

Principles of Human Joint Replacement

Frederick F. Buechel · Michael J. Pappas

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Design and Clinical Application

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Frederick F. Buechel
South Mountain Orthopaedics
South Orange
NJ, USA

Michael J. Pappas
Jensen Beach
Florida
USA

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Preface

This book is written for the users and designers of joint replacements. It is an attempt to convey to the reader the knowledge accumulated by the authors during their thirty five year effort on the development of replacement devices for the lower limb and shoulder for the purpose in aiding the reader in their design and evaluation of joint replacement devices.

Users include both the orthopaedic surgeons that implant such devices and patients who actually use the devices. The evaluation of such devices is far from simple and information provided by the manufacturer is usually self serving and often incomplete and inaccurate. There is relatively little information on long term experience with specific devices since most devices are abandoned before long term results are available. Thus, users should educate themselves sufficiently to allow independent evaluation of candidate devices in order to choose the best device available for the treatment of the pathology involved. This book provides information needed for such evaluation.

Patients should educate themselves on joint replacement since the selection of a device for use by a surgeon is often compromised by what is best for the surgeon. The selection of a device may be more dependent on the surgeons familiarity with the surgical procedure used to implant the device they select rather than the expected performance of the device. Further, many surgeons, particularly very successful surgeons, are provided with funding by a manufacturer for their collaboration and use of the manufacturers devices.

The history of joint replacement includes many triumphs and disasters. The triumphs are the result of clever individuals attempting to solve important human problems. The disasters are usually the result of the ignorance, or lack of application, of engineering and medical principles to the solution of complex problems. Designers of joint replacements should be familiar with past successes and failures so as to learn the lessons provided by them so as to apply successful features and not to repeat the errors of the past. Designers must also be capable of applying appropriate engineering, scientific and medical principals to the design, or redesign, of joint replacement so as to maximize their performance and minimize their risk. A primary purpose of this book is to provide and describe this history and such principals.

The first two chapters describe the engineering, scientific and medical principles needed for replacement joint evaluation. One must understand the

nature and performance of the materials involved and their characteristics in vivo i.e. the response of the body to implant materials. It is also essential to understand the response of the implants to applied loading and motion, particularly in the hostile physiological environment. The third chapter describes the design methodology now required for joint replacement in the USA and EU countries. The remaining chapters provide a history of joint replacement, an evaluation of earlier and current devices and sample case histories of some of the authors devices.

Frederick F. Buechel
Michael J. Pappas

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