Original article

Multicentre study of surgical referral and outcomes of patients with benign colorectal lesions

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Background: A multicentre cohort study was performed to analyse the motivations for surgical referral of patients with benign colorectal lesions, and to evaluate the endoscopic and pathological characteristics of these lesions as well as short-term surgical outcomes.

Methods: Patients who underwent surgery for a benign colorectal lesion in 15 Dutch hospitals between January 2014 and December 2017 were selected from the pathology registry. Lesions were defined as complex when at least one of the following features was present: size at least 40 mm, difficult location according to the endoscopist, previous failed attempt at resection, or non-lifting sign.

Results: A total of 358 patients were included (322 colonic and 36 rectal lesions). The main reasons for surgical referral of lesions in the colon and rectum were large size (33·5 and 47 per cent respectively) and suspicion of invasive growth (31·1 and 58 per cent). Benign lesions could be categorized as complex in 80·6 per cent for colonic and 80 per cent for rectal locations. Surgery consisted of local excision in 5·9 and 64 per cent of colonic and rectal lesions respectively, and complicated postoperative course rates were noted in 11·2 and 3 per cent. In the majority of patients, no attempt was made to resect the lesion endoscopically (77·0 per cent of colonic and 83 per cent of rectal lesions).

Conclusion: The vast majority of the benign lesions referred for surgical resection could be classified as complex. Considering the substantial morbidity of surgery for benign colonic lesions, reassessment for endoscopic resection by another advanced endoscopy centre seems to be underused and should be encouraged.
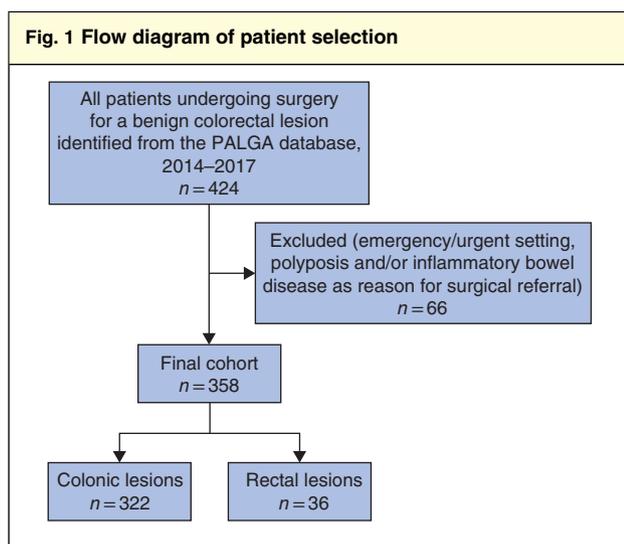
Introduction

The vast majority of colorectal cancers arise from benign precursor lesions, namely adenomas or serrated polyps[1,2]. Although most polyps never progress to colorectal cancer and identifying polyps at risk remains challenging[3–6], it has been shown[7] that removing adenomas reduces colorectal cancer-related mortality. Together with the long dwell time, this makes colorectal cancer a suitable disease for population-based screening.

In the Netherlands, a colorectal cancer screening programme was implemented in 2014. Every individual aged between 55 and 75 years is invited biennially to participate and perform a faecal immunochemical test (FIT), followed by colonoscopy if the FIT result is positive.

Lesions identified by colonoscopy are mostly treated by conventional endoscopic resection, with a minimal risk of complications such as bleeding or perforation[8–10]. Formal oncological bowel resection is still often considered as the main therapeutic approach for large benign lesions, with additional surgical alternatives for rectal lesions, such as transanal endoscopic microsurgery (TEM) or transanal minimally invasive surgery (TAMIS)[11,12]. More recently, 'advanced' endoscopic alternatives have become available, such as endoscopic mucosal resection (EMR), endoscopic submucosal dissection (ESD) and endoscopic full-thickness resection (eFTR).

