Endoscopic Submucosal Dissection of Early Gastric Cancer Using the Insulated Tip Knife

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Abstract

Endoscopic submucosal dissection (ESD) is an endoscopic technique in which a gastrointestinal mucosal neoplasm can be excised by cutting through the submucosa with an endoscopic knife. It can be used with diagnostic or therapeutic intent and allows *en bloc* removal of the specimen. ESD usually begins with identification and evaluation of the lesion and assessment of the margin with chromo-endoscopy. The subsequent steps include marking, submucosal injection, and circumferential and submucosal dissection. Complications should be promptly recognized and dealt with immediately if necessary.

This video demonstrates the main steps of the technique and management of complications. This article is part of an expert video encyclopedia.

Keywords

Bleeding; Endoscopic submucosal dissection; IT-knife; Needle knife; Standard endoscopy; Video.

Video Related to this Article

Video available to view or download at doi:10.1016/S2212-0971(13)70058-X

Technique

- Endoscopic submucosal dissection.

Materials

- Endoscope: GIF-H180 Video Gastroscope; Olympus, Tokyo, Japan.
- Saline (NaCl 0.9% with epinephrine 0.5 mg 100 ml^{-1} and methylene blue).
- Indigo carmine.
- Spray catheter: PW-6P-1; Olympus, Tokyo, Japan.
- Needle knife: KD-1L-1; Olympus, Tokyo, Japan.
- Insulated-tip knife (IT-knife/IT-knife 2): KD-610L/KD-611L; Olympus, Tokyo, Japan.
- Coagrasper: FD-410LR; Olympus, Tokyo, Japan.

Endoscopic Procedure

Endoscopic submucosal dissection (ESD) is a well-recognized endoscopic technique used in the treatment of gastrointestinal superficial neoplasms. If successful, it allows *en bloc* removal of the specimen with the intention to achieve complete cure of the disease.

ESD should be applied when there is a possibility to excise the lesion totally and *en bloc*, with negligible risk of lymph node metastasis. In 2000, Gotoda *et al*. analyzed 5265 patients who had undergone gastrectomy with lymph node dissection for early gastric cancer, and found that none of the 1230 well-differentiated intramucosal cancers less than 30 mm diameter were associated with nodal metastases regardless of ulceration findings.[1] Recently, the criteria to perform ESD have been expanding, and bigger lesions (>20 mm), partially ulcerated (IIc) and with submucosal invasion (<500 μm), are being treated by this method.

Historically, ESD has evolved from the older techniques of endoscopic mucosal resection, namely endoscopic resection, after local injection of a solution of hypertonic saline-epinephrine. Over the years many improvements have occurred, and the technology behind this technique has evolved. Several endoscopic knives are used in ESD, including the IT-knife, needle knife, hook knife, flex knife, triangle-tipped knife, flush knife, dual knife, Mucosectome 2 (DP-D2518/DP-D2622, Pentax, Tokyo, Japan), and the Swanblade (DC-D2618, Pentax, Tokyo, Japan), to name a few.

This video demonstrates this technique, divided into its main steps (identification and delimitation of the lesion, chromoendoscopy, marking, and submucosal injection and dissection) in two different gastric lesions. Complications such as arterial bleeding and their resolution are demonstrated.

Key Learning Points/Tips and Tricks

- The selection of the lesions is vital, and difficult lesions or less comfortable locations such as the incisura or cardia should be addressed with adequate time and resources.

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- Circumferential dissection should always precede the rest of the submucosal dissection because partial dissection can later complicate the procedure (mainly with lesser trained endoscopists).
- Slight to moderate bleeding should always be expected and managed as necessary with coagulation forceps or epinephrine injection.
- During the dissection, clipping should be avoided because it can complicate the rest of the procedure.
- At the end of the procedure, review of the wound and coagulation of submucosal vessels is recommended.

