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Immediate Results of Colonic Flat Epithelial Neoplasms Removal Using Diathermic Snare Endoscopic Mucosal Resection and Mucosectomy Combined with Dissection in the Submucosal Layer: Comparative Assessment

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Aim: to compare the immediate outcomes of removing colonic flat epithelial neoplasms by using diathermic snare endoscopic mucosal resection (EMR) and mucosectomy with endoscopic submucosal dissection (ESD).
Materials and methods. Ninety-six endoscopic procedures were conducted on the colon of 93 patients with flat epithelial neoplasms. The mean age of patients was 64.9 ± 10.7 years, with an age range of 39 to 88 years. The size range of epithelial neoplasms was 20 to 70 mm, with a median of 37.4 ± 14.8 mm. Only patients with benign epithelial neoplasms were included in the study since patients with suspected malignancy in laterally spreading tumors are indicated for ESD intervention to avoid fragmentary excision and risk of colorectal cancer progression due to possible positive resection margins. The patients were separated into two equally sized groups and treated with EMR and ESD methods.
Results. Epithelial neoplasms in the ESD group had an average size of 41.6 ± 15 mm while those in the EMR group had an average size of 33.1 ± 13.5 mm. The ESD group had an average intervention time of 143.6 ± 102.9 min, whereas the EMR group had an average intervention time of 52.6 ± 34.4 min. Both groups (96 adenomas) had a total of 10 (10.4 %) patients who experienced colonic perforations during the intervention, with 4 (4.1 %) cases observed in the EMR group and 6 (6.2 %) in the ESD group. No statistically significant differences were identified in the occurrence of perforations during the operation ($p = 0.7401$). ESD resulted in an en bloc removal rate of 44/48 (91.6 %), whereas EMR only achieved a rate of 14/48 (29.1 %).
Conclusion. Endoscopic mucosectomy with submucosal dissection (ESD), in contrast to endoscopic mucosal resection (EMR) with diathermic snare, provides a higher frequency of tumor removal en bloc, regardless of tumor size, but is characterized by a longer duration of intervention ($p < 0.0001$). In the ESD group, there were twice as many intraoperative bleedings ($p = 0.0061$) due to the longer duration and technical complexity of the procedure. There were no statistically significant differences in the incidence of late complications between the groups ($p = 0.9999$). Local recurrence of adenoma developed in two patients (4.1 %) after pEMR, statistically significant differences were noted ($p < 0.0006$).
Keywords: colon, colonoscopy, flat epithelial neoplasms, mucosal resection, dissection in the submucosal layer
Conflict of interest: the authors declare that there is no conflict of interest.

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Непосредственные результаты удаления плоских эпителиальных новообразований толстой кишки методами эндоскопической петлевой электрорезекции слизистой оболочки и мукозэктомии с диссекцией в подслизистом слое: сравнительная оценка

