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Poor Agreement between Preoperative Biopsies and Pathological Resection Findings in IBD-Associated Dysplasia

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Abstract

Background: The decision to perform a proctocolectomy in patients with inflammatory bowel disease (IBD)-associateddysplasia is based on the degree of dysplasia on endoscopic biopsies. Unexpected pathological findings at the time of surgery can be troubling to patients. Therefore, we aimed to determine the extent of pathological agreement between endoscopic biopsies and surgical resection specimens in patients undergoing surgery at a tertiary referral center and to identify risk factors for poor agreement.

Methods: Aretrospective review of patients who underwent surgery for IBD-associated dysplasia was performed. Data including demographics, disease history, endoscopic surveillance, and procedure type were collected. Risk factors for poor agreement were assessed using regression analysis.

Results: 81 patients were identified; 60 (74%) male with a mean age of 54 years. Ulcerative colitis was seen in 70 (86%) while 11 (14%) had Crohn's disease. In the colectomy specimens, newly diagnosed adenocarcinoma was identified in 16 (20%) and no dysplasia was seen in 16 (20%). Agreement between preoperative endoscopic biopsies and whole specimen pathology occurred in 33 (41%) patients (r=0.17, p=0.14). Highest agreement was flat low grade dysplasia, while lowest agreement was indefinite dysplasia and polypoid low grade dysplasia. The diagnosis of cancer was more common with a preoperative diagnosis of high grade dysplasia. A repeat endoscopic evaluation at our institution was associated with lower likelihood of the findings of no dysplasia on the final surgical specimen.

Conclusions: Agreement between preoperative biopsies and final pathology remains low, however, newer endoscopic techniques may provide better pathological correlation. This study highlights the necessity of preoperative counseling and joint decision making prior to surgery for dysplasia in IBD.

Keywords: Inflammatory Bowel Disease; Dysplasia; Colorectal Cancer; Endoscopy; Surveillance; Colectomy

Abbreviations

IBD: Inflammatory Bowel Disease; HGD: high grade dysplasia; LGD: low grade dysplasia; UC:Ulcerative Colitis; CD: Crohn's disease; CPT: Current Procedural Terminology; ICD-9:International Classifications of Disease 9th version; ALM: adenoma like mass; DALM: dysplasia associated lesion or mass; PSC: primary sclerosing cholangitis;ANOVA: Analysis of Variance; OR: Odds Ration

Introduction

Inflammatory Bowel Disease (IBD) was first linked to increased risk of colorectal cancer in 1925. Since then, a recognized transition in IBD is the evolution of reparative changes in the setting of inflammation to dysplasia and then carcinoma [1]. The reported risk of detecting invasive carcinoma in patients with a preoperative diagnosis of high grade dysplasia (HGD) is 42 - 58% and is 16 - 27% in patients with pre-operative biopsies showing low grade dysplasia (LGD) [2,3]. In the presence of a dysplastic polypoid lesion, the reported risk has been even more variable, ranging from 19% - 42% [4,5].Therefore, IBD patients are prescribed to strict endoscopic surveillance regimens to screen for dysplasia beginning 8 years after initial diagnosis [5]. Surveillance regimens include 4 quadrant biopsies collected every 10 cm throughout the colon [6,7,8]. Screening and surveillance colonoscopy have been shown to reduce the development of colorectal cancer in IBD [9,10]. Similar to non-IBD-associated colorectal cancer patients, the mortality rates in patients with IBD-associated neoplasia may be reduced by detection and early removal [9,11,12].

The decision to perform a colectomy on IBD patients for dysplastic findings is complex for both the patient and the health care provider. Recommendations for colectomy in IBD-associated dysplasia have been outlined by experts in this field [10]. Currently, the decision is based on endoscopic surveillance biopsies and often there is little opportunity for shared decision making due to a lack of patients' understanding of their disease [13,14,15]. Furthermore,

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histological diagnosis of dysplasia in IBD can also be difficult with significant inter-observer variation among pathologists [16]. The goal of this study is to assess level of agreement between preoperative endoscopic biopsies and postoperative pathological findings and to identify risk factors for poor agreement. We hope to gain a further understanding of the expected pathological outcome following resection for IBD-associated dysplasia at a tertiary referral center, and to use this information in the preoperative counseling with the patients to enhance shared decision making.

