique

Takagi Tatsuya, National Center for Global Health and Medicine

I became a resident in the Endoscopy Division at the National Cancer Center Hospital in June 1995. At that time, Dr. Koichi Hosokawa (presently at Showa University Northern Yokohama Hospital) was an active investigator who was experimenting to improve the needle knife used for ESD. After developing distal tips from various materials aimed at preventing perforation, he eventually arrived at what is now called ITknife. When I returned to the Endoscopy Division after completing my rotation in 1996, the chief resident, Dr. Hisao Hasuike (currently Director, Endoscopy and GI Oncology Division, Shizuoka Cancer Center) was struggling with ESD using ITknife and experiencing difficulties that are unimaginable today. The lucky thing for me was that there was another resident specializing in the upper gastrointestinal tract at that time. I was able to gain experience with ITknife by assisting Dr. Ono. I eventually became a Cancer Center resident with the hope of working in endoscopy, but I happily combined my convenience and luck to my encounter with Dr. Hosokawa, Dr. Ono, and ITknife.

ITknife2 Technique

Hisayuki Ono, Shizuoka Cancer Center

I have experienced the problems with ITknife, notably the fact that the cutting performance tends to deteriorate in cases with severe fibrosis such as ulcer scars. A few other doctors have also noted that lateral cutting is difficult with ITknife and that the ceramic tip at the distal end catches in the mucosa. So, I decided to make the tip longer to improve the cutting performance of the conventional ITknife, while maintaining its advantages. My idea was to attach the three short blades shaped like the three-pointed star of Mercedes-Benz at the bottom of the ceramic tip which are perpendicular to the conventional knife blade. I proposed this idea to Olympus for actual prototyping. When I applied the prototype in an actual clinical procedure after confirming its safety with a pig stomach, I was surprised by how well the cutting ability increased. I convinced myself with Drs. Isao and Hasuike saying that it would be hard to go back to the conventional ITknife once you have used ITknife2 and that this would be the definitive version for the ITknife technique.

HookKnife Technique

Nishina Yohsai, Keio University

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 a needle knife was bent more or less when it was used. I was thinking, ‘Why don’t we just use a hook as an incision instrument? A flexible tip may be a good assistant in basic surgical procedures, as well as in ESD. Axis alignment was difficult when using a flexible endoscope, so I invented TriangleTipKnife. This had three tips at the distal end pointing in three different directions, which act like hooks, but do not need axis alignment.

DualKnife Technique

Nishina Yohsai, Keio University

As suggested by the name “Dual,” DualKnife can be set to either of two lengths, eliminating the need for the precise knife length adjustment required with ITknife. The needle-knife design of DualKnife provides sharp incision performance, as well as easy removal of any tissue that coagulates on the mucosa via the distal holes when the knife is extended completely. The small disc on the tip remains projected so that it can easily be used for coagulation and haemostasis by contact. In my opinion it is a safer, easier-to-use knife than FlexKnife, solving the problems I experienced with FlexKnife.

Support Devices Technique

Yoshikazu Shinoda, National Cancer Center Hospital East

ESD has proven that it can expand the indications and improve the curability of EEMR. However, ESD’s practice remains limited and it is relegated to a minor position in the hierarchy of EEMR 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 massed incision technique that resembles biopsy. What exactly should be the first time used of the ESMD is that, while precise treatment devices are maintained with a pushing action, ESD with ITknife demands an advanced endoscopy maneuvering except for the sections that can be cut by pulling ITknife. In particular, the actions required to make introductory holes with a biopsy 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 introductory holes and then applying current. We also figured that ITknife is a tool for lifting the mucosa for incision and observation. Our intention was to reduce the risk of perforation by applying an upward force instead of a downward cutting force. For 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 haemostasis, but as a device exclusively designed for haemostasis, Coagrasper’s shape and electrical characteristics are suitable for haemostasis. Our goal has always been to develop an ITknife technique that is safe and can be performed by beginners.
**Interview With The Expert**

**Q.** What are the advantages of ITknife2?

Like ITknife, ITknife2 features a long stroke and can be easily operated by an assistant, making it possible to complete endoscopic surgery in a limited amount of time. In addition, the needle knife can be used as a deflection knife, so it is much easier to manipulate, allowing you to grasp the needle knife just like a hook knife.

