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Piecemeal Resection for Large Colorectal Adenomas Remains Essential in 2022: A Single-Center Experience in a Tertiary French Center

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ABSTRACT

Background & Aims: Colorectal lesions measuring greater than 20 mm are unsuitable for en bloc endoscopic mucosal resection (EMR): piecemeal EMR (PM-EMR) and endoscopic submucosal dissection (ESD) are needed. The European Society of Gastrointestinal Endoscopy (ESGE) recommends ESD only for microinfiltrative lesions, although Japanese teams perform en bloc ESD for all lesions. We report the outcomes obtained in our endoscopy unit for these lesions and assess the hybrid "knife-assisted piecemeal EMR" (KAPM-EMR) technique. The main aim was to assess the short-term outcomes (C1). The secondary objectives were to evaluate the long-term results (C2), adverse event rate and management of recurrence.
Methods: We retrospectively analyzed data from patients treated by PM-EMR, KAPM-EMR and ESD for a colorectal lesion measuring greater than 20 millimeters using prospective inclusion over four years.
Results: Data from 167 patients (median age: 70) with a median follow-up of 15.1 months were analyzed after excluding 95 patients. A total of 131 lesions were removed by PM-EMR, 24 by KAPM-EMR and 12 by ESD; 146/167 (87.4%) patients were considered in remission at C1. Recurrence was treated by endoscopy in 20/21 patients (95%); 86/89 (96.6%) were in remission at C2. A total of 16/167 patients developed adverse events, all of whom except one were endoscopically managed. KAPM-EMR was associated with a higher perforation risk (p=0.037). No differences in postoperative bleeding were found among the three groups (p=0.576).
Conclusions: Piecemeal resection remains an effective and safe technique for large colorectal adenomas. KAPM-EMR may be useful but should be applied with caution due to the risk of perforation.

Key words: large laterally spreading colorectal adenomas – knife-assisted piecemeal resection – colorectal piecemeal EMR – colorectal ESD.

Abbreviations: ADKim: intramucosal adenocarcinoma; ADKsm: submucosal adenocarcinoma; C1: short-term outcomes; C2: the long-term results; EMR: endoscopic mucosal resection; ESD: endoscopic submucosal dissection; ESGE: European Society of Gastrointestinal Endoscopy; HGD: high-grade dysplasia; KAPM-EMR: knife-assisted piecemeal EMR; LGD: low-grade dysplasia; PM-EMR: piecemeal EMR.

INTRODUCTION

The management of colorectal cancer is a major public health issue, as it is the 4th leading cause of cancer and the 2nd leading cause of cancer death worldwide [1]. Colonoscopy is the main preventive weapon against colorectal cancer since resection of adenomas significantly reduces their incidence [2, 3].

The resection techniques have evolved substantially in the recent decades, and the indications for resection of superficial lesions have been extended to all lesions with negligible lymph nodes [4].

Endoscopic mucosal resection (EMR) became popular in the 1990s and then underwent massive developments in the 2000s [5]. However, EMR was first described for resecting en bloc lesions smaller than 20 mm [6]. Thus, various techniques derived from EMR have been developed, such as piecemeal EMR (PM-EMR), endoscopic submucosal dissection (ESD) or the hybrid mucosectomy/submucosal dissection (hybrid ESD) technique [7-10]. This development was possible not only due to improvements in detection, equipment and techniques but also due to improved characterization of superficial lesions. Indeed, a study on the appearance of the lesions and their pit patterns with high-definition endoscopy and classic or virtual chromoendoscopy has allowed the use of different

classifications, such as Paris, Kudo, SANO, JNET and, more recently, CONECCT, to select patients with negligible lymph node risk [5, 7, 10-12].

