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ORIGINAL ARTICLE

Endocuff-Assisted Colonoscopy Versus Standard Colonoscopy for Detection of Colonic Lesions

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Abstract

Background: ***Colonoscopy is the primary screening modality used to diagnose various colonic lesions that are often overlooked due to the endoscopist's proficiency and the condition of the bowel preparation. However, other aspects related to the form and architecture of the lesions contribute to this. People often overlook small lesions, like diminutive polyps, with potential malignancy rates.***

Aim : ***The objective is to evaluate the effectiveness of endocuff-assisted colonoscopy in enhancing the identification of diverse colonic lesions and boosting cecal intubation rates.***

Methods: ***We carried out a randomized clinical trial, enrolling 100 patients with diverse abdominal symptoms who visited the Al-Azhar University Hospital endoscopic unit from January 2023 to June 2023 for colonoscopy, all requiring a lower gastrointestinal endoscopy. We performed a standard colonoscopy on each patient first, followed by an end cuff-assisted colonoscopy in the same session.***

Results: ***Endoscopes with endo cuff tubes can significantly detect more colonic lesions (p-value <0.001). An endoscope with an end cuff tube detected more diminutive polyps, although the difference was insignificant. There was no statistically significant variance among the two diagnostic modalities regarding cecal intubation.***

Conclusion: ***Endocuff-assisted colonoscopy outperforms standard colonoscopy in detecting colonic polyps, mainly due to its minimal ulceration rate; however, it's essential to balance the risks against the benefits.***

Keywords: Endocuff; colonoscopy; cecal intubation; colonic polyps

1. Introduction

Colorectal cancer (CRC) is a prevalent kind of cancer on a global scale, occupying the third position in terms of its frequency and the second most common cause of cancer-related mortality worldwide. Experts predicted that over 1.9 million newly diagnosed cases of CRC and over 930,000 [1] deaths would occur in 2020. Modifiable risk factors such as obesity, tobacco usage, diabetes, excess consumption of processed meat, excess consumption of alcohol, and lack of physical activity can significantly reduce CRC.[2] Additionally, the identification and elimination of precancerous lesions significantly contribute to the early detection of colon cancer and the reduction of related mortality.[3] We can utilize screening tests to identify pre-malignant lesions and diagnose cancer in its early stages. We can categorize screening tests into two distinct groups: (i) indirect tests, which aim to detect the presence of markers indicating the presence of colorectal neoplasms in the stool, and (ii) techniques that rely on direct observation of neoplasms inside the large bowel.[3]

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The primary methods used for CRC screening on a global scale include stool-based tests, such as the fecal occult blood test (FOBT) and fecal immunochemical test [4], as well as endoscopy, such as flexible sigmoidoscopy (FS) and total colonoscopy (TC). Both opportunistic and organized CRC screening initiatives predominantly utilize these screening approaches. .[5] Research has demonstrated the effectiveness of endoscopic monitoring in preventing CRC. While it is crucial to identify colorectal polyps in their early stages, seeing early neoplasia through endoscopy might pose challenges. We can affix the Endocuff, a novel apparatus, to the distal end of the colonoscope to displace the colonic folds and prevent visual field obstruction during withdrawal phase.[6] This research aimed to determine the value of endocuff-assisted colonoscopy in increasing the detection rate of various colonic lesions and increasing cecal intubation.

2. Patients and methods

We conducted randomized controlled research and enrolled 100 patients for screening or diagnostic colonoscopy at the Sayed Galal Hospital endoscopic unit in the hepatology, gastroenterology, and infectious diseases department from January 2023 to June 2023. We performed a standard colonoscopy on each patient first, followed by an end cuff-assisted colonoscopy in the same session.

The study procedures excluded patients with a history of colonic polyps or CRC, colonic surgery, acute surgical conditions such as severe colitis and toxic megacolon, as well as those who refused to participate.

After signing a written informed consent, the following conditions applied to all cases: Full history: taking stress on: Describe your personal history, including your age, gender, occupation, place of residence, and any significant medical habits such as smoking or alcohol use. The current illness's history includes symptoms such as nausea, vomiting, dysphagia, loss of appetite, heartburn, hematemesis, dyspepsia, eructation, water brushing, diarrhea, bleeding in the rectum, constipation, flatulence, tenesmus, abdominal pain, and weight loss. Past medical history: CRC, diabetes mellitus, hypertension, and other comorbidities. Drug history and surgical history. The general examination includes measures such as BMI and lymph node enlargement.

