

Electro Medical Therapy

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Today electronics science, like other branches of science, finds its application to a great extent in clinical application. In early days clinical science was mostly treated with medicine and surgery. With the advent of various developments of electronics science, physicians are looking at ways to newer applications of modern technology.

Basically clinical science deals with the physiology of a living system which is run with the help of closed loop control operation of numerous electrical stimulations of some optimal nature and amount. When their control system fails to render its operations perfectly, indications are available by various sensors present in the physiological system and ailment is said to occur.

Analysis of physiological system needs the help of various mathematical tools available with us. Almost all physiological systems are non-linear in nature, nonlinearity being determined by the variation in value of a system parameter with respect to time. This nonlinearity complicates the study and analysis of a physiological system. Physiological systems are conveniently modelled to suitable electrical equivalence. With the help of analysis using modelling, complicated study of physiological system in artificial environments, as may be the cases in special circumstances, can be done. With the help of control theory approach, total physiology is divided into linear as well as non-linear parts. The linear part which is called the basic part may be easily tackled with the help of mathematical technique readily available with us and the non-linear part may be analysed by considering this as a piecewise continuous linear system and thus the total system can be dealt with effectively.

An integral component of a living system is Sino Atrium (SA) node which is natural pacemaker existing in the right atrium of cardiovascular system. SA node which starts working immediately after one is born and works till one lives, is essentially an electrical source providing excitations spread all over the body engaged to render various tasks - ECG, EEG, EMG, being typical expressions of them. In a living system fluids, limbs and their parts have various electrical, magnetic and chemical properties, and so a living system responds to electrical, magnetic and chemical sources. These are probably the very reasons why medical science is growing side by side with electronics development. Electronic data acquisition system is of immense use for the processing of biosignals available at various parts of a living system. Impedance plethysmography is a very important tool to study the nature of blood flow from the measurement of change in impedance between different parts of interest of a living body. A simple theoretical analysis shows that the calculation of segmental volume from impedance change require assumption as to the manner in which the limb expands. If the type of expansion is constant, then the change in volume can be determined. Changes in the segmental blood flow can also be determined from the volume changes if the steady state component of the blood flow is known. Impedance plethysmography is quite popular as the technique is a non-invasive one.

Ultrasonic imaging system for soft tissue and cardiac applications provides supplementary information to isotope imaging. This technique of imaging is potentially useful for diversified fields and replace x-ray methods. A number of

non-invasive techniques ranging from wave form analysis of the volume breathed in and out to the analysis of chest wall movement for detection of Air Way Obstruction (AWO) have been developed in advanced laboratories. The techniques are mostly made computer aided, so that the diagnosis may be made on live.

Magnetic Resonance Imaging (MRI), Computer Tomography (CT), Ultrasound Imaging (USI), Position Emission Tomography (PET) reveal aspects of the body, so that the physicians have enough scientific images for effective treatment of a patient. Lasers, Lithotripsy, pacemakers, implantable defibrillators treat conditions that might otherwise require drugs or surgery. People are reported to have relief from various pains using magnetic therapy. Prosthesis has gained immense credit as it has even made a lame dance freely and vigorously earning distinction at different form.

Biofeedback is an interesting topic of medical science. It is the process that allows one to tune to some physiological parametric level, it being done automatically as and when the level suffers variation from that corresponding to the condition of normalcy. So long the biofeedback process goes okay, we cannot feel it, but when it fails, we immediately realise the failure effect. Consider a very simple example of touching a heated material. One's internal control system momentarily sends efferent signal towards the vasomotor centre which in turn, after the sensation is felt, issues efferent signals. They seek to provide remedial steps to either maintain the touch or withdraw it depending on whether the present status is pleasing or strained. When this control action fails, damage occurs to the point of touch.

Meditation like all other states of consciousness should have specific physiological correction in the nervous system. If we find out, for instance, that meditative states are associated with brain wave patterns, we should be able to reproduce

the same patterns in a relatively short time through biofeedback training. The viability of biofeedback training as a short cut to meditation is today a hotly debated issue. It is believed that Zen, the various paths of Yoga, transcendental meditation and similar techniques lead to a state of being that goes beyond mere physical description. Body charting is a simple but valuable tool for self awareness, of one keeping track of one's hourly, daily, monthly and even yearly body rhythms.

In early days the physicians used to diagnose diseases after observing various symptoms of the patients and applying their practical knowledge on them. Today the physicians prefer to have the diagnosis done and confirmed through various instrumental aids which are, however, not free from their flip sides. To be certain of a diagnosis for brain treatment, some physicians prefer an MRI scan, a CT scan and an ultrasound scan. CT scans subject a patient to ionizing radiation, which in large enough quantities can give rise to fatal disease.

Worldwide advanced levels of electronic technologies are increasingly being used in psychophysical methods for study and control of sensory systems. Sophisticated machines using suitable transducers show the value of important parametric levels which are continuously checked with respect to the corresponding standard values, announcements are produced indicating whether the values are in safe limits with the progress of modern instrumentation, the diagnosis will become more and more straightforward and confident and the treatment by drug therapy will subsequently be replaced more and more by electro-medical therapy. More information will obviously be known to the physicians who shall then be able to work wonders more and more. A better cure of patients, would be possible and a better and healthy world would thus be ushered in.