ISSN: 2091-2889 (online)
2091-2412 (print)

Received: 23 July 2025
AccePLed: 22 Aug 2025
Published: 31 Aug 2025

DOI: 10.54530/jcmc.1735

OPEN ACCESS

Comparison of Workgroup Serrated Polyps and Polyposis (WASP) classification of colorectal polyps evaluated with blue laser imaging against histopathological diagnosis

Kamal Lamichhane[1], Ramila Shrestha[2], Dibas Khadka[3]

[1]DM Resident, [2]Professor [3]Assistant Professor, Department of Gastroenterology, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal

Peer reviewed

Abstract

Introduction: Colorectal polyps are precursors of colorectal carcinoma. Virtual chromo endoscopy and classification systems have improved real-time diagnosis. This study compared diagnostic accuracy of Workgroup serrAted polypS and Polyposis (WASP) classification using Blue Laser Imaging (BLI) against histopathological examination (HPE).

Method: An observational study was conducted at Bir Hospital, Nepal (Feb 2024-Apr 2025). Colorectal polyps detected during colonoscopy were examined under white light and BLI to classify using WASP. Patients' demographics (age, gender) and polyp characteristics (site, size, number, type) were recorded. Resected polyps were sent for HPE. Diagnostic performance (sensitivity, specificity, predictive values, and accuracy) was calculated in reference to HPE. Data analysis was performed using SPSS v26; p≤0.05 was considered significant at 95% CI.

Result: Eighty-six colorectal polyps from 62 patients (mean age 54.4 years, 66.1% male) were evaluated. Diminutive polyps (≤5 mm) were 58(67.4%) and 56(65.1%) left-sided. By WASP classification, 64(74.4%) were hyperplastic, 21(24.4%) adenomatous, and 1(1.2%) sessile serrated adenoma/polyp. Histopathology confirmed 27(31.4%) adenomatous polyps, of which 18(66.7%) were left-sided. For adenomatous polyps, BLI-WASP demonstrated 59.3% sensitivity, 91.5% specificity, 76.2% PPV, 83.1% NPV and 81.4% accuracy. Hyperplastic polyps were identified with 100% sensitivity and 37.3% specificity. In diminutive adenomatous polyps, diagnostic accuracy was 81.0%. There was a significant association between WASP classification and histopathology (p<0.001).

Conclusion: The BLI with WASP classification demonstrated high specificity and accuracy in differentiating adenomatous from hyperplastic polyps, but with modest sensitivity. Its strong negative predictive value suggests potential for optical diagnosis, reducing reliance on histopathology in selected cases.

How to cite

Lamichhane K, Shrestha R, Khadka D. Comparison of Workgroup serrated polyps and Polyposis (WASP) Classification of colorectal polyps evaluated with Blue Laser Imaging against histopathological diagnosis. Journal of Chitwan Medical College. 2025;15(53):32-9.

Correspondence

Kamal Lamichhane, Department of Gastroenterology, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal. Email: kamallamichhane71@gmail.com, Telephone: +977 9849099215

Introduction

Colorectal polyps are early lesions that can develop into colorectal cancer (CRC), and polypectomy can reduce the risk of CRC.[1] Missed cases of CRC lead to the development and recognition of the role of serrated lesions in carcinogenesis. Approximately one-third of CRC cases are attributed to sessile serrated polyps, which can develop into CRC through the serrated neoplasia pathway.[2–5] Features of advanced neoplasia are higher in larger polyps (>10mm) compared to small (6-9mm) and diminutive (<6mm) polyps.[6] Traditional categorization of hyperplastic polyps as non-cancerous and adenomatous as precancerous has its limitation.[7]

Image enhanced endoscopy (IEE) can enhance the visualization of mucosal surface patterns and microvascular features of gastrointestinal lesions, including those in the early stages.[8] Conventional dye-based chromoendoscopy (CE) and virtual CE are the two types of IEE. Blue Laser Imaging (BLI) is the virtual CE developed by Fujifilm corporation, which uses two monochromatic lasers to produce an enhanced image during endoscopy and hence do not require dye.[9]

