HISTORY OF ELECTROCARDIOLOGY

Introductory Note to a Classic Article by Robert A. Bruce

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Dr. Robert A. Bruce, the father of the treadmill exercise stress test, died on February 12, 2004 when he was 87 years of age. He obtained his medical degree at the University of Rochester School of Medicine and did his early cardiology training with Dr. Paul Yu in Rochester. Dr. Bruce became the first Director of Cardiology at the University of Washington in Seattle in 1950, and he continued as Director for more than 30 years.

Dr. Bruce was initially involved in the study of patients with rheumatic valvular heart disease, and his early work on exercise testing related to the use of the treadmill to evaluate the functional capacity of these patients.¹ By 1956, he used the treadmill to establish guidelines for the grouping of cardiac patients into New York Heart Functional Class I through IV.² Bruce's early use of the treadmill was a single-stage test with a fixed rate of 1.7 miles per hour at a 10% grade. Dr. Bruce quickly realized the limitations of the single-stage exercise test, and so he developed a multistage treadmill test that required each individual to attain a self-determined point of maximal exertion.

In 1962, the American Academy of Pediatrics held a symposium on Exercise Fitness Tests in Los Angeles, California. The symposium was an outgrowth of concern by the Academy about the fitness or unfitness of American youth. The symposium was chaired by Dr. Forrest H. Adams, and the major portion of the symposium was devoted to the basic aspects of exercise physiology. Dr. Robert Bruce was one of the invited participants, and he contributed his now classic paper entitled "Exercising Testing in Adult Normal Subjects and Cardiac Patients" that was published in 1963 in

a special Symposium Supplement to Pediatrics.³ In that article, Bruce highlighted the importance of, and experience with, the multistage exercise test in 83 normal subjects and 130 patients with various forms of heart disease. This now classic 1963 article is being reprinted in its entirety in this History of Electrocardiology section of the *Annals* with the permission of the American Academy of Pediatrics.

Dr. Bruce was both modest and uniquely practical. When he was asked in 1996 about his involvement in exercise testing, he responded with the following analogy: "You would never buy a used car without taking it out for a drive and seeing how the engine performed while it was running, and the same is true for evaluating the function of the heart."

Dr. Robert Bruce made landmark contributions to cardiology at both the clinical and research level. He was an avid exerciser, and his enthusiasm for physical exercise was contagious for all those with whom he had contact. It is most appropriate that the most widely used exercise test in cardiology is known as the "Bruce Protocol."

REFERENCES

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