ICCP
Member

Indocynine Green Flourescence-Guided Laparoscopic Total Mesocolic Excision

Nasser Al-Sanea, FASCRS (Hon.)

Professor of Colon & Rectal Surgery, Alfaisal University

Princess Nourah bint Abdulrahman University

Riyadh, Saudi Arabia

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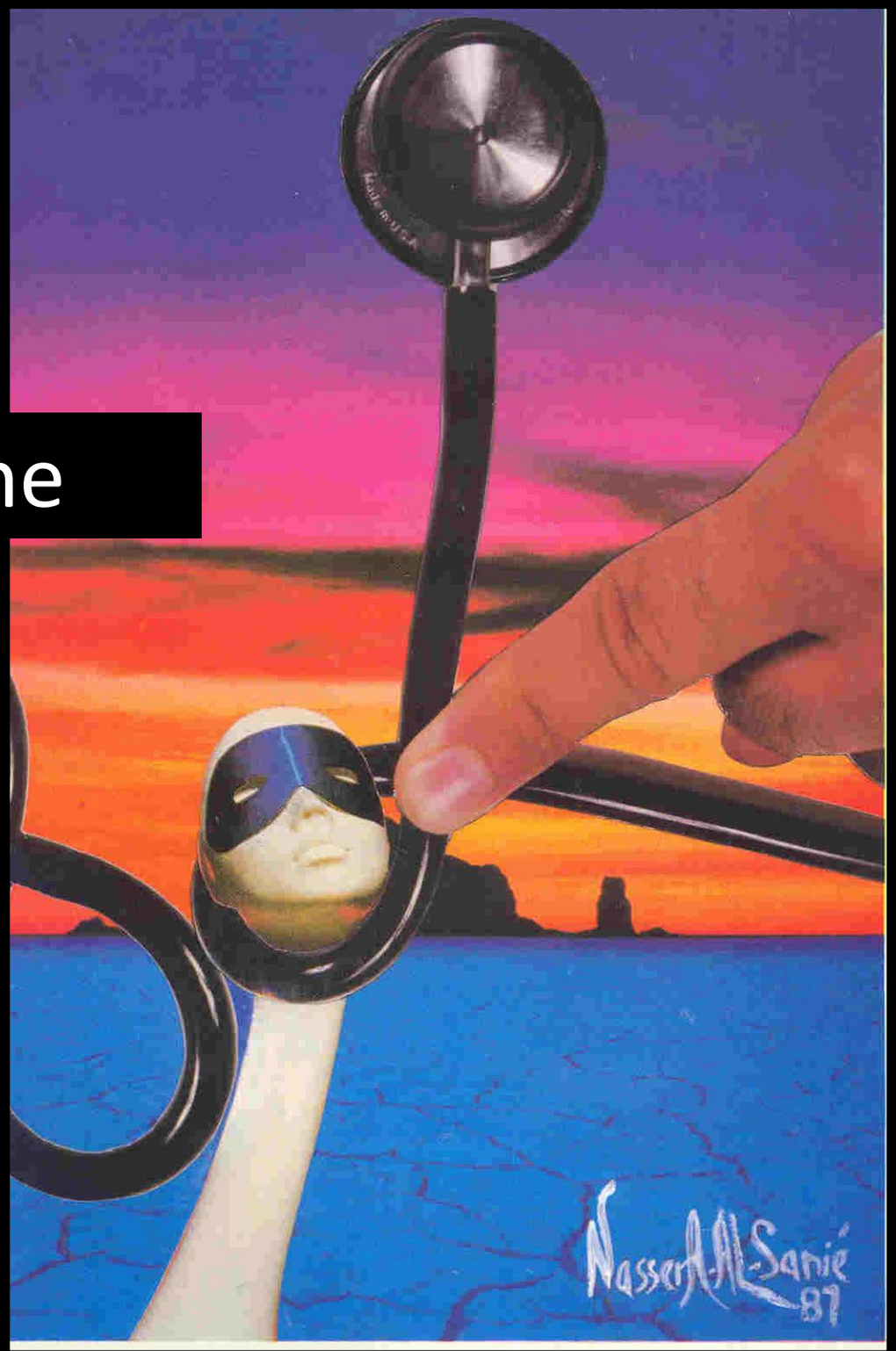
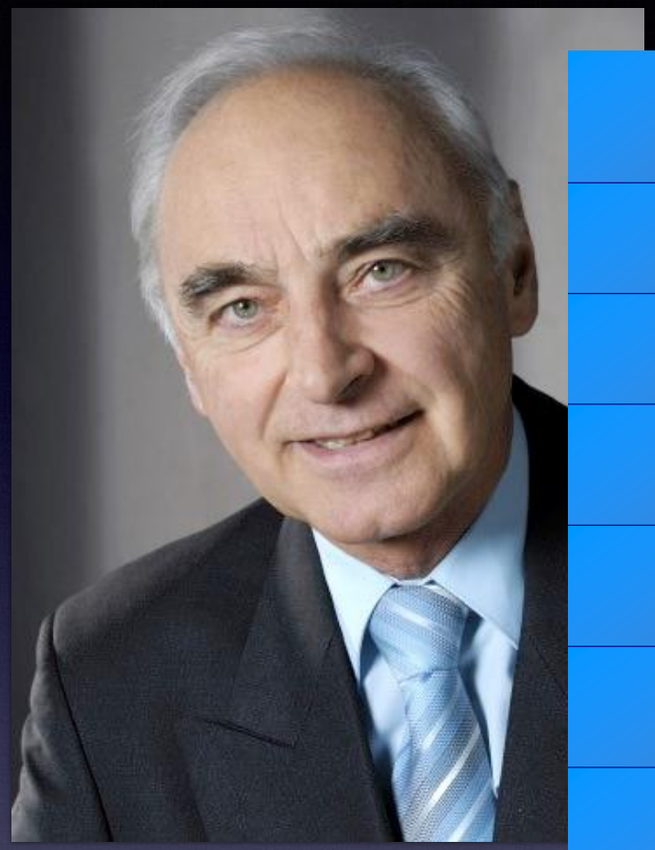
Financial Disclosures

