

PROCEEDINGS

## THE ROLE OF ENDOSCOPIC TATTOOING IN COLORECTAL SURGERY

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### ABSTRACT

The intraoperative finding of a lesion, which has already been located previously by endoscopy, can sometimes be a challenge, especially during laparoscopy. Failure to locate the exact place of the lesion can cause the resection of a wrong bowel segment. Endoscopic submucosal tattooing is a minimally invasive technique, allowing marking of a carcinoma or polyp that is not suitable for endoscopic mucosal resection (EMR) in the colon.

During a colonoscopy for marking a certain spot, we use 0.5–1.0 mL of submucosal solution of indigo ink. Injecting the substance causes a dark mark, which is visible in the peritoneal cavity during surgery. The risks of this manipulation are coloring the peritoneum and other structures and organs outside the colon such as kidneys, omentum, stomach, or a part of the intestines. This can be avoided using the proper technique of injection. There are no strict rules of execution of the manipulation. The approach is individual and depends on the endoscopist and the location of the lesion. Frequently used methods are circular marking of the affected area and placement of the ink distally and/or proximally of the lesion.

In conclusion, tattooing reduces time in the operating room, lowers the risk of healthy bowel resection and aids in faster finding of the exact location of the lesion. The procedure is easily executed by an experienced endoscopist and does not carry a significant risk of complications.

**Keywords:** *endoscopic tattooing, lesion, intraoperative*

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**Received:** September 3, 2023

**Accepted:** October 24, 2023

### INTRODUCTION

The intraoperative identification of lesions previously detected by endoscopy is often difficult, particularly during laparoscopic surgery (1). Endoscopic submucosal tattooing is a minimally invasive technique, allowing the marking of a carcinoma or a malignant polyp in the colon. Its preoperative need is significantly increasing due to the rising number of physicians who practice minimally invasive surgery.



It reduces the time in the operating room, prevents wrong segment resection, and decreases the chances of reoperation due to lack of oncologic resection (2). This is an effective and safe procedure with a 70–100% precision rate in the localization of the lesion (3). The marking of lesions benefits surgeons greatly in laparoscopic/robotic surgery where haptic feedback is lower and finding small colonic lesions can be challenging.

**PATIENTS AND METHODS**

A retrospective study on fifteen patients with histologically verified adenocarcinoma or endoscopically unresectable polyps in all parts of the colon who underwent minimally invasive surgery was conducted. All of the procedures were performed in a tertiary medical center in Plovdiv, Bulgaria. The subjects underwent lower GI endoscopy, where the colon neoplasms/non-resectable polyps were found and marked using the 3-quadrant tattooing method. Tattoos were placed at a 120-degree angle, three centimeters distally from the lesion, which secured adequate extramural visualization. We used a double injection technique, which included first injecting saline to confirm that the needle tip was in the submucosal space. Once the bleb appeared we stopped injecting, leaving the needle and changing the syringe to a tattooing agent (India ink). Up to three milliliters were injected for the best tumor localization during laparoscopic surgery.

The fifteen patients included in the study were tattooed and operated on by laparoscopy. The most common location was the transverse colon (6), followed by the sigmoid colon (5), as shown in Table 1. The majority of the patients had polypoid lesions, followed by stenosing neoplasms as seen in Table 2. All of the above-mentioned patients gave written consent before they underwent the procedure.

*Table 1. Location of the lesions.*

ENDOSCOPIC LOCATION	
Sigmoid colon	5
Transverse colon	6
Ascending colon	2
Descending colon	3

*Table 2. Endoscopic description of the lesions.*

ENDOSCOPIC DESCRIPTION	
Polypoid lesions	6
Neoplasms <50% circumference	3
Neoplasms >50% circumference	2
Stenosing neoplasms	4

**RESULTS**

None of the patients required a second colonoscopy for marking, as 100% of the tattoos were visualized during surgery. The median time between tattooing and surgery was 7 (3–15) days. We discourage tattooing lesions in the rectum as proctoscopy or digital exam can be easily done. Furthermore, submucosal tattoos are difficult to visualize because of the thick mesorectum. Our study shows that endoscopic tattooing provides 100% identification rate and excludes the need of intraoperative colonoscopy to find the lesion. The percentage of inaccurate marking was zero; this may be due to the low patient count and the vast experience of the performing endoscopists.

**DISCUSSION**

Preoperative colonoscopy is used to localize lesions, but most of the tumors are described in relation to major anatomic landmarks such as the ileocecal valve, hepatic flexure, or splenic flexure (2). As endoscopists, we also use the length of the colonoscope to be more precise and provide better information of the whereabouts of the lesion. These methods have limitations due to the anatomic variability of each patient, such as colonic loops, which make measurements challenging and inaccurate (2). These errors cause wrong segment resection and require conversion to open laparotomy and additional resection. The identification of neoplasms during surgery is important, when using a laparoscopic approach. There are currently no evidence-based guidelines for when or on what kind of lesions should endoscopic tattooing be considered. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) guidelines for the laparoscopic resection of curable colon and rectal cancer from 2013 recommended marking all small lesions without clearly specifying their size (4). Our study shows that lesions that are occupying less than 50% of the lumen, polyps, which after endoscopic mucosal resection (EMR) have suspicion of

muscular invasion, and non-resectable polyps should always be tattooed.

On the other hand, computed tomographic colonography can identify lesions greater than 1 cm with an adequate anatomical accuracy (5). This also tilts the scales towards our recommendation that all small polypoid lesions should be tattooed. All of our markings were 100% accurate with no substantial adverse effects.

We aimed to establish an easy criterion for markings in the colon and as a result of this study we consider that all lesions that occupy less than 50% of the bowel lumen, appear malignant, and are less than 1 cm should be tattooed. Post-polypectomy scars where there is doubt of muscularis invasion should also be marked. Neoplasms in the cecum or rectum can be easily recognized, so we discourage tattooing them (6).

## CONCLUSION

We conclude that submucosal tattooing for neoplasms and malignant polyps is a safe procedure that is easily done by an experienced endoscopist. It saves operative time and lowers the risk of wrong bowel resection. We strongly suggest that these results should prospectively be validated in a larger cohort of patients.

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