AB050. SOH21AS071. In-silico colorectal cancer discrimination via near infra-red fluorescence angiography

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Background: Near infra-red fluorescence (NIR) using indocyanine green (ICG) is an ascendant technique for colonic intra-operative angiography. A growing body of evidence supports its use in determining perfusion in colorectal anastomosis and research has investigated the quantitative significance of patterns of flow. On the other hand, still image analysis of ICG in tumour tissue reveals possible pathological discernability. With computational enhancement this dynamic digital angiogram may discriminate between normal colonic mucosa and cancerous tissue when applied intra-luminally.
Methods: Colorectal patients undergoing examination under anaesthesia for rectal cancer received intravenous ICG at 0.25 mg/kg while recording an intra-luminal view with an endo-laparoscopic near infra-red stack (Pinpoint, Stryker) trans-anally. Videos were then processed using bespoke software, and time intensity plots were charted. The temporal-fluorescence curves for tumours and healthy control tissues were interrogated statistically for discriminatory curve patterns and milestones.
Results: This method allowed collection of rich temporal fluorescence curves and the bespoke software was able to generate significant data for statistical interrogation. When compared to control tissue cancerous colonic lesions displayed a significantly shallower upslope, taking longer to rise from baseline and achieve their peak. Benign lesions showed a significant brisker outflow of ICG with greater downslope gradients later in the curve.
Conclusions: Endoluminal ICG flow varies between different colonic pathologies. These discernable variations in continuous fluorescence signals may be exploited using computational ability to characterise neoplastic lesions.
Keywords: Colorectal cancer; indocyanine green (ICG); artificial intelligence; near field fluorescence; fluorescence angiography

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Footnote

Conflicts of Interest: Prof. RAC is named on a patent filed in relation to processes for visual determination of tissue biology, receives speaker fees from Stryker Corp, research funding from Intuitive Corp and holds research funding from the Irish Government in collaboration with IBM Research in Ireland. Drs. JD and NH and are employed as researchers on the same collaboration. Dr. PH is employed by MathWorks®. Prof. DO has a financial interest in patents filed and granted relating to NIR-fluorophores and processes for visual determination of tissue biology. The other 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.

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