Materials and Methods

Patients

We performed a retrospective study of patients with IBD who were referred to a tertiary center for surgical colectomy and underwent resection at Johns Hopkins Hospital from 2003 to 2013. The Johns Hopkins pathology databaseand physician's billing codes were utilized to identify patients. Patients were included if they underwent laparoscopic or open restorative proctocolectomy, total proctocolectomy with end ileostomy, or subtotal colectomy. The following procedure codes were utilized: Current Procedural Terminology (CPT) 44150, 44155, 44157, 44158, 44210, 44211, 44212, and 45113. The following International Classification of Disease codes (ICD-9) for IBD were matched with CPT codes: 555.0–555.9, 556.0-556.6, 556.8, and 556.9. All patients who underwent evaluation or re-evaluation of their pathology at Johns Hopkins Hospital and were found to have IBD-associated dysplasia or a dysplasia associated lesion or mass (DALM) were eligible for inclusion in the study. Patients considered to have an adenoma like mass (ALM) were not included in this study. Patient variables and disease characteristics collected included age, gender, race, disease type, time with IBD, time with dysplasia, personal history of primary sclerosing cholangitis (PSC), and personal or family history of colorectal cancer. This study was approved by the Johns Hopkins institutional review board.

Endoscopic evaluation

Patients who underwent outside endoscopic evaluation which lacked a sufficient number of random biopsies with regards to assessment of the entire colon, were offered repeat surveillance at out institution. Surveillance endoscopy at Johns Hopkins is performed by a group of gastroenterologists specializing in IBD. Guidelines published by the American College of Gastroenterology are followed [17]. For the purpose of dysplasia surveillance, patients who have had a diagnosis of ulcerative colitis (UC) for at least 8 years, colonoscopy is performed with four quadrant biopsies taken every 10 cm. Repeat endoscopic surveillance is performed approximately every 1 to 3 years.

For the appearance of a mass or raised lesion on endoscopy performed at our institution, a biopsy of the mass and surrounding tissue, tattooing, and/or polypectomy was performed at the discretion of the endoscopist. The decision to label these lesions as polypoid was determined by an endoscopist and was dependent upon the ability of the polyp to be removed by polypectomy. All other LGD found on random biopsy or in non-polypoid lesions were labelled flat LGD. Furthermore, chromoendoscopy, narrow band imaging, and high definition endoscopy was performed at the discretion of endoscopist.

Pathologic evaluation

All preoperative biopsies performed elsewhere were re-evaluated at Johns Hopkins Medical Institution by experts in gastrointestinal and IBD pathology.Specimens obtained by referring institutions or at Johns Hopkins were initially read by one pathologist and the diagnosis was then confirmed by showing the case at the daily interdepartmental quality assurance conference. Preoperative biopsies were classified into one of the following 4 categories: indefinite for dysplasia, flat LGD, polypoid LGD, high grade dysplasia (HGD). For the purpose of this analysis, classification was based upon the highest degree of dysplasia found.

All operative specimens were reviewed by pathologists specializing in gastrointestinal and IBD pathology at Johns Hopkins Medical Institutions. Postoperative colectomy diagnoses were categorized into 6 groups: no dysplasia, indefinite for dysplasia, flat LGD, polypoid LGD, high grade dysplasia (HGD), or invasive adenocarcinoma. All operative specimens underwent standardized tissue sampling with sectioning every 10 cm. Additional histological sections were performed for any focal lesions, ulcers, or polyps identified on gross inspection of the entire specimen by pathologist at the time of resection. For the purpose of this study these additional sections were labeled as sections of areas of interest. All sections taken were examined at 5 micron intervals. Colectomy specimens were evaluated to see if the final pathology diagnosis agreed with the preoperative diagnosis.

Statistical methods

Patient characteristics including demographics and medical history were analyzed. Preoperative diagnosis on biopsy specimens were compared with postoperative whole specimen pathology. The percent agreement overall and within each biopsy or specimen category was examined separately. Agreement between preoperative and postoperative diagnoses was assessed using Lin's concordance correlation coefficient to test correlation between the two specimens [18].

