

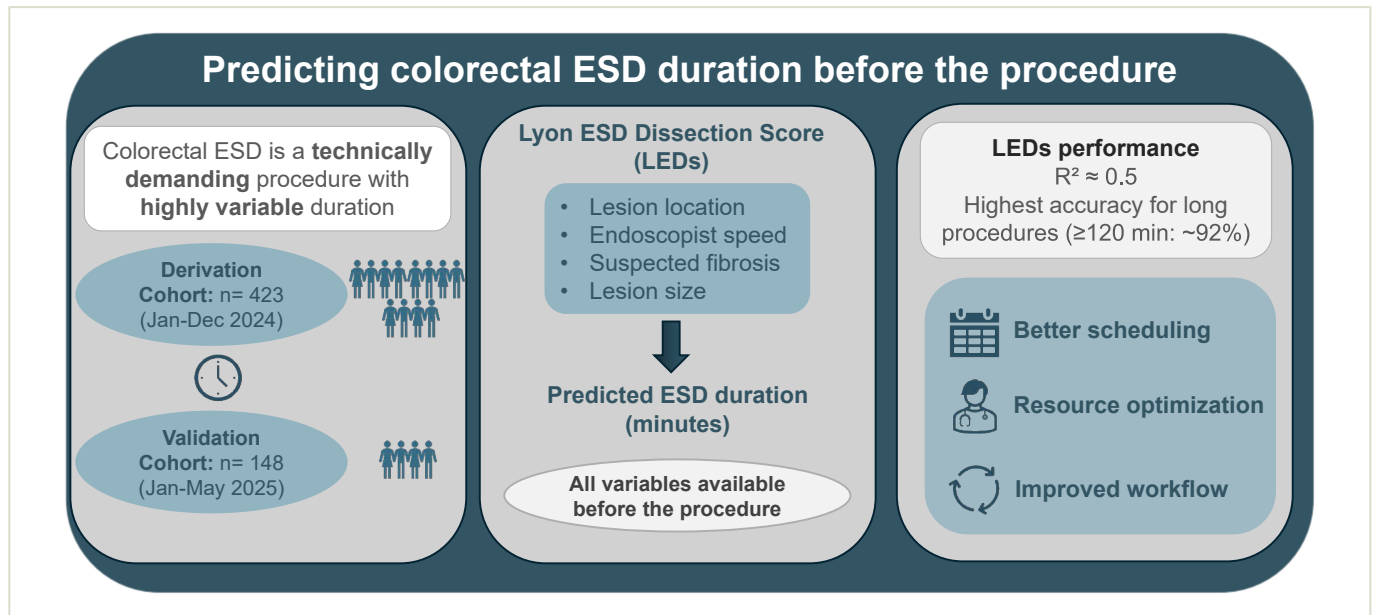


Lyon endoscopic submucosal dissection score: a preprocedure prediction model for operating time in colorectal endoscopic submucosal dissection

Elena De Cristofaro, MD, PhD,¹ Jean Grimaldi, MD,² Diana Giannarelli, PhD, MSc,³ Roupen Djinbachian, MD,^{4,5} Jérémie Jacques, MD, PhD,⁶ Timothée Wallenhorst, MD,⁷ Clara Yzet, MD,⁸ Louis-Jean Masgnaux, MD,² Florian Rostain, MD,² Alexandru Lupu, MD,² Jérôme Rivory, MD,² Mathieu Pioche, MD, PhD²

Rome, Italy; Lyon, Limoges, Rennes, Amiens, France; Montreal, Quebec, Canada

GRAPHICAL ABSTRACT



Background and Aims: Colorectal endoscopic submucosal dissection (ESD) is an effective curative technique for superficial colorectal lesions but remains technically demanding, with variable procedure times. This study aimed to develop and validate a preprocedure predictive model for colorectal ESD duration in the era of traction-assisted strategies.

Methods: We retrospectively analyzed prospectively collected data from patients who underwent colorectal ESD at Edouard Herriot Hospital (Lyon, France). The derivation cohort included 423 cases (January-December 2024), and an independent temporal validation cohort included 148 cases (January-May 2025). A generalized linear model with a gamma distribution and log-link function identified independent preprocedural predictors of ESD duration. Variables were selected on the basis of univariate significance and the Akaike information crite-

Current affiliations: Gastroenterology Unit, Department of Systems Medicine, University of Rome Tor Vergata, Rome, Italy (1), Department of Gastroenterology and Endoscopy, Hôpital Edouard Herriot, Hospices Civils de Lyon, Lyon, France (2), Facility of Epidemiology and Biostatistics, Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Rome, Italy (3), Gastroenterology, Montreal University Hospital Research Center, Montreal, Quebec, Canada (4), Gastroenterology, Centre hospitalier de l'Université de Montréal (CHUM), Montreal, Quebec, Canada (5), Department of Gastroenterology

and Endoscopy, Dupuytren University Hospital, Limoges, France (6), Hépatogastro-Entérologie, CHU de Rennes, Rennes, France (7), Department of Gastroenterology, Amiens University Hospital, Amiens, France (8).

