Gastroenterologists' perceptions about a new multimodal photonics endoscope for in-vivo colorectal cancer diagnosis

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1. Introduction

Due to the high incidence and mortality rate of colorectal cancer, it is essential to perform an early detection of the disease. In the current colonoscopy standard method, all polyps detected are removed and analyzed, even benign. Sometimes, residues of the polyp remain and there are recurrence rates. It is necessary to determine the invasion depth of the polyp to achieve a better diagnosis. Almost 30% of polyps are not detected, especially flat polyps.

2. Methods

PICCOLO project aims to develop an endoscope based on photonic technologies to improve the diagnosis of colorectal cancer by providing an in-vivo optical biopsy to get the diagnosis in real time. With white light the polyps would be detected, and with OCT (Optical Coherence Tomography) and MPT (Multi-Photon Tomography) photonic technologies it is intended to classify hyperplastic and neoplastic polyps. Software based on deep learning algorithms would allow performing such processes. Moreover, the depth of the polyp could be get, as well as evaluate its safe removal.

PICCOLO project has been presented to gastroenterologists with a video, after which attendants were asked to fill in a survey to get feedback from end-users about the PICCOLO system.

3. Results

21 gastroenterologists filled in the survey, whose results are shown in Table 1.

4. Discussion & Conclusion

According to gastroenterologists' opinion, PICCOLO system would meet the current medical needs of colorectal cancer diagnosis. Although participants had no previous experience with OCT and MPT, they think that it would improve results obtained with imaging techniques they currently use (NBI). The new endoscope would contribute with in-situ diagnosis decision based on visual aids and marks, as gastroenterologists prefer. PICCOLO system would not replace any clinical staff, but would serve as support and assistance for the detection and decision making in the diagnosis of colorectal cancer, avoiding thus the distrust shown by participants to a diagnosis provided by software without the supervision of a human expert. Usual handling and short acquisition time provided by PICCOLO system would meet preferences of participants to use it in their service.

Table 1	Results of questionnaire		
Question	Value	n	%
Job status			
	Resident	7	33.33
	Gastroenterologist	14	66.66
Do you think the PICCOLO device would meet the current medical needs related to colonoscopy procedure and colorectal cancer diagnosis?			
	Yes	20	95.24
	No	1	4.76
Do you have previous knowledge or experience with photonic technologies?			
	Optical Coherence Tomography (OCT)	0	0.00
	Multiphoton Tomography (MPT)	0	0.00
	Fluorescence spectroscopy	0	0.00
	Narrow Band Imaging (NBI)	16	76.19
	Other	3	14.29
	None	4	19.05
Do you think PICCOLO (OCT, MPT and fluorescence) would improve results obtained with advanced imaging techniques currently used (NBI, chromoendoscopy, etc.) for colorectal cancer diagnosis?			
	Yes	20	95.24
	No	1	4.76
Do you think it is important that a system such as PICCOLO could provide additional information (for example, polyp warning!) for supporting the decision-making in the assessment of polyps or colorectal cancer?			
	Yes	21	100.00
	No	0	0.00
How would you like the associated software to provide you with such additional information?			
	Highlight it over the endoscopic image	20	100.00
	Show it outside the endoscopic image	0	0.00
	Inform by acoustic warning	0	0.00
Current diagnostic patterns (Paris, Kudo, etc.) have a high intra- and inter-observer variability. Would you trust the diagnosis obtained by a software automatically?			
	Yes, absolutely	2	9.52
	Yes, under the supervision of a human expert	12	57.14
	No, but it would be good support for my decision	7	33.33
	Not at all	0	0.00
Would you use this system in your service?			
	Yes	19	90.48
	No	2	9.52
What characteristics would you give more importance to?			
	Good handling	16	88.89
	Short acquisition and processing time	13	72.22
	Reasonable price	14	77.78
	Overall standard size	2	11.11
	Compatible output	7	38.89