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Assessing The Effectiveness, Complications, And Recurrence of Flat Colonic Polyps After Endoscopic Mucosal Resection (EMR)

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Abstract
Background: Endoscopic mucosal resection (EMR) is a significant advancement in treating early cancers of the upper and lower gastrointestinal tract.
Objective: To evaluate the Effectiveness, complication, and recurrence of flat colonic polyps following endoscopic mucosal resection (EMR).
Methods: A prospective trial was conducted in Lady Reading and Khyber Teaching Hospitals of Peshawar, Pakistan from Jan 2021 to Jan 2023.
Results: A total of 243 polyps were resected in 211 patients. 23 patients had more than one polyp. The mean age was 45±13 years. En-bloc resection was possible in 240 patients (98.8%). Bleeding immediately after resection was seen among 6 patients (2.84%) while delayed bleeding after 24 hours after the procedure occurred in 8 patients (3.8%). Perforation occurred in one patient. The recurrence rate was 9 % (18/205) during a follow-up of 12 months.
Conclusion: Endoscopic Mucosal Resection is an effective and safe outpatient procedure for sessile or flat colonic polyps.

Keywords: Endoscopic Mucosal Resection, Sessile Polyps, Saline-assisted polypectomy

Introduction

Endoscopic mucosal resection (EMR) is a globally standardized procedure for treating gastrointestinal neoplasms that only affect the mucosa (1). Endoscopic mucosal resection (EMR) is an endoscopic method used to remove sessile or flat neoplasms from the mucosa of the gastrointestinal (GI) tract. EMR can be characterized in several ways. Endoscopic techniques, such as injection-assisted EMR, cap-assisted EMR, ligation-assisted EMR, and underwater EMR, are popular classification methods (2). The most commonly utilized technique is injection-assisted EMR, which involves injecting a lifting solution into the submucosal area to allow for safe and full removal of the lesion while minimizing injury to deeper layers. The solution for submucosal lift and the method for lesion removal may differ, as will be detailed (3). These lesions are difficult to remove using traditional snare polypectomy. EMR is frequently used for neoplasms smaller than 2 cm; bigger neoplasms can be excised separately. EMR is a reasonable alternative to surgery since it eliminates the need for surgical intervention, reducing the morbidity and mortality associated with surgery. The technique was first documented in 1955. The procedure involves injecting a fluid under the lesion to raise it by promoting excision of the neoplasms and protecting against electrocautery-induced or mechanical harm to deeper layers of the GI tract wall (4). The colon is the most common site for EMR; indeed, over the last decade, EMR has become a standard procedure for removing big colorectal polyps (5,6,7). EMR provides for efficient and thorough polyp removal, minimizing colorectal cancer-related death and avoiding surgical risks and downsides. Indeed, surgical resection, which was formerly the usual treatment for large polyps, is associated with severe morbidity and mortality whereas EMR is both safe and effective, with high R0 (complete) resection rates (8). ESD is also highly effective for achieving R0 resection in big lesions, particularly those in the left colon and rectum (9). EMR is typically used to remove sessile or flat polyps under 2 cm or to remove bigger tumors in stages—a significant advantage. EMR delivers a resected specimen for histopathologic evaluation. EMR has become a routine procedure for lesions with low- or high-grade dysplasia (LGD), as well as early neoplastic lesions, because of its advantages and lower morbidity and mortality compared to traditional surgical methods. The absence of lymph node metastases in these tumors enables a cure by EMR alone (10). Literature has shown that still there is a dire need among the masses to develop improvements in endoscopic skills, awareness, and imaging techniques so that more frequent diagnosis of flat and sessile lesions can be done easily. The objective of this research was to prospectively evaluate the efficacy, comorbidities, and recurrence rates following EMR of flat colonic polyps.

