The CORAIL® Hip System

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(Editors)

The CORAIL® Hip System

A Practical Approach Based on 25 Years of Experience

Springer

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Foreword

I was honoured and delighted to be asked by Jean-Pierre Vidalain to write the forward to the book documenting the astonishing journey of the Corail® Hip – from its conception and humble beginnings to becoming the most widely used – and copied! – uncemented hip in the world.

It was only really in the early 1960s that total hip replacement became a routine surgical treatment for patients crippled with end-stage arthritis. In those early years, the procedure was virtually reserved for the elderly and markedly disabled. The increasing prevalence of osteolysis was erroneously identified as being due to "cement disease" and this led to many surgeons abandoning cemented stems in favour of uncemented fixation.

These early uncemented stems were usually large and often obtained fixation in the diaphysis. This led to a high incidence of thigh pain and proximal stress protection osteopenia. In the early 1980s, the question challenging the orthopaedic community was how to achieve predictable fixation with a reproducibly simple technique, while avoiding thigh pain and stress protection.

The Corail® was conceived in this era of uncertainty, not by the machinations of a contrived design and development team, but by the passion of the shared beliefs of a dedicated team of arthroplasty surgeons, the ARTRO Group. No scientific or design consideration was too small to warrant a robust debate to achieve consensus as to the best solution.

Bioactive coatings were being developed in the early 1980s. Early problems included rapid resorption if the coating was too thin and debonding if the coating was too thick. However, optimisation of the hydroxyapatite (HA) coating provided the adjacent cancellous bone with a willing partner in pursuit of rapid, reproducible, and durable osseointegration.

This book faithfully records the evolution of the philosophy in those early years.

The marriage of a stem design which impacted and preserved bone, was sympathetic to flexural matching in the proximal femur and with an optimised bioactive coating, has been one of the most successful and enduring in the history of hip arthroplasty. As it attains its 25th year, the Corail® Hip System celebrates unsurpassed long-term results in hip registries around the world. It has a very wide clinical application and its unqualified success in both the young and the old are reported in this book.

The success of the Corail® owes much to the teaching and training, which has formed the cornerstone of its global acceptance. Some 40 training courses have been held in Annecy and Lyon. This book is a treasure trove of the techniques, tips and tricks, which allow the Corail® to be reproducibly inserted with predictably

favourable outcomes. The Corail® Hip is a complete hip system and its contribution to revision surgery – especially conservative revision – cannot be overstated.

The ARTRO Group – bonded by trust, friendship and loyalty – are to be congratulated on the vision and perseverance they displayed in developing and believing in the Corail® System. How the long-term results have justified their belief! They are to be admired for the undiminished passion and enthusiasm they sustain for the philosophy and concept of the Corail® Hip System. Underpinned by science, it is this passion that shines through the book and makes it such a pleasure to read.

Bristol, UK Ian D. Learmonth

Preface

Twenty-five years already! In the history of the Corail® prosthesis, this quarter century is certainly an appropriate period of time after which to stand back and take a look at the decisive stages and high points in this fantastic and incredible odyssey. We do this without nostalgia, but with the greatest pleasure. We should keep in mind the main events, but also and above all, those who have contributed to the worldwide success of this prosthetic system, which, at the beginning and for many years, was subject to intense controversy and caustic criticism. These events are now ancient history, but deserve to be remembered, if only, briefly.