Endoscopic submucosal dissection was first developed in East Asia and then exported to Western countries; it is mainly used for the treatment of the upper digestive tract (stomach and esophagus), where EMR very quickly becomes insufficient and inefficient, especially for stomach and epidermoid esophageal lesions [13, 14]. Endoscopic submucosal dissection has also been widely applied to the subperitoneal rectum due to the lower risk of complications (few consequences in cases of perforation) and greater benefit than oncological rectal surgery [15]. Regarding large colorectal lesions, the European Society of Gastrointestinal Endoscopy (ESGE) suggests very careful selection of patients for ESD and considers this technique only useful for suspicious micro-infiltrative lesions, while Japanese teams advocate en bloc resection as soon as possible [16, 17]. This difference in recommendation is because the results of ESD in Western countries are poorer, sometimes accompanied by a high complication rate (8.6% perforations) [18, 19]. In addition, large series have shown the safety and efficiency of PM-EMR in large colorectal lesions with a nonnegligible recurrence rate (approximately 16%), most of which are endoscopically manageable (93%) [20]. Nevertheless, certain teams of ESD experts are convinced that this difference tends to disappear and that the loss of histological information linked to PM-EMR is excessively pejorative [21].

Thus, we wanted to report the results from our tertiary endoscopy center for any colorectal lesion measuring >20 mm using a retrospective analysis of our prospective database. The team, experienced in PM-EMR and esophagogastric and rectal ESD, also wanted to evaluate the use of dissection material to perform difficult, large piecemeal resections (KAPM-EMR). Indeed, it seemed to us an interesting technique but has been rarely described [22].

The main aim of this study was to assess short-term outcomes. The secondary objectives were to evaluate the long-term results, the overall morbidity and mortality of each technique, and the management of recurrence and to identify predictive factors for failure and compare the techniques if possible.

METHODS

Study Design and Data Collection

We performed a prospective collection of all patients who were expected to benefit from colorectal endoscopic resection for a lesion measuring 20 cm or more in our tertiary endoscopy center between September 2016 and January 2020. Verbal anonymous consent to participate was obtained from all patients. A detailed standard endoscopy report was required and generated by each operator. Patients who ultimately received en bloc EMR were excluded immediately after the procedure. All data from the database were analyzed retrospectively in 2020.

All data were collected from the patients' electronic medical files, which contained information on medical consultations, medical observations, endoscopic procedures, and definitive histology; phone calls were conducted in cases of missing information.

We reported the following demographic and clinico-pathological characteristics of the patients and lesions: gender, date of birth, lesion size, Paris classification, location of the lesion, resection type, Kikuchi classification, modified Vienna classification, qualitative pathology results (differentiation, presence of vascular or lymphatic emboli, presence of grade 2 or 3 budding), tumor margin, complication rate, and remission rates at the first (3 to 6 months) and second clinical visits after endoscopic treatment (>12 months).

The main objective was to assess endoscopic midterm remission between 3 and 6 months (C1). Remission was defined by the absence of an endoscopic adenomatous or adenocarcinomatous lesion after an initial curative resection. The time of C1 was chosen according to the ESGE guidelines [16].

The secondary objectives were to evaluate the long-term results, i.e., at more than 12 months (C2), to determine the overall morbidity rate and, for each of the techniques, to evaluate the management of recurrences to attempt to highlight the predictive factors for failure, to compare the effectiveness of the different resection techniques, and to evaluate the positive and negative predictive values in demonstrating submucosal infiltration by studying the pit pattern.

Procedures

All procedures were performed under sedation with propofol or under general anesthesia with orotracheal intubation under the direct control of an anesthesiologist. The bowel was prepared by administration of polyethylene glycol with ascorbic acid or sodium picosulfate. A PENTAX MEDICAL™ colonoscope (EC38-i10F2) or a PENTAX MEDICAL pediatric colonoscope (EC3490TFi) was used. CO_2 insufflation was systematically used.

