Prognostic Roles and Survival Benefits of Endoscopic Resection Versus Surgical Resection in the Management of Malignant Colon Polyps

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Abstract

Background   Due to few sufficient data regarding the comparison between endoscopic and surgical resection of malignant colorectal polyps regarding outcomes and survival benefits, there are no clear guidelines of management strategies of malignant colorectal polyps.
The aims of the present study were to compare endoscopic resection alone and surgical resection in patients with malignant polyps in the colon (T1N0M0) readings advantages, disadvantages, recurrence risks, survival benefits, and long-term prognosis to detect how management strategy affects outcome.
Patients and methods   we included 350 patients. All included patients were divided into 2 groups; the first group included 100 patients who underwent only endoscopic polypectomy and the second group included 250 patients who underwent endoscopic polypectomy followed by definitive surgical resection after histopathological diagnosis. We followed all patients for about 5 years, ranging from 18 to 55 months.
The primarily evaluated parameters are surgical consequences and patients' morbidity. The secondary evaluated parameters are recurrence risks, recurrence free survival, and overall survival rates.

Keywords
► malignant colon polyps
► surgical resection
► polypectomy
► survival

Results   The age of patients who underwent polypectomy is usually younger than the surgical group, males have more liability to polypectomy in comparison with females. Patients with tumors in the left colon have more liability to polypectomy in comparison with the right colon ($p < 0.0001$). Tumor factors associated with more liability to surgical resection are presence of lymphovascular invasion, high grade, and poor tumor differentiation ($p < 0.0001$).

The management strategy was the most significant predictor of overall and recurrence free survival rates in patients with malignant colon polyps ($p < 0.001$).

Conclusions   We found that survival benefits and lower incidence of recurrence are detected in the surgical resection group more than in the polypectomy group.

Introduction

Colon cancer is still considered the third commonest cancer worldwide, but its fatality has declined. This was explained by many parameters, such as advancement in screening methods, which leads to early detection and removal of adenomatous polyps before progression to cancer.[1,2]

Malignant colorectal polyps which were appearing grossly as benign adenomatous polyp but microscopically contain a malignant focus which invades the muscularis mucosae and submucosa. These polyps correspond to 2 to 5% of all removed polyps.[3]

Management of these polyps is still challenging, with two main scenarios of management: either follow-up after the initial endoscopic resection/polypectomy or performing surgical resection/colectomy. It was hypothesized that complete resection of these polyps until reaching a clear safety margin of $\sim$ 1 to 2 mm away from the excised edge, good or moderate differentiation of the cancer and absence of lymphovascular invasion, favor performing polypectomy alone, while presence of invaded margins, poorly differentiated carcinoma, presence of lymphovascular invasion, deep submucosal invasion or tumor budding favor performing colon resection.[4,5]

Although polypectomy has the risks of low morbidity, particularly in elderly patients who could not afford surgery, in comparison to surgical excision but has the risks of early recurrences due to incomplete removal, repeated costly manipulations, delay in radical management with risks of presence of nodal metastases even in T1 colon cancer that was reported in about 15% of cases.[6]

Due to few sufficient data regarding the comparison between endoscopic and surgical resection regarding outcomes and survival benefits, there are no clear guidelines of management strategies.[7,8] Moreover, the results of performed studies are conflicting.[2,9–11]

The aim of the present study was to compare between endoscopic resection alone and surgical resection in patients with malignant polyps in the colon (T1N0M0) readings advantages, disadvantages, recurrence risks, survival benefits and long-term prognosis to detect how management strategy affects outcome.

Patients and Methods

Inclusion Criteria

The present retrospective multicenter cohort study included all patients more than or equal to 18 years of age, with invasive adenocarcinoma discovered in colon polyps staged as T1N0M0 in the period between January 2015 and December 2020.

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Exclusion Criteria

We excluded patients with incomplete data; patients with a positively invaded resection margin, patients with malignant rectal polyps due to different management options which is not just polypectomy or surgical resection.

After application of the inclusion criteria, we included 350 patients. All included patients were divided into 2 groups; the first group included 100 patients who underwent only endoscopic polypectomy and the second group included 250 patients who underwent endoscopic polypectomy followed by definitive surgical resection after histopathological diagnosis.

We followed all patients for about 5 years, ranging from 18 to 55 months.