None



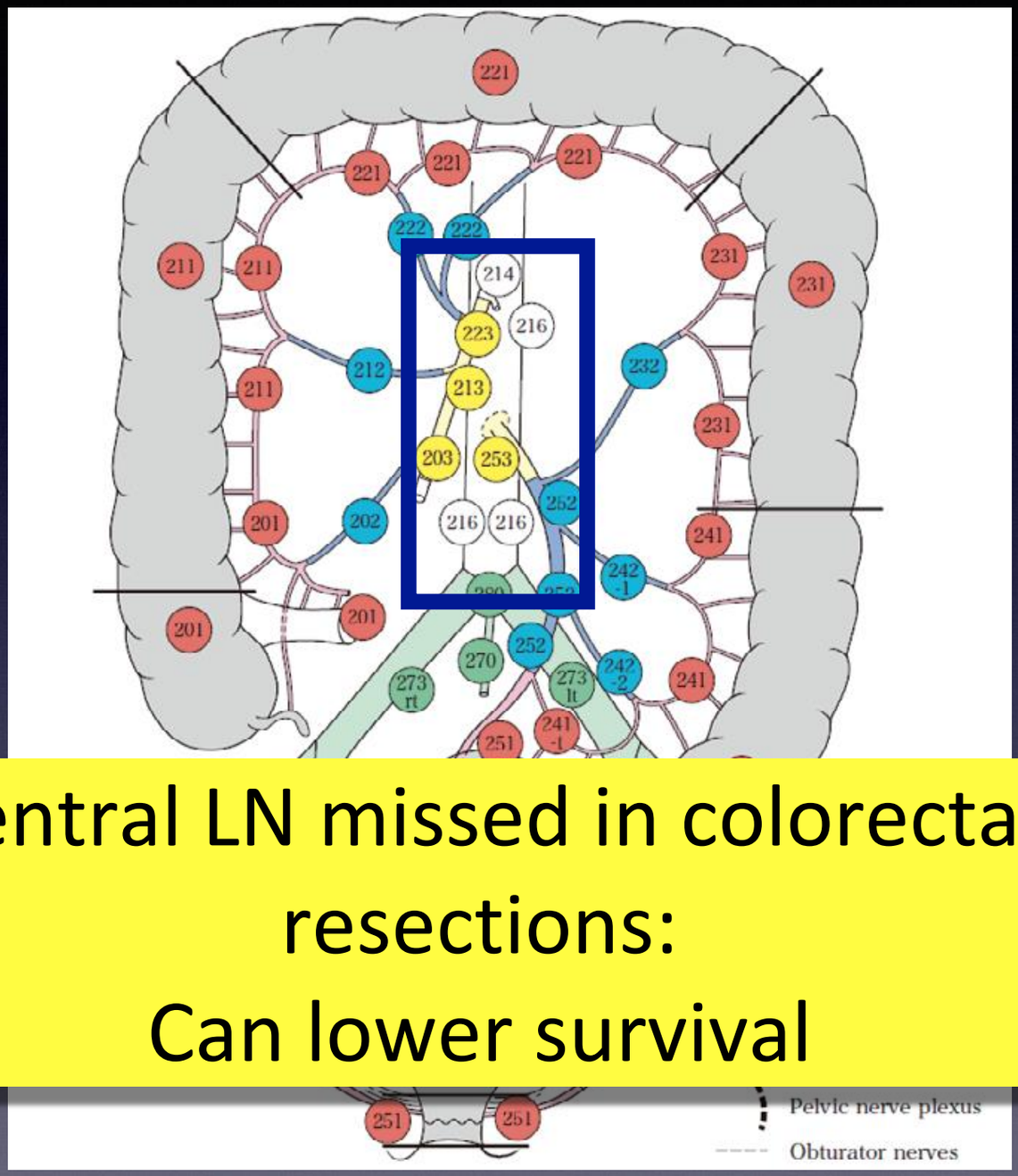
Complete Mesocolic Excision (CME)



Stage	5-Yr Survival (%)	Stage
I	93	
IIA	85	
IIB	72	T4a
IIIA	83	
IIIB	64	T4a
IIIC	44	T4b
IV	8	

Colorectal Dis. 2009 May;11(4):354-64; discussion 364-5. doi: 10.1111/j.1463-1318.2008.01735.x. Epub 2009 Nov 5.
Standardized surgery for colonic cancer: complete mesocolic excision and central ligation--technical notes and outcome.
Hohenberger W1, Weber K, Matzel K, Papadopoulos T, Merkel S.

