SAS Journal of Medicine
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspublishers.com

OPEN ACCESS

Hepato-Gastroenterology

Artificial Intelligence and Digestive Endoscopy: A Revolution for Gastroenterology

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DOI: 10.36347/sasjm.2022.v08i11.012 | **Received:** 08.10.2022 | **Accepted:** 13.11.2022 | **Published:** 27.11.2022

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Abstract **Review Article**

Digestive endoscopy is experiencing a whole new era with the introduction of artificial intelligence. It is a very wide field of application, from upper to lower digestive endoscopy. Several systems have already emerged, whether for oesophago-gastro-duodenal fibroscopy, video-capsule endoscopic small bowel, and colonoscopy or hepatobiliary exploration. Morocco is considered a hub for Africa in the field of artificial intelligence; however the place of the latter in digestive endoscopy is still unclear.

Keywords: Digestive endoscopy, Artificial intelligence, Innovation.

INTRODUCTION

For decades, we have witnessed an invasion of artificial intelligence (AI) in the human world. Artificial intelligence (AI) currently occupies an important place that continues to grow.

Step by step, AI is entering the world of health. It is revolutionizing it by using automatic learning models to facilitate diagnosis, therapy and monitoring. It allows for early treatment thanks to a diagnosis made more quickly.

Digestive endoscopy constitutes a vast field of application for AI, encompassing screening, diagnosis, characterization, therapy, prognosis, and this for any type of intervention.

Artificial Intelligence: What is it?

It seems necessary to us to recall beforehand some more general notions concerning on the one hand the definition of AI itself and on the other hand its potential applications in the field of digital health.

The latter constitutes “the set of theories and techniques implemented with a view to producing machines capable of simulating human intelligence” according to the Robert dictionary. Its application in health is to use machine learning models to search medical data and uncover insights to improve health outcomes.

Artificial Intelligence and Digestive Endoscopy

Endoscopic techniques are evolving very rapidly, partly thanks to artificial intelligence. Endoscopy represents a vast field of applications at all levels. We present here some examples of the application of AI on upper and lower digestive lesions.

-> Oeso-Gastro-Duodenal Fibroscopy

Most of the work has focused on bringing artificial intelligence to colonoscopy, but AI has a lot to bring to upper GI endoscopy as well. Current research focuses on its application in particular: gastroesophageal reflux disease, Barrett's esophagus and gastric cancer.

Gastroesophageal Reflux Disease (GERD)

GERD is a common pathology of clinical diagnosis. The indication for endoscopy is codified. The contribution of AI would consist in using electronic staining, for example of the Narrow Band Imaging (NBI) type, to better differentiate between healthy and pathological mucosa. In 2021, a study compared GERD images using the Los Angeles classification on conventional endoscopy and endoscopy using NBI electronic staining. The results showed that the

accuracy of endoscopy with NBI was 87.9% while that of conventional endoscopy was 75% [1].

Gastric Cancer

Endoscopic diagnosis is difficult because of two major problems: firstly at an early stage, the lesions are difficult to detect with the naked eye, secondly it is difficult to estimate the depth of invasion when it is a parameter that determines support. Several advances have emerged to help detect, delimit and also estimate the depth of invasion. Including: NBI, Flexible Color Spectral Imaging (FICE), Blue Light Imaging (BLI) or CADx [5].

-> Endoscopic Video-Capsule

The endoscopic videocapsule is a means of visualizing the mucous membranes that cannot be reached by the endoscope, in particular the small intestine mucosa. It has all its interest in the exploration of unexplained anemia but also in chronic inflammatory pathologies of the intestine and other small intestine pathologies [6]. The analysis of video capsules is a challenge for gastroenterologists because it includes thousands of images and the lesions are mostly millimetric. Among the AI solutions currently being developed, the most mature are those concerning the automated detection of videocapsule lesions. The fields of application of AI cover: assisting in the detection of polyps, the detection of gastrointestinal-hemorrhages and angio-ectasias, the diagnosis of celiac disease and Crohn's disease [7].

-> Colonoscopy

The application of artificial intelligence to colonoscopy has been booming for a decade. Several studies have focused on the benefits of its contribution to colonoscopy and in particular to the diagnosis and characterization of polyps [5].

Assistance

Artificial intelligence is a means of assistance to the practitioner, there are algorithms which make it possible to ensure in real time the quality of a colonoscopy by analyzing the ratio of dirt/cleanliness but also blur/sharpness to guarantee an examination accurate and not miss a lesion [8].

Polyps

Artificial intelligence not only helps in the real-time detection of polyps but also their characterization by classifying them as adenoma or hyperplastic polyp with a sensitivity of around 96%. Several studies have compared the results without and with AI and have concluded that AI improved the percentage of polyp detection significantly [5, 8, 9].