The Workgroup serrAted polypS and Polyposis (WASP) classification is a system created for the optical diagnosis of small and diminutive adenomas (ADs), hyperplastic polyps (HPs), and sessile serrated adenomas/polyps (SSA/Ps).[10] This classification is developed by integrating the existing NBI, Narrow Band Imaging (NBI) International Colorectal Endoscopic (NICE) classification with the criteria established by Hazewinkel[11] in a stepwise approach.[12]

Accurate optical diagnosis of diminutive polyps using virtual chromoendoscopy (CE) could enable a resect-and-discard approach without the need for histopathological evaluation (HPE), or allow certain polyps to be left in situ without resection, depending on their classification.[13] This study also aids in determining the accuracy of BLI for diagnosing the nature of polyps, which could contribute to developing future protocols for managing colorectal polyps.

Method

This cross-sectional study was conducted at the Department of Gastroenterology, Bir Hospital, National Academy of Medical Sciences (NAMS), Kathmandu, Nepal, from 9 Feb 2024 to 8 Apr 2025.

A convenience sampling technique was used to collect the data. All patients aged 18 and above with colorectal polyps detected during colonoscopy using the ELUXEO® video processor VP-7000 were included in the study. Patients undergoing emergency colonoscopy, pregnant, diagnosed as Familial adenomatous polyposis syndrome or Peutz-Jeghers syndrome, known cases of inflammatory bowel disease, and patients whose polyps couldn't be retained after polypectomy were excluded.

In this study, we use the term SSA/P (Sessile Serrated Adenoma/Polyp), which is the current WHO-recommended terminology. The older term, SSP (Sessile Serrated Polyp), widely used earlier and still common in North America, emphasises the endoscopic appearance (sessile + serrated).

Colonoscopy procedures were conducted in the Endoscopy Suite of the Department of Gastroenterology, either by consultant gastroenterologists or by DM residents under the supervision of consultants. The study included only colorectal polyps smaller than 10 mm, which were classified as diminutive polyps (≤5 mm) or small polyps (6–9 mm).

Images of the polyps were captured using white light. Each polyp was examined using Blue Light Imaging (BLI), and corresponding images were obtained. An optical diagnosis was made based on the WASP classification. Polypectomy was performed, and the resected specimen sent for histopathological evaluation. Histopathological analysis was carried out by experienced pathologists. Patients were followed up, and the final histopathological diagnoses were recorded.

A structured proforma was used to collect data. Data were checked for completeness and missing values, and edited for other errors. The data were entered into an Excel sheet and subsequently transferred to SPSS version 26 for

further analysis. Descriptive statistics were used to analyse the data, including frequencies, percentages, and measures of central tendency. Using histopathology as the gold standard, sensitivity, specificity, positive and negative predictive values (PPV, NPV), and accuracy were calculated. The Chi-square test was used to assess the significance of the association between BLI results and HPE findings.

Ethical approval for the study was granted by the NAMS Institutional Review Board (Reference No. 1037/2080/81). Written informed consent was obtained and confidentiality maintained.