In the European Society of Gastrointestinal Endoscopy (ESGE) guideline published in 2017, Ferlitsch and colleagues[13] proposed a decision tree for the treatment

Fig. 1 Flow diagram of patient selection

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All patients undergoing surgery
for a benign colorectal lesion
identified from the PALGA database,
2014–2017
n = 424
            │
            ├──────────▶  Excluded (emergency/urgent setting,
            │              polyposis and/or inflammatory bowel
            │              disease as reason for surgical referral)
            │              n = 66
            ▼
      Final cohort
        n = 358
       ┌────────┴────────┐
       ▼                 ▼
  Colonic lesions    Rectal lesions
    n = 322            n = 36
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PALGA, Pathological Anatomy National Automated Archive.

of colorectal neoplasia. In this guideline, *en bloc* EMR, or piecemeal EMR removal if an *en bloc* removal is not feasible, should be considered for all large (20 mm or more) colorectal neoplasias with no endoscopic suspicion of invasive growth. All colorectal neoplasias above 40 mm without any suspicion of invasive growth should be referred to an expert centre. When there is suspicion of invasive growth, referral for *en bloc* endoscopic removal or surgery should also be considered[13]. However, even though advanced endoscopic alternatives are proven safe and effective[14,15], multiple studies[16–18] have shown that surgery for benign neoplasia is still common, and referral patterns vary widely[19]. For obvious reasons, formal segmental bowel resection results in higher morbidity and mortality rates compared with endoscopic resection[20]. Especially for benign lesions, this could raise questions about proportionality of surgery in relation to the anomaly. Up-to-date studies allowing a more in-depth insight of surgically resected benign lesions are sparse, thereby limiting our understanding of the context in which referral for surgery took place. Therefore improvements regarding referral patterns to both surgeons and gastroenterologists remain obscure.

This multicentre cohort study aimed to analyse referral for surgery of patients with benign lesions of the colon and rectum separately, and to evaluate the endoscopic and pathological characteristics and short-term surgical outcomes.

Methods

An inquiry was performed into the Pathological Anatomy National Automated Archive (PALGA), the nationwide network and registry of histopathology and cytopathology in the Netherlands with complete national coverage[21]. All patients undergoing a surgical resection for a benign lesion over a 4-year period (January 2014 to December 2017) were eligible. The selection of patients was done retrospectively, by analysing the PALGA histopathology reports of both the polypectomy/endoscopic resection and the pathology report of the bowel resection. Selection of patients was moderated by two investigators.

This study was conducted in four academic hospitals, ten large teaching hospitals and one community hospital in different parts of the Netherlands. Each participating hospital appointed a surgeon responsible for (supervising) the data registration. Data were retrieved from electronic patient records, pathology reports and endoscopy reports. Data were entered in an online, web-based survey, based largely on the Dutch ColoRectal Audit (DCRA), a web-based national audit in which all patients undergoing surgery for primary colorectal carcinoma are recorded prospectively[22]. This research was conducted as part of the DCRA, which is an obligatory audit from the inspectorate of healthcare and requires no informed consent from patients for data collection. Data analyses were performed on an anonymized data set and did not need ethical approval according to Dutch law.

