Evolution of Endoscopic Ampullectomy and Considerations for a Contemporary Approach

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Endoscopic ampullectomy (or endoscopic resection of lesions associated with the ampulla of Vater) has now been performed for more than 25 years and has been supported by the literature, however, since its inception, the efficacy of this approach is still somewhat underappreciated. In our recent publication [1], despite its high success rate for clearance of ampullary adenomas, even with quite an extensive lateral spreading tumour component (LST-P), we wished to re-iterate and even celebrate the value of endoscopic ampullectomy, discuss our technique, highlight the risk of post procedural haemorrhage, discuss the adenoma recurrence rate and the need for a commitment to surveillance. We wished to re-iterate its important role in staging a lesion that may well be borderline, on the basis of morphological features, biopsy histology or imaging; even if endoscopic resection did not achieve complete removal and cure [2-4].

By reviewing our data and placing a spotlight on these issues, we provided an excellent opportunity to develop a practical and pragmatic algorithm to be considered for a contemporary approach to these lesions.

The main stimulus for our recent publication was to revitalise thought about the most cost effective and sensible clinical approach to the endoscopic removal of ampullary lesions. We also wished to reaffirm the high clearance rate, even in cases with a large LST-P.
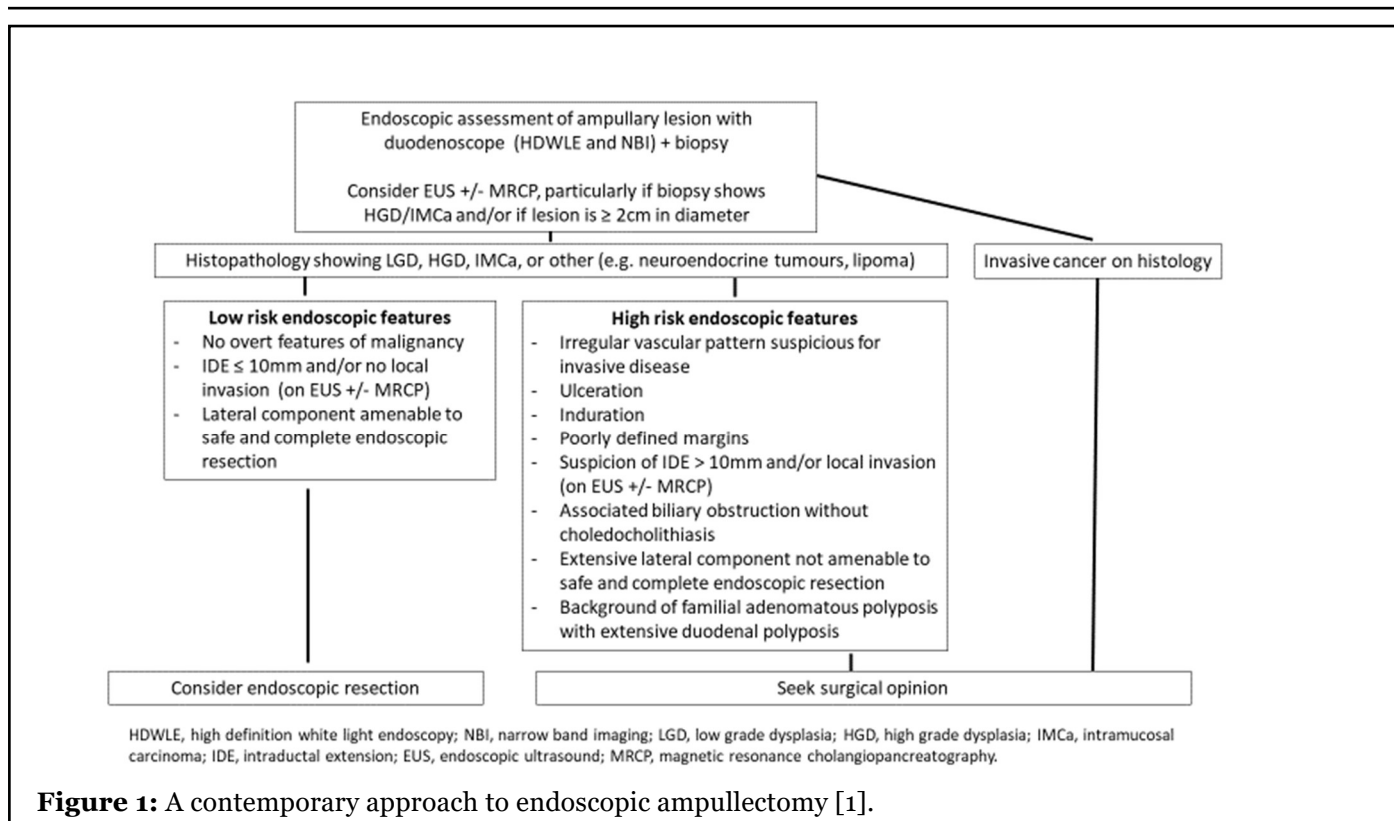
The introduction of narrow band imaging (NBI) and similar light technology in the duodenoscope, as well as high definition optics has provided tools to markedly increase the diagnostic value of purely inspecting the lesion morphology, whereas previously size and a non-specific, unstandardized description may have lowered the threshold for direct surgical management. The expectation now is to spend time inspecting the lesion to glean as much information as possible from the morphology, even to the point where biopsy potentially may not even be required, prior to pursuing attempted endoscopic resection. The resection specimen usually provides the definitive staging biopsy, hence the importance of trying to achieve an en bloc resection of lesions without significant LST-P.

