

Pediatric Cardiology

Mary Allen Engle, M.D. | Guest Editor

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Foreword

Dedication

In times when few heroes are proclaimed, it is a special pleasure to dedicate this volume to two of ours: Dr. Helen B. Taussig and the late Dr. Alfred E. Blalock. Keen intellect, sound judgment, modesty, warm personality, dedication to high principles, and dedication to people characterized these two, the mother of pediatric cardiology and the father of cardiovascular surgery.

Alan Allen Flege, M.D.
Guest Editor

Foreword

My thanks, admiration, and affection go to some of my favorite people, the contributors to this issue of Cardiovascular Clinics. The work of Doctors Helen B. Taussig and Alfred E. Blalock was an inspiration to many of us. They opened a whole new world of health and happiness for children with congenital heart disease and, at the same time, they created two stimulating and gratifying fields: Pediatric Cardiology and Cardiovascular Surgery. Their followers have continued the pursuit of excellence in precise diagnosis and optimal medical and surgical management. Members of our fine team at Cornell join with outstanding cardiologists across the country to present our thoughts on the state of the art in Pediatric Cardiology.

Mary Allen Engle, M.D.
Guest Editor

Contributors

Michael A. Brennan, M.D.

Editor's Commentary

Pediatric cardiologists have contributed immensely to our knowledge of the heart and its unique function. Their expertise is showcased especially in the clinical realm of congenital heart disease; and therefore it is particularly appropriate that this issue should feature many of the clinical and basic science interfaces exhibited by the congenital anomalies. No other aspect of cardiology requires such broad knowledge and comprehension. However, the expertise of the pediatric cardiologist extends far beyond congenital heart disease; he is vitally concerned with every other aspect of cardiology and is involved, in addition, with the very special challenges of the pediatric age group. Therefore, as an adult cardiologist, I can only express unabashed admiration for the extraordinary skills of the pediatric cardiologists and their supporting "team." I am grateful to the individual authors for their superb contributions to this issue, and I am forever in debt to Mary Allen Engle for her guidance in the formulation of this volume.

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Contents

The Prevention of Rheumatic Fever: Opportunities, Frustrations, and Challenges	1
<i>by Angelo Taranta, M.D., and Leon Gordis, M.D., D.P.H.</i>	
Atherosclerosis: A Pediatric Problem?	11
<i>by Sidney Blumenthal, M.D., and Mary Jane Jesse, M.D.</i>	
Innocent Murmurs	17
<i>by Arthur M. Levy, M.D.</i>	
Cardiac Conduction Pathways in the Infant and Child	27
<i>by George K. Massing, M.D., Jerome Liebman, M.D., and Thomas N. James, M.D.</i>	
Neuropharmacologic Studies of Perinatal Myocardium	43
<i>by William F. Friedman, M.D.</i>	
Supraventricular and Ventricular Dysrhythmias in Infants and Children	59
<i>by Kathryn H. Ehlers, M.D.</i>	
Congenital Complete Heart Block: An International Study of the Natural History	85
<i>by Magnus Michaëlsson, M.D., and Mary Allen Engle, M.D.</i>	
The Pharmacology of Cardio-Active Agents	103
<i>by Arthur H. Hayes, Jr., M.D.</i>	
The Pathophysiology of Congestive Heart Failure in Infancy	119
<i>by Norman S. Talner, M.D.</i>	
Etiology of Congenital Heart Disease	137
<i>by Catherine A. Neill, M.D., F.R.C.P.</i>	
The Development of Isolated Ventricular Septal Defect, Persistent Truncus Arteriosus, A-V Canal Malformation, and Transposition Complexes	149
<i>by Daniel A. Goor, M.D.</i>	

