SUPCAM EUROPEAN PROJECT: PRELIMINARY PROTOTYPING AND TEST OF A NEW GENERATION ACTIVE ENDOSCOPIC COLON CAPSULE

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INTRODUCTION: Optical colonoscopy is currently the diagnostic gold standard for colic diseases, however it is also invasive, risky and embarrassing and minimally invasive diagnostic procedures are required. Market available video endoscopic capsules (VCE) explore the GI tract proceeding by means of visceral peristalsis and gravity. Higher diagnostic accuracy, more extensive clinical application and shorter times of investigation would be achieved by controlling the VCE locomotion. Some authors demonstrated that magnetic fields allow controlling the VCE movement. However the cylindrical shape, while may be suitable for the small intestine, esophagus and stomach, in the colon, due to its anatomical features, has intrinsic disadvantages as regard to VCE propulsion, surface friction and cleaning. Other limits of the previous solutions depend on the movement control precision, or in the use of a very cumbersome and expensive external instrumentation. The SUPCAM concept is based on the development of an innovative Active VCE (AVCE) whose design allows to safely and accurately guide it along the colonic lumen from the outside, using an innovative electromagnetic approach and an external compact assisted handle adapted to be transported and suitable for common outpatient setting. The SUPCAM EU Project is aimed at developing a new generation of AVCE able to investigate the colon, ensuring a high level of navigation and diagnostic accuracy.

AIMS & METHODS: The aim of this study is to present a new mechanical configuration of a colon capsule and to demonstrate its precise locomotion in the colon from the anus to the cecum and vice versa through external magnetic fields generated by an external low-cost and assisted magnetic handle. An external electromagnetic handle and a capsule prototype were developed within the SUPCAM Project. Experimentally the prototype locomotion capabilities were assessed with motion control tests inside an insufflated human-sized plastic phantom colon.

RESULTS: A prototype of a double sphere colon capsule and external low-cost and assisted magnetic handle for magnetic fields generation and capsule propulsion have been fabricated. The prototype has been inserted transanally into the phantom colon. The endoscopist, moving manually the external handle, drove and accurately oriented the SUPCAM capsule within the phantom colon from the anus to the cecum and vice versa.

CONCLUSION: Our study demonstrated the development and test of a capsule prototype with a completely new double sphere mechanical configuration and an innovative electromagnetic approach. SUPCAM mechanical prototype allowed a precise, effective and safe propulsion and orientation in a phantom model through a low-cost, compact and easily manageable external assisted magnetic handle. In our opinion, SUPCAM endoscopy represents a highly innovative and disruptive solution for colon diseases diagnosis and screening. The further development of this innovative magnetically controlled AVCE, reducing clinical risk, improving tolerance, acceptability, territory availability and adherence to colorectal cancer screening programs, will provide significant benefits for patients and the whole healthcare system. Other studies are planned to test performance of more advanced SUPCAM prototypes in ex-vivo and in-vivo settings.

I confirm having declared any potential Conflict of Interest for ALL authors listed on this abstract: Yes

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