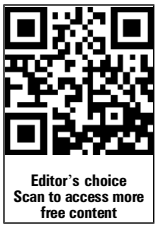

RESEARCH

A novel method for determining the difficulty of colonoscopic polypectomy

S Gupta,[1] D Miskovic,[2] P Bhandari,[3] S Dolwani,[4] B McKaig,[5] R Pullan,[6] B Rembacken,[7] S Riley,[8] M D Rutter,[9] N Suzuki,[1] Z Tsiamoulos,[1] R Valori,[10] M E Vance,[1] O D Faiz,[2] B P Saunders,[1] S Thomas-Gibson[1]

[1]Wolfson Unit for Endoscopy, St Mark's Hospital and Imperial College London, Harrow, UK
[2]Department of Surgery and Cancer, Imperial College London, St Mary's Hospital, London, UK
[3]Department of Gastroenterology, Queen Alexandra Hospital, Cosham, Portsmouth, UK
[4]Department of Gastroenterology, University Hospital of Wales, Cardiff, UK
[5]Department of Gastroenterology, New Cross Hospital, Wolverhampton, UK
[6]Department of Colorectal Surgery, Torbay Hospital, Torquay, UK
[7]Department of Gastroenterology, Leeds General Infirmary, Leeds, UK
[8]Department of Gastroenterology, Northern General Hospital, Sheffield, UK
[9]Department of Gastroenterology, University Hospital North Tees, Stockton-on-Tees, UK
[10]Department of Gastroenterology, Gloucestershire Royal Hospital, Gloucester, UK

Correspondence to
Dr S Gupta Wolfson Unit for Endoscopy, St Mark's Hospital and Imperial College London, Watford Road, Harrow HA1 3UJ, UK; sachindr@gmail.com

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ABSTRACT

Introduction Endoscopists are now expected to perform polypectomy routinely. Colonic polypectomy varies in difficulty, depending on polyp morphology, size, location and access. The measurement of the degree of difficulty of polypectomy, based on polyp characteristics, has not previously been described.

Objective To define the level of difficulty of polypectomy.

Methods Consensus by nine endoscopists regarding parameters that determine the complexity of a polyp was achieved through the Delphi method. The endoscopists then assigned a polyp complexity level to each possible combination of parameters. A scoring system to measure the difficulty level of a polyp was developed and validated by two different expert endoscopists.

Results Through two Delphi rounds, four factors for determining the complexity of a polypectomy were identified: size (S), morphology (M), site (S) and access (A). A scoring system was established, based on size (1–9 points), morphology (1–3 points), site (1–2 points) and access (1–3 points). Four polyp levels (with increasing level of complexity) were identified based on the range of scores obtained: level I (4–5), level II (6–9), level III (10–12) and level IV (>12). There was a high degree of interrater reliability for the polyp scores (interclass correlation coefficient of 0.93) and levels (κ=0.888).

Conclusions The scoring system is feasible and reliable. Defining polyp complexity levels may be useful for planning training, competency assessment and certification in colonoscopic polypectomy. This may allow for more efficient service delivery and referral pathways.

BACKGROUND

Colonoscopy has evolved from a diagnostic[1] to a therapeutic procedure and endoscopists are now expected to perform polypectomy on a routine basis.[2] However, supportive training and assessment, specific to polypectomy, is yet to be incorporated formally as part of any endoscopic accreditation process in the UK.[3]

There are differences, albeit poorly defined, in the levels of difficulty of various diagnostic endoscopic procedures, ranging from diagnostic oesophagoduodenoscopy to colonoscopy. Similarly, colonic polypectomy can vary in difficulty, depending on factors such as polyp morphology, size, location and access. The measurement of the degree of difficulty of polypectomy, based on polyp characteristics, has not previously been studied. Evidence suggests that large, right-sided colonic polyps are associated with more adverse outcomes.[4] Polypectomy performed on a 2 cm flat lesion behind a fold in the ascending colon requires a different set of skills compared to those required for a 1 cm pedunculated polyp in the left colon with easy access. These polyps offer varying challenges to the endoscopist and they clearly require different levels of competency. The complications of polypectomy are well documented,[5–8] occurring even in experienced hands.[9 10] Colonoscopists inevitably have different levels of competency according to the stage of their training and experience of larger polyps. Relatively few will gain enough experience of larger lesions to remove them safely and completely. In view of this it is potentially dangerous if a less competent colonoscopist attempts to remove 'difficult' lesions. To make the best judgements about whether to remove a polyp, an operator must be aware of the complexity of the lesion they are about to remove and their own level of competency.