Corresponding author: Mathieu Pioche, MD, PhD, Endoscopy Unit, Department of Digestive Diseases, Pavillon L – Edouard Herriot Hospital, 69437 Lyon Cedex, France. E-mail: Mathieu.pioche@chu-lyon.fr.

rion. Model calibration and discrimination were assessed using R^2 , mean absolute error, and classification accuracy at predefined thresholds (60, 90, and 120 minutes). A point-based score (Lyon ESD Dissection score, [LEDS]) and nomogram were derived from model coefficients.

Results: Median procedure time in the derivation cohort was 50 minutes (IQR, 30-90). Independent predictors of ESD duration included dissection speed of endoscopists, lesion location (flexures, appendix, cecum, and ileocecal valve), predicted lesion size, and suspected fibrosis (all $P < .05$). The LEDS provides a direct estimation of the expected procedure time in minutes based on these variables, showing a strong correlation between predicted and observed durations ($R^2 = 0.52$). Classification accuracy was 76.1%, 82.2%, and 88.1% for thresholds of 60, 90, and 120 minutes, respectively. Validation confirmed good performance ($R^2 = 0.48$) with 91.8% accuracy for procedures ≥ 120 minutes.

Conclusions: This validated preprocedure scoring system accurately predicts colorectal ESD duration, especially for longer procedures. It may facilitate scheduling, optimize resource use, and improve workflow in endoscopy units. (Gastrointest Endosc 2026;104:436-44.)

INTRODUCTION

Colorectal endoscopic submucosal dissection (ESD) enables en bloc resection of superficial lesions, aiming to achieve optimal histologic assessment and reduce recurrence by ensuring an R0 resection.^{1,2} Despite these advantages, ESD remains a technically demanding procedure, associated with higher morbidity and substantially longer and difficult to predict operating times compared with EMR.¹ For these reasons, ESD adoption has been limited in Western countries compared with Eastern ones. Several studies have shown that, for lesions of comparable size, ESD may require 3 to 4 times longer than piecemeal EMR.^{3,4} However, in recent years, various technical innovations have been introduced to simplify the procedure and shorten operating times, such as traction-assisted ESD⁵ and underwater ESD.⁶

These advances have facilitated the resection of increasingly complex lesions, both in size and in challenging anatomical sites, such as the appendix⁷ or the ileocecal valve.⁸ Nevertheless, resection speed in colorectal ESD remains highly variable, ranging from 14 to 61 mm²/min in recent studies.^{9,10} This variability makes it difficult to predict procedure duration, which is critical given the medical, economic, and occupational health implications, including the high prevalence of musculoskeletal disorders among endoscopists.^{11,12} Procedure time is also a key factor in university centers, where training activities substantially affect scheduling.

Only limited data exist on predictors of ESD duration. Most available studies were conducted before the widespread use of traction-assisted ESD and, therefore, tend to overestimate current procedure times.^{13,14}

The aim of this study was to identify preoperative factors associated with procedure duration and to develop a predictive model to support scheduling and resource allocation in the era of traction-assisted ESD.

METHODS

Study design and data collection

To establish a scoring system for predicting colorectal ESD duration, we conducted a retrospective analysis of prospectively collected data from patients who underwent colorectal ESD at Edouard Herriot Hospital (Lyon, France). All epithelial colorectal lesions ≥ 20 mm treated by ESD were included. Hybrid ESDs, procedures involving 2 or more simultaneous ESDs, subepithelial tumors, and anal neoplasms were excluded. The final study population consisted of a derivation cohort (January-December 2024, $n = 423$) and an independent temporal validation cohort (January-May 2025, $n = 148$). The participant selection process is summarized in Figure 1.

Baseline data included demographic variables (age, sex, and American Society of Anesthesiologists score) and lesion-related characteristics (location, predicted size, morphology, and presence of suspected fibrosis).

Endoscopist dissection speed was calculated on the basis of each operator's prior experience. For each endoscopist, dissection speed was defined as the mean speed (mm²/min) across the 20 most recent colorectal ESD procedures performed before the index case. On the basis of its distribution within the database, operators were categorized into 3 groups: slow (< 20 mm²/min), intermediate (20 – 40 mm²/min), and fast (> 40 mm²/min). A total of 6 endoscopists were involved in the study. All operators were fully trained endoscopists, and no fellows were involved in performing the procedures.

Tumor location was stratified into 9 anatomical segments (rectum, sigmoid, descending colon, splenic and hepatic flexures, transverse colon, ascending colon, cecum, appendix, and ileocecal valve).

