OPEN ACCESS

ORIGINAL ARTICLE *Volume 14 (Issue 4), 2025*

PAKISTAN JOURNAL OF MEDICINE & DENTISTRY

Frequency and Predictors of Post–Polypectomy Syndrome in Patients Undergoing Endoscopic Polypectomy

Jawad Khan[1], Rania Hidayat[2], Bushra Fiaz[2], Saad Aziz[3], Muhammad Qasim[4], Arshad Jadoon[5]

[1]Department of Gastroenterology, Police and Services Hospital, Peshawar, [2]Department of Gastroenterology, Ayub Teaching Hospital, Abbottabad, [3]Department of Gastroenterology, Prime Teaching Hospital, Peshawar, [4]Department of Orthopaedics, Hayatabad Medical Complex, Peshawar, [5]Department of Gastroenterology, Bacha Khan Medical Complex, Swabi, Pakistan.

ABSTRACT

Background: A rare but significant clinical consequence of endoscopic polypectomy operations is post-polypectomy syndrome (PPS). The study's goal was to determine the prevalence and risk factors for post-polypectomy syndrome in individuals having endoscopic polypectomy.

Methods: The Police and Services Hospital in Peshawar was the site of this cross-sectional study for a year, from 1st June, 2023 to 31st May, 2024. The study employed a non-probability consecutive sampling technique and recruited 500 individuals. Demographic information, comorbidities, polyp features, surgery type, and PPS occurrence were extracted from hospital records. SPSS version 26 was used to analyze the data. The Chi-square test and the t-test were used to compare continuous and categorical variables, respectively. To find independent predictors, significant factors from univariate analysis were incorporated into multivariate logistic regression.

Results: The mean age of patients was 52.6 ± 12.8 years, and 56% were male. PPS was identified in 25 patients (5%). On univariate analysis, hypertension (p=0.021), larger polyp size (p<0.001), sessile morphology (p = 0.001), and ESD procedures (p = 0.004) were significantly associated with PPS. Multivariate logistic regression confirmed hypertension (p = 0.042), polyp size >20 mm (p = 0.001), sessile morphology (p = 0.007), and ESD (p = 0.021) as independent predictors.

Conclusion: PPS occurs in a minority of patients, but its risk is significantly elevated by comorbid hypertension, larger and sessile polyps, and advanced procedures like ESD. Recognition of these predictors can guide preventive strategies, individualized monitoring, and improved post-polypectomy care.

Keywords: Colonic Polyps; Post-Polypectomy Syndrome; Risk Factors; Endoscopic Mucosal Resection.
***Corresponding Author:** Arshad Jadoon,
Email: alefjeem@yahoo.com

How to cite: Khan J, Hidayat R, Fiaz B, Aziz S, Qasim M, Jadoon A. Frequency and Predictors of Post-Polypectomy Syndrome in Patients Undergoing Endoscopic Polypectomy. Pak J Med Dent. 2025 September ;14(4): A-B. Doi: https://doi.org/10.36283/ziun-pjmd14-4/079.

Received: Wed, September 14, 2025 **Accepted:** Sun, September 28, 2025**. Published:** Mon, September 29, 2025

INTRODUCTION

Colorectal cancer (CRC) is a leading cause of cancer morbidity and mortality worldwide, and endoscopic polypectomy remains the cornerstone preventive intervention because it interrupts the adenoma–carcinoma sequence[1]. Endoscopic removal of polyps, whether by conventional snare polypectomy, endoscopic mucosal resection (EMR), or endoscopic submucosal dissection (ESD), has transformed colorectal cancer prevention and reduced the need for more invasive surgery. However, as larger and more complex lesions are increasingly treated endoscopically, recognition and management of procedure-related adverse events have become more important[2, 3].

Post-polypectomy syndrome (PPS), also known as post-polypectomy coagulation or post-polypectomy electrocoagulation syndrome, is a well-established but infrequent complication of thermal-assisted endoscopic polypectomy. It results from transmural thermal injury to the bowel wall during electrocautery, inducing localized peritoneal inflammation without frank perforation. Typical presentations include localized abdominal pain, fever, leukocytosis, and radiologic evidence of focal mural thickening without extraluminal free air. Recognizing PPS is critical because it is usually managed conservatively (intravenous fluids, bowel rest, antibiotics, and analgesia), while true perforation requires surgical management[4, 5].