Defining a lesion in terms of complexity of excision should help a colonoscopist make the right decision in whether

or not to proceed. Furthermore, it has been proposed there should be minimum levels of polypectomy competency for different contexts and case mix. For example, the high frequency of large and difficult to remove lesions in patients identified by fecal occult blood test screening suggests that colonoscopists scoping these patients should have a higher level of competency than those dealing with symptomatic patients. The converse is true for those offering screening flexible sigmoidoscopy in which a lesser level of competency may be all that is required.

To measure the level of difficulty of a polyp, its characteristics have to be quantified. The aims of this study were to identify and classify colorectal polyp characteristics based on expert consensus and to validate a scoring system to predict the difficulty level of colonoscopic polyp excision, thereby creating 'levels of polypectomy' competency.

METHODS

Expert group

A working group of experienced endoscopists was formed, comprising nine members of a UK-based endoscopic training and accreditation body, the joint advisory group for gastrointestinal endoscopy, the British Society of Gastroenterology and representation from all the professional bodies that perform bowel cancer screening (BCS) colonoscopy (physicians, surgeons and nurse endoscopists).

Group discussion and Delphi method

Consensus by the nine experienced endoscopists regarding the characteristics of a polyp that they felt determined its difficulty level was sought using two focus group meetings and the Delphi method. The focus group discussions were led by one author (SG) and group members were asked to identify parameters that are likely to increase the complexity of a polypectomy. Answers were categorised and listed on an electronic database. Using the Delphi method, these characteristics were listed and the group members were asked independently to assign a score ranging from 1 (strongly disagree) to 5 (strongly agree) for each item regarding how likely it increased the complexity of a polypectomy. This process was repeated in a second round but this time the average results and SD from the previous round were displayed to the experts. This process encouraged experts to reflect on their previous decision and the opinion of their peers.[11] A simple scoring system was devised using the defining characteristics (parameters) as determined by the group. The scores for each parameter were weighted based on the relative importance the group assigned to each parameter. The same group of experts was then used individually to rate each possible combination of parameters, giving rise to a complexity level. This resulted in four levels of difficulty (levels I–IV, with increasing degrees of difficulty), each with a range of scores determined by the working group rating.

Reliability of the scoring system

The scoring system (with four difficulty levels and a range of scores defining each level) was validated by two very experienced endoscopists with a special interest in advanced endoscopy. Both expert endoscopists independently viewed 24 polypectomy videos. The videos incorporated only the endoscopic view and were edited to show only the size and morphology of the polyp but not the polypectomy itself. The expert endoscopists were informed about the site of the polyp in the colon as this could not be determined from the endoscopic view. The 24 videos included six examples of each of the four levels, arranged in random order. Both endoscopists had to assign a score to each polyp using the new scoring system as well as assigning a difficulty 'level' to each polyp. The polyp scores and difficulty levels, as assigned by the two experts, were compared using interclass correlation and Cohen's κ, respectively.

RESULTS

Focus group discussion and Delphi method

Four parameters were identified by the group as being most relevant for determining the difficulty level of a polyp (table 1). These were site (S), morphology (M), size (S) and access (A). In two Delphi rounds, the range for three of these polyp parameters was determined, that is, site, morphology and size. The polyp could either be left or right sided (two variables). Morphology was described as pedunculated, sessile or flat (three variables), with varying polyp size. Access (A), by census was deemed to be either easy or difficult for simplification purposes and was not subjected to the Delhi methodology. The group agreed on the following cut-offs for size: less than 1, 1–1.9, 2–2.9, 3–3.9 cm or over 4 cm (five variables). Each variable was assigned a score (table 2). The expert group agreed that the literature suggested polyp size to be one of the most important characteristics determining outcomes and difficulty, and hence each range of polyp sizes was assigned 2 instead of 1 point. The group was then asked to look at all possible combinations of the variables (two for site, three for morphology and five for size, giving a total of 30 possibilities) and assign a level to each of these. Using the scoring system, each level (as determined by the group response to the scenarios) was assigned a range of scores (table 3). As polyp size is one of the key factors associated with complications, it was weighted higher than the other factors.[4]

Reliability of the scoring system and difficulty levels

Figure 1 is a scatter plot comparing the scores given by the two experts (1 and 2) for the 24 polypectomy videos. The interclass correlation coefficient was

