

Risk Factors for Delayed Post Polypectomy Bleeding Following Colonoscopic Polypectomy: A Study of 1073 Cases

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Abstract: Background: Bleeding occurs in approximately 1.0–6.1% cases of endoscopic polypectomy. Bleeding can be immediate or delayed. The incidence of delayed post polypectomy bleeding ranges from 0.4% to 1.1%. This study aims at identifying risk factors for delayed post polypectomy bleeding. Methods: A retrospective study was carried out to evaluate the risk factors of delayed Post Polypectomy Bleeding following colonoscopic polypectomy. Patient who had post polypectomy bleeding were assigned to the case group. These patients were age and sex-matched to 57 randomly selected control patients who didn't have post polypectomy bleeding after colonoscopic polypectomy. The baseline characteristics of the case and control groups were similar. No significant differences were identified between the two groups of patients in terms of demographic characteristics, laboratory findings, and comorbidities. Different characteristics of the patients and their polyps (size, location, shape, and histopathological findings) were compared between the case and control group using Chi-square(X^2) test. Odds ratio (OR) was calculated for each risk factor to be evaluated. A p-value <0.05 was considered as significant. Statistical analysis was done with SPSS v22. Result: Among the 1073 patients who underwent colonoscopic polypectomy during the study period, 19 (1.77%) experienced delayed PPB. A polyp size of more than 10mm showed significant association with occurrence of delayed PPB with an OR of 6.7. Sessile polyps were more likely to be associated with delayed PPB with an OR of 4.4. Polyps located at the right colon were more prone to delayed PPB with an OR of 4.7. Obese patients with a BMI of more than 25 were more likely to have delayed PPB with an OR of 6.6. Patients aged more than 65 years, patients having cardiovascular disease & patients having CKD were more likely to have delayed PPB in comparison with those who didn't have these comorbidities. Conclusion: The incidence of delayed PPB was 1.77% in our study, and patients with large polyps (>10 mm), sessile polyps & polyps located in the right hemi colon showed an increased risk of delayed PPB. In addition, patients with higher BMI (>25) also showed a higher risk of delayed PPB. Patients aged more than 65 years, patients having cardiovascular disease & patients having CKD were more likely to have delayed PPB in comparison with those who didn't have these comorbidities. Polypectomies in patients with these risk factors carry high risk of delayed PPB and should always be dealt with extra precaution.

Keywords: Risk Factors, Delayed Post Polypectomy Bleeding (PPB), Colonoscopic Polypectomy

1. Introduction

Colonic polyps are very common. Its incidence rises with age. Most of the colorectal carcinomas arise on the top of colorectal adenomas. The best approach to treat these is

colonoscopic polypectomy. Mortality from colorectal carcinoma can be reduced by colonoscopic polypectomy [1-3]. Bleeding occurs in approximately 1.0–6.1% cases of endoscopic polypectomy [4-6]. Bleeding can be immediate or delayed. The incidence of delayed post polypectomy

bleeding ranges from 0.4% to 1.1%. [6-12]. Delayed PPB can be much more hazardous than immediate PPB, as the volume of blood loss is much more in case of delayed PPB. Moreover initiation of appropriate treatment is often delayed in case of delayed PPB [13].

Polyp size, shape & location are all well-defined risk factors for delayed PPB [4, 10, 11, 14-16]. Watabe et al. in his study showed that larger polyps had 4.5 times higher risk of PPB (95% CI, 2.0–10.3; $P=0.003$), when compared with the smaller ones [15]. Patients with sessile polyps have also been reported to be at increased risk of delayed PPB compared to patients with pedunculated ones. Buddingh et al. in their study concluded that polyps located at the right hemi colon were more likely to bleed following colonoscopic polypectomy [17]. Patient's age & other comorbidities may also be significantly associated with increased risk of delayed Post Polypectomy Bleeding (PPB). Several studies have been conducted to identify these risk factors for delayed post polypectomy bleeding. But no such studies are conducted in our country for evaluating these risk factors for delayed post polypectomy bleeding. This retrospective study aims at identifying risk factors for delayed post polypectomy bleeding.

2. Methods

This retrospective study was done in the department of Gastrointestinal, Hepatobiliary and Pancreatic Diseases (GHPD), Square Hospitals, Dhaka, Bangladesh. We retrospectively reviewed data from patients who underwent colonoscopic polypectomy between July 2017 and June, 2019.

