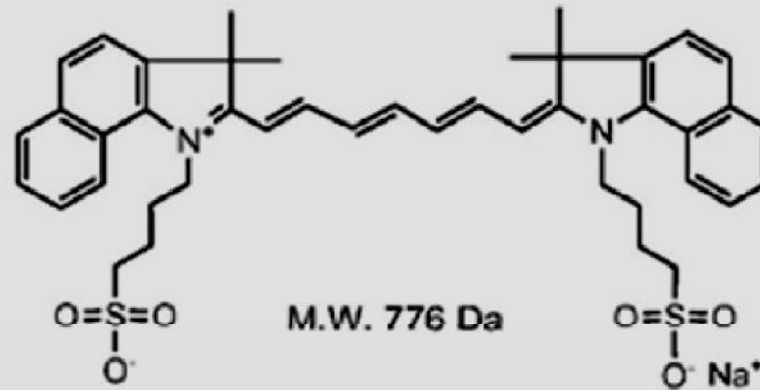


Indocyanine Green (ICG)



Excitation Peak: 807 nm

Extinction Coefficient ($M^{-1}cm^{-1}$): 121,000

Emission Peak: 822 nm

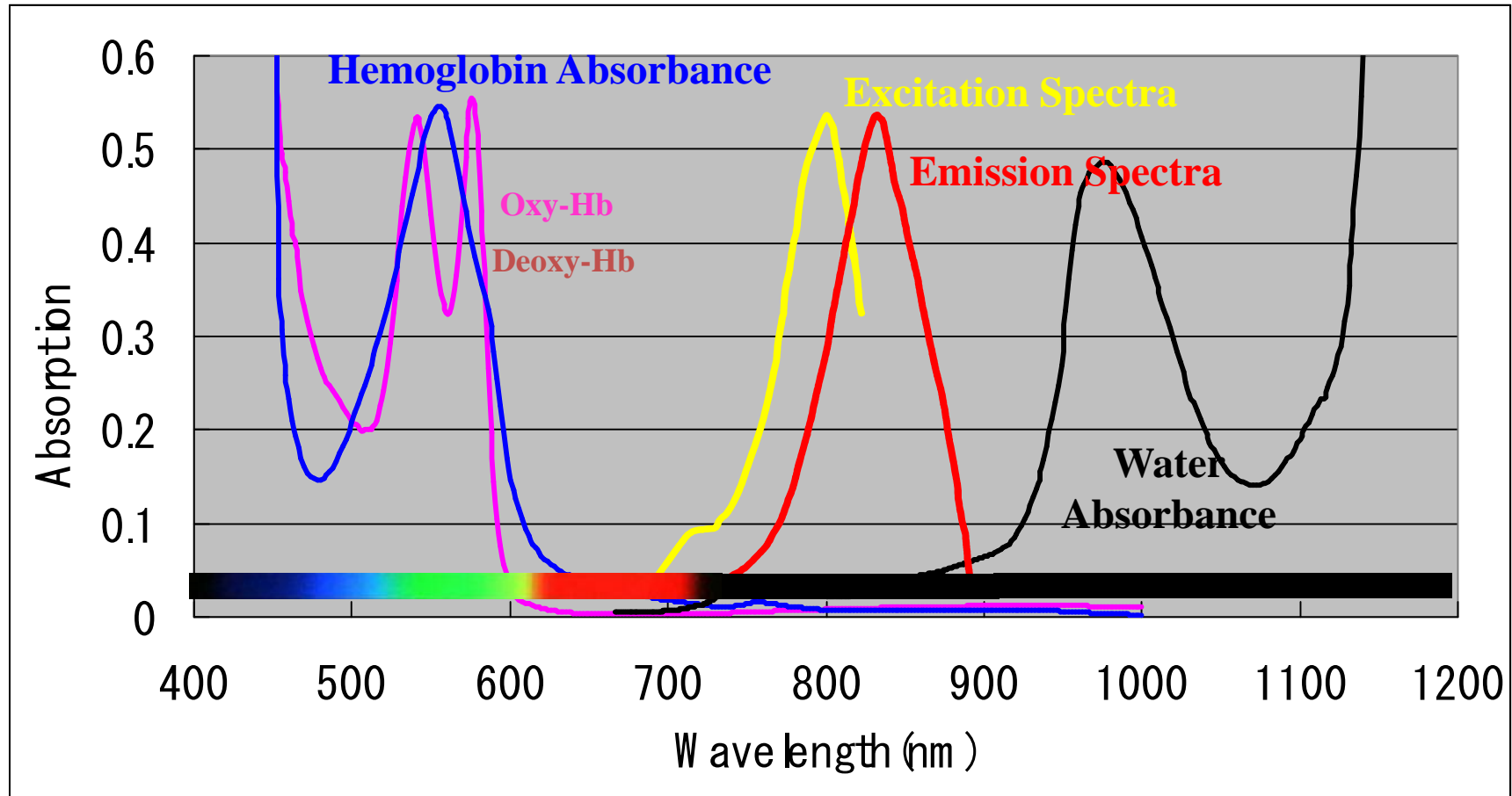
Quenching Threshold: 10 μM

Quantum Yield: 9.3%

ICG fluorescence spectra

ICG spectra in NIR

Near infrared wavelengths
So-called `optical window`



Surgical application of ICG fluorescence imaging

Vascular imaging