Lesion size was estimated preprocedurally and defined as the predicted maximum diameter before the procedure, as

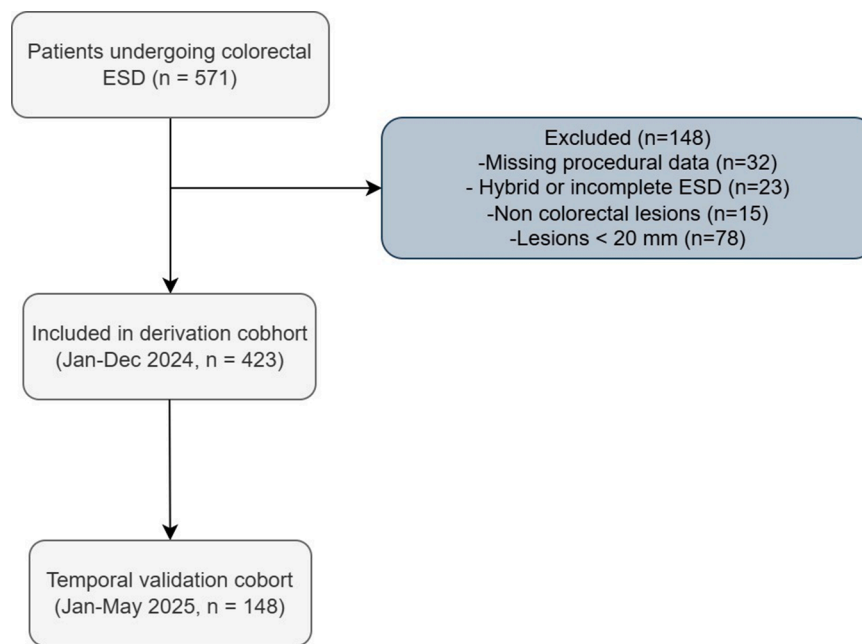


Figure 1. Flowchart of the study. ESD, Endoscopic submucosal dissection.

reported by the referring center or endoscopist and confirmed via endoscopic images and photographs.

Lesion morphology was categorized as laterally spreading tumor granular type or nongranular type. Lesion pit pattern was assessed by Japan Narrow-band Imaging Expert Team (JNET) classification.¹⁵ Suspected fibrosis was defined as the presence of inflammatory bowel disease (IBD) or a previously attempted or recurrent lesion. This variable was used as a preprocedural surrogate for anticipated technical difficulty.

Model development

A generalized linear model was developed to identify independent predictors of procedure time, expressed in minutes. Candidate variables were selected on the basis of clinical relevance and univariate analyses, with model selection guided by the Akaike information criterion (AIC). The performance of the score was assessed in the derivation cohort composed of patients treated between January and December 2024.

Model validation

The score was subsequently validated on an independent temporal cohort of patients who underwent colorectal ESD at the same institution between January and May 2025. This approach constitutes a temporal internal validation, designed to test the model's stability over time within the same institution. Model calibration was evaluated by comparing predicted and observed procedure times using mean differences and standard errors. Discrimination was assessed through classification accuracy at 3 prespecified duration thresholds (60, 90, and 120 minutes). In addition, a nomogram was constructed

on the basis of the final model to facilitate practical application of the scoring system.

Outcomes

The primary outcome was the accuracy of the model in predicting ESD procedure time, expressed as the percentage of correctly classified cases within predefined duration categories (<60, 60-89, 90-119, and ≥ 120 minutes). Secondary outcomes included the difference between predicted and actual procedure duration (in minutes) and the percentage of overestimated and underestimated procedures.

ESD procedure

All ESD procedures were performed using a standard or pediatric high-definition single-channel colonoscope (Olympus, Tokyo, Japan) equipped with a transparent distal attachment, with the patient under carbon dioxide insufflation. General anesthesia was administered to all patients. A DualKnife J (Olympus) was used for mucosal incision and submucosal dissection. Submucosal injection was performed with a glycerol and indigo carmine solution to achieve adequate lifting. Traction strategies, including clip-with-line or adaptive devices, were applied at the discretion of the operator to facilitate visualization of the submucosal layer. Hemostasis was achieved with hemostatic forceps whenever necessary. Resected specimens were retrieved immediately after completion of dissection for pathologic assessment. Procedure time was defined as the interval from the start of the first submucosal injection to specimen retrieval and included all procedural components, including hemostasis in case of intraprocedural bleeding. Defect closure, when performed, was excluded from the procedure duration calculation.

Statistical analysis

As a first step, the analysis was mainly descriptive. Quantitative variables are summarized as median and IQR, whereas categorical factors are reported as absolute counts and percentages. Differences between derivation and validation cohorts were investigated using the Mann-Whitney test when referring to quantitative variables and the χ^2 test for categorical items.

The relation between ESD duration and baseline patient and operator characteristics was investigated through a generalized linear model initially considering each factor separately (univariate analysis) and then tested in a multivariable setting. The best model was chosen on the basis of the AIC. The model was validated in a separate cohort. The concordance between predicted and actual ESD duration was reported graphically. To facilitate the use of the predictive model, a nomogram was built.

RESULTS

Full cohort characteristics

A total of 571 patients were enrolled: 423 in the derivation cohort (from January to December 2024) and 148 in the validation cohort (from January to May 2025). [Table 1](#) summarizes the clinical and endoscopic characteristics of the study population. Differences between the 2 cohorts were generally not statistically significant, except for physician's speed ($P = .014$) and use of anticoagulants ($P < .001$). In the derivation cohort, 26 (6%) procedures were performed by slow operators (mean dissection speed <20 min/cm²), 130 (31%) by operators with moderate dissection speed (21-40 min/cm²), and 265 (63%) by fast operators (>40 min/cm²). In the validation cohort, 17 (11%) procedures were performed by slow, 56 (38%) by moderate, and 75 (51%) by fast operators.