Patients with IBD, non-epithelial neoplasms, or familial adenomatous polyposis were excluded from this study. In addition, patients with a bleeding tendency (e.g., ongoing anticoagulant or antiplatelet therapy, prothrombin time $>30\%$ of the normal range, or a platelet count $<100 \times 10^3/\text{mm}^3$) and those with a history of colon surgery were also excluded. Patients unwilling to give voluntary consent to participate in the study were also excluded. Consecutive type of non-probability sampling technique was applied to enroll the patients. Prior to the commencement of this study, the research protocol was approved by the Ethical Review Committee (ERC) of the institution. A predesigned structured questionnaire was used for recording all the data.

Delayed PPB was defined as lower gastrointestinal bleeding that occurs between 24 hours and 14 days after the procedure. Patient who had post polypectomy bleeding were assigned to the case group. These patients were age and sex-matched to 57 randomly selected control patients who didn't have post polypectomy bleeding after colonoscopic polypectomy. The baseline characteristics of the case and control groups were similar. The male-to-female ratio and mean age did not differ between delayed PPB and control groups. No significant differences were identified between the two groups of patients in terms of demographic

characteristics, laboratory findings, and comorbidities such as hypertension, diabetes, IHD & dyslipidemia (Table 1). Different characteristics of the patients and their polyps (tumor size, tumor location, tumor shape, and histopathological findings) were compared between the case and control group using Chi-square(X^2) test. The primary aim of this study was to evaluate the risk factors of delayed PPB after colonoscopic polypectomy. Polypectomies were performed by using a standard flexible colonoscope (190: Olympus Optical Co., Tokyo, Japan). Snare polypectomy was most frequently used as either en bloc or piecemeal resection. An electrosurgical unit (300D; ERBE, Tübingen, Germany) was set according to the manufacturer's instructions, and mixed current was used at the time of resection. Delayed PPB was treated by transfusion, if needed, and endoscopic interventional procedures such as injection adrenaline, argon plasma coagulation or application of hemoclips to achieve hemostasis.

Statistics

Statistical analyses were carried out by using the Statistical Package for Social Sciences version 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as mean & standard deviation, and categorical variables were expressed as frequencies and percentages. Different characteristics of the patients and their polyps (tumor size, tumor location, tumor shape, and histopathological findings) were compared between the case and control group using Chi-square(X^2) test. Odds ratio (OR) was calculated for each risk factor to be evaluated. A p -value <0.05 was considered as significant.

3. Result

A retrospective study was carried out to evaluate the risk factors of delayed Post Polypectomy Bleeding following colonoscopic polypectomy. Among the 1073 patients who underwent colonoscopic polypectomy during the study period, 19 (1.77%) experienced delayed PPB.

A polyp size of more than 10mm showed significant association with occurrence of delayed PPB (Table 2) with an OR (Odds ratio) of 6.7 (Table 10). Sessile polyps were more likely to be associated with delayed PPB (Table 3) with an OR (Odds ratio) of 4.4 (Table 10). Polyps located at the right hemi-colon were more prone to delayed PPB (Table 4) with an OR (Odds ratio) of 4.7 (Table 10). Obese patients with a BMI of more than 25 were more likely to have delayed PPB (Table 5) with an OR (Odds ratio) of 6.6 (Table 10).

No significant association was found between the histologic variety of polyp & the occurrence of delayed post polypectomy bleeding (Table 6). Patients aged more than 65 years, patients having cardiovascular disease & patients having CKD were more likely to have delayed PPB in comparison with those who didn't have these comorbidities (Tables 7, 8 & 9).

Table 1. Demographic, clinical and biochemical characteristics of the case and control groups.

Variables	Case	Controls	P-value
Age (years)	47.99±15.90	48.34±14.24	0.453
Sex (Male)	11 (57.89)	35 (61.4)	0.628
Comorbidities			
Diabetes mellitus	6 (31.57)	17 (29.82)	0.329
Hypertension	8 (42.1)	25 (43.86)	0.482
IHD	5 (26.31)	16 (28.07)	0.339
Dyslipidemia	7 (36.84)	20 (35.08)	0.618
BMI	27.36±3.4	26.67±5.1	0.439
Blood parameters			
Hb (g/dL)	12.21±1.30	11.55±1.50	0.568
Platelets (10 ⁹ /L)	212.23±34.1	218.47±41.4	0.418
PT (INR)	1.02±0.32	1.03±0.21	0.574

Values are expressed as mean±SD. Values within the bracket are expressed as percentage.