Scripted Voiceover

Time (min:sec)	*Voiceover text*
00:06	Endoscopic submucosal dissection is a technique applied for resection of gastrointestinal (GI) superficial neoplastic lesions. It can have diagnostic or therapeutic intent.
00:18	In the stomach endoscopic submucosal dissection (ESD) can be a therapeutic tool in lesions less than 20 mm, and confined to the mucosa. Recently, the spectrum of applications has been broadened and submucosal invasion can be tolerated if the neoplastic invasion is less than 500 μm.
00:30	In our unit ESD is performed under deep sedation with endotracheal intubation and mechanical ventilation. It is considered essential for stability through the procedure and patient tolerance. Moreover, continuous evaluation of vital signs is paramount in the identification of possible complications or intercurrences.
00:58	The materials used in this procedure include a gastroscope with high resolution, an injection catheter and spraying catheter for chromoendoscopy. There is a considerable choice of knives that might be selected to access the submucosa and dissect it afterwards: two of the most popular knives are the insulated tip knife, the so called "IT"-knife, which is illustrated in image "g" and the needle-knife, which is illustrated in image "a" on the upper left side of the box. Several characteristics of these knives and the experience of the endoscopist determine the selection.
01:10	Here we demonstrate the use of the spraying catheter and the endoscopic knifes.
01:24	The hook knife has a 90 degree deflection and can be rotated 360° by the assistant, which helps orienting the dissection.
01:46	The IT-knife offers the advantage of an insulated ceramic tip that helps prevent perforation. However, initial mucosal incision for submucosal access has to be performed with a non-insulated knife that cuts deep. For this purpose we use a needle or flex-knife.
01:58	The first step in ESD is the identification of the lesion. Chromoendoscopy with a contrast dye like indigo carmine can be very helpful for demarcation of the neoplasia.
02:02	Here you see visualization of a lesion with narrow band imaging and indigo carmine spraying.
02:12	After this, the lesion's lateral margins are marked with a needle-knife in soft coagulation mode (20–40 W) with a 3 mm margin of normal mucosa. This provides a safety margin to achieve clean borders in the histology specimen. Argon plasma coagulation (APC) can also be used in this step.
02:16	Here you see marking of the lesion that is located at the incisura angularis.
2:38	In a next step submucosal injection is performed to provide mucosal lifting.
02:42	A variety of solutions can be used for this purpose. In this case we use saline with epinephrine solution 0.5 mg/100 ml and mixed with some methylene blue.
02:59–03:03	Before we can start submucosal dissection we need to achieve submucosal access with a circumferential incision. For this purpose we use the needle knife. Our strategy is to perform limited incisions in all four quadrants of the lesion. Each incision is about 2 mm long and it should be deep enough to overcome the muscularis mucosa.
3:07	Here the needle knife incisions are performed.
3:25–03:28	Now we are ready to start circumferential dissection. For this purpose we switch to the IT-knife. The IT knife is inserted in the incisions and then submucosal circumferential dissection is performed uniting all four pre-existing incisions.
3:30	There are different strategies for circumferential dissection. We prefer complete circumferential dissection to isolate the lesion from the surrounding mucosa.
3:53–03:55	Following circumferential dissection, it is prudent to once again lift the lesion by repeated submucosal injection to maximize the diameter of the submucosa. Then we can start with submucosal dissection.
4:05	For dissection we also use the IT-knife. There are a few important rules during dissection: always avoid superficial cutting because this might compromise the lesion integrity. The knife should be kept as parallel as possible to the gastric wall to avoid deep lesions and reduce the risk of perforation. Also, try to apply traction force in the submucosal fibers to dissect.
4:48–04:50	Common complications include bleeding and perforation. Significant arterial bleeding should be addressed with coagulation of the bleeding vessel with hemostatic forceps (soft coagulation mode 80 W).
05:02	When you apply hemostatic forceps always keep traction on the vessel away from the deeper tissues to avoid transmural coagulation.
05:20	Now complete resection of the lesion is achieved and the specimen can be retrieved.
5:28–05:31	After the removal of the specimen, the wound should be carefully evaluated to detect points of wall fragility and submucosal vessels that need to be coagulated.

5:31 These are some important tips that help to perform successful ESDs:

1. The most important issue is to select the right lesions for resection.
2. Before submucosal dissection of the lesion our strategy is to perform complete circumferential dissection. However, there are also ESD experts who recommend semicircumferential incision and completion of the circumcision in a later phase of the procedure.
3. For management of mucosal bleeding use a coagulation forceps rather than clipping because this might interfere with dissection.
4. At the end of the procedure always perform thorough evaluation of the wound and perform prophylactic coagulation or clipping of vessels.

Reference

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Further Reading

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