Development of the predictive model

A total of 423 patients were included in the derivation cohort ([Table 1](#)). Traction strategies were used in 380 of 423 procedures (90%), of which 250 (59%) used adaptive traction devices, whereas the remaining traction-assisted procedures used nonadaptive techniques such as clip-with-line traction or double-clip traction systems. The median lesion size was 43 mm (IQR, 35-56), with the majority of procedures performed in the rectum (22.7%) or right side of the colon (14.7%). The median procedure time was 50 minutes (IQR, 30-90). Univariate analyses of preoperative clinical and endoscopic factors are summarized in the supplementary table ([Supplementary Table 1](#), available online at www.giejournal.org). Variables showing significant associations in the univariate analysis ($P < .1$) were subsequently included in the multivariable generalized linear model to identify independent predictors of ESD duration. The final model retained endoscopist dissection speed (slow, β : 54.1; 95% CI, 40.5-67.7; $P < .001$; moderate, β : 40.2; 95% CI, 33.3-47.2;

$P < .001$), lesion located in the splenic and hepatic flexures (β : 31.1; 95% CI, 21.1-41.0; $P < .001$), ileocecal valve (β : 15.0; 95% CI, 1.8-28.2; $P = .03$), cecum (β : 13.4; 95% CI, 1.7-25.1; $P = .02$), and appendix (β : 31.6; 95% CI, 16.4-46.9; $P < .001$), as well as lesion diameter (β : 1.3; 95% CI, 1.1-1.4; $P < .001$) and suspected fibrosis (β : 11.8; 95% CI, 2.7-20.9; $P = .01$), as significant predictors ([Table 2](#)).

The model explained a large proportion of the variance, with a mean difference between estimated and observed procedure duration of only 0.1 minutes (SE, 1.5 minutes), and demonstrated a highly significant goodness of fit ($P < .0001$). Regression analysis between observed and predicted procedure times showed an R^2 of 0.522, indicating a strong linear correlation. The model tended to slightly overestimate shorter procedures (<60 minutes), whereas predictions for procedures ≥ 120 minutes were more accurate, consistent with the classification accuracy results ([Fig. 2](#)).

A simplified point-based scoring system was derived from the model coefficients ([Table 3](#)). The constant was set at -26 , and points were assigned as follows: slow operator $+54$, moderate operator $+40$, and fast operator 0 ; for location, rectum 0 , sigmoid $+1$, left side of the colon $+4$, splenic and hepatic flexures $+31$, transverse colon $+7$, right side of the colon $+6$, ileocecal valve $+15$, cecum $+13$, and appendix $+32$. Maximum lesion diameter was multiplied by 1.3 , and $+12$ points were added if fibrosis was suspected (IBD or recurrent lesion). The sum of these elements provided the estimated procedure duration in minutes ([Table 3](#); <https://lyone.sddurationscore.github.io/leds/>). To facilitate clinical application, the predictive model was graphically translated into a nomogram ([Fig. 3](#)). Each independent predictor (operator speed, lesion location, maximum lesion diameter, and suspected fibrosis) is assigned a score on the upper scale. The sum of these scores corresponds to the total points, which can then be converted into the predicted procedure duration in minutes.

When prespecified duration thresholds (<60 , 60-89, 90-119, and ≥ 120 minutes) were applied, the model most accurately predicted procedures lasting ≥ 120 minutes (classification accuracy 88.1%), whereas shorter procedures (<60 minutes) were occasionally overestimated (76.1% accuracy). Intermediate thresholds showed good accuracy as well (82.2% for 90 minutes). The full cross-tabulation of predicted versus observed procedure times is provided in [Supplementary Table 2](#) (available online at www.giejournal.org).

Validation cohort

An independent validation cohort included 148 patients treated between January and May 2025. Traction strategies were used in 136 of 148 procedures (92%), of which 61 (41%) used adaptive traction devices. The distribution of physician dissection speed was slightly different compared with derivation cohort ($P = .014$). Lesion locations and sizes were similar to the derivation group. The median lesion size was 40 mm (IQR, 35-50), and 10.8% of lesions showed suspected fibrosis (IBD or recurrent lesion) ([Table 1](#)).

