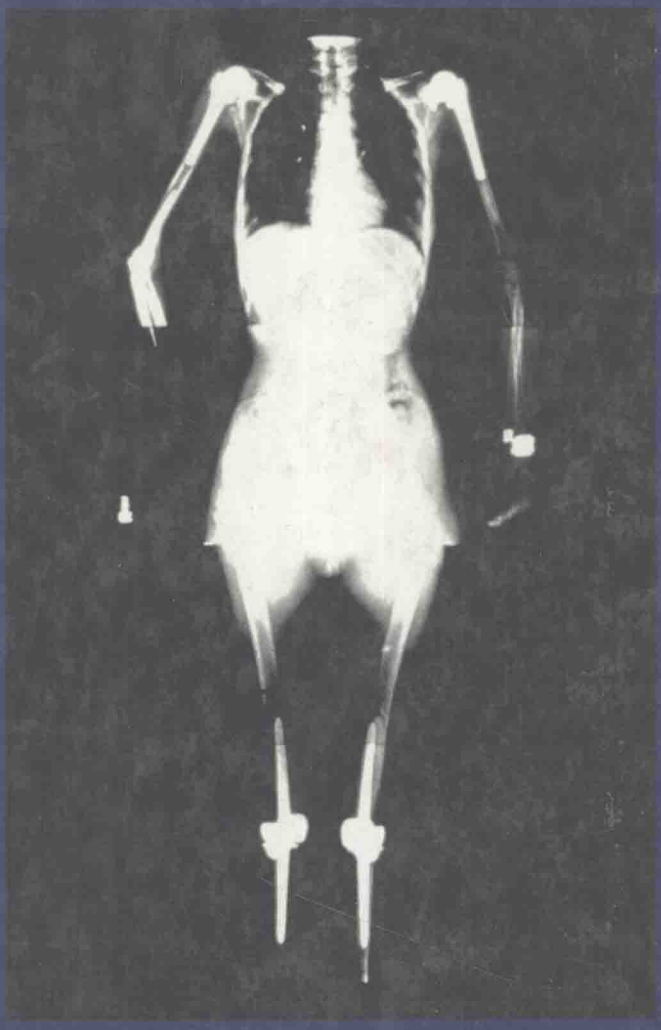
Joint Replacement

• State of the Art •

Richard Coombs
Anthony Gristina
David Hungerford



Mosby Year Book

Joint Replacement
• State of the Art •

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Preface

This volume, the fourth in a series, reviews the state of the art in joint replacement with contributions from the USA, Europe, Japan and Australasia.

The success or otherwise of most orthopaedic procedures is apparent within days, weeks or months. The long-term results of joint replacement are apparent only after many years of careful follow-up.

This book reviews the latest results for a number of well-tried and established prostheses and their operative techniques. It contrasts these long-term results with concepts introduced only months prior to publication.

Secretarial assistance has been crucial to the production of this book as with the others in the series and, in particular, the assistance of Philippa Spearman, Mary Coombs, Jennifer Waterston, Joanna Konorza and Jane Oxley.

Once again, the encouragement and wisdom provided by Bob Pearson has been much appreciated. The hard work of Jane Seymour, publishing executive of Orthotext, has made this book possible.

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Introduction

No operation has done more to alleviate human suffering than hip replacement. The elderly arthritic confined to a wheel chair is now a rarity. A few years ago, the cemented Charnley hip and the simple hinged knee appeared to be more than adequate. Each still forms the standard by which other prostheses must be judged.

The 30-year prosthesis

The ambition of every surgeon involved in joint replacement must be to achieve routine prosthetic replacement with implants which have an average survival of 30 years. If early mechanical failure and infection are avoided, the major long-term problem is loosening of the implant within the bone which is often closely related to wear of the articular surfaces.

In an initial section reviewing prosthetic design and biomaterials, the value of structural composites and hydroxyapatite is considered. The marked effect of irradiation on the wear properties of high-density polyethylene is noted (Chapter 6). A number of bioactive materials have been proposed for resurfacing joints and, of these, amniotic membrane is one of the most interesting. The amnion represents a primitive multi-potential membrane which, at the same time, is immunologically privileged, lying between the mother and her baby and reacting with neither (Chapter 7).

Cementless joint replacement

The average cemented joint will survive for 10–15 years which is more than adequate for most older patients above the age of 65. For the younger individual, however, such survival is less than ideal and 12 chapters review various ideas on cementless hip replacement. Early concern that the uncemented hip might not bond adequately to femoral bone has been replaced by concern that it may bond too effectively. The distal tip of the implant may then become anchored while the proximal part works loose. Within the shaft, stress-shielding may lead to osteoporosis of the proximal bone which ultimately fractures. The recent trend with the femoral component is for bone ingrowth to be encouraged only over selected parts of the proximal region.