Observations on the Morphological Changes of the Developing Heart	175
<i>by M. Renate Dische, M.D.</i>	
Radiologic Evaluation of the Patient with Congenital Heart Disease	193
<i>by Larry P. Elliott, M.D.</i>	
Correlations of the Electrocardiogram and Vectorcardiogram to Congenital Heart Disease	219
<i>by Warren G. Guntheroth, M.D.</i>	
The Science of Cardiac Catheterization in the Diagnosis of Congenital Heart Disease	235
<i>by Aaron R. Levin, M.D.</i>	
The Cyanotic Newborn: Approach to Diagnosis and Treatment	275
<i>by William Rashkind, M.D.</i>	
Ventricular Septal Defect: Status Report for the Seventies	281
<i>by Mary Allen Engle, M.D.</i>	
Surgical Treatment for Tetralogy of Fallot: A Quarter of a Century of Progress	305
<i>by Paul A. Ebert, M.D.</i>	
The Role of the Pediatric Cardiologist in the Team Approach to Cardiac Surgery	319
<i>by Dan G. McNamara, M.D.</i>	
The Team Approach to Pediatric Cardiac Surgery: Pediatric Nursing Aspects	325
<i>by Carol A. Dewey, B.S.N., R.N.</i>	
The Regionalization of Infant Cardiac Care in New England	339
<i>by Donald C. Fyler, M.D., Lucy Parisi, M.D., and Michael A. Berman, M.D.</i>	
Index	357

Among the major cardiovascular diseases seen today, rheumatic heart disease is perhaps unique in that preventive measures of established effectiveness are available. There is, however, no easy path to preventing rheumatic heart disease such as we have for polio and measles. Ineffective vaccine is available, and prevention depends on the accurate diagnosis and adequate treatment of streptococcal infections in the general population and on continued prophylactic therapy in patients with a history of rheumatic fever. Effective prophylactic agents are available, but their successful use calls for a high degree of vigilance and cooperation on the part of the doctor and requires that the patient be seen often, one or both of these being the most difficult parts of the preventive effort.

The Prevention of Rheumatic Fever: Opportunities, Frustrations, and Challenges*

Angelo Taranta, M.D., and
Leon Gordis, M.D., D.P.H.

Rheumatic fever is an important disease because of the potential for its attacks of rheumatic fever (primary prevention)—this is done often the role of pediatricians, cardiologists, and internists. The physician who sees the patient with the previous rheumatic fever who is now being treated with the prophylactic penicillin, may whom the other physician as well as the community as a whole to understand the importance of primary prevention. In the prevention of rheumatic fever, the physician, cardiologist, and internist are directly involved, because they see patients with rheumatic heart disease, with history of rheumatic fever, or both, in their offices or clinics. Since many of these patients are asymptomatic, the cardiologist may often feel that in providing care for them his skills are being wasted, and hence has one of the most thorny problems in preventing this disease. Until an effective approach to the management of these patients is found, however, the responsibility for preventing recurrences rests with the cardiologist or with any other physician who has assumed responsibility for the care of the patient. This physician must, generally, find that the management of prophylactic penicillin is a challenging problem both in the art and in the science of medicine.

Another problem in preventing rheumatic fever is the widely held view that "rheumatic fever is no longer a problem," either in incidence or severity. However, a true picture of the magnitude of the rheumatic fever problem today is difficult to obtain because of the problems in assessing the validity of the data available. Comparisons between different areas and populations are between different points in time are particularly difficult to make because of differences in the diagnostic criteria used, and because of variations in the completeness of reporting. For example, in Baltimore during a recent five-year period, only two thirds of hospitalized cases were reported to the statewide rheumatic fever

* Supported in part by Grant HE 14564-01 from the National Heart and Lung Institute.

Among the major cardiovascular diseases seen today, rheumatic heart disease is perhaps unique in that preventive measures of established effectiveness are available. There is, however, no easy path to preventing rheumatic heart disease such as we have for polio and measles; no effective vaccine is as yet available, and prevention therefore rests on the accurate diagnosis and adequate treatment of streptococcal infections in the general population and on continual antistreptococcal prophylaxis in patients with a history of rheumatic fever. Effective prophylactic agents are available, but their successful use calls for a high degree of diligence and persistence on the part of the doctor and requires compliance on the part of the patients. All too often, one or both of these parties are reluctant to do their share in this collaborative preventive effort.