The local examination should include hepatosplenomegaly, abdominal tenderness, palpable mass, and digital rectal examination (DGR).

A complete blood count (CBC), an erythrocyte sedimentation rate (ESR), liver enzymes and liver function tests (ALT, AST, bilirubin, albumin, and INR), renal function (serum creatinine, urea), and carcinoembryonic antigen (CEA) were all done in the lab.

Endoscopy: A specialized endoscopist performed a standard technique colonoscopy (Fujifilm) without an endocuff, and another specialized endoscopist, who performs over 300 colonoscopies annually, used an endocuff for each patient during the same session. A soft, cylindrical polymer device with flexible projections arranged circumferentially makes up the endocuff. The colonoscope mounts it onto its distal tip without compromising the instrument's view or functionality. During the withdrawal phase, the hinged projections extend radially, flattening the colonic mucosal folds and potentially improving mucosal visualization.

Patients underwent bowel preparation prior to colonoscopy. The procedure involved administering 2 to 3 L of a polyethylene glycol solution the day before.

2.1.Ethical considerations: The scientific committee of the hepato-gastroenterology and infectious diseases department and the ethical committee of the Faculty of Medicine at Al-Azhar University approved the study protocol. All patients signed a written informed consent after receiving information about the study procedures, expected benefits, and potential risks.

We conducted a statistical analysis using SPSS 22nd edition, presenting categorical variables as count and percent and quantitative variables as mean, standard deviation, min, and max. We compared endoscopes with and without end cuff tubes using the McNemar test for categorical data and the Wilcoxon sign rank test for quantitative variables. We considered any p-value less than 0.05 as significant.

3. Results

We enrolled 100 patients who presented with various abdominal symptoms; all were indicated for lower GI endoscopy. They had a mean age of 48.1±11.8 years old, and males and females representation was comparable (52% vs. 48%). Higher proportions resided in urban cities, accounting for 56% of the included patients. The main complaints of the included patients were mainly abdominal pain, followed by bleeding per rectum, constipation, and anemia, accounting for 41%, 26%, 12%, and 11%, respectively. 55% of the included patients reported abdominal tenderness, 10% had hepatomegaly, and none had lymphadenopathy.

Table 1. demographic, clinical and laboratory characteristics of the studied population.

		MEAN± SD	MIN-MAX
AGE IN YEARS	48.1±11.8		19-71
BMI (KG/M2)	25.3±3.3		18-32
		Count	%
SEX	Female	52	52%
	Male	48	48%
RESIDENCE	Rural	44	44%
	Urban	56	56%
SMOKING	Non-smoker	60	60%
	Smoker	40	40%
DM	Diabetic	18	18%
	Not diabetic	82	82%
HTN	HTN	26	26%
	Not hypertensive	74	74%
FAMILY HISTORY	Father, CRC	2	2%
	Mother, CRC	2	2%
	Sister, CRC	1	1%
	Irrelevant	95	95%
MAIN COMPLAIN	Abdominal pain	41	41%
	Anemia	11	11%
	Bleeding/Rectum	26	26%
	Bloody Diarrhea	3	3%
	Chronic diarrhea	7	7%
	Constipation	12	12%
HSM	Hepatomegaly	10	10%
	No organomegaly	90	90%
ABDOMINAL TENDERNESS	No	45	45%
	Yes	55	55%
		Mean± SD	Min-Max
HEMOGLOBIN (GM/DL)		10.9±1.6	7.5-15
PLATELET (10/CC)	285±64		68-590
TLC (10/CC)		7.3±1.9	2.6-18.5
AST (IU)	32±15		8-210
ALT (IU)		29±18	11-173
INR		1.1±0.2	0.7-2.2
ALBUMIN (GM/DL)		3.9±0.9	2.4-5.3
CREATININE (MG/DL)	1.1±0.3		0.6-4.3
UREA (MG/DL)		27±10	13-110
ESR (FIRST HOUR)	20.7±22.2		6-110
CEA (NG/ML)		12.1±28.3	1-215