Reported incidence estimates for PPS vary across studies and clinical settings. Most contemporary analyses estimate the overall incidence at ~0.1% to 2% after polypectomy/EMR, with many series clustering around 1%.[6] In contrast, a selected series of advanced resections reports higher rates (2–8%) in some ESD cohorts. An extensive registry study and several recent systematic and single-center reports emphasize that although PPS is uncommon, the absolute number of cases is increasing as therapeutic colonoscopy expands. Across reviews and case series, reported incidence ranges and exact estimates differ by lesion size, resection technique, and surveillance definitions used by authors[4, 7].

Several consistent predictors of PPS have been identified in recent literature[8, 9]. Larger lesion size commonly >10–20 mm, and especially >20 mm, right-sided colonic location (thin wall of the proximal colon), non-polypoid or sessile morphology, use of thermal coagulation (hot snare, EMR, ESD), and certain lesion or procedural factors (deep thermal injury, submucosal fibrosis, prolonged cautery time) are repeatedly associated with higher PPS risk. Patient factors such as hypertension and other cardiovascular comorbidities have also been linked to increased risk in some multicenter analyses[10]. Recent dedicated analyses and prediction studies suggested combinations of clinical (fever, leukocytosis, raised CRP) and procedural variables can improve early identification of patients at risk[7, 10, 11].

Prevention strategies suggested in recent publications include technical measures to minimize transmural injury (adequate submucosal lifting before thermal resection, limiting coagulation time and power, "tenting" the lesion away from the muscularis, and careful technique with ESD), selective prophylactic clipping in high-risk defects, and judicious use of electrosurgical settings. Nonetheless, evidence remains heterogeneous: while some series show reduced adverse events with specific prophylactic approaches, high-quality randomized data are limited, and consensus on universal preventive algorithms is lacking. Because the clinical picture of PPS can mimic perforation, diagnostic imaging (CT abdomen/pelvis) and careful clinical assessment are important to avoid unnecessary laparotomy. When recognized early, most PPS cases resolve with conservative care; however, severe and even fatal presentations have been reported, underscoring the need to identify predictors of more complicated courses[12, 13].

Although PPS is recognized in endoscopic practice, the contemporary literature shows wide incidence ranges and variable definitions, and many existing studies are single-center, retrospective, or focused on specific techniques (EMR/ESD)[14, 15]. With increasing adoption of advanced endoscopic resections, a clear, locally-derived estimate of PPS frequency and a validated understanding of independent predictors is urgently needed to inform peri-procedural risk stratification, targeted preventive measures, and safe post-procedure monitoring protocols. Consequently, the purpose of this study was to ascertain the prevalence of post-polypectomy syndrome in individuals having endoscopic polypectomy.

METHODS

This study was designed as a hospital-based, cross-sectional observational study. The study was conducted in the Department of Gastroenterology at the Police and Services Hospital, Peshawar, for 1 year, from 1st June 2023 to 31st May 2024. Ethical approval for the study was obtained from the Ethical Review Committee (ERC) of Police and Services Hospital, Peshawar (Dated: 11th March, 2023). Written informed consent was obtained from all patients before enrollment, and all procedures were performed in accordance with relevant guidelines and regulations.

The sample size was calculated using OpenEpi (single-proportion formula). Based on an anticipated prevalence of 1% for PPS reported in recent literature (0.03–1% after polypectomy/EMR and up to 9% after ESD), with a 95% confidence level and 1% margin of error, the minimum required sample was 381[3, 16]. After adjusting for a 10% non-response rate, the sample size increased to 420. To improve power in identifying predictors, a final sample of 500 patients was selected.

The method of non-probability sequential sampling was applied. Participation was open to all adult patients (age ≥18 years) who met the inclusion criteria and presented to the Department of Gastroenterology for therapeutic endoscopic polypectomy, including hot snare polypectomy, endoscopic mucosal resection (EMR), and endoscopic submucosal dissection (ESD) during the study period. Until the sample size was reached, patients were added one after the other. Patients were excluded if they had incomplete colonoscopy or failed polypectomy, pre-existing intra-abdominal infection or perforation, known inflammatory bowel disease, incomplete medical records for key study variables, or if they were lost to follow-up within seven days of the procedure.