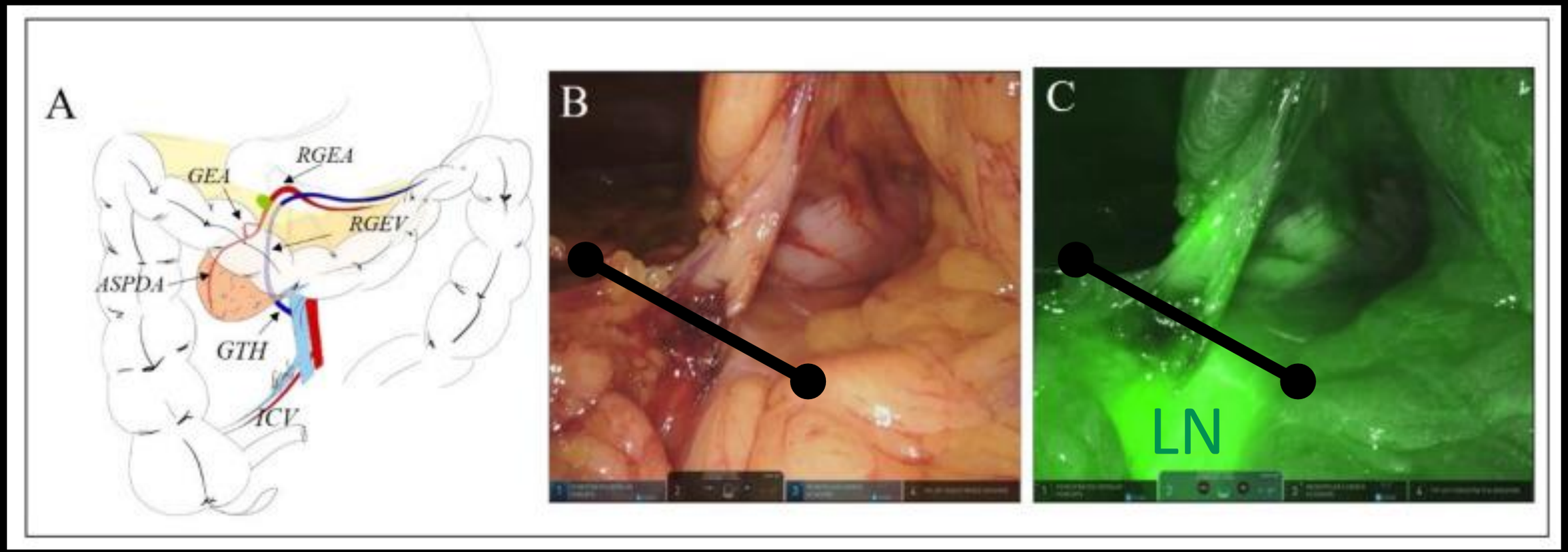
CME vs. D3



Central LN missed in colorectal resections:
Can lower survival

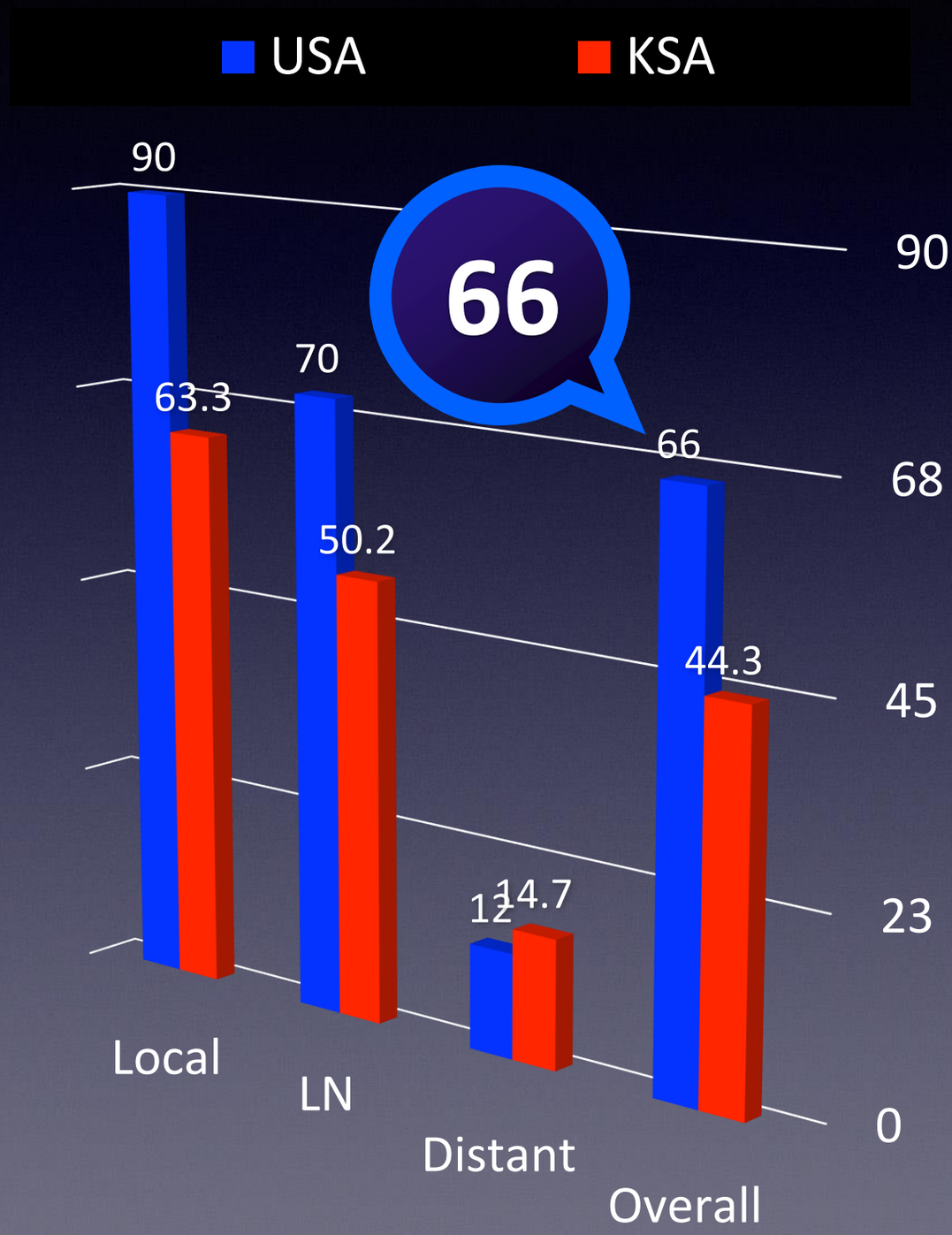
...panese Society for Cancer of the ...olon and Rectum. Japanese Classification of Colorectal, Appendiceal, and Anal Carcinoma: the 3d English Edition [Secondary Publication]. J Anus Rectum Colon. 2019 Oct 30;3(4):175-195. doi: 10.23922/jarc.2019-018. PMID: 31768468; PMCID: PMC6845287.