Piecemeal-EMR was performed after injecting saline or a viscous solution. Indigo carmine was used as the inner dye to facilitate visualization of the lesion margins and identification of the correct plane for resection. During this period, a 25-mm COOK MEDICAL™ snare, a hexagonal COOK MEDICAL™ snare, and a Monofil™ ultrasnare (10 and 15 mm) MEDWORK™ (Höchstadt, Germany) were used. All resections were performed according to the classical PM-EMR technique while avoiding mucosal bridges. KAPM-EMR was performed with the same devices and a Dual knife™ or an ITknife nano™ (OLYMPUS™, Tokyo, Japan). During KAPM-EMR, a partial and circumferential incision was performed to improve the snare resection via a better grip. All KAPM-EMRs were only piecemeal resections by definition. ESD was performed after injection of saline or viscous solution. A circumferential incision was performed followed by step-by-step dissection. Double clip traction with the rubber band technique (INSTINCT endoscopic clip, COOK MEDICAL™ or RESOLUTION clip BOSTON SCIENTIFIC™) was sometimes used at the discretion of the operator. Dissection was performed with a Dual Jet knife™ (OLYMPUS™, Tokyo, Japan) combined with a dedicated injection pump (OLYMPUS™, Tokyo, Japan). For all procedures, an ERBE VIO 200D or 300D (ERBE™, Tübingen, Germany) was used. Preventive hemostasis was also performed at the end of the resection. The resection type (PM-EMR, KAPM-EMR or ESD) was chosen at the discretion of

the operator according to the Paris classification, the technical difficulties and the pit pattern, which was analyzed using elements from the Kudo, Sano, NICE or JNET, and CONNECT classifications (without zoom and using i-scan OE™, PENTAX MEDICAL™ instead of NBI OLYMPUS™)[5, 11, 12, 23, 24].

During the procedure, special attention was given to removing residual adenomatous tissue and to checking the lateral margins.

Ambulatory care or a short hospitalization stay was chosen by the responsible operator and the anesthesiologist according to the patient's comorbidities.

All operators had at least 9 years of experience in large endoscopic resections and ESDs.

Endoscopic recurrence was defined by the presence of typical adenomatous or tumoral tissue confirmed with biopsy or on second endoscopic resection pathology. Examples of the resection technique are shown in Fig. 1.

Statistical Analysis

The data were collected using Microsoft Excel software. Statistical analyses were carried out at the α=0.05 significance level with SAS Enterprise Guide v7.15 software. Lesion types were identified as follows: if the patient had more than one lesion, the patient was categorized according to the largest lesion.

Data were summarized using descriptive statistics. For quantitative variables, medians (min-max) and means (standard deviations) were calculated, whereas percentages and frequencies were calculated for categorical criteria.

Remission (C1), complete remission (C2), recurrence and adverse event rates were estimated in both the overall population and the PM-EMR, KAPM-EMR and ESD subgroups. Remission (C1) and adverse event rates of the three resection techniques were compared by using Pearson's chi-squared tests or Fisher's exact tests. Univariate analyses were performed following the same procedures to determine the association with recurrence for the following potential predictive factors: type of resection technique (PM-EMR, KAPM-EMR and ESD), piecemeal resection, tumor size (>4 cm vs. ≤4 cm), perforation, preoperative bleeding, superficial submucosal infiltration, and systematic electrocoagulation of margins. Follow-up was estimated by using the reverse Kaplan–Meier method.

Negative and positive predictive values of high-definition endoscopic and advanced virtual chromoendoscopy (i-scan OE™, PENTAX™) in identifying submucosal infiltration were estimated by considering anatomopathological results as a reference.

Ethical Considerations

Approval was obtained from the institutional review board and the local medical Ethics Committee. The institutional review board number was obtained.