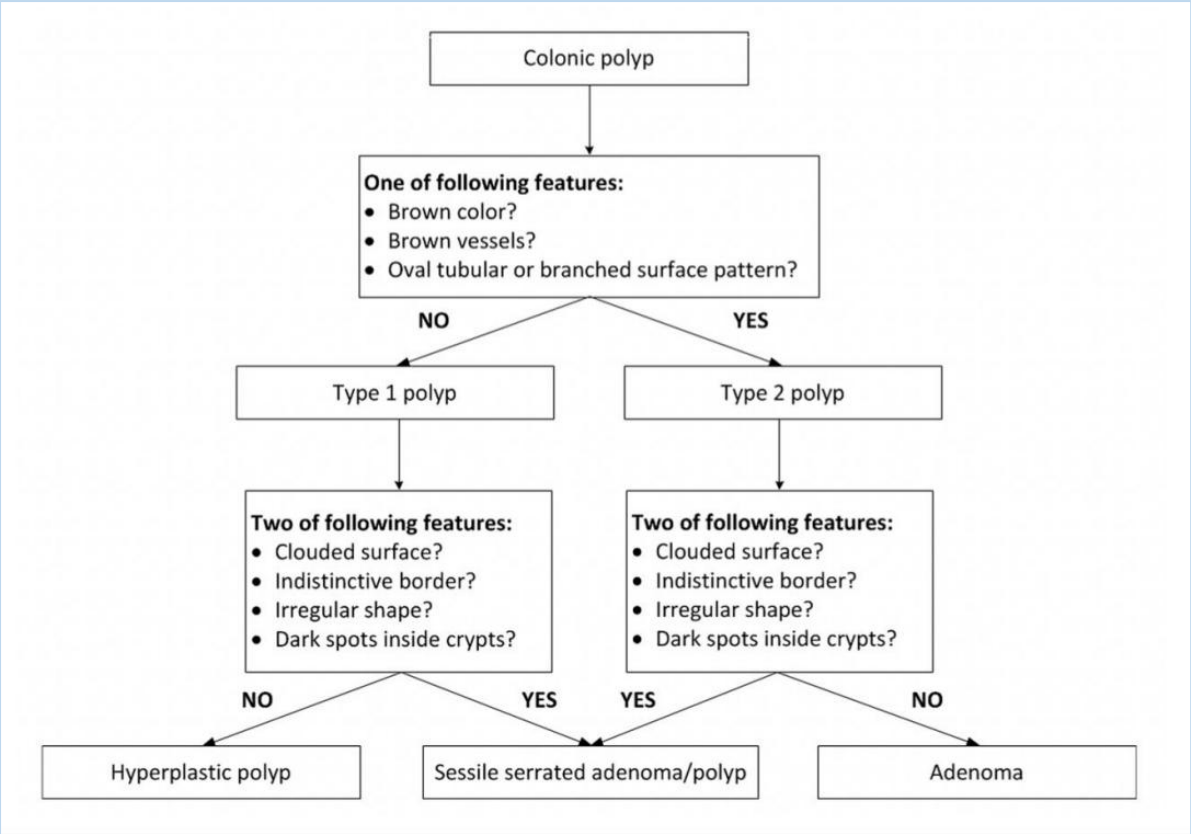

Figure 1. The WASP classification[10]: method for optical diagnosis of hyperplastic polyps, sessile serrated adenomas/polyps and adenomas based on the NICE[12] criteria and the Hazewinkel[11] criteria in a stepwise approach. (NICE, NBI International Colorectal Endoscopic; NBI, narrow band imaging; WASP, Workgroup serrAted polypS and Polyposis).

Result

Data on a total of 62 patients with 86 colorectal polyps (included only <10 mm, classified as diminutive polyps ≤5 mm or small 6–9 mm) were analysed. Of the total 86 polyps studied, WASP classified 21/86 (24.4%) as adenomatous polyps (AP), while histopathology confirmed 27/86 (31.4%), with BLI-WASP achieving 59.3% sensitivity, 91.5% specificity, and 81.4% overall accuracy for AP.

In patient demographics, the mean age was 54.4 years, more than half 33(53.2%) were >54 years, and two-thirds 41(66.1%) were male, Table 1.

In polyp characteristics, out of 86 polyps, 56(65.1%) were in left colon and 58(67.4%) diminutive (≤5 mm), mostly single polyp 41(47.7%). According to WASP classification, hyperplastic were most common, 64(74.4%), followed by adenomatous 21(24.4%). Histopathology confirmed 27(34.1%) as AP, of which two-thirds 18(66.6%) were left-sided, Table 1.