Routine interrogation of an ampullary adenoma with endoscopic ultrasound and MRI/MRCP has become more commonplace [5]. One could question the cost effectiveness of pursuing both investigations for smaller ampullary lesions. I would opine that smaller lesions (less than or equal to 2 cm) may not indicate assessment with endoscopic ultrasound or MRI/MRCP, unless the morphology or histology was concerning or indeterminate. This was therefore included in our recently published management algorithm (Figure 1).

Ampullary adenomas are relatively uncommon and even in the tertiary/quaternary setting this can lead to a varied endoscopic approach.

The original technique for ampullectomy could essentially be described as a combination of initial snare resection of the ampullary lesion, immediate lesion retrieval, then a subsequent ERCP, primarily for careful and atraumatic cannulation of the pancreatic duct for stent placement, as a prophylactic measure (Figures 2-5).

Figure 1: A contemporary approach to endoscopic ampullectomy [1].

This procedure offers a unique challenge, as a side viewing endoscopic instrument is required to remove a mucosal lesion from a somewhat awkward anatomical site within the gastrointestinal tract, where there is a relatively thin wall and an inherently high risk of delayed haemorrhage with endoscopic intervention. The "piece de resistance" is that the lesion overlies the pancreas with the intrinsic risk of pancreatitis from endoscopic intervention.

It is now more widely accepted that one should aim to remove the major ampullary lesion en bloc (even in the setting of a significant LST-P) and aim for a resection margin "flush" with the duodenal wall; this commonly leaves separate biliary and pancreatic orifices, which can usually be easily identified for selective cannulation. The pancreatic orifice commonly appears as a "smiling" crescentic shape from 3-6 o'clock. Gentle selective cannulation of the pancreatic with a hydrophilic wire assists in minimising shearing and perturbation of the adjacent mucosal defect, which can promote immediate bleeding.

In the original literature both biliary and pancreatic sphincterotomies were recommended as a prophylactic measure. Some centres may still practice this approach or simply perform a biliary sphincterotomy. We tend to avoid both, if possible, however would pursue a biliary sphincterotomy to allow closer scrutiny of suspected intraductal ingrowth, particularly if we felt that it was amenable to eventual endoscopic resection, usually as a second stage procedure. We tend to avoid attempted endoscopic resection of any biliary intraductal ingrowth at the time of endoscopic ampullectomy to minimize over manipulation and potential shearing of the endoscopic resection site, with the concomitant risk of promoting immediate haemorrhage. Biliary sphincterotomy would also be performed in cases of synchronous choledocholithiasis. We routinely place a prophylactic pancreatic stent in patients without pancreas divisum.

These are what we believe are important features that could be considered in the contemporary approach to endoscopic ampullectomy:-

Inspection and planning

We commonly perform a planning duodenoscopy prior to booking an endoscopic resection session, even if prior histology or photo documentation has been made available. This offers the opportunity to possibly diagnose a previously unappreciated overtly malignant lesion. Narrow band imaging (NBI) or similar technology is a very useful tool in this regard. The true extent of any lateral component can also be assessed. A strategy for complete endoscopic approach can be developed, including the sessional time that may be required and the indication for general anaesthesia.