Using univariate analysis, we examined whether there was a relationship between preoperative factors and three specific outcomes: 1) no dysplasia, 2) invasive carcinoma on final pathology, and 3) biopsy agreement with final pathology. The variables that we examined were age, gender, diagnosis (UC vs. Crohn's disease (CD)), time with IBD, time with dysplasia, history of PSC, family history of colorectal cancer, family history of IBD, endoscopy, biopsy pathology, polypectomy and numbers of total histological sections and sections of area of interest. Additional multivariate logistic regressions were performed examining the impact of the variables used in univariate analysis on the outcomes of 1) no dysplasia on final pathology and 2) cancer on final pathology. In the no dysplasia on final pathology model, history of PSC was excluded as it was collinear with the outcome.

Comparisons of the number of total histological sections and sections of interest with the disease type, final pathology, type of surgery and level of pathological agreement were performed using descriptive statistics, specifically the Mann-Whitney test and Analysis of Variance (ANOVA). For all analyses, $p<0.05$ was used as the accepted level of statistical significance.

Results

Patient characteristics

A total number of 363 cases meeting the study criteria were

Table 1: Patient characteristics.

Patient Characteristics (*n* = 81)	
Male (%)	60 (74%)
Female (%)	21 (26%)
Mean Age (years)	53.9 (19-81)
Ulcerative Colitis (%)	70 (86%)
Crohn's Disease (%)	11 (14%)
Mean time with IBD (years)	18.7 (1-49)
Mean time with dysplasia (range) (years)	3.8 (1-13)
History of PSC (%)	10 (12%)
Family History of Colorectal Cancer (%)	18 (22%)
Personal History of Cancer (%)	2 (2%)
Preoperative endoscopic evaluation	
Our institution vs. other (%)	51 (63%) vs. 30 (37%)
Used Newer Methods of Endoscopic Techniques	18 (35%)
Polypectomy performed (total)	18 (22%)
Our institution vs. other (%)	13 (72%) vs. 5 (28%)
Procedure type	
Restorative Proctocolectomy (%)	44 (54%)
Proctocolectomy with end ileostomy (%)	30 (37%)
Subtotal Colectomy (%)	7 (9%)
Histological sections	
Overall (mean (range))	39.7 (14-131)
Sections of interest (mean (range))	5.3 (0-24)

performed between the years 2003 and 2013. Of these procedures, a total of 81 (22%) patients underwent resection for IBD-associated dysplasia and were included in this study. The clinical features of these patients are summarized in table 1. The majority of patients was male, had UC, and underwent a total proctocolectomy. Furthermore, 51 (63%) of patients had a repeat endoscopic evaluation at our institution and of these patients, 18 (35%) were evaluated with newer methods of endoscopy

Pathological findings and agreement

A summary of preoperative and postoperative pathological findings is listed in table 2. Preoperatively, 5 patients had epithelial changes indefinite for dysplasia. Flat LGD or polypoid LGD was identified in 44 patients, and HGD was identified in 32 patients. Overall, 16 cancers (20%) were identified and 16 (20%) of the 81 postoperative colectomy specimens were found to be negative for any IBD-associated dysplasia. Among patients preoperatively diagnosed with LGD (flat or polypoid), previously undetected cancers were identified in 3 patients (7%). Of the patients diagnosed with HGD, previously undetected cancers were found in 10 patients (31%).

The overall agreement of preoperative biopsies to colectomy specimens was seen in 33(41%) patients; (r=0.17, p=0.14). Table 2 indicates the exact percent agreement for each type of preoperative dysplasia. The best agreement was with flat LGD 15 (60%) while the worst agreement was seen in polypoid LGD 6 (32%) and indefinite dysplasia 0 (0%).

Predictors for poor agreement

Demographic and clinical characteristics of patients were compared to the level of agreement, risk of cancer, and negative final pathology using univariate analysis (table 3). The primary risk factor for identifying cancer on final pathology was having HGD on preoperative endoscopic surveillance (OR 6.21, 95% CI 1.55-24.95, p=0.01).This finding was confirmed on multivariate analysis as well; (OR 10.94, 95% CI 2.03-59.13, p=0.005). No other factors were identified (table 4). When examining predictors for no dysplasia on final pathology (table 3 and 5), no patients with PSC had findings of no dysplasia and the agreement between preoperative and final pathology was four times more likely, however this did not reach statistical significance (OR 4.04, 95% CI 0.96 – 16.98, p=0.057). Furthermore, patients undergoing repeat endoscopic evaluation at our institution were significantly less likely to have no dysplasia found on the final pathology (OR 0.27, 95% CI 0.09-0.83, p=0.023). The performance of a polypectomy was not associated with an increased risk for cancer or a predictor of no dysplasia on final pathology.