Hospital records of patients who had endoscopic polypectomy during the study period were used to gather data retrospectively. Patient files, operative notes, and endoscopy unit registers were reviewed in detail. A structured proforma was designed to extract relevant information, including socio-demographic data (age, sex, residence), clinical characteristics (comorbidities such as hypertension or diabetes), and polyp-related variables (size, morphology, number, and anatomical location). The type of operation carried out, standard polypectomy, endoscopic mucosal resection (EMR), or endoscopic submucosal dissection (ESD), as well as other procedural details, were documented.

Post-procedural outcomes were carefully documented by reviewing progress notes, laboratory findings, and discharge summaries. Particular attention was given to symptoms and signs suggestive of post-polypectomy syndrome (abdominal pain, fever, leukocytosis, or localized peritonitis without radiological evidence of perforation). Data extraction was performed by two trained investigators, and any discrepancies were resolved by consensus to ensure reliability.

All collected data were entered and analyzed using IBM SPSS Statistics version 26. Continuous variables, such as age and polyp size, were summarized as means with standard deviations (SD). Categorical variables, including sex, comorbidities, type of procedure, and presence of post-polypectomy syndrome (PPS), were expressed as frequencies and percentages. The frequency of PPS was calculated as the primary outcome. The Chi-square test or Fisher's exact test for categorical variables and the independent t-test for continuous data were initially used to evaluate associations between PPS and putative predictors (age, sex, comorbidities, polyp features, and operation type). To find independent predictors of PPS, variables that were significant on univariate analysis ($p \leq 0.05$) were then added to a multivariate logistic regression model. 95% CIs were included with adjusted odds ratios (ORs), and a p-value ≤ 0.05 was deemed statistically significant.

RESULTS

A total of 500 patients were included in the study. The majority were males (56.0%), while females accounted for 44.0% of the participants. Among comorbidities, hypertension was present in 28.0% of patients and diabetes mellitus in 20.0%, whereas 52.0% had no comorbid condition. Regarding polyp morphology, 62.0% were pedunculated and 38.0% were sessile. According to the distribution of polyp locations, the right colon had 36.0% of them, the left colon had 46.0%, and the rectum had 18.0%. Regarding procedure type, endoscopic mucosal resection accounted for 28.0%, endoscopic submucosal dissection for 8.0%, and standard polypectomy for 64.0%. (Table 1)

Table 1. Baseline Characteristics of Study Participants (n = 500)

Variable	**n (%) / Mean ± SD**
Age (years)	52.6 ± 12.8
Sex	
Male	280 (56.0%)
Female	220 (44.0%)
Comorbidities	
Hypertension	140 (28.0%)
Diabetes mellitus	100 (20.0%)
None	260 (52.0%)
Polyp size (mm)	15.4 ± 6.8
Polyp morphology	
Pedunculated	310 (62.0%)

Sessile	190 (38.0%)
Polyp location	
Right colon	180 (36.0%)
Left colon	230 (46.0%)
Rectum	90 (18.0%)
Procedure type	
Standard polypectomy	320 (64.0%)
Endoscopic mucosal resection	140 (28.0%)
Endoscopic submucosal dissection	40 (8.0%)

Post-polypectomy syndrome (PPS) was observed in 25 (5.0%) of patients, while the remaining 475 (95.0%) did not develop PPS during the study period. (Figure 1)

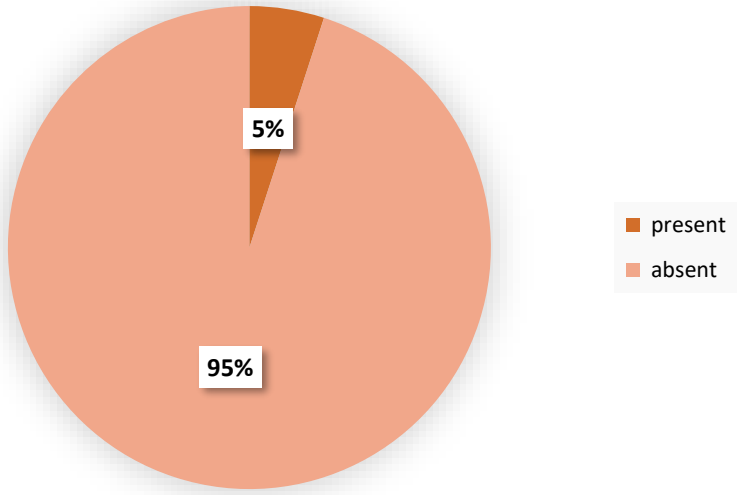

Figure 1: A pie chart showing the frequency of post-polypectomy syndrome in patients undergoing endoscopic polypectomy