Utility of ICG



Ribero D, Mento F, Sega V, Lo Conte D, Mellano A, Spinoglio G. ICG-Guided Lymphadenectomy during Surgery for Colon and Rectal Cancer-Interim Analysis of the GREENLIGHT Trial. Biomedicines. 2022 Feb 24;10(3):541. doi: 10.3390/biomedicines10030541. PMID: 35327344; PMCID: PMC8945555.

Survival Colorectal CA



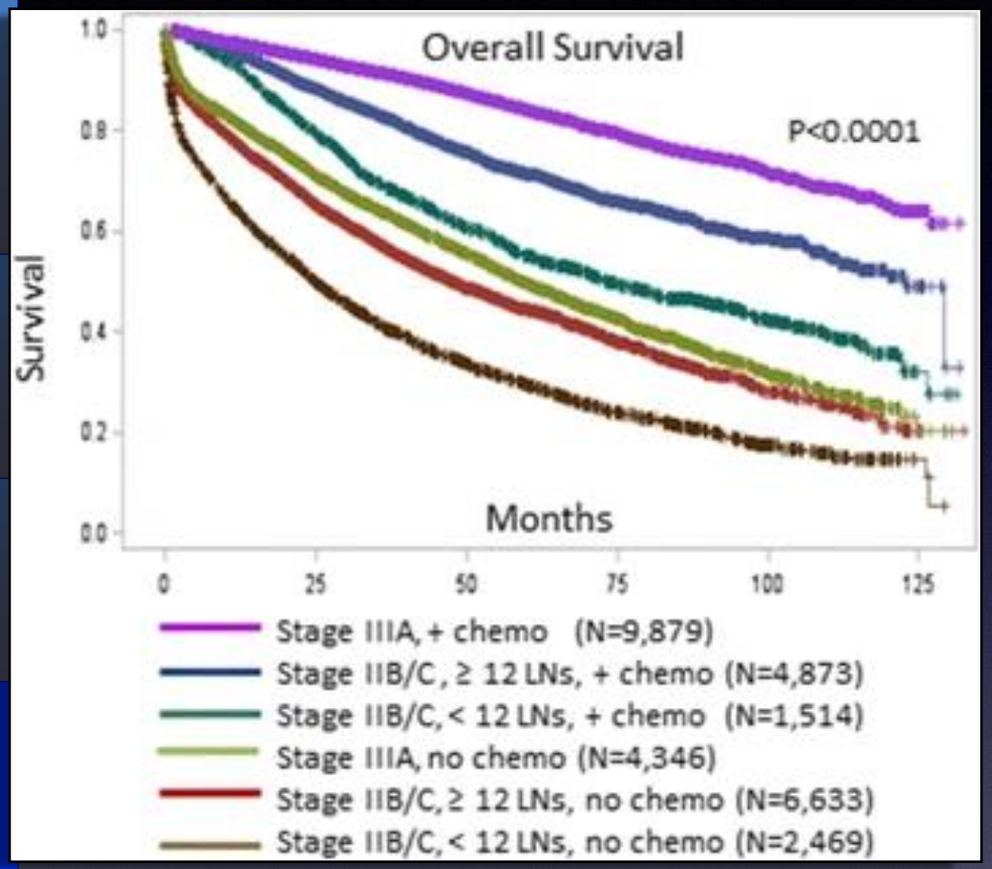
National Cancer Institute
Statistics-2010
USA
Saudi Cancer Registry 2008

Colorectal cancer in Saudi Arabia: incidence, survival, demographics and implications for national policies.
Alsanea N, Abduljabbar AS, Alhomoud S, Ashari LH, Hibbert D, Bazarbashi S.
Ann Saudi Med. 2015 May-Jun;35(3):196-202. doi:

Chemotherapy Benefit

Colon CA-LN+

N=34,999	No Chemo	+Chemo
IIIA >12 LN	49.5%	84.1%
IIB/C >12 LN	43.7%%	70.8%
IIB/C <12 LN	27.7%	53.9%



<12 LN

Survival Not ↑↑ Chemo

LN+ removal

Indocynine Green

L.