Inclusion and exclusion criteria

Inclusion criteria were benign lesions in the colon or rectum that were treated surgically. Surgical treatment included formal bowel resections, as well as local excisions, such as TEM/TAMIS, and wedge or segmental resections. Endoscopic resections, such as EMR, ESD and eFTR, were excluded. Exclusion criteria were adenocarcinoma (category T1 or above) as well as pathological (suspicion of) invasive carcinoma in the polypectomy specimen together with no residual carcinoma in the surgical specimen, polyposis syndromes, or a non-neoplastic indication for bowel surgery (such as inflammatory bowel disease).
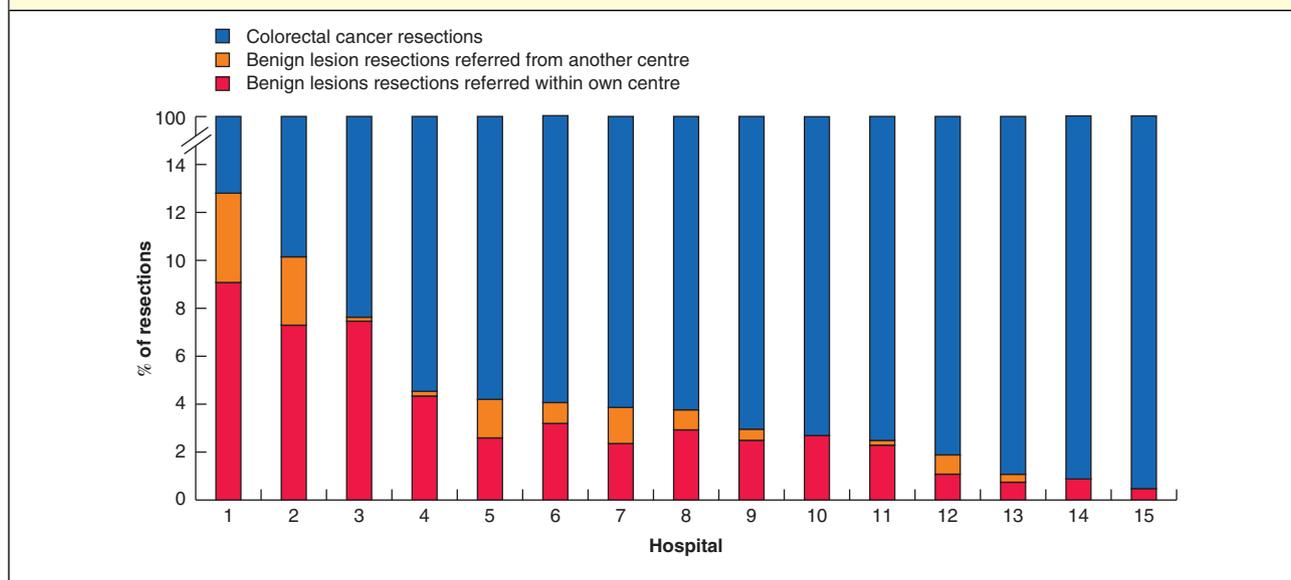
Definitions

Benign colorectal lesions were defined as conventional adenomas (tubular, tubulovillous, villous adenoma, with either low- or high-grade dysplasia) and two types of serrated polyps: sessile serrated adenoma and traditional serrated adenoma. In the present study, lesions were categorized into three groups: lesions referred for suspicion of malignancy; complex lesions, with at least one of the following features: size 40 mm or more, difficult location according to the endoscopist, previous failed

Table 1 Patient and lesion characteristics of 358 patients undergoing surgery for benign colorectal lesions, 2014–2017		Colon (n = 322)	Rectum (n = 36)
Patient characteristics			
Age (years)	≤ 60	37 of 320 (11·6)	1 (3)
	61–70	154 of 320 (48·1)	18 (50)
	71–80	110 of 320 (34·4)	14 (39)
	≥ 81	19 of 320 (5·9)	3 (8)
Male sex		182 (56·5)	20 (56)
ASA grade ≥ III		71 of 320 (22·2)	7 (19)
BMI (kg/m^2)	Unknown	35 (10·9)	2 (6)
	> 30	69 (21·4)	6 (17)
Charlson co-morbidity score	> 2	87 (27·0)	12 (33)
Lesion characteristics			
Diagnosis of lesion	Screening programme	146 (45·3)	18 (50)
	Surveillance	35 (10·9)	6 (17)
	Symptomatic	70 (21·7)	8 (22)
	Incidental finding	25 (7·8)	1 (3)
	Other	46 (14·3)	3 (8)
Location of lesion	Ileocaecal valve	30 (9·3)	
	Caecum	112 (34·8)	
	Appendiceal orifice	7 (2·2)	
	Ascending colon	69 (21·4)	
	Hepatic flexure	24 (7·5)	
	Transverse colon	23 (7·1)	
	Splenic flexure	8 (2·5)	
	Descending colon	21 (6·5)	
	Sigmoid	28 (8·7)	
	Rectum		36 (100)
Endoscopic size of lesion (cm)	0–1·9	13 (4·0)	1 (3)
	2–3·9	82 (25·5)	5 (14)
	4–5·9	74 (23·0)	8 (22)
	≥ 6	69 (21·4)	12 (33)
	Missing	84 (26·1)	10 (28)
Endoscopic removal of lesion			
Assessed as radically removed		5 (1·6)	0 (0)
Attempt to remove failed		62 (19·3)	6 (17)
Reason attempt failed	Non-lifting	43 of 62 (69)	0 (0)
	Complication	0 of 62 (0)	3 of 6 (50)
	Other	16 of 62 (26)	3 of 6 (50)
No attempt to remove		248 (77·0)	30 (83)
If no attempt, was biopsy taken?	Yes	212 of 248 (85·5)	26 (87)
Not known whether attempt was made		7 (2·2)	0 (0)
Histological findings*	Tubular adenoma	100 of 279 (35·8)	7 of 32 (22)
	Tubulovillous adenoma	149 of 279 (53·4)	14 of 32 (44)
	Villous adenoma	19 of 279 (6·8)	11 of 32 (34)
	Sessile serrated adenoma	8 of 279 (2·9)	0 (0)
	Traditional serrated adenoma	1 of 279 (0·4)	0 (0)
	Missing	2 of 279 (0·7)	
Dysplasia adenoma	Low grade	206 of 268 (76·9)	20 of 32 (63)
	High grade	62 of 268 (23·1)	12 of 32 (38)
Dysplasia sessile serrated polyps	No dysplasia	4 of 8 (50)	
	With dysplasia	4 of 8 (50)	