Detailed histopathological data were assessed, such as; number of polyps, tumor size, tumor grade, pathological TNM stage, (pTNM), nodal status, AJCC Cancer Stage, presence of lymphovascular and perineural invasion.

Regarding site of the malignant polyps, we divided them in two main categories to facilitate statistical analysis and comparison: right colon if the malignant polyps were found in the cecum, the ascending colon, the hepatic flexure, and the transverse colon, and left colon if the malignant polyps were found in the splenic flexure, the descending, and the sigmoid colon).

Outcome Parameters

Primarily evaluated parameters are surgical consequences, patients' morbidity, hospital readmission within 30 days of
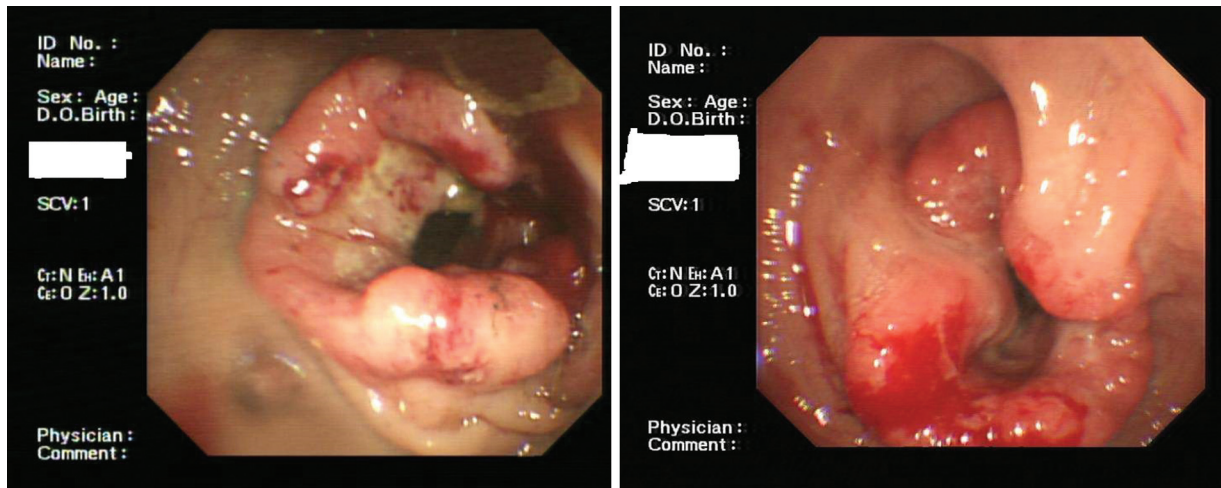
Fig. 1 Endoscopic finding in colon cancer

discharge and 30- to 90-day mortality. Secondary evaluated parameters are recurrence risks, recurrence free survival, and overall survival rates.

Results

A total of 350 patients were included, 100 (28.6%) of them underwent only polypectomy and 250 (71.4%) of them underwent surgical resection (►Figure 1).

►Table 1 demonstrates detailed clinical, demographic, and tumor findings of all patients in association with management status.

The patients who underwent polypectomy are usually younger than the surgical group, males have more liability to polypectomy in comparison with females.

There is a significant difference between groups regarding presence of comorbidity ($p < 0.001$), presence of lymphovascular invasion ($p = 0.029$), recurrence and low survival rates ($p < 0.001$). Both groups did not significantly differ regarding sex, histopathological subtypes, T stage, or grade (►Table 1).

Patients with tumors in the left colon have more liability to polypectomy in comparison with the right colon ($p < 0.0001$). Tumor factors associated with more liability to surgical resection are presence of lymphovascular invasion, high grade, and poor tumor differentiation ($p < 0.0001$).

Regarding survival and follow-up findings; female gender, younger age, low grade tumor and absence of lymphovascular invasion were associated with improved survival. The primary tumor location was not associated with survival benefits.

Patients who underwent surgical resection have longer hospital stay time in comparison with polypectomy, have more liability to hospital readmission within 30 days, and high possibility of 30-day mortality, but there were no significant differences in 90-day mortality between both groups.

There is statistically a nonsignificant relation between overall survival and approach of colon resection, whether laparoscopic or open.