**Q.** Are there any weak points of ITknife2?

I don’t think there is anything to be concerned about when using ITknife2. However, there are a couple of points to note. First, for areas where the endoscopic location is unknown, it is recommended to use a deflection knife. Second, the needle knife should be used with caution when cutting the submucosal layer. The key point is to ensure the correct needle knife position is used.

**Q.** Under what circumstances would you also use another device?

For areas like the duodenal bulb and esophagus, manipulation of ITknife2 is very delicate in narrow or thin-walled region; for example in ESD. For such cases, I often use a needle knife with a proximal attachment that facilitates stable manipulation under sufficient local anesthesia. There are also cases in which confirmation of the endoscope manipulation orientation is difficult, such as when the dissection plane is covered by a duodenal bulb. In such cases, we use a deflection knife to ensure the correct needle knife position is used.

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**Applicability of ITknife2**

**Difficulty by region**

- **Cardiac region**: Bleeding occurs by cutting towards the stomach.
  - Easier to approach the anterior wall of the body.
  - Posterior wall of the upper body is difficult.
  - Less easier to approach the posterior wall of the upper body.
  - Greater curvature of the upper body is difficult.
  - Greater curvature of the lower body is difficult.
  - Anterior wall of the lower body is difficult.
  - Anterior wall of the stomach is difficult.

- **Fundus**: Bleeding occurs by cutting towards the antrum.
  - Easier to approach the anterior wall of the body.
  - Posterior wall of the upper body is easy.
  - Less easier to approach the posterior wall of the upper body.
  - Greater curvature of the upper body is easy.
  - Greater curvature of the lower body is easy.
  - Anterior wall of the lower body is easy.
  - Anterior wall of the stomach is easy.

- **Lesser curvature of the upper body**: Bleeding occurs by cutting towards the pyloric ring.
  - Easier to approach the anterior wall of the body.
  - Posterior wall of the upper body is easy.
  - Less easier to approach the posterior wall of the upper body.
  - Greater curvature of the upper body is easy.
  - Greater curvature of the lower body is easy.
  - Anterior wall of the lower body is easy.
  - Anterior wall of the stomach is easy.

- **Greater curvature of the upper body**: Bleeding occurs by cutting towards the antrum.
  - Easier to approach the anterior wall of the body.
  - Posterior wall of the upper body is easy.
  - Less easier to approach the posterior wall of the upper body.
  - Greater curvature of the upper body is easy.
  - Greater curvature of the lower body is easy.
  - Anterior wall of the lower body is easy.
  - Anterior wall of the stomach is easy.

- **Anterior wall of the upper body**: Bleeding occurs by cutting towards the antrum.
  - Easier to approach the anterior wall of the body.
  - Posterior wall of the upper body is easy.
  - Less easier to approach the posterior wall of the upper body.
  - Greater curvature of the upper body is easy.
  - Greater curvature of the lower body is easy.
  - Anterior wall of the lower body is easy.
  - Anterior wall of the stomach is easy.

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**Abscess**

- **Easier**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Easy**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Ordinary**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Difficult**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Very difficult**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

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**Haemostatic forceps**

**Liquid**

- **Easy**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Easy**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Ordinary**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Difficult**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

- **Very difficult**: Mucosal incision (10,000X dilution) Used
  - Caution: Needle knife
  - Countertraction: Needle knife
  - Cautery setting: Slow 50W

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**Conclusion**

ITknife2 is a remarkable device that is easy to use and highly effective. It is a powerful tool for endoscopic surgery, and I highly recommend it to those who are looking to improve their endoscopic skills.
**Interview With The Expert**

**Q&A**

**What are the advantages of ITknife2?**
There is a clear improvement in cutting performance in lateral cutting and fibroid areas. It facilitates resection and dissection in these areas while maintaining the advantages of the conventional ITknife. The incision and dissection speeds have also been increased even more.

**Are any procedures or precautions different from the conventional ITknife?**
You can feel the difference in cutting performance by using the knife in the same way with ITknife. However, if you have to cut too deeply, you should be careful to avoid perforation. You should be careful with the knife until you get used to it. It's also a good idea to use the EndoCut mode. Or stop on the high-frequency switch intermittently with a continuous wave mode, to prevent ITknife2 from slipping and causing a perforation. In addition, as with ITknife, tying the knife down too much increases the risk of perforation, so ITknife2's design should be kept slightly upright direction than ITknife. Remember to be careful to avoid problems in the initial introductory phase. However, you won't need to think about these points once you've gotten used to ITknife2 after several uses.