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Цель исследования: провести сравнительную оценку непосредственных результатов удаления плоских эпителиальных новообразований толстой кишки методами эндоскопической петлевой электрорезекции слизистой оболочки (EMR) и мукозэктомии с диссекцией в подслизистом слое (ESD).
Материалы и методы. Проведено 96 эндоскопических операций на толстой кишке у 93 пациентов с плоскими эпителиальными новообразованиями. Пациенты были в возрасте от 39 до 88 лет, средний возраст — 64,9 ± 10,7 года. Размер эпителиальных новообразований варьировал от 20 до 70 мм, медиана — 37,4 ± 14,8 мм. В исследование были включены только пациенты с доброкачественными эпителиальными новообразованиями, поскольку пациентам с подозрением на злокачественное новообразование в толстой кишке показано вмешательство в виде ESD для исключения фрагментарного удаления и риска прогрессирования колоректального рака из-за возможных положительных краев резекции. Пациенты были распределены на две равные группы, в одной из которых выполнялось лечение методом EMR, в другой — ESD.
Результаты. Средний размер эпителиальных новообразований в группе ESD составил 41,6 ± 15 мм, в группе EMR — 33,1 ± 13,5 мм. Среднее время вмешательства при ESD — 143,6 ± 102,9 мин., при EMR — 52,6 ± 34,4 мин. В ходе вмешательства у 10 (10,4 %) пациентов в обеих группах (96 аденом) возникли перфорации толстой кишки; в группе EMR в 4 (4,1 %), в группе ESD — в 6 (6,2 %) случаях. Статистически значимых различий в развитии интраоперационных перфораций между методами не выявлено (p = 0,7401). Частота удаления единым блоком для ESD составила 44 из 48 операций (91,6 %), для EMR — 14 из 48 (29,1 %).
Выводы. Эндоскопическая мукозэктомия с диссекцией в подслизистом слое (ESD), в отличие от петлевой электрорезекции слизистой оболочки (EMR), обеспечивает более высокую частоту удаления новообразований единым блоком вне зависимости от их размера, однако характеризуется большей продолжительностью вмешательства (p < 0,0001). В группе ESD вдвое чаще отмечались интраоперационные кровотечения (p = 0,0061), развившиеся по причине технической сложности операции и обусловившие увеличение времени операции. Статистически значимых различий по частоте отсроченных осложнений между группами выявлено не было (p = 0,9999). Местный рецидив аденомы развился у двух пациентов (4,1 %) после pEMR, отмечены статистически значимые различия (p < 0,0006).
Ключевые слова: толстая кишка, колоноскопия, плоские эпителиальные новообразования, резекция слизистой оболочки, мукозэктомия с диссекцией в подслизистом слое
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Advances in modern intraluminal endoscopy have made it possible to ensure not only earlier detection of superficial epithelial neoplasms, but also their safe and effective treatment [1, 2]. Worldwide, the development of intraluminal endoscopic techniques has led to a decreasing role of surgery in the treatment of epithelial neoplasms of the esophagus, stomach and colon, with improved outcomes due to the low number of complications.

The first and most actively used method in modern intraluminal endoscopy is endoscopic (snare) resection of the mucous membrane (endoscopic mucosal resection, EMR). The second relatively recently introduced into the clinical practice of some hospitals method is endoscopic mucosectomy with dissection in the submucosal layer (endoscopic submucosal dissection, ESD). However, there is no clear consensus among specialists on the applications of one or another method. As before, the choice of removal method remains at the discretion of the operating surgeon and depends on personal preference or technical availability.

EMR was developed in 1984 by M. Tada et al. as a new method for the removal of gastrointestinal tumors. Its principle is to cut off a portion of the mucosa containing an epithelial neoplasm with a diathermic snare; it is first necessary to lift the mucosa above the muscular wall by injecting fluid into the submucosal layer [3]. A potential constraint of this approach is the limited size of the snare employed (typical diameter being 20–35 mm), as well as the inability to control the condition of the tissue both at the edges of the tumor and in its depth. In this regard, a large tumor cannot be removed en bloc, which is extremely important for a thorough and high-quality histological examination and prediction of subsequent treatment prognosis.

The method proposed by Japanese doctors N. Kakushima and M. Fujishiro in 2008 [4] to remove epithelial tumors by mucosectomy with dissection in the submucosal layer is devoid of the described disadvantages, since it allows control of both horizontal and vertical resection margins, moreover the size of the neoplasm is not crucial.

Currently, endoscopic removal is considered a widely accepted approach to the treatment of benign and early malignant tumors of the colon [5]. However, understanding the morphological structure of the tumor is crucial for selecting

the appropriate endoscopic intervention method. Domestic guidelines describe preliminary morphological verification of neoplasms, performed by forceps biopsy, whereas European and Japanese recommendations [6, 7] are advocating for the so-called "optical biopsy" — which involves a comprehensive visual assessment of the surface. In this area, further substantiation of the most reliable and accurate method for preoperative assessment of the oncological potential of pathological changes is necessary. Tactics regarding obviously non-invasive neoplasms should be revised in the direction of rejecting preoperative biopsy [8].

The use of modern equipment does not guarantee the quality of diagnosis and staging of epithelial neoplasms due to the subjectivity of the endoscopist's evaluation, which is why it is necessary to remove tumors en bloc, with subsequent full pathomorphological examination, that is ensured for large flat neoplasms only by using the ESD method [9].

The aim of this work was to comparatively evaluate the immediate results of EMR and ESD techniques in the removal of flat epithelial neoplasms of the colon.

