

**"VICTOR BABEȘ" UNIVERSITY OF
MEDICINE AND PHARMACY TIMIȘOARA
DOCTORAL SCHOOL
MEDICINE DOMAIN**



**PRESENT AND FUTURE PERSPECTIVES IN
INNOVATIVE FUNDAMENTAL AND CLINICAL
RESEARCH IN OSTEOARTICULAR PATHOLOGY**

ABSTRACT

Associate Professor Andor Bogdan Corneliu

**Timișoara
2022**

The Habilitation Thesis consist of the most important scientific achievements along with a synthesis of academic and professional activity. The research activity and the clinical part were closely linked throughout my career in the Orthopedics-Traumatology specialization. I started my research activity with the doctoral studies, completed by the doctoral thesis in the field of chronic osteomyelitis. This Habilitation Thesis is the peak of my scientific and medical activity after completing my doctoral thesis in 2008. Dissemination of the results was done by participating in numerous national conferences and by publishing articles in specialty journals.

Chronic osteomyelitis is a complex condition with devastating consequences for patients. In the Doctoral Thesis, we performed a series of experimental studies in order to demonstrate the changes produced by microbial agents and their metabolic products on bone tissue. The first part consisted of a study performed on laboratory animals. *Staphylococcus Aureus* was isolated from the infected wounds or fistulas of patients with chronic osteomyelitis and inoculated to laboratory animals.

In the series of experiments performed, we tried to establish the changes of the bone structure in chronological order over a period of 9 months. Secondly, we tried to demonstrate the general reaction of bone tissue to the pathogen by observing how prompt and effective is the mechanism of defense of the bone.

In the next part of the Doctoral thesis, we analyzed a group of patients with chronic osteomyelitis hospitalized in the Orthopedy Department of the County Emergency Clinical Hospital "Pius Brânzeu" from Timișoara. We created a database called OM-TIM, that included all patients with osteomyelitis treated at that time, with all the data used in the Thesis.

We evaluated both the diagnostic techniques and therapeutic algorithm used and we highlighted the fact that the complex treatment consists of both antibiotic therapy and surgical interventions, which addresses the bone and soft tissues and requires a multidisciplinary approach. The conclusions of the research on chronic osteomyelitis were published in 4 articles and a monography.

My research activity continued within the collective of the 2nd Orthopedy Department of the County Emergency Clinical Hospital "Pius Brânzeu" from Timișoara , under the

supervision of Prof. Pătrașcu Jenel Marian. Together with my colleagues, I contributed to a series of research directions. One of the most important approaches, in my opinion, is the one aimed at joint degenerative pathology.

Osteoarthritis is one of the most common, cost demanding and disabling orthopedic pathology.

My research has addressed various aspects from basic science to applied clinical research, in the field of etiology, diagnosis, complex therapeutic possibilities and aspects of quality of life and patient satisfaction regarding the osteoarthritis involving hip and knee, but also the small joints, and among these, the metatarsophalangeal joint of the great toe.

Therapeutic strategies currently consider the various stages of osteoarthritis and the possibilities of approach which can improve the quality of life in terms of symptoms and functional outcome.

The first research project that I discuss in the Thesis of Habilitation refers to the nonoperative approach, an area of research in which I published an article on the use of Chronic Symptomatic Slow Acting Drugs for OA (SYSADOAs), more specifically *orally administered hyaluronic acid* as a first step in the treatment of OA. The paper studies the impact of this therapy on the decrease of symptoms, correlated with the improvement of the range of motion of the knee joint. Another article evaluated the effect of non-steroidal anti-inflammatory drugs in patients with osteoarthritis.

Osteoarthritis is, as I underlined in the Habilitation Thesis, a condition with multiple valences, in terms of multifactorial etiology but also a pathology which causes complex damages to different joints. The extent of the damage is also a key point in deciding therapeutical strategy.

One type of osteoarthritis included in my area of interest was hip osteoarthritis and in particular secondary hip osteoarthritis due to aseptic necrosis of the femoral head.

The diagnosis of aseptic necrosis of the femoral head should be made as early as possible so that it can be treated, if possible, before it becomes a disabling condition which requires hip arthroplasty.

The therapeutic strategy is in close relation with the extent of damage to the femoral head. Because most of the patients are young and active, some of the surgical solutions are aimed to preserve the bone stock. Among the bone stock preserving techniques, an important role has rotational osteotomies.

One of the studies in which I was involved, targeted the research of the articular surface of the femoral head. The study was part of a doctoral thesis and it was started from

the desire to contribute to the current knowledge regarding the therapeutic options for relatively young patients with aseptic necrosis of the femoral head. The aim of the study was to "map" the articular surface of osteochondral fragments harvested from the human femoral head, in the context of secondary hip osteoarthritis with surgical indication. The main objective was to demonstrate that there is quasi-normal cartilage on a significant area of the femoral head surface in patients with indication for hip endoprosthesis. This hypothesis was proven by implementing a standardized technique for joint surface scanning at weight-bearing and non-bearing areas of the femoral head using confocal microscopy, and ulterior 3D reconstructions of the surface anatomy for further analysis.