RESULTS

Patient and Lesion Characteristics

Two hundred and sixty-two patients were included between September 2016 and January 2020 from our center (Paoli-Calmettes Institute, Marseille, France). After the first analysis, 24 patients were excluded because of noncurative resection according to the European guidelines (nonnull lymph

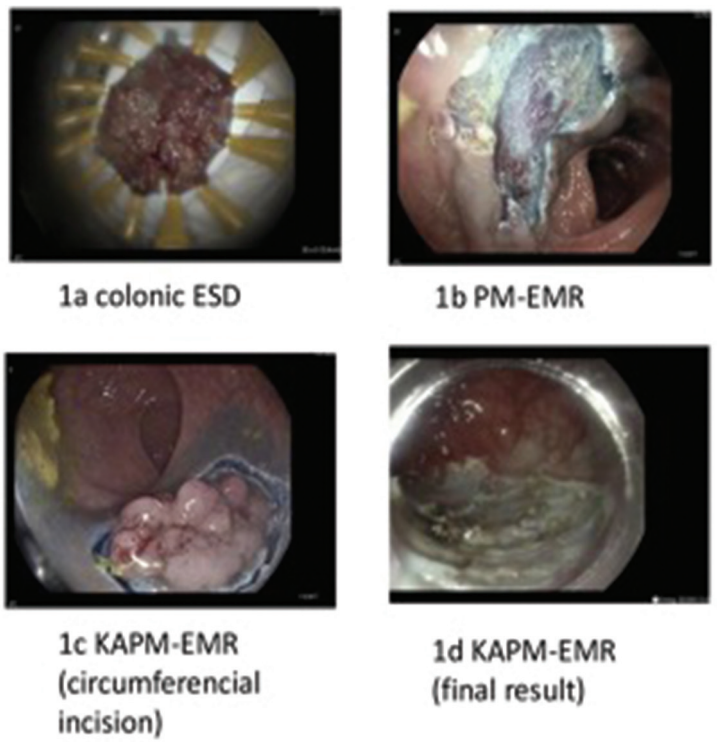

Fig. 1. Examples of different resection type. ESD: endoscopic submucosal disection; PM-EMR: piecemeal endoscopic mucosal resection; KAPM-EMR: knife-assisted piecemeal endoscopic mucosal resection.

node risk: deep invasion of more than 1000 micrometers or worse pathologic qualitative criteria) [16]. These noncurative resections concerned 14 PM-EMR, 4 ESD and 6 KAPM-EMR.

Subsequently, 71 patients were also excluded because of pending follow-up or loss to follow-up.

Data from 167 patients (88 men and 79 women) were analyzed (patients with sufficient follow-up). The median follow-up was 15.1 months [95% confidence interval (95%CI): 13.1-17.1], and the median age was 70 years (range 42-92). Lesion diameters were between 20 and 30 mm in 84/167 patients (50.6%), between 31 and 40 mm in 39/167 patients (23.5%) and >40 mm in 43/167 patients (25.9%). The diameter measurement was missing in one patient. The lesions were located in the right colon in 75/167 patients (44.9%), in the transverse colon in 21/167 patients (12.6%), in the left colon in 18/167 patients (10.8%) and in the rectum in 53/167 patients (31.7%). One hundred thirty-one lesions were resected by PM-EMR (78.4%), 24 by KAPM-EMR (14.4%) and 12 by ESD (7.2%). Fifty-five out of 167 patients (32.9%) had low-grade dysplasia (LGD), 49/167 (29.3%) had high-grade dysplasia (HGD), 43/167 (25.7%) had intramucosal adenocarcinoma (ADKim), 14/167 (8.3%) had serrated polyps, and 6/167 (3.6%) had submucosal adenocarcinoma (ADKsm). All patient and lesion characteristics are shown in Table I. The study design is shown in Fig. 2.