Both modalities had the same findings regarding proctitis, large colonic mass, internal piles, diverticulosis, and ulceration. The difference was found between the number of patients with colonic polyps, more accurately detected by the endoscope with the endoscope cuff, without any statistically significant difference (p-value 0.502). A comparison of the histopathology results of each endoscopic modality showed a minor difference in the types of polyps detected, as endoscopy with an endocuff tube detected more hyperplastic polyps and tubular adenoma without any statistically significant difference. The comparison of the sites of polyps for each endoscopic modality showed a minor difference in the sites of polyps detected, as the endoscope and end cuff tube were more commonly detecting two sites of polyps without any statistically significant difference. Diminutive polyps were detected more using an endoscope with an end cuff tube without any statistically significant difference. Endoscopes with endocuff tubes can significantly detect more colonic polyps (p value <0.001). The ileal intubation rate was substantially greater among cases who experienced endoscopes without endocuff than those with endocuff (p value <0.001). There was no statistically significant variance amongst the two diagnostic modalities regarding cecal intubation (with a p-value of 0.081), as shown in Table 2.

Table 2. comparison of conventional endoscopy and endocuff assisted endoscopy findings among the studied population.

	ENDOSCOPE WITHOUT ENDOCUFF		ENDOSCOPE WITH ENDOCUFF		
ENDOSCOPIC FINDING					
	Count	%	Count	%	p value
PROCTITIS	1	1%	1	1%	1
LARGE COLONIC MASS	5	5%	5	5%	1
INTERNAL PILES	32	32%	32	32%	1
COLONIC POLYPS	21	21%	25	25%	0.502
DIVERTICULOSIS	6	6%	6	6%	1
COLON ULCERATION	4	4%	4	4%	1
ANGIODYSPLASIA	2	2%	2	2%	1
NORMAL	41	41%	37	37%	0.56
HISTOPATHOLOGY					
HYPERPLASTIC POLYP	11	33.30%	14	35.90%	0.818
TUBULAR ADENOMA	12	36.40%	15	38.50%	0.862
TUBULO-VILLOUS ADENOMA	1	3.00%	1	2.60%	0.918
ULCERATIVE COLITIS	3	9.10%	3	7.70%	0.831
ADENOCARCINOMA	5	15.20%	5	12.80%	0.77
CROHN'S DISEASE	1	3.00%	1	2.60%	0.918
SITE OF POLYP					
ASCENDING	8	33.30%	13	43.30%	0.458
DESCENDING	5	20.80%	5	16.70%	0.702
TRANSVERSE	3	12.50%	4	13.30%	0.931
RECTUM	3	12.50%	3	10.00%	0.773
SIGMOID	5	20.80%	5	16.70%	0.702
	Number of polyps				
POLYPS	24	32.43%	30	37.50%	<0.001
SIZE OF POLYP					
DIMINUTIVE	12	50%	16	53.3%	0.811
LARGE	4	16.70%	4	13.30%	0.729
SMALL	8	33.30%	10	33.30%	1
INTUBATION					
ILEAL INTUBATION RATE	83	83%	75	75%	<0.001
CECAL INTUBATION TIME	14.2± 2.8	9-22	13.9±2.2	9-19	0.081
COMPLICATIONS					
BLEEDING	0	0%	0	0%	NA
PERFORATION	0	0%	0	0%	NA
SURFACE EROSIONS	8	8%	16	16%	<0.001

4. Discussion

We conducted a randomized controlled study to assess the value of endocuff-assisted colonoscopy in increasing the rate of detection of various colonic lesions and its effect on cecal intubation time. We enrolled 100 patients who presented with various abdominal symptoms; all were indicated for lower GI endoscopy. They had a mean age of 48.1±11.8 years old, with equal gender representation. They had a mean BMI of 25.3±3.3 kg/m2, 40% were smokers, 26% were hypertensive, and 18% were diabetic. Only 5% had first-degree family members with CRC.

The main complaints of the included patients were mainly abdominal pain followed by bleeding per rectum, constipation, and anemia, accounting for 41%, 26%, 12%, and 11%, respectively. 55% of the included patients reported abdominal tenderness, 10% had hepatomegaly, and none had lymphadenopathy.

We found that the number of patients with colonic polyps was more accurately detected by the endoscope with the endoscope cuff, without any statistically significant difference (p value 0.502). Endoscopes with endocuff tubes can significantly detect a higher number of colonic polyps (p value <0.001).