Table 1 Working group response using Delphi technique

Question	Average score Score 1–5 (1 strongly disagree; 5 strongly agree)	SD
Do you feel site, size and morphology of a polyp is useful to help define the level of difficulty?	4.75	0.46
Level I		
Should level I polyps be <1 cm in size?	4.50	0.53
Can level I polyps be right or left sided?	3.38	1.60
Level II		
Left-sided lesions		
Should level II polyps include pedunculated lesions <3 cm in size?	3.44	1.51
Should level II polyps include sessile lesions <2 cm in size?	3.44	1.42
Right-sided lesions		
Should level II polyps include pedunculated and sessile lesions <2 cm	2.67	1.58
Level III		
Left-sided lesions		
Should level III polyps include pedunculated lesions >3 cm in size?	3.63	1.69
Should level III polyps include sessile lesions >2 cm in size?	3.75	1.28
Right-sided lesions		
Should level III polyps include pedunculated and sessile lesions >2 cm	3.63	1.41
Level IV		
Should level IV polyps include any lesion >5 cm?	4.44	1.01
Any polyp with difficult access (clamshell distribution, peri-appendicular, peri-diverticular, extending into I-C valve)?	4.56	0.53
Should level IV polyps include all laterally spreading tumours >3 cm?	3.89	1.54
Should level IV include residual polyps on scars?	3.78	1.48

0.938, suggesting a high level of interrater reliability. Table 4 compares the polyp levels assigned by experts 1 and 2. The results for levels I and II demonstrated 100% agreement. There were only two cases rated as level III by expert 1 and level IV by expert 2. This results in an interrater reliability (Cohen's κ) of κ=0.888.

DISCUSSION

There is recognised variability in polypectomy techniques.[12–18] It is assumed that the choice of technique used for the removal of a particular polyp is determined by the polyp's characteristics, that is, size, morphology, site and access (eg, endoscopic mucosal resection for a flat, 2 cm, right-sided polyp). These polyp-dependent variables influence the difficulty of a polypectomy procedure. However, polypectomy is also dependent on factors other than polyp characteristics, such as the endoscopist's technical ability, scope stability, patient characteristics and the wider endoscopy team. Recent work has explored the assessment of polypectomy skills in more detail.[19] The purpose of this study was to define and devise an easily reproducible scoring system that quantifies polyp characteristics and therefore links them to polypectomy levels of difficulty, which may inform training and competency assessment.

The Munich Polypectomy Study[4] analysed 4000 snare polypectomies across 13 institutions and performed multivariate regression analysis to determine risk factors for polyp-related complications. The study results demonstrated that polyp size and right-sided location were associated with a higher complication

Table 2 Scoring system for determining the difficulty level of a polyp

Parameter	Range	Score
Size	<1 cm	1
	1–1.9 cm	3
	2–2.9 cm	5
	3–3.9 cm	7
	>4 cm	9
Morphology	Pedunculated	1
	Sessile	2
	Flat	3
Site	Left	1
	Right	2
Access	Easy	1
	Difficult	3

Table 3 Range of scores for each polyp level

Polyp level	Range of scores
Level I	4–5
Level II	6–8
Level III	9–12
Level IV	>12

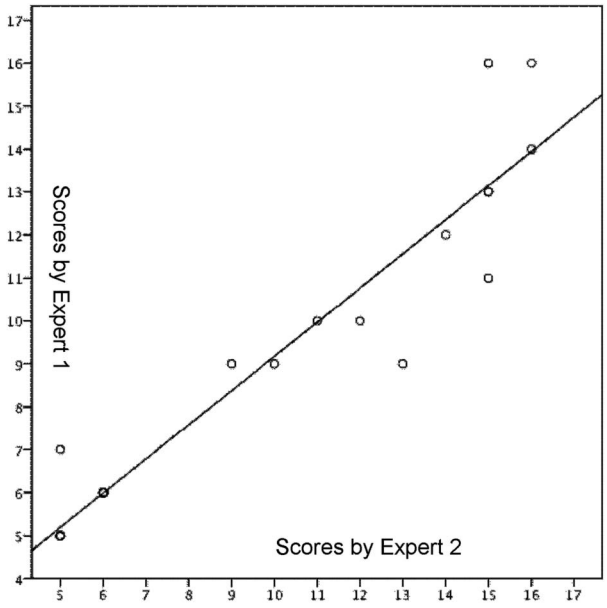

Figure 1 Scatter plot of scores assigned to polyp videos by two experts showing an interclass correlation coefficient of 0.938.

rate. The authors concluded that polyps larger than 1 cm in the right colon or 2 cm in the left colon carried an increased risk of complications. Applying these cut-offs to this study, using our scoring system, right-sided lesions greater than 1 cm in size or left-sided lesions greater than 2 cm in size would score a minimum of 8 points. According to the Munich study, anything above this cut-off would qualify as high risk. Similarly, any polyp that scores above 8 points in this study would be deemed a relatively difficult (difficulty level III) polyp. It is expected that the majority of BCS colonoscopists should be able to manage level III polyps competently because of the high frequency of finding these lesions. If they did not have this level of competency then they would either be removing lesions they should not attempt, or too frequently referring on to another operator resulting in additional procedures.