Materials and methods

A total of 260 patients with 268 colonic flat epithelial neoplasms (laterally spreading tumor, LST) were hospitalized in Sechenov University Clinical Hospital No. 2, on the basis of the Clinic of Coloproctology and Minimally Invasive

Table 1. Characteristics of the study groups
Таблица 1. Характеристика исследуемых групп

Groups Группы	Number of patients/ENs Кол-во пациентов/ЭН	Age, years Возраст, лет		Gender of patients, abs. (%) Пол пациентов, абс. (%)	
		m ± δ; *Me*	min; max	males мужчины	females женщины
In total / Все	93/96	64.9 ± 10.7; 64	39; 88	35 (36.5)	61 (63.5)
Distribution by localization of neoplasms in the colon Распределение по локализации новообразований в толстой кишке					
cecum слепая	15	70.1 ± 8.4; 70	54; 85	6 (40.0)	9 (60.0)
ascending colon восходящая ободочная	22	66.5 ± 8.7; 67	49; 88	5 (22.7)	17 (77.3)
transverse colon поперечная ободочная	24	63.6 ± 9.2; 63	49; 85	13 (54.2)	11 (45.8)
descending colon нисходящая ободочная	1	39	39	1 (100.0)	0
sigmoid colon сигмовидная	8	62.8 ± 12.2; 59	46; 80	1 (12.5)	7 (87.5)
rectum прямая	26	63.2 ± 12.6; 64	39; 83	10 (38.5)	16 (61.5)
Distribution by tumor removal method Распределение по методу удаления новообразований					
EMR	15	66.7 ± 12.7; 67	45; 85	6 (40.0)	9 (60.0)
pEMR	33	65.4 ± 10.2; 64	39; 88	12 (36.4)	21 (63.6)
ESD	48	63.9 ± 10.4; 64	39; 83	17 (35.4)	31 (64.6)
Distribution over the macroscopic structure of the LST surface Распределение по макроскопической структуре поверхности LST					
LST-G	74	64.7 ± 11.2; 65	39; 88	26 (35.1)	48 (64.9)
LST-NG	22	65.5 ± 8.9; 63	52; 85	9 (40.9)	13 (59.1)

Note: EN — epithelial neoplasms; *m* — average value; δ — standard deviation of the mean; *Me* — median; min — minimum value; max — maximum value; pEMR (piecemeal EMR) — fragment removal method; LST-G — laterally spreading tumor of granular type; LST-NG — laterally spreading nongranular tumor.

Примечание: ЭН — эпителиальные новообразования; *m* — среднее значение; δ — стандартное отклонение среднего; *Me* — медиана; min — минимальное значение; max — максимальное значение; pEMR (piecemeal EMR) — фрагментный метод удаления; LST-G (laterally spreading tumor) — латерально стелящаяся опухоль гранулярного типа; LST-NG — латерально стелящаяся опухоль негранулярного типа.