The next goal was to determine the percentage of cases that, at the time of hip arthroplasty surgery, still have, in our opinion, a sufficient area with relatively healthy cartilage and a smooth, functional contact surface that is 'wasted' by the replacement procedure.

The secondary objective of our research was to propose an original osteotomy technique which can preserve the natural femoral head and delay the replacement with a total hip arthroplasty.

To achieve this, an artificial bone mold is needed on which the proposed technique can be further tested. In this context, another part of the research was aimed at finding a material to manufacture these molds, which have physical characteristics similar to natural bone and last but not least are financially affordable. Thus, was born a collaboration with University Politehnica Timișoara, and the result was published in an article that presents the tests performed on such materials. Necuron 600 is a polyurethane foam that could meet these characteristics. Preliminary results showed that this material has characteristics almost similar to that of human bone, but we recommend testing other materials in the same class, in order to find a material that can be used in the proposed tests.

Another topic from the clinical part of the Thesis, focused on the surgical treatment of hip arthritis advanced stages, which requires hip arthroplasty. This intervention aims to restore mobility and reduce pain until it finally disappears, after the completion of recovery procedures. Hip arthroplasty is a major procedure that causes both pre- and postoperative pain symptoms. It is accompanied by a variable period of hospitalization which sometimes can be longer and associated with an increased use of analgesic medication. All this ultimately leads to increased social and financial costs. In the desire to reduce this impact as much as possible, the use of multimodal pain therapy has become frequently used. I approached this topic in my research, and I wanted an evaluation of the effectiveness of

some of the methods of multimodal pain therapy, so we made a study on patients operated in our Department, which were subject of hip replacement surgery.

The results showed the benefits of this therapeutic approach both in terms of quality of life and from an economic point of view.

The next chapter of my research topic referred to knee pathology. The pathology of the knee joint was of a special interest in our Department. In 2002 Prof. Pătrașcu started to use the technique of autologous chondrocyte transplantation on three-dimensional solid support (Hyaff-11) - Hyalograft C and soon after that also the three-dimensional matrix Chondrotissue for cartilaginous lesions of the knee. In 2006 Our Clinic is also Certified - "Certificate of Excellence for trainer for application of LARS Ligament Advanced Reinforcement System". All of these encouraged us to focus on other new techniques meant to repair knee lesion.

My interest as a researcher was targeted on the role of traumatic ruptures of the anterior cruciate ligament and osteocartilaginous lesions in the context of the onset of knee osteoarthritis.

All of these have facilitated the publication of a series of articles on the results of using this type of implant along with other ligament reconstructive techniques, and lead us to start a collaboration with West University of Timisoara on the possibility of improving materials used in the manufacturing process of this type of implants.

In 2015 I had the opportunity to initiate an international collaboration, in a multicenter study, in which I participated together with Prof. Dr. Pătrașcu and Dr. Florescu Sorin. As coordinator of this study, I initiated a research in the direction of using a new type of implant Agili C, for osteocartilaginous joint lesions, in the first phase applied to the knee joint, later the studies being extended to the metatarsophalangeal joint of the great toe and of the ankle joint, for osteocartilaginous lesions of the talus.

Given the experience gained in the use of several types of implants in the knee, Hyalograft-C, Chondrotissue and Agili C, from the collaboration with colleagues from our Department resulted an article in which we presented the comparative results obtained by using these three types of implants for the treatment of knee osteocartilaginous lesions.

Also, another article from the same research project shows the results obtained by using the Agili C implant in patients with hallux rigidus.

Finally, my concerns regarding the results obtained in designed in my surgical activity, determined another research which was aimed to quantify patients satisfaction. We started a research on the quality of life in patients with hallux valgus surgery, the results being

published in collaboration with colleagues from the Discipline of Psychology at UMF "Victor Babeș" from Timișoara.

The last chapter of the Habilitation Thesis presents the academic, didactic, and scientific development plans.

First, I want to reaffirm that I am determined to continue and emphasize my involvement in basic and applied research in orthopedic and traumatic pathology, to support multidisciplinary integrative approach, collaborations with other recognized universities, to encourage ongoing education, application and consolidation of skills and knowledges. All this will also include the participation, in all these projects, of students, residents and postgraduate and doctoral students.

Regarding my future contribution in the didactic activity, the most important objectives are related to the continuous improvement of teaching methods, as well as to the publication of textbooks which relate to the updated Curriculum of our university and to the latest literature of specialty, through the improves of their content and their presentation.

Another key objective of my subsequent scientific development plans is applying for national and international research projects and grants. I also consider that the dissemination of research results is utmost important at national and international congresses and conferences. Also, reaching journals from "red and yellow list" and publishing our articles in such journals will be another target for my future activity.

In conclusion, my plans and perspectives regarding the evolution and development of my professional, scientific and academic career converge towards one single idea: that of scientific and clinical excellence in close correlation and for supporting of the developmental plan of our University, and also for increasing the prestige and recognition of the University of Medicine and Pharmacy "Victor Babeș" Timișoara and the 2nd Department of Orthopedy from Timișoara as well, which are the places where I trained as a surgeon but also as a teacher and researcher.