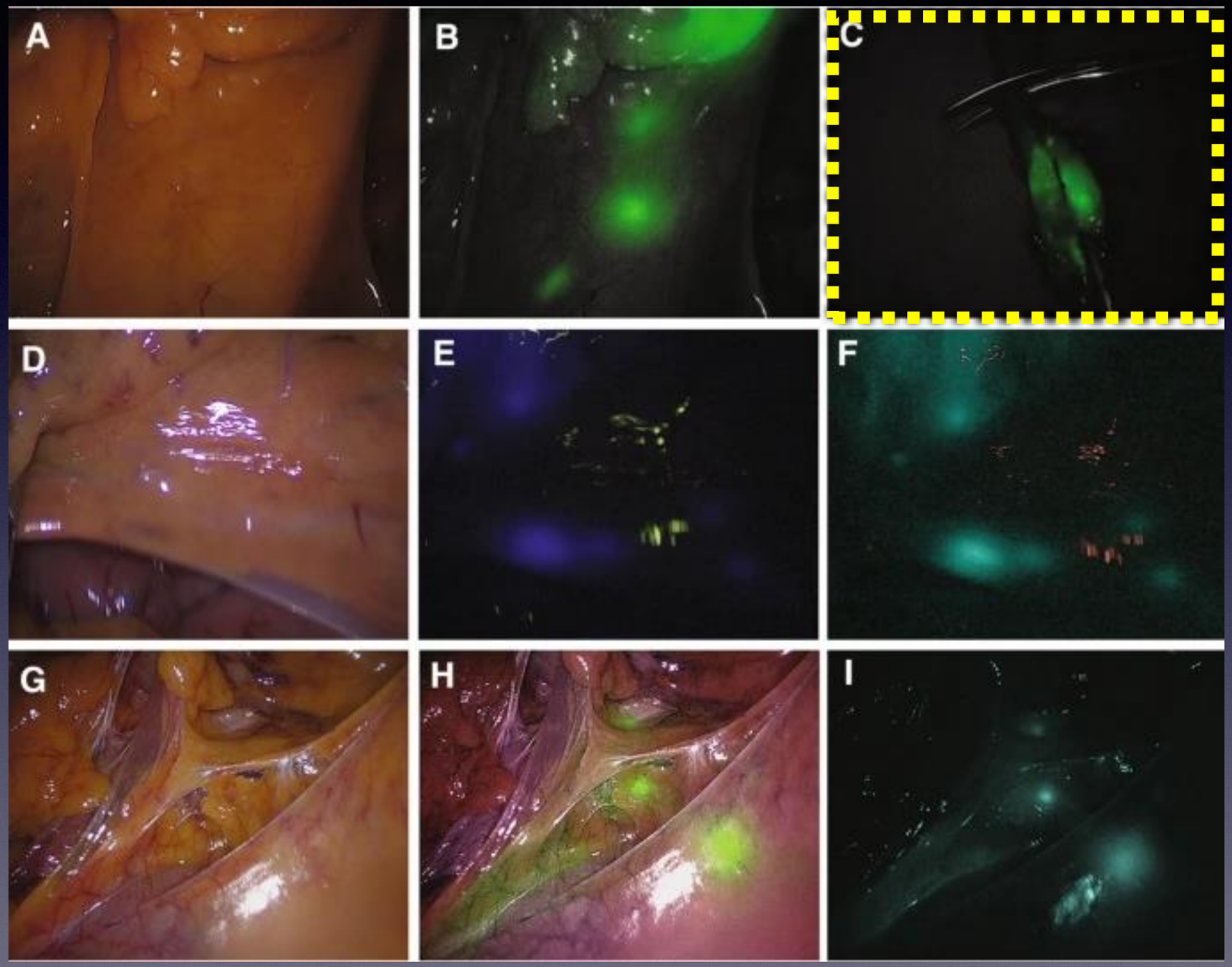
1-

sists

quate

and receipt of adjuvant chemotherapy. BMC Cancer 16, 460 (2016). https://doi.org/10.1186/s12885-016-2446-3

Systems Available



1

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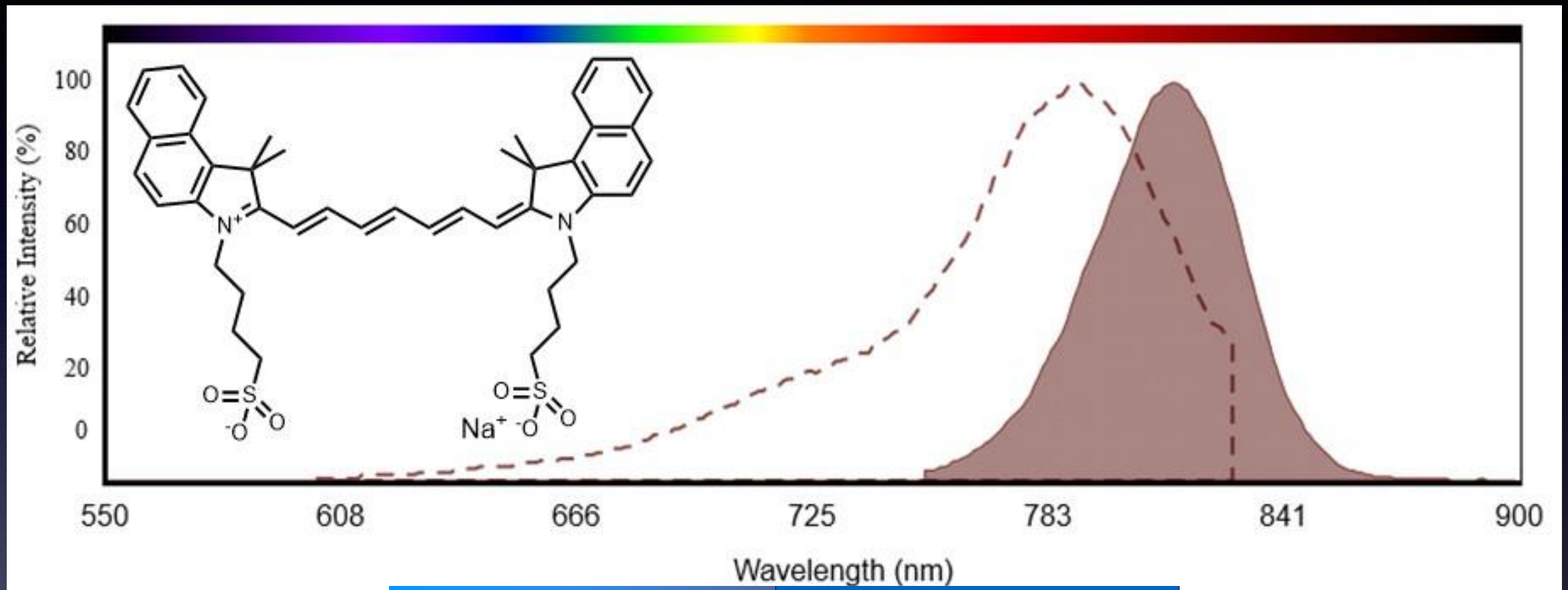
..., Lee, I.Y. et al. Optimal ICG dosage of preoperative colonoscopic tattooing for fluorescence-guided laparoscopic colorectal surgery. Surg Endosc 36, 1152–1163 (2022). https://doi.org/10.1007/s00464-021-08382-5