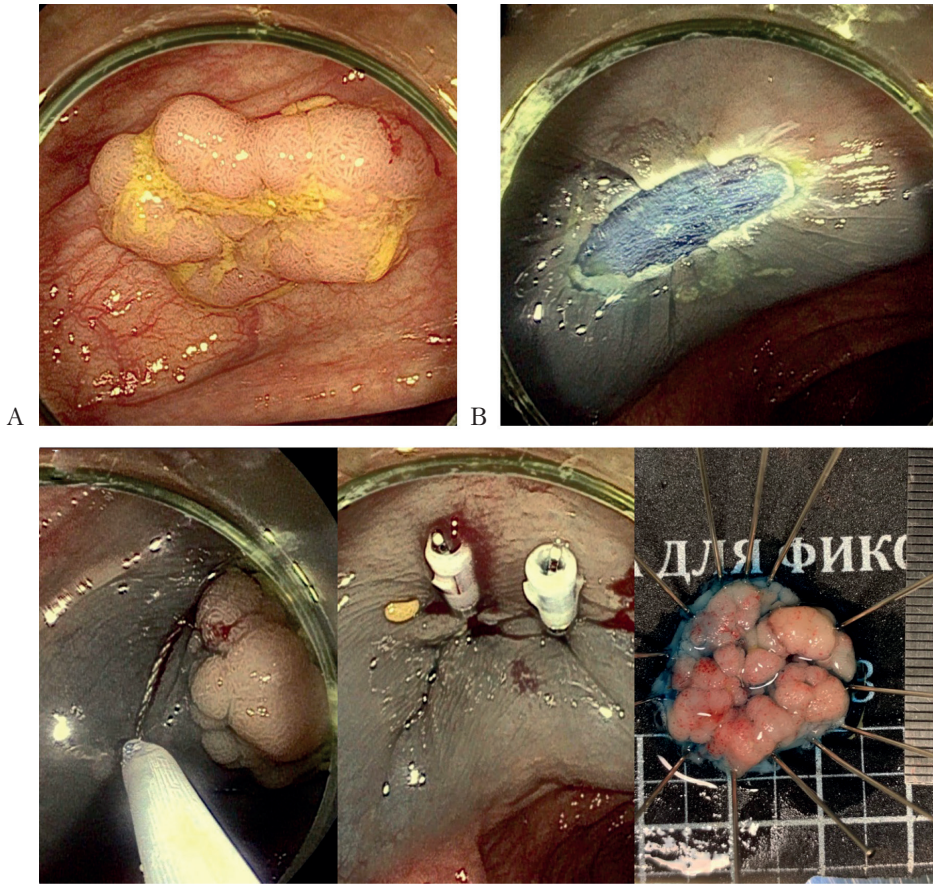

Figure 1. Epithelial neoplasm of the ascending colon LST-G, removal method — EMR: A — epithelial neoplasm LST-G; B — postoperative wound; C — the process of placing a loop on the mucous membrane at the edge of the epithelial neoplasm; D — closure of the postoperative wound using clips; E — extraction of a flap of the mucous membrane with an epithelial neoplasm and its fixation

Рисунок 1. Эпителиальное новообразование восходящей кишки LST-G, метод удаления — EMR: A — эпителиальное новообразование LST-G; B — послеоперационная рана; C — процесс наложения петли на слизистую оболочку у края эпителиального новообразования; D — закрытие послеоперационной раны при помощи клипс; E — извлечение лоскута слизистой оболочки с эпителиальным новообразованием и его фиксация

Surgery, from 01.01.2019 to 12.30.2022. After a preliminary analysis of 268 removed epithelial neoplasms, 96 (35.8 %) patients aged 39 to 88 years (64.9 ± 10.7) were included in the study. The groups treated with EMR and ESD methods did not differ significantly in age, morphological structure of tumors, their number and localization (Table 1). The size of the epithelial neoplasms varied from 20 to 70 mm (median — 37.4 ± 14.8 mm).

The removal method was chosen with the assistance of the randomization program "Random Allocation Software". Two patient groups were established: patients in the first group underwent mucosal resection using the EMR method, in the second one — the ESD method. The number of patients in both groups was the same (48/48). Only patients with benign epithelial neoplasms were included in the study, since patients with suspected colonic malignancy are indicated for ESD intervention to avoid fragmentary excision and the risk of colorectal cancer progression due to possible positive resection margins. The study protocol was approved by the Medical Ethics Committee at the I.M. Sechenov First Moscow State Medical University (No. 04-21 dated 02.18.2021).

All interventions were performed on "Olympus" and "Pentax" video systems (Japan), using electrosurgical units "ERBE" VIO 300D (Germany), "Olympus" ESG-300 (Japan). Depending on the removal method, various instruments and modifications of polypectomy snares were used: "Finemedix" (Korea) and "Fujifilm" DH-28GR, 29GR and 30GR (Japan) distal caps; "Olympus" (Japan) and "Endo Stars" (Russia) hemostatic

clips; "Olympus" (Japan) and "Boston Scientific" (USA) injectors; "Olympus" Coagrasper FD-411QR and FD-411UR (Japan) coagulation forceps; "Olympus" DualKnife (Japan) and I-type, Q-type or O-type "Finemedix" (Korea) electric knives.

Technique of execution. In case of snare electroresection after visual determination of the neoplasm margins, the injection of NaCI 0.9 % physiological solution with indigo carmine (1 : 5000) was performed in the submucosal layer, directly under the neoplasm involving the unchanged mucosa, achieving its elevation (detachment) with the mucosa above the muscular layer of the intestinal wall to prevent thermal damage and immediate or delayed perforation (Fig. 1).

The next step involved placing the polypectomy electrosnare around the epithelial neoplasm with capturing the unchanged mucosa, presumably 2–3 mm away from the edges of the neoplasm, followed by tightening it. The mucosa with the tumor was subsequently excised using the coagulator's mixed mode of cutting and coagulation. The postoperative wound was subjected to revision: the edges were carefully examined to assess the completeness of resection, as well as the gross specimen itself. In doubtful cases, additional thermal ablation of the postoperative wound margins with a snare tip or closed coagulation forceps was performed to prevent possible adenoma formation and growth (recurrence).

