How to prevent anastomotic leakage after laparoscopic colorectal surgery?
- A method of vessel flow observation using the near-infrared range (NIR) imaging device

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Backgrounds

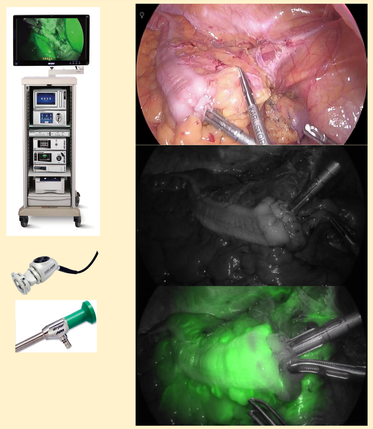
- **Anastomotic leakage (AL)** is one of the life-threatening complications in colorectal surgery.
- The AL variants may be oncologic, surgical, and patient side.
- Insufficient blood flow at the anastomotic site is considered one of the most important factors for AL.
- A **Near-Infrared Range (NIR) imaging device** to observe bowel vessel flow (**ICG flow imaging**; ICG-FI) is expected to be effective in preventing AL during laparoscopic colorectal surgery.
- We present our method and usage results for laparoscopic rectal cancer surgery.

Methods

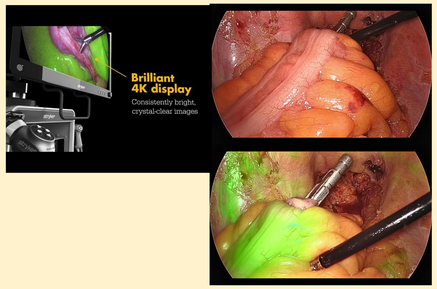
- The **Stryker 1588/1688 AIM camera system** was used for ICG-FI.
- After determining the dissection line, the mesenteric dissection should parallel the feeding vessels.
- The rapid injection of 5 ml of indocyanine green (**ICG; 2.5mg/ml**) followed by 20 ml of normal saline was administered intravenously before anastomosis.
- The blood flow determination was observed in NIR mode laparoscopically, and the fluorescence confirmed that the blood flow at the anastomotic site was enough.
- Measured time until the anastomotic site fluoresces after ICG injection.
- If the fluorescence was not obtained, additional bowel resection was planned in the good flow area.

Devices used for ICG-FI

Stryker Endoscopy 1588 AIM



Stryker Endoscopy 1688AIM 4K



The figure shows the normal and the NIR mode when using the Stryker 1588/1688 AIM

AL variants in ICG-FI

	Total (N=143)	AL (+) (N=12)	AL(-) (N=131)	P
Gender (n; F:M)	51:92	3:9	48:83	0.4980
Age median (y.o.; median (range))	69 (39-91)	70 (51-84)	69 (39-91)	0.9046*
ASA score (1:2:3)	5:106:32	0:9:3	5:97:29	0.8659
BMI 25≤ n	33	2	31	0.5589
Combined Diabetes mellitus n(%)	24 (16.8)	3 (2.1)	9 (6.3)	0.3749
Steroid use n(%)	3 (2.1)	2 (1.4)	1 (2.1)	0.0125
Comorbidity (+) n(%)	79 (55.2)	8 (5.6)	71 (50.0)	0.5392
Preoperative treatment (+) n(%)	24 (16.8)	1 (0.7)	23 (16.1)	0.3841
Procedure				0.0048
High anterior resection n(%)	45 (31.5)	2/45 (4.4)	43 /45 (95.6)	
Low anterior resection n(%)	98 (68.5)	10/98 (10.2)	88/98 (89.8)	
Robot-assisted n(%)	91 (63.6)	5/91 (5.5)	86/91 (94.5)	0.1011
Lateral lymph node dissection n(%)	10 (7.0)	0/10 (0.0)	10/10 (100)	0.3207
Operating time (min.; median (range)	345 (163-867)	331.5 (168-460)	345 (163-867)	0.1176*
Estimated Blood loss (ml; median (range))	5 (5-1476)	5 (5-765)	5 (5-1476)	0.4353*
Diverting ostomy n(%)	42 (29.4)	1/42 (2.4)	41/42 (97.6)	0.0704

(Logistic regression analysis, * Linear regression analysis)

Results

- Data were retrospectively collected on **243 patients** at our institution from **Jan 2018 to Dec 2021**.
- **ICG-FI was performed for 143 patients** who were planned stapled anastomosis.
- The median time to fluorescence confirmation of the anastomotic site was **15 seconds** (range from 5 to 80 seconds).
- After ICG-FI, **additional bowel resection** due to poor perfusion was required in 8 cases (**5.6%**).
- The **AL rate** was **8.4%** (12/143).
- Among the ICG-FI cohort, steroid use was a significant risk factor for AL.
- Anastomosis less than 5cm from the anal verge was more likely to develop AL.
- Robotic surgery and diverting stoma creation may decrease the incidence of AL (Robot (+) 5.5% vs. (-) 13.5% [n.s.], Ostomy (+) 2.4% vs. (-) 10.9% [n.s])

Conclusions

- Currently, it is difficult to prevent AL completely.
- AL can be reduced by visualizing blood perfusion with ICG-FI.
- Low anterior resection for rectal cancer should be performed by robotic surgery and confirmed by bowel perfusion with ICG-FI, and the creation of a diverting ostomy is recommended.

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COI disclosure
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