Cardiologists are clinicians at heart and, like most clinicians, they are attracted by the diagnosis and therapy of disease, especially when severe and life-threatening. Compared with the excitement and glamour of the catheterization laboratory and the operating room, preventive cardiology seems a drudgery. For all its lack of continual intellectual challenge, however, prevention may be preferable to cure. In the case of rheumatic fever where no effective cure exists, prevention is not only desirable but essential.

Cardiologists are not, in general, directly involved in the prevention of first attacks of rheumatic fever (primary prevention)—this is more often the role of primary physicians such as general practitioners, pediatricians, and internists who are more likely to see the patient with no previous rheumatic fever who complains of a sore throat. However, cardiologists who are concerned with the seriousness of rheumatic fever and the importance of its prevention, may stimulate other physicians as well as the community at large to undertake or upgrade programs of primary prevention. In the prevention of recurrences (secondary prevention), cardiologists *are* directly involved, because they see patients with rheumatic heart disease, with history of rheumatic fever, or both, in their offices or clinics. Since many of these patients are asymptomatic, the cardiologist may often feel that in providing care for them his skills are being wasted, and therein lies one of the most thorny problems in preventing this disease. Until an alternative approach to the management of these patients is found, however, the responsibility for preventing recurrences rests with the cardiologist or with any other physician who has assumed responsibility for the care of the patient. This physician may actually find that the maintenance of prophylaxis presents challenging problems both in the art and in the science of medicine.

Another problem in preventing rheumatic fever is the widely made claim that "rheumatic fever is no longer a problem" either in incidence or severity. However, a true picture of the magnitude of the rheumatic fever problem today is difficult to obtain because of the problems in assessing the validity of the data available. Comparisons between different areas and populations or between different points in time are particularly difficult to make because of differences in the diagnostic criteria used and because of variations in the completeness of reporting. For example, in Baltimore during a recent five-year period, only two thirds of hospitalized cases were reported to the statewide rheumatic fever

registry.¹ This incompleteness of ascertainment is hard to overcome.* Even when physicians are questioned periodically regarding the number of rheumatic fever patients they have seen, those questioned at shorter intervals reported having seen twice as many rheumatic patients as those questioned less frequently.³

Nevertheless, if the comparative data which are available in the United States and Canada are examined, there is little cause for rejoicing. In Toronto, two studies carried out 13 years apart showed virtually no change in the prevalence of history of rheumatic fever among school children.^{4,5} In Baltimore, the incidence rate for rheumatic fever from 1960 to 1964 was studied by a combined hospital and physician survey. The incidence in the 5 to 19 age group was 24 per 100,000 during this period.⁶ A previous report by the National Health Survey in 1935-1936 reported a rate of 40 per 100,000.⁷ Most of the decline was accounted for, however, by a reduction in recurrences; the frequency of first attacks was 28.5 per 100,000 in 1935-1936 and 21 per 100,000 from 1960 to 1964—little evidence of any triumph in prevention over a quarter of a century!

PRIMARY PREVENTION

That first attacks of rheumatic fever can be prevented by treating streptococcal infections was demonstrated in adults in military camps.⁸ The extrapolation of this finding to younger age groups and to the civilian population in general seems justified, although the rheumatic fever attack rate per streptococcal infection in these groups may be lower. In view of these low attack rates, the question may be asked whether major efforts in primary prevention are warranted. Although the rates are low, we unfortunately cannot predict which patients with streptococcal infections will go on to develop acute rheumatic fever. Since the potential threat of the disease and its sequelae are very serious, *all* patients with streptococcal infections must receive prompt and adequate treatment. On the other hand, patients with nonstreptococcal upper respiratory infections are not at risk for rheumatic fever, and should therefore be spared the inconvenience, expense, and risk of antibiotic therapy.