**Are there any weak points of ITknife2?**
Although the cutting performance is better than ITknife, a certain degree of skill is required when working on sites where the knife needs to approach perpendicularly. Therefore, to prevent ITknife2 from slipping, you can use a needle knife until the mucosa is curled up in a certain amount and then switch to ITknife2.

**Under what conditions do you use other devices?**
Since I started using ITknife2, I have rarely needed to use a needle knife. However, a needle knife offers better cutting performance when an ulcer scar is very hard. In such a case, I use a needle knife until the mucosa is curled up in a certain amount and then switch to ITknife2.

**Applicability of ITknife2**

- **Difficulty per region**

  - **Cardiac region**
    - Posterior wall of middle body
      - Easy
    - Greater curvature of upper body
      - Ordinary
    - Lesser curvature of middle body
      - Difficult
  - **Fundus**
    - Lesser curvature of middle body
      - Difficult
    - Greater curvature of middle body
      - Easy
    - Lesser curvature of upper body
      - Easy
    - Greater curvature of upper body
      - Ordinary
    - Anterior wall of middle body
      - Difficult
    - Anterior wall of lower body
      - Difficult
  - **Corpus**
    - Anterior wall of middle body
      - Difficult
    - Anterior wall of lower body
      - Difficult
  - **Antrum**
    - Greater curvature of upper body
      - Ordinary
    - Lesser curvature of upper body
      - Easy

**Note for beginners:** It is recommended to start a trial procedure on a minor lesion in the anterior or posterior wall in the antrum or in the greater curvature. If the endoscope cannot approach the lesion in the lesser curvature of the lower body, it is recommended that you use a multi-bending endoscope.

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**Intravenous anaesthesia**
- **Premedication**: Opioid (perhexiline hydrochloride), cerine (hexametharamine), midazolam
- **General anaesthesia**: Not used
- **Monitoring**: Not used

**Electrosurgical unit**
- **Device**: APC probe
  - **Caution**: Causes little bleeding in marking and can leave clear marks.
  - **Setting**:
    - APC Flow 1 mL/min
    - APC Flow 2 mL/min

**SpO2, ECG, blood pressure, ETCO2, BIS**

**Device**
- **Caution**: If the vessels are plentiful and bleeding is expected, use the SoftCoag mode.
- **Setting**:
  - APC Flow 50 W
  - APC Flow 60 W
  - APC Flow 80 W

**Device**
- **Caution**: Large vessels should be coagulated using hot biopsy forceps in advance.
- **Setting**:
  - APC Flow 50 W
  - APC Flow 60 W
  - APC Flow 80 W

**Device**
- **Caution**: When vessels are plentiful and bleeding is expected, use the SoftCoag mode.
- **Setting**:
  - APC Flow 50 W
  - APC Flow 60 W
  - APC Flow 80 W

**Device**
- **Caution**: If coagulation is too strong, the EndoCut mode can also be used.
- **Setting**:
  - APC Flow 50 W
  - APC Flow 60 W
  - APC Flow 80 W

**Device**
- **Caution**: With a small perforation, make the ulcer floor approximate. If large, patching with omentum is easier.
- **Setting**:
  - APC Flow 50 W
  - APC Flow 60 W
  - APC Flow 80 W

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**Method**
- **Applying a clip. Prevent blind operation by avoiding bleeding and securing the field of view.**
- **Tying up the vessel.**

**Timing**
- Immediately after perforation if possible.
- Alternatively, when clips will not come in.

**Tip**
- With a small perforation, make the ulcer floor approximate. If large, patching with omentum is easier.
3) After you experience about 10 cases, observe procedures performed by experts again.

**Recommendation for beginners:**

**Upper Body**

- Anterior wall of upper body
- Greater curvature of upper body
- Lesser curvature of upper body

**Middle Body**

- Anterior wall of middle body
- Greater curvature of middle body
- Lesser curvature of middle body

**Lower Body**

- Anterior wall of lower body
- Greater curvature of lower body
- Lesser curvature of lower body

- Posterior wall of lower body

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**Under what circumstances do you also use other devices?**

I use a needle knife for circumferential incision. The needle knife is convenient because its cutting style is like flicking the tissue. Also, ITknife and FlexKnife have a higher vertical incision speed so I sometimes use them instead of HookKnife.