TABLE 1. Comparison of clinical, endoscopic, and operator characteristics between derivation cohort and validation cohort

Variable	Derivation cohort (n = 423)	Validation cohort (n = 148)	P value
Duration in min, median (IQR)	50 (31-90)	48 (30-80)	.26
Sex			.85
Male	245 (57.9)	87 (58.8)	
Female	178 (42.1)	61 (41.2)	
Age in y			
Median, IQR	70 (63-76)	68 (62-76)	.32
ASA score, n (%)			.30
1	63 (14.9)	15 (10.1)	
2	237 (56.0)	91 (61.5)	
3	120 (28.4)	41 (27.7)	
4	3 (0.7)	1 (0.7)	
Anticoagulant/antiplatelet agents, n (%)			<.001
No	356 (84.2)	94 (63.5)	
Yes	67 (15.8)	54 (36.5)	
Lesion location, n (%)			.07
Rectum	96 (22.7)	32 (21.6)	
Sigmoid colon	48 (11.3)	15 (10.1)	
Left side of the colon	20 (4.7)	7 (4.7)	
Splenic and hepatic flexures	77 (18.2)	21 (14.2)	
Transverse colon	23 (5.4)	6 (4.1)	
Right side of the colon	62 (14.7)	19 (12.8)	
Ileocecal valve	31 (7.3)	17 (11.5)	
Cecum	43 (10.2)	12 (8.1)	
Appendix	23 (5.4)	19 (12.8)	
Lesion morphology			.74
LST-granular type	280 (67.5)	100 (69.0)	
LST-nongranular type	135 (32.5)	45 (31.0)	
JNET classification			.14
I	46 (9.8)	6 (4.1)	
IIA	216 (46.2)	77 (52.7)	
IIB	172 (36.8)	54 (37.0)	
III	34 (7.0)	9 (6.2)	
Predicted lesion size (max diameter), mm			.27
Median, IQR	43 (35-56)	40 (35-50)	
Suspected fibrosis (IBD or lesion recurrence)			.48
No	366 (86.9)	132 (89.2)	
Yes	55 (13.1)	16 (10.8)	
Dissection speed of endoscopist, n (%)			.014
Slow	26 (6.1)	17 (11.5)	
Moderate	130 (30.7)	56 (37.8)	
Fast	265 (62.6)	75 (50.7)	

ASA, American Society of Anesthesiologists; IBD, inflammatory bowel disease; JNET, Japan Narrow-band Imaging Expert Team; LST, laterally spreading tumor.

When applied to this cohort, the model demonstrated a mean difference between predicted and actual duration of -10.1 minutes (SE, 2.8 minutes), indicating a slight overestimation of procedure time. Classification accuracy re-

mained acceptable: 65.3% for 60 minutes, 79.6% for 90 minutes, and 91.8% for 120 minutes. Overall, the model appeared to predict longer durations more accurately than shorter ones.

TABLE 2. Multivariable generalized linear model identifying independent predictors of colorectal endoscopic submucosal dissection duration

Variable	β	95% CI	P values
Dissection speed of endoscopist			
Slow	54.1	40.5-67.7	<.001
Moderate	40.2	33.3-47.2	<.001
Fast	0	Ref.	–
Lesion location			
Rectum	0	Ref.	–
Sigmoid colon	0.9	–10.4 to 12.1	.88
Left side of the colon	4.1	–11.5 to 19.7	.61
Splenic and hepatic flexures	31.0	21.1-41.0	<.001
Transverse colon	7.4	–7.8 to 22.6	.34
Right side of the colon	6.0	–4.7 to 16.7	.27
Ileocecal valve	15.0	1.8-28.2	.03
Cecum	13.4	1.7-25.1	.02
Appendix	31.6	16.4-46.9	<.001
Predicted lesion size (max diameter), mm	1.3	1.1-1.4	<.001
Suspected fibrosis (IBD or lesion recurrence)			
No	0	Ref.	.01
Yes	11.8	2.7-20.9	

IBD, Inflammatory bowel disease.

Regression analysis between predicted and observed procedure times confirmed a good linear correlation, with a tendency to overestimate shorter procedures and more accurate predictions for longer ones (Fig. 4). When prespecified thresholds were applied (<60, 60-89, 90-119, and ≥ 120 minutes), the model most accurately predicted procedures ≥ 120 minutes, whereas shorter procedures (<60 minutes) were occasionally overestimated. The full cross-tabulation of predicted versus observed procedure times is reported in [Supplementary Table 3](#) (available online at www.giejournal.org).

DISCUSSION

This study developed and validated a preprocedural model to predict the operating time of colorectal ESD. Our findings demonstrate that operator experience, lesion location, size, and suspected fibrosis are independent predictors of procedure duration, and that a simplified scoring system can provide reliable time estimation before the procedure.

Previous prediction tools mainly originated from Asian centers and were based on conventional strategies without traction. Matsumoto et al¹⁶ proposed one of the first preoperative scoring systems to estimate the difficulty of colorectal ESD, identifying lesion size, location, morphology, and scarring as major contributors. However, their model was designed to classify difficulty levels rather than to estimate procedure time, and its predictive performance was modest.

More recently, Li et al¹⁴ developed a quantitative model to predict technically difficult ESD using large Eastern data sets, which was subsequently adapted and validated in Western centers by Dang et al¹³ through the time prediction model (cESD-TIME formula), including 6 variables. Although that model achieved good internal validation ($R^2 = 0.61$), it relied on continuous formulas with limited usability and was built before the widespread adoption of traction devices.