Unfortunately, the diagnosis of a streptococcal infection cannot be made on clinical grounds alone.⁹ A properly taken throat culture^{10,11} is essential for correct diagnosis. However, while a negative result virtually excludes a streptococcal infection, a positive culture may represent either active streptococcal infection or a carrier state with a superimposed viral infection. Since it is impossible at the time of the acute illness to differentiate between these two condi-

* The twin problem of over-reporting should not be dismissed, especially in statistics based on death certificates, and particularly in the older days. Before 1956, all death certificates on which minimal insufficiency appeared were classified, ipso facto, as rheumatic heart disease, even though the insufficiency may have been relative and due to cardiac enlargement secondary to arteriosclerotic or hypertensive heart disease. Like everything else, diagnoses also may follow fashions and whims: from 1940 to 1952 a doctor from Tennessee used the diagnosis of "acute endocarditis," usually with "chronic rheumatism" as a contributing cause, in all of 30 death certificates filed in persons over 70! They all found their way, in due time, in mortality statistics, under the rubric of "rheumatic heart disease."²

tions, treatment should be given to all symptomatic patients with positive throat cultures.

In a number of situations, it may be necessary to treat before obtaining the results of the culture: when patients have high fever or are severely toxic, and when patients cannot be depended upon to contact the physician for the culture results or cannot be contacted by him. Even in these cases, however, a culture should be taken before antibiotic therapy is instituted, for several reasons: (1) in the event of a negative culture result, therapy may be stopped if oral medication has been employed; (2) the patient may be better motivated to complete his ten-day course of oral therapy if a culture has been taken; (3) the culture results may be useful in interpreting subsequent symptoms suggestive of rheumatic fever or glomerulonephritis; and (4) the bacteriologic result may enable the physician better to diagnose other illnesses in the community.

For optimal eradication of the streptococcus, which appears to be essential in preventing the rheumatic attack,¹² blood levels of penicillin must be maintained for ten days. These levels can be provided either by a single injection of benzathine penicillin or by a ten-day course of an oral preparation.¹³ In view of the potential problem of noncompliance,¹⁴ the oral preparations should be used only when the physician is confident that a full ten-day course of therapy will be completed. Oral medication does have a number of advantages: (1) it can be stopped if the culture is negative; (2) it can be stopped if there is an allergic reaction; (3) it is less likely to result in penicillin allergy; and (4) it is usually preferred by the patient over an injection of benzathine penicillin which is painful. In patients allergic to penicillin, erythromycin may be used. Since many streptococcal strains are showing resistance to tetracyclines, these agents should not be used for treating streptococcal infections. The sulfonamides should also not be used for they have been shown to be ineffective.

Accurate diagnosis and appropriate treatment of patients with symptomatic pharyngitis not only will be beneficial to the patients, but will interrupt the chain of infection. Both symptomatic and asymptomatic infections, which would have arisen by contagion from the symptomatic patient, will thus be prevented. For optimal care the previous intimate contacts of the patient, especially siblings, should have a throat culture and should be treated if that is positive. In clinic practice, when dealing with large, overcrowded families, it may be wise to treat the whole family at once, since the rate of intrafamily spread is known to be very high under these circumstances.¹⁵