On univariate analysis, several factors were associated with the development of post-polypectomy syndrome (PPS). Patients with PPS were more likely to have hypertension (48.0% vs. 26.9%, p = 0.021), larger polyp size (22.6 mm vs. 15.0 mm, p < 0.001), and sessile morphology (72.0% vs. 36.2%, p = 0.001) compared to those without PPS. The syndrome was also significantly more frequent in patients undergoing endoscopic submucosal dissection (24.0% vs. 7.2%, p = 0.004). Although PPS was more common among males (72.0% vs. 55.2%) and in right-sided colonic lesions (48.0% vs. 35.4%), these associations did not reach statistical significance. Similarly, no significant relationship was found with age or diabetes mellitus. (Table 2)

Table 2. Univariate Analysis of Predictors of PPS of the Study Participants (n=500)

Variable	**PPS**		**p-value**
	Present (n=25)	**Absent (n=475)**	
Age (years, mean ± SD)	56.8 ± 11.5	52.3 ± 12.9	0.082
Sex			

Male	18 (72.0%)	262 (55.2%)	0.124
Female	7 (28.0%)	213 (44.8%)	
Comorbidities			
Hypertension	12 (48.0%)	128 (26.9%)	0.021*
Diabetes mellitus	8 (32.0%)	92 (19.4%)	0.152
Polyp size (mm)	22.6 ± 7.5	15.0 ± 6.6	<0.001*
Sessile morphology	18 (72.0%)	172 (36.2%)	0.001*
Right colon location	12 (48.0%)	168 (35.4%)	0.18
Procedure (ESD)	6 (24.0%)	34 (7.2%)	0.004*
*Statistically significant			

Several independent predictors of post-polypectomy syndrome (PPS) were found using multivariate logistic regression analysis. A two-fold higher risk was linked to hypertension (OR: 2.1, 95% CI: 1.0–4.6, p = 0.042). The risk was almost four times higher for patients with polyps larger than 20 mm (OR: 3.8, 95% CI: 1.7–8.5, p = 0.001). Another significant predictor was sessile morphology (OR: 2.9, 95% CI: 1.3–6.3, p = 0.007). Additionally, having an endoscopic submucosal dissection (ESD) more than tripled the risk of PPS (OR: 3.5, 95% CI: 1.2–9.8, p = 0.021). (Table 3)

Table 3. Multivariate Logistic Regression Analysis for Predictors of PPS

Predictor	Adjusted OR	95% CI	p-value

Hypertension	2.1	1.0 – 4.6	0.042*
Polyp size >20 mm	3.8	1.7 – 8.5	0.001*
Sessile morphology	2.9	1.3 – 6.3	0.007*
ESD procedure	3.5	1.2 – 9.8	0.021*
*Statistically significant			

DISCUSSION

In this study, PPS occurred in 5.0% of patients undergoing endoscopic polypectomy. This incidence is higher than many reports that place PPS at ≈0.1–1% after standard polypectomy or EMR but lower than rates reported in some ESD series; the difference likely reflects case-mix and procedural complexity at our center. Several contemporary single-center and multicenter reports and reviews document a low overall incidence of PPS after routine polypectomy/EMR, with higher rates after advanced resections such as ESD, a pattern consistent with our finding of increased PPS after ESD[4, 17].

Polyp size emerged as a strong independent predictor in our cohort: polyps >20 mm were associated with an almost four-fold increased odds of PPS. This aligns closely with multiple recent analyses that identify larger lesion size as a dominant risk factor for thermal transmural injury and post-procedural inflammatory sequelae. For example, Fusco et al. (2024) and other large series have repeatedly reported polyp diameter (commonly >10–20 mm thresholds) as a major determinant of PPS and other adverse events following resection. Larger lesions require more extensive coagulation or longer dissection times, both of which increase the risk of transmural thermal injury and consequent localized peritonitis[4, 10].

Sessile or non-pedunculated morphology was also independently associated with PPS in our analysis. This observation is concordant with prior literature showing that non-polypoid or flat/sessile lesions carry higher complication rates than pedunculated polyps, likely because they require broader mucosal and submucosal dissection and are more difficult to lift and resect cleanly using snare

techniques. Several clinical studies highlight non-polypoid morphology as a recognized risk factor for post-polypectomy thermal complications, supporting our finding[10, 18, 19].