Sentinel node biopsy

Hepatic imaging

Vascular imaging in cardiac surgery

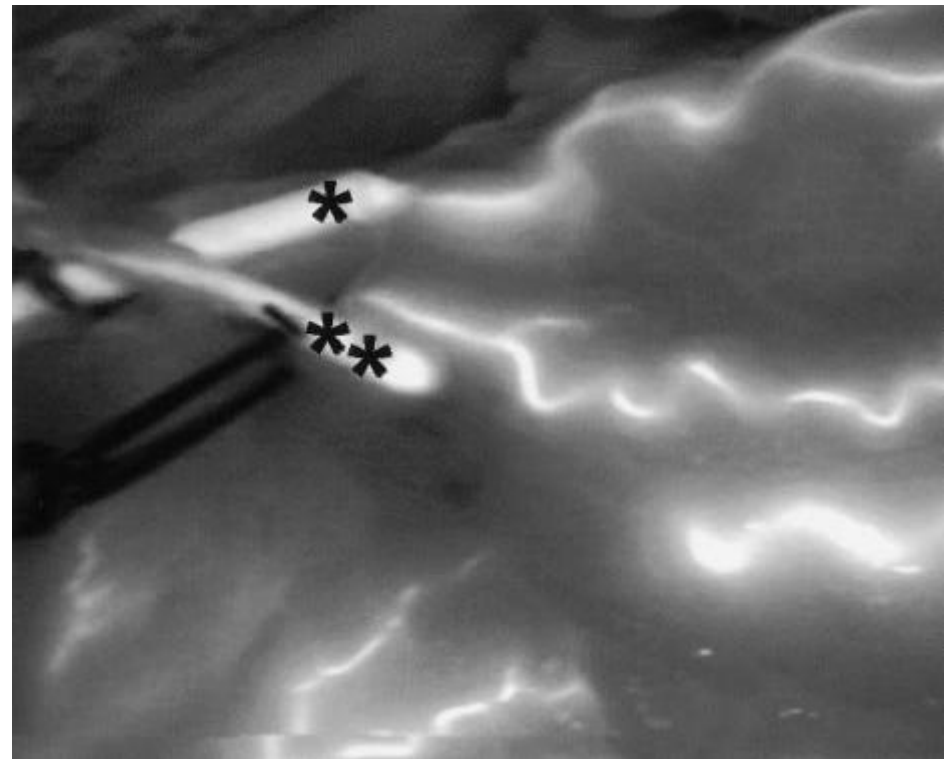
Novadaq SPY*

Intraoperative Quality Assessment in Off-Pump

Coronary Artery Bypass Grafting

Oliver Reuthebuch

CHEST 2004; 125:418–424



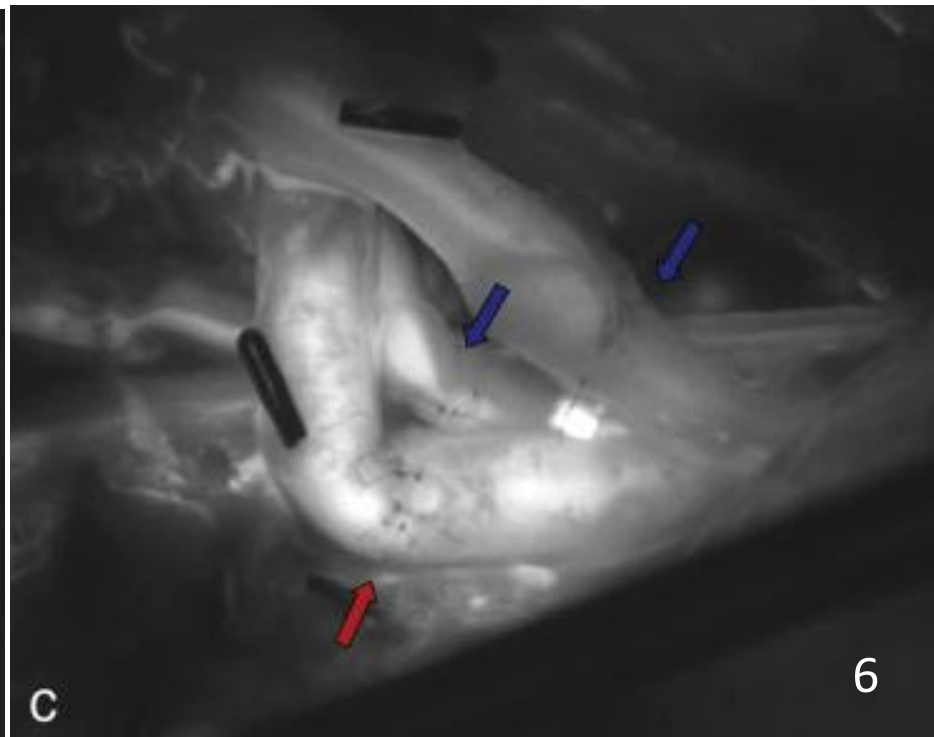
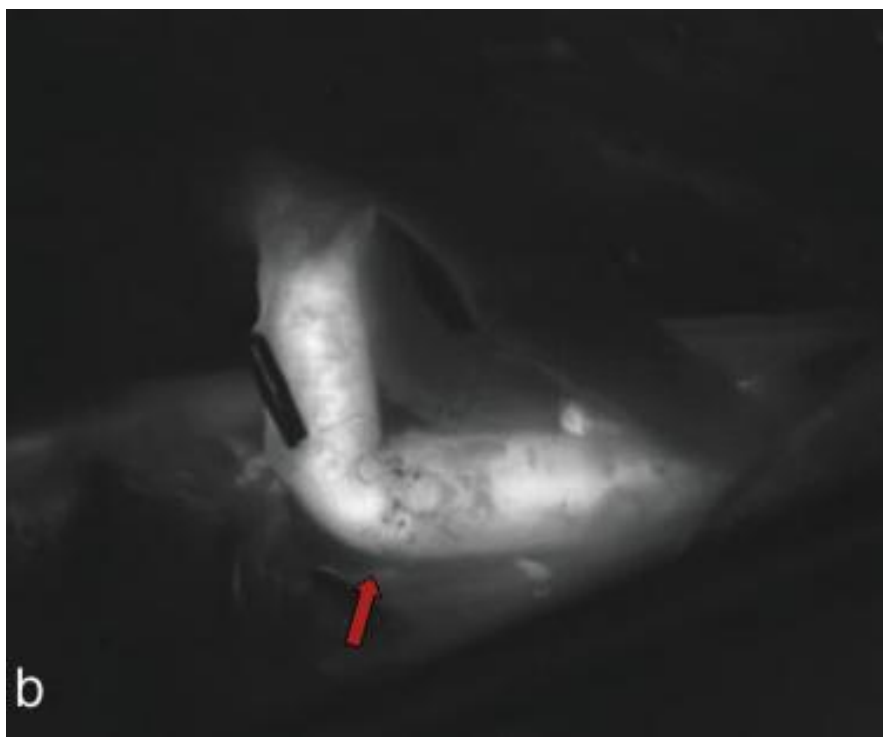
Presently available NIR fluorescence imaging systems

Imaging system	Excitation wavelength	Light source	Field of view	Working distance	Color video
SPY (Novadac)	806 nm	Laser	7.5*7.5 cm	30 cm	No
PDE-neo (Hamamatsu)	760 nm	LED	10*10 cm	20 cm	Yes (alternative)
Fluobeam (Fluoptics)	690 nm or 780 nm	Laser	12.4*8.4 cm	15 cm	No
FLARE Mini-FLARE	670 nm and 760 nm 670 nm or 760 nm	LED	15*11.3 cm 12*9 cm	45 cm 32 cm	Yes (simultaneous)
HyperEye (Mizuho)	760 nm	LED	10*10 cm	30 cm	Yes (simultaneous)