Material and methods

A prospective trial was conducted in Lady Reading and Khyber Teaching Hospitals of Peshawar, Pakistan from Jan 2021 to Jan 2023. 211 patients were recruited by using open epi belonging to the age group 40-50 out of which 72% were male and

28% were female suffering from sessile polyps less than 2 cm having no evidence of definite malignancy on initial biopsy. A sessile polyp was defined according to the Paris classification of superficial neoplastic lesions as Protruded lesion without a stalk (11).
Demographic details of patients along with their endoscopic characteristics of polyps such as number, size, and diameter were collected. Polyp diameter was estimated by comparing it to the open biopsy forceps. Hence those patients who had definite evidence of malignancy, pedunculated polyps along non-lifting signs of polyps were excluded from the study. EMR was performed after obtaining informed consent under conscious sedation. A single experienced endoscopist performed all procedures.

A high-definition colonoscope equipped with a CV180 Exera processor (Olympus Japan) was utilized for colonoscopies. After proper positioning, a pre-mixed solution was injected into the submucosa around the lesion to lift it. This solution was prepared by mixing 1 ml of epinephrine (1:10,000) and 3 ml of indigo carmine with 100 ml of 0.9% normal saline. An open polypectomy snare was applied around the lifted neoplasm and gently tightened against the mucosa. The snare was then closed around the lesion while using the endocut mode at a fixed power of 120 watts to excise the lesion. A high-definition colonoscope with a CV180 Exera processor (Olympus Japan) was used for performing colonoscopies.
The base of the resected area was examined for any remaining tissue, which was removed using the same method if found. After resection, all visible tissue was eliminated with adjuvant argon plasma coagulation (APC). Metal clips were used to close the mucosal defect. The resected specimen was retrieved using a snare, Roth net, suction, or forceps. Qualified pathologists reviewed the specimens, identifying them as adenoma (tubular, villous, or tubulovillous), serrated, non-adenoma (e.g., hyperplastic polyps, lipoma), or carcinoma-in-situ (CIS). Patients were monitored for complications such as perforation and bleeding, which were managed with APC or hemostatic clips. Fresh rectal bleeding occurring 24 hours after the procedure was classified as delayed bleeding, and patients were instructed to report any rectal bleeding or persistent abdominal pain. Surveillance colonoscopies were conducted at 3, 6, and 12 months. Biopsies were taken from the previously resected area, and recurrence was defined as the presence of polypoid or adenomatous tissue. If feasible, recurrence was treated with repeat EMR or APC. Continuous variables were presented as mean ± standard deviation, while categorical variables were shown as frequencies (%). Statistical analyses were conducted using SPSS software version 23.0.

Results

In total, 243 polyps were resected from 211 patients, with 23 patients having more than one polyp. The mean patient age was 45±13 years, with over 70% being male. The left colon was the most common site, containing more than 50% of the polyps. The mean polyp size was 13±6.7 mm, ranging from 6-20 mm. Among the 240 retrieved polyps, tubular adenoma was the most frequent type (50%), followed by hyperplastic polyps (25%), as detailed in Table 1.

Table 1-Demographic Details and Characteristics of Polyp

Variables	**n=211**
Age (years)	45 ±13
Gender **Male** **Female**	 150 (71.09) 61(28.9)
Site of Polyp **Rectum** **Sigmoid** **Descending**	 60 (24.69) 39 (16.04) 31 (12.76)
The total number of polyp	243
Size of Poly p	13+-6.7
Range	6-20mm
Histology of Polyp **Tubular** **Hyperplastic** **Villous** **Tubulovillous** **Serrated**	n=240 120 (50) 60 (25) 15 (6.25) 20 (8.33) 25 (10.42)

En-bloc resection was achieved in 240 patients (98.8%), with only 3 patients requiring piecemeal resection. Immediate post-resection bleeding occurred in 6 patients (2.84%), while delayed bleeding beyond 24 hours post-procedure was observed in 8 patients (3.8%). There was one case of perforation. At 3 months, 205 patients returned for surveillance colonoscopy, with 4 patients lost to follow-up and 2 refusing the procedure. Recurrence of polypoid/adenomatous tissue was observed in 10 patients (4.8%). At 6 months, an additional 25 patients were lost to follow-up, and 180 patients underwent colonoscopy, with 5 patients (2.78%) showing recurrent disease. By 12 months, 140 patients remained under surveillance, with a recurrence rate of 2.14%, as shown in Table 2.