Sedation

At the very least we advocate anaesthetist supervised deep sedation with Propofol. We do, however, have a low threshold for general anaesthesia, as fortunately it is readily available within our institution. We consider general anaesthesia to be best practice for larger ampullary lesions, particularly those with a significant LST-P, which usually require a procedure with a longer duration. These cases commonly require a large volume of water irrigation, which naturally transports in a retrograde fashion into the gastric lumen. This, in combination with potential immediate haemorrhage from the resection site, increases the risk of aspiration. The patient is also guaranteed not to move, which facilitates each step of this delicate procedure.

Submucosal pre-injection

Most ampullary lesions with NO lateral spreading component do not require pre-injection. Some experts, in fact, would argue that this can hinder en bloc resection. We choose to inject (2-5 mls Gelofusine/Indigocarmine/1:100,000 adrenaline at the inferior or caudal aspect of the ampullary lesion. This provides good delineation of the inferior margin, which occasionally can be poorly defined. Slight elevation of the caudal component also assists with the "fulcrum technique" [6,7] where the tip of the open snare (superficially embedded in the duodenal mucosa at the superior/cranial aspect of the lesion) engages the entire ampullary lesion, flush with the duodenal wall.

Snares

We favour a more rigid, braided snare (*Olympus Medical Systems*) ranging in size from 10 mm to 20 mm for the ampullary lesion. Our choice is governed by the appropriate size to achieve an en bloc resection of the main ampullary lesion. We would most commonly use a 15 mm braided snare with a blended current (*Endocut, Erbe Elektromedizin GmbH, Tuebingen, Germany*). If there is insufficient progress during the resection or "jamming" of the snare from desiccated, coagulated tissue, we have a low threshold to change directly to a pure cut current (*Autocut, Erbe Elektromedizin GmbH, Tuebingen, Germany*) to immediately complete resection and avoid deep thermal injury. This latter strategy may well be practiced by many colleagues, however, appears to be under reported in the literature. This again highlights the need for the endoscopist to have a good understanding of their electrosurgical generator and the potential changes in settings, which may be required at short notice.

More recently we have changed our practice to using cold snare polypectomy preferentially to resect any LST-P (Figure 2). We feel that this offers the benefit of reduced thermal injury, reduced delayed haemorrhage and a reduced risk of perforation.

We have also recently commenced snare tip soft coagulation of the edges of the mucosal defect as a parallel to the evidence-based reduction in recurrence of colonic adenomas when using this technique [8] (Figure 4).

Specimen collection

Our preference is a Roth Net retrieval device (US Endoscopy) or a similar device to immediately collect the specimen post endoscopic resection (Figure 3).
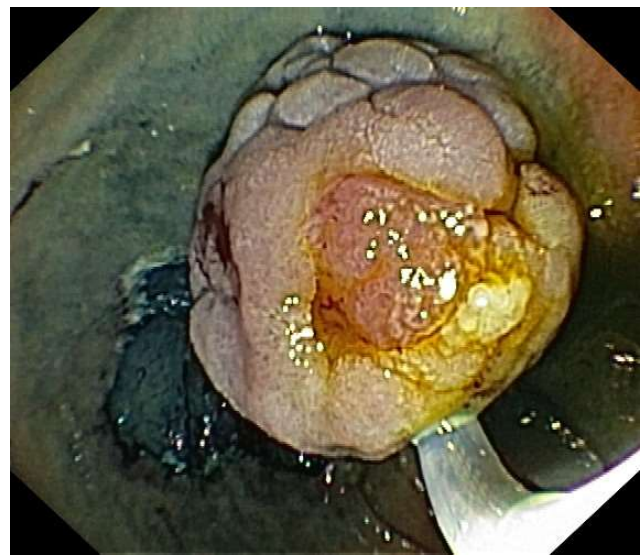

Figure 2: En bloc resection of major ampullary lesion after cold snare resection of the LST-P.

Figure 3: Immediate collection of the major ampullary lesion with a Roth Net retrieval device after en bloc resection.

