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World Journal of Gastrointestinal Endoscopy
 Baishideng Publishing Group Inc
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Observational Study

Endoscopic assessment and management of sporadic duodenal adenomas: The results of single centre multidisciplinary management

Kheman Rajkomar, Michelle Kweon, Imran Khan, Paul Frankish, Michael Rodgers, Jonathan B Koea

Kheman Rajkomar, Michelle Kweon, Michael Rodgers, Jonathan B Koea, the Department of Surgery, North Shore Hospital, Private Bag 93503, Takapuna, Auckland, New Zealand

Imran Khan, Paul Frankish, the Department of Gastroenterology, North Shore Hospital, Private Bag 93503, Takapuna, Auckland, New Zealand

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Correspondence to: Dr. Jonathan B Koea, Chief of Upper gastrointestinal Unit, the Department of Surgery, North Shore Hospital, Private Bag 93503, Takapuna, Auckland, New Zealand. jonathan.koea@waitematahd.govt.nz
Telephone: +64-9-4868900
Fax: +64-9-4884621

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Abstract

AIM

To review the role of multidisciplinary management in treating sporadic duodenal adenomas (SDA).

METHODS

SDA managed at North Shore Hospital between 2009-2014 were entered into a prospective database. Pathology, endoscopic and surgical management as well as follow up were reviewed.

RESULTS

Twenty-eight patients (14 male: Median age 68 years) presented with SDA [18 were classified as non ampullary location (NA), 10 as ampullary location (A)]. All SDA were diagnosed on upper gastrointestinal endoscopy and were imaged with a contrast enhanced CT scan of the chest, abdomen and pelvis. Of the NA adenomas 14 were located in the second part, 2 in the first part and 2 in the third part of the duodenum. Two patients declined treatment, 3 patients underwent surgical resection (2 transduodenal resections and 1 pancreaticoduodenectomy), and 23 patients were treated with endoscopic mucosal resection (EMR). The only complication with endoscopic resection was mild pancreatitis post procedure. Patients were followed with gastroduodenoscopy for a median of 22 mo (range: 2-69 mo). There were 8 recurrences treated with EMR with one

patient proceeding to pancreaticoduodenectomy because of high grade dysplasia in the resected specimen and 2 NA recurrences were managed with surgical resection (distal gastrectomy for a lesion in the first part of the duodenum and a transduodenal resection of a lesion in the third part of the duodenum).

CONCLUSION

SDA can be treated endoscopically with minimal morbidity and piecemeal resection results in eradication in nearly three quarters of patients. Recurrent SDA can be treated with endoscopic re-resection with surgical resection indicated when the lesions are large (> 4 cm in diameter) or demonstrate severe dysplasia or invasive cancer.

Key words: Duodenal adenoma; Endoscopic resection; Surgical resection; Pancreaticoduodenectomy; Endoscopic surveillance; Dysplasia

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Core tip: Sporadic duodenal adenomas can be treated endoscopically with minimal morbidity and even piecemeal resection results in eradication in nearly three quarters of patients. Optimal surveillance strategies include re-endoscopy 6 mo after the initial resection is a satisfactory starting point. Recurrent sporadic adenomas can be treated with endoscopic re-resection with surgical resection indicated when the lesions are large (> 3 cm in diameter) or demonstrate severe dysplasia or invasive cancer.

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INTRODUCTION

Sporadic duodenal adenomas (SDA) are rare lesions with a prevalence of 0.3%-1.5%^[1]. Due to this rarity, the natural history of SDA is not well understood although it is known to follow an adenoma to carcinoma sequence similar to colorectal cancer^[2]. The reported rate of malignant transformation of SDA ranges from 25% to 85% and this provides a rationale for preventative intervention and surveillance^[2-4]. The majority of sporadic adenomas are sessile and occur in the second part of the duodenum^[5,6] and can be divided into those with an ampullary location (A) or non ampullary location (NA)^[1,2].

Currently there is no consensus on the optimal management of SDA and, in particular, the choice of surgical or endoscopic resection remains controversial since surgical resection involves either

local resection by the transduodenal approach or by pancreaticoduodenectomy with the risk of significant morbidity and mortality. In contrast endoscopic mucosal resection (EMR) was first described in 1992 and has become increasingly favoured as the first line treatment modality^[6-8].

