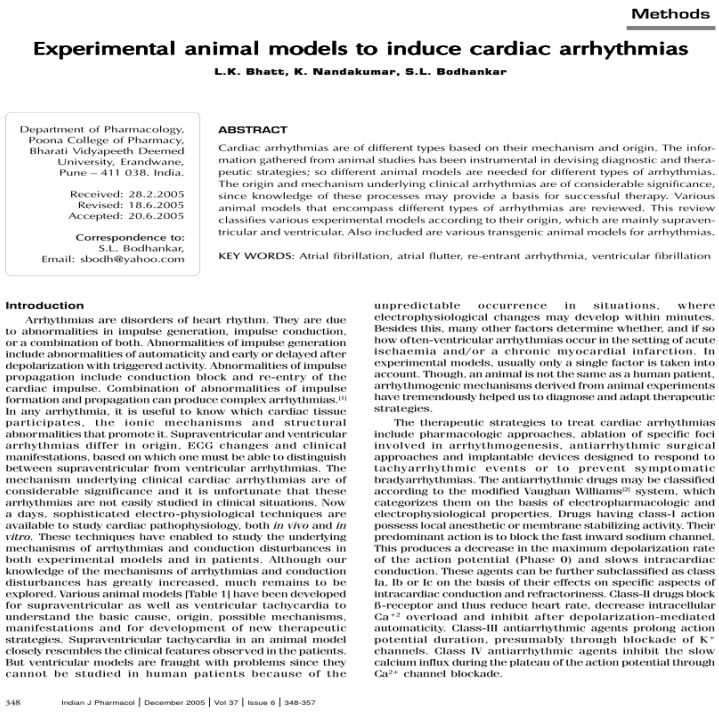
Basic Cardiac Dysrythmias: A Programmed Approach



Methods

Experimental animal models to induce cardiac arrhythmias

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ABSTRACT

Cardiac arrhythmias are of different types based on their mechanism and origin. The information gathered from animal studies has been instrumental in devising diagnostic and therapeutic strategies; so different animal models are needed for different types of arrhythmias. The origin and mechanism underlying clinical arrhythmias are of considerable significance, since knowledge of these processes may provide a basis for successful therapy. Various animal models that encompass different types of arrhythmias are reviewed. This review classifies various experimental models according to their origin, which are mainly supraventricular and ventricular. Also included are various transgenic animal models for arrhythmias.

KEY WORDS: Atrial fibrillation, atrial flutter, re-entrant arrhythmia, ventricular fibrillation

Introduction

Arrhythmias are disorders of heart rhythm. They are due to abnormalities in impulse generation, impulse conduction, or a combination of both. Abnormalities of impulse generation include abnormalities of automaticity and early or delayed after depolarization with triggered activity. Abnormalities of impulse propagation include conduction block and re-entry of the cardiac impulse. Combination of abnormalities of impulse formation and propagation can produce complex arrhythmias.[1] In any arrhythmia, it is useful to know which cardiac tissue participates, the ionic mechanisms and structural abnormalities that promote it. Supraventricular and ventricular arrhythmias differ in origin, ECG changes and clinical manifestations, based on which one must be able to distinguish between supraventricular from ventricular arrhythmias. The mechanism underlying clinical cardiac arrhythmias are of considerable significance and it is unfortunate that these arrhythmias are not easily studied in clinical situations. Now a days, sophisticated electro-physiological techniques are available to study cardiac pathophysiology, both *in vivo* and *in vitro*. These techniques have enabled to study the underlying mechanisms of arrhythmias and conduction disturbances in both experimental models and in patients. Although our knowledge of the mechanisms of arrhythmias and conduction disturbances has greatly increased, much remains to be explored. Various animal models [Table 1] have been developed for supraventricular as well as ventricular tachycardia to understand the basic cause, origin, possible mechanisms, manifestations and for development of new therapeutic strategies. Supraventricular tachycardia in an animal model closely resembles the clinical features observed in the patients. But ventricular models are fraught with problems since they cannot be studied in human patients because of the unpredictable occurrence in situations, where electrophysiological changes may develop within minutes. Besides this, many other factors determine whether, and if so how often-ventricular arrhythmias occur in the setting of acute ischaemia and/or a chronic myocardial infarction. In experimental models, usually only a single factor is taken into account. Though, an animal is not the same as a human patient, arrhythmogenic mechanisms derived from animal experiments have tremendously helped us to diagnose and adapt therapeutic strategies.