Values in parentheses are percentages. *Histological findings of lesion provided there was a biopsy or attempt at endoscopic removal.

Fig. 2 Proportion of operations performed for benign colorectal lesions per centre

Percentage of benign lesion resections of total (benign and colorectal cancer) resections.

attempt at resection, non-lifting sign after submucosal injection; and non-complex lesions (all lesions without one of the above features). The definition of a complex lesion in this study was based largely on features of complexity as defined by the Association of Coloproctologists of Great Britain and Ireland[12].

A complicated postoperative course was defined as a postoperative complication resulting in a hospital stay of more than 14 days and/or reintervention and/or postoperative mortality. Reintervention was defined as surgical, endoscopic or radiological intervention after primary bowel surgery. This composite outcome measure includes complications and mortality, which are seen as important outcome factors representing quality of care, and has been a quality indicator for several years within the DCRA[23–25].

Statistical analysis

Descriptive statistical analysis was performed using SPSS® version 24.0 for Windows® (IBM, Armonk, New York, USA).

Results

A total of 358 patients underwent surgical treatment for a benign colorectal lesion in one of the 15 participating hospitals across the Netherlands between 1 January 2014 and 31 December 2017 (*Fig. 1*). The lesions were located in the colon in 89·9 per cent (322 patients) and in the rectum in 10·1 per cent (36). Patient and lesion characteristics are shown in *Table 1*. Some 59·7 per cent of patients with colonic lesions and 53 per cent of patients with rectal lesions were 70 years or younger.

Colonic and rectal lesions were diagnosed through the colorectal cancer screening programme in 45·3 and 50 per cent respectively. Colonic lesions were mainly right-sided, especially in the ileocaecal location (149 of 322, 46·3 per cent). If documented, the size of the lesion was assessed endoscopically as at least 40 mm in 60·1 per cent (143 of 238) of colonic and 77 per cent (20 of 26) of rectal lesions. In the majority of patients, no attempt was made to resect the lesion endoscopically (77·0 and 83 per cent for colonic and rectal lesions respectively), but a biopsy was often taken (85·5 and 87 per cent respectively).

For colonic lesions, histopathology reports of biopsies or endoscopic resection attempts showed a tubulovillous adenoma in 53·4 per cent, followed by tubular adenoma (35·8 per cent), villous adenoma (6·8 per cent), sessile serrated adenoma (2·9 per cent) and traditional serrated adenoma (0·4 per cent). For rectal lesions, there was tubulovillous adenoma in 44 per cent, villous adenoma in 34 per cent and tubular adenoma in 22 per cent. Of the adenomas, the majority contained low-grade dysplasia (colon 76·9 per cent, rectum 63 per cent).

