



# ICG fluorescence triple check during TaTME

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**Abstract:** The use of fluorescence angiography has been widespread for almost 50 years, and the use of Indocyanine Green angiography is one of the latest technical evolutions in colorectal surgery. Its application to evaluate the vascular supply of the colon is analyzed in many studies to assess its possible effectiveness to minimize the risk of anastomotic leak. This article describes the ICG fluorescence triple check technique, standardized in a high-volume colorectal center and applied during transanal total mesorectal excision (TaTME) to assess the vascularization of both the colonic stump and the rectal stump before the anastomosis. A last transanal check is performed after the construction of the anastomosis. This technique is now standardized in this center and it could represent a possible application of ICG fluorescence to minimize the risk of anastomotic leak following TaTME.

**Keywords:** Transanal total mesorectal excision (TaTME); indocyanine green one (ICG); fluorescence; colorectal surgery

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## Introduction

It has been almost 50 years since fluorescence angiography (FA)—and especially the indocyanine green one (ICG)—was officially approved by the FDA. Since then, this tool found its fortune in a huge number of surgical fields, from hepatobiliary to plastic surgery.

Recently, it has also been used in colorectal surgery to evaluate the vascular supply of the colon in bowel resections. Furthermore, ICG can be used to check the integrity and vascularization of the mucosa after the anastomosis is completed. Nowadays, more and more studies are trying to analyze how ICG is going to minimize anastomotic leak (AL). One of the most recent meta-analysis (1) found that ICG was associated with a lower AL rate after robotic, laparoscopic or open resection for rectal cancer. An increasing amount of papers showed that ICG is a safe and feasible technique, potentially capable of permanently becoming part of daily surgical strategies.

As far as transanal total mesorectal excision (TaTME)

is concerned, Penna *et al.* (2) reported an early leak rate of 7.8% in a series of 1,594 patients who underwent TaTME. Considering this data, experts in transanal rectal surgery are trying to integrate ICG and TaTME with the aim of improving the quality of rectal cancer resection.

The experience of a high-volume colorectal center with indocyanine green fluorescence angiography in TaTME is described here.

## Technique description

During TaTME, an ICG fluorescence triple check has been standardized since June 2018 in order to evaluate the vascularization of both the colonic and the rectal stump before the anastomosis, and the anastomosis itself once it is constructed.

The transabdominal *équipe* performs a laparoscopic (standard or single-port) rectal anterior resection. The section of the inferior mesenteric artery and the inferior mesenteric vein are performed respectively at the origin



**Figure 1** The 3 steps of the ICG check at the end of a TaTME (3). ICG, indocyanine green one; TaTME, transanal total mesorectal excision.

Available online: <http://www.asvide.com/watch/33126>

and the lower edge of the pancreas. Preparation of the left mesocolon is achieved with posterior, medial to lateral technique. The splenic flexure is always mobilized. The dissection of the sigma and the rectum intra- and extraperitoneal is conducted up to the anterior peritoneal reflection in the Douglas pouch.

The transanal *équipe* performs a standardized TaTME. After a purse-string below the tumor, a full-thickness circumferential rectotomy is performed to identify the mesorectal plane. Preparation of the posterior plane is achieved above the presacral fascia to the sacrum promontory and the anterior plane below the Denonvilliers fascia up to the peritoneal reflection. Extraction of the colon and the rectum is performed through a Pfannenstiel incision or through the access of the abdominal single-port.

As shown in the video (*Figure 1*), the abdominal surgeon assesses the proximal colon resection point with a first evaluation of blood supply under white light. At this point of the procedure, 25 mg of indocyanine green are diluted in 10 mL of sterile normal saline, and a bolus of 0.2 mg/kg is injected intravenously by the anesthesiologist through a peripheral access. After 20–30 seconds, an intracorporeal colonic stump check is performed using the fluorescence of indocyanine, excited by near infrared light. The abdominal surgeon, after evaluating the perfusion of the proximal margin, performs the resection.

A second ICG check is simultaneously performed by the transanal surgeon to assess the good perfusion of the rectal stump before the anastomosis. The ICG laparoscope is introduced through the transanal port to evaluate the fluorescence of the mucosa.

After the anastomosis construction, a second indocyanine green bolus of 0.2 mg/kg is performed, and a third assessment of the proximal and distal mucosal perfusion is performed. The camera is introduced through the transanal port and the perfusion is evaluated from the colonic and rectal mucosa.

The last check is performed to evaluate a good hemostasis and perform an air-leak test.

## Discussion

The experience in Transanal Total Mesorectal Excision at “Fondazione Policlinico Universitario Agostino Gemelli IRCCS” started in 2015. After almost 100 cases, this technique is becoming the standard for rectal cancer resection due to its safety and feasibility (4). Indocyanine green can be the added value to such practice to improve the quality of the procedures.

Mizrahi *et al.* (5) reported that ICG changed the planned proximal resection margin in 18.5% of the 54 patients who underwent TaTME, possibly accounting for relatively low AL rates. In this center’s series, the resection margin chosen by the surgeon was always confirmed by the ICG level of perfusion.

However, anastomotic leak could depend on the perfusion of the resected bowel, but several other factors need to be considered, such as the patient’s general conditions or a tension-free anastomosis. The former depends on the anatomy of the colon—considering for instance the presence or the absence of the marginal artery of Drummond which can significantly impact on the risk of ischemia of the considered tract. The latter depends on the mobilization of the splenic flexure and on the level of ligation of the inferior mesenteric artery. The center’s group tries to preserve the left colic artery to achieve a tension-free anastomosis. By adopting this perspective, it emerges that some factors are modifiable and some are not, but it is possible to improve surgical safety with emerging technologies. It must also be noted that mechanical defects occurring during stapler firing can be easily brought to light through the hydropneumatics test intraoperatively. On the other hand, with regard to bowel perfusion, studies have shown how the surgeon’s eye-guided assessment of the resection margin is not related to anastomotic leak rates (6).

It would therefore make sense to use ICG, giving more certainty about the blood supply of the anastomosis’ margins. The image that really impressed the authors is the one that the ICG gives from inside the anal canal or the rectum after the anastomosis is completed. The adequate

perfusion of the anastomosis' mucosal margins can be checked in that very moment.

The authors believe that a real time evaluation of bowel perfusion can lead to lower anastomotic leak in the future. TaTME is showing advantages and implementations to rectal surgery, proved by experiences in high-volume centers. In this context the triple ICG check can be regularly introduced as a common surgical step during the rectal resection with transanal approach.

## Conclusions

The triple ICG check can be a common surgical step during TaTME to verify the vascular supply of the colon tracts before and after the anastomosis.

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## Footnote

*Conflicts of Interest:* The authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/ls.2019.10.02>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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