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Argon Plasma Coagulation in Barrett's Esophagus

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Abstract

In the present case, thermal ablation of the Barrett's remainder by argon plasma coagulation (APC) is shown in a patient recently cured of early Barrett's cancer by endoscopic resection. Ablation is carried out in order to reduce the risk of metachronous neoplasia in the residual nonneoplastic Barrett's esophagus.

APC is applied dynamically in longitudinal and circumferential stripes, and a wattage of 50 is used. In this patient, the Barrett's segment is completely ablated in one session. This article is part of an expert video encyclopedia.

Keywords

Ablation; Argon plasma coagulation; Barrett's esophagus; Video.

Video Related to this Article

Video available to view or download at doi:10.1016/S2212-0971(13)70003-7

Materials

- APC (VIO APC 300D with APC 2; ERBE Elektromedizin GmbH, Tübingen, Germany).
- Flexible front-fire APC probe (ERBE Elektromedizin GmbH, Tübingen, Germany).
- Pulsed APC; effect 2; VIO APC 200 (ERBE Elektromedizin GmbH, Tübingen, Germany).

Background and Endoscopic Procedure

Argon plasma coagulation (APC) is a widely established method in gastrointestinal endoscopy.

The first video shows the theoretical background of APC and the second video shows a case of APC ablation in Barrett's esophagus (BE).

When using APC during endoscopy, an ablation probe is introduced via the working channel of the endoscope, and thermal energy is transferred to the target tissue via ionized argon gas without the need of direct contact of the APC probe to the tissue.

APC has been shown to be effective and safe especially in various gastrointestinal bleeding disorders and BE.[1]

In BE, thermal ablation is mainly carried out after successful endoscopic treatment of early Barrett's neoplasia in order to reduce the risk of metachronous neoplasia in the nonneoplastic Barrett's remainder.[2,3] In contrast, ablation of primarily nonneoplastic BE is not indicated because of a very low risk of malignant transformation.

In the present case, thermal ablation of the Barrett's remainder by APC is shown in a patient recently cured from early Barrett's cancer by endoscopic resection (ER).

APC is applied dynamically in longitudinal and circumferential stripes, and a wattage of 50 is used (pulsed APC, effect 2; VIO APC 300D with APC 2). During one ablation session, the Barrett's segment can be completely ablated in the present case.

There are general recommendations that can be given for endoscopists who use APC ablation for BE. First, in order to avoid painful distension of the stomach or other abdominal organs, intermittent suction of the argon gas previously inflated should be carried out during an APC procedure, or at least at the end of any APC procedure in the gastrointestinal tract. Second, coagulated and dehydrated tissue may get stuck on the tip of the APC probe. To avoid coagulation of the APC probe, intermittent cleaning of the tip is recommended. Third, direct contact of the tip of the APC probe with the target tissue should be avoided whenever possible in order to keep the risk of gastrointestinal (GI) wall perforation as low as possible.

In general, APC is considered a contact-free ablation method. APC of the target tissue can be carried out using a distance of 1–5 mm, depending on the power setting used: the higher the power setting chosen, the larger can be the distance to the target tissue.

Several trials have been able to show that it is in general feasible and safe to eradicate BE by means of APC. Nevertheless, incomplete eradication may occur.[4,5] In the largest trial reported on this issue so far, the complete BE eradication rate was 77%.[1]

APC, as any other ablation method, for example, also the widely used method of radiofrequency ablation (RFA), should not be used in BE that still shows neoplastic changes, including macroscopic changes such as nodularities or ulcerations, or histologically proven neoplasia in flat BE. In these cases, residual malignancy should primarily be ruled out by biopsy or ER, depending on the macroscopic appearance, as only through this can a true tissue diagnosis be obtained.

According to the recently published consensus statements for management of Barrett's dysplasia,[6] RFA was described as

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the currently best available ablation technique for eradication of residual Barrett's mucosa after focal ER. Other ablation techniques mentioned in these statements were APC, as used in the present case, and cryotherapy.[6] However, it has to be pointed out that up to now, no randomized trial exists comparing RFA to APC or cryotherapy in nonneoplastic BE. Therefore, the value of the various methods of thermal ablation has not yet been definitely clarified.

