ABSTRACT

I became Orthopaedic surgeon in 1994, but I consider that my real entrance in orthopaedic field was in 1996, during my first arthroscopy training in Wien. This new approach of orthopaedic surgery, minimally invasive and, consequently, with faster recovery and less cost, have attracted me at once and I remained for the rest of my carrier linked to it. My training in arthroscopic surgery continued next year, in 1997 in United States, at Florida Knee and Orthopaedic Centres. Here my mentor was John Barrett, a brilliant arthroscopic knee surgeon.

In United States I have assisted and performed not only meniscectomies, meniscus suture, ACL reconstructions but also total knee arthroplasties as well; it was the beginning of my passion for knee surgery. Also this training has confirmed for me that understanding of pathological events and of pathogenic mechanisms is the key for a correct therapeutic approach.

As young surgeon performing arthroscopy I have been attracted towards meniscal repair and ACL reconstruction. Meniscal repair after arthroscopic meniscal suture has become one of my frequently performed surgery and the theme I have chosen for PhD Degree. The research concerning meniscal repair was done from 1999 to 2001, under Professor Dinu Antonescu guidance. I have received the PhD Degree in 2001. I am the surgeon who have performed the first arthroscopic meniscal suture in Romania and I have performed experimentally research concerning cellular mechanisms of meniscal repair. The experimentally research were done in collaboration with University of Veterinary Medicine from Bucharest. These research have proven that in meniscal repair two cellular population are involved: fibroblast derived from cell inside meniscus and activated sinoviocites. The study has also established the importance of adjuvants therapies in meniscal repair as are the following: vascular access channel, synovial flap and fibrin clot.

In next stage I have evaluated the clinical results after meniscal suture and I was able to prove that: meniscal repair has occurred, the surgical technique- outside-in- was efficient, the adjuvants therapies procedures were helpful. Also the study has documented that the correct placement of meniscal suture points is critical for a successful result. The study was published in Romanian Society for Orthopaedic –SOROT –Journal and presented in SOROT Congresses. The mid-term follow-up evaluation- at 5 years' post-surgery- was published in KSSTA- official Journal of European Society for Arthroscopy and Knee Surgery (ESSKA) in 2003. I became a fervent promoter of meniscal suture and an advocate of meniscal preservation. For promoting meniscal repair, I give lectures at SOROT Congress as well as in SRATS (Romanian Society for Arthroscopy and Sports Traumatology) Congress in 2016, 2018 and 2010. On the same subject I have organised 2 post-graduate courses in Colentina Hospital and I have participate-as invited lecturer- at Arthroscopies courses organised under ESSKA patronage in Targu Mures in 2017 and 2019.

The second line of research in arthroscopy field was linked to ACL reconstruction. I have performed first ACL reconstruction in 1997 and I have been –along my career- searching to improve this technique. One of the selected issue to be address was finding an algorithm for proper graft selection, in accordance with biomechanical and functional profile of the patient. I have presented in SRATS and SOROT Congresses results after ACL reconstruction done with bone-tendon-bone, semitendinosus graft or allografts. Graft fixation as well as potential complications related to this surgery type were also investigated. The study's results were presented in Romanian Biomaterials Society Congress and were published in Key of Engineering Materials in 2014 and 2016.

In vivo behaviour of bioresorbable implants used in arthroscopy is another direction for research, in which I am involved since 2010, as soon as they became part of our practice. My attention was focused towards primary fixation as well as to their long time behaviour, especially long term complications, resorption and integration phenomena's. I have also searched a way to improve this special screw design. This was the main goal of the project AURABIOMAT; the project was conducted together with Polytechnic University of Bucharest, between 2011 and 2013. All my researches concerning complications related to bioresorbable implants used in arthroscopy were gather in an International Book Chapter, published in 2014 at Springer: Handbook of Bioceramics - Clinical Limitations of the Biodegradable Implants Used in Arthroscopy. The title of the chapter is very clearly pointing the addressed subjects: early and late complications related to bioresorbable implants. As the trend of implants used in arthroscopy moved towards new biocomposite materials, our research has expanded to include them also. The biocomposite implants have in composition, among the bioresorbable materials an osteoinductive material, most frequent tricalcium phosphate-TCP- or hidroxiapatite-HA. As results of osteoinductive properties these materials have presumed: better and faster osteointegration, a more predictable behaviour, without altering the primary graft fixation.

The studies we have conducted upon biocomposite screws used during ACL reconstruction have documented that the incidence of long term complications is related to their chemical composition, especially to polylactic acid-PLLA- content. These results were presented in SICOT Congress in Cancun in 2019.

Skeletally immature patients represent a particular group among the patients in need for ACL reconstruction. From 2010 I got involved in research about this subject and I have sustained invited lectures in SRATS Congress from 2016,2018 and 2020; also I have published papers regarding various aspects related to this subject in Key Engineering Materials in 2013 and 2014 and in Revista Materiale Plastice in 2016.

I have cumulate a serious experience in arthroscopic surgery and this experience was the base for the two monographies published in 2003 and 2004, regarding meniscal repair and ACL reconstruction. As one of the first arthroscopic surgeons in Romania I have advocated for arthroscopic approach in knee sports medicine and for meniscal preservation.

I became a founder member of SRATS and the President of this society between 2018-2020.

I shall also mention my involving in research and surgeries related to meniscal transplantation. I am the first surgeon in Romania performing meniscal transplantation with allograft-as on literature research; the results of these studies were presented during invited lecture at the Second SRATS Congress in Bucharest 2018.