Indocynine Green (ICG)



ICG	Near Infra-red
Clearance	Liver
Half-life	3-4 min

Ahn, Hm., Son, G.M., Lee, I.Y. et al. Optimal ICG dosage of preoperative colonoscopic tattooing for fluorescence-guided laparoscopic colorectal surgery. Surg Endosc 36, 1152–1163 (2022). https://doi.org/10.1007/s00464-021-08382-5

Indocynine Green (ICG)

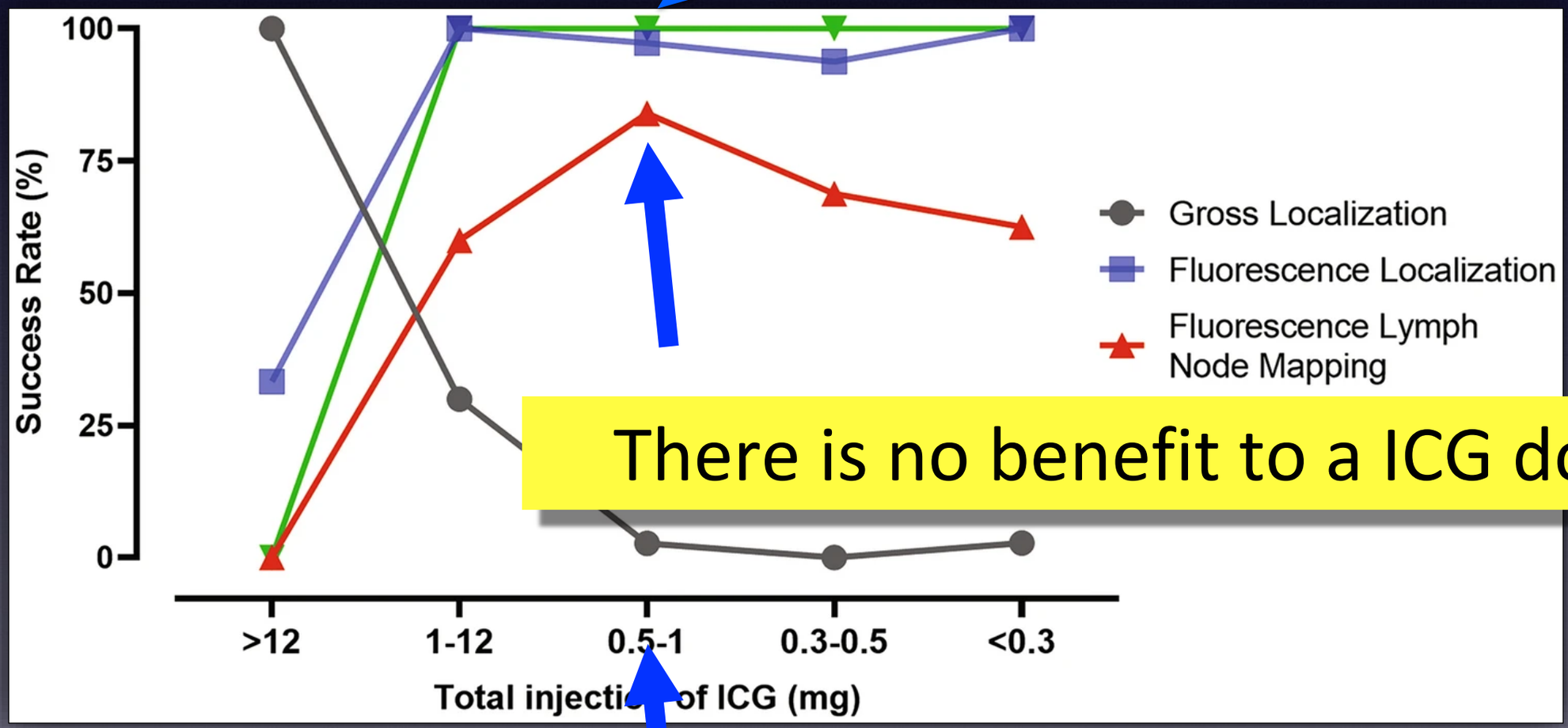
ICG	Near Infra-red	
Vial	75 US $	
Amount	25 mg	
Reconstitution	Sterile H_2O	
For vascular	2.5-5 mg/ml	Add 5-10 ml H_2O
For LN	0.5-1 mg/ml	Add 25-50 ml H_2O

Ahn, Hm., Son, G.M., Lee, I.Y. et al. Optimal ICG dosage of preoperative colonoscopic tattooing for fluorescence-guided laparoscopic colorectal surgery. Surg Endosc 36, 1152–1163 (2022). https://doi.org/10.1007/s00464-021-08382-5

Optimal Dose

0.5-1 mg/ml

	Metastasis
Time	12-18 hrs
Dose	0.5-2.5 mg/ml



There is no benefit to a ICG dose >1 mg

Ahn, Hm., Son, G.M., Lee, I.Y. et al. Optimal ICG dosage of preoperative colonoscopic tattooing for fluorescence-guided laparoscopic colorectal surgery. Surg Endosc 36, 1152–1163 (2022). https://doi.org/10.1007/s00464-021-08382-5

