REVISIOn
OF LOOSE FEMORAL PROSTHESES
WITH A STEM SYSTEM
BASED ON THE “PRESS-FIT” PRINCIPLE
A CONCEPT AND A SYSTEM OF IMPLANTS
A METHOD AND ITS RESULTS
REVISION
OF LOOSE FEMORAL PROSTHESES

WITH A STEM SYSTEM
BASED ON THE “PRESS-FIT” PRINCIPLE

A CONCEPT AND A SYSTEM OF IMPLANTS
A METHOD AND ITS RESULTS

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This book is a monography with the purpose of telling our personal experience with the use of a cementless modular stem system in femoral revision surgery, which relies on the “press-fit”-principle in order to achieve primary stability. The monography does not address all the problems that could arise while performing revision surgery of loose femoral components and it does not mention the different techniques actually available, e.g. cemented femoral revision.

The implants which have been used by the authors are commercialized as a system named REVITAN, which unites different cementless stems showing a large variety of geometric forms and which have only the modularity as a common principle. This way of presentation by the producer could mislead the user by suggesting him an identical way of using those different stems. This is clearly not the case.

If a surgeon wants to achieve a primary fixation of a stem by the means of the “press-fit”-principle, the geometry of the stem plays an essential role in doing so. It is evident that the operating principles for a straight stem are quite different from those used for the fixation of a curved stem. The user must be aware of the fact that modularity is not a fixation concept by itself, but the basic step for achieving a correct leg length in order to restore the biomechanics of the revised hip.

The fact that implants which require different surgical techniques and strategies are presented under the same name may be interesting from a commercial point of view, but we strongly feel this could give rise to errors during a revision surgery, especially by suggesting to the user a versatility which in fact does not exist. This error of appreciation could lead to poor technical results.

The authors want to draw your attention to the fact that this monography is dealing with the technique and the results that apply only for PFM-Revision prostheses of first generation (Press-Fit Modular Revision prostheses), whose stability is purely based on the “press-fit”-principle, presently called Revitan Straight system or PFM-Revision of second generation.

NB. The differences between the stems of first or second generation are minor; they concern mostly the adjustment of the antetorsion on the assembly system of the two prosthetic components.

The PFM-Revision stems of first generation have been implanted since 1994 and must be clearly differentiated from the other implants of the REVITAN system, especially the newly introduced (in 2003) REVITAN CURVED STEMS, which should not be used in the same way. We urge those surgeons who want to implant such a curved stem to follow exactly the strategies and implanting techniques that have been developed for those curved stems.

Finally, at a somewhat unfavourable time, when the necessity for mercantilism “at any price” prevails over the age of the “doctrines”, which was sometimes slightly restrained by a narrow dogmatism, it is worth emphasizing that this monography as been written in utter independence and that the author has not been influenced in any way during the process of this work.
INTRODUCTION

PROFESSOR ERWIN W. MORSCHER

The objective of the revision of a loose femoral prosthesis is to restore a hip joint as close as possible to normal through the replacement of the deficient implant with a new one which anchorage should be both stable and durable.

Among the concepts allowing to ensure a durable anchorage without resorting to cement, none has ever been as effective as the press-fit and this is true for cups, femoral stems, primary arthroplasty or revision of femoral cemented implant.

The press-fit can be described as a means to guarantee the stability of a rigid structure and of a conical shape (the implant) which is wedged in an elastic environment (medullary cavity) slightly under dimensioned. If a pre-load is applied axially to the implant, a conical shape will entail stressing forces toward the host bone, which consequence is to improve stability; moreover, the intensity of the forces applied diminishes gradually, from the proximal to the distal region, which results in a better distribution of the loads. This way, the bony atrophy due to a stress-shielding phenomenon can be avoided and in case of a late seating, the stability of the implant can be restored. The press-fit is thus the only concept providing a "second line of defense" because it allows a second stabilization of the implant with a further wedging in case of a secondary seating.

But any system of implants can only achieve a good result if the designs, the material, the surface of the stem, and last but not least, the surgical technique, comply with the requirements of the chosen concept to ensure the primary fixation of the implant. These various factors will have to combine in the most favourable manner in order to perform any arthroplasty (or revision of arthroplasty).

THE MONOGRAPHY WRITTEN BY DOCTOR LE BEGUEC IS DIVIDED IN 4 PARTS

The first part concerns the description of the press-fit concept and of the implants which constitute the PFM-Revision of first generation (Revitan Straight system).

At the time when the system of these implants was created and during its development, the author strictly complied with the requirements of the press-fit concept, avoiding some preposterous innovations. This way, the author resorted to well-tried principles: straight stem with sufficient conical area of anchorage to ensure a press-fit effect, as well as a range bearing fins which has been also tried and tested with the revision stems selected by Wagner. Similarly the grit-blasted titanium surface is well-tried as an osteophile substrate highly beneficial to bony ongrowth. The modularity shows some advantages: it facilitates a more anatomical reconstruction and thus a better function of the hip, it enables to guarantee an effective press-fit; but this characteristic can result in a weakening of the implant and the author was aware of the potential dangers of such a system. The construction of the assembly system of the proximal and distal components has been technically dealt with in an ingenious manner and after 12 years of use without encountering any serious incidents, this coupling system can be considered as reliable.