It can be assumed that for long BE segments, the balloon-based method of RFA may be quicker than APC because fewer ablation sessions may be required for complete ablation. However, APC may be useful especially for the ablation of small Barrett's remainders, for example, in the area of the esophagogastric junction, or for islands of residual BE, as it is quick and easy to use and relatively cheap.

It is still under discussion whether APC may lead to a higher rate of buried glands in comparison with RFA. However, up to now, no randomized trial has been published on this issue. In the literature, buried glands have been reported in up to 40% of patients with BE treated by APC.[4,5] This relatively high rate of buried glands may have derived from an inhomogenous depth of tissue injury as a result of APC. It has therefore to be pointed out that APC has to be carried out meticulously in order to ablate BE homogenously. However, long-term results of ER plus APC for eradication of Barrett's neoplasia and ablation of the BE remainder have been reported to be excellent.[3] Therefore, APC still plays an important role in the management of BE.

Key Learning Points/Tips and Tricks

- APC should be used dynamically in order to avoid deep GI wall damage; do not stay too long in one place (at best 1–2 s).
- APC is applied longitudinally or circumferentially.
- For Barrett's ablation, a mean wattage of 40–50 (pulsed APC, effect 2; VIO 300D with APC 2) should be chosen in order to keep the rate of complications low (especially strictures) and to achieve an adequate ablation success.
- The tip of the APC probe (approximately 1 cm in length) should be visible during ablation in order to avoid damage to the endoscope.
- Direct contact of the tip of the APC probe to the target tissue should be avoided whenever possible during application in the GI tract in order to avoid deep thermal damage to the GI wall. In general, APC can be used as a contact-free ablation method. In clinical practice, the distance between the tip of the probe and the target tissue is at best 1–5 mm, depending on the power setting used.
- To avoid painful distension of the stomach or other abdominal organs, intermittent suction of the argon gas should be carried out during any APC procedure.
- Coagulated and dehydrated tissue may get stuck at the tip of the APC probe during an ablation procedure. It is recommended to clean the tip of the probe intermittently in order to avoid coagulation effects at the tip of the probe.

Scripted Voiceover

Video 1

Time (min:sec)	*Voiceover text*
00:00–00:05	This video shows the physical principle of argon plasma coagulation.
00:06–00:13	The argon plasma coagulation (APC) system consists of a gas source, for example argon gas, a high-frequency generator, and an applicator.
00:14–00:26	The high-frequency electrode of the applicator is surrounded by argon gas. The high-frequency current ionizes the argon gas, and a plasma field is created between the probe tip and the tissue surface.
00:27–00:33	This allows the current to flow to the tissue without contact.
00:34–00:39	The thermal effect causes a dehydration of the tissue that is decreasing its contactivity.
00:40–00:52	The flow lines diverge automatically to hemorrhagic, electrically more conductive areas. This creates a self-limiting, uniform penetration depth.
00:53–01:04	First, a zone of desiccation forms at the tissue surface. Below it, a zone of coagulation, and then of devitalization, is created.
01:05–01:08	There is no vaporization as with a laser.
01:09–01:12	Desiccation causes an immediate shrinkage of the tissue.
01:13–01:17	There is very little char build up in the tissue since argon is an inert gas.

Video 2

Time (min:sec)	*Voiceover text*
00:00–00:17	This 70-year-old patient recently underwent endoscopic resection for early Barrett's cancer. Scarring and residual Barrett's mucosa can be seen mainly at the gastroesophageal junction.
00:18–00:25	Thermal ablation of residual Barrett's is carried out using argon plasma coagulation (APC).
00:26–00:42	After a flexible APC probe has been introduced via the working channel of the endoscope, the Barrett's mucosa is ablated dynamically using a wattage of 50.
00:43–00:49	Finally, tiny islands of Barrett's mucosa are ablated in the tubular esophagus.

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