ICG Systematic Review

Sentinel LN

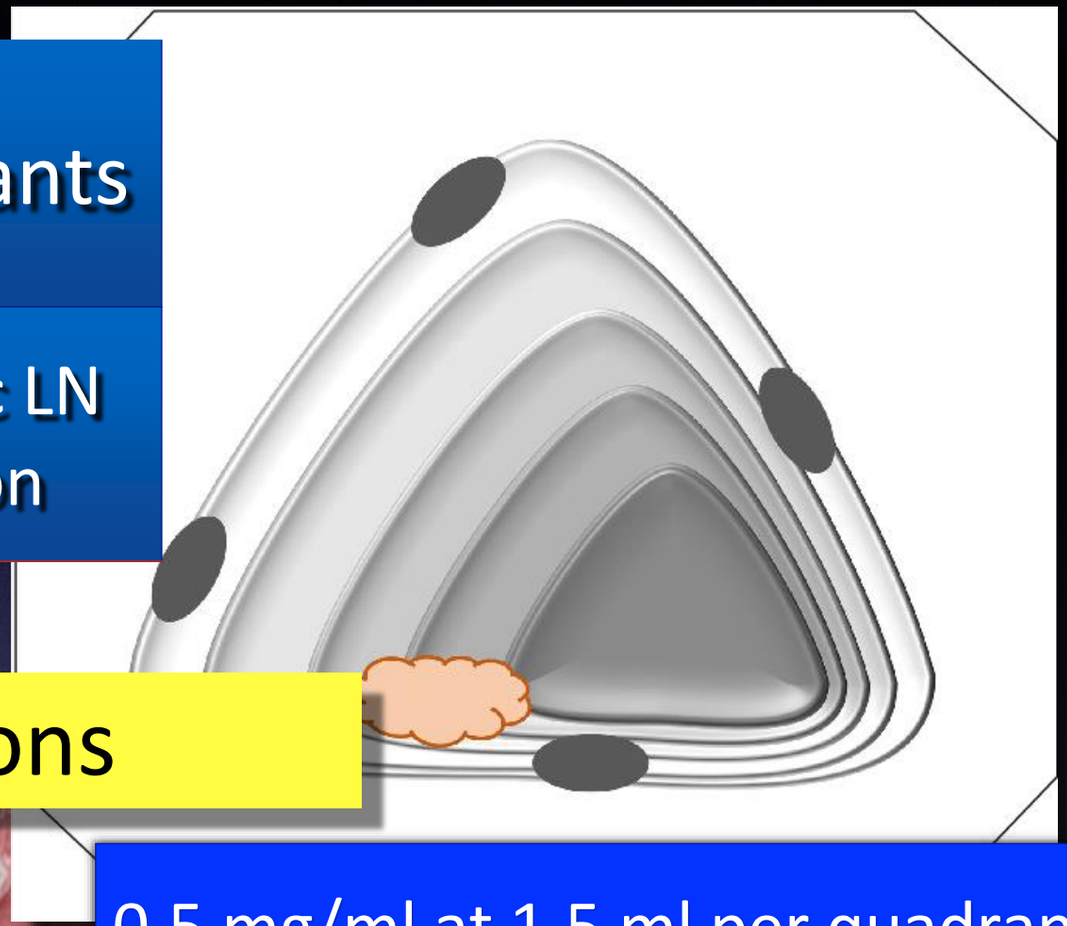
Studies: 10	Detection Rate
Colon CA	65.5-100%
Rectal CA	28-92%

ICG improves LN yield Colon, but less in Rectum

Liberale G, Bohlok A, Bormans A, Bouazza F, Galdon MG, El Nakadi I, Bourgeois P, Donckier V. Indocyanine green fluorescence imaging for sentinel lymph node detection in colorectal cancer: A systematic review. Eur J Surg Oncol. 2018 Sep;44(9):1301-1306. doi: 10.1016/j.ejso.2018.05.034. Epub 2018 Jun 21. PMID: 30131103.

Location of Endoscopic Injection

N=100	Submucosal	4 Quadrants
LN	Sentinel LN	Oncologic LN resection



Avoid Subserosal injections

0.5 mg/ml at 1.5 ml per quadrant using 22G needle endoscopically

Avoid Intra-op colonoscopy & injection: Inflates colon esp. R → difficult lap.

Ribero D, Mento F, Sega V, Lo Conte D, Mellano A, Spinoglio G. ICG-Guided Lymphadenectomy during Surgery for Colon and Rectal Cancer-Interim Analysis of the GREENLIGHT Trial. Biomedicines. 2022 Feb 24;10(3):541. doi: 10.3390/biomedicines10030541. PMID: 35327344; PMCID: PMC8945555.

Timing of Endoscopic Injection

24-27hrs

N=100	24 hrs	72 hrs	P-value
Extra-regional LN	48.9%	23.8%	0.065
↑↑ LN	57.1%	33.3%	0.116