In case of ESD, after a similarly performed preliminary detachment of the mucosa with a tumor, a bordering incision or initiating incisions were performed around the epithelial neoplasm using an "Olympus" ESG-300 block (Japan) with operating modes in a mixed cycle of the coagulator PulseCut Slow 2 40 W, Forced/SoftCoag 2 40 W (Fig. 2). If a tunnel modification of dissection was considered (in case of extended epithelial neoplasms), the distal end of the knife was introduced into the submucosal layer, where tissue dissection was carried out in successive movements along the muscular layer. Cutting and coagulation modes were chosen during the operation, depending on the immediate situation. When visualizing large vessels, they were coagulated and subsequently transected. For this purpose, Coagrasper coagulation forceps or diathermic biopsy forceps in the SoftCoag 50 W mode were used.

Adipose tissue was occasionally noted in the submucosal layer, with the translucent layer for dissection located below the adipose tissue. Submucosal fibrosis significantly affects the technical difficulty of dissection by reducing the transparency of the submucosal layer and narrowing the space between the mucosa and muscle, resulting in a complicated dissection process. Additionally, the presence of submucosal fibrosis can be challenging to predict and is often only detected during surgery.

After the neoplasm was removed, its edges were fixed by stretching it on a solid base with the help of stationary pins. Then, it was placed in a container with a 10 % neutral formalin solution and sent to the pathomorphological laboratory for examination. Processing of morphological material was carried out according to generally accepted methods.

The histological type of tumor and the degree of dysplasia were determined in accordance with the WHO classification of gastrointestinal tumors (2019) [10]. Malignancy of adenoma was determined by the presence of adenocarcinoma structures with invasion into the submucosal layer, assessing the depth and width of the invasive component of the tumor, measured in microns (according to the H. Ueno classification). Resection margins were evaluated according to European Society of Gastrointestinal Endoscopy guidelines.

Results

Removal of 96 tumors was performed (48 interventions in each of the EMR and ESD groups) in 93 patients. The average adenoma size in patients within the ESD group was 41.6 ± 15 mm, within the EMR group — 33.1 ± 13.5 mm. Average intervention time: ESD — 143.6 ± 102.9 min, EMR — 52.6 ± 34.4 min. The intervention with electric knives required more time, the differences are statistically significant ($p < 0.0001$). The results are presented in Table 2.

Analyzing the results by groups, we noted that when using mucosectomy with dissection in the submucosal layer, such intraoperative complications as bleeding were twice as high ($p = 0.0061$) due to the longer duration and technical complexity of the intervention.

In both groups (96 adenomas), intraoperative perforations occurred in 10 patients (10.4 %): in the EMR group — in 4 cases (4.1 %), in the ESD group — in 6 cases (6.2 %). There were no statistically significant differences in the occurrence of perforations during the operation between the methods ($p = 0.7401$).

Late postoperative complications (within 30 days) in the EMR group occurred in two patients (4.1 %). Endoscopic intervention with clip placement was used to control delayed bleeding in one patient. The second patient required emergency surgical intervention in the form of laparotomy, abdominal cavity debridement and drainage, and creation of a temporary colostomy.