Besides the femoral component, various types of uncemented acetabulum are discussed. Follow-up for

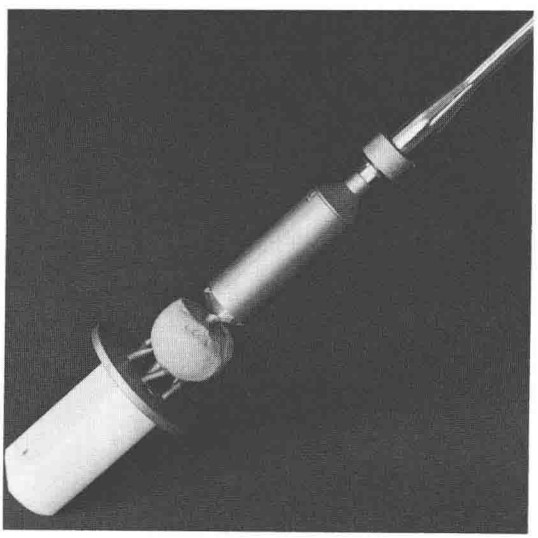
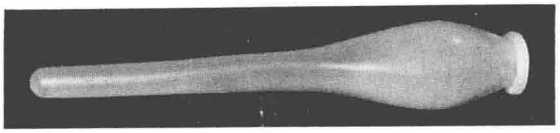
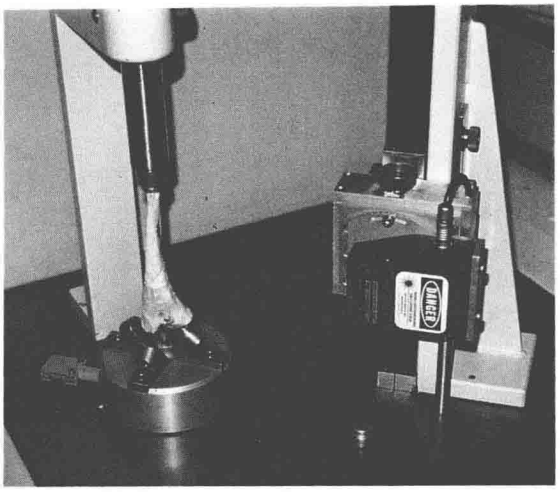


Figure 1 Oxford bone mill. The femoral head is implanted on the angled spikes. The central cancellous bone can then be quickly removed with the hollow drill/reamer

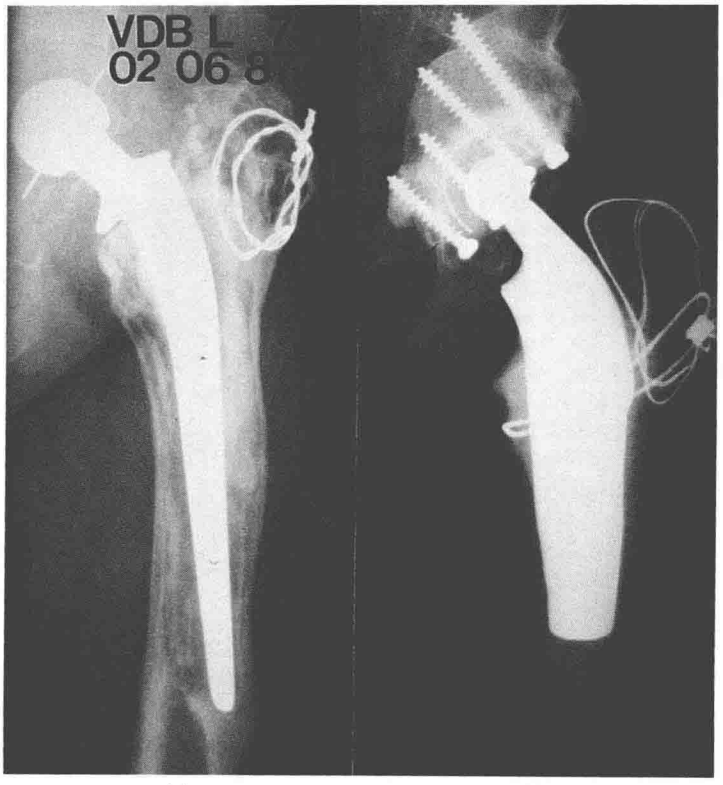


(a)