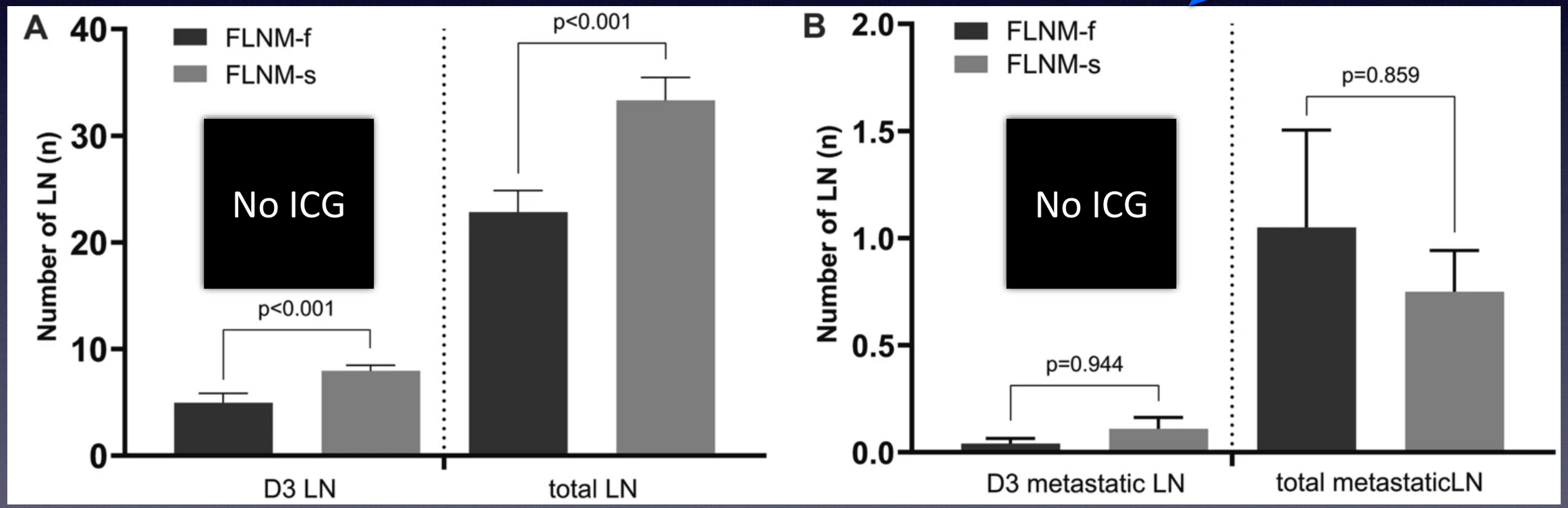
ICG improves LN yield within a window of 24 hrs

Ribero D, Mento F, Sega V, Lo Conte D, Mellano A, Spinoglio G. ICG-Guided Lymphadenectomy during Surgery for Colon and Rectal Cancer-Interim Analysis of the GREENLIGHT Trial. Biomedicines. 2022 Feb 24;10(3):541. doi: 10.3390/biomedicines10030541. PMID: 35327344; PMCID: PMC8945555.

LN Yield

>LN retrieved
P <.001

+LN similar
P=.859



ICG >12 LN yield by 4X, but not ⊕LN

Ahn, Hm., Son, G.M., Lee, I.Y. et al. Optimal ICG dosage of preoperative colonoscopic tattooing for scence-guided laparoscopic ctal surgery. Surg Endosc 36, 1163 (2022). https://doi.org/10.1007/s00464-021-08382-5

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Extent of D3 Lymphadenectomy
GREENLIGHT Trial

N=70	Outcome	Remarks
↑↑ LN	50% of cases change of dissection due to ICG	R Colon (63.1%) L Colon (55.0%) Rectal (38.7%)
Outside standard basin		↓ Rectal (post CRT)
Median LN	16	2 LN above non-ICG

ICG improves LN yield in CME (D3)

Conte D, Melfano A, Spinoglio G. ICG-Guided Lymphadenectomy during Surgery for Colon and Rectal Cancer-Interim Analysis of the GREENLIGHT Trial. Biomedicines. 2022 Feb 24;10(3):541. doi: 10.3390/biomedicines10030541. PMID: 35327344; PMCID: PMC8945555.

Location of Aberrant LN in D3 GREENLIGHT Trial

N=70	LN Location	⊕LN outside normal basin
R Colon	Around Pancreas	4/9
L Colon	Para-aortic Aortocaval	6/10
Rectum	Para-aortic Aortocaval	10/10

Without ICG aberrant LN may be missed even in D3 dissection

Sega V, Lo A, Spinoglio G. adenectomy Colon and rim Analysis of rial. Biomedicines. 2022 Feb 24;10(3):541. doi: 10.3390/biomedicines10030541. PMID: 35327344; PMCID: PMC8945555.

ICG Identify Patients with ⇊ Survival

N=220 (50 ICG)	LN	Lower Survival	P-value
Detection Rate	98%	-	
Accuracy	8		
Sensitivity	6		
Micro-mets Isolated Tumor Cells	5/29 (17%) in ⊖LN pts	HR 1.96	0.09

ICG identify a subset of patients with ↓↓survival

Mapping with Isosulfan Blue or Indocyanine Green in Colon Cancer Shows Comparable Results and Identifies Patients with Decreased Survival: A Prospective Single-Center Trial. World J Surg. 2017 Sep;41(9):2378-2386. doi: 10.1007/s00268-017-4051-2. PMID: 28508233.

Correlation: ICG and ⊕ LN

Survival data

ICG	⊕LN	⊖LN	%	P-value
Fluorescent	12	210	5.7%	Non
Non-Fluorescent	56	1,147	4.9%	Non

ICG improves total LN yield, but not ⊕LN

Ushijima H, Kawamura J, Ueda K, Yane Y, Yoshioka Y, Daito K, Tokoro T, Hida JI, Okuno K. Visualization of lymphatic flow in laparoscopic colon cancer surgery using indocyanine green fluorescence imaging. Sci Rep. 2020 Aug 31;10(1):14274. doi: 10.1038/s41598-020-71215-3. PMID: 32868829; PMCID: PMC7459107.

Conclusions

ICG is an objective way to improve D3

ICG improves LN yield & detection rate

Probably Neoadjuvant chemoradiation in Rectal CA lowers the value of ICG

ICG ⊕LN ≠ CA ⊕LN

R Colon: LN missed Peri-pancreatic

L Colon & Rectal CA: LN missed: Para-aortic and aortocaval

Optimal dose 0.5-1 mg/ml given within 24 hours endoscopically