As a good rheological environment inside knee joint is one of the factors impacting on knee health. I have started early in 2008 the study concerning enhancing and preserving a good rheological status inside knee joint. The Project ARTROMAG 2008-2011, in which we worked together with a team from Polytechnic University of Bucharest and from ICECHIM was focused on improvement of rheology inside knee joint. The project has intended to and has successfully obtained magnetic nanoparticles, which embedded with chitosan and Hyaluronic acid-HA- targeting cartilaginous lesions inside knee. This targeting was facilitated by the mean of a knee orthosis who incorporated proper positioned magnets. As result of the project a patent: Orthosis with magnets for knee, no 128699 29/11/2017 was obtained.

The subject of improving knee rheology was not abandoned but rather extended by using and searching developments concerning the new orthobiological products. Due to this continuous

attention paid to knee rheology and orthobiologic products I was invited to an ESSKA Initiative Group-ORBIT-in 2020. ORBIT is a group formed from experts in orthobiological used in knee ostheorthritis. The target is to deliver a European Protocol, concerning the usage of orthobiological products inside osteoarthritic knee joints. The expected results are due to be delivered at ESSKA Congress from Paris in 2022.

Knee arthroplasty is another subject of interest in my research activity. I was involved in both unicompartimental as well as in total knee arthroplasty. We are performing unicompartimental knee arthroplasties in Colentina Hospital since 2006 and we have worked continuously in improving our technique. In this respect we followed and completely evaluated every single failure, in collaboration with UPB. We may say we have the largest experience on this subject among orthopaedic surgeons in Romania, as the RNE (National Register for Endoprosthesis) data may prove. This is why I have sustained an invited lecture about this subject at SOROT Congress in 2020 and at The Royal Medical Club Congress in Bucharest in 2019.

In the field of total knee arthroplasty, I have worked on improving and choosing the right surgical approach- based on patient local status and history. We have also used the reduction osteotomy for severe varus cases. Our observations and results concerning utility of reduction osteotomy were presented at 2019 ISAKOS Congress in Cancun.

Enhancing diagnosis and treatment in periprosthetic joint infections is another direction for our research, which were done in collaboration with a team from Matei Bals National Infectious Dissease Institute. We have organised commune team work, interactive work-shop presentations concerning periprosthetic infections. As result, the sonication became almost a rule in this pathology and the protocol for treatment are under continuously improvement. Also pertinent recommendations in the field of prevention of this pathology were delivered. The results of this studies were presented at Scientific Days of Matei Bals Institute in 2011 and 2014 and at SOROT Congress.

The use of bone-tendon allograft is another special activity and is supported by Colentina Tissue Bank functioning since 2006. I am the surgeon performing the first meniscal allograft transplantation and the first allograft ACL reconstruction in Romania. Since that time we constantly are using allografts in our daily practice, whenever they are necessary based on local condition. We kept reporting our experience and clinical results at all ROMTRANSPLANT Congresses as well as in SOROT and SRATS Congresses. As a recognition of my experience in transplant activity, I was invited to participate in the POSDRU 2014-2015 Project: Development of Competencies in Transplant. I was the Coordinator of bone-tendon course and I have conducted the training of 10 physicians and 20 nurses in bone-tendon, from the accredited clinical centres' all over Romania. For all the above mentioned, I have been designated the expert for bone-tendon in the SIPOCA 2021-2022 project, conducted by Romanian Ministry of Health. The Project will deliver the guide lines for allograft transplantation in Romania as well as the protocols for bone-tendon allograft practice.

The continuous improvement on the imagistic examination as well as on the 3D printing technology have lead us towards the POIGO Project 2014-2018, in collaboration with UPB team. The goal was to elaborate an interactive platform for facilitating the communication and interaction between physician and the engineer –specialised in 3D printing- in order to obtain better results for the patient. The project was just the starting point for a long time collaboration –and is continuing even today. The goal is to make our surgeries easier and more accurate. Here we include also improving in the parts of the instruments used during surgery-as you can see from the Patent: Dynamometric dispositive for acetabular cup insertion devices in cementing total hip arthroplasty,2018. We have continued the study regarding the influencing subjects such as: 3D printing- paper in Polymer Testing 2018-, multiple

sterilisations and natural aging of printed parts-paper in Mechanics of Materials 2020, on personalised cutting guides- paper in Journal of Rapid Prototyping 2019- and on pre-countouring plates used in Orthopaedic-paper in Journal of Clinical Medicine 2019. The new and special condition developed during Covid-19 pandemic had encourage us to continue research in 3D printing and to expand the possible use of this technology. In order to choose the best modality for orthopaedic surgeon to obtain the information we have conducted a usability study comparing the information's obtained from DICOM viewer, virtual reality and 3D print- paper in Journal of Engineering in Medicine 2021.

Restoration of a deficient bone stock was the start point for BIMBONE 2011-2013 Project in which we have collaborated with UPB. The goal was to obtain injectable biomaterials, with osteoinductive activity. Our interest in the field of biomimetic and osteoinductive capabilities of biomaterials have go one, in the same team; the result was a biocomposite material, able to induce biomimetic activity and bone remineralisation-paper in Materiale Plastice 2017. Next step was to obtain a 3D printed matrix able to be activated by injecting a biogel -paper inPolymers 2020.As results of the above mentioned studies a patent was issued: Procedure for obtaining hydrated bionanocomposite substrates for cell growth and tissue regeneration / modeling, 2020.

Our research concerning biomimetic materials is an ongoing activity; our goal is to obtain an injectable material able to induce, to sustain and to accelerate bone remineralisation in cases with poor bone stock.