„OVIDIUS" UNIVERSITY OF CONSTANȚA

DOCTORAL FIELD
DENTAL MEDICINE

ABSTRACT OF THE HABILITATION THESIS

„ ADVANCED STUDIES IN INVESTIGATION OF BIOMATERIALS USED IN ANATOMY AND DENTAL MEDICINE "

Candidate,

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SPECILTY ANATOMY

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ABSTRACT OF THE HABILITATION THESIS

„ Advanced studies in investigation of biomaterials used in anatomy and dental medicine "

The thesis titled „ Advanced studies in investigation of biomaterials used in anatomy and dental medicine " presents the scientific and personal achievements starting from the moment of supporting the doctoral thesis, as well as the career evolution and development plans, according to the legal requirements in force.

After supporting the PhD thesis, my work focused on three main directions: didactic activity, scientific and research activity, and medical activity, in fact, these intersected each other.The motivation of this paper is based on the observation that, from ancient times, people have been concerned with restoring parts of the body affected or lost due to accidents or illnesses. Among the first worries was the restoration of the teeth, which, usually, first deteriorated due to the way of life and food.The action and performance of biomaterials in the human body can be studied from several perspectives. First, we can characterize biomaterials in terms of the area with problems to be healed. Secondly, we can consider the body only at the level of the tissues, organs, or the whole system. Thirdly, we can emphasize the classification of materials in metals, polymers, ceramics and their compounds. In this case, the main function of materials such as biomaterials refers to how the material and the body interact, precisely, the influence that the body's environment exerts on the material and the effect of the material on the body.

The thesis is structured in three parts. **The first part** includes studies representative of my research activity, published in extenso in ISI Thomson Reuters medical journals. The existence of different anatomical variants involves the accurate knowledge of the macro, meso

and microscopic anatomy at the system or organ level. Anatomy, although fundamental, has a special importance in transferring the results of these researches to clinical, medical and, above all, surgical practice.

Subchapter 1.1 *„Applications of plastic materials in vascular renal investigations"* includes the results of researches performed on renal vessels, using various methods of study, starting with dissection on