Our findings were consistent with those of Wada et al., who reported that Endocuff an endocuff-endoscope detected higher numbea higherdenomas, colonic polyps, higher number a higheryps per patients & highepatient, and af adenomas per patient however onlypatient; ahowever,omas per patients showed statispatientsignificant variance with p value <0.05.[6] Thesa p findings were obtained although their study was conducted on different patients, while our study was conducted on the same patients at the same session.

Rex et al. compared high-definition (HD) forward viewing colonoscopy alone to HD with Endocuff and HD with Endo Rings to the full-spectrum endoscopy (FUSE) system. They found that endocuffal endoscopy revealed a greater polyp detection rate (PDR) compared with standard colonoscopy.[7]

Baek et al. found that endocuff endoscopy was able to detect a higher number of colonic polyps compared to standard endoscopy; additionally, they found that there was a significant increase in the sessile serrated adenoma/polyps detection rate with EAC at 15% compared to 3% in the standard colonoscopy group (P≤0.0001).[8]

Another meta-analysis showed that endocuffal-assisted endoscopy had a greater probability of detecting adenoma compared to those who had conventional colonoscopy. However, there were no variations in cecal intubation rates between the two groups.[9]

Similar findings were reported by Biecker et al. and Floer et al., who found in their randomized control trials that the detection rate was significantly higher with the use of endocuffal assisted colonoscopy.[10]

During the withdrawal of the colonoscope, the endocuff can be utilized to visually examine the oral aspect of the colonic folds. We can attribute the observed rise in polyp detection rate (PDR), adenoma detection rate (ADR), mean number of polyps per patient (MPP), and mean number of adenomas per patient (MAP) to the reduced presence of blind spots resulting from the utilization of this particular technology. Our study further showed that when the range of observation expanded, there was a tendency for the withdrawal time to increase, without any statistically significant variations in outcomes. Regarding cecal insertion, the rates of cecal intubation were comparable in both groups. The endocuff-assisted examination was discontinued at the sigmoid colon in four individuals within the EAC group. Incomplete insertion was attributed to the presence of many diverticula and circumferential malignancies, as described. The aforementioned exams were conducted with a conventional colonoscope subsequent to the removal of the endocuff. The presence of a hood mounted at the tip of the colonoscope necessitates cautious utilization of the instrument in patients who exhibit stenosis of the intestinal tract lumen as a result of diverticula or tumors or in individuals with anal stenosis caused by hemorrhoids.[6]

In the present study, we found that diminutive polyps were detected more frequently using an endoscope with an endocuff tube, without any statistically significant difference. Our findings are consistent with Van Doorn et al., who reported that endocuffal-assisted colononoscopy increases the detection of diminutive and flat adenomas.[11]

Our data showed that Endocuff endoscopy detected more small polyps compared to standard endoscopy without significant difference; similarly, De Palma et al. and van Doorn SC et al. stated that Endocuff endoscopy improved the detection of small adenomas .[11–12]

In the current study, the incidence of bleeding and perforation was 0%, while surface erosions were reported more commonly among patients who underwent endoscopes with endocuffal compared to those who underwent conventional endoscopes (p value <0.001).

The results were consistent with the results stated by Chin et al., which indicated that the endocuff group had a higher rate of complications than the conventional colonoscopy group (5.47% vs. 0.61%, P < 0.001). A superficial mucosal lesion, deemed clinically insignificant, was the

most frequently observed complication. It affected 27 patients (2.3%) in the endocuffal group .[9]

We found that the ileal intubation rate was significantly greater among cases who underwent endoscopes without endocuff compared to those with endocuff (p value <0.001). Our findings were consistent with González-Fernández et al., who found that the ileal intubation rate was significantly higher among patients who underwent standard colonoscopy compared to endocuff-assisted colonoscopy.[13]

These findings were not consistent with many other studies that reported no statistically significant variance in ileal intubation rate and time among study groups .[4] Rex et al. reported that Endocuff does reduce the ease and success rate of terminal ileal intubation.[7]

5. *Conclusion*

We finally concluded that end cuff-assisted colonoscopy is superior to standard colonoscopy in detecting colonic polyps, especially diminutive and small polyps. A higher ulceration rate could occur with endocuff-assisted colonoscopies, but risks should be weighed against benefits.

We recommend standardizing endoscuff-assisted colonoscopy in the screening of high-risk populations for cancer. A learning curve should be estimated to allow the implementation of endoscuff-assisted colonoscopy (EAC) in diagnosing and screening colon polyps.

Disclosure

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