For diagnostic performance of AP, the BLI with WASP classification achieved a sensitivity of 59.3%, specificity of 91.5%, PPV of 76.2%, NPV of 83.1% and accuracy of 81.4%. The hyperplastic types were identified with a sensitivity of 100%, specificity of 37.3%, PPV of 42.2%, and NPV of 100%. None of the HPE reported SSA/P (sessile serrated adenoma/polyps), whereas WASP reported one, Table 2.

Among diminutive polyps (≤5 mm, n=58), the diagnostic accuracy for AP was 81.0% (sensitivity 30.8%, specificity 95.6%). The hyperplastic were recognised with 100% sensitivity but low specificity (19.4%). For neoplastic polyps overall, the diagnostic accuracy was 79.3%, Table 3.

There was a statistically significant association between WASP classification under BLI and HPE for AP (X^2=25.885, p<0.001), HP (X^2=13.529, p<0.001), and AP + SSA/P (Sessile Serrated Adenomas/Polyp) combined category (X^2=23.447, p<0.001), Table 4.

None of the SSA/P findings were confirmed histologically; thus, for the combined group, AP + SSA/P, the findings mainly correspond to AP.

Table 1. Characteristics of patients (n=62) and colorectal polyps, n=86

Variables	n	%
Patients (n=62)		
Age (years), Mean 54.39(CI:50.35- 58.42)		
<54	29	46.8
≥54	33	53.2
Sex		
Male	41	66.1
Female	21	33.9
Polyps (n=86)		
Site		
Caecum	11	12.8
Ascending colon (AC)	9	10.5
Transverse colon (TC)	10	11.6
Descending colon (DC)	5	5.8
Sigmoid colon (SC)	20	23.3
Rectum	31	36.0
Number		
1	41	47.7
2	36	41.9
3	9	10.5
Size (mm)		
≤5	58	67.4
>5	28	32.6
Location		
Right-sided polyps (Caecum+AC+TC)	30	34.9
Left-sided polyps (DC+SC+Rectum)	56	65.1
WASP (Workgroup Serrated Polyps and Polyposis) classification		
Adenomatous polyp (AP)	21	24.4
Hypertrophic polyp (HP)	64	74.4
Sessile serrated adenoma/polyp (SSA/P)	1	1.2
Histopathologically confirmed AP, n=27		
AP right-sided	9	33.4
AP left-sided	18	66.6

One polyp was classified as SSA/P by WASP, but none were confirmed on histopathology. In this study, we use the term SSA/P (Sessile Serrated Adenoma/Polyp), which is the current WHO-recommended terminology. The older term, SSP (Sessile Serrated Polyp), which was widely used earlier and is still common in North America, emphasises the endoscopic appearance (sessile + serrated).

Table 2. Comparison of diagnostic performance of WASP and histopathology, n=86

Types of polyps	Sensitivity% (95% CI)	Specificity % (95% CI)	PPV % (95% CI)	NPV % (95% CI)	Accuracy %
AP	59.3 (39.6-77.0)	91.5 (80.1-97.6)	76.2 (54.5-91.0)	83.1 (71.7-91.2)	81.4 (72.1-88.5)
HP	100 (87.2-100)	37.3 (24.5-52.1)	42.2 (31.2-53.9)	100 (84.6-100)	57.0 (45.6-68.9)
AP+SSA/P	59.03 (38.8-77.6)	89.8 (78.2-96.6)	72.7 (50.8-88.6)	82.8 (70.1-91.9)	80.2 (70.3-87.7)

As none of SSA/P was confirmed histologically, the combined group (AP+AAA/P) correspond to AP