Overall and Recurrence free Survival Findings:

The management strategy was the most significant predictor of overall and recurrence free survival rates in patients with malignant colon polyps ($p < 0.001$) (►Figure 2) (►Tables 2–6).

Absent lymphovascular invasion, conventional adenocarcinoma protect against recurrence after polypectomy, while increasing age, female sex, comorbidity, increase risk by 1.023, 1. 2.59 and 3.07 folds respectively.

T stages and grades higher indefinitely increase the risk of recurrence.

Discussion

In the present study, we showed that in patients diagnosed with malignant polyps in the colon who underwent surgical excision have more favorable RFS and OS rates and a lower incidence of recurrence than patients who underwent only polypectomy. This was similar to Lowe et al.[2]

Moreover, we showed that factors that make performing polypectomy alone is more beneficial to the patients include; complete resection of the polyps until reaching free safety margins of ∼ 1 to 2 mm from the resected edge, low grade tumor (grade I and II), and absence of lymphovascular and perineural invasion, results similar to those of Quirke et al.,[4] and Williams et al.[5]

Lowe et al.,[2] showed that these criteria of performing only polypectomy might be easily applied to pedunculated polyps with a stalk which could be easily resected en bloc, but might be difficult to be applied for sessile malignant polyps.

Absence of a stalk leads to a short access for malignant spread from the polyp surface to the depth of bowel wall thus leads to a higher rate of lympho-vascular invasion and metastases to regional lymph node.

In the present study, we showed that malignant proximal colon polyps are more sessile, less liable to be adequately excised, with inadequate assessment of resection margins, high rates of residual tumor, and high incidence of tumor

Table 1 Comparison between the studied groups regarding baseline data

	Polypectomy	Colon resection	x^2	*p-value*
	n = 100 (%)	*n* = 250 (%)		
Sex:				
Female	34 (34%)	80 (32%)	0.13	0.718
Male	66 (66%)	170 (68%)		
Comorbidity:				
Absent	87 (87%)	250 (100%)	MC	< 0.001**
Present	13 (13%)	0 (0%)		
Histopathological subtype:				
Conventional adenocarcinoma	93 (93%)	220 (88%)	1.889	0.169
Mucoid carcinoma	7 (7%)	30 (12%)		
T stage:				
I	93 (93%)	214 (85.6%)		
II	5 (5%)	32 (12.8%)	2.256	0.133
III	2 (2%)	4 (1.6%)		
N stage (0)	100 (100%)	250 (100%)		
M stage (0)	100 (100%)	250 (100%)		
AJCC stage I	100 (100%)	250 (100%)		
Lymphovascular invasion				
Absent	94 (94%)	214 (85.6%)	4.773	0.029*
Present	6 (6%)	36 (14.4%)		
Grade:				
I	28 (28%)	55 (22%)		
II	62 (62%)	176 (70.4%)	3.574	0.059
III	10 (10%)	19 (7.6%)		
Recurrence:	20 (20%)	22 (8.8%)	8.485	0.004*
Survival:				
Absent	83 (83%)	237 (94.8%)	12.691	<0.001**
Present	17 (17%)	13 (5.2%)		

Abbreviations: AJCC, American joint committee; MC, Mucinous carcinoma.
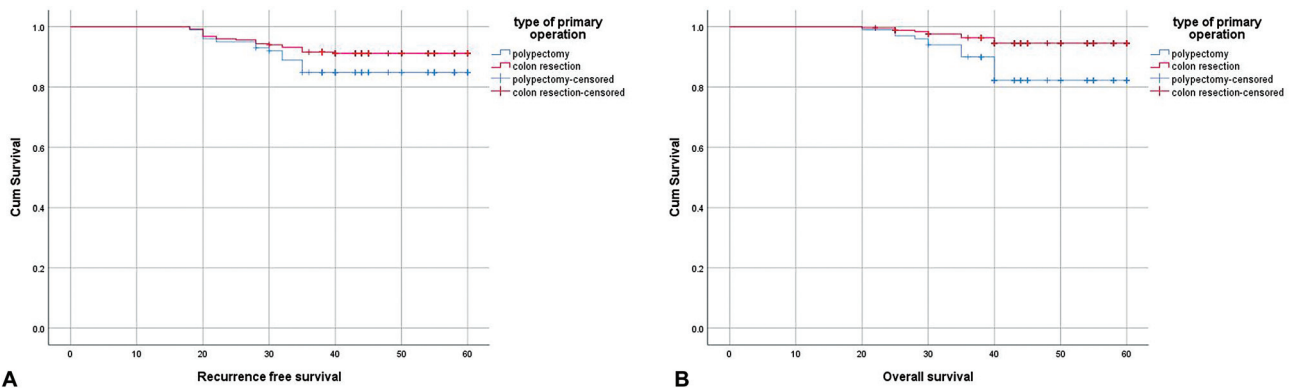
Fig. 2 Kaplan-Meier survival plot showing correlations between recurrence free survival rate (**A**) and overall survival rate (**B**) and type of primary operation