The assigning of scores to polyps, and creation of levels, may help endoscopists decide when not to attempt to remove a particularly challenging polyp. The aim of this work is not to discourage endoscopists operating at a particular level to attempt more complex polypectomy, but to highlight the increased risks of such lesions. This may help to streamline endoscopic referral services and reduce complications.

The scoring system and polyp levels were validated by two specialist endoscopists. This could possibly have skewed the scoring towards an expert level of ability. As an example, both experts assigned a 3 cm sessile, left-sided polyp with easy access (giving a score of 11), to level III. However, it is acknowledged that not all colonoscopists would be able to manage a lesion of this size and morphology competently. Whether or not a particular endoscopist opts to perform polypectomy on this type of lesion may depend on other individual or situation-specific factors, such as experience, technical ability, the competence of the supporting team and the availability of equipment. The scoring system may then serve as a guide alongside the above-mentioned factors. It is acknowledged that it is not applicable under all circumstances for all endoscopists, but may help define standards for each level. Furthermore, large-scale, prospective validation by a wider range of endoscopists is required to strengthen the reliability of this scoring system.

There was a high degree of interrater agreement among the two expert endoscopists with regard to polyp scores as well as overall polyp levels. This demonstrates that the experts generally agreed on the expected level of competency required for each polypectomy difficulty 'level'. The experts agreed on the classification of level I and II polyps; however, for the more difficult lesions, there was disagreement in two cases, which were rated as level III by expert 1 and level IV by expert 2. This variation in assigning levels may be explained by differences in the experts' individual experience or approach to polypectomy. However, it highlights the fact that individual judgement should be used in conjunction with the polyp level on a case to case basis. The assignment of polypectomy levels may have an application for endoscopists operating at different levels of training, for example, all endoscopists performing flexible sigmoidoscopy should be able to remove level I polyps safely, whereas a BCS endoscopist may be expected to remove a level III polyp competently, exercising judgement as to whether a level IV polyp might need referral to a tertiary centre. This would require a detailed discussion among the endoscopic community.

The high interrater agreement for the scores assigned to each polyp illustrates that the scoring system is feasible and reproducible, and may help target training and assessment of polypectomy skills at different levels. However, we acknowledge that the two UK-based endoscopy experts in this study remain a highly selected group, which may have skewed their perception of what constitutes a difficult polypectomy.

Table 4 Comparison of polyp levels assigned by two experts for 24 polypectomy videos viewed to establish reliability of the scoring system

	Polyp levels assigned by expert 2			
	I	II	III	IV
Polyp levels assigned by expert 1				
I	6	0	0	0
II	0	7	0	0
III	0	0	3	2
IV	0	0	0	6

The numbers indicate the number of polypectomy videos each expert assigned to a particular level.

Further validation of this tool with a wider range of national and international endoscopists would enhance its applicability.

This study is the first to report a simple scoring system to determine the difficulty level of a polyp. It defines and quantifies easily measurable characteristics that determine the difficulty of a particular polypectomy. This, in turn, may help to stratify polypectomy 'service levels' and allocate resources to reflect the four levels of difficulty. Advanced, complex, or large sessile lesions generally require subspecialty endoscopic management to achieve complete and safe excision. They may require advanced endoscopic skills, specialised equipment, extra procedural time and a more experienced supporting team. They should thus be managed by specialists with the relevant expertise in the right environment. The choice between a surgical or endoscopic approach may depend on local expertise but the development of a network of specialist endoscopic teams may enable a wider choice for patients. A large Australian study[20] has shown that when difficult or advanced lesions are managed by a tertiary endoscopic service, substantial cost savings can be realised with limited morbidity and no mortality when compared with surgery. Validation of the scoring system and polyp levels on a wider scale, and comparison with outcome data, may increase awareness in the endoscopic community and ultimately help improve polypectomy outcomes.

Key messages

What is already known on this topic

- There are recognised differences in the difficulty level of polypectomy, based on polyp characteristics.

What this study adds

- This is the first study which attempts to quantify the difficulty of polypectomy, using polyp characteristics.

Impact on clinical practice

- The SMSA scoring system has wide utility for endoscopists and may help to stratify difficulty levels of polypectomy.

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