Table 3. Comparison of diagnostic performance of colorectal polyps ≤5mm, n=58

Types of polyps	Sensitivity% (95% CI)	Specificity % (95% CI)	PPV % (95% CI)	NPV % (95% CI)	Accuracy %
AP	30.8 (12.2-54.5)	95.6 (84.5-99.4)	66.7 (22.3-95.7)	82.7 (69.4-92.9)	81.0 (68.8-89.6)
HP	100 (85.5-100)	19.4 (8.4-35.4)	43.1 (28.8-58.2)	100 (59-100)	50.0 (36.6-63.4)
AP+SSA/P	30.8 (12.2-54.5)	93.3 (80.9-98.5)	57.1 (18.4-90.1)	82.4 (68-92.7)	79.3 (66.5-89.3)

PPV/NPV- positive/negative predictive value; No SSA/P was confirmed by histology, the combined group (AP+AAA/P) correspond to AP

Table 4. Association between WASP classification and histopathology, n=86

		Yes	No	X^2	p-value
AP (WASP)	**AP (HPE)**				
Yes		16	5	25.885	<0.001
No		11	54		
HP (WASP)	**HP (HPE)**				
Yes		27	37	13.529	<0.001
No		0	22		
AP+SSA/P (WASP)	**AP+SSA/P (HPE)**				
Yes		16	6	23.447	<.001
No		11	53		

WASP classified 21/86 (24.4%) as adenomatous polyps (AP), while histopathology confirmed 27/86 (31.4%), as none of SSA/P was confirmed histologically, the combined group (AP+AAA/P) correspond to AP

Discussion

Among 62 patients, out of 86 polyps examined using virtual chromoendoscopy BLI WASP criteria classified 21/86 (24.4%) AP, while histopathology confirmed 27/86 (31.4%); with BLI-WASP achieving 59.3% sensitivity, 91.5% specificity, and 81.4% overall accuracy for AP. The hyperplastic types were identified with a sensitivity of 100% a specificity of 37.3%. No SSA/P (sessile serrated adenoma/polyps) was reported by HPE, whereas WASP reported one.

Out of 86 colorectal polyps examined, majority were diminutive 58(67.4%), and left-sided 56(65.1%), which is a common finding. This is in contrast to another study, which found a majority of polyps located proximal to the splenic flexure.[2] In our study, only 33.4% of polyps were located in the right-sided colon. This variation in polyp location may be attributed to differences in the studied populations, including dietary habits and overall lifestyle.

The primary aim of image-enhanced endoscopy (IEE) is to improve the overall polyp detection rate and to accurately characterise detected polyps, enabling appropriate management and surveillance planning. Virtual chromoendoscopy, when combined with a reliable classification system, can support the adoption of strategies such as “diagnose and leave” for diminutive rectosigmoid hyperplastic polyps and “resect and discard” for diminutive adenomatous rectosigmoid polyps—provided the American Society for Gastrointestinal Endoscopy (ASGE)

Preservation and Incorporation of Valuable Endoscopic Innovations (PIVI) criteria are met. For the "diagnose and leave" strategy to be applied, the virtual chromoendoscopy technique must provide a negative predictive value (NPV) of 90% or higher for adenomatous histology. Similarly, to implement the "resect and discard" strategy, there must be at least 90% agreement in determining post-polypectomy surveillance intervals compared to those based on histopathological assessment as per PIVI criteria.[13,14]

A meta-analysis assessing the pooled negative predictive value (NPV) of optical biopsy techniques—NBI, i-SCAN, and FICE—for predicting adenomatous histology found that NBI had an NPV greater than 90%.[14]

A study utilising BLI and the Hiroshima classification for polyp characterisation reported that BLI without magnification achieved a diagnostic accuracy of 95.2% in distinguishing neoplastic from non-neoplastic polyps smaller than 10 mm in diameter.[15]

In a study comparing the agreement with pathology for the surveillance interval of small colorectal polyps among the NICE, SANO, and WASP classifications using BLI, the WASP classification showed a negative predictive value (NPV) of 87.5% for adenomatous histology in rectosigmoid polyps.[16]

Overall accuracy in predicting polyp histology is lower in our study as compared to previous studies; however, the NPV of our study is comparable. Virtual chromoendoscopic evaluation is inherently subjective and depends on the endoscopist's experience with IEE.

