

# Avoidance, Recognition, and Management of Complications Associated with Lumen-Apposing Metal Stents

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## KEYWORDS

- Lumen-apposing metal stent • Complications • Maldeployment • Migration
- Bleeding • Perforation

## KEY POINTS

- The lumen-apposing metal stent has evolved endoscopic transluminal therapies, although it has potential complications, including maldeployment, bleeding, perforation, and migration.
- Careful planning and technique mitigate the inherent risks of lumen-apposing metal stent deployment.
- Early recognition and management of lumen-apposing metal stent complications are critical to alleviating morbidity and avoiding mortality.

## INTRODUCTION

For decades, most endoscopists feared full-thickness mucosal defects and therefore the field, save for a handful of pioneers, had long been limited to disease management within the gastrointestinal tract. The advent of the lumen-apposing metal stent (LAMS), however, has allowed a broad swath of endoscopists the ability to create controlled full-thickness defects with the intent of connecting the gastrointestinal lumen with other walled compartments or adjacent lumen. With this, advanced gastroenterology now includes the capability of limited extraluminal therapies, including more aggressive transluminal management of walled off necrosis, alternative means of biliary and gallbladder drainage, and creation of enteroenterostomies for alternative routes

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Disclosure Statement: Both authors are consultants for Boston Scientific, the manufacturer of the Axios Lumen-Apposing Metal Stent. Neither have financial relationships with companies producing competing products.

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of per os nutrition or reversal of surgical anatomy.<sup>1-9</sup> As with any advanced intervention, there are risks for complications. These complications can be immediately during the deployment phase or delayed because of the subsequent effects of the intervention and/or stent itself. As with any complication, early recognition remains critical to avoid long-term sequelae and overall poor outcomes. Limited observational data exist evaluating the safety of LAMS for each of the indications; however, maldeployment, bleeding, and free perforation are 3 recognized immediate complications, and migration, bleeding, stent occlusion, and fistulas are delayed concerns. Careful planning, technique, and clinical surveillance will assist in avoiding complications; however, the endoscopist should be ready to manage complications, be it by medical, endoscopic, or surgical interventions.

## IMMEDIATE COMPLICATIONS DURING DEPLOYMENT

### *Cardiopulmonary*

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Clinical instability and even death may occur acutely following tract creation and stent deployment from aspiration of contents, brisk bleeding, and air embolus. Therefore, all procedures involving LAMS deployment, regardless of the indication, should be performed in conjunction with an anesthesiologist to allow for endotracheal intubation and assistance with clinical monitoring and ventilatory support. Drainage of walled off necrosis or pseudocysts, intraluminal management of strictures, and extraluminal enteroenterostomies all include the risk of fluid reflux, which could be catastrophic if aspirated. Moreover, standard of care involves utilization of carbon dioxide rather than room air for insufflation. Carbon dioxide will both decrease the risk of fatal air emboli, reported in a handful of cases<sup>1</sup> from direct insufflation into a compromised vascular structure, and decrease the morbidity of unforeseen free perforation.

### *Bleeding*

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Regardless of the indication, there is a risk of bleeding during stent deployment ranging up to 18% across studies.<sup>1</sup> This may involve rupture of small or large vessels during tract creation, tract dilation, or subsequent spontaneous expansion of the stent. Transluminal placement of the LAMS always involves endoscopic ultrasound (EUS) guidance, allowing for identification of intersecting and nearby vascular structures with adjunct utilization of Doppler. Although choosing the ideal location for placement, the endoscopist should think 3-dimensionally, with concerns beyond the immediate intervening distance and structures, rather to also include the neighboring regions. The covered nature of the stent allows some margin of error because this and the radial expansile properties of the stent allow a degree of constant tamponade. With intramucosal bleeding following stent deployment, subsequent dilation of the stent should be tempered because the slow natural expansion may prompt less immediate bleeding (Fig. 1). Immediate bleeding may also occur with rupture of vessels perforating within the adjacent cavity, such as with necrotizing pancreatitis. Preprocedural contrasted imaging frequently will demonstrate large perforating vessels, and frequently those within a few centimeters of the ultrasound probe will be seen on Doppler (Fig. 2). Tract creation using free-hand electrocautery tract creation must take these vessels into consideration, and depth of electrocautery application should be controlled so as to not disrupt structures beyond clear endosonographic view.

### *Maldeployment*

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Proper deployment of LAMS requires at least partial expansion of both the proximal (outward, deployed second) and the distal (inward, deployed first) flares or anchors.

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