Mini Review

Computational medical bioinformatics

Abstract

Biotechnology is a technological discipline based on Biology and applied to meet the needs of human life. Which can be considered essential, as is health. This discipline has developed in the last decades a series of medical applications that are interrelated with other fields of science, which are not precisely those inherent in the health sciences. One of the main ones is Computational Bioinformatics, which has become a useful tool in the practice of the different medical areas through the generation of biomodels.

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Introduction

Computational Bioinformatics is a novel tool that can be applied in the study of the behaviour presented by the different levels of organization of living matter (cells, tissues and organs), under the effects of stimuli and external agents, such as burdens mechanical, which influence the behaviour of cellular metabolism.[1] Through the generation of anatomical biomodels, is interested in solving biological problems in a multidisciplinary and interdisciplinary way. It uses computational tools for the rapid organization and analysis of biological data. Which, in addition to making use of databases, also uses algorithmic processes and computer programs to perform high-speed evaluations and analyses to study the ethiology and the natural history of the disease, which make it possible to establish diagnoses, treatment plans, prognosis and until the prevention of some disease. Nowadays, digital imaging is widely used as part of diagnostic means in practically all medical areas. However, the programs or viewers that offer the radiological services only allow a very reduced vision to explore the anatomical structures. However, if these diagnostic means are used in conjunction with Computational Bioinformatics, the images obtained from them allow a visualization and manipulation that offers better results (Figure 1).

Proposal

With the images obtained from the imaging studies, it is possible to generate biomodels that allow a better exploration of the anatomical structures to be treated, observe them with greater precision and even be able to perform numerical analyzes that also provide a better diagnosis, a planning of the treatment or treatments that can be performed on the patient, which will result in better prognoses and treatments with a higher success rate. The biomodels allow a better understanding of the biomechanical mechanisms of living systems, through high precision images obtained from Computed Tomography, TC Conebeam,[2] Magnetic Resonances and CAD programs. These models have a morphology with a high degree of accuracy or bio-fidelity. Which, in turn, has allowed establishing the mechanical properties of each of the tissues that make them.[3] This allows obtaining results with greater shutdown to the biological function (Figure 1), as well as better diagnoses without invasive techniques (Figure 2).

Figure 1 Three-dimensional imaging.

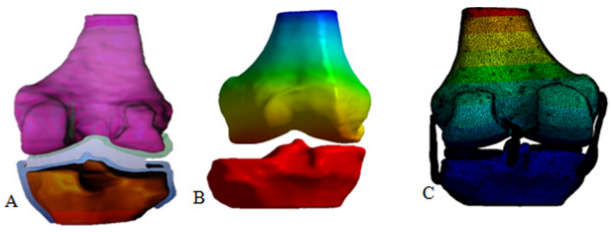

Figure 2 Computational Biomodels A) knee with pathology, B) healthy knee, C) numerical analysis.

Discussion

Although these computer tools are known, their use has not been exploited to their full potential. Its application is indicated mainly for very specific cases of research without taking into account its application in daily medical practice. This is mainly due to the fact that the scope of this tool has not yet been widely disseminated. In addition, the interaction of Medicine with the computer and Engineering areas, although they already exist, are still in the process of establishing the necessary bridges of interaction with each other, allowing new advances and scope with the joint participation of these areas.

Health professionals can use these means to facilitate diagnosis and to be able to perform treatments with greater precision. In addition, they turn out to be much more innovative means for their clinical practice.

Conclusion

Currently the biomodelling and simulation of the various biological systems are considered fundamental and novel in various medical areas. They allow simulations and analysis of complex biological systems, very close to reality. It is possible to carry them out in relation to the physiology, pathologies, recovery, regeneration and remodeling of various structures. What allows reducing the risks of experimentation and obtaining new knowledge. They offer the possibility of involving more accurately, various variables that can generate new knowledge to improve treatment plans with new and innovative solutions.

The analysis by means of the Finite Element Method as well as the use of biomodels, can be powerful diagnostic tools and even to achieve prosthesis manufacturing through CAM/CAD programs and 3D printing. However, its management is not the general domain of the medical community. Therefore, it is necessary to disseminate this knowledge through multidisciplinary working groups, which will allow a better treatment to patients from the dental office.

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Conflict of interest

Author declares that there is no conflict of interest.

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