Table 2. Association between polyp size & occurrence of delayed post polypectomy bleeding.

Polyp size	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
>10 mm	13 (68.4)	14 (24.6)	27 (35.5)	<0.001
<10 mm	6 (31.6)	43 (75.4)	49 (64.5)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X²) test was done to measure the level of significance.

Table 3. Association morphology of polyp & occurrence of delayed post polypectomy bleeding.

Morphology of polyp	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
Sessile	14 (73.7)	22 (38.6)	36 (47.4)	<0.005
Pedunculated	5 (27.3)	35 (61.4)	40 (52.6)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X²) test was done to measure the level of significance.

Table 4. Association between polyp location & occurrence of delayed post polypectomy bleeding.

Polyp location	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
Right colon	13 (68.4)	18 (31.6)	31 (40.8)	<0.005
Left colon	6 (31.6)	39 (68.4)	45 (59.2)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X²) test was done to measure the level of significance.

Table 5. Association between BMI & occurrence of delayed post polypectomy bleeding.

BMI	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
BMI>25	14 (73.7)	17 (29.8)	31 (40.8)	<0.001
BMI<25	5 (26.3)	40 (70.2)	45 (59.2)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X²) test was done to measure the level of significance.

Table 6. Association between histology of polyp & occurrence of delayed post polypectomy bleeding.

Histology	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
Adenomatous	10 (52.6)	28 (49.1)	38 (50.0)	0.791
Non-adenomatous	9 (47.4)	29 (50.9)	38 (50.0)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X²) test was done to measure the level of significance.

Table 7. Association between age & occurrence of delayed post polypectomy bleeding.

Age in years	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
>65	13 (68.4)	11 (19.3)	24 (31.6)	<0.001
<65	6 (31.6)	46 (80.7)	52 (68.4)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X^2) test was done to measure the level of significance.

Table 8. Association between cardiovascular disease & occurrence of delayed post polypectomy bleeding.

Cardiovascular disease	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
Present	11 (57.9)	8 (14.0)	19 (25.0)	<0.001
Absent	8 (42.1)	49 (86.0)	57 (75.0)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X^2) test was done to measure the level of significance.

Table 9. Association between CKD & occurrence of delayed post polypectomy bleeding.

CKD	Delayed post polypectomy bleeding		Total	p-value
	Present	Absent		
Present	10 (52.6)	8 (14.0)	18 (23.7)	<0.001
Absent	9 (47.4)	49 (86.0)	58 (76.3)	
Total	19 (100.0)	57 (100.0)	76 (100.0)	

Chi-square(X^2) test was done to measure the level of significance.

Table 10. Different Odds Ratios (OR) of factors influencing occurrence of delayed post polypectomy bleeding.

Factors	OR	p-value
Polyp size>10mm	6.7	<0.001
Sessile polyp	4.4	<0.005
Polyp at Right Colon	4.7	<0.005
BMI>25	6.6	<0.001
Adenomatous polyp	1.1	0.791
Age>65 years	9.1	<0.001
Cardiovascular disease	8.4	<0.001
CKD	6.8	<0.001

4. Discussion

Colonic polyps are very common. The incidence of colonic polyps tends to rise with age. Most of the colorectal carcinomas arise on the top of colorectal adenomas (adenoma-carcinoma hypothesis). The best approach to treat these is colonoscopic polypectomy. Mortality from colorectal carcinoma can be reduced by colonoscopic polypectomy [1-3]. Bleeding occurs in approximately 1.0–6.1% cases of endoscopic polypectomy [4-6]. Post polypectomy bleeding is generally divided into 2 types, namely immediate bleeding after polypectomy and delayed bleeding that can occur up to 14 days after the procedure [4, 8]. Immediate bleeding following colonoscopic polypectomies can be easily detected and controlled at the time of procedure, but delayed post polypectomy bleeding can have serious outcomes, as the diagnosis is often delayed and moreover the volume of blood loss tends to be higher in this cases [18].

