EDITORIAL
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ARTIFICIAL INTELLIGENCE AND BREAST RADIOLOGY

A inteligência artificial e a radiologia mamária

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Artificial intelligence (AI) is a branch of computer science that researches the development of intelligent machines. Its current success results from a history of ups and downs. Since its development in the 1950s, it had moments of complete neglect, mainly in the decades of 1970 and 1980, with cuts in research funding due to discouraging initial results (called AI winter). However, its prestige started to improve at the end of the 1990s, especially after the Deep Blue computer, from IBM, defeated the world chess champion, Garry Kasparov, for the first time. In 2016, AI had another extraordinary victory. A neural network model called AlphaGo beat the world's greatest player of the board game Go, Lee Sedol. Currently, the progress of AI had an impact so large that its true history may be just beginning. The development of machine learning (ML) and deep learning (DL), the latter inspired in biology and mimicking the human cortex, made it possible to process a large volume of data and make complex inferences, often impossible for humans[1,2].

This technology is now reaching the medical field. Specifically in radiology, it can change the way exams are analyzed. Nonetheless, assuming that the role of AI would be restricted to this stage would be too naive. It has the potential to change the whole structure of a radiology clinic, from patient arrival to the delivery of results, reducing costs, and increasing agility[3]. Clinical practice has been implementing four fundamental systems in its procedures:

- Lesion detection system: can identify and classify lesions with better performance than the traditional computer-aided detection (CAD);
- Lesion quantification system: can quantify the lesion regarding its diameter, volume, and distance from anatomical structures (papillae, skin, and others), in addition to comparing the new exam with previous ones automatically;
- Decision support system: helps to decide the best approach for the case, that is, it suggests an algorithm for research;
- Differential diagnosis system: indicates the most likely diagnosis for the lesion, as well as the main differential diagnoses.

However, some points still constitute obstacles for the wide implementation of AI in daily practice: the need for large databases, appropriately cataloged and with a broad representation of populations; a large number of different clinical scenarios for each pathology; and a high number of image findings for each condition. Another known issue is the usual difficulty of introducing to clinical practice a new technology that has been approved in clinical research[3,4].

Moreover, another essential aspect has not been defined yet: AI *regulations and legal liability*. Among the few existing publications, one from the European Union determines that no AI program can finalize a diagnosis, that is, the doctor is legally responsible for it. In the United States, in 2018, the Medical Law included the principle that "physicians must be responsible for diagnosis and therapeutic decisions," given the risk of error that still exists with AI[5]. Nonetheless, in April 2018, the Food and Drug Administration (FDA) approved the first AI device capable of diagnosing retinal lesions without the supervision of a physician. Since then, a series of tools were approved, but all of them are considered closed devices, i.e., their performance does not improve with use. The main issue is regulating devices that can enhance their performance alone. The FDA has recently published a notice declaring that it "is seeking a regulatory balance that will allow promising products to enter the market as soon as possible. However, the approval requires data demonstrating the safety of these tools in a real clinical environment"[5]. Brazil still has no legislation on the subject.

If the current questioning concerns whether AI will replace radiologists or mastologists, the answer is no. At least not in the short run, as we should take two facts into account: first, AI will probably substitute doctors who only describe their findings in an exam. Second, we will need a smaller number of radiologists to perform the same tasks. Nevertheless, the fear and resistance in the face

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of what we do not know are common and expected[6,7]. Thus, it is crucial to clarify some AI-related points:

- AI can work like the human brain: in the most different areas, AI performs only specific tasks in a given context. Each system created is limited to a set of activities. A system as complex and comprehensive as the human brain is still a distant reality;
- AI will eliminate all jobs: AI can store and analyze billions of data, in addition to carrying out tasks based on these analyses, but it cannot create strategies nor solve problems from scratch. Besides, everything that involves humanization will still depend on the interaction between a person and the machine. Jobs, as we know it today, will change, many will cease to exist, but several new ones will be created;
- AI will change the world in a few years: despite the large percentage of positions that have automated part of their processes, currently, this technology can entirely replace less than 10% of activities.

Therefore, the integration between physicians and AI has the potential to improve the workload, enhance individual performance, and reduce the risk of human error. Numerous studies have demonstrated that, currently, for a physician to have access to all information published in their specialty, they would have to study 167 hours per week, that is, more than 20 hours per day. This situation goes beyond our capacity for individual processing. If we can take advantage of the transformative potential of new technologies, we have a great chance of humanizing medicine, elevating the profession, and giving more satisfactory answers to patients regarding their need to be heard and participate in health management and promotion.

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