Microvascular surgery

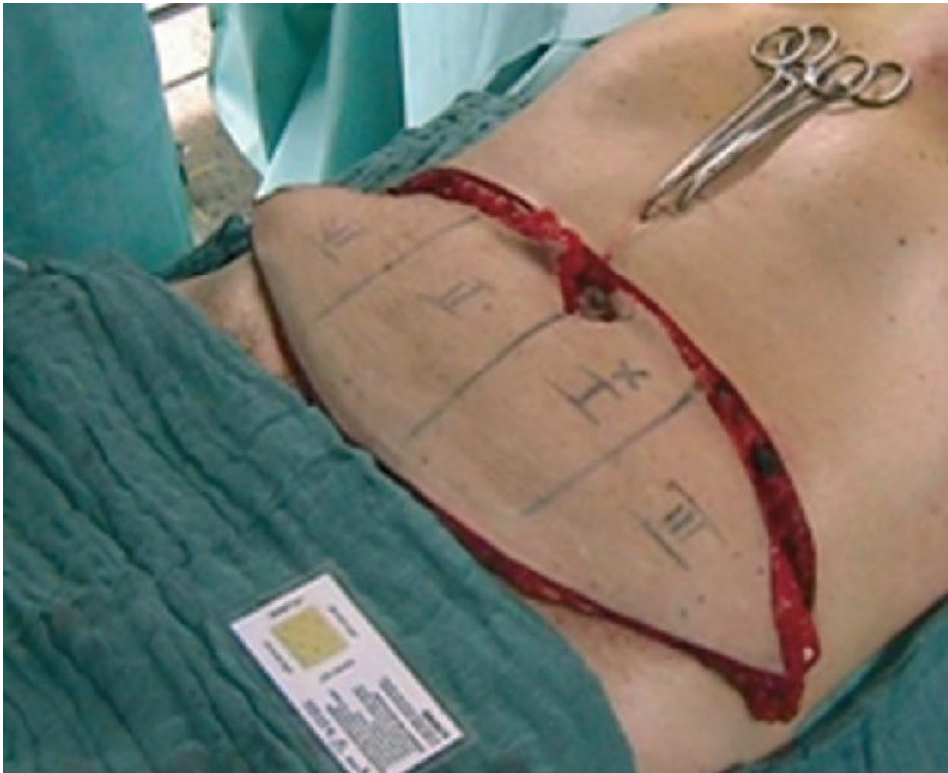
CHARLOTTE HOLM

Microsurgery 29:509–514, 2009



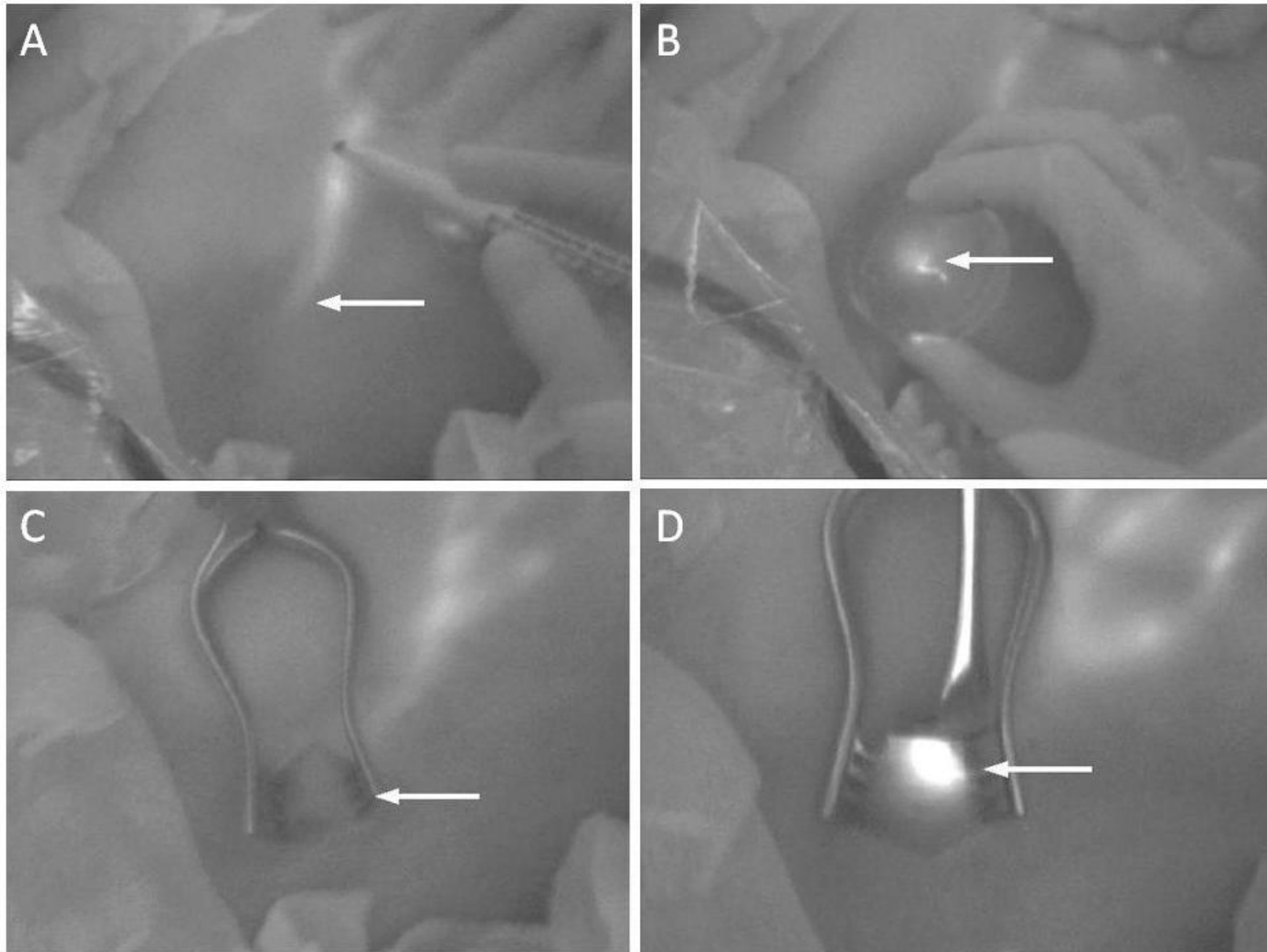
Plastic surgery

Charlotte Holm (*Plast. Reconstr. Surg.* 122:1612, 2008)