Table 2 Comparison between the studied groups regarding different approaches of colon resection

	Laparoscopic	Open	χ^2	*p-value*
	n = 159 (%)	*n* = 91(%)		
Sex:				
Female	61 (38.4%)	19 (20.9%)	8.132	0.004*
Male	98 (61.6%)	72 (79.1%)		
Comorbidity:				
Absent	87 (87%)	250 (100%)	Fisher	< 0.001**
Present	13 (13%)	0 (0%)		
Histopathological subtype:				
Conventional adenocarcinoma	142 (89.3%)	78 (85.7%)	0.708	0.4
Mucoid carcinoma	17 (10.7%)	13 (14.3%)		
T stage:				
I	139 (87.4%)	75 (82.4%)		
II	19 (11.9%)	13 (14.3%)	2.039	0.153
III	1 (0.6%)	3 (3.3%)		
Lymphovascular invasion				
Absent	139 (87.4%)	75 (82.4%)	1.176	0.278
Present	20 (10.7%)	16 (17.6%)		
Grade:				
I	36 (22.6%)	19 (20.9%)		
II	114 (71.7%)	62 (68.1%)	3.574	0.059
III	9 (5.7%)	10 (11%)		
Resection site:				
Cecum	32 (20.1%)	21 (23.1%)		
Ascending colon	33 (20.8%)	16 (17.6%)		
Transverse colon	9 (5.7%)	8 (8.8%)	1.908	0.753
Descending colon	60 (37.7%)	35 (38.5%)		
Sigmoid colon	25 (15.7%)	11 (12.1%)		
Recurrence:	11 (6.9%)	11 (12.1%)	1.927	0.165
Survival:				
Absent	150 (94.3%)	87 (95.6%)	Fisher	0.774
Present	9 (5.7%)	4 (4.4%)		

χ^2 chi squared test *$p < 0.05$ is statistically significant **$p \leq 0.001$ is statistically highly significant

Table 3 Correlation between OS rate and approach of colon resection

	Total	Events	Censored	Estimate ± SE	95%CI	*p-value*
Approach						
Laparoscopic	159	9	150 (94.3%)	58.32 ± 0.56	58.23–59.41	0.679
Open	91	4	87 (95.6%)	58.87 ± 0.56	57.78–59.97	
Total	250	13	237 (94.8%)	58.62 ± 0.41	57.72–59.32	

Abbreviation: CI, confidence interval.
p for Mantel Cox test *$p < 0.05$ is statistically significant

Table 4 Correlation between OS rate and type of primary operation

	Total	Events	Censored	Estimate ± SE	95%CI	*p-value*
Approach						
Polypectomy	100	17	83(83%)	55.41 ± 1.04	53.38–57.45	< 0.001**
Resection	250	13	237(94.8%)	58.52 ± 0.41	57.72–59.32	
Total	350	30	320(91.4%)	57.62 ± 0.42	56.79–58.45	

Abbreviation: CI, confidence interval.
p for Mantel Cox test *$p < 0.05$ is statistically significant

Table 5 Correlation between recurrence free survival and approach of colon resection

	Total	Events	Censored	Estimate ± SE	95%CI	*p-value*
Approach						
Laparoscopic	159	11	148 (93.1%)	57.7 ± 0.68	56.36–59.04	0.163
Open	91	11	80 (87.9%)	55.88 ± 1.18	53.55–58.2	
Total	250	22	228 (91.2%)	57.04 ± 0.61	57.72–58.25	

Abbreviation: CI, confidence interval
p for Mantel Cox test *$p < 0.05$ is statistically significant