Resection rates differed among the 15 participating hospitals. The proportion of patients who had surgery

for benign colorectal lesions in proportion to colorectal surgery for both colorectal cancer and benign lesions varied between 0·5 and 12·8 per cent (*Fig. 2*).
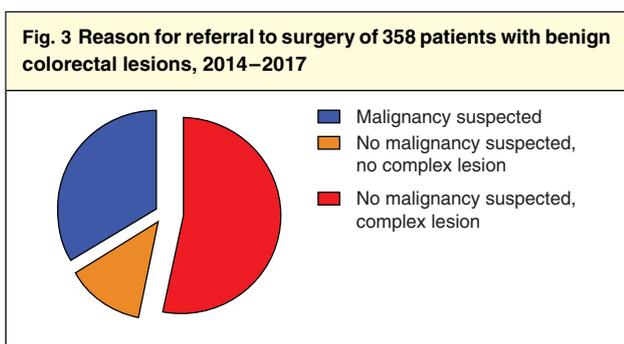
Referral for surgery

The three main reasons for surgical referral of colonic lesions were size considered to be too large (33·5 per cent), suspicion of invasive growth (31·1 per cent) and a non-lifting sign (22·0 per cent) (*Table 2*). For rectal lesions, the main reasons for surgical referral were suspicion of invasive growth (58 per cent), size (47 per cent) and location (28 per cent). If no malignancy was suspected, lesions could be categorized as complex in 80·6 and 80 per cent of colonic and rectal lesions respectively (*Table 2* and *Fig. 3*). Patients with benign lesions, either complex or non-complex, were referred to another centre for an (additional) endoscopic resection preceding surgical treatment in 1·4 and 13 per cent of cases respectively.

Surgical characteristics and outcomes

Laparoscopic resection was the commonest approach for colonic lesions (274 of 321, 85·4 per cent) and the most commonly performed type of bowel resection was a right-sided colectomy 187 of 322, 58·1 per cent. For rectal lesions, 23 (64 per cent) were resected via a local excision, primarily by TEM or TAMIS procedure (22 of 23). A stoma was constructed in 0·6 per cent of colonic (2 of 321) and 6 per cent of rectal (2 of 36) resections.

Following surgical treatment of colonic and rectal lesions, median hospital stay was 5 and 3 days respectively, the complicated postoperative course rate was 11·2 and 3 per cent, 30-day readmission rate was 4·0 and 0 per cent, and the 30-day or in-hospital mortality rate was 0·9 and 0 per cent. Surgical treatment characteristics and outcomes are summarized in *Table 3*.

Most colorectal lesions were treated by formal oncological resection. For the whole cohort, local or segmental resections were performed in 16 (13·2 per cent) of 121 patients in whom there was suspicion of invasive growth, in 22 (11·5 per cent) of 191 patients with complex lesions, and in ten (22 per cent) of 46 patients with lesions that were not complex. For rectal lesions, these rates were 57 per cent (12 of 21) 75 per cent (9 of 12) and 67 per cent (2 of 3) respectively. Of the 48 patients treated with local or segmental resection, only two (4 per cent) had a postoperative complication.

Table 2 Surgical referral characteristics of 358 patients undergoing surgery for benign colorectal lesions, 2014−2017		
	Colon (n = 322)	Rectum (n = 36)
Reason for referral for surgical resection*		
Size	108 (33·5)	17 (47)
Endoscopic size of lesion (cm)		
0–1·9	2 of 108 (1·9)	0 (0)
2–3·9	21 of 108 (19·4)	3 of 17 (18)
4–5·9	40 of 108 (37·0)	3 of 17 (18)
≥6	20 of 108 (18·5)	8 of 17 (47)
Missing	25 of 108 (23·1)	3 of 17 (18)
Suspicion of invasive growth	100 (31·1)	21 (58)
Location	61 (18·9)	10 (28)
Ileocaecal valve	14 of 61 (23)	
Caecum	32 of 61 (52)	
Appendicular orifice	4 of 61 (7)	
Ascending colon	4 of 61 (7)	
Hepatic flexure	1 of 61 (2)	
Transverse colon	2 of 61 (3)	
Splenic flexure	0 of 61 (0)	
Descending colon	1 of 61 (2)	
Sigmoid	3 of 61 (5)	
Distance from anal verge (cm)		
<5		3 of 10 (30)
5–10		2 of 10 (20)
>10		2 of 10 (20)
Unknown		3 of 10 (30)
Non-lifting sign	71 (22·0)	4 (11)
(Suspicion of) incomplete resection after endoscopic removal	31 (9·6)	5 (14)
Incomplete resection based on histological examination	18 (5·6)	0 (0)
Patient preference	5 (1·6)	0 (0)
Symptoms related to lesion	6 (1·9)	0 (0)
Other	13 (4·0)	1 (3)
Categorized reason for referral		
Malignancy suspected		
Yes	100 (31·1)	21 (58)
No	222 (68·9)	15 (42)
Complex lesion	179 of 222 (80·6)	12 of 15 (80)
No complex lesion	43 of 222 (19·4)	3 of 15 (20)
Referral made to another centre†	3 of 222 (1·4)	2 of 15 (13)
Preoperative MDT meeting	186 (57·8)	21 (58)