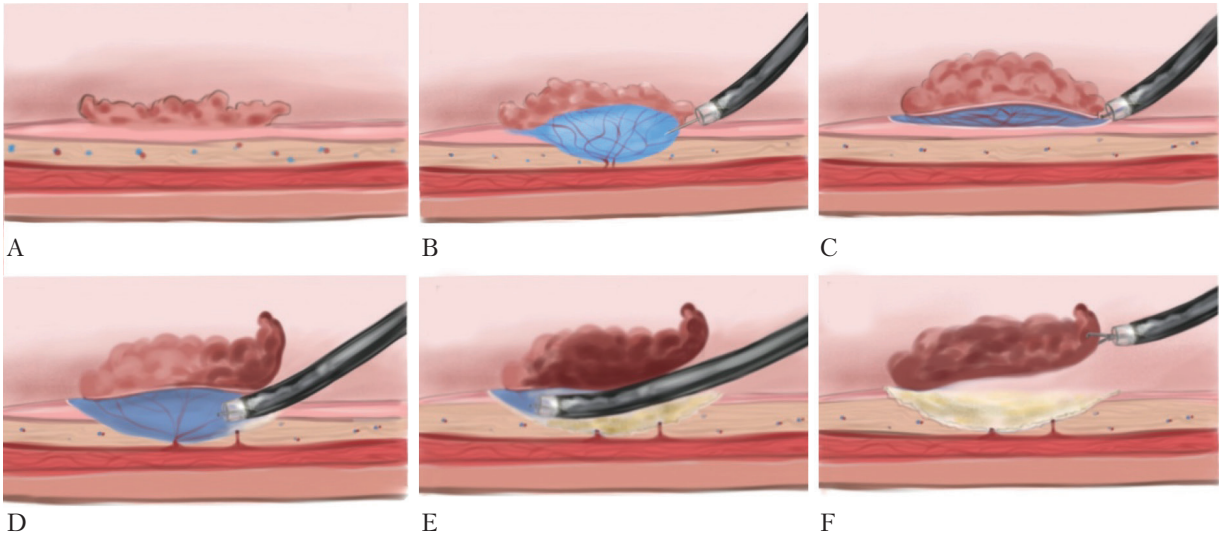

Figure 2. Endoscopic mucosectomy with submucosal dissection (ESD): A — epithelial neoplasm; B — creation of a "cushion" in the submucosal layer using solution injection; C — section of the mucous membrane and the edge of the epithelial neoplasm; D — entrance to the submucosal layer; E — dissection process in the submucosal layer; F — removal of a flap of the mucous membrane with an epithelial neoplasm

Рисунок 2. Эндоскопическая мукозэктомия с диссекцией в подслизистом слое (ESD): A — эпителиальное новообразование; B — создание «подушки» в подслизистом слое с помощью инъекции раствора; C — разрез слизистой оболочки и края эпителиального новообразования; D — вход в подслизистой слой; E — процесс диссекции в подслизистом слое; F — извлечение лоскута слизистой оболочки с эпителиальным новообразованием

Table 2. Data by group (EMR and ESD) on duration of intervention, size of tumors, number of relapses and clips used to close defects

Таблица 2. Данные по группам (EMR и ESD) по продолжительности вмешательства, размерам новообразований, количеству рецидивов и затраченных клипс для закрытия дефектов

Characteristic / Признак	EMR (n = 48)	ESD (n = 48)	p
Operation time, $M \pm SD$, min Время проведения операции, $M \pm SD$, мин.	52.6 ± 34.4	143.6 ± 102.9	< 0.0001*
Size of EN, $M \pm SD$, mm Размер ЭН, $M \pm SD$, мм	33.1 ± 13.5	41.6 ± 15	0.0027*
Clips, *Me* [Q1; Q3], number of pcs. Клипсы, *Me* [Q1; Q3], кол-во шт.	3 [0; 4]	4 [0.5; 6]	0.0407*
Recurrent neoplasm Рецидивное новообразование	2	0	0.0006*

Note: EN — epithelial neoplasm; $M \pm SD$ — mean value ± standard deviation; Me [Q1; Q3] — median [interquartile range]; * — changes in indicators are statistically significant ($p < 0.05$).

Примечание: ЭН — эпителиальное новообразование; $M \pm SD$ — среднее значение ± среднеквадратическое отклонение; Me [Q1; Q3] — медиана [интерквартильный размах]; * — изменения показателей статистически значимы ($p < 0,05$).

In the ESD group, one patient (2 %) had a late complication (perforation of the bowel wall with subsequent peritonitis) requiring emergency surgery in a similar scope.

There were no statistically significant disparities in the occurrence of late complications among the cohorts ($p = 0.9999$). No deaths were reported.