In our study, colonoscopies were performed either by residents under the supervision of a gastroenterologist or by gastroenterologists themselves, with varying levels of experience in IEE. Previous studies involving trained endoscopists with substantial experience in IEE have demonstrated higher accuracy in predicting polyp histology. With advancements in technology and the development of new, improved classification systems, the optical diagnosis of colorectal polyps is continually improving. As endoscopists gain more exposure and receive adequate training in virtual chromoendoscopy, their diagnostic accuracy improves over time. Accurate optical diagnosis of colorectal polyps has the potential to bring about a paradigm shift in colorectal polyp management, reducing both the overall cost and burden of care.

Although the ASGE PIVI criteria were not fully met in our study, BLI imaging combined with the WASP classification shows promise for evaluating and managing small colorectal polyps.

There were several limitations in our study that may have influenced the results. In our study, colorectal polyps were evaluated using BLI only after initial observation under white light imaging (WLI), and no magnification was used. Magnification enhances visualisation of surface and vascular patterns, potentially increasing the accuracy of histological predictions. Studies incorporating magnification alongside virtual chromoendoscopy have reported improved diagnostic performance and higher NPVs for adenomatous histology. As this was a single-centre study with BLI available on only one endoscopy machine, we were limited to evaluating 86 polyps in 62 individuals. Inclusion of a larger number of polyps could have yielded more robust and generalizable findings.

Conclusion

In this study, the blue light imaging (BLI) combined with Workgroup Serrated Polyps and Polyposis (WASP) criteria for classification of colorectal polyps demonstrated a high specificity (91.5%) and a strong negative predictive value (NPV of 83.1%) for differentiating adenomatous from hyperplastic polyps, supporting its role in real-time optical diagnosis. Although the sensitivity for adenomas was modest (59.3%), the high NPV suggests this technique holds significant potential for guiding the "diagnose-and-leave" strategy, particularly for diminutive polyps. With further training and technological advancement, BLI with WASP has potential to reduce reliance on routine histopathological assessment for small polyps in selected cases.

Author contribution

Concept design: KL, RS, DK, MSP; Literature search: KL; Data collection: KL; Data analysis: KL, RS; Draft manuscript: KL, RS, DK, MSP; Final manuscript and accountability: KL, RS, DK, MSP