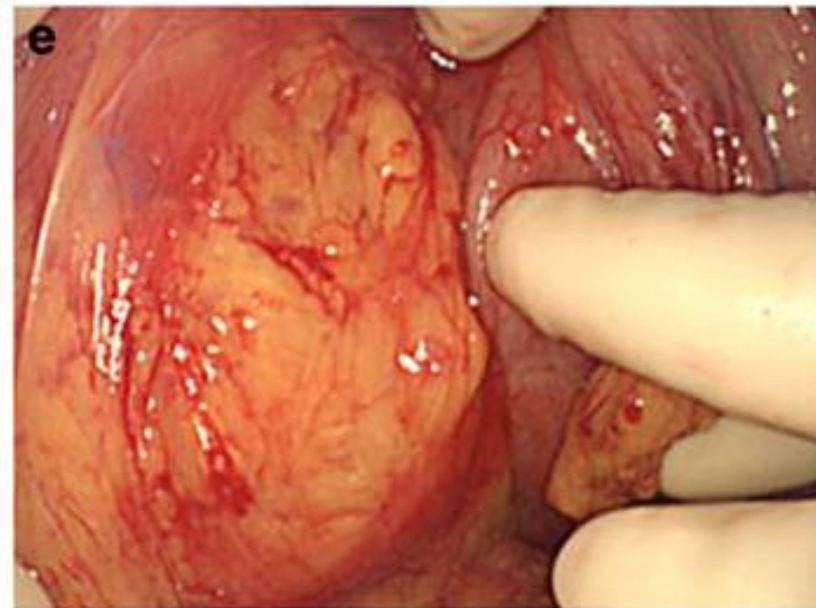
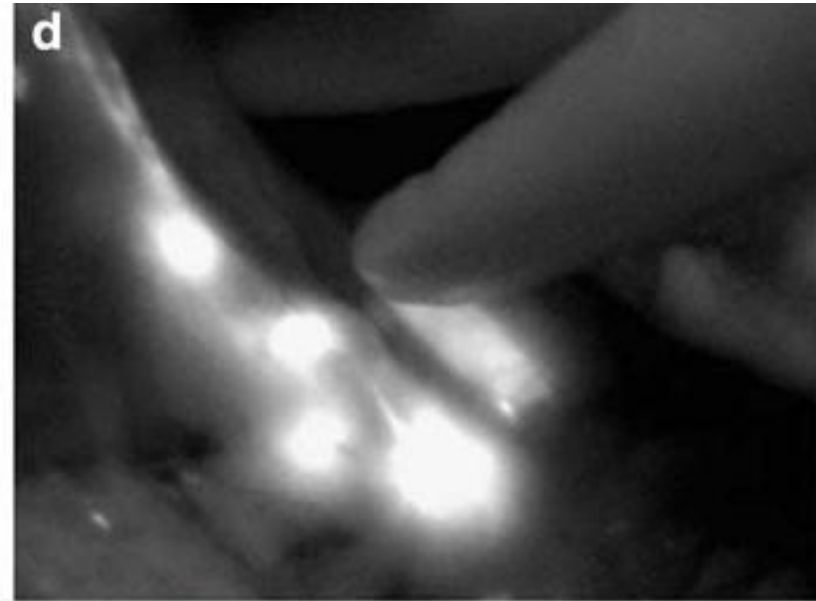
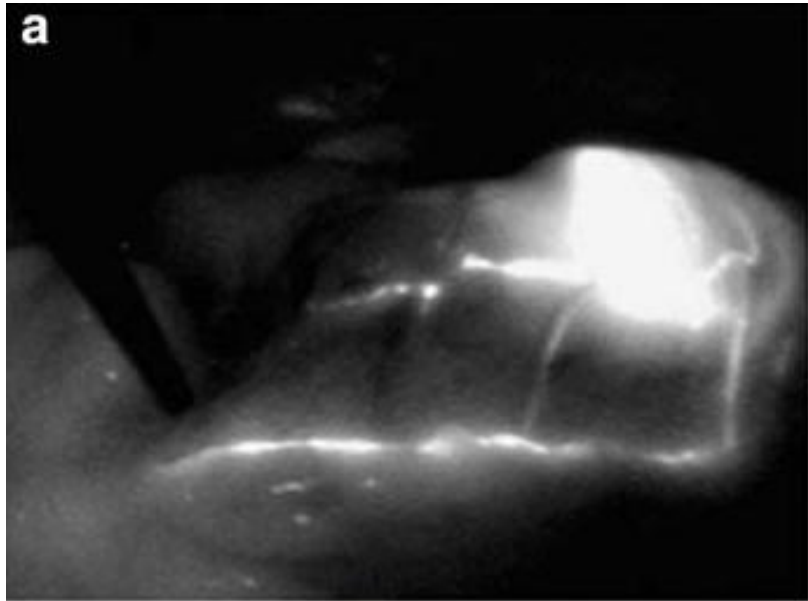
SNB in breast cancer