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**What are the advantages of HookKnife?**

Above all, it’s safer than a needle knife because it hooks the mucosa for incision and dissection, so it is less invasive for the deeper tissues. The rotary function provides another advantage, the ability to align the knife horizontally or vertically. Marking with the back of HookKnife will reduce the risk of perforation. In addition, safer use is possible by mounting an attachment to the endoscope's distal end to maintain the field of view and by pulling the mucosa into the attachment before supplying current. The capability to perform dissection by directly observing the submucosal layer enables precoagulation. It is nice to be able to perform dissection with a good view and no bleeding.

The muscle layer is a white cloudy thick wall, while the submucosal layer is transparent. Therefore, the two layers are easy to distinguish. The vessels in the submucosal layer can be observed more transparently when indigo-carmine is not used. Also, it does not include cautery or bluing.

**What are the advantages of HookKnife?**

- Above all, it’s safer than a needle knife because it hooks the mucosa for incision and dissection, so it is less invasive for the deeper tissues.
- The rotary function provides another advantage, the ability to align the knife horizontally or vertically.
- Marking with the back of HookKnife will reduce the risk of perforation.
- In addition, safer use is possible by mounting an attachment to the endoscope's distal end to maintain the field of view and by pulling the mucosa into the attachment before supplying current.
- The capability to perform dissection by directly observing the submucosal layer enables precoagulation.
- It is nice to be able to perform dissection with a good view and no bleeding.

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**Are there any weak points of HookKnife?**

Due to the fact that the hook length is 1.3 mm long, it is unavoidable to say that the cutting amount for each time is not plentiful.

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**Applicability of HookKnife**

- **Difficulty per region**
  - **Cardiac region:** Posterior wall of upper body
  - **Foregut:** Lesser curvature of upper body
  - **Mediastinal region:** Greater curvature of esophagus
  - **Upper esophagus:** Lesser curvature of middle body
  - **Esophagus:** Lesser curvature of lower body
  - **Anterior wall of middle body:** Anterior wall of distal esophagus
  - **Antrum:** Lesser curvature of upper body

- **Selection of instruments**
  - **Clip suture:** Dissect to some extent before clipping to prevent the clip from interfering with subsequent treatment.

- **Perforation made by HookKnife**
  - About 1–2 mm small.

- **Caution**
  - Used Not used
  - Used Not used
  - Used Not used

- **Device**
  - **HookKnife**
  - **Coagrasper**

- **Setting**
  - **Device Caution**
  - **Countertraction**
  - **SprayCoag 60W**
  - **APC mode 60W**
  - **SoftCoag 60W**

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**Interview With The Expert**

**QA:**

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**Device**

- **HookKnife**: Use the hook part to approach/interpalpate toward the proper muscle layer. Use the anterior wall approaching is possible if allowed.

- **Coagrasper**: If feeding continues, the grasped position may be inappropriate. It is important to try grasping a different position.

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**Tutorial**

- **Clip suture**: Dissect to some extent before clipping to prevent the clip from interfering with subsequent treatment.

- **Perforation made by HookKnife**: About 1–2 mm small. A single clip can suture it and air leak is low.

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**Information as of October 1, 2009.**

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**Device**

- **HookKnife**
  - **Model KD-620LR**
  - **Dr. Tsuneo Oyama**
  - **Saku Central Hospital**

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**HookKnife**

- **Preparation**
  - **Posterior wall of upper body**
  - **Posterior wall of middle body**
  - **Posterior wall of lower body**

- **Procedure**
  - **Preparation**
  - **Then Dissection**

- **Electrosurgical unit**

- **Setting**

- **Device Caution**

- **Countertraction**

- **SprayCoag 60W**

- **APC mode 60W**

- **SoftCoag 60W**

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**Conclusion**

- **Device**
  - **HookKnife**
  - **Coagrasper**

- **Method**

- **Timing**

- **Tip**

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* May not be available in your area.
Applicability of DualKnife

### Difficultly per region

<table>
<thead>
<tr>
<th>Region</th>
<th>Difficulty</th>
<th>Easy</th>
<th>Ordonary</th>
<th>Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac region</td>
<td>3</td>
<td>More than 2 mm</td>
<td>Medium</td>
<td>Less than 2 mm</td>
</tr>
<tr>
<td>Pyloric ring</td>
<td>4</td>
<td>( \rightarrow ) 200 ( \times ) dilution</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
</tr>
<tr>
<td>Greater curvature of antrum</td>
<td>4</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
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<tr>
<td>Posterior wall of upper body</td>
<td>4</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
</tr>
<tr>
<td>Preserved liver tissue</td>
<td>4</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
<td>( \rightarrow ) 10,000 ( \times ) dilution</td>
</tr>
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### Interview With The Expert