Table 2- Outcome measures of Endoscopic Mucosal Resection (EMR)

EMR Technique	
En-bloc	240 (98.8)
Piecemeal	3 (1.2)
Consequences of EMR	
Bleeding	
Immediate	6 (2.84)
Delayed	8 (3.8)
Perforation	1 (0.5)
Recurrence	
3 months	10 (4.8)
6 months	5 (2.78)
12 months	3 (2.14)

Discussion

Colonoscopy is widely recognized as a crucial tool in managing early neoplasms of the large intestine (12). Currently, colonoscopic polypectomy is the preferred treatment for most colonic polyps (13). However, traditional colonoscopic resection techniques, such as snare polypectomy or hot biopsy, are challenging when dealing with flat and sessile colonic polyps and carry a significant risk of perforation (14). These challenges can be mitigated by using Endoscopic Mucosal Resection (EMR), where submucosal injection elevates the lesion, allowing for safer and more complete resection in most cases. If the lesion does not elevate after submucosal injection (indicating a "non-lifting sign"), it suggests that the lesion has invaded the deeper layers of the intestinal wall, and patients with such lesions are typically referred for surgical management due to the increased risk of perforation with EMR (15).

Numerous studies have explored the safety and efficacy of EMR in managing colonic tumors (16,17,18). En-bloc resection is preferred because it provides precise histological evaluation and reduces the risk of local recurrence. Complete endoscopic resection is defined by the presence of normal colorectal mucosa at the margins of the excised tumor and the absence of neoplastic cells (19). The current study's results indicate that EMR, when performed by an experienced practitioner, is both safe and effective and should be considered the treatment of choice for flat and sessile polyps of the colon and rectum. In the study, En bloc resection was attempted in 98.8% of polyps. Comparatively, Alan Moss et al. and G. Laongcraft-Wheaten reported En bloc resection rates of 89.2% and 92%, respectively (14,15).

Commonly reported complications of EMR include bleeding (reported in 1-45% of cases), perforation (0.7-4%), and post-polypectomy syndrome (0-7.6%). To reduce these risks, various solutions are injected into the submucosa before lesion removal, creating a cushion between the lesion and the muscular layer of the intestinal wall (20). These submucosal solutions include normal saline, with or without epinephrine, glycerol, 50% dextrose, and sodium hyaluronate, with normal saline being the most commonly used (21,22). In the study, the use of normal saline with epinephrine (1:10,000) and indigo carmine proved to be both safe and effective, resulting in a low rate of post-polypectomy bleeding. Immediate bleeding occurred in 2.8% of patients (n=6), and delayed bleeding occurred in 3.8% (n=8); all cases of bleeding were managed endoscopically. We observed one case of perforation (0.5%), which required surgical intervention. Similarly, the study conducted by Laongcraft-Wheaten reported immediate bleeding in 2% and delayed bleeding in 4% of patients (14).

Endoscopic follow-up is essential due to the high risk of recurrence (23). Recurrence rates after EMR of large colonic polyps vary widely across studies, ranging from 0% to 46%, depending on the size of polyps included and the duration of follow-up. In the study, the recurrence rate was 9% (18/205) during a mean follow-up of 12 months. Alan Moss et al. and G. Laongcraft-Wheaten reported recurrence rates of 17% and 20%, respectively (14,15). The primary limitation of the study was that it was a single-center study with relatively small polyps. Therefore, further research involving a larger number of patients with larger polyps is necessary to enhance our understanding of EMR's effectiveness and safety.

Conclusion

Mucosal Resection (EMR) is a safe and effective minimally invasive technique for the treatment of flat or sessile colonic polyps. It allows surgery to be avoided in approximately 84% of patients, leading to significant clinical and financial benefits.

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