Third
USA-USSR
Joint Symposium

3 SUDDEN CARDIAC DEATH

Kaunas, USSR
June 29- July 1, 1982

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
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NIH Publication No. 84-1604 January 1984

PREFACE

The Third USA-USSR Joint Symposium on Sudden Cardiac Death was held in Kaunas, USSR, on June 29-July 1, 1982. This symposium was conducted under the bilateral Agreement in the Field of Medical Science and Public Health between the governments of the United States and the Soviet Union. It follows two previous symposia held in 1977 and 1979; these have been published separately as DHEW Publication No. (NIH) 78-1470 and NIH Publication No. 81-2101.

This area of cooperation between American and Soviet scientists has been active and rewarding. Since joint discussions began in 1973, focus has been given to identifying individuals at risk of sudden death through epidemiological studies, basic research on cardiac electrophysiology and neural activity, and examination of pathological and morphological changes with sudden death, and to preventing the onset of disturbances leading to sudden death by testing a variety of antiarrhythmic drugs. In addition to joint symposia and working sessions, the exchange of information, particularly in the context of joint research projects, has contributed to expansion of the shared pool of information.

The 28 papers presented at the third symposium were grouped into three areas: morphofunctional changes in the heart and its regulating systems in sudden cardiac death, the relationship between rhythm disorders and risk of sudden death with attention to pharmacological means of prevention, and neural factors and electrical activity of the heart. The discussions were fruitful and agreement was reached on areas of continued collaboration.

The US coordinator for this area is Dr. Thomas N. James, the Mary Gertrude Waters professor of cardiology and distinguished professor of the University of Alabama; the USSR coordinator is Professor Anatoli M. Vikhert, chief of the department of human cardiovascular pathology, National Cardiology Research Center, USSR Academy of Medical Sciences. Dr. Barbara Packard, director, Division of Heart and Vascular Diseases, is the Institute liaison.

On behalf of the National Heart, Lung, and Blood Institute, I wish to thank the US and USSR chairmen, and other US and USSR participants, and all those in both the USSR and USA who participated in the planning and conduct of the symposium and editing of the proceedings. I also want to thank Dr. John A. Vaillancourt of the NHLBI for his assistance in organizing the symposium and preparing the proceedings.

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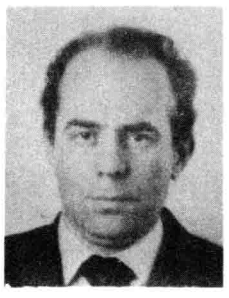

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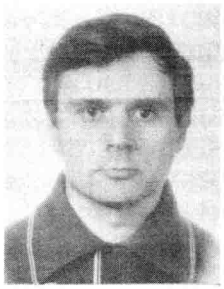

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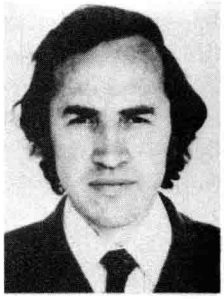

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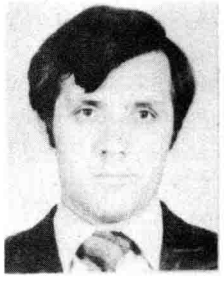

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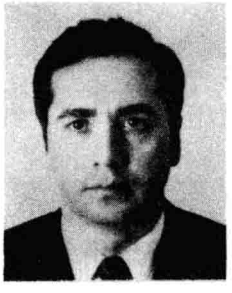

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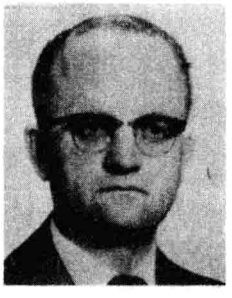

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part 1

Morphofunctional Changes in the Heart and Its Regulating Systems in Sudden Cardiac Death

TABLE OF CONTENTS

NORMAL AND ABNORMAL VARIATIONS IN MORPHOLOGY OF THE ATRIOVENTRICULAR NODE AND HIS BUNDLE: FUNCTIONAL SIGNIFICANCE RELATIVE TO SUDDEN DEATH

Thomas N. James

ABSTRACT. Although the atrioventricular (AV) node and His bundle of the human heart are fully formed by the sixth week of fetal development, some additional changes begin in the postnatal period and are usually completed in 2 years. This postnatal morphogenesis is normal and occurs in everyone, but it is associated with some cell death. Given appropriate other circumstances, it may cause electrical instability in the young infant, ending in crib death. Some advantages of this normal morphogenesis include the removal (by resorptive degeneration) of AV nodal protrusions into the central fibrous body which may serve as pathways for reentrant tachycardia, the severing of abnormal connections between the atrium and His bundle, and the removal of Mahaim fiber connections. However, postnatal morphogenesis may fail in either of two opposite ways: It may not proceed to completion, or it may become overactive. Incomplete morphogenesis results in persistent fetal dispersion of the AV node and His bundle throughout the central fibrous body. Overactive morphogenesis acts to destroy the His bundle by progressive fibrosis and causes heart block. Both persistent fetal dispersion and overgrowth fibrosis of the His bundle have been observed in human hearts from victims of sudden unexpected death.