Hypertension was an independent patient-level predictor in our cohort, doubling PPS risk after adjustment. Cardiovascular comorbidity (including hypertension) has appeared in several recent analyses and meta-analyses as associated with adverse outcomes after polypectomy, possibly reflecting underlying microvascular disease, altered tissue perfusion, or differential healing responses that could exacerbate transmural ischemic injury after cautery. A meta-analysis of post-polypectomy bleeding and related complications also identified hypertension and cardiovascular disease among important risk variables, lending external validity to our hypertension finding[11, 20, 21].

Procedural type, specifically undergoing ESD, was another strong predictor in our study, with ESD conferring a more than threefold increased odds of PPS. This is consistent with larger comparative studies and systematic appraisals demonstrating higher rates of adverse events (including PPS, perforation, and delayed bleeding) after ESD than EMR or standard snare polypectomy, although ESD also achieves lower local recurrence for large non-pedunculated lesions. Recent comparative data emphasize that ESD's longer procedure time, deeper submucosal dissection, and use of extended coagulation contribute mechanistically to higher PPS risk, mirroring our results[22-24].

Several studies have proposed and validated risk models or nomograms for post-procedural adverse events (primarily delayed bleeding or ESD-related complications) that include lesion size, location, morphology, anticoagulant/antiplatelet use, and procedural time. Our multivariate model, highlighting size, morphology, hypertension, and ESD, overlaps substantially with predictors used in these published scores, suggesting our findings are generalizable to other centers performing a mix of standard and advanced resections. Those studies also underscore that incorporating both patient and procedural variables improves risk stratification compared with single-factor approaches[24-26].

There are some differences between our results and a few published reports. Several studies place greater emphasis on right-sided location as an independent risk factor because of the thinner wall of the proximal colon; right-sided location in our cohort did not remain significant after adjustment. This could be explained by the predominance of other, stronger predictors in our sample, i-e. large size, sessile shape, and ES; alternatively, local practice patterns, e.g., greater use of prophylactic clipping or differing electrosurgical settings, may mitigate the effect of laterality. Several recent reviews note that the relationship between location and PPS can be inconsistent across cohorts and may interact with lesion size and technique[27].

Clinical implications of our findings include reinforcing the need for tailored peri-procedural planning for patients with identified risk factors. For large (>20 mm), sessile lesions and planned ESDs, endoscopists should emphasize optimal submucosal lifting, minimize coagulation where feasible, consider prophylactic defect closure when appropriate, and ensure close post-procedural monitoring for early signs of PPS. Moreover, patients with cardiovascular comorbidity, particularly hypertension, may merit heightened surveillance or discussion of alternative management strategies when the expected procedural risk is substantial. These practical recommendations echo prevention strategies discussed in recent guidelines and cohort studies.

This study has limitations that temper interpretation. It is based on a single-center dataset and uses retrospective record review, which may introduce selection and information biases, especially if milder PPS cases were managed elsewhere or not documented. Our overall PPS rate of 5.0% is higher than many series and may reflect referral of more complex cases (higher ESD proportion) or center-specific practice patterns; prospective multicenter validation would be needed to confirm the magnitude of the associations we observed. Finally, although our multivariable model adjusted for several confounders, residual confounding cannot be excluded, factors emphasized in mechanistic ESD studies.

CONCLUSION

Sessile morphology, hypertension, higher polyp size, and endoscopic submucosal dissection (ESD) operations were positively correlated with post-polypectomy syndrome (PPS), which was seen in 5% of patients. These findings demonstrate how important procedure-related variables and patient comorbidities are in predicting the probability of PPS. Importantly, the identification of polyp size >20 mm and sessile morphology as independent predictors underscores the need for careful patient selection, meticulous endoscopic technique, and vigilant post-procedural monitoring in high-risk groups. Given the rising use of advanced resection methods such as ESD, these findings carry clinical relevance by emphasizing a tailored approach to surveillance and risk mitigation. In conclusion, proactive identification of risk factors and individualized management strategies may reduce the burden of PPS and improve patient safety following colorectal polypectomy.

