

SUMMARY

The habilitation thesis entitled "***STUDY OF OSTEOPOROSIS IN ARTHROSIC DISEASE - FROM BASIC RESEARCH TO CLINICAL IMPLICATIONS***" is structured according to the CNATDCU recommendations in three sections.

The first section contains a synthesis of didactic, scientific and research activity, detailing the stages of academic and professional career development as well as the most important publications, articles and research grants obtained through competition.

I am a graduate of the Faculty of Medicine at University of Medicine and Pharmacy Craiova, the 2000 promotion. I entered the competition as a teaching assistant at this faculty in 2007, later promoting in 2013 as lecturer and in 2017 as associate professor.

I am a medical physician in the field of medical recovery (Ord. MS nr. 985/2016). Currently I have a teaching and professional activity as an associate professor in Physical Medicine and Recovery, as well as a medical physician in the Department of Physical Medicine and Rehabilitation, Emergency County Hospital Craiova.

Since joining the university education, I have guided groups of students during the practical internship of medical rehabilitation during the 6th year in the Faculty of Medicine as well as Practical Occupational Therapy for the 3rd year Balneo-physio-kinetotherapy and recovery students.

After promoting as university lecturer, my didactic norm included the guidance of the students' practical activities and the support of the Medical Recovery and Occupational Therapy courses at the mentioned discipline.

I finished my doctoral thesis entitled "Etiopathogenesis and management of digestive hemorrhages in liver cirrhosis" in 2006, being confirmed as doctor of medical science (Ord MEC 5764/28.11.2006) and in 2016 I graduated the Master entitled "Management of leading health units".

I am a member of the Medical Rehabilitation Society, the Romanian Society of Physical Medicine, Recovery and Balneoclimatology as well as a member of the Romanian Society of Osteoporosis and Musculoskeletal Diseases.

I was invited as a peer review of the journal Hippokratia (indexed ISI Web of Science) and I am a member of the editorial advisory board of the Current Health Sciences Journal.

So far, I have published a number of 13 ISI articles in extenso, out of which 12 as lead author and 13 articles in BDI indexed magazines.

My participation in international scientific manifestations has been materialized in publishing 20 articles in summary in ISI-rated journals.

As a single author or co-author I have published 3 medical books.

I also participated in the scientific colectivities of 8 research grants, obtained by competition, out of which 2 as director and scientific responsible.

The second section details the main aspect of scientific knowledge about the osteoporosis process, from fundamental research (anatomical, histological changes of the bone structure) to clinical implications (altered articular biomechanics and bone structure resistance, changes of the vertebral static and walking, the appearance and evolution of joint lesions with their consequences on the quality of life of patients).

Osteoporosis is a systemic disease characterized by impairment of the bone tissue architecture, resulting in an increased bone fragility and risk of fractures.

According to the World Health Organization (WHO), osteoporosis is defined in terms of diagnostic after DXA (Dual-Energy X-ray Absorptiometry) osteodensitometry, respectively by decreasing bone mineral density by more than 2.5 standard deviations from average of young people of same gender. WHO also states that osteoporosis is the most common bone metabolism disorder, being classified as among the first 10 diseases worldwide.

Women over 50 years old experience possess a higher incidence of osteoporosis (40%) compared to men (20%). Depending on the importance, osteoporosis risk factors include: menopause, age 65, inadequate calcium intake, high protein diet, chronic corticosteroid treatment, inadequate physical activity, low body weight.

According to a recent study by the International Foundation for Osteoporosis (IOF) and the European Federation of Pharmaceutical Industries and Associations (EFPIA) on the epidemiology, impact and treatment of osteoporosis in the 27 European Union (EU) Member States it was reported that 22 million women and 5.5 million men suffered from osteoporosis in 2010. The two organizations estimate that in 2025 the total number of osteoporosis cases in the EU Member States will reach around 34 million.

Therefore, in the case of osteoporosis, prophylaxis continues to be the first and most important mean in reducing the incidence of fractures. In this matter, the use of nutritional supplements of medicinal products with high content of silicon and magnesium in combination with organic complexes based on calcium and boron can be a determining factor.

Calcium fructoborate (CF), a boron-based nutritional supplement with the composition of $\text{Ca}[(\text{C}_2\text{H}_{10}\text{O}_6)_2\text{B}]_2 \cdot 4\text{H}_2\text{O}$, isolated from the plant kingdom, can also be obtained by chemical synthesis. Its chemical structure is similar to one of the natural forms of boron such as bis-manitol, bis-sorbitol, bis-fructose, and bis-sucrose borate complexes found in edible plants, whose utility in osteoporosis has been extensively researched in the last 5 years.

As a fact, the study of osteoporosis, the ways to prevent it and the complications of osteoporosis in the evolution of the osteo-articular system has been a constant concern in my scientific research during the last period.

In addition to this, given the profile of my medical specialty and the fact that arthrosis is the most common disease in my patients in the Medical Recovery Clinic, a large part of my studies and scientific publications have focused on this pathology, trying to make later connections between osteoporosis and arthrosis disease. Starting with fundamental research and imaging exploration, we attempted to establish algorithms for the diagnosis and evaluation of patients, also using artificial neural networks.

Arthrosis is a degenerative disease that affects mainly elder people, but whose incidence has increased significantly in the last decade in population under the age of 65. This disease has an increased debilitating potential, leading to significant care costs and a significant decrease in quality of life.

Several risk factors associated with the occurrence of osteoarthritis have been documented so far, such as genetic predisposition, aging, obesity and perturbations in existing alignment in the affected joints; however, the pathogenesis of osteoarthritis remains largely unknown. During the disease there are changes in all parts of the joint (cartilage, synovium, bone underlying), ultimately leading to its total compromise. Structural changes in the sinovial membrane, in osteoarthritis of the knee, are varied, from the hypertrophy and hyperplasia, in synovial cell growth, the appearance of inflammatory infiltrate and the appearance of neovascularization at this level.

Morphometric analysis of histological images can be considered a borderline method when using fractal dimension, combined with fractal box counting methods providing information both on existing structures areas in an image, as well as to the nature of each investigated element. Computer aided diagnosis systems can provide

new possibilities in the diagnosis and staging of tumor. Artificial neural networks (ANN) are the result of research in medical informatics, representing a form of artificial intelligence.

Little is known about the role of synovial membrane in the initiation and propagation of pain in adult patients with osteoarthritis and how it can affect synovial membrane degradation. There are studies that demonstrated the role of neuropeptides expressed in the synovial membrane in the initiation and propagation of local pain. It was established that there is a correlation between increased densities of neuropeptides in the synovial membrane in the perception of painful sensation in patients with osteoarthritis compared to patients with older pathology located at this level. The changes in the synovial membrane may be a predictor of the occurrence of pain in patients with osteoarthritis, also may be associated with the degree of alteration of other structures that are part of the joint.

At the end of this section I have presented the plans for the development of my academic career and the main directions for continuing the research in the field of osteoporosis with the testing of new products whose effectiveness is to be established in combating the unfavorable consequences of the joint destruction.

The third section contains the list of the most important bibliographical references that I have used to describe the current state of fundamental knowledge and the most important clinical consequences of osteoporosis.