During a thorough examination of all 96 postoperative gross specimens, it was observed that 63 (65.6 %) epithelial neoplasms were successfully removed en bloc, while 33 (34.3 %) ones were removed in fragments. Examination of five epithelial neoplasms (5.2 %) revealed the presence of coagulated tissue along the resection margin, preventing an unequivocal determination of the completeness of removal. As a result, it was concluded that there was a positive horizontal resection margin, or R1. Thus, 60.4 % or 58 out of 96 cases can be classified

Table 3. Data on intraoperative complications depending on the method of removal
Таблица 3. Данные по интраоперационным осложнениям в зависимости от метода удаления

Characteristic / Признак	EMR (n = 48)	ESD (n = 48)	p
Time of the bleeding arrest, *Me* [Q1; Q3], min Время остановки кровотечения, *Me* [Q1; Q3], мин.	0 [0; 1.5]	3.5 [0; 5.5]	0.0012*
Intraoperative complications (bleedings and perforations), abs. (%) Интраоперационные осложнения (кровотечения и перфорации), абс. (%)	15 (31.3)	33 (68.7)	0.0005*
Intraoperative bleedings, abs. (%) Интраоперационные кровотечения, абс. (%)	11 (22.9)	25 (52.1)	0.0061*
Intraoperative perforations, abs. (%) Интраоперационные перфорации, абс. (%)	4 (8.3)	6 (12.5)	0.7401

Note: Me [Q1; Q3] — median [interquartile range]; * — changes in indicators are statistically significant ($p < 0.05$).
Примечание: Me [Q1; Q3] — медиана [интерквартильный размах]; * — изменения показателей статистически значимы ($p < 0,05$).

as R0 resections with negative tumor margins based on clear morphological evidence.

In the EMR group, resected adenoma was fragmented in 33 out of 48 cases (68.7 %), making it impossible to determine the radicalism of removal along the horizontal edge through morphological assessment.

In cases of fragmentary removal (pEMR), an attempt was made to recreate a whole gross specimen ("assembling a jigsaw puzzle") with each fragment fixed to the substrate.

The final pathomorphological report reveals that 89 out of 96 (92.7 %) epithelial neoplasms were adenomas of varying structures. Serrated neoplasms were detected in 6 cases (6.2 %), while adenocarcinoma, the malignant neoplasm, was found in 1 patient (1.1 %). In most cases (84 tumors, 88.4 %) low or absent (sessile serrated neoplasms) dysplasia was present. However, 11 cases (11.6 %) had severe epithelial dysplasia. Table 4 displays the results of the pathological examination.

The final histological report indicated that only one case (1.1 %) was identified as having high-grade adenocarcinoma. Taking into account the type of differentiation, the location of the tumor within the mucosa layer, the absence of its tissue at the resection margins (R0), the absence of lymphatic and vascular invasion (LV–), the multi-disciplinary team recognized the operation as radical.

Local recurrence of adenoma in the scar area occurred in two cases (4.1 %) when using fragmentary resection (pEMR) for removal. However, no relapses were observed after en bloc removal in both EMR and ESD groups.

All patients with recurrent tumors underwent repeated endoscopic resection procedures, including cold snare resection and EMR, with additional argon plasma ablation of the wound edges. The subsequent control endoscopic examination revealed no signs of disease recurrence. The median follow-up for both groups was 18 months with a range of 12 to 36 months.

Discussion of the results

Endoscopic loop electrosurgical excision of polypoid (pedunculated and sessile, broad-based) epithelial neoplasms of the colon has been the optimal method for treating this pathology for many years. The ease with which the method can be mastered, coupled with the low cost and high efficiency of the intervention in centers where endoluminal endoscopy is well-developed have made it possible to virtually completely exclude "major" surgery from the planned treatment of epithelial tumors [11].

However, loop electrosurgical excision did not prove to be significantly advantageous over abdominal surgery in treating large flat, laterally spreading tumors (LST). This is due to a lower incidence of R0 resections, higher number of disease relapses, and increased complication rates compared to routine polypectomy.

A recently developed technique for excising tumors through endoscopy, known as mucosectomy with submucosal dissection, has led to higher rates of R0 resections in the treatment of large lateral spreading tumors (LSTs) using intraluminal endoscopy. ESD combines the low traumatic potential of endoluminal endoscopic procedures with the adequate radicalism found in surgical interventions. Moreover, submucosal dissection yields benefits over both loop resection and "major" surgery.