The second part concerns the planning of the operation.

A satisfactory planning of the operation is decisive for a successful primary arthroplasty or revision and the author puts a special accent on the preoperative planning: "failing to make a preoperative planning is a plan on how to fail".
During the radiological analysis, the attention of the surgeon is drawn on the causes of complications, especially the presence of a femoral curving when evaluating the morphotype, as well as the difficulties which can arise during the cement removal. When determining a strategy, the author rightly consider the actual classifications as insufficient, which, in daily practice, makes them often useless because each concept has its own requirements and each patient is a special case. Finally, it is reminded that the planning is always completed by a template, necessary to measure the main reference lines useful during the operation.

The third part is devoted to the surgical technique.
For the operation, 2 options are proposed depending on the femoral approach selected: endofemoral approach or femoral flap. Each option is detailed, and the author, aware of the necessity for a perfect surgical technique in order to achieve good results, complies continuously with the required principles to ensure a stable anchorage with the press-fit effect: creation of a bone-implant contact surface, avoiding isolated contact points, then secure a perfect wedging and he underlines the significant advantages provided by a modular system in order to achieve an effective press-fit effect.

Thanks to his extensive experience in femoral revision surgery, the author is also able to make numerous recommendations on how to manage difficult or special situations.

The fourth part concerns the analysis of the results.
The author discloses his results from a series of 180 operated hips, 152 being meticulously documented both clinically and radiologically (25% of patients were between 80 and 90 years old and 65% were overweight).

It is interesting to note that with the test of time, short stems are increasingly implanted: for the 78 first prostheses, following the learning curve, a short stem is placed in 44% of cases while this figure is of 68% for patients in the second group (74 prostheses).

On the whole, clinical and radiological results are outstanding considering the complexity of the operation. It is also worth emphasizing that these results are improving with experience: regarding bone regeneration, the percentage of very good results progresses from 25% for the patients in the first group to 46% for the patients of the second group, and simultaneously, the figure for poor results has decreased from 22% to 4%!

The radiographs displayed show the possibilities provided by the method in order to achieve good or excellent results, even in the most difficult cases.

Lastly, the different possible complications are mentioned, their number should be considered as reasonable and it should be especially observed that the number of PFM-R stems that required revision is low: 5 among a total of 180 operated hips!

In conclusion: one should wish to this PFM-Revision system of implants a deserved success and it is highly recommended to each surgeon to read the monography by Doctor Le Béguec, primarily when this system has been selected for a revision surgery, it is the best way to reduce the learning curve which also exists for these implants.
FOREWORD

The revision of a loose femoral prosthesis causes apprehension among many surgeons because this operation involves numerous pitfalls. To avoid any hazardous surgery leading to failure, which would be, so to speak, “planned” and most of the time immediate, the only possible option for the surgeon is to make the reasonable choice of a concept and an implant, to plan the surgical procedure in a second step and apply the selected method logically and rigorously.

The first part of this work is devoted to the press-fit concept and to the system of implant used by the author. Making the choice of a concept in order to ensure primary stability of a cementless implant, with a thorough knowledge of its fundamentals, is the first step the surgeon should take. It is the best way to avoid serious errors when selecting an implant and determining a surgical strategy. The failures of a press-fit stem are often due to an insufficient understanding of the requirements imposed by the method.

The second part concerns the planning of the surgery. An extensive experience in surgery, in the field of hip arthroplasties, has taught us that surgery is never compatible with improvisation and that the revision of a loose femoral prosthesis should not be limited to a surgical step.

The planning of an operation, consisting in a rigorous radiological analysis of the femur in order to determine a strategy complying with the chosen concept, is the way to achieve a successful surgery; conversely, overlooking this preoperative evaluation is running the risk of any hazard during the operation.

The third part is devoted to the surgical technique. Most of the time, the medical documentation related to an implant is merely composed of the description of the surgical technique, which is necessary as well as insufficient. Indeed, if a surgical technique is not associated with the description of the concept and its requirements, numerous decisive technical details are likely to be overlooked (or to be misunderstood) and, in these conditions, the surgeon will hardly be able to carry them out during the surgery.

The fourth part is related to the results. Considering the heterogeneity and insufficiency of the methods employed to evaluate these results until now, we have felt the necessity of proposing a new methodology. The way we proceed seems interesting and practical, but to definitely finalize it requires a wider clinical study which has not been performed yet.

Between 1994 and 1999, 180 prostheses have been placed by the author. The results concern a series of 152 prostheses, clinically and radiologically analyzed with a mean follow-up time of three years. We are aware that this mean follow-up time, although not negligible, is not sufficient to obtain definitive results. Nevertheless, and considering the fact that it is an already long-established concept and an implant which design is also well-tried, we think we can publish these results, with limited risks, since the innovative character of the implants used only concerns the modular system. This innovation has been employed successfully since 1989 with primary stems and since 1994 with revision stems.
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A SYSTEM OF IMPLANTS

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