Figure 4: Final mucosal defect prior to prophylactic pancreatic stent placement. LST-P was removed with a cold snare and the edges of mucosal defect were treated with snare tip soft coagulation.
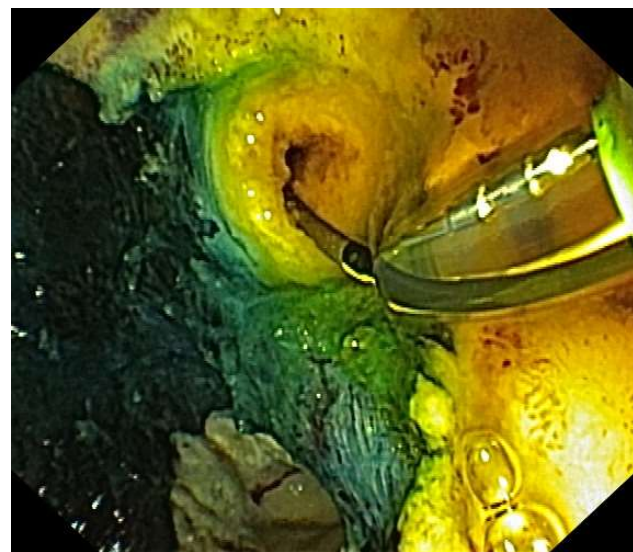

Figure 5: Selective cannulation of the pancreatic duct prior to placement of a prophylactic pancreatic stent.

We ensure that we have a paediatric colonoscope, on hand, to retrieve the specimen in case the specimen migrates distally, despite providing local suction with the duodenoscope, to hopefully prevent this from occurring.

Haemorrhage and Haemostasis

We choose to use snare tip soft coagulation (*Erbe Elektromedizin GmbH, Tuebingen, Germany*) or a coagulation grasper (*Olympus Medical Systems*) on a similar electrosurgical setting for management of immediate haemorrhage at the ampullectomy resection site. We avoid using haemostatic clips, if possible, unless mucosal "edge to edge" closure is essentially guaranteed. We find that clips can promote shearing of the mucosal defect and promote immediate bleeding. The use of clips within the mucosal defect should be avoided at all costs, because of the high risk of resultant perforation, considering the fixed nature of the duodenum in this location and the high likelihood of tearing the fibers of the muscularis propria.

We have recently embraced the application of Purastat on the mucosal defect, particularly in cases with a large LST-P. This would presently be a low evidence-based recommendation, however, there has been some evidence of its beneficial effect in the upper gastrointestinal endoscopic submucosal dissection (ESD) scenario. It is part of our effort to use every measure to minimise the relatively high risk of delayed haemorrhage from endoscopic ampullectomy.

Our study demonstrated a high rate of delayed haemorrhage, particularly in those lesions with an LST-P greater than >3 cm, which was associated with an up to 30% risk of haemorrhage. Unfortunately, delayed haemorrhage is a common complication of endoscopic ampullectomy; we therefore admit all patients afterwards for observation. The majority are placed on a clear fluid diet and administered a high dose proton pump inhibitor. Most clinically significant haemorrhage can be managed conservatively, including blood transfusion. Fortunately, subsequent endoscopic or radiological intervention for delayed haemorrhage is required only rarely.

Surveillance

The goal of endoscopic ampullectomy for benign lesions should be a high clearance rate. There are similarities with colonic polypectomy in that a high percentage of clearance should be able to be achieved after the first surveillance procedure at approximately 3-6 months, when any minor residual adenoma can be removed endoscopically. There is higher risk of recurrence with a more significant initial LST-P. As with all endoscopic resection, a commitment to surveillance is required. In our recent publication, we performed surveillance at 3 months, 6 months then annually for 5 years, when clearance was achieved. Patients with familial adenomatous polyposis (FAP) underwent ongoing surveillance at least annually. Our recently published study also showed an endoscopic treatment success rate of 91.1% among patients who had non-invasive lesions on final histopathology with a median endoscopic follow-up of 30 months.

In conclusion, endoscopic ampullectomy has evolved significantly since it was first performed in the 1990s. This has been driven mainly by advances in endoscopic technology including high definition optics,

endosonographic functionality, new single use devices and fine tuning of the endoscopic approach, to maximize clearance and minimize complications. Contemporary endoscopic ampullectomy should provide high rates of clearance, however, it is at least a two-stage procedure and the trade-off, for this minimally invasive approach, is a commitment to endoscopic surveillance.

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