

Risk factors and management of colonic perforation after diagnostic colonoscopy

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Background/Aims: With the intensification of colorectal cancer screening programs, colonoscopy plays a central role. Bowel perforation of diagnostic colonoscopy is a rare, but it causes serious complications. So far, the risk factors for perforation are not understood in detail. We aim to describe incidence, risk factors and outcomes of perforation in diagnostic colonoscopy.

Methods: We performed a retrospective analysis of risk factors for perforation in 74,426 diagnostic colonoscopies between 2013 and 2018 in Samsung Medical Center, Seoul, Korea. Logistic regression was used to find risk factors for perforation.

Results: There were total 19 perforations after 74,426 colonoscopies and sigmoidoscopies (incidence 0.025%). Fifteen patients (78.9%) were diagnosed during procedure, whereas four patients (21%) were diagnosed after procedure. Regarding the site of the perforation, the majority (15 out of 19 or 78%) were found at the sigmoid colon and recto-sigmoid junction, followed by the rectum (4 out of 19 or 21%). Most perforations (16 out of 19 or 84%) in relation to the experience of the examiner occurred during the first 1000 colonoscopies. On multivariate analysis, old age (≥ 70), inpatient setting, low BMI and sedation state were significantly associated with increased risk of perforation. Nine (47%) of the patients underwent operative treatment and ten (53%) were managed non-operatively. All delayed diagnosis of perforation required surgical treatment. But all perforations of rectum were successfully treated with endoscopic clipping.

Conclusions: The incidence of perforation from a diagnostic colonoscopy is low. Old age (≥ 70), sedation state, low BMI (< 20), inpatient setting and lack of endoscopists' experience had a high correlation with perforation. Most perforations were treated successfully with endoscopic clipping, if the diagnosis was not delayed.

Univariate analysis and multivariate analysis of risk factors for a perforation from a diagnostic colonoscopy

Variables	Perforation		Univariate analysis			Multivariate analysis		
	No	Yes	Odds ratio	95% CI	P value	Odds ratio	95% CI	P value
	N=74,407 (%)	N=19 (%)						
Age, n(%)								
<70	59,404 (80)	9 (47)	Reference	1.78-	<001	Reference	1.62-	0.003
≥ 70	15,003 (20)	10 (53)	4.39	10.82		4.11	10.44	
Sex, n(%)								
Male	41,778 (56)	6 (32)	Reference	1.05-	0.031			
Female	32,629 (44)	13 (68)	2.77	7.29				
Patient								
Outpatient	65,168 (88)	10 (53)	Reference	2.57-	<001	Reference	1.19-	0.020
Inpatient	9,239 (12)	9 (47)	6.38	15.62		3.08	7.93	
Weight(kg)								
≥ 50	38,100 (88)	12 (63)	Reference	1.63-	0.001			
< 50	5,352 (12)	7 (37)	4.15	10.55				
BMI(kg/m ²)								
≥ 20	32,696 (89)	11 (58)	Reference	2.35-	<001	Reference	1.34-	0.015
< 20	4,062 (11)	8 (42)	5.85	14.56		4.76	16.86	
Sedation								
No	60,078 (81)	4 (21)	Reference	5.21-	<001	Reference	3.67-	<.001
Yes	14,329 (19)	15 (79)	15.72	47.38		11.25	34.42	
Albumin(g/dL)								
≥ 4.0	48,368 (87)	10 (53)	Reference	2.39-	<001			
< 4.0	7,373 (13)	9 (47)	5.90	14.53				
Hb(g/dL)								
≥ 10	53,458(92)	12 (63)	Reference	2.74-	<001			
< 10	4,475 (8)	7 (37)	6.96	17.70				
WBC (μ L)								
$\geq 10,000$	4,338 (7)	2(10)	Reference	0.15-	0.615			
$< 10,000$	53,595(93)	17(90)	0.68	2.97				

Risk factor for surgical treatment after colonoscopic perforation

Variable	Treatment		P value
	Non-operation N=10	Operation N=9	
Sex			
Male	3	3	0.640
Female	7	6	
Patient			
Outpatient	6	4	0.414
Inpatient	4	5	
Mechanism			
Insertion	5	9	0.022
Retroflexion	5	0	
Location			
Rectum	4	0	0.045
Sigmoid	6	9	
Diagnosis			
Immediately	10	5	0.033
Delayed	0	4	
Abdominal surgery history			
Yes	7	5	0.430
No	3	4	
Anticoagulation			
Yes	8	7	0.667
No	2	2	
Age	69 \pm 6.0	72 \pm 3.7	0.358
BMI	21.7 \pm 3.9	20.2 \pm 2.6	0.361
Albumin	4.0 \pm 0.3	3.8 \pm 0.5	0.255
Hemoglobin	11.5 \pm 2.7	11.3 \pm 2.0	0.849
Fever($\geq 38^{\circ}\text{C}$)	2	2	0.906
Tachycardia (HR ≥ 100 BPM)	2	3	0.510
Shock(MBP < 65)	0	1	0.279
Abdominal pain	5	9	0.013
CRP elevation ($> 0.5\text{mg/dL}$)	3	6	0.110
Leukocytosis (WB C $> 10 \times 10^3/\mu\text{L}$)	3	3	0.392