(b)

Figure 2 Identifit prosthesis. With the Identifit prosthesis developed by Professor Mulier and his colleagures in Leuven, Belgium, a latex balloon (a) is inserted down the femoral shaft and is filled with a quick-setting silicone elastomer. The resulting dummy femoral component is scanned with a laser to analyse its detailed geometry (b). The femoral component is then manufactured during the operation from an appropriate titanium blank. Any desired size and shape of implant can be produced, which is especially useful for difficult revision cases with osteolysis and bone resorption (c, d). Chapter 32 reviews the technique in detail



(c) (d)

many of these devices has been brief. It must be anticipated that the long-term results for a proportion of the implants described in this book will fall far below the expectations of their originators. Already, some of the devices have attracted vigorous antagonism in rival centres. The usual reply to such criticism is the suggestion that the critics have failed to use the correct operative technique or have inserted the devices into inappropriate cases, possibly only complex patients requiring revision surgery.

Time will provide for more substantial series with longer follow-up from neutral centres which will eventually settle such controversies.

Included is a review of two hybrid hip replacements; the techniques of Harris with an uncemented cup and a cemented femoral component (Chapter 33) are contrasted with the Identifit prosthesis with a cemented cup and custom-made uncemented femoral component (Chapter 32).

Cementless fixation may be assisted by using bone graft obtained from the patient's own femoral head during primary hip replacement. This can be simply harvested using the Oxford bone mill (*Figure 1*).

The Identifit prosthesis

All uncemented femoral components depend for initial stability on a close match between the prosthesis and the femoral shaft. The closer the fit, the greater the chance of long-term stability. Preoperative computed tomography can provide some indication of bone size, but cannot evaluate the quality or strength of cancellous or cortical bone.

A novel idea from Professor Mulier and his colleagues in Leuven, Belgium, enables the surgeon to use an implant manufactured during the operation (*Figure 2*). A dummy femoral component is prepared

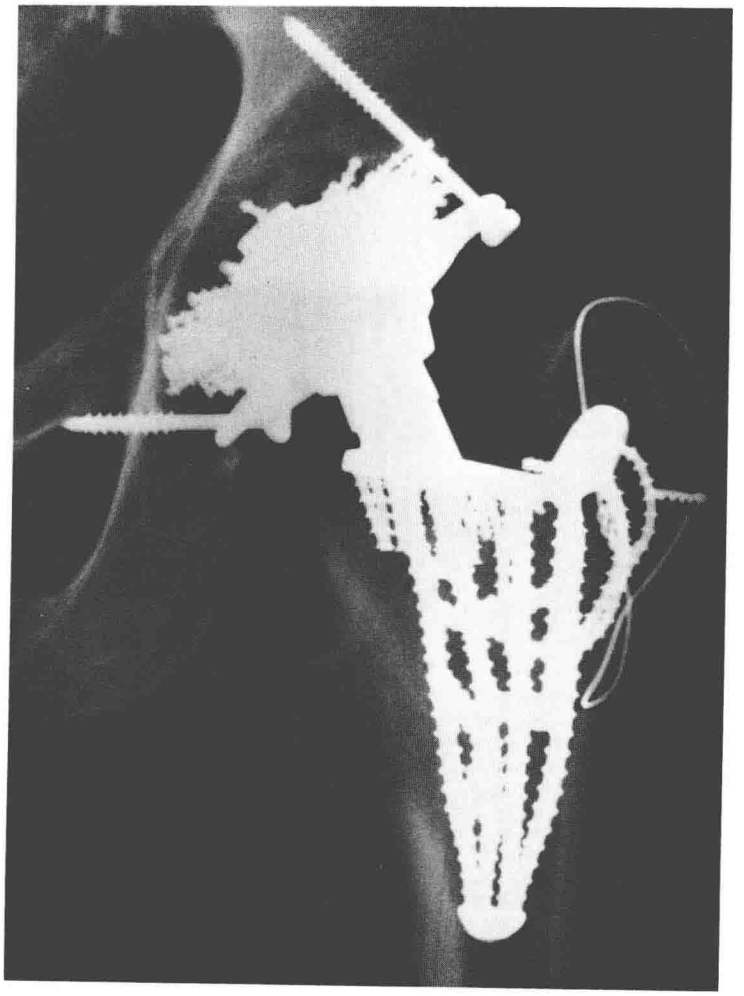


Figure 3 Trabecular prosthesis. The trabecular prosthesis of Holz and Copf (Chapter 16) is designed for cementless fixation, preserving most of the cancellous bone which is packed around the pillars and cross-members of the implant