Table I: Patient and lesion characteristics

Variable	Values	Patients with curative resection (n=167)
Gender	Men	88
	Women	79
Age (years)	Mean (SD)	69 (9.2)
	Median [min-max]	70 [42-92]
Location, n (%)	Rectum	53 (31.7)
	Right colon	75 (44.9)
	Transverse colon	21 (12.6)
	Left colon	18 (10.8)
Lesion diameter (mm) n (%)	21-30	84 (50.6)
	31-40	39 (23.5)
	>40	43 (25.9)
Resection technique, n (%)	PM-EMR	131 (78.4)
	KAPM-EMR	24 (14.4)
	ESD	12 (7.2)
Histology, n (%)	LGD adenoma	55 (33)
	HGD adenoma	49 (29.3)
	Serrated adenoma	14 (8.4)
	Intramucosal ADK	43 (25.7)
	Superficial submucosal ADK	6 (3.6)

PM-EMR: piecemeal endoscopic mucosal resection; KAPM-EMR: knife-assisted endoscopic mucosal resection; ESD: endoscopic submucosal resection; LGD: low-grade dysplasia; HGD: high-grade dysplasia; ADK: adenocarcinoma.

Main Objective Results (Remission at C1)

Two hundred and thirty-eight from 262 patients underwent curative endoscopic resection. One hundred and sixty-seven from 262 patients had undergone endoscopic control at C1. Seventy-seven patients were pending follow-up or lost to follow-up.

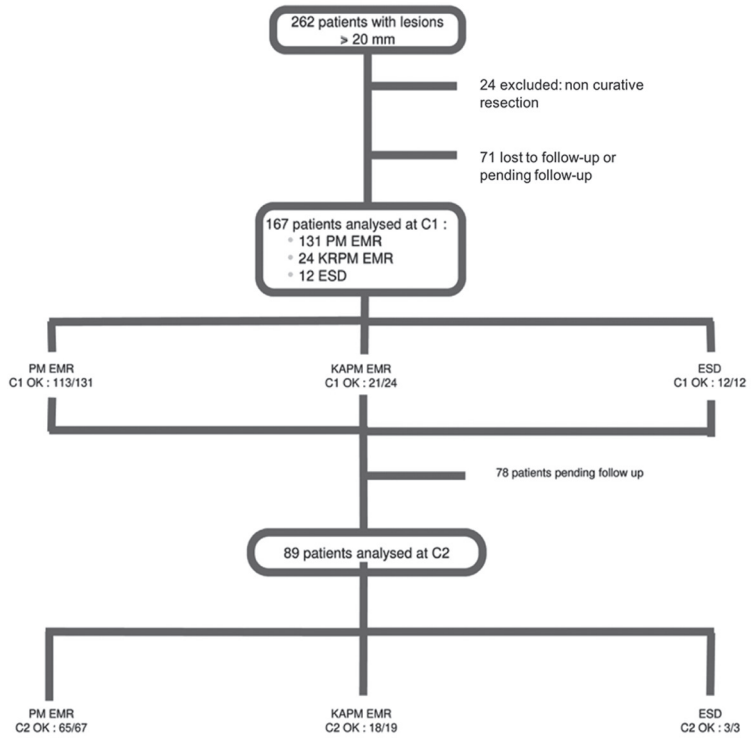

Fig. 2. Design of the study. C1: endoscopic control at midterm (3-6 months); C2: endoscopic control at longterm (> 12 months). For the rest of abbreviations see Fig 1.

One hundred forty-six out of 167 patients (87.4%) were considered in remission at C1. Of these 167 patients, 131 were treated by PM-EMR (78.4%), 24 were treated by KAPM-EMR (14.4%), and 12 were treated by ESD (7.2%).

Twenty-one patients (12.6%) had recurrence at C1. Among these patients, 18 were treated initially by PM-EMR and 3 by KAPM-EMR (with 0 treated by ESD). Outcomes concerning the main result are shown in Fig. 2.

Secondary Endpoint Results (Remission at C2)

Endoscopic control at C2 (>12 months) was available for 89 patients. Eighty-six out of 89 patients (96.6%) were in remission. The 3 patients who experienced recurrence were initially treated by PM-EMR (2/3) and KAPM-EMR (3/3). Two-thirds of these patients also had recurrence at C1.