Toshiyuki Kitai
The Open Surgical Oncology Journal, 2010



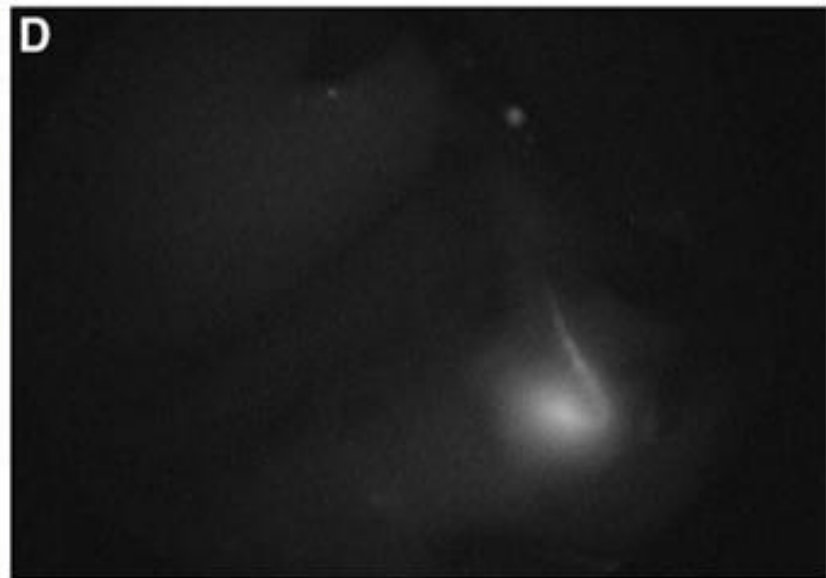
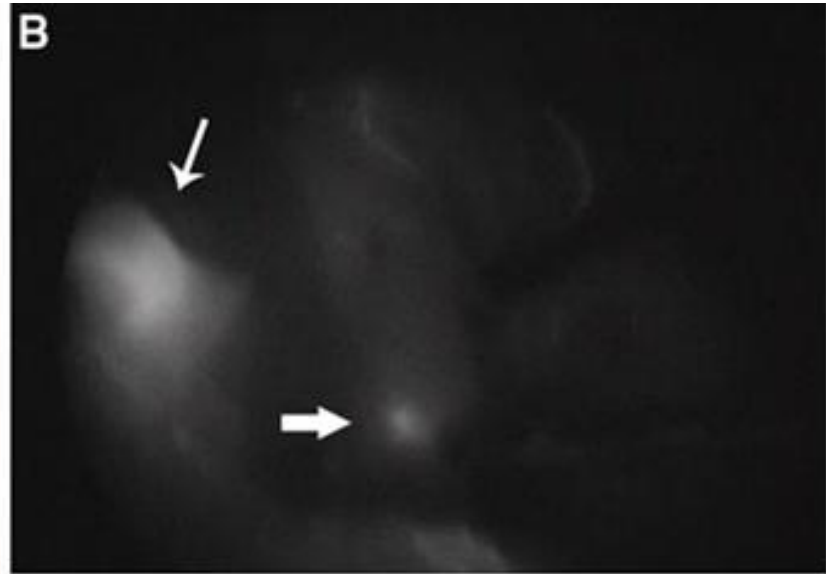
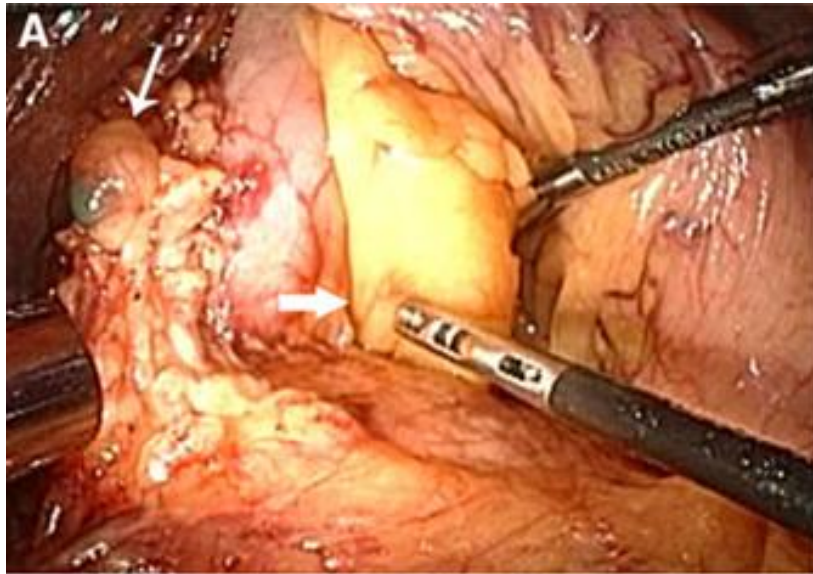
SNB in gastric cancer

