PLASTICS IN SURGICAL IMPLANTS

ASTM STP 386

PLASTICS IN SURGICAL IMPLANTS

A symposium presented by

Committee F-4 on Surgical Implant Materials

AMERICAN SOCIETY FOR TESTING AND MATERIALS

Indianapolis, Ind., Nov. 5–6, 1964

ASTM Special Technical Publication No. 386

Price $5.00; to Members $3.50

Published by the
AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race St., Philadelphia 3, Pa.

Library of Congress Catalog Card Number: 65-21216

Cover: View of outlet side of mitral ball valve prosthesis for human implantation.

Printed in Philadelphia
April, 1965

FOREWORD

This Symposium on Plastics in Surgical Implants, held in Indianapolis, Ind., Nov. 5 and 6, 1964, was sponsored by ASTM Committee F-4 on Surgical Implant Materials. There were three sessions, on medical applications, properties and design, and compatibility. Of the fourteen papers presented at the symposium, nine are included in this volume, together with abstracts of the remaining five.

Chairman of the Program Committee for the symposium was Dr. Fred Leonard, Walter Reed Army Medical Center. H. R. Lissner, Biomedical Research Center, Wayne State University, is chairman of Committee F-4.

NOTE—The Society is not responsible, as a body, for the statements and opinions advanced in this publication.

CONTENTS

Introduction—Polymer Implants

By Fred Leonard[1]

Recent advances in surgery have enhanced the need for providing polymeric materials which can be utilized in replacing or repairing tissues or organs which have been damaged as a result of trauma or disease.

The wide range of mechanical properties available in plastic materials makes them attractive candidates for such uses. However, even though a polymer may possess the desired physical properties, there is no assurance that it may be successfully utilized in the body. Tissue compatibility is a *sine qua non* for the long-term utilization of a surgical repair material.

What are the parameters involved in preparing tissue-receptive materials? What is the relationship between molecular structure and tissue receptivity? What is the effect of physical form? What biological endpoints does one utilize to determine the receptivity of a material?

The answers to these questions are not known with certainty at the present time, and research toward the solution of such problems will require the combined efforts of the polymer chemist, engineer, and physician. It is through the efforts of such multidisciplined groups that surgical repair materials of outstanding long-term utility will be produced, studied, evaluated, and made available to the patient.

Dr. B. Mc'Farland, looking into the future,[2] commented on the ever-increasing number of injuries resulting from the use of helicopters and stated: "Fortunately this increase in the frequency of bone fractures has been unimportant because intramedullary fixation with thermostatic homoplastic agents injected directly into the fracture site, cancellous in their form, setting to the resilience and strength of steel, stimulating callus formation and being resorbed in that process has permitted weight bearing in nearly every fracture." Dr. T. B. Quigley[3] prophesied that the time is ripe for the design of an organic substance which would fulfill Mc'Farland's prophecy provided that "some sort of organized cross-fertilization of prepared minds with adequate facilities for such investigation be developed."

This symposium on plastic implants provides a forum for the cross-fertilization of such prepared minds. In the first session, practicing surgeons present problem areas in typical medical implant applications. This is followed by a discussion by two polymer scientists on the relationship between molecular structure and mechanical and surface properties of organic high polymers. The third group of papers is concerned with the engineering aspects of producing textiles, plastics, and elasto-

mers suitable for implant applications. Finally, a full-day discussion is devoted to the effects of the implants on the host, of the host on the implant, and methods concerned with evaluating these effects.

It is hoped that this symposium will help toward the development of a common language between the various disciplines, provide for an interchange of information, and result in the stimulation of further research in this important medical field.

---

[1] U.S. Army Medical Biomechanical Research Laboratory, Forest Glen, Md.

[2] "Editorial of A.D. 2000," *Journal of Bone Surgery*, 1950, 32 Bi, 458.

[3] *Surgery Gynecology and Obstetrics*, June, 1962.