Adverse Events and Management

A total of 16/167 patients developed adverse events, including 6 perforations and 10 cases of postoperative bleeding needing reintervention. Nine out of 10 postoperative bleeding events concerned patients treated by PM-EMR and 1/10 by KAPM-EMR. Three out of 6 perforations concerned patients treated by PM-EMR, 3/6 by KAPM-EMR, and 0/6 by ESD. All complications were endoscopically managed without the need for transfer to the intensive care unit except for one patient managed by surgery. This patient received KAPM-EMR and underwent laparoscopic lavage with sutures but no colostomy. There were no deaths related to endoscopic resection. These results are shown in Table II.

Knife-assisted PM-EMR was associated with a higher perforation risk than the two other techniques (p=0.0371). No differences in postoperative bleeding were found among the three groups (p=0.5766).

Management of Local Recurrence

During the follow-up, 21 patients experienced recurrence at C1. Recurrent lesions were resected by PM-EMR in 13/21 (61%) patients, by KAPM-EMR in 5/21 (24%) patients, by ESD in 2/21 patients (10%) and by surgery in 1/21 patients (5%). The patient who underwent surgery had adenomatous recurrence that was not accessible by the new endoscopic procedure because of a benign stricture postresection.

Among these patients, endoscopic control at C2 showed no recurrence in 19/21 patients.

At C2, three patients experienced recurrence (two of whom had recurrence at C1). Of these 3 patients, 2/3 were treated by PM-EMR, and 1/3 was treated by ESD.

Significant postoperative bleeding requiring reintervention by endoscopy occurred after resection by KAPM-EMR for a patient who experienced recurrence at C1. No other complications occurred during recurrence management. Outcomes concerning recurrence management are summarized in Fig. 2.

Predictive Factors for Recurrence

No differences were found for any of the following criteria studied: type of resection technique (p=0.39), piecemeal resection vs. en bloc (p=0.17), PM-EMR vs. KAPM-EMR (p=0.87) resection tumor size > 4 cm vs. ≤ 4 cm (p=0.17), perforation vs. no perforation (p=0.76), perioperative bleeding vs. no perioperative bleeding (p=0.92), superficial submucosal infiltration vs. only intramucosal lesion (p=0.35), systematic margin electrocoagulation vs. no systematic electrocoagulation (p=0.73). These results were determined from univariate analyses and are shown in Table III.

Comparison of the Efficiency for Each Type of Resection (PM-EMR, KAPM-EMR and ESD)

Concerning the main objective (remission at C1), no differences were found between the three resection techniques (p=0.38), and no difference was observed between KAPM-EMR and PM-EMR (p=0.87).

Predictive Value for Identification of Submucosal Infiltration by Endoscopy

Using high-definition endoscopic and advanced virtual chromoendoscopy (i-scan OE™, PENTAX™), the positive predictive value (PPV) in identifying submucosal infiltration was 50%, and the negative predictive value (NPV) in eliminating submucosal infiltration was 91%.

Procedure Time

Average procedure time were 31 min for PM-EMR, 65 for KAPM-EMR and 73 min for ESD.

DISCUSSION

Regarding the main aim, our series of 167 patients showed a success rate of 87.4% at 6 months after resection at the first endoscopic control, with endoscopic management of recurrence in 20/21 patients (95.2%). Only one patient needed surgical resection (the second endoscopic resection failed because of a sigmoid benign stricture postresection). These results are substantially similar to those of Moss et al. [20], whose series of 1000 lesions concerned only PM-EMR with 84% efficiency and 93.1% endoscopic management of recurrence.

Table II. Complication rate and management

	All patients N=167	PM-EMR N=131	KAPM-EMR N=24	ESD N=12	p
Remission at C1		113 (86)	21 (87.5)	12 (100)	
Remission at C2		65/67 (97)	18/19 95%	3/3 (100)	
En bloc resection		NA	NA	12 (100)	
Bleeding, n (%)	10 (6%)	9 (6.9)	1 (4.2)	0 (0)	0.5766
Perforation, n (%)	6 (3.6)	3 (2.3)	3 (12.3)	0 (0)	0.0371

NA: not adapted. For the rest of abbreviations see Figs. 1 and 2.