Table 4. Characteristics of epithelial neoplasms based on pathological examination of postoperative specimens

Таблица 4. Характеристика эпителиальных новообразований на основании патоморфологического исследования послеоперационных препаратов

Tumor characteristics Характеристика опухоли	Epithelial neoplasms Эпителиальные новообразования (n = 96)	
	abs. / абс.	%
Morphological structure of the tumor / Морфологическая структура опухоли		
Tubular / Тубулярная	21	21.8
Tubulovillous / Тубулярно-ворсинчатая	67	69.8
Tubular-papillary / Тубулярно-папиллярная	1	1.1
Serrated neoplasm / Зубчатое новообразование	3	3.1
Traditional serrated tumor / Традиционная зубчатая	3	3.1
Adenocarcinoma (G1) / Аденокарцинома (G1)	1	1.1
Degree of epithelial dysplasia / Степень дисплазии эпителия		
Without dysplasia / mild dysplasia Без дисплазии / легкая дисплазия	84	88.4
Severe dysplasia / Тяжелая дисплазия	11	11,6

ESD is characterized by a lower frequency of relapses and also allows for obtaining a gross specimen for a full histological examination en bloc, thereby facilitating morphological assessment of the resection completeness and progression risk factors in case of adenoma malignancy [12]. ESD yields better outcomes than "traditional" surgery when applied selectively to suitable patients. The endoscopic method does not have severe complications such as anastomotic suture leaks and intra-abdominal bleeding, resulting in increased hospitalization and treatment costs. ESD pertains to organ-preserving interventions, and therefore patient quality of life is usually not affected, while adequate clinical outcomes are maintained [13].

Meanwhile, ESD presents a challenging to master technique for removing flat neoplasms using endoscopy, features a long learning curve and has slightly more complications when compared to traditional snare electrosurgical excision[14].

Important components of the success of any endoscopic operation are numerous factors, including the specialist's experience, quality of equipment, anesthesia, material supply of consumables, preparation of the colon for intervention, and the presence of fibrosis in the submucosal layer after a biopsy or previously performed resection interventions. ESD is particularly challenging and relies heavily on these factors. When performing ESD in the intestine, intravenous anesthesia based on propofol (Diprivan) is typically used along with analgesics as needed. In rare cases, spinal anesthesia may be employed. Our department is equipped with high-quality endoscopic equipment and a sufficient amount of consumables, staff have undergone training and gained experience. All of the aforementioned allowing for the successful completion of complex and lengthy interventions with minimal complications.

Some studies have reported that the technical difficulty of ESD is significantly impacted by poor endoscope maneuverability and severe submucosal fibrosis [15–17]. While it is not feasible to predict fibrosis in the submucosal layer with a high likelihood before surgery, several known risk factors exist. These factors include a prior forceps biopsy or removal attempt, as well as a large neoplasm size with a pronounced exophytic component. Rough fibrosis of the submucosal layer rated F2 (severely pronounced) during an ESD procedure was observed in 21 cases, constituting 44 % of observations in our study. Dissection was carried out in all cases, however, the duration of the intervention increased along with the risk of possible complications.

Based on the results obtained, the intraoperative perforation rate for ESD in our study was 12.5 %, which is comparable to the rates reported in a previous meta-analysis with a similar highest perforation rate of 12 % [18]. Although this rate is higher than that observed in large Japanese centers [19–21], where it corresponds to approximately 6 %, it is comparable to data from other countries [22–24]. However, intraoperative perforations that are successfully covered with clips do not require additional surgical activity and therefore are not significant. On the other hand, delayed perforations play a significant role as they often require

extensive surgical interventions, including bowel resection, debridement and drainage of the abdominal cavity. Such complication occurred in 2 (2%) patients, with one being in each group.

Although the average neoplasm size in the EMR group was smaller than in the ESD group, local recurrence rates were significantly higher in the resection group, with 2 recurrences compared to 0. However, repeated endoscopic resection during the observation phase led to complete neoplasm removal without the need for surgery.

Currently, the quantity and quality of endoscopic interventions are steadily increasing in both Russia and across the globe. Colleagues in related specialties, including therapy, surgery, and coloproctology, are being introduced to the results of the endoscopic service, which enables us to redirect a portion of patient flow to a gentler, organ-preserving endoscopic treatment. However, it is imperative to discuss the proposed intervention's scope in multi-disciplinary teams involving specialists. The type of endoscopic intervention (EMR, pEMR, ESD) is still open to debate, given the diverse treatment approaches across various healthcare systems and capabilities of endoscopic and surgical departments in specific clinics. The systematic application of these approaches and the development of robust national guidelines will enhance recurrence-free survival rates while simultaneously ensuring an acceptable quality of life in conjunction with feasible economic interventions.

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