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OR 6147 inglés

A retrospective, multicenter analysis of incidents associated with Axios[™] lumenapposing stents

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CONFLICTS OF INTEREST

Dr. Manuel Pérez-Miranda serves as a consultant for Boston Scientific and M.I. Tech and is a speaker for Boston Scientific and Olympus.

ABSTRACT

Introduction: there is controversy with regard to the risks associated with lumenapposing metal stents (LAMSs), with significant variations between available reports.



Objectives: to describe the types and proportions of complications that arise during the permanence time and removal of Axios[™] LAMS. Furthermore, the relationship between patency time, therapeutic target and the presence of complications was also described.

Methods: a retrospective, multicenter case series study was performed of all patients with an implanted LAMS to access extra-luminal structures during 2017. Only technically successful cases were recorded.

Results: a total of 179 patients from seven sites (range, 4-68 cases/site) were included in the study, with a mean age of 64.3 years (SD: 15.8; range: 24.6-98.8 years) and 122 (68.2%) were male. Most common indications included encapsulated necrosis (58, 32.4%), pseudocysts (31, 17.3%) and gallbladder drains (26, 14.5%). Complications during LAMS stay were reported in 19 patients (10.9%); stent lumen or gastroduodenal obstruction (8, 4.5%) and bleeding (7, 3.9%) were the most common. LAMS were not removed in 86 (48%) patients due to the following reasons: a permanent stent was used (46, 53.5%), loss to follow-up (18, 20.9%), patient demise (16, 18.6%) and stent migration (6, 7%). Five (5.4%) complications were reported during stent removal, which were three bleeds and two perforations. No association was found between stent duration and complications (p = 0.67).

Conclusion: complications secondary to LAMS insertion are uncommon but may be serious. This study found no association between complications and stent duration.

Key words: Retrospective. Removal. Lumen-apposing stent. Axios™. Complications.

INTRODUCTION

The use of Axios[™] lumen-apposing metal stents (LAMSs) (Boston Scientific; Massachusetts, USA) to drain the bile and pancreatic duct, retroperitoneal spaces and to perform digestive anastomoses is currently increasing. This is due to the relatively easy placement and proven effectiveness of these devices (1-4), which are inserted under endoscopic ultrasound (EUS) guidance.

When transiently placed, such as in draining encapsulated necrotic collections, the placement duration to optimize drainage whilst minimizing potential adverse effects is



controversial (5-8). Despite reports from a number of studies on this topic, the time to removal has never been accurately established (6-11). Leaving a LAMS in place has been thought to be beneficial for the drainage of pancreatic collections. However, it may penetrate adjacent vessels and organs once collections have been cleared, causing bleeding and wall impingement (8,12,13). Therefore, it has been recently recommended that stents be removed within four weeks, in order to reduce the delayed bleeding risk (7).

A retrospective, multicenter study was performed to assess the complications associated with the removal of Axios[™] LAMSs and their potential relation to the length of stay.

PATIENTS AND METHODS

This is a retrospective, multicenter case series of patients who received an Axios[™] LAMS. The project was approved by the Ethics Committee of the institute of the principal investigator (reference PI 104-18).

Patients

All patients that underwent a technically successful implantation of an Axios[™] LAMS between January 2017 and December 2017 were consecutively enrolled into the study.

Participating centers

Third-level sites with advanced endoscopy units and at least one endoscopist experienced (\geq 20 procedures) in the insertion and subsequent removal of AxiosTM lumen-apposing metal stents participated in the study.

Objectives

The primary goal was to provide a description of the scheduled removal of Axios[™] LAMS, the techniques involved and the associated secondary complications. Secondary endpoints included a description of other incidents that occurred during stent patency time and an analysis of the risk factors that potentially lead to complications.