This investigation describes the multidisciplinary management strategy for SDA as used at a single unit and involves contributions from surgery, endoscopy and gastroenterology. The specific aims of this study were to: (1) define the role of EMR of SDA; (2) define the role of whole vs piece meal endoscopic resection; (3) define an optimal surveillance strategy following endoscopic resection; and (4) define the optimal treatment for recurrence SDA following endoscopic resection.

MATERIALS AND METHODS

Consecutive cases of duodenal adenoma diagnosed at North Shore Hospital (NSH) between 2009 and 2014 were reviewed. The pathology findings from all patients was entered into a prospective database. Demographic, diagnostic, biopsy, treatment and follow up information was then reviewed as well as details pertaining to local recurrence rate and salvage treatments.

This project was logged with the Awhina Research and Knowledge Centre at NSH and ethics approval was obtained from the Regional Ethics Committee.

RESULTS

Thirty-four patients were diagnosed with duodenal adenomas between 2009 and 2014 of which six patients were excluded because of an underlying diagnosis of familial adenomatous polyposis. Data from 28 patients was analysed for the investigation of whom 18 were classified as NA and 10 as A.

Demographics, presentation and investigation

A summary of patient demographics, polyp morphology and investigations utilized in the management of the reported patients with SDA are presented in Table 1. All patients were New Zealand European with no Maori or Pacific Island patients presenting with SDA. Five patients (50%) with ampullary lesions presented with adenoma specific symptoms (iron deficiency anaemia 3, obstructive jaundice 2), while five (28%) of the NA patients presented with iron deficiency anaemia. The remaining patients with ampullary lesions underwent investigation for non-specific abdominal pain or following an incidental finding on ERCP for choledocolithiasis. In patients with NA upper gastrointestinal endoscopy was also undertaken for non-specific pain (4 patients), peptic ulcer disease or reflux (4 patients), and one patient each for globus, dysphagia, incidental finding during ERCP and investigation of Crohn's disease and incidentally noted raised carcino-embryonic antigen. All SDA were diagnosed on upper gastrointestinal endoscopy and were biopsied (Table 1). All patients

Table 1 Summary of patient demographics, adenoma morphology and investigations utilized *n* (%)

	Non-ampullary (<i>n</i> = 18)	Ampullary (<i>n</i> = 10)
Demographics		
Median age, yr (range)	69 (47-88)	67 (48-80)
Male: female	9:9	5:5
Morphology		
Pedunculated	3 (17)	1 (10)
Sessile	15 (83)	9 (90)
Median size, mm (range)	15 (9-24)	20 (10-35)
Number ≥ 20 mm	7 (39)	6 (60)
Investigations		
Biopsy	7 (39)	8 (80)
EUS	3 (17)	0
ERCP	0	10 (100)

ERCP: Endoscopic retrograde cholangiopancreatography; EUS: Endoscopic ultrasound.

were imaged with a contrast enhanced CT scan of the abdomen to define signs of invasion or metastases. Of the non-ampullary adenomas 14 were located in the second part of the duodenum, two in the first part and two in the third part of the duodenum. Endoscopic ultrasound (EUS) was used selectively to locoregionally stage lesions that were large, ulcerated or had high grade dysplasia on biopsy (5 of 8 ampullary adenomas and 8 of 15 non-ampullary adenomas). EUS permitted detailed assessment of lesional size and depth and location of further biopsy specimens^[4,5,7].

Treatment

Patient management is summarised in Figure 1 and Table 2. All endoscopically treated patients had an EMR. All endoscopic procedures were undertaken in a specialist endoscopy suite with conscious sedation administered intravenously followed by recovery and same day discharge. Endoscopic resection was undertaken after submucosal injection of saline, epinephrine or methylene blue depending on the endoscopist's preference. The median number of endoresections per patient was 1 and was higher for ampullary (median 2.5) than non-ampullary adenomas (median 1). Endoscopic *en bloc* resection was aimed for in all cases but, due to the size of the lesions, 11 NA and 6 A underwent piecemeal resection (Table 2). The only complication of endoscopic resection was one episode of mild pancreatitis post-procedure which was self-limiting.

Once removed specimens were orientated and sent for pathological examination. Overall biopsies were concordant with final pathology in 4 of 7 NA and 7 of 8 A (Table 2).

Two non-ampullary adenomas underwent surgical resection: Two patients underwent transduodenal resection of lesions in the second and third parts of the duodenum and one patient with a large ampullary adenoma, was treated with a pancreaticoduodenectomy. In addition, two elderly patients declined any treatment.