Table III. Predictive factors for recurrence

Variable	Values	Format	All (n=167)	Remission at C1 (n=146)	Recurrence at C1 (n=21)	p (Wilcoxon or Chi²)
Resection	All techniques	n (%)	167 (100.0)	146 (100.0)	21 (100.0)	.
Technique	PM-EMR	n (%)	131 (78.4)	113 (77.4)	18 (85.7)	0.3891
	ESD	n (%)	12 (7.2)	12 (8.2)		
	KAPM-EMR	n (%)	24 (14.4)	21 (14.4)	3 (14.3)	
Lesion diameter	<= 40	n (%)	123 (74.1)	110 (75.9)	13 (61.9)	0.1724
	> 40	n (%)	43 (25.9)	35 (24.1)	8 (38.1)	
PM-EMR vs. KAPM-EMR	PM-EMR	n (%)	131 (84.5)	113 (84.3)	18 (85.7)	0.8703
	KAPM-EMR	n (%)	24 (15.5)	21 (15.7)	3 (14.3)	
Perforation	No	n (%)	161 (96.4)	141 (96.6)	20 (95.2)	0.7582
	Yes	n (%)	6 (3.6)	5 (3.4)	1 (4.8)	
Margin soft coagulation	No	n (%)	132 (79.0)	116 (79.5)	16 (76.2)	0.7313
	Yes	n (%)	35 (21.0)	30 (20.5)	5 (23.8)	
Periprocedural bleeding	No	n (%)	133 (80.1)	116 (80.0)	17 (81.0)	0.9186
	Yes	n (%)	33 (19.9)	29 (20.0)	4 (19.0)	
		Number of missing data	1	1		
ADKsm vs. all other lesions	ADKsm	n (%)	63 (37.7)	57 (39.0)	6 (28.6)	0.3567

ADKsm: submucosal adenocarcinoma. For the rest of abbreviations see Figs 1 and 2.

Apart from the confirmation of these results regarding piecemeal resection for large colorectal lesions, another novelty of our study is that we also analyzed the KAPM-EMR group. In this group, dissection material was used at the discretion of the operators, who were all experienced in ESD, to facilitate resection by creating, for example, an anchor point for the loop. This technique seemed safe to us, and we wanted to evaluate its effectiveness.

The efficacy of KAPM-EMR was statistically similar to that of ESD and PM-EMR (p=0.38), but it is important to note that the complication rate in the KAPM-EMR group was significantly higher than that in the PM-EMR group (p=0.0139) although the majority of the perforations were managed endoscopically. All perforations occurred during the snaring time maybe by muscularis aspiration from a deep incision. These two groups had comparable populations, which suggests the need for greater caution in the use of KAPM-EMR. However, the operators used KAPM-EMR when PM-EMR was difficult (anchoring difficulties) or even impossible, which may explain this difference. This technique may have produced possible resections that would not have been possible by PM-EMR, but only a randomized study can confirm this.

Twelve patients were treated with ESD for a single perforation. However, the ESD group was not comparable to the other groups mainly because of its size. This is probably a bias related to the fact that resection, especially in certain locations (behind a fold or in an angle), did not appear reasonable.

This low rate of colonic ESD in intention-to-treat analyses is in line with the experience and organization of interventional endoscopy units not yet adapted in the West to colonic ESD, even in a team that has performed ESDs at other sites for several years.

Several studies have shown a difference between Western and East Asian teams in terms of results of these techniques [19, 25, 26]. For instance, in a meta-analysis, the R0 resection rate was 71.3% in non-Asian countries versus 85.6% in Asian countries, although the incidence of adverse events that required surgery was 3.1% versus 0.8%, respectively [19].