Isao Miyashiro, J Surg Oncol 2008



Laparoscopic SNB in gastric cancer

Isao Miyashiro, Surg Endosc 2010

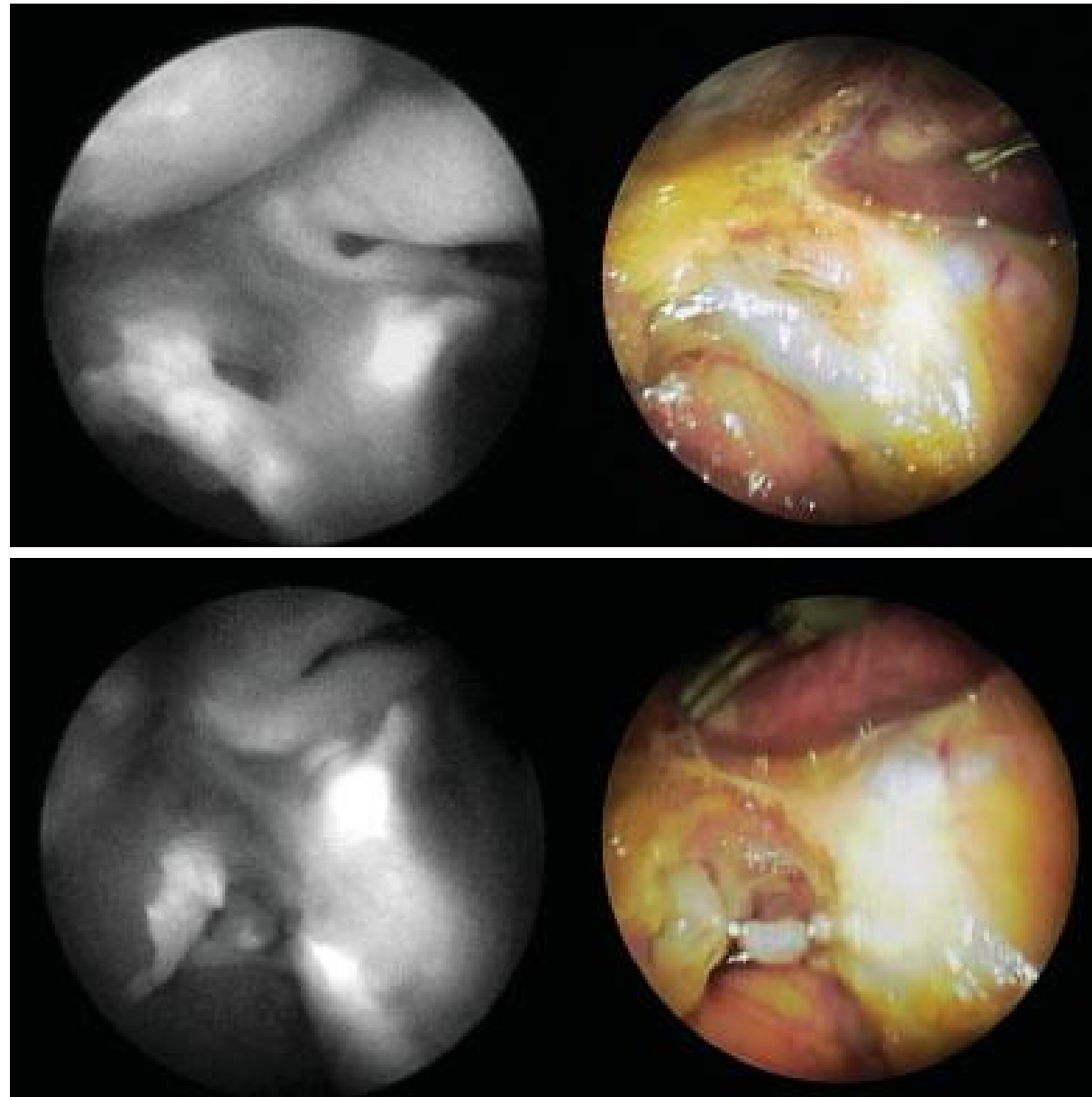


SNB is not a standard practice in cancer other than breast or skin

- 1) Lymph node dissection is closely associated with primary site resection.
- 2) Local control for the cases of false negative or local recurrence is difficult.