Everything started during the late 1970s, when a group of seven young surgeons of the same age, including myself, having developed a strong friendship and having trained at the same university (Medical University of Lyon), decided to leave the Department of Orthopaedic Surgery at the end of their training period and to start a private practice in the Rhône-Alpes region of France. At the same time, we decided to create our own association: The Association for Research in Traumatology and Orthopaedics. And so the ARTRO Group was born! We could not anticipate that we were at the beginning of an incredible saga. Actually, the group was not predisposed to play a key role within the international orthopaedic community. At that time, our sole ambition was to meet each other, sometimes over a few drinks, to talk about professional concerns and to discuss difficult clinical and radiological cases. These debates mainly focused on hip replacement and to broaden our knowledge acquired during our training with Prof. Georges de Mourgues, we undertook numerous educational trips to internationally renowned experts. We were at the beginning of our private practice and, of course, had minimal experience. We achieved some success, but also suffered some disappointment. We attempted to imagine the ideal hip prosthesis, perfectly suited to the majority of the patients and clinical cases encountered in our practice, but also easy to insert, reliable and reproducible by the majority of orthopaedic surgeons. This dream became a reality, when in 1982 we began collaborating with Landos, a new French orthopaedic company based in the Champagne region of France, and subsequently in 1985 with a small 'start-up company' called Bioland located in Toulouse. At that time, Bioland was the world leader in calcium phosphate ceramics and plasma-sprayed hydroxyapatite (HA) coatings. Only a few in the field knew about the behaviour of biomaterials and the extraordinary and promising osteoconductive properties of calcium phosphates. There were even fewer who were prepared to trust this new technique for the fixation of implants in host bone. It is through this collaboration that the ARTRO Group joined the exclusive circle of pioneers, which included such famous figures as Ronald Furlong, Freidrich Osborn, and Rudolph Geesink. This is all ancient history, but in fact the path was long and

laborious. Do not forget that in those days hydroxyapatite was considered, at best, as a short-term solution, but was also cautioned, at worst, as a dangerous constituent with disastrous consequences!

The history of the Corail® prosthesis can also be seen as a great human adventure. First, the ARTRO Group and its founding members continue to be very good friends and still share the same common values: honesty, loyalty and devotion towards each other and their colleagues. Gradually, the group expanded by including talented and energetic young people, who were driven by the same values and dynamism as the original group. The adventure has gradually exceeded the group. Let's pay a very sincere tribute to our friends, the French and foreign orthopaedic surgeons who committed themselves early to our basic principles, which were based upon the complementary nature of mechanical (material, technology, geometry) and biological requirements (integration, bone stock, remodelling) and who were able to resist the many criticisms of the system, most of which were without a strong scientific basis.

Thank you to our courageous friends in Belgium, Norway, Portugal, Spain and Israel who joined the adventure at the very beginning. Thank you to our American friends who joined us in the mid 1990s and helped us enter the New World market. And thank you to our UK friends who joined our cause in the 2000s: they have greatly contributed to the peaceful conquest of the Anglo-Saxon world, typically a traditional cement market.

The remarks and comments from renowned objective and independent experts have confirmed the validity of our initial choices. Over the last two decades, an abundant literature has enriched and confirmed our convictions. The fact that the concept and design of the intramedullary segment of the Corail® prosthesis has remained unchanged over the past 25 years demonstrates the excellence of the basic concepts. Improvements being made on the extramedullary part of the prosthesis do not compromise the founding principles. The Corail® prosthesis has, still, a future and each day more and more surgeons discover the incredible performance of the bioactive fixation and its adaptability to all types of patient situations and morphologies, both in primary and revision hip surgery.

Other individuals have also played a decisive role in this long adventure and we would like to extend our warmest thanks to the collaborative teams working at DePuy France and DePuy International Ltd. including senior management, sales and marketing, communications, administrative and regulatory affairs teams. A special thanks to the Research and Development engineers who successively worked on our projects. Their assistance and support made this project possible. The worldwide dissemination of our philosophy and concepts would never have been possible without the time spent by each of you, without your expertise and skills and without the whole educational program. We deeply appreciate and acknowledge your valuable contributions and we thank you for your efforts! We would like to thank our publishing editor, Mrs Gabriele M. Schröder and her team, from Springer, for her valuable cooperation, which was crucial to the completion of this project.

Certainly, we have a strong feeling of nostalgia for this quarter-century, but our feeling of pride is even stronger. However, we need to look forward as well as remember the past. This book not only describes the history, development and clinical results of this unique hip prosthesis system, but it also gives practical, everyday advice. So we are totally convinced that it will not just be a book that sits on the bookshelf! Hip arthroplasty is constantly evolving and implants and surgical techniques are constantly improving. We sincerely hope that in the future this book will help many

surgeons improve their daily practice of hip replacement. Our sincerest wish is to keep on contributing to the improvement of the quality of life of patients, wherever they may be.