Values in parentheses are percentages. *Multiple answers possible; †for reassessment of possible endoscopic removal.

Fig. 3 Reason for referral to surgery of 358 patients with benign colorectal lesions, 2014–2017

- ■ Malignancy suspected
- ■ No malignancy suspected, no complex lesion
- ■ No malignancy suspected, complex lesion

A complex lesion comprised: size 40 mm or more, difficult location according to endoscopist, previous failed attempt at resection, or non-lifting sign after submucosal injection.

Table 3 Treatment characteristics and 30-day adverse events after surgery for benign colorectal lesions, 2014–2017

	Colon (*n* = 322)	Rectum (*n* = 36)
Surgical procedure		
Ileocaecal resection	44 (13·7)	
(Extended) right colectomy	187 (58·1)	
Transversectomy	6 (1·9)	
(Extended) left colectomy	25 (7·8)	
Sigmoid resection	20 (6·2)	
Subtotal colectomy (caecum to rectum)	2 (0·6)	
Segmental resection of colon	6 (1·9)	
Anterior resection (PME)	4 (1·2)	
Low anterior resection		11 (31)
Abdominoperineal resection		1 (3)
Local excision	19 (5·9)	23 (64)
Other	9 (2·8)	1 (3)
Stoma		
No stoma	319 (99·1)	34 (94)
Defunctioning ileostomy	1 (0·3)	1 (3)
Defunctioning colostomy		1 (3)
End colostomy	1 (0·3)	
Unknown	1 (0·3)	
Complications		
None	240 (74·5)	35 (97)
Surgical	24 (7·5)	1 (3)
Non-surgical	32 (9·9)	0 (0)
Surgical and non-surgical	17 (5·3)	0 (0)
Type unknown	7 (2·2)	0 (0)
Unknown	2 (0·6)	
Reintervention	26 (8·1)	1 (3)
Complicated course	36 (11·2)	1 (3)
Mortality	3 (0·9)	0 (0)
Length of hospital stay (days)*	5 (3–8)	3 (1–5)
Readmission	13 (4·0)	0 (0)

Values in parentheses are percentages unless indicated otherwise; *values are median (i.q.r.). PME, partial mesorectal excision.

Discussion

This multicentre cohort study demonstrates that the majority of the benign colorectal lesions referred for bowel resection in the Netherlands were classified as complex. Size was the most common reason for surgical referral, followed by a suspicion of invasive growth, difficult location and non-lifting sign. Referral to another centre with advanced endoscopic expertise to assess the possibilities of an additional endoscopic resection attempt before deciding on surgical treatment was seldom undertaken. The majority of rectal lesions are treated by local excision with only minor morbidity. In contrast, lesions located in the colon were treated mainly by oncological resection, with notable morbidity (complicated course 11·2 per cent) and a mortality rate of 0·9 per cent.

Whereas in most studies on surgical treatment of benign colorectal lesions, no data are provided on location, in the present study a notable difference was seen in motivation for surgery between colonic and rectal lesions. Patients with rectal lesions were more often referred to the surgeon because of suspicion of malignancy (58 per cent for rectal polyps compared with 31·1 per cent for colonic polyps). This might be explained by the possibility of treating large rectal adenomas by local excision, with a relatively low risk of complications due to better accessibility, greater stiffness of the wall, and the whole coverage of the rectal wall by surrounding mesentery, which limits the clinical consequences of anastomotic dehiscence.