ICG fluorescence navigation method may be beneficial to reduce the false negative cases.

Hepatic imaging

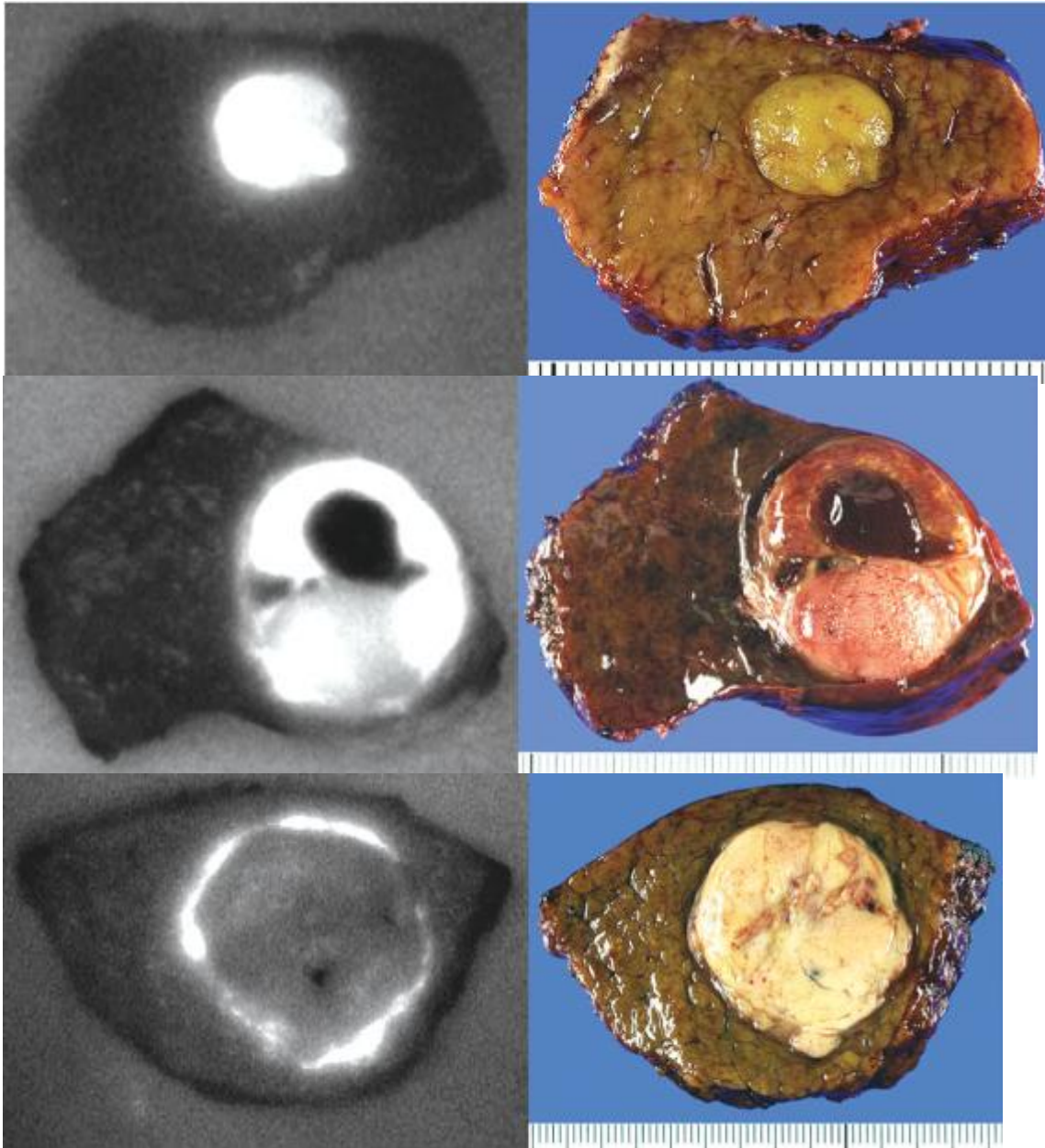


Fluorescent cholangiography illuminating the biliary tree during laparoscopic cholecystectomy

T. Ishizawa

British Journal of Surgery 2010; **97**: 1369–1377

Hepatocellular carcinoma and metastatic liver cancer



Futurte perspective

Cancer imaging by conjugating with tumor specific antibody (trastuzumab) or enzymes (galactosidase, MMP)