Acknowledgment

None

Conflict of interest

None

Funding

None

Supplementary material

The data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Vogelaar I, Van Ballegooijen M, Hankey BF, et al. Colonoscopic Polypectomy and Long-Term Prevention of Colorectal-Cancer Deaths. N Engl J Med. 2012 Feb 23;366(8):687–96. PubMed Google Scholar Full Text
2. Laird-Fick HS, Chahal G, Olomu A, Gardiner J, Richard J, Dimitrov N. Colonic polyp histopathology and location in a community-based sample of older adults. BMC Gastroenterol. 2016 Dec;16(1):90. DOI PubMed Google Scholar Full Text
3. Kawasaki K, Kurahara K, Yanai S, Oshiro Y, Yao T, Kobayashi H, et al. Colonoscopic features and malignant potential of sessile serrated adenomas: comparison with other serrated lesions and conventional adenomas. Colorectal Dis. 2016 Aug;18(8):795–802. DOI PubMed Google Scholar Full Text
4. Snover DC. Update on the serrated pathway to colorectal carcinoma. Human Pathology. 2011 Jan;42(1):1–10. DOI PubMed Google Scholar Full Text
5. Leggett B, Whitehall V. Role of the Serrated Pathway in Colorectal Cancer Pathogenesis. Gastroenterology. 2010 May;138(6):2088–100. DOI PubMed Google Scholar Full Text
6. Kolligs FT, Crispin A, Graser A, Munte A, Mansmann U, Göke B. Risk factors for advanced neoplasia within subcentimetric polyps: implications for diagnostic imaging. Gut. 2013 Jun;62(6):863–70. DOI PubMed Google Scholar Full Text
7. Vogelstein B, Fearon ER, Hamilton SR, Kern SE, Preisinger AC, Leppert M, et al. Genetic Alterations during Colorectal-Tumor Development. N Engl J Med. 1988 Sep;319(9):525–32. DOI PubMed Google Scholar Full Text
8. Sano Y, Chiu H, Li X, Khomvilai S, Pisespongsa P, Co JT, et al. Standards of diagnostic colonoscopy for early-stage neoplasia: Recommendations by an Asian private group. Digestive Endoscopy. 2019 May;31(3):227–44. DOI PubMed Google Scholar Full Text
9. Osawa H, Yamamoto H. Present and future status of flexible spectral imaging color enhancement and blue laser imaging technology: FICE and BLI. Digestive Endoscopy. 2014 Jan;26:105–15. DOI PubMed Google Scholar Full Text
10. IJspeert JEG, Bastiaansen BAJ, Van Leerdam ME, Meijer GA, Van Eeden S, Sanduleanu S, et al. Development and validation of the WASP classification system for optical diagnosis of adenomas, hyperplastic polyps and sessile serrated adenomas/polyps. Gut. 2016 Jun;65(6):963–70. DOI PubMed Google Scholar Full Text
11. Hazewinkel Y, López-Cerón M, East JE, Rastogi A, Pellisé M, Nakajima T, et al. Endoscopic features of sessile serrated adenomas: validation by international experts using high-resolution white-light endoscopy and narrow-band imaging. Gastrointestinal Endoscopy. 2013 Jun;77(6):916–24. DOI PubMed Google Scholar Full Text
12. Hewett DG, Kaltenbach T, Sano Y, Tanaka S, Saunders BP, Ponchon T, et al. Validation of a Simple Classification System for Endoscopic Diagnosis of Small Colorectal Polyps Using Narrow-Band Imaging. Gastroenterology. 2012

Sep;143(3):599-607.e1. DOI PubMed Google Scholar Full Text

13. Rex DK, Kahi C, O'Brien M, Levin TR, Pohl H, Rastogi A, et al. The American Society for Gastrointestinal Endoscopy PIVI (Preservation and Incorporation of Valuable Endoscopic Innovations) on real-time endoscopic assessment of the histology of diminutive colorectal polyps. Gastrointestinal Endoscopy. 2011 Mar;73(3):419–22. DOI PubMed Google Scholar Full Text
14. Abu Dayyeh BK, Thosani N, Konda V, Wallace MB, Rex DK, Chauhan SS, et al. ASGE Technology Committee systematic review and meta-analysis assessing the ASGE PIVI thresholds for adopting real-time endoscopic assessment of the histology of diminutive colorectal polyps. Gastrointestinal Endoscopy. 2015 Mar;81(3):502.e1-502.e16. DOI PubMed Google Scholar Full Text
15. 1Yoshida N, Yagi N, Inada Y, Kugai M, Okayama T, Kamada K, et al. Ability of a novel blue laser imaging system for the diagnosis of colorectal polyps: Blue laser imaging of colorectal polyps. Digestive Endoscopy. 2014 Mar;26(2):250–8. DOI PubMed Google Scholar Full Text
16. Djinbachian R, Pohl H, Marchand E, Marques P, Bouin M, Deslandres E, et al. A78 COMPARISON OF THE NICE, SANO, AND WASP CLASSIFICATIONS FOR OPTICAL DIAGNOSIS OF SMALL COLORECTAL POLYPS. Journal of the Canadian Association of Gastroenterology. 2020 Feb 26;3(Supplement_1):92–3. DOI PubMed Google Scholar Full Text