From the Callaway Laboratory of the Department of Medicine, The University of Alabama Medical Center, Birmingham, Alabama. This work was supported by the National Heart, Lung, and Blood Institute (program project grant HL-11310 and Specialized Center of Research on Ischemic Heart Disease grant HL-17667) and by the Greater Birmingham Foundation.

INTRODUCTION

In normal fetal development of the human heart both the AV node and His bundle are fully formed between the fourth and sixth week of gestation. They remain in that stage of development until birth, at which time distinctive further changes begin which transform both the AV node and His bundle into their adult form. These postnatal changes begin at about 2 weeks of life and are usually completed in 1 or 2 years. They consist of a noninflammatory resorptive degeneration which is confined exclusively to the left side of both the AV node and His bundle (1,2). The result of this postnatal resorptive degeneration, which occurs as a normal process in everyone, is to transform the "relatively enormous" (3) fetal AV node and His bundle from an irregular outline with many protruding extensions into the more sharply circumscribed configuration which is characteristic of the normal adult heart (figure 1). Inevitably, cell death accompanies this ubiquitous postnatal event, but many examples of normal morphogenesis are characterized by the necessary occurrence of cell death (4-7).

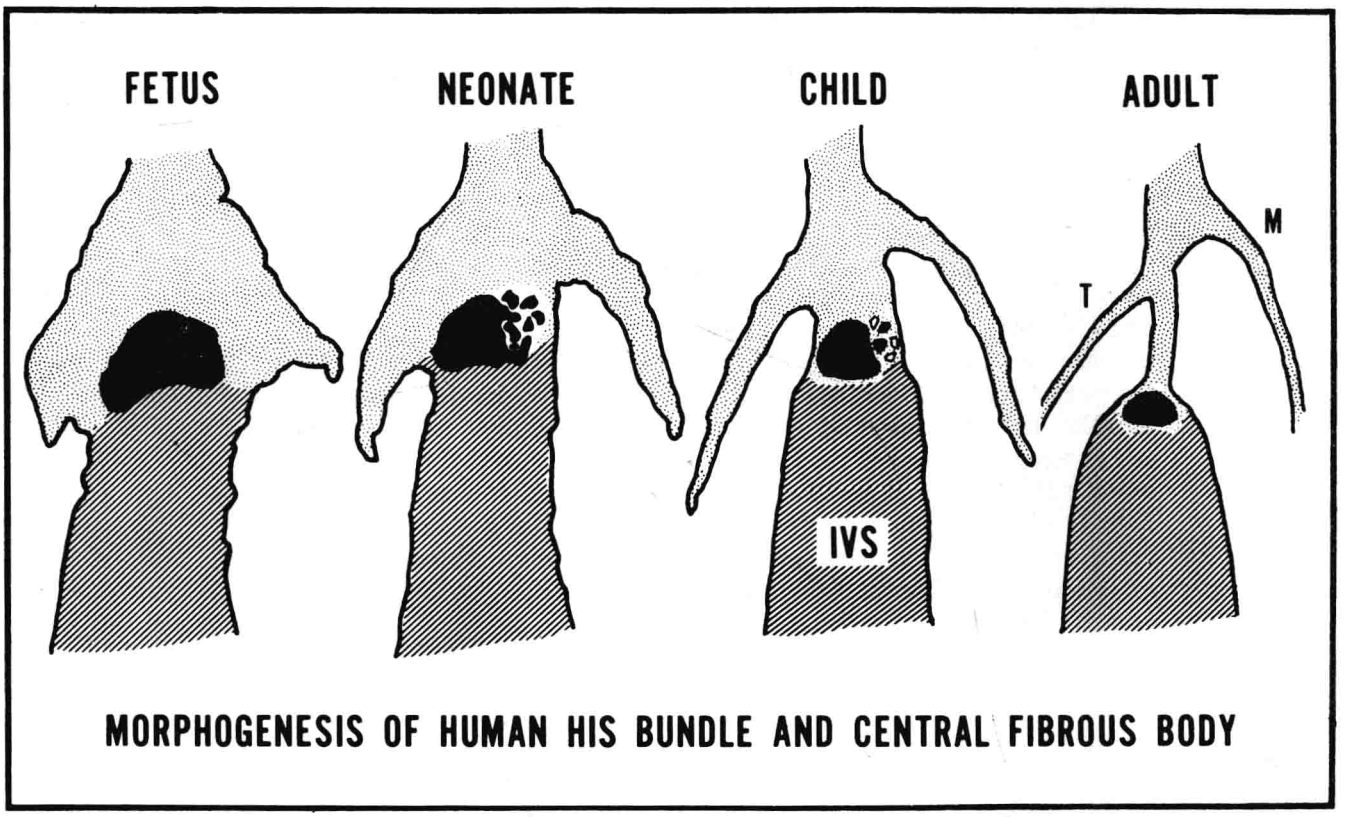

FIGURE 1. Schematic depiction of how the left portion of the His bundle is transformed as part of the postnatal development of the heart. See text for discussion.