

Colonic injury from electric arcing: a significant complication of argon plasma coagulation

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Argon plasma coagulation is increasingly used in endoscopic haemostasis. This case report illustrates the potential for thermal injury at a staple line remote from the area of argon plasma coagulation treatment as a result of electrical arcing. Increasing numbers of colorectal anastomosis and reconstruction procedures are now being performed using stapling techniques and the use of argon plasma coagulation in these patients has become a common situation in clinical practice. Information about this potential danger should be well disseminated to endoscopists and surgeons to avoid preventable complications. The presence of a staple line nearby should be considered a contra-indication for argon plasma coagulation.

Introduction

Argon plasma coagulation (APC) is an established technique for achieving endoscopic haemostasis and tissue ablation.¹⁻⁸ Due to the electric arcing effect, deep thermal injury is minimised and it has been shown to be a relatively safe technique both in vitro⁹ and in vivo.^{10,11} The following case report, however, illustrates an important potential complication that may occur when APC is applied near a stapled colonic anastomosis.

Case report

A 58-year-old man with carcinoma of the rectum was managed with a total mesorectal excision and a colonic L-pouch (side-to-end anastomosis reconstruction). He presented 9 months after the operation for recurrent episodes of rectal bleeding in April 2007. Colonoscopy showed a small granuloma (Fig 1a) at the colo-anal anastomosis with contact bleeding. This was judged to be the bleeding source as no other abnormality was found in the colon or the anal canal. The granuloma was biopsied and coagulated with APC to prevent further bleeding. The APC was performed with the Erbe system (Erbe Medical, Tübingen, Germany) that included an argon source (APC 300), high-frequency electrosurgical generator (ICC 350), and APC probe 2200A (Ø 2.3 mm, L 2.2 m). The argon flow rate was 2 L/min and a power of 60 W was used. Two shots, each lasting less than 1 second, were given using the standard no-touch technique. The patient's bowel was prepared by giving him a drink of polyethylene glycol solution to achieve perfect cleansing. The granuloma biopsy was examined pathologically and found to be inflamed granulation tissue with no evidence of malignancy. The patient remained asymptomatic until 4 days later when he presented with abdominal pain. A physical examination revealed localised peritoneal signs in his lower abdomen. An urgent computed tomographic scan of his abdomen and pelvis

Key words

Argon; Gastrointestinal hemorrhage; Hemostasis, endoscopic; Laser coagulation; Radiation injuries

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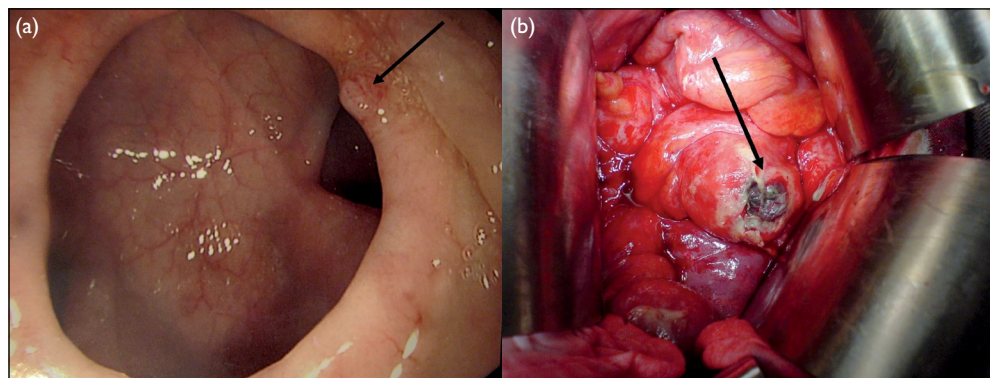


FIG 1. (a) Granulation tissue at the colo-anal anastomosis (arrow). (b) Perforation at the tip of the colonic L-pouch at the time of laparotomy (arrow)

電弧後的結腸損傷：氬等離子電凝術的一個嚴重併發症

應用氬等離子電凝術於內窺鏡止血的手術中日漸普及。本文報告一宗經電弧的燙傷個案，受傷位置是離使用氬等離子電凝術較遠的吻合線。使用吻合法和氬等離子電凝術作直結腸吻合及重整，已成為一項愈來愈普遍的臨床技術。必須讓內窺鏡及外科醫生知悉此項技術的潛在風險，避免引致併發症。施行氬等離子電凝術的位置附近的吻合線被認為是此項技術的禁忌。