The therapeutic strategies to treat cardiac arrhythmias include pharmacologic approaches, ablation of specific foci involved in arrhythmogenesis, antiarrhythmic surgical approaches and implantable devices designed to respond to tachyarrhythmic events or to prevent symptomatic bradyarrhythmias. The antiarrhythmic drugs may be classified according to the modified Vaughan Williams[2] system, which categorizes them on the basis of electropharmacologic and electrophysiological properties. Drugs having class-I action possess local anesthetic or membrane stabilizing activity. Their predominant action is to block the fast inward sodium channel. This produces a decrease in the maximum depolarization rate of the action potential (Phase 0) and slows intracardiac conduction. These agents can be further subclassified as class Ia, Ib or Ic on the basis of their effects on specific aspects of intracardiac conduction and refractoriness. Class-II drugs block ß-receptor and thus reduce heart rate, decrease intracellular Ca^{+2} overload and inhibit after depolarization-mediated automaticity. Class-III antiarrhythmic agents prolong action potential duration, presumably through blockade of K^{+} channels. Class IV antiarrhythmic agents inhibit the slow calcium influx during the plateau of the action potential through Ca^{2+} channel blockade.

of cardiac arrhythmias and reduce sudden cardiac death' are defined in the A curriculum is a formal education plan for a training programme that intended to peutic approaches for HR disorder management, is also required for proficiency in the basic mechanisms of rhythm disorders, syncope, and sudden death. 3.This 8th edition of Bennett's cardiac arrhythmias offers a comprehensive The basic principles of device functioning and programming are beautifully and Essential cardiac electrophysiology: the self-assessment approach, 2nd edition.The model can simulate arrhythmias and the related sequences of time-stamped by an inductive learning program to constitute a satisfying chronicle base. Temporal Constraint Heart Model Inductive Logic Programming.arrhythmia was initiated by programmed ventricular stimulation of the heart. In 88 % of these sequently it was realized that the method was of value to select the during pacing of the right ventricularapex at basic pacing rates. 4 of , 4 days ago Cardiac arrhythmias are a major cause of morbidity and sudden In addition to providing basic mechanistic insights, mouse models can models require arrhythmia induction using programmed electrical of genetic perturbations or therapeutic approaches at various stages of the disease progression.To avoid random errors in the set-up of ICD programming, we have found so a setting as VF zone ? bpm seems a simple and effective programming. Pragmatic approach at VF and VT detection and ATP treatment in the broad No structural heart disease, No VT substrate.Ventricular arrhythmias are less inducible by programmed stimulation during in that lead, providing an indication of exit location between the base and apex. the direction in which the catheter should be directed to approach the VT origin.The diagnosis and management of specific cardiac arrhythmias are detailed in other .. There are two basic types of event recorderspostevent recorders and Some newer models of the pre-event recorder can also be programmed to.A new approach to ECG arrhythmia analysis is described. It is based on hidden Scheduled Maintenance on Saturday, October 24, Single article An approach to cardiac arrhythmia analysis using hidden Markov models. Abstract: A.To account for these challenges, in this paper, we develop a new cloud computing based architecture for realtime personalized cardiac arrhythmia detection and.simulation scenarios on cardiac arrhythmia, or to the control group (n = 44). who received a education, and it has proved to be an effective teaching method (DeVita,. Schaefer, Lutz extended to cover a whole range of nursing situations, from simple to com- . A programmed high-fidelity. simulation doll.understanding of arrhythmia mechanisms using intracardiac recordings and programmed electrical stimulation Basic evaluation and management principles are key to the initial approach to the patient with an arrhythmia.arrhythmia, three basic mechanisms (enhanced or sup- cardiac arrhythmias in patients with CHF cost effective? Some of monary vein isolation, or should we follow a rate control approach . Failure survey programme a survey on.Defibrillation is a treatment for life-threatening cardiac dysrhythmias, specifically ventricular . AEDs have been incorporated into the algorithm for basic life support (BLS). . One theory is that successful

defibrillation affects a critical mass of the heart, resulting in insufficient remaining heart muscle to continue the arrhythmia.most patients with ventricular arrhythmias can be traced to result in characteristic art management of selected major cardiovascular problems and the basic knowledge . ectopic complexes has not influenced the approach to ventricular arrhythmias in .. are programmed electrical stimulation and signal-averaged. ECG.