Table 6 Correlation between OS rate and type of primary operation

	Total	Events	Censored	Estimate ± SE	95%CI	*p-value*
Approach						
Polypectomy	100	15	85 (85%)	55.18 ± 1.17	52.88–57.47	0.088
Resection	250	22	228 (91.2%)	57.04 ± 0.61	55.84–58.25	
Total	350	37	313 (89.4%)	56.51 ± 0.55	55.43–57.6	

Abbreviation: CI, confidence interval
p for Mantel Cox test *$p < 0.05$ is statistically significant

recurrence and unfavorable survival rates. These results are similar to.[5,12,13]

Most of the polyps which are located in the left colon are diagnosed in old age patients, similar to what has been observed by Belderbos et al.,[7], Cooper et al.,[8] and Wasif et al.[14]

We performed surgical resection of polyps located in right colon than in left colon and this was similar to results of Lowe et al.[2]

Our results were nearly similar to those of Cooper et al.,[8] who compared survival rates of patients with malignant colon polyps who underwent endoscopic resection and patients who underwent surgical excision and they found more favorable survival rates in the surgical excision group than in the polypectomy group.

Similar to our findings, Lowe et al.[2] showed that a larger number of patients underwent surgical excision in comparison with only polypectomy.

Previous data[15] and Wasif et al.[14] showed increasing rates of surgical resection more than polypectomy alone.

Regarding patient demographic findings and histopathological tumor data, we showed similar results to previous studies.[2,8]

Lowe et al.[2] and Nfonsam et al.[16] included patients with a wide age distribution and 44% of their patients were < 65 years old, which was similar to our included patients that allow more accurate correlations. This adds an important aspect to our study especially given the rising incidence of colon cancer in those < 50 years old.

Moreover, we adequately assessed the presence of lymphovascular invasion and we demonstrated its association with a high incidence of lymph node metastasis and malignant recurrence in the polyp which necessitated surgical resection later on in addition to unfavorable survival in both groups of patients. Similar findings were stated by previous studies.[2,4,5]

We demonstrated a survival advantage for the group that underwent surgical resection more than for the group that underwent polypectomy, which was similar to results of previous studies in which the survival rates of their patients were better in the group that had surgical resection.[2,7–10]

Our cohort of patients was younger and most of them were without significant comorbidity, thus has more liability to afford surgery more than old populations. A large percentage of our patients has their polyps located in right sided colon and has ales liability to be adequately excised by polypectomy alone. Our findings were similar to results of.[8,13,14]

Field effect or cancerization, which is defined as the liability of normally appearing mucosa which surrounds

the malignancy to transform to metachronous cancer, was detected in colon cancer.[17] So, surgical resection of the colonic segment will lead to reduction of risks of occurrence of such malignancy, thus improving survival.

Although patients who underwent surgical resection had a longer duration of postoperative hospital stay, had more liability to readmission within 30 post-operative days with increased risks of 30-day mortality, but, improving surgical techniques and using minimally invasive laparoscopic assisted approaches leads to less post-operative morbidity, rabid recovery of bowel functions and short duration of post-operative hospital stay.[18] All these findings and data are in favor of surgical resection more than polypectomy.

Points of Strength of the Study

Our study is a prospective large cohort and multicenter study which allows the inclusion of a large number of patients with better comparison between both techniques with a high chance of reaching accurate results.

Limitations and Points of Weakness

We have no data about family history of colon cancer or past history of colon polyps to correlate surgical techniques and recurrence with genetic basis.

Conclusion

In our study, we included a large number of patients with malignant colon polyps (T1N0M0). When we compared between both surgical resection of the colon and polypectomy alone we found that survival benefits and lower incidence of recurrence are detected in the surgical resection group more than in the polypectomy group even after adjusting all pathological, clinical, and demographic findings. Although recent studies demonstrated that malignant polyps with good histopathological prognostic findings and free resected margins can be safely managed by only polypectomy, our data stated that polypectomy has no survival or recurrence advantages over surgical resection, so it will be of no benefit.

Recommendations

We recommend performing large studies including many patients with malignant colon polyps who underwent both surgical techniques considering the collection of genetic data and family history of colon cancer for better stratification of patients.

Conflict of Interests
The authors have no conflict of interests to declare.

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