We conducted a retrospective study to evaluate the risk factors of delayed post polypectomy bleeding following colonoscopic polypectomy. Among the 1073 patients who

underwent colonoscopic polypectomy during the study period, 19 (1.77%) experienced delayed PPB.

In our study a polyp size of more than 10mm showed significant association with occurrence of delayed PPB (Table 2) with an OR (Odds ratio) of 6.7 (Table 10). Watabe et al. in his study showed that larger polyps had 4.5 times higher risk of PPB (95% CI, 2.0–10.3; $P=0.003$), when compared with the smaller ones [15]. Bae et al. in his study found that 1mm increase in the polyp size was associated with 11.6% increase of risk of delayed PPB [10]. Sawhney et al. in their study concluded that the risk of secondary PPB increased by 9% for every additional millimeter increase in polyp size [7]. The results of these studies are quite similar with our study. As it is true for most of the larger polyps, the greater the size of the polyp, the greater would be the vascular supply and larger will be the arterial caliber. And as a result, the risk of delayed PPB is much more in large polyps.

Some polyps are sessile and some are pedunculated. Sessile polyps tend to bleed more when compared with the pedunculated ones. In our study, sessile polyps were more likely to be associated with delayed PPB (Table 3) with an OR (Odds ratio) of 4.4 (Table 10). Sessile polyps have a broader base and, in some cases, they tend to have a much rich vascular supply, when compared to that of the pedunculated ones. These factors may contribute to the increased risk of delayed PPB in sessile polyps.

Polyp location also affect the outcome following colonoscopic polypectomy. In our study polyps located at the right hemi-colon were more prone to delayed PPB (Table 4) with an OR (Odds ratio) of 4.7 (Table 10). Buddingh et al. in their study concluded that polyps located at the right hemi colon were more likely to bleed following colonoscopic

polypectomy [17]. One suggested hypothesis for increased risk of PPB for polyps located in right hemi-colon is that the thinner wall of the cecum & right hemi-colon increases vascular damage in the deeper submucosal layer and contributes to the increased risk of PPB [14].

In our study obese patients with a BMI of more than 25 were more likely to have delayed PPB (Table 5) with an OR (Odds ratio) of 6.6 (Table 10). Various adaptations and/or alterations of the cardiovascular system occur in obese individuals, which are affected by substances like interleukin-6 and tumor necrosis factor- α , that is excessively accumulated in the adipose tissue [12, 19].

No significant association was found between the histologic variety of polyp & the occurrence of delayed post polypectomy bleeding (Table 6). Patients aged more than 65 years, patients having cardiovascular disease & patients having CKD were more likely to have delayed PPB in comparison with those who didn't have these comorbidities (Tables 7, 8 & 9). We assumed that various alterations in the microvasculature might play a role in increased delayed PPB in aged patients. Moreover, atherosclerotic changes in vessels, history of intake of antiplatelets or anticoagulants might have affected the increased occurrence of delayed PPB in patients having cardiovascular diseases. Uremic platelet dysfunction might have been the reason of increased occurrence of delayed PPB in patients having CKD.

This study had few limitations. This study was a retrospective one & was solely based on existing medical records. Moreover, our sample size was relatively small. During randomization of subjects into case & control groups, selection bias might have affected the validity of the study. A long-term prospective study with a much larger sample size would have made the results much valid.

5. Conclusion

Colonoscopic polypectomy is the mainstay of treatment of colorectal polyps. It significantly reduces mortality from colorectal carcinoma. But this procedure comes with the risk of post polypectomy bleeding. Delayed post polypectomy bleeding is one of the most serious complications of polypectomy. We evaluated several probable risk factors for delayed post polypectomy bleeding that follows colonoscopic polypectomy. Delayed post polypectomy bleeding was observed in 1.77% of cases following colonoscopic polypectomy in our study. Patients with large polyps (>10mm), sessile polyps & polyps located in the right hemi colon were associated with an increased risk of delayed PPB. In addition, patients with higher BMI (>25) also showed a higher risk of delayed PPB. Patients aged more than 65 years, patients having cardiovascular disease & patients having CKD were more likely to have delayed PPB in comparison with those who didn't have these comorbidities. Polypectomies in patients with these risk factors carry high risk of delayed PPB and should always be dealt with extra precaution.

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