Our study, therefore, fills an important gap by integrating traction-assisted ESD into predictive modeling. This integration is crucial because traction has been shown to significantly improve visualization, shorten dissection time, and reduce technical difficulty, as demonstrated by multiple randomized trials and meta-analyses.¹⁷⁻¹⁹ Consequently, previously published models developed without traction may underestimate achievable performance under current conditions. Our findings suggest that predictive tools must evolve alongside technological advances and procedural strategies, and that future models should explicitly account for the type of traction applied, such as clip-line, double-clip, or magnetic systems, to ensure broader applicability.

The variables retained in our final model are easily measurable before the procedure and reflect key determinants of technical difficulty. As in previous studies, operator skills, evaluated by average speed, emerged as the strongest predictor, consistent with cumulative learning-curve data showing marked improvements in speed after 30 to 40 cases. Lesion location also significantly influenced procedure time, particularly for flexural, cecal, and appendiceal sites, which are known to limit endoscope maneuverability. Lesion size and

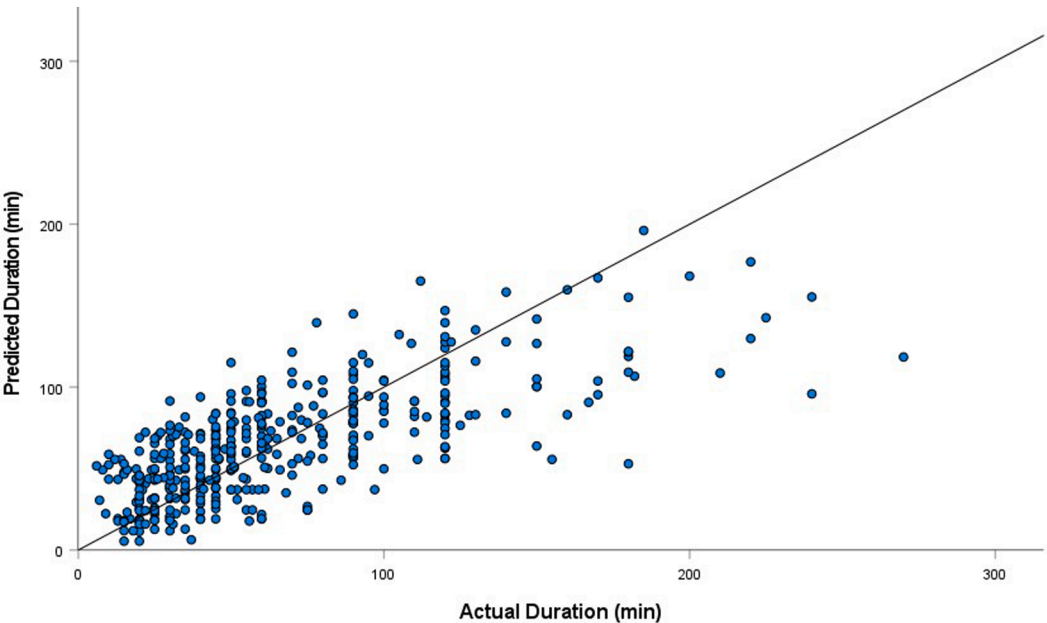


Figure 2. Correlation between predicted and actual endoscopic submucosal dissection procedure times in the derivation cohort. Each dot represents an individual procedure.

TABLE 3. Lyon endoscopic submucosal dissection score: point-based system for preprocedural estimation of colorectal endoscopic submucosal dissection duration

Predictor	Points
Constant	−26
Dissection speed of endoscopist	–
Slow	+54
Moderate	+40
Fast	0
Lesion location	
Rectum	0
Sigmoid colon	+1
Left side of the colon	+4
Splenic and hepatic flexures	+31
Transverse colon	+7
Right side of the colon	+6
Ileocecal valve	+15
Cecum	+13
Appendix	+32
Predicted lesion size (max diameter), mm	Multiply by 1.3
Suspected fibrosis	
No	0
Yes	+12

Points were assigned to each predictor according to model coefficients. The total score, obtained by summing all values and the constant (−26), directly corresponds to the expected procedure time in minutes (available at <https://lyonesddurationscore.github.io/leds/>).

suspected fibrosis, representing anatomical and submucosal resistance factors, further contributed to prolonged procedures, as previously reported.^{14,16}

Importantly, our model demonstrated robust performance, explaining 52% of variance and accurately classifying procedures ≥120 minutes, confirmed in an independent validation cohort. The slight overestimation of short procedures is consistent with prior models and may reflect variability in setup time or the rapid completion of small rectal resections. Nevertheless, the prediction of procedural time for large and complex lesions, inherently subject to greater variability, remains the most clinically relevant and useful in daily practice.

From a practical standpoint, the ability to predict procedure duration has implications beyond logistics. Accurate time estimation can optimize scheduling, anesthesia allocation, and staff workload, improving efficiency and occupational safety. Furthermore, predictive tools could be integrated into electronic scheduling systems or simulation-based training platforms, similar to approaches already implemented in surgical disciplines.