Finally, the number of routine histological sections and number of sections of interest performed during final pathological review were compared to disease type, final whole-specimen pathology, type of surgery, and pathological level of agreement (table 6). The overall mean number of routine histological sections per specimen was 39.7 (14-131). The overall mean number of sections of interest identified per specimen was 5.3 (0-24). There was no difference in the average number of sections of interest performed in patients with UC vs. CD. Furthermore, no difference was found in number of routine histological sections or number of sections of interest when compared to final whole specimen pathology, type of surgery and pathological level of agreement.

Discussion

In this study we report that the agreement between preoperative endoscopic biopsies and postoperative whole specimen pathology is poor and the risk of cancer is elevated with 20% of patients having a new cancer diagnosis. The preoperative endoscopic biopsy pathology that demonstrated the least agreement with final pathology was those patients with indefinite dysplasia and those with polypoid LGD. The finding of poor agreement among patients with polypoid LGD was concerning. Patients referred to a tertiary care center are concerned when their preoperative pathological diagnosis which led them to undergo surgery is not identified on the final resection specimen. In fact, in 20% of our patients, no dysplasia was identified. To explore why our agreement between preoperative polypoid LGD and final pathology was poor, we looked at several factors including whether the patient had a repeat endoscopic evaluation at our institution, whether or not a polypectomy was performed, and the number of histological sections and sections of interest that were performed by our pathologists when analyzing the final surgical specimen. We demonstrated that a repeat endoscopic evaluation at our institution was associated with lower likelihood of the findings of no dysplasia on the final pathological specimen, and this was confirmed on multivariate analysis.

Recent literature suggests that newer methods of endoscopic evaluation may be beneficial in the management of patient with IBD-associated dysplasia. A recent meta-analysis has demonstrated that chromoendoscopy offers higher sensitivity as well as specificity for dysplasia in UC compared with conventional colonoscopy

Table 2: Agreement between preoperative endoscopic pathology and postoperative whole-specimen review.

	Postoperative Pathological Diagnosis						
Preoperative Pathological Diagnosis	No dysplasia	Indefinite	Flat LGD	Polypoid LGD	HGD	Cancer	Total
Indefinite	0	0	1 (20%)	1 (20%)	0	3 (60%)	5 (6%)
Flat LGD	5 (20%)	1 (4%)	15 (60%)	0	2 (8%)	2 (8%)	25 (31%)
Polypoid LGD	4 (21%)	2 (11%)	2 (11%)	6 (32%)	4 (21%)	1 (5%)	19 (23%)
HGD	7 (22%)	0	3 (9%)	0	12 (38%)	10 (31%)	32 (40%)
Total	16 (20%)	3 (4%)	21 (26%)	7 (9%)	18 (22%)	16 (20%)	81

Table 3: Univariate analysis of risk factors for final pathological findings.

Characteristics	No dysplasia		Cancer		Agreement with biopsy	
	OR (95% CI)	***p*-value**	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Age	1.02 (0.98-1.06)	0.419	1.01 (0.97-1.05)	0.778	1.0 (0.97-1.04)	0.838
Gender (female)	2.83 (0.90-8.96)	0.076	0.94 (0.27-3.32)	0.925	0.65 (0.23-1.85)	0.424
IBD Diagnosis (UC/CD)	1.13 (0.22-5.80)	0.888	1.13 (0.22-5.8)	0.888	0.52 (0.15-1.88)	0.322
Time with IBD (years)	0.94 (0.88-1.00)	0.068	1.02 (0.97-1.07)	0.404	1.01 (0.97-1.05)	0.614
Time with dysplasia (months)	0.92 (0.73-1.15)	0.452	0.80 (0.61-1.07)	0.129	1.15 (0.97-1.36)	0.103
History of PSC	--	--	1.91 (0.44-8.40)	0.391	4.04 (0.96-16.98)	0.057
Family history of colorectal cancer	0.77 (0.19-3.06)	0.710	0.77 (0.19-3.6)	0.710	0.33 (0.10-1.13)	0.078
Family history of IBD	0.70 (0.14-3.53)	0.667	0.70 (0.14-3.53)	0.667	0.60 (0.17-2.13)	0.428
Endoscopy at our institution	0.27 (0.09-0.83)	0.023	1.38 (0.43-4.43)	0.593	1.64 (0.64-4.20)	0.300
Biopsy pathology *LGD (polypoid or flat)* *HGD*	Ref 1.09 (0.36-3.31)	-- 0.881	Ref 6.21 (1.55-24.95)	-- 0.01	Ref 0.66 (0.26-1.66)	-- 0.375
Polypectomy	0.77 (0.19-3.06)	0.710	0.19 (0.02-1.53)	0.119	0.91 (0.31-2.56)	0.856
Number of total histological sections	1.00 (0.98-1.03)	0.849	0.98 (0.95-1.02)	0.338	1.00 (0.98-1.03)	0.817
Number of histological sections of interest	0.94 (0.83-1.07)	0.366	1.01 (0.92-1.12)	0.797	0.96 (0.88-1.05)	0.404