Table 2 Summary of treatment, biopsy and final pathology and recurrence

	Non-ampullary (<i>n</i> = 18)	Ampullary (<i>n</i> = 10)
Endoscopic treatment	15	8
Stenting		
Biliary	0	2
Pancreatic	0	5
Specimen removal		
Piecemeal	11	6
<i>En bloc</i>	4	2
Complications	0	1
Surgical resection	2	1
No treatment	1	1
Histology		
	1 no dysplasia	7 low grade dysplasia
	13 low grade dysplasia	1 high grade dysplasia
	3 high grade dysplasia	1 adenocarcinoma
Concordance with biopsy	4/7	7/8
Recurrence	5	5

Surveillance

All patients had follow up gastroscopies although five patients declined follow up and one patient had undergone a pancreaticoduodenectomy (*n* = 1). The average time taken for the first endoscopic surveillance post resection was 7.9 mo for NA and 5.9 mo for A. The median follow up period was 22 mo (range 2-69 mo).

Recurrence

Details on recurrence rate in the 20 cases actively followed up are presented in Table 3 in addition to salvage therapy employed. EMR was used to treat 8 recurrences. Endoscopic ultrasound was used in two ampullary recurrences to rule out transmural invasion. One of eight patients treated with endoscopic resection was shown to be a high grade dysplastic lesion and was subsequently treated with a pancreaticoduodenectomy (final pathology T₁N₀ adenocarcinoma). Two non-ampullary recurrences were managed with surgical resection (distal gastrectomy for a lesion in the first part of the duodenum and a transduodenal resection of a lesion in the third part of the duodenum).

DISCUSSION

This investigation was undertaken to review multidisciplinary management of SDA and confirms that the majority of SDA are not symptomatic and are found incidentally^[6-9]. Endoscopically SDA tend to be large, sessile and located in the second part of the duodenum^[6,10-13] and this series also confirms that most SDA harbour dysplasia^[14-19]. Kim *et al.*^[13] found that all of their 17 non ampullary adenomas were dysplastic while a larger series from Japan^[14] demonstrated that dysplasia was presented in all 233 non-ampullary adenomas assessed. The rate of low grade dysplasia

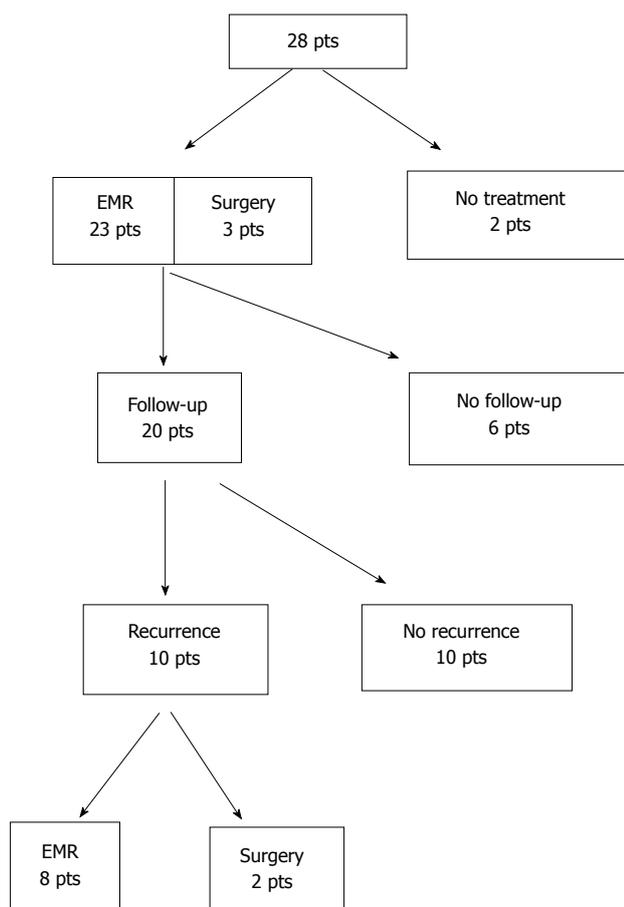


Figure 1 Summary of treatment of ampullary and non-ampullary adenomas. EMR: Endoscopic mucosal resection.

in non-ampullary adenomas in our series was 73.3%, which was within range (52%-84%) of recently published series^[13-15,19], while the rate of low grade dysplasia in our ampullary adenomas (78%) was higher than 53%-66% previously reported^[16-18]. The processes responsible for the high rates of dysplasia in SDA are not clear however Rubio^[19] suggested that the duodenum of those patients may exhibit gastric duodenal metaplasia and bile acids and pancreatic juices may provide a milieu that encourages the metaplasia to proceed onto the adenoma-carcinoma sequence. It is possible that SDA progress to dysplasia faster than other adenomas in the gastrointestinal tract^[19].

