Editorial

Artificial intelligence (AI) in ortho-rheumatology

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A R T I C L E   I N F O

Artificial intelligence (AI) is new but well-known technology being used in each and every field including Medical science. AI can be described as the ability of a computerised machine to simulate the human brain in various pre-decided applications to help humans in day-to-day works.[1] Its use in medical science has evolved dramatically over the past decade and gaining popularity in all disciplines including Ortho-Rheumatology which is an important and well grown subspecialty of orthopaedics. It is pertinent to mention that Ortho-Rheumatology covers not only the medical aspect of Ortho-Rheumatological problem but also expanding scope to cover Surgical Ortho-Rheumatology e.g. corrective surgeries and joint replacement. Use of AI in Medical Ortho-Rheumatology is evolving however its use in Surgical Ortho-Rheumatology is growing fast and well proved e.g. Robotic Surgery (RS) for total knee arthroplasty (TKA). This editorial is a pen picture of use of AI & RS in Ortho-Rheumatology.

John McCarthy has been regarded as "Father of Artificial Intelligence". He was an American computer and cognitive scientist at Dartmouth College He coined the term AI in 1956 and defined as the science and engineering of making intelligent machines.[2] Since then AI was gaining popularity and by 21st century it became a well proved human augmentation tool for use in various field including Medical Science. Initially, use of AI in medical science was limited to interpreting medical data and images but later on extended to preoperative evaluation and decision making in surgeries. In mid 1990s, Robotic Surgery was introduced and then the use of AI & Robotics started gaining popularity as a complete package to tackle medical ailments. The first robotic applications of orthopedic surgery started in 1992 with the ROBODOC system. Applications started with hip arthroplasty continued with knee arthroplasty.[1,2] As far as Ortho-Rheumatology is concerned, these technical developments resulted in two main contributions: (i) the use of artificial intelligence (AI) in decision support systems for the diagnosis and treatment and (ii) the use of AI based Robotic surgery in surgical treatment.[3]

The traditional way of practice of a physician in diagnosing and treating health issues has relied heavily on human intelligence, intuition, and experience and same is true for practicing 'Ortho-Rheumatologists' also. Such practice involves gathering information through patient history, physical examination, laboratory tests, and imaging studies, followed by the interpretation of this data to establish diagnosis and then treatment.[4] From history to data interpretation for diagnosing a case is not easy rather tedious job and often proves to be challenging and subjective. Here comes the role of AI to make physician's work-up easy wherein AI is utilized to augment human intelligence in managing big data and interpretation to support clinicians in the actual clinical practice.[1,4] By virtue of this, traditional way of practice is changing day by day.

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Machine-learning algorithms of AI show promise for processing advanced imaging techniques, such as fluorescence optical imaging (FOI), which enables the visualization and analysis of inflammation in rheumatic diseases. There are various examples available in literature about application of AI.[5,6] AI can also be utilized as an assistant in Tele consultation and telemedicine. There is enough evidence to support such role of AI in 'Ortho-rheumatology'.[4]

Robotic systems are best example of AI and being widely used in Ortho-rheumatology. They can be divided into two types: haptic and active. Haptic Robotic System is surgeon-guided systems consist of user's physical manipulations to increase the success rate of operation. Active Robotic System is also known as autonomous systems in which surgery is carried out by robots based on complete preoperative plan without the surgeon's intervention.[2,7]

As per literature, the first robotic system used in ortho-rheumatology was the ROBODOC system (Curexo Technology, Fremont, CA, USA) used in 1992.[1,2] It was originally an active-autonomous, image-based, robotic system which allowed the surgeon to plan the femoral side for component implantation and to assist surgery in cementless total hip arthroplasty (THA).[8] The CASPAR (Ortho- Maquet/URS, Schwerin, Germany) was another early autonomous system. It was an image-guided, active robot used for THA and total knee arthroplasty similar to ROBODOC.[9] Application of AI and Robotics in ortho-rheumatology is not only limited to joint replacement surgery but for various other aspect also.[10]

In conclusion on one side, AI has the potential to revolutionize the diagnosis, treatment, and management of ortho-rheumatologic diseases by virtue of taking care of the biomechanics, statistics, and measurements but on the other side, helpless for solving unpredictable factors of the biology of such diseases. One must remember the potential of creative thinking and emotions that are unique to humans and will keep them always superior to any new technology.

Conflict of Interest

None.

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