Table 4: Multivariate analysis examining factors associated with cancer on final whole-specimen pathology.

Variable	**OR**	**95% CI**	***p*-value**
Age	0.98	0.93-1.03	0.470
Gender (female)	0.86	0.19-3.99	0.847
IBD diagnosis (UC vs. CD)	1.83	0.28-12.04	0.527
History of PSC	4.91	0.61-39.43	0.134
Time with IBD (years)	1.03	0.97-1.11	0.329
Time with dysplasia (months)	0.89	0.68-1.17	0.419
Family history of colorectal cancer	1.12	0.21-6.10	0.895
Family history of IBD	1.25	0.18-8.91	0.823
Endoscopy at our institution	1.48	0.34-6.41	0.601
Biopsy with HGD histology	10.94	2.03-59.13	0.005
Polypectomy	0.12	0.01-1.49	0.098

Table 5: Multivariate analysis examining factors associated with no dysplasia on finalwhole-specimen pathology.

Variable	OR	95% CI	*p*-value
Age	1.01	0.97-1.07	0.576
Gender (female)	3.40	0.81-14.30	0.095
IBD diagnosis (UC vs. CD)	0.90	0.12-6.48	0.913
Time with IBD (years)	0.94	0.87-1.01	0.107
Time with dysplasia (months)	0.88	0.66-1.18	0.405
Family history of colorectal cancer	0.61	0.12-3.12	0.551
Family history of IBD	0.60	0.09-3.80	0.586
Endoscopy at our institution	0.21	0.05-0.87	0.032
Biopsy with HGD histology	0.96	0.25-3.67	0.954
Polypectomy	1.65	0.29-9.36	0.573

Table 6: Differences in histological sections in relation to diagnosis, final whole-specimen pathology, type of surgery and level of pathological agreement.

	Total Histological Sections	*p*-value	Section of interests	*p*-value
Diagnosis				
UC	40.9	0.396	5.4	0.112
CD	32.4		2.7	
Final pathology				
No dysplasia	40.6		3.8	
Indefinite	29.7		6.3	
Flat LGD	42.3	0.420	5.3	0.526
Polypoid LGD	29.9		2.1	
HGD	45.3		6.4	
Cancer	35.4		5.4	
Type of surgery				
Restorative proctocolectomy	39.8	0.146	4.9	0.732
Total proctocolectomy with end ileostomy	35.1		5.0	
Subtotal colectomy	59.1		6.6	
Level of pathological agreement				
Exact agreement	40.3	0.819	4.5	0.407
No agreement	39.2		5.5	

[19]. Further, Subramanian et al [20] found that high-definition colonoscopy improves targeted detection of dysplastic lesions during surveillance colonoscopy of patients with colonic IBD. Although we were unable to evaluate which endoscopic techniques were used for all patients in this study, we did note that newer methods of endoscopic surveillance were performed in 35% of patients undergoing repeat endoscopy at our institution. However; we were not able to show that the use of these techniques was associated with increased detection of HGD or cancer or better final pathological agreement; this is most likely because of the small sample size.

The ability to differentiate between dysplastic IBD-associated polypoid lesions and sporadic adenoma has always been a challenge for both gastroenterologist and pathologists. Recently, Kiran et al [2] examined their experience with the level of agreement among patients undergoing surgery for UC with dysplasia. In this study, patients with polypoid lesions were differentiated based upon whether the lesion was a DALM or an ALM. They found that 70% of patients with ALMs had no dysplasia on final pathology. Patients with UC, as they age, have the same risk for sporadic adenoma as the general population and the differentiation between DALM and sporadic adenoma in difficult [21]. Attempts to differentiate between them are performed based on both the endoscopic and pathological features [22,23]. At our institution, patients considered to have an ALM are treated with continued endoscopic surveillance preferentially. It is plausible that some patients in this study who underwent surgery for presumed DALM, had no dysplasia identified in the final specimen, and therefore, the polypoid dysplasia may have been an ALM.