**Q. What are the advantages of DualKnife?**

DualKnife is an improvement over FlexKnife that offers safer and easier use while it continuously provides all the benefits of FlexKnife. DualKnife can be set to either of two lengths. When the knife is extended to maximum length, it can be used for incision and dissection. When the knife is retracted, the kniﬁe tip still protrudes by 0.5 mm so it can be used for marking as well as simple haemostasis. The knife length can be set to either 2 mm or 1.5 mm. The 2 mm length is for gastric ESD, while the 1.5 mm length is for esophageal ESD. The knife tip has a projecting section, which catches the tissue during incision and dissection, considerably improving knife maneuverability. Moreover, the dome-shaped knife tip improves the knife contact during incision and dissection. In addition, the outer diameter of the sheath is just 2 mm, so smooth water and smoke suction is possible even when the knife is retracted in the instrument channel.

**Q. What are the differences between FlexKnife and DualKnife in terms of operation and precautions?**

The basic procedures are identical, but the thin, needle-shaped design of DualKnife provides superior incision performance. Consequently, physicians typically set DualKnife’s high-frequency power about 10 W lower than FlexKnife. In addition, burn tissue does not get attached to DualKnife compared to FlexKnife. Even when residue bleed heavily.

**Q. Are there any weak points of DualKnife?**

The knife is short so it cannot incise unless the knife is brought in contact optimally. The thinness of the sheath makes it hard to transmit proper force. The thinness of the sheath widens, distance is made to transmit proper force. For pulsatile bleeding, I use Coagrasper. Moving the knife slowly when dissecting small vessels.

**Q. Under what circumstances would you also use another device?**

Though not as frequently as when I used FlexKnife, I sometimes switch to DualKnife when I encounter advanced fibrosis during dissection, limited space for endoscope maneuver, or unstable knife contact due to severe respiratory movements. Haemostatic for small amount of bleeding can generally be achieved by bringing the retracted knife in contact for coagulation. For pulsatile bleeding, I use Coagrasper.

**Applicability of DualKnife**

<table>
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### Intraoperative anaesthesia

<table>
<thead>
<tr>
<th>General anaesthesia</th>
<th>Monitoring</th>
</tr>
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<tbody>
<tr>
<td>Less than 2 hours</td>
<td>More than 2 hours</td>
</tr>
<tr>
<td>Pethidine hydrochloride 35 mg</td>
<td>All cases: SpO2, blood pressure</td>
</tr>
<tr>
<td>Cefazolin (dissomethyl) 5 to 10 mg (appropriate amount)</td>
<td></td>
</tr>
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</table>

### Monitoring

<table>
<thead>
<tr>
<th>Device</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>DualKnife</td>
<td>Retract the knife.</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>Used</td>
</tr>
</tbody>
</table>

**Electrosurgical unit**

### VIO-300D

<table>
<thead>
<tr>
<th>Device</th>
<th>Caution</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>DualKnife</td>
<td>Retract the knife.</td>
<td>SoftCoag 50W  Effect 4</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>Used</td>
<td>SoftCoag 50W</td>
</tr>
</tbody>
</table>

### YD-300D (Storz) / ESG-140 (Oraput Medical System)

<table>
<thead>
<tr>
<th>Device</th>
<th>Caution</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>DualKnife</td>
<td>Do not perform circumferential incision.</td>
<td>ForceCut 30W 20 W 40W 50W</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>Used</td>
<td>ForceCut 30W 20 W 40W 50W</td>
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### Sedation

<table>
<thead>
<tr>
<th>Device</th>
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<th>Setting</th>
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<tbody>
<tr>
<td>DualKnife</td>
<td>Move the knife slowly when dissecting small vessels.</td>
<td>ForceCut 30W 20 W 40W 50W</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>Used</td>
<td>ForceCut 30W 20 W 40W 50W</td>
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### Marking