In addition, the superiority of the "selective ESD" versus "all-ESD" strategy was described by a Western team, particularly with regard to the use of surgery [18].

Some teams believe that this difference between West and East Asia has diminished sharply in recent years [27, 28]. However, even if there are a few ultraexpert teams in the West, treating all adenomas larger than 20 cm with ESD seems impractical to date given the increasing number of adenomas discovered each year, in particular due to the screening programs used for mass populations in various Western countries [29]. In addition, the good results of the PM-EMR (and here of the KAPM-EMR) do not argue in favor of a change to the European guidelines at present [16].

In our series, another important point to consider is that late recurrences after more than 12 months were rare and, in 2/3 of cases, concerned patients who had already experienced recurrence at C1. Furthermore, this recurrence could be treated endoscopically in all cases.

Surprisingly, only one complication was noted among the 23/24 patients treated endoscopically at C1 and C2. Indeed, these were understandably difficult resections involving fibrosis. In this case, the team's ESD experience was probably of great assistance in the use of the dissection equipment. Indeed, we note that a large portion of the lesions required the use of dissection equipment (8/23, 34.8%).

On the other hand, it is just as surprising that we did not find any predictive factor for failure, especially with lesion sizes > 40 mm. Regardless of the team's experience, this criterion has been found in most studies concerning piecemeal resection [20]. We could therefore assume that KAPM-EMR made it possible to overcome the size criterion, but the study design absolutely does not allow this conclusion, and these data will have to be specifically evaluated in future investigations. The characterization of the lesions before resection, particularly the demonstration by endoscopy of submucosal infiltration, is relatively disappointing in this Western study, with a PPV of 50% despite an NPV of 91%. Rapidly expanding artificial intelligence for detection is expected to improve this characterization in the near future [30, 31]. This will prevent piecemeal resections for microinfiltrating lesions, although such procedures may be acceptable only under certain conditions [32].

Other limitations of this study are the lack of randomization between the different groups, its monocentric nature and the high number of dropouts. However, the purpose of this study was not to carry out a test but to evaluate the practices of our expert center for piecemeal resection that is experienced in ESD, excluding colonic ESD. Regarding the number of patients lost to follow-up, these are mainly patients referred by other centers whose follow-up information could not be retrieved despite numerous reminders to the patients and their corresponding doctors.

These good results should not make us forget that the resection of large colorectal lesions remains a difficult technique with a learning curve and a number of significant complications reserved for trained teams able to manage the complications as well as an adapted technical platform allowing their management.

As a result, in 2022 in the West, piecemeal resection (more or less assisted by dissection material) remains an effective and safe technique for treating adenomas and noninfiltrating adenocarcinomas. This will persist so as long as the number of operators trained in very high-level ESD (colonic localization being one of the most difficult) will not allow the resection of all colonic adenomas, the incidence of which has been increasing with screening [33]. All-ESD seems unlikely in the near future, but as the techniques improve [33] and the use of robotic arms and the organization of training in the West increases [34], this is sure to change. Currently, 20% of patients are operated on for benign colonic adenomas, which implies that assessment of the resectability of these lesions and/or access to PM-EMR is insufficient in France [35].

CONCLUSIONS

In the West in 2022, piecemeal resection must remain, for the moment, the reference technique for large unresectable monobloc adenomas so as not to paradoxically increase the number of adenomas operated on (due to failure of colonic ESD or intraoperative perforation).

Conflicts of interest: None to declare.

Authors' contribution: J.P.R. conceived and designed the study, was the principal investigator and drafted the paper. C.A. collected the data and contributed substantialy to the manuscript writing. C.F. was the second investigator and collected the data. C.P., S.H., Y.D., M.M. and M.G. performed the endoscopic resections. F.P. performed the histological analyses. B.C. gave the oncological advices. B.L., H.M and C.D.C perfoemd the surgical procedures. C.Z. and A.S. performed the statistical analyses. M.G supervised the procedures and the study. All the authors aproved the final version of the paper.

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