Strategy for investigations

The variable investigations performed during patient workup is a reflection of the lack of guidelines available in managing this rare entity.

Role of biopsy: There are no clear guidelines regarding the absolute need to biopsy all lesions and therefore the decision is often left to the discretion of the endoscopist. However a pre resection biopsy for SDAs may compromise a subsequent safe "lift off" technique of EMR and may increase the risk of perforation especially in the setting of a thin duodenal wall or a large duodenal

Table 3 Comparison of characteristics of recurrences ($n = 10$) vs no recurrence ($n = 10$)

	Recurrence ($n = 10$)	No recurrence ($n = 10$)
Non-ampullary/ ampullary	5:5	7:3
Median size (mm)	20 mm	10 mm
Treatment		
Endoscopic resection	10	8
Surgical resection	0	2
Specimen retrieval		
Piecemeal	8	6
<i>En bloc</i>	2	4
Margin positivity	9 (90%)	6 (60%)
Salvage therapy		
Endoscopic resection	8	
Surgical resection	2	

tumour. Moreover morphological changes after biopsy may give the false impression of submucosal infiltration of a superficial lesion^[20,21]. The American Society for Gastrointestinal Endoscopy (ASGE) guidelines suggests that all suspicious lesions should be biopsied^[22]. Although biopsy concordance with final pathology is commonly around 75%, as in this investigation^[23-25], and the non-concordant biopsies usually fail to sample a small focus of malignancy within the SDA particularly ampullary adenomas^[26]. Elek suggests taking large, multiple biopsies (up to 6) or doing papillectomies to improve the diagnostic yield^[27].

Role of EUS: We pursued a selective policy of EUS prior to resection to define invasion or pancreatic ductal involvement in large SDA that were suspicious (large size, ulceration or the presence of high grade dysplasia on biopsy)^[8,27-29]. However SDA size is a variable determinant of high grade dysplasia or malignant change with authors quoting a size > 10 mm^[30], > 20 mm^[8,27,28,31], and > 30 mm^[29]. ASGE guidelines suggest the use of EUS in lesions > 2 cm in non-ampullary and > 1 cm in ampullary adenoma^[22]. Currently the role of intraductal ultrasound is not well defined. Menzel *et al*^[32] suggested it was more useful than EUS in tumour diagnosis but a recent prospective study suggested that it could overstage tumours^[33].

Role of ERCP: This is the least controversial investigational tool for ampullary adenomas and was performed in all our patients since it provides an accurate means of assessing ductal involvement^[34-36].

Treatment

Most of the SDAs were resected endoscopically, which is in line with contemporary management^[37].

Role for EMR: The factors affecting the suitability for a lesion to undergo endoscopic resection include size, presence of malignant signs, extension along the wall

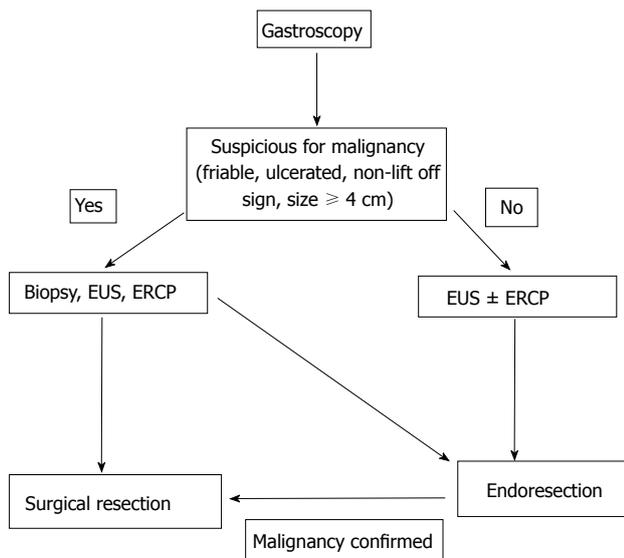


Figure 2 Management of ampullary adenomas. ERCP: Endoscopic retrograde cholangiopancreatography; EUS: Endoscopic ultrasound.