When examining the number of histological section and sections of interest, we did find variability in the individual number per case and histological diagnosis but this did not reach statistical significance. The current recommendations for gross pathologic assessment include careful inspection of the intestinal mucosa for alterations such as polypoid or flat lesions, tattoos, and strictures. Microscopic evaluation of IBD-associated dysplasia must consistently ensure adequate sampling. To do so, representative sections of tissue are harvested at 10-cm intervals, beginning at the distal end of the specimen and proceeding proximally in step-wise fashion. Sections of any focal lesions such as ulcers or polyps are submitted in addition to these interval sections as sections of interest [24]. A direct comparison of the location of dysplasia identified at the time of endoscopic evaluation and at the time of resection is difficult to perform. Our concern was that endoscopic polyp removal without a tattoo may not be easily recognized on gross inspection and therefore, leads to a decrease in the number of sections of interest than would be expected. However, there was no difference in the number of histological sections of interest examined when a polypectomy was or was not performed. Perhaps this is due to small patient numbers, but nevertheless, as a result of this study, we have implemented routine tattooing of all lesions or polyps identified and/or removed endoscopically at our institution.

This study clearly demonstrates the complex nature of this disease. Patients, especially those with polypoid lesions, should be counseled regarding expected findings on final pathology prior to undergoing colectomy. The appropriateness of continued surveillance with or without newer endoscopic techniques vs. surgery should be discussed with the patient and a joint decision made considering the risk/benefit ratio. Recently, an IBD collaborative highlighted the importance of patient education and support in the management of this disease [25]. Few studies exist regarding what patients with IBD understand of their illness. We feel that unless patients have a complete knowledge of their disease nature; they will be not able to discuss their options (surveillance vs. surgery) with their care provider with full understanding of the possible outcomes. Wardle et al [15] recently summarized their findings using the Crohn's and Colitis Knowledge Score (CCKNOW). In their study, they demonstrated that knowledge deficits in IBD patients lead to increased anxiety whereas improved knowledge was associated with the utilization of more active coping skills. Efforts in education about IBD and risk of cancer are needed to practice shared decision making.

There are several limitations to this study. First, it is a retrospective review of patients who did not have all their endoscopic procedures performed at Johns Hopkins Hospital. Therefore, we were unable to ensure that standard procedures for endoscopic evaluation were performed. Our sample size may also have limited our ability to determine the effect of some of the variables studied on outcomes from the study. We only had 18 patients who underwent a newer endoscopic screening method (chromoendoscopy) so we were unable to evaluate the effect of screening techniques on pathological agreement. Furthermore, although we attempted to limit the study time period to more recent years, because there was a 10 year period of evaluation, there may be some variability in pathological evaluation. We did not send out our pathological specimens for a further read as many have recommended, however, the majority of these cases were already re-reviewed by a panel of experts in GI pathology due to the fact that Johns Hopkins Medical Institution is a tertiary referral center for this disease [26]. In addition, since less debate exists over the necessity of surgery in the setting of HGD, we did not distinguish flat vs. polypoid HGD in this patient population. Finally, there were 7 patients who did not undergo a total proctocolectomy for IBD-associated dysplasia, adding more variability into our study population. However, the performance of subtotal colectomy did not affect the outcomes reported in this study.

Conclusions

Regardless of these limitations, this study emphasizes the need for careful evaluation and counseling in patients with IBD-associated dysplasia. Perhaps newer screening methods such as chromoendoscopy, magnification endoscopy, confocal laser endomicroscopy and the development of newer genetic markers will clarify the decision regarding surgery for IBD-associated dysplasia in the future. Regardless, we have implemented repeat endoscopic evaluation on all patients referred to our tertiary care center for consideration for proctocolectomy. Furthermore, patients undergoing surgery for IBD-associated neoplasia should understand that agreement between preoperative endoscopic biopsies and final pathology remains low and the risk of cancer remains elevated. More effort in patient's education is needed and further studies about the clinical benefits of disease understanding and knowledge are required.

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