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### ForceCut

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<tr>
<th>Device</th>
<th>Caution</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>DualKnife</td>
<td>For venous bleeding, contact the bleeding point with the retracted knife and supply current for a very short period.</td>
<td>ForceCut 30W 20 W 40W 50W</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>Used</td>
<td>ForceCut 30W 20 W 40W 50W</td>
</tr>
</tbody>
</table>

### Selective use

<table>
<thead>
<tr>
<th>Device</th>
<th>Caution</th>
<th>Setting</th>
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<tbody>
<tr>
<td>DualKnife</td>
<td>For arterial bleeding, use Coagrasper.</td>
<td>ForceCut 30W 20 W 40W 50W</td>
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<tr>
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**Device Caution Setting**

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<thead>
<tr>
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<tbody>
<tr>
<td>DualKnife</td>
<td>Do not perform circumferential incision.</td>
<td>ForceCut 30W 20 W 40W 50W</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>Used</td>
<td>ForceCut 30W 20 W 40W 50W</td>
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</tbody>
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### ForceCut

<table>
<thead>
<tr>
<th>Device</th>
<th>Caution</th>
<th>Setting</th>
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</thead>
<tbody>
<tr>
<td>DualKnife</td>
<td>Move the knife slowly when dissecting small vessels.</td>
<td>ForceCut 30W 20 W 40W 50W</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>Used</td>
<td>ForceCut 30W 20 W 40W 50W</td>
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### selective use

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**Applicability of DualKnife**

- **Overall**: DualKnife enables easy operation.
- **Multi-bending endoscope**: The thinness of the sheath to transmit proper force.
- **Mucosa and it is difficult to transmit force**.

---

**Small vessels**: Use the SwiftCoag mode and cut by moving the knife slowly.

**Large vessels**: Use haemostatic forceps in the SoftCoag mode. Grasp the vessel, lift it up slightly and supply current. For arterial bleeding, use Coagrasper.

**Clip suture**: Apply the auxiliary water jet function to confirm the bleeding point.
Interview With The Expert

What are the advantages of TriangleTipKnife?

First, it does not need any kind of axis alignment. It can hook effectively in any direction. Also, by discharging spray coagulation, the submucosal layer will be dissected without any contact of the knife.

Are there any weak points of TriangleTipKnife?

When there is serious fibrosis in submucosal dissection, it is better to use a hook because it has a thinner distal end than TriangleTipKnife.

Under what conditions do you use other devices as well?

If the dissected part of the mucosa starts dangling when you are about to resect, it's easier to complete the procedure using ITknife.

If haemostasis using the tip of TriangleTipKnife is difficult, use Coagrasper by contacting the retracted knife tip to the bleeding point. Also effective to do haemostasis by contacting the retracted knife tip to the bleeding point.

A small perforation with a size of 10 mg + Dormicum (midazolam)* can be covered with a clip for conservative treatment.

Operation area

- Greater curvature
- Lesser curvature
- Fornix
- Cardiac region
- Greater curvature of antrum
- Lesser curvature of antrum
- Pyloric ring

Device Setting

- Caution: Use forceps to grasp the bleeding point and supply current for 2 or 3 seconds in the SoftCoag mode. It is important to confirm the bleeding point to grasp it accurately.

- Setting: SoftCoag 80W Effect

Intravenous anaesthesia

- Premedication: Buscopan, scopolamine butylbromide* 1 ampule
- General anaesthesia: Perform the procedures in the operating room under general anaesthesia when it is expected to take more than two hours.

Electrosurgical unit

- VIO-300D (Erbe)*
- ESG-100 (Olympus Medical Systems)

Monitor

- SpO2, ECG and blood pressure are monitored in all cases.

- Information as of October 1, 2009.

Caution

- Use sufficient bulging, and perform dissection with the knife tip.

- A small perforation with a size of 10 mg + Dormicum (midazolam)* can be covered with a clip for conservative treatment.

- The basic is to obstruct the hole with a clip immediately after perforation. If clipping is difficult, it is sometimes recommended to incise or dissect a little further and retry clipping.

- May not be available in your area.