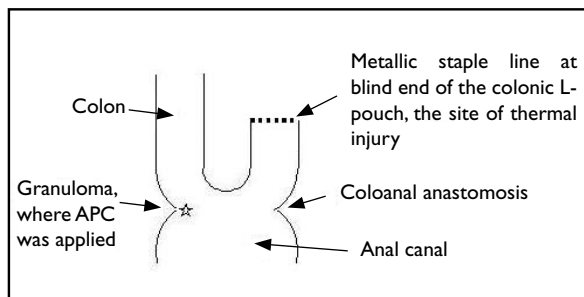


FIG 2. Schematic diagram illustrating the colonic L-pouch reconstruction, the site of argon plasma coagulation (APC) application, and the site of thermal injury

showed a pneumoperitoneum, so an emergency laparotomy was performed. At laparotomy, the blind end of the colonic L-pouch was found to be necrotic (Fig 1b), compatible with late effects of a transmural thermal injury. The anastomosis itself was intact. The necrotic part of the pouch was resected with primary closure and a defunctioning loop sigmoid colostomy was performed. The patient recovered well and the colostomy was closed afterwards.

Discussion

Argon plasma coagulation is a non-contact form of monopolar electrocautery using argon gas as a transmitted medium.¹² The argon gas is subjected to high-frequency monopolar alternating current producing lasers with wavelengths of 488 or 514 nm. These wavelengths are strongly absorbed by haemoglobin and melanin; one of the main applications of APC is to achieve endoscopic haemostasis and tissue ablation. A theoretical advantage of APC is a limited depth of injury caused by arcing of the transmitted current away from areas of treated, desiccated areas to non-desiccated areas with low resistance. This arcing of current minimises

the risk of deep thermal injury and perforation at the site of treatment.^{9-11,13} With accumulation in experience, APC has become an established technique with many potential applications in therapeutic endoscopy including tumour debulking, ablation of vascular malformations, and coagulation of bleeding sites.¹⁻³ It is unique in that it is an ablative method that requires no contact with the mucosal surface. When used in colonic lesions, the morbidity rate is low with a minor complication rate of about 10% and major complications of less than 0.3%.^{4,5,12} Minor complications include gas bloating, transient abdominal or anal pain in 10% of patients.^{4,5,12} Major complications include bowel explosion with perforation,⁴ rectovaginal fistula,⁵ chronic rectal ulceration, and stricture.¹⁴ These major complications are rare and are reported to be less than 0.3%.^{4,5,12,14} Previous reports have described perforation as a result of thermal injuries at the treatment site. Potential reasons for this include violation of the no-touch technique, energy levels being too high, an overlong application duration, or an excessive gas flow rate.^{10,11,15} In contrast, the thermal burn in our case happened at a nearby staple line, remote from the APC application site. Argon plasma coagulation, being a no-touch monopolar device, requires a grounding route. This route is usually provided by the grounding plate but any metal present at or near the vicinity of the APC application point might interfere with this grounding route. Current passing through this metal will generate heat and cause thermal injury. We postulate that a nearby metallic staple line may act as a grounding plate and interfere with the usual grounding route. The staple line concentrated current, produced heat, and caused thermal injury and delayed perforation at the colonic L-pouch, where no APC had ever been applied (Fig 2).

This is the first case report illustrating this potential complication of the electrical arcing effect. The use of APC in patients with metallic staple lines in the colon may cause unexpected thermal injuries, which will not be recognised during endoscopy. Patients may present later with delayed perforation at the staple line. As an increasing proportion of colorectal anastomoses and reconstructions are now being performed using stapling, a significant number of patients requiring APC treatment for endoscopic haemostasis may have an adjacent metallic staple line. It is therefore essential that endoscopists and surgeons be made aware of this potential but preventable complication. The presence of an adjacent metallic staple line should be considered a relative contra-indication for APC. Careful selection of patients and prudent use of APC is warranted.

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Corrigendum

"A reversible cause of blindness that should not be forgotten: cyclosporine-induced posterior reversible encephalopathy syndrome" (April 2009;15:153-4). On page 154, left column, line 11 should have read "Diffusion-restricted lesions appear dark or hypointense on ADC images." rather than "Diffusion-restricted lesions appear dark or hyperintense on ADC images." as printed. We regret the error.