

عنوان مقاله:

Computer simulation and applications of a versatile mechanistic theory for functional adaptation of bone

محل انتشار:

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تعداد صفحات اصل مقاله: 8

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خلاصه مقاله:

It is currently believed that the trabecular architecture in bone is the result of dynamic adaptation process in which : mechanical loads play a dominant role. Huiskes et al proposed a successful regulatory mechanism for this process. We implemented this model in a MATLAB code and studied effects of changing different parameters and other capabilities of such a mechanism. Starting from different initial configurations and by changing loading magnitude and direction in a plate model we observed that this model is very stable and always produces trabecular-like structures similar to those produced in simulation series performed by Huiskes. In addition to confirming the results of earlier simulations, such a general computer code can be used as a platform to study more sophisticated samples of bone and provide us with a better understanding of mechanisms and parameters involved in the adaptation process. Because a major problem threatening the long-term integrity of total hip replacement is the loss of proximal bone around non-cemented stems caused by "stress shielding", in the next simulation series we created a simple model of stress shielding around a prosthesis in trabecular bone. By changing osteoblast and osteoclast related parameters we obtained results that well agree with the latest research in osteoporosis treatment. We also performed a comparison of this model and a topology optimization model. Surprisingly both models produced very similar results. Apparently .this bone adaptation model provides us with something that we have not explicitly asked for

کلمات کلیدی:

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