There are two kinds of systems. Either a classic colonoscopy image analysis system or a zoomed image analysis system (endocytoscopy).

According to the guidelines of the European Society of Gastrointestinal Endoscopy (SEEG), all polyps > 5 mm must be respected and sent for anatomo-pathological study. The same applies to small polyps of <5 mm with an adenomatous structure. There is a way thanks to artificial intelligence to know if the structure is adenomatous or not in per-endoscopy for small polyps which modifies the course of action and avoids unnecessary resections.

-> Hepatobiliary

One of the problems of pancreatology remains the distinction between tumor tissue and pseudo-tumor or even normal inflammation. Recently, the concept of ultrasound-endoscopic computer-assisted diagnosis of pancreatic cancer (endoscopic diagnosis by computer-assisted ultrasound or EUS-CAD) has come into its own. For example, by helping to guide an interventional gesture, with the possibility of having training platforms to recognize and puncture the most difficult areas under echoendoscopy or solutions to help with the diagnosis of adenocarcinoma, auto pancreatitis-immune or papillary and mucinous intraductal tumors of the pancreas and thus guide the punctures [4].

Artificial Intelligence and Endoscopy: State of Play in Morocco

In Morocco, artificial intelligence is booming. In 2018, the "Benguerir Declaration" was born following a strategic reflection and a debate between UNESCO, OCP and UM6P on the different dimensions of artificial intelligence in the African context. In the continuity of this declaration, the OCP and the UM6P created in 2020 the International Center for Artificial Intelligence of Morocco, a reference center in Artificial Intelligence and a hub for the transformation of artificial intelligence on an African scale [10].

The place and the practical, daily and codified use in Morocco of artificial intelligence in digestive endoscopy is still unclear.

CONCLUSION

It is important to emphasize that to create an AI medical system, collaboration with expert clinicians in endoscopy is essential, especially at the level of learned societies in order to unify information. Gathering a bank of varied images annotated by experts is a first step in building the computer database. The quality of these databases is of paramount importance for the efficiency of the functioning of artificial intelligence and is determined by the value of the medical team that participated in its development.

REFERENCES

1. Wang, C. C., Chiu, Y. C., Chen, W. L., Yang, T. W., Tsai, M. C., & Tseng, M. H. (2021). A deep learning model for classification of endoscopic gastroesophageal reflux disease. *International*

journal of environmental research and public health, *18*(5), 2428.
2. Macías-García, F., & Domínguez-Muñoz, J. E. (2016). Update on management of Barrett's esophagus. *World journal of gastrointestinal pharmacology and therapeutics*, *7*(2), 227-34.
3. Mori, Y., Kudo, S. E., Mohmed, H. E., Misawa, M., Ogata, N., Itoh, H., ... & Mori, K. (2019). Artificial intelligence and upper gastrointestinal endoscopy: Current status and future perspective. *Digestive Endoscopy*, *31*(4), 378-388.
4. Bonnaud, G. Santé numérique et hépato-gastro-entérologie.
5. Sinonquel, P., Eelbode, T., Bossuyt, P., Maes, F., & Bisschops, R. (2021). Artificial intelligence and its impact on quality improvement in upper and lower gastrointestinal endoscopy. *Digestive Endoscopy*, *33*(2), 242-253.
6. Présent et futur de l'endoscopie par capsule [Internet]. FMC-HGE. [cited 2022 Aug 20]. Available from: https://www.fmcgastro.org/textes-postus/no-postu_year/present-et-futur-de-lendoscopie-par-capsule/
7. Sullivan, P., Gupta, S., Powers, P. D., & Marya, N. B. (2021). Artificial intelligence research and development for application in video capsule endoscopy. *Gastrointestinal Endoscopy Clinics*, *31*(2), 387-397.
8. Dray, X., Leenhardt, R., Histace, A., & Becq, A. (2019). Intelligence artificielle et endoscopie: le meilleur des mondes?. *Hépato-Gastro & Oncologie Digestive*, *26*(3), 319-331.
9. Hassan, C., Spadaccini, M., Iannone, A., Maselli, R., Jovani, M., Chandrasekar, V. T., ... & Repici, A. (2021). Performance of artificial intelligence in colonoscopy for adenoma and polyp detection: a systematic review and meta-analysis. *Gastrointestinal endoscopy*, *93*(1), 77-85.
10. UM6P. L'Intelligence Artificielle au service de nouveaux modèles de développement [Internet]. [cited 2022 Sep 12]. Available from: https://um6p.ma/index.php/arabe/node/6871