LIST OF ABBREVIATIONS:

CRC: Colorectal cancer

EMR: Endoscopic mucosal resection

ESD: Endoscopic submucosal dissection

PPS: Post-polypectomy syndrome

ACKNOWLEDGEMENT

None

FUNDING

None

CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval for the study was obtained from the Ethical Review Committee (ERC) of Police and Services Hospital, Peshawar (Dated: 11th March, 2023).

AUTHORS' CONTRIBUTION

All authors contributed equally as per ICMJE.

REFERENCES

1. Teka MA, Yesuf A, Hussien FM, Hassen HY. Histological characteristics, survival pattern and prognostic determinants among colorectal cancer patients in Ethiopia: A retrospective cohort study. Heliyon. 2021 Feb 27;7(2):e06366. doi: 10.1016/j.heliyon.2021.e06366.
2. Gao P, Zhou K, Su W, Yu J, Zhou P. Endoscopic management of colorectal polyps. Gastroenterol Rep (Oxf). 2023 May 27;11:goad027. doi: 10.1093/gastro/goad027.
3. Mann R, Gajendran M, Umapathy C, Perisetti A, Goyal H, Saligram S, Echavarria J. Endoscopic Management of Complex Colorectal Polyps: Current Insights and Future Trends. Front Med (Lausanne). 2022 Jan 20;8:728704. doi: 10.3389/fmed.2021.728704.
4. Zachou M, Pikramenos K, Mpetsios G, Lalla E, Panoutsakou M, Varytimiadis K, Karantanos P. Post-polypectomy coagulation syndrome: a tricky to diagnose hot snare problem that can be eliminated thanks to cold snare revolution. Arch Clin Cases. 2022 Dec 19;9(4):170-172. doi: 10.22551/2022.37.0904.10226.
5. ASLAN İE. Post-polypectomy coagulation syndrome: A case with descending colon involvement. Gastroenterology. 2025;24:110-2. Doi: 10.17941/agd.1581174

6. Forbes N, Gupta S, Frehlich L, Meng ZW, Ruan Y, Montori S, Chebaa BR, Dunbar KB, Heitman SJ, Feagins LA, Albéniz E. Clip closure to prevent adverse events after EMR of proximal large nonpedunculated colorectal polyps: meta-analysis of individual patient data from randomized controlled trials. Gastrointestinal endoscopy. 2022 Nov 1;96(5):721-31. https://doi.org/10.1016/j.gie.2022.05.020
7. Chow CWS, Fung TLD, Chan PT, Kwok KH. Endoscopic submucosal dissection for colorectal polyps: outcome determining factors. Surg Endosc. 2023 Feb;37(2):1293-1302. doi: 10.1007/s00464-022-09672-2.
8. Zammit AP, Lyons NJ, Chatfield MD, Hooper JD, Brown I, Clark DA, Riddell AD. Patient and pathological predictors of management strategy for malignant polyps following polypectomy: a systematic review and meta-analysis. Int J Colorectal Dis. 2022 May;37(5):1035-1047. doi: 10.1007/s00384-022-04142-6.
9. Eleftheriadis D, Imalis C, Gerken G, Wedemeyer H, Duerig J. Risk factors for post-polypectomy bleeding; a retrospective case-control study of a high-volume colonoscopy center. Z Gastroenterol. 2022 Oct;60(10):1475-1482. English. doi: 10.1055/a-1690-7795.
10. Fusco S, Bauer ME, Schempf U, Stüker D, Blumenstock G, Malek NP, Werner CR, Wichmann D. Analysis of Predictors and Risk Factors of Postpolypectomy Syndrome. Diagnostics (Basel). 2024 Jan 5;14(2):127. doi: 10.3390/diagnostics14020127.
11. Zhang X, Jiang X, Shi L. Risk factors for delayed colorectal postpolypectomy bleeding: a meta-analysis. BMC Gastroenterol. 2024 May 14;24(1):162. doi: 10.1186/s12876-024-03251-6.
12. Waddingham W, Kamran U, Kumar B, Trudgill NJ, Tsiamoulos ZP, Banks M. Complications of diagnostic upper Gastrointestinal endoscopy: common and rare - recognition, assessment and management. BMJ Open Gastroenterol. 2022 Dec;9(1):e000688. doi: 10.1136/bmjgast-2021-000688.
13. Gordon SR, Eichenwald LS, Systrom HK. Endoscopic techniques for management of large colorectal polyps, strictures and leaks. Surg Open Sci. 2024 Jul 4;20:156-168. doi: 10.1016/j.sopen.2024.06.012.
14. Ahmed Y, Othman M. EMR/ESD: Techniques, Complications, and Evidence. Curr Gastroenterol Rep. 2020 Jun 15;22(8):39. doi: 10.1007/s11894-020-00777-z.
15. Shahini E, Passera R, Lo Secco G, Arezzo A. A systematic review and meta-analysis of endoscopic mucosal resection vs endoscopic submucosal dissection for colorectal sessile/non-polypoid lesions. Minim Invasive Ther Allied Technol. 2022 Aug;31(6):835-847. doi: 10.1080/13645706.2022.2032759.
16. Kim SY, Kim HS, Park HJ. Adverse events related to colonoscopy: Global trends and future challenges. World J Gastroenterol. 2019 Jan 14;25(2):190-204. doi: 10.3748/wjg.v25.i2.190.