Procedures

All procedures were performed under sedation with propofol and midazolam in some cases, under endoscopist or anesthetist control as per the protocol established in each center. Insertion was performed using a sector echoendoscope (Olympus). The therapeutic target was first located under EUS view and was punctured with a nitinol needle, usually 19G or 22G (Boston Scientific). A guidewire (usually a 0.035-inch Jagwire[™] (Boston Scientific) or a 0.025-inch VisiGlide[™] (Olympus) was introduced under radiographic control after confirmation that the needle was properly placed. The transmural stent was released over the guidewire, under echoendoscopic, radiographic and endoscopic control. There is a technical, so-called "free hands" variation that involves direct stenting of the target with no need for prior needle puncturing or a guidewire. Removal was performed using a standard gastroscope (Olympus) and once located, stents were removed using a number of procedures (see below).

Data collection

Data were collected retrospectively. Patients were identified using specific databases in each site, which included all LAMS carriers, or the Endobase (Olympus) system, which includes all endoscopic procedures performed in each participating site. Complications and events during removal were identified using the databases available in the participating sites and by a review of medical records. The data collected in each center were recorded in a database that was set up for the present study. All databases were subsequently merged together by the principal investigator.

Follow-up

Patient follow-up ensued until June 30th 2018. Follow-up until stent removal or patient demise with the stent in place, or patients that underwent a clinical checkup within three months of follow-up completion were defined as complete studies. Patients with the stent in place and no checkup within three months of follow-up completion were categorized as a loss to follow-up.



Sample size

The number of stents inserted annually by the participating centers ranged from ten to 80. The number deemed adequate for the study was 50-100 removed stents as some stents were placed with a permanent intent, such as gastrojejunostomies.

Definitions

 Technical success: LAMS correctly released across the GI tract and target organ walls, which remained in place upon procedure completion (Fig. 1).

- Removal: a successful removal was defined as the endoscopic removal of the LAMS. Removal procedures included the following: a) forceps removal using proximal traction, using forceps or a snare to pull the luminal flange of the stent (Fig. 2); b) forceps removal using distal traction, using the forceps to pull the intracavitary flange; and c) placing another stent, a stent-in-stent technique. Reasons for a failed removal included: a) a buried stent, a metallic mesh fully embedded in granulation tissue and therefore, unidentifiable; and b) non-buried fixed LAMS, where the proximal flange metallic mesh is visible but is firmly adhered to the GI tract or fistula wall. All cases of a failed removal for any other reason, such as sedation-associated complications, were collected as free text.

Statistical analysis

Categorical variables were reported as percentages. Normally distributed continuous variables were reported as the mean with the standard deviation values. Non-normally distributed continuous variables were reported as the median and interquartile range; the range was also used in some cases. The Pearson's χ^2 or Fisher's exact tests were used to assess differences between categorical values when the expected frequencies in contingency tables were lower than 5. The Student's t-test or Wilcoxon's test were used to assess association between continuous and categorical variables. The statistical analysis was performed using the Stata package (StataCorp. 2013, College Station, Texas).

RESULTS



A total of 179 patients from seven sites (4-68 cases/site) were included in the study, with a mean age of 64.3 years (SD: 15.8; range: 24.6-98.8 years) and 122 (68.2%) were males. Indications, proportion of removed stents and the number of complications during removal are listed in table 1.

Complications during stent duration

Complications were identified during LAMS permanence time in 19 patients (10.9%). In eight (4.5%) cases, they resulted from stent lumen or gastroduodenal obstruction. Five occurred in encapsulated necrosis areas and resulted in infection flare-ups in three cases and pyloric obstruction in two cases. Gallbladder drains obstruction led to relapsing cholecystitis in two cases and jaundice recurred in one choledochoduodenostomy. All events were resolved endoscopically in all cases. Bleeding was reported in seven (3.9%) cases and was most often resolved with conservative measures or endoscopic injection to provide hemostasis. However, a fatal bleeding event occurred in a gallbladder drain due to a hepatic artery pseudoaneurysm nine months after stent implantation. Two perforations, one posthepaticogastrostomy and one after a gastrojejunostomy, led to patient demise. Finally, two symptomatic migrations occurred. One occurred within a gallbladder drain that led to relapsing cholecystitis and another in a pseudocyst that led to symptom recurrence. Both cases were managed endoscopically and new LAMS were placed.