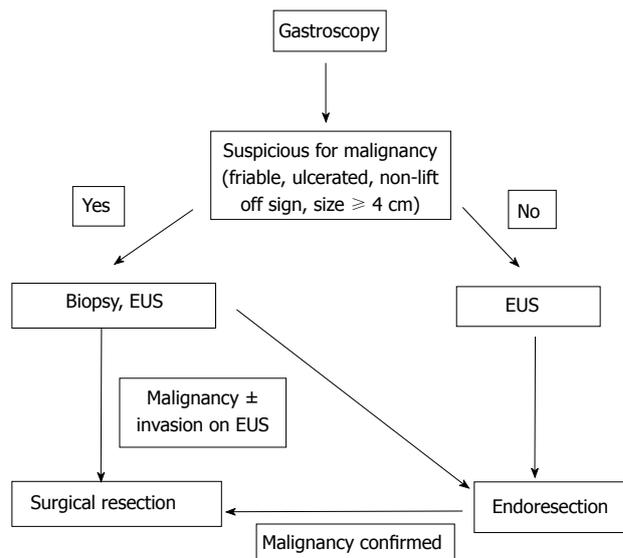


Figure 3 Management of non-ampullary adenomas. EUS: Endoscopic ultrasound.

of the duodenum and extension into biliary/pancreatic ducts^[37]. There is no consensus regarding the absolute size that would make a lesion suitable for endoscopic resection although a maximum size of 4-5 cm for an endoscopic ampullectomy has been suggested, due to the increased risk of malignancy. Large adenomas can be challenging to resect *en bloc* although Irani had a success rate of 84%, with a mean lesion size of 2.4 cm^[38].

There has been a significant shift with respect to size criteria for non ampullary lesions. In 2003 Perez *et al*^[8] suggested that lesions more than 2 cm ought to be resected surgically. In 2009 Alexander *et al*^[7] showed that lesions with mean size of 27.6 mm could be resected endoscopically. Apart from size, the physical appearance of the lesion is important. If the depressed segment is < 10 mm and non-depressed segment < 50 mm then it will be suitable for endoscopic resection and the non-lift sign is a strong sign of malignancy^[39].

Role for endoscopic submucosal dissection: In our institution we have favoured EMR as a method of endoscopic resection. In general it has a success rate of 79%-100% with ability to deal with any lesion in only one session in 80%. The complication rate been quoted as 0.6% for perforation and up to 9% for non-fatal bleeding. Endoscopic submucosal dissection has recently been trialled in duodenal adenomas and electrosurgical dissection with an endoscopic knife achieves a better *en bloc* resection of the lesion^[11]. However the complication rate is higher with perforation rates of 31%, 15% for post-procedural bleeding and a longer procedural duration.

En bloc vs piecemeal resection: We have more commonly resorted to piecemeal resection for both types of adenoma. Ideally *en bloc* resection would

allow an oncologically better resection of the tumour but this can be challenging for lesions > 2 cm^[7,40]. Piecemeal resection allows tumours of larger size to be resected endoscopically with reduced risk of perforation, reduces resection time and uses less electrocautery. Unfortunately it does predispose to repeated subsequent resections^[22] as there is increased risk of recurrence^[7] especially when the lesion is > 20 mm^[7,22].

Role of pancreatic stenting following ampullectomy: Pancreatic duct stenting has been shown to reduce the risk of post procedural pancreatitis in a prospective randomised trial^[41], although the study only included 19 patients. A meta-analysis of five studies involving 481 patients showed that patients in the no stent group had a 3-fold increased risk of post-ERCP pancreatitis^[42]. Our pancreatic stenting rate is only 62.5%, without however any trend towards significant pancreatitis post resection. There is no strong evidence regarding prophylactic biliary stenting, although it has a role should biliary drainage post procedure be a concern^[33].

Complications

We reported a 4.3% complication rate. This was a single patient with self-limiting mild pancreatitis after a papillectomy. The rate of specific complications associated with endoscopic resections include pancreatitis (8%-15%), perforation (up to 4%), cholangitis (up to 2%), papillary stenosis (0%-8%)^[22]. A recent prospective study showed a risk of minor bleeding of 18% and 6.5% for major bleeding^[43]. The low rate of bleeding at our institution could be due to meticulous hemostasis being achieved once resection is completed.