Difficult region

- Greater curvature of upper body
- Lesser curvature of upper body
- Greater curvature of middle body
- Lesser curvature of middle body
- Greater curvature of lower body
- Lesser curvature of lower body
- Greater curvature of anterior wall
- Lesser curvature of anterior wall
- Posterior wall of upper body
- Anterior wall of upper body
- Greater curvature of middle body
- Lesser curvature of middle body
- Greater curvature of posterior wall
- Lesser curvature of posterior wall

Note for beginners: The most difficult regions are the upper part and posterior wall side of the stomach.
ITknife are welcomed for beginners. Beginners should start with lesions that do not require dissection after circumferential incision. Keep in mind that ESD (haemostasis, dissection, and incision) becomes unmanageable. If the curability is expected to be lower than that of piecemeal with preoperative diagnosis of m/ul (-). The operator must know another method besides ESD to complete the treatment in case continuing difficulty per region.

**Note for beginners:**

**Applicability of the Support Devices**

<table>
<thead>
<tr>
<th>Device</th>
<th>Caution</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>HotBite</td>
<td>No mark</td>
<td>Forced 35W</td>
</tr>
<tr>
<td>Needle knife</td>
<td>No mark</td>
<td>Forced 35W</td>
</tr>
</tbody>
</table>

**Support Devices**

<table>
<thead>
<tr>
<th>Device</th>
<th>Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HotClaw</td>
<td>FD-420LR</td>
<td>Recommended for connecting the incised parts or when approach with ITknife is difficult. HotClaw can be applied after 2CH endoscope. Facilitated by using a 2CH endoscope. Pulling cut direction (2CH endoscope: An appropriate biopsy port is used). Suitable for beginners. *A HotBite may also be used with scarring, etc.. thanks to “ITknife’s line contact with tissue.” Coagulation performance is quite stable with full consideration for safety. HotClaw is suitable for connecting the incised parts or when approach with ITknife is difficult. Hemostasy performance is also suitable thanks to “ITknife’s line contact with tissue.” HotBite: Use the distal end in the same way as a coagulation probe. Low risk of perforation.</td>
</tr>
<tr>
<td>Coagrasper</td>
<td>FD-410LR</td>
<td>Recommended for circumferential incision of a 30-mm (or less) differentiated carcinoma and safety. Using the appropriate device for a specific purpose is important, but there are affinities depending on the lesion. Preventive Sedation: Intravenous anaesthesia: Premedication: General anaesthesia: Monitoring:</td>
</tr>
</tbody>
</table>

- Intravenous anaesthesia: | Premedication: | General anaesthesia: | Monitoring: |
- Successful induction | No mark: | No mark: | Used with all cases |
- Successful intubation | No mark: | No mark: | |
- Successful maintenance | No mark: | No mark: | |
- Sedation Marking | Local injection: | | |
- Complications: | | | |
- Haemostasis: | | | |
- Dissection: | | | |
- Incision: | | | |
- Caution: | | | |
- Counteraction: | | | |
- Setting: | | | |
- Method: | | | |
- Timing: | | | |
- Tip: | | | |
- Clipping (Ligation snare can also be used together.) | | | |
- Immediately after finding perforation. | | | |
- Discontinue the procedure if required and start over the next day. | | | |

**Device Caution Setting**

- **Device:** ITknife, Coagrasper, HotClaw, HotBite, Needle knife
- **Caution:** Use with all cases
- **Setting:** Forced 35W, Forced 35W

**Electrosurgical unit**

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**Note for beginners:** These devices are basically recommended for circumferential incision of a 30-mm (or less) differentiated carcinoma with preoperative diagnosis of m/ul (+). The operator must know another method besides ESD to complete the treatment in case continuing difficulty per region. If the curability is expected to be lower than that of piecemeal with preoperative diagnosis of m/ul (+), the operator must know another method besides ESD to complete the treatment in case continuing difficulty per region. In addition, cutting regions with strong fibrosis may be difficult. Due to the fact that, in present, coagulation results in strong degradation and electrosurgical systems have not yet been improved, these devices may become difficult even if the current is supplied. In addition, cutting regions with strong fibrosis may be difficult. Due to the fact that, in present, coagulation results in strong degradation and electrosurgical systems have not yet been improved, these devices may become difficult even if the current is supplied.

**Use of indig:** Recommended in principle.

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**Applicability of the Support Devices**

<table>
<thead>
<tr>
<th>Difficulty per region</th>
<th>Easy</th>
<th>No mark</th>
<th>Ordinary</th>
<th>Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater curvature of middle body</td>
<td>Used with all cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesser curvature of middle body</td>
<td>Used with all cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer wall of middle body</td>
<td>Used with all cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer wall of lower body</td>
<td>Used with all cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater curvature of lower body</td>
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