17. Jacques J, Schaefer M, Wallenhorst T, et al. Endoscopic en bloc versus piecemeal resection of large nonpedunculated colonic adenomas: A randomized comparative trial. Ann Intern Med 2024; 177: 29-38.
18. Oh SJ, Jung Y, Hwangbo Y, Cho YS, Chung IK, Lee CK. Prediction of immediate bleeding after cold snare polypectomy: A prospective observational study. Medicine (Baltimore). 2024 Sep 6;103(36):e39597. doi: 10.1097/MD.0000000000039597.
19. Syed KA, Koseki M, Satoi S, Park E, Simoes P, Nishimura M. Colon polyp characterization (morphology and mucosal patterns): clinical application and techniques. Ann Laparosc Endosc Surg 2023;8. doi: 10.21037/ales-23-10
20. Valvano M, Fabiani S, Magistroni M, Mancusi A, Longo S, Stefanelli G, Vernia F, Viscido A, Romano S, Latella G. Risk of colonoscopic post-polypectomy bleeding in patients on single antiplatelet therapy: systematic review with meta-analysis. Surgical Endoscopy. 2022 Apr;36(4):2258-70. https://doi.org/10.1007/s00464-021-08975-0
21. Bozkurt H, Sert ÖZ, Ölmez T, Keklikkıran ZZ, Uzun O, Gülmez S, Polat E, Duman M. The risk of post-polypectomy bleeding among patients receiving antithrombotic agents: A prospective observational study. Sao Paulo Med J. 2021 Mar 22;139(3):218-225. doi: 10.1590/1516-3180.2020.0305.R1.10122020.
22. Gweon TG, Yang DH. Management of complications related to colorectal endoscopic submucosal dissection. Clin Endosc. 2023 Jul;56(4):423-432. doi: 10.5946/ce.2023.104.
23. Dalal I, Andalib I. Advances in endoscopic resection: a review of endoscopic submucosal dissection (ESD), endoscopic full thickness resection (EFTR) and submucosal tunneling endoscopic resection (STER). Transl Gastroenterol Hepatol. 2022 Apr 25;7:19. doi: 10.21037/tgh-2020-10.
24. Song HY, Kim SJ, Lee J, Jin BC, Kim DH, Kim HS, Oh HH, Joo YE, Myung DS, Kim SW, Seo GS. Risk Factors for Post-Endoscopic Submucosal Dissection Electrocoagulation Syndrome in Patients with Colorectal Neoplasms: A Multicenter, Large-Scale, Retrospective Cohort Study by the Honam Association for the Study of Intestinal Disease (HASID). J Clin Med. 2024 Jul 4;13(13):3932. doi: 10.3390/jcm13133932.
25. Xu L, Zhang N, Zhang Y, Luo D, Lu H, Wang Y, Zheng Y, Li Q. A dynamic online nomogram for predicts delayed postoperative bleeding after colorectal polyp surgery. Sci Rep. 2024 Aug 25;14(1):19728. doi: 10.1038/s41598-024-70635-9.
26. Lu Y, Zhou X, Chen H, Ding C, Si X. Establishment of a model for predicting delayed post-polypectomy bleeding: A real-world retrospective study. Front Med (Lausanne). 2022 Oct 19;9:1035646. doi: 10.3389/fmed.2022.1035646.

27. Jung YS. Summary and comparison of recently updated post-polypectomy surveillance guidelines. Intest Res. 2023 Oct;21(4):443-451. doi: 10.5217/ir.2023.00107.