ORIGINAL ARTICLE

Simulation of Lymph Drainage Pump System

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Abstract

Introduction: Lymphatic system, as a part of body immunesystem, is comprised of tissuesand vessels conducting unidirectionallya clear liquid called lymph fluid from interstitial matrix to the blood circulation. If the lymphatic system fails to drain out the lymph fluid it will be accumulated in the matrix causing an inflammation called "Lymphatic Edema". There exist various methods to control the edema, yet none has provided a thorough treatment to subside the inflammation. This paper aims to propose a new computerized method by simulating the lymph drainage pump system while utilizing two computerized engineering software.

Methods: In the first software (called proteus) a lymph drainage pump system is programed with proper schematic chips design and a constant speed for the pump. In the second software (Matlab) a stimulating DC motor was used to control an artificial neurological network for particular volume and pressure of lymph fluid. Biological data for this research were collected from a lymph edema clinic in Tehran (seyed khandan physiotherapy institute).Each individual patient's data is retrieved and calculated by the software.

Results: The lymph fluid effects due to pressure, volume, speed and height changes were figured in to determine a constant speed and pressure for the motor. Also the simulation system was designed to function with the external varying temperature as a variable input. Based on the simulated motor pump output, the estimated results by neurological network and application of the regression method the study has resulted in a coefficient R=1.This result indicates that the neurological network has possessed the proper estimation.

Conclusion: considering the heights ,volumes and pressures of lymph fluids along with the natural lymph drainage system while utilizing neurological network package we may claim that we have surpassed the transition for artificial drainage pump design from the scientific concept and mathematical stage to that of simulation criteria. Once this system is undergone practical design process, further theoretical and clinical researches are required to make the system engineering feasible for ensuing biological applications.

Keywords: Lymphatic System, Lymph Drainage Pump, Lymph Pump Simulation, Lymph Edema, Breast Cancer.