Although this study represents one of the largest contemporary Western series of colorectal ESD, its monocentric design may limit generalizability. Differences between centers in operator experience, lesion complexity, anesthesia protocols, and availability of traction devices may influence procedure duration and, consequently, model performance. In particular, the systematic use of traction-assisted ESD in our center reflects current best practice but may not yet be universally adopted, especially in centers where ESD is

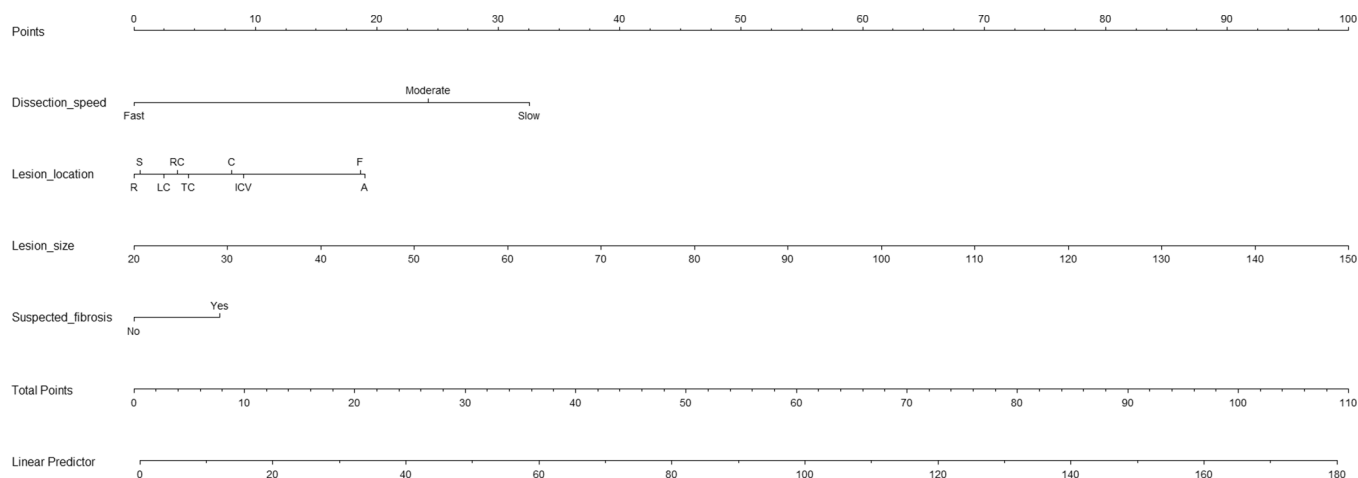


Figure 3. Lyon endoscopic submucosal dissection (ESD) score nomogram. Each variable contributes a specific number of points; the total score corresponds to the predicted ESD duration in minutes. A, Appendix; C, cecum; F, flexures; ICV, ileocecal valve; LC, left side of the colon; R, rectum; RC, right side of the colon; S, sigmoid colon; TC, transverse colon.

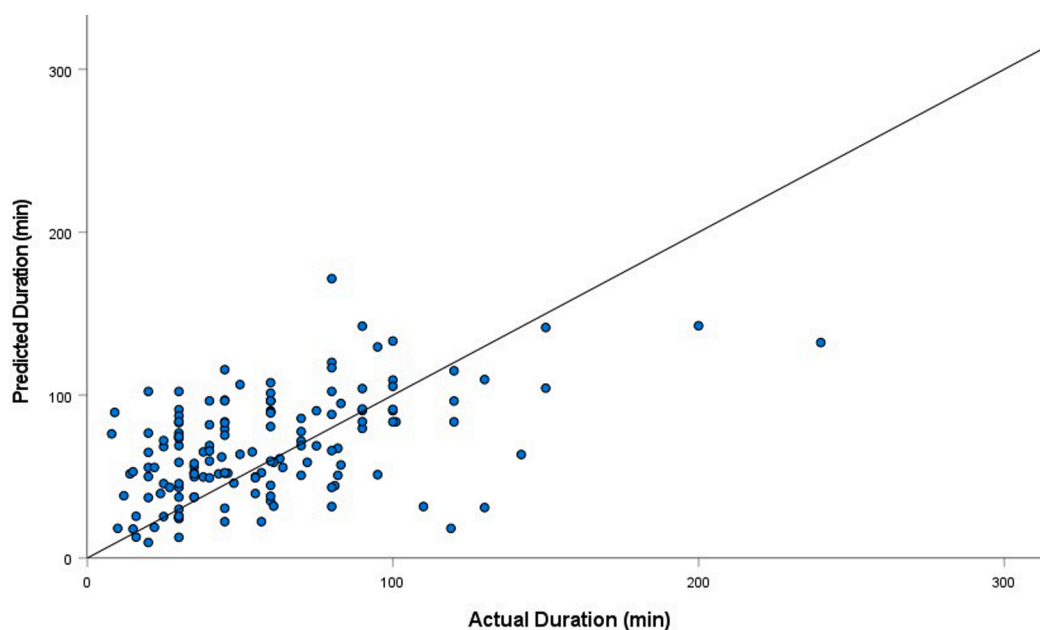


Figure 4. Correlation between predicted and actual endoscopic submucosal dissection procedure times in the validation cohort. Each dot represents an individual procedure.

performed without traction or using alternative devices or techniques.