Although multiple classification systems have been developed to grade the complexity of a lesion, referral for surgery remains largely subjective. However, referral to an advanced interventional endoscopist seems to be indicated for complex lesions with no evident features associated with the risk of covert malignancy, for example according to the criteria proposed by Burgess and colleagues[26]. In the present study, an attempt at endoscopic resection was made in about one-quarter of lesions with no suspicion of malignancy, and only five patients were referred to another centre for (an additional attempt of) endoscopic resection. Furthermore, if there was no suspicion of malignancy and endoscopic resection was not attempted, a biopsy was taken in the vast majority of cases. The current expert view is that, when a polyp looks benign, biopsy has no advantage over an endoscopic diagnosis, could cause fibrosis and might impede successful endoscopic resection at referral.

A previous Dutch study by Bronzwaer and co-workers[17] has already demonstrated that referral to another centre with advanced interventional endoscopy expertise is seldom considered, comprising an overall rate of 2·4 per cent between 2005 and 2015. It could be argued that all lesions with no suspicion of malignancy and size greater

than 2 cm would be appropriate candidates for referral to an advanced interventional endoscopist, according to the ESGE guideline[13]. Following these criteria, more than 90 per cent of lesions in the present study would have been eligible for referral for endoscopic reassessment. Literature on benign colorectal lesions has reported that surgery could have been avoided in up to 70 per cent of patients following reassessment of the lesion by an expert endoscopist, although the sample sizes were small[27–30].

Formal oncological resection of benign colorectal lesions would be expected to be associated with higher morbidity and mortality rates compared with local excision alternatives. A large cohort of 12 732 patients studied by Peery et al.[31] reported a 14 per cent risk of a major postoperative adverse event and a 30-day mortality rate of 0·7 per cent, in agreement with the present results (10·3 per cent complicated course and 0·8 per cent 30-day mortality rate). For endoscopic resections including conventional polypectomy, EMR and ESD, the primary complications are bleeding and perforation. Delayed bleeding after these endoscopic techniques has been reported in 1·6, 1·2–1·7 and 0·7–2·2 per cent respectively, and perforation in 0·05, 0·3–0·8 and 2–14 per cent[32,33].

This study has several limitations. First and most importantly, there was no information on lesions treated successfully by endoscopic resection. Thus, it remains unclear to what extent the relative surgery rates change over time. In addition, it is not known to what extent the endoscopic removal of lesions was successful in patients referred to another advanced endoscopy centre for endoscopic resection. Also, some parameters were not registered, in particular the morphology of the lesions according to their appearance (flat, sessile, pedunculated). For that reason, existing scoring systems could not be used to define the difficulty of polypectomy[34]. It remains unclear whether the decision not to attempt an endoscopic resection was based on a single opinion, or whether colleagues in the same hospital were consulted. Furthermore, as in 26·3 per cent of patients there were no data on the size of the lesion, this should be taken into consideration when interpreting the results. Moreover, as no information was available on the number of colonoscopies per centre, variability between the hospitals, as shown in *Fig. 2*, is of limited value. An upcoming surgical alternative for colonic lesions that are not suitable for endoscopic removal is the limited endoscopy-assisted wedge resection[35]. This technique is currently being investigated in a multicentre cohort study, perhaps reflecting the high resection rates in some of the participating hospitals. Other factors that might contribute to the variation in resection rate among different hospitals could be a subject for future research.

In addition, to put the present results into a wider context, it would have been interesting to have data on how many lesions with an endoscopic suspicion of malignancy were indeed malignant at final histopathological assessment, or how many lesions that were classified as benign turned out to be malignant after surgical resection.

The majority of benign colorectal lesions referred to the surgeon are classified as complex, both for colonic and rectal localizations. Referral to another centre for reassessment of endoscopic resection seems to be underused. When a patient is referred for surgical resection of a colonic lesion, treatment is accompanied by substantial morbidity. A national consensus on when to refer a patient to an advanced interventional endoscopist, and defining what constitutes an advanced interventional endoscopist, would be desirable.

Acknowledgements

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