Migrations

Eight (4.5%) LAMS migrations were reported among the 179 patients included and six (3.4%) were asymptomatic. A higher number of migrations was observed for LAMSs inserted in pseudocysts, with 3/31 (9.7%) cases, whereas the remaining three migration events occurred in an abscess (1/11 = 9.1%), encapsulated necrosis (1/58 = 1.7%) and a hepaticogastrostomy case (1/5 = 20%).

Non-removed stents

Stents were not removed in 80 (46.2%) of the remaining 173 patients, including the six migration cases where a LAMS was not re-implanted. In 60 (75%) cases, stents had



been placed with a permanent intent. This included 22 gallbladder drains, 19 choledochoduodenostomies, 14 gastrojejunostomies and five hepaticogastrostomies. The remaining 20 cases included 15 losses to follow-up that included nine encapsulated necroses, four pseudocysts and five deaths before stent removal, which included two encapsulated necrosis events.

Removal technique

LAMSs were removed from 93 patients after a permanence time of 8.3 weeks (interquartile range [IQR]: 4.3-13.3; range: 0.3-42.4). The majority (94.6%) were removed by pulling the proximal flange. A mucosal precut was required for access in one case with a 10 x 10-mm LAMS in an encapsulated necrosis lesion that stayed in place for 26.9 weeks with the proximal flange embedded. This was followed by an instent balloon dilation and a subsequent traction. In three cases (3.2%), pulling was applied on the distal flange and stents were extracted "sock-like". Two cases involved 8 x 8-mm LAMSs in pelvic abscesses after a permanence time of 7.3 and 39 weeks, respectively. Another involved a 15 x 10-mm stent for pseudocyst drainage after a permanence of 9.4 weeks. Finally, the stent-in-stent technique was used in two cases (2.2%). One case was a bladder drain using a 20 x 10-mm stent that could not be initially removed as it was impinged, although it was not embedded. Another case was a choledochoduodenostomy.

Complications during removal

A total of five (5.4%) complications secondary to LAMS removal were reported, as shown in table 1. Three bleeding episodes were reported: one mild, one moderate and one severe. Furthermore, there were two perforations, one mild that was resolved endoscopically using an OTSC[®] (Ovesco) system and one severe that required surgery. There was no association between permanence time and the presence of complications (p = 0.67). In addition, there was no significant association with other assessed factors, such as indication, site, removal technique, age and gender.

DISCUSSION

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This study involves a multicenter case series of Axios[™] LAMS carriers. The primary goal was to assess removal-related complications, regardless of indication, as well as the issues identified during permanence time.

A LAMS for draining peripancreatic collections seems to offer higher clinical success rates, fewer endoscopy sessions, shorter procedure times, shorter hospital stays and lower costs (14,15) as compared to plastic stents. However, the report by Bang et al. of the preliminary results of a clinical trial raised doubts on the potential use and optimal permanence time of this sort of stent (7). In this study, three of 12 patients had severe spontaneous bleeding at weeks 3 and 5 and there was a severe bleeding event secondary to LAMS removal after five weeks. Other series have reported conflicting data with regard to the frequency and timing of complications, as well as their association with LAMS removal. Similar results were obtained in a series of 46 encapsulated necrosis where an Axios[™] or Nagi[™] (Taewoong Medical) LAMS was inserted, which was published in the wake of the Bang study (7). There were bleeding complications in eight cases (17.4%), six of which were severe and 62.5% developed after the first four weeks (8). Other studies have reported significantly lower rates. Severe bleeding developed in three (6.4%) cases in a retrospective, multicenter study in Australia of 53 patients with pseudocysts and encapsulated necrosis who received a Nagi™ LAMS. There was one early and two late bleeds in this study (16). However, only one severe bleeding event developed among 93 (1.2%) patients (3) and there were no events among 60 patients in two multicenter studies of patients with peripancreatic collections (17). While most reported bleeding events were delayed, a series of 82 patients with encapsulated necrosis reported six secondary bleedings. All of these occurred within the first week and two required embolization under radiographic guidance (18). A systematic review found that the rate of bleeding events secondary to LAMS was 0-25%, albeit lower than the 11% reported in most series (11). A recent literature review of gallbladder drainage using this type of stent, with over 200 patients and 13 studies, reported a stent-related complication rate of 8.2% (19). This included ten bleeding cases (5.6%), seven (3.9%) during permanence and three during removal, which is similar to most reported series. Stent impingement on the visceral wall has been reported in case series (20,21). In our cohort, two (2.2%) cases were

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recorded and the stents were removed in both cases.