Moreover, the majority of procedures were performed by highly experienced or expert operators with high dissection speeds, which may further limit applicability to less experienced settings.

Another limitation is that the preprocedural estimation of lesion size could be different from the actual lesion size,²⁰ and certain parameters, such as endoscope maneuverability, which can influence the procedure duration,²¹ are not objectively measurable before the procedure.

In addition, all ESD procedures in this study were performed with the patient under general anesthesia, which

may influence procedural stability and duration. Finally, the score demonstrated higher accuracy for longer procedures and lower performance for shorter ones, which may limit its applicability in shorter cases.

For these reasons, our results should not be interpreted as universal performance thresholds or quality benchmarks applicable to all endoscopy units. Rather, the proposed model represents a site-specific decision-support tool designed to optimize scheduling and workflow within an expert setting. Future multicenter prospective studies should, therefore, aim to externally validate and adapt this score according to the traction strategy used, including different traction systems or alternative dissection techniques, and to assess its

applicability across different ESD indications and levels of operator experience.

However, our study represents one of the largest Western series of colorectal ESD with standardized data collection, allowing for robust and contemporary modeling. The inclusion of consecutive, prospectively recorded cases minimizes selection bias, and the use of an independent validation cohort supports the reproducibility of the findings. The resulting model is intentionally simple and clinically intuitive, using readily available preprocedural variables and providing an easy-to-use online calculator (available at <https://lyonesddurationscore.github.io/leds/>) that enables immediate application in clinical and research settings.

In conclusion, this study provides a simple, reliable, and validated preprocedural model for predicting colorectal ESD duration, particularly for longer procedures. By integrating traction-assisted procedures, it represents a contemporary and pragmatic tool for Western centers. This tool may support better scheduling, resource optimization, and benchmarking across Western ESD centers.

DISCLOSURE

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Abbreviations: AIC, Akaike information criterion; ASA, American Society of Anesthesiologists; ESD, endoscopic submucosal dissection; IBD, inflammatory bowel disease; JNET, Japan Narrow-band Imaging Expert Team.



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SUPPLEMENTARY TABLE 1. Univariate analysis

Variable	β	95% CI	P values
Dissection speed of endoscopist			
Slow	44.8	27.5-62.1	<.001
Moderate	27.4	18.4-36.4	<.001
Fast	0	Ref.	–
Sex			.36
Male	4.1	–4.6 to 12.9	
Female	0	Ref.	
Age in y	0.5	0.2-0.9	.007
ASA score			
1	–10.8	–24.6 to 2.9	.12
2	–5.9	–15.8 to 3.9	.24
3-4	0	Ref.	–
Anticoagulant/antiplatelet agent			.12
No	0	Ref.	
Yes	7.3	–1.8 to 16.5	
Lesion location			
Rectum	0	Ref.	.06
Sigmoid colon	–14.9	–30.4 to 0.5	.05
Left side of the colon	–21.5	–43.0 to –0.1	.19
Splenic and hepatic flexures	9.0	–4.3 to 22.4	.32
Transverse colon	–10.2	–30.5 to 10.0	.41
Right side of the colon	–6.0	–20.3 to 8.2	.27
Ileocecal valve	–10.1	–28.1 to 8.0	.37
Cecum	–7.3	–23.3 to 8.8	.06
Appendix	–19.9	–10.1 to 0.4	.06
Lesion			.001
LST-granular type	15.3	6.0-24.5	
LST-nongranular type	0	Ref.	
JNET classification			
I	–12.9	–36.3 to 10.5	–
IIA	3.9	–13.1 to 20.9	.28
IIB	16.2	–1.1 to 33.4	.65
III	0	Ref.	.07
Predicted lesion size (max diameter), mm	1.1	0.9-1.3	<.001
Suspected fibrosis (IBD or lesion recurrence)			.88
No	0	Ref.	–
Yes	–1.0	–13.8 to 11.8	–

–, Not applicable; ASA, American Society of Anesthesiologists; IBD, inflammatory bowel disease; JNET, Japan Narrow-band Imaging Expert Team; LST, laterally spreading tumor.

SUPPLEMENTARY TABLE 2. Predicted versus observed procedure time categories in the derivation cohort

Actual duration (min)	Predicted duration				Total
	<60	60-89	90-119	≥120	
<60	169	59	8	0	236
60-89	21	33	15	2	71
90-119	9	21	15	5	50
≥120	4	16	23	22	65
Total	203	129	61	29	422

Diagonal values indicate correctly predicted endoscopic submucosal dissection durations.

SUPPLEMENTARY TABLE 3. Predicted versus observed procedure time categories in the validation cohort

Actual duration (min)	Predicted duration				Total
	<60	60-89	90-119	≥120	
<60	49	25	8	0	82
60-89	14	12	10	2	38
90-119	3	4	7	3	17
≥120	1	2	4	3	10
Total	67	43	29	8	147

Diagonal values indicate correctly predicted endoscopic submucosal dissection durations.