Surveillance and recurrence

In our series of cases, recurrences in ampullary

adenomas occurred earlier and more often than in non ampullary SDA. The inherent risk of recurrence after endoscopic resection has been investigated separately in both subgroups of adenomas. Two series on ampullary adenomas showed a recurrence rate of 19% on follow-up^[43,44] while a published case series of endoscopic resection of non-ampullary adenomas showed an average recurrence rate of 19.9%^[31]. However subset analysis shows that the recurrence rate of 37% can go up to 63% if lesion of > 2 cm diameter are analysed separately^[6]. Currently there is no accepted standardized follow up regime. Most commonly it is suggested that patients should have annual endoscopic follow up for first 2 years after complete resection^[6], while Apel *et al*^[10] suggests 3 monthly endoscopy for 1 year, increasing to 6 monthly for 2 years followed by annual endoscopy.

Best salvage therapy

A treatment plan for recurrences should be devised by all units offering endoscopic therapy of duodenal adenomas as recurrences are common, especially if there has been more than one endoresection, the lesion was large or the resection was incomplete. Unfortunately there is no consensus on the optimal salvage therapy. As more experience is being gathered with endoresection it is increasingly becoming an attractive tool to treat recurrences, often coupled with ablative therapy such as argon beam coagulation (APC). Alexander *et al*^[7] noted 5 recurrences after treating 23 patients with NA by EMR, with median size of 20 mm. Those were cleared with a further session of APC ± EMR with a mean follow up of 13 mo. Similarly a series of 54 patients with non-ampullary adenomas (mean size 15 mm)^[45] had 16 recurrences of which 15 were eradicated with a further session of EMR ± APC. However, the median follow up period was only 10.8 mo.

Very few series have assessed ablation therapy in isolation. Lienert *et al*^[46] assessed 16 cases of NA treated with APC ± polypectomy where 3 of the 4 recurrences were successfully treated with ablative therapy. Apel *et al*^[10] had assessed 18 cases of non-ampullary adenoma, with a median size of 27.5 mm, treated with a combination of serial sessions of polypectomy and APC (33 sessions) carried out over 3 wk to achieve a 55% success rate although 6 cases could not be eradicated despite multimodal endoscopic therapy.

Recently Schneider *et al*^[47] addressed the role of surgery to treat recurrences after failed endoscopic treatment of ampullary adenomas. Forty-four cases were referred for transduodenal surgical ampullectomy following a median of 3 endoscopic treatments before referral. The surgical cure rate was 84% with a post-operative morbidity of 24%, the majority being mild (Clavien-Dindo grade I/II). This was comparable to morbidity associated with endoresection (8%-27%).

Proposed management algorithm

Based on this information a management algorithm for sporadic non-ampullary and ampullary adenomas is

summarised in Figures 2 and 3 respectively. However, management does depend on the experience of the endoscopist (*e.g.*, with respect to size of polyp), the availability of investigative tools (*e.g.*, EUS) and the fitness of the patient to tolerate the treatment offered.

In conclusion, this investigation has confirmed that SDA can be treated endoscopically with minimal morbidity and that piecemeal resection results in eradication in nearly three quarters of patients. Optimal surveillance strategies following resection are not clearly established but re-endoscopy 6 mo after the initial resection is a satisfactory starting point. Recurrent SDA can be treated with endoscopic reresection with surgical resection indicated when the lesions are large (> 3 cm in diameter) or demonstrate severe dysplasia or invasive cancer.

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COMMENTS

Background

The optimal treatment strategy for sporadic duodenal adenomas (SDA) is not yet established although it is clear that this involves contributions from both advanced endoscopy and upper gastrointestinal surgery.

Research frontiers

Developing algorithms to accurately predict the optimal treatment (endoscopic or surgical resection) based on morphology and pathology of both primary and recurrent SDA will assist in their multidisciplinary management.

Innovations and breakthrough

Most SDA can be treated endoscopically with even piecemeal resection resulting in eradication in three quarters of patients. Surgical resection can be reserved for lesions > 4 cm in diameter or with malignant change.

Applications

With multidisciplinary review, endoscopic resection can be the primary treatment modality for SDA.

Terminology

SDA is a management challenge due to their anatomical position and the often comorbid status of patients.

Peer-review

This manuscript is interesting due to the paucity of precise international guidelines regarding the topic.

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