SECONDARY PREVENTION

Rheumatic fever has a striking—and still unexplained—tendency to recur.¹⁶ Since the recurrence rate per streptococcal infection is much higher in patients with previous rheumatic fever than is the occurrence rate of initial attacks in the general population, and since recurrences often follow asymptomatic infections that cannot be diagnosed and treated, continual prophylaxis is indicated. Of particular importance to the cardiologist is the fact that recurrences are still seen, over the age of 20, in rheumatic patients who are not on prophylaxis.¹⁷ Moreover, recurrences in patients with previous heart disease are

more dangerous than first attacks in terms of acute mortality and are often followed by a worsening of the cardiac status. Therefore, continual prophylaxis is indicated for life in patients with rheumatic heart disease. In patients with no rheumatic heart disease, the indication for continual prophylaxis is controversial once the period of maximum susceptibility is over (five years after the latest attack and over 21 years of age). Prophylaxis should be continued or reinstituted in patients with unusual exposure to contagion, such as parents of young children, school teachers, and military recruits. At times, ruling out mild rheumatic heart disease is difficult. The most prudent course may be indefinite continuation of prophylaxis in all patients with previous rheumatic fever.¹³

Monthly injections of benzathine penicillin are undoubtedly the most effective prophylactic regimen (Fig. 1).¹⁸ The main disadvantage of this regimen is pain at the site of the injection; the physician should recognize, however, that

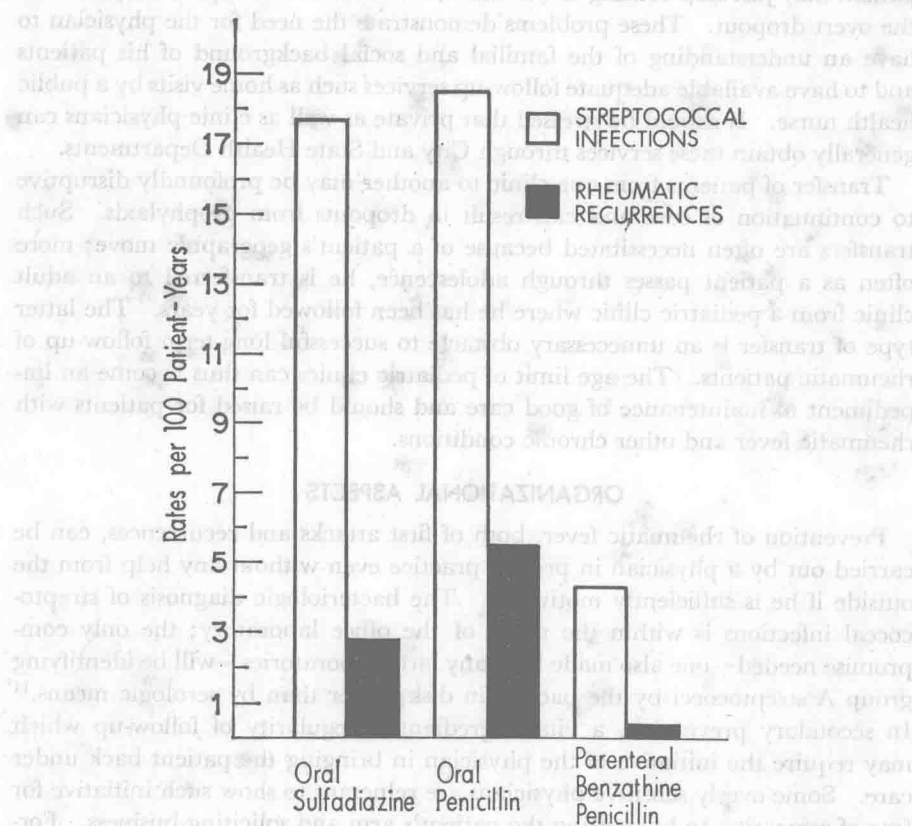


Figure 1. Streptococcal infection rates and rheumatic recurrence rates per 100 patient-years in children and adolescents with previous rheumatic fever. The three prophylactic regimens were tested concurrently: sulfadiazine, 1 gm./day orally in a single dose (576 patient-years); penicillin G, 200,000 units/day orally in a single dose, $\frac{1}{2}$ hour before breakfast (545 patient-years); and benzathine penicillin G, 1,200,000 units IM every four weeks (560 patient-years).¹⁸