V-2 Role of fluorescence imaging and artificial intelligence in colorectal surgery

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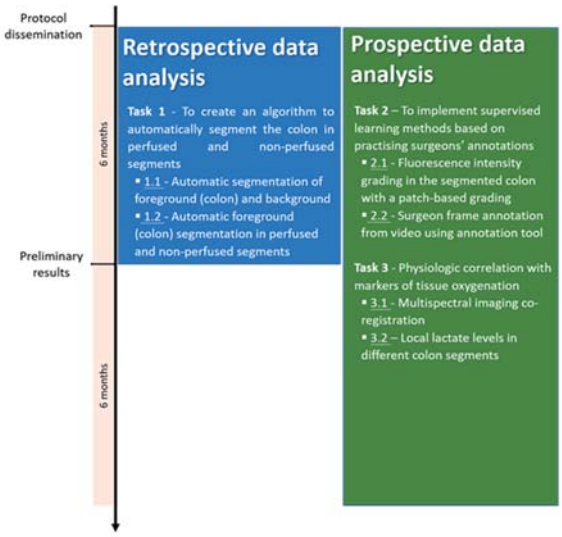
Intraoperative fluorescence angiography enables the assessment of bowel perfusion. An adequate bloodflow remains the key determinant of an anastomotic leak. Traditional practice has been to check for the pulsation of the marginal artery, bleeding from the cut edges of the bowel and/or assessment of the colour of the bowel segments that form the anastomosis. These are all subjective assessments and rarely provide a clear demarcation between well-perfused and non-perfused tissue.

The use of Indocyanine Green (ICG) in left-sided resections has been standardised with regards to technique and can lead to a change in resection margin in 3.7-19% of cases when compared to standard clinical assessment. However, there is a non-quantified degree of variability related to the signal characteristics of the fluorescence and consequently, the point of bowel transection. Specifically, after checking for the fluorescent signal, there is no guidance as to what constitutes "optimal perfusion", and at which point the transection should be made. Various investigations have attempted to quantify perfusion when using ICG but these lack specificity and clinical application.

The use of artificial intelligence techniques has begun to show promise and potential in interventional healthcare specialities such as radiology and pathology. Machine learning concepts through the subspecialty of neural networks (convoluted and recurrent) are specifically suitable for analysing image and video data. This technique has the potential to be used in the assessment of fluorescent perfusion and may assist the surgeon in determining the optimal area for transection, thereby enabling complete standardisation of this assessment.

By developing algorithms from retrospective and subsequently prospective training sets, there is an opportunity to machine learning techniques to help augment the surgical decision-making process.



However there remain limitations for real-time analysis. There needs to be correlation with clinical data and patient outcomes. Furthermore, there needs to be sufficiently powerful processors that are able to analyse the video feed in real-time and provide the accurate information to the surgeon. And the most challenging aspect is too collect a sufficient quantity of video data to build and train the algorithm.