Opinion

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Will Artificial Intelligence Unveil Hepatocellular Carcinoma?

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ABSTRACT

Abbreviations: AI: Artificial Intelligence; ML: Machine Learning; DL: Deep Learning; HCC: Hepatocellular Carcinoma; TACE: Transarterial Chemoembolization

Opinion

Dear Editor, due to continuous implementing of medical devices physicians are dealing with tremendous amount of data and clinical information. This is especially true within the oncological setting. Therefore, the management of oncological patients requires that clinical decisions be taken within multidisciplinary teams made up of clinicians, radiologists, geneticists, surgeons, pathologists, psychologists and oncologists. However, some lights may be at the end of the tunnel. Recent development of computer algorithms has reached excellent results and is now able to simulate human cognitive functions, such as learning or problem solving. This processing is called artificial intelligence (AI). AI utilized Machine Learning (ML) and deep learning (DL). The first one, ML is based on the ability of the computer to "learn" and improve from past examples without being programmed. DL is a subset of ML and is computer software that mimics the network of neurons in a brain. In DL, the learning phase occurs through a neural network. For the above reasons is clear that AI is potentially useful for making clinical diagnosis and taking clinical decisions especially in oncology.

We believe that AI could become the new tool for the management of hepatocellular carcinoma (HCC) helping to predict the onset, recurrence and prognosis. Recently, Jiménez Pérez M and Grande RG and their colleagues published a review article showing how AI could help differentiate between normal liver, chronic liver disease, cirrhosis and HCC or benign and malignant nodules. AI is able to in the diagnostic accuracy, tumor staging, treatment planning by utilizing several types of radiological images (ultrasound, CT-scan, MRI-scan, etc), WHO classifications, histopathological findings (malignant tumors non-HCC, indeterminate masses, dysplastic nodules etc.) [1]. Interestingly, the use of AI and ML techniques has also been applied on the predictivity of response both in terms of HCC recurrence after resection and after transarterial chemoembolization (TACE). In the first case, radiomics can improve predictive accuracy for HCC recurrence after curative resection [2]. Also, the effects of transarterial chemoembolization in patients with HCC can be predicted by combining clinical data and MR imaging.

The images obtained from CT, MRI or PET exams are converted into numerical data through radiomics. These data are manipulated

with the use of AI for the management of so-called "big data". With these techniques is possible to obtain from the integrated analysis of several radiological imaging the correct indications on which treatment should be performed to achieve the best clinical response [3]. Translational research in HCC has introduced amounts of molecular data. These data come from studies conducted from patients, tissues, in vitro models (cell lines and organoids) and in vivo models. In recent years, the diagnostic markers and therapeutic targets based on genomic mutations, expression of proteins, genes or metabolites between HCC and healthy tissues have been proposed. Although this methodology has led to the discovery of several drugs, that are molecularly targeted, this has not been the case in HCC. The therapeutic failure of HCC is most likely the presence of tumor heterogeneity, both among patients and within them AI could help therefore unveil HCC diagnosis and correct treatment [4].

Although promising, AI in HCC has some problematics: specific studies are needed to confirm that the developed algorithm can be used in clinical practice. Also, multicenter prospective studies are needed to avoid any bias that may later affect learning. The power of AI is affected by the fact that data are retrospectively collected and often that databases are not consistent and homogeneous. Users need to understand the true usefulness of AI, including its limitations. In addition, economics and ethical aspects can not be forgotten. Finally, statistical association does not necessarily mean a causal link. In conclusion, neural networks are efficient only if the variables are carefully chosen.

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