In our study, over 75% of the 58 LAMS used for encapsulated necrosis remained in place for over four weeks. This did not result in an increased number of complications during removal and severe bleeding was not reported during permanence. This is similar to LAMS use for pseudocyst drainage. These findings support longer permanence times compared to the current usage, which would increase the odds of a complete lesion resolution.

In our series, most complications reported during removal were bleeding. With regard to migrations, eight cases were identified and six were asymptomatic. The extent to which asymptomatic migrations that do not require an intervention are considered as complications is something worth considering. The fact that most migrations occurred in pancreatic collections is consistent with the existing literature and should be highlighted (22).

With regard to the removal technique, most stents were withdrawn by simple traction and a small percentage required complex maneuvers such as the stent-in-stent technique or buried stent rescue. The retrospective character of our study precluded the assessment of other interesting variables regarding procedure complexity, including removal duration or stent condition after removal. However, the low number of related complications suggests that most stents could be easily withdrawn.

In our view, this study is important due to its multicenter design and the assessment of the service life of LAMS, from placement to removal. However, the deficiencies cannot be ignored. First, the retrospective nature of the study conditions the presence of biases. An attempt was made to correct this by using a multicenter approach and a standardized system for the collection of data as wide as possible. This not only included sites where stents were implanted but also those where they were removed. Second, a high number of cases was only available for pancreatic collections. Thus, the proportion of complications reported for other indications should be taken with caution.

To conclude, the present study showed that the permanence of an Axios[™] LAMS is safe, even beyond the currently recommended duration. Prospective, multicenter studies should be performed to establish the optimal permanence time and to assess



the complications associated with long-term use.

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Table 1. Indications, complications, proportion of removed stents and time to removal

Indication	Procedures, n	Complications during	Stents	Time to	Complications
	(%)	permanence, n (%)	removed, n	removal	during
			(%)	(weeks), med	removal, n (%)
				(IQR)	
Encapsulated	58 (32.4%)	Migration: 1 (1.7%)	46 (79.3%)	8.7 (5.1-13.1)	Bleeding: 1
necrosis		Stent obstruction: 3			(2.2%)
		(5.2%)			
		Antral obstruction: 2		X	
		(3.4%)			
		Bleeding: 4 (6.9%)			
Pseudocyst	31 (17.3%)	Migration: 4 (12.9%)	24 (77.4%)	7.9 (3.4-11)	Bleeding: 1
					(8.3%)
Gallbladder	26 (14.5%)	Migration: 1 (3.8%)	4 (15.4%)	3.5 (2.7-8.7)	Perforation: 1
drainage		Stent obstruction: 2			(25%)
		(7.7%)			
		Bleeding: 2 (7.7%)			
Choledochoduoden	21 (11.7%)	Stent obstruction: 1	2 (9.5%)		0
ostomy		(4.8%)			
Gastrojejunostomy	16 (8.9%)	Bleeding: 1 (6.3%)	2 (12.5%)		Perforation: 1
					(50%)
Abscesses	11 (6.2%)	Migration: 1 (9.1%)	8 (72.7%)	8.8 (7.1-16.1)	0
Hepaticogastrosto	5 (2.8%)	Migration: 1 (20%)	2 (40%)		0
my					
Other	11 (6.2%)		5 (45.5%)	5.3 (4.3-8.3)	0
			1		





Fig. 1. Axios[™] placement:
view of a correctly placed,
transmural Axios[™] stent.
The proximal flange is

shown.





Fig. 2. Removal technique. The forceps removal technique by pulling the proximal flange. A variant is shown where traction is exerted using two forceps.