Once again, many thanks to all of you!

Annecy le vieux, France Jean-Pierre Vidalain

Editor Biographies

Book Editors

Jean-Pierre Vidalain
ARTRO Group

Jean-Pierre Vidalain is one of the original ARTRO Group members and has helped to forge what the team is today. He received his orthopaedic training in Lyon with Prof. Georges de Mourgues, one of the French pioneers in Total Hip Replacement. He also spent some time, in the early 1970s, with Sir John Charnley in Wrightington (UK) and with Prof. GK MacKee in Norwich (UK). Therefore, his major interest is surgery of the hip, with a special mention to hip biomechanics. His passion for bone biology led him to consider a more biological approach for implant fixation and to participate, as co-designer, in the development of the Corail® Hip System.

Jean-Pierre Vidalain routinely presents on the history, research and development, as well as the long-term clinical results associated with the Corail® stem. He is frequently invited as a guest speaker by many institutions and hip associations worldwide. He also acts as a chairperson at numerous international meetings.

As a practicing orthopaedic surgeon, he was based, since 1976, at the Clinique d'Argonay, Annecy, France, which was established as a Corail® Surgeon Visitation Centre in 1995. Although now officially retired from practice he remains an active founding member of the ARTRO Group with ongoing interests in research, education and training. Among many other responsibilities, he is an honorary member of several national and international orthopaedic societies and he is a reviewer for different orthopaedic publications.

Tarik Aït Si Selmi
ARTRO Group

One of the latest ARTRO Group members, Tarik Aït Si Selmi excelled under the tutelage of Jean-Claude Cartillier. It was through this early education and training that Tarik Aït Si Selmi formed his own passionate belief in the Corail® Stem. He was gratified when Cartillier offered him a place within the ARTRO Group in 2004.

After a year vocation in Australia in 2008, Tarik Aït Si Selmi returned to his beloved Lyon to establish a thriving orthopaedic practice as part of the Centre Orthopédique Santy. Tarik Aït Si Selmi continues to be an active member of the ARTRO Group by assisting with research and development as well as the worldwide professional education programmes. He remains particularly interested in orthopaedic innovation.

As a part of his practice, Tarik Aït Si Selmi has a well-established Corail® surgeon visitation centre and regularly hosts international visitors. He is fluent in French and English languages.

David Beverland
Musgrave Park Hospital
Belfast, Northern Ireland

David Beverland is the lead consultant for primary joints at Musgrave Park Hospital, Belfast, Northern Ireland, where he has been an orthopaedic surgeon for the past 20 years. During this time, David Beverland has been instrumental in driving positive change. One notable accomplishment has been the creation and development of the Belfast Orthopaedic Information System (BOIS). David Beverland also established the BART Charity in 2001 which provides funding for a variety of research projects within his primary joint unit.

In 1988, David Beverland undertook the Sir John Charnley Hip Revision Fellowship at Wrightington Hospital in Manchester, UK. He also completed an orthopaedic trauma fellowship with special interest in pelvic and acetabular surgery in 1989 at Sunnybrook Hospital, Toronto, Canada. This training and education was the beginning of future interests specifically in relation to correct cup placement and conservative surgery.

At present, there are over 1,200 primary joints performed annually at Musgrave Park Hospital under the care of David Beverland. In order to manage this capacity, David Beverland has formed a skilled orthopaedic care team which is the largest single consultant primary joint unit in the UK. David Beverland has also been the senior author in over 60 publications with 26 of those published from 2005. He is also an accomplished presenter having given several hundred presentations on different aspects of hip and knee replacement.

Tim Board
Wrightington Hospital
Manchester, United Kingdom

Tim Board specialises in the treatment of complex hip problems and reconstructions. He commonly performs both arthroplasty and arthroscopy of the hip and uses a range of techniques for revision hip surgery including the use of bone graft and cemented components as well as the Corail® Hip System.

He has a strong research interest and currently supervises a number of Ph.D. and M.D. students in collaborations with the University of Manchester's Bioengineering Department and the Tissue Regeneration Lab, where he holds an Honorary Senior Lecturer Position. He has presented over 110 papers at National and International Scientific meetings and published over 65 papers in scientific journals and written numerous book chapters. He is also a Research Advisor to the National Bone Bank and a Member of Editorial panel for the *Journal of Bone and Joint Surgery*.

Tim regularly lectures at international courses and meetings and is involved as a member of faculty on two M.Sc. courses. Throughout his training he received numerous awards and scholarships including ARC grant (1992), Peter Mallimson Bursary (2003), Treloars/Gauvain Fellowship (2004), Sir Harry Platt Fellowship (2005), AO Fellowship (2006) and the British Hip Society European Fellowship (2007).

Jens Boldt
Berne, Switzerland

With a background in biomedical engineering, Jens Boldt has been actively involved in scientific research since before establishing himself as an orthopaedic consultant in 2004. As a result, Jens Boldt has published and presented many scientific papers over the last 10 years. One particularly significant study was the radiographic analysis of 206 consecutive Corail® patient x-rays and the resulting published paper. These results remain significant to this day.

Having recently established an orthopaedic department in Berne, Switzerland, Jens Boldt continues to pursue his interests in radiographic analysis and other scientific work on joint reconstruction. As an active member of the Corail® International Faculty, his contribution in research and publication of clinical papers as well as books is invaluable.

Scott Brumby
Wakefield Orthopaedic Clinic
Adelaide, Australia

Scott Brumby is an orthopaedic surgeon at Wakefield Orthopaedic Clinic and operates at both Calvary Wakefield Hospital and Stirling District Hospital. He specialises in primary and revision hip and knee joint arthroplasty. Scott Brumby obtained his orthopaedic fellowship in 1999 after having completed a Ph.D. in joint replacement research in 1997. Awarded the Marjorie Hopper Travelling Fellowship, the Mark Jolly Travelling Fellowship and the Johnson and Johnson Joint Replacement Fellowship he worked at several centres excelling in the treatment of arthritic disorders of the hip and knee in Switzerland, Sweden, UK, and Harvard Medical School, USA.

He is currently a board member of the Stirling District Hospital and a Clinical Lecturer at The University of Adelaide. Scott Brumby has a strong interest in evidence based medicine and he is actively involved in reviewing data from the Australian Orthopaedic Association National Joint Replacement Registry and has been a member of the Arthroplasty Society of Australia surgeon review panel for the last 3 years. He is actively involved in arthroplasty education and surgical training within Asia Pacific and Internationally. Scott Brumby is a member of the Corail® International Faculty.

Steve Young
Warwick Hospital
Warwick, United Kingdom

Steve Young has been an orthopaedic consultant at Warwick Hospital since 1988. He specialised in hip and knee arthroplasty but over the years he has developed an almost exclusive hip practice. Steve Young performs primary and revision hip arthroplasties. On average, he carries out over 300 primary joints and 30 revision hip arthroplasties each year.

Since 2002, Steve Young has been using the Corail® stem as his first choice hip implant. He embraces the Corail® surgical philosophy of conservative Total Hip Arthroplasty and will use the Corail® stem for all patient pathologies including complex primaries and revisions. He actively encourages the use of a patient algorithm to determine the best bearing combination dependent on age, morphology and activity level.

Over the years, Steve Young has regularly presented on hip arthroplasty at various meetings and congresses. He has a specific interest in hospital management solutions. He has worked with other clinical staff and Managers at Warwick Hospital to implement an effective programme that allows the safe early discharge of post hip replacement patients. This not only has reduced the length of stay for patients but also has reduced hospital costs dramatically.

Steve Young has also been instrumental in establishing the foremost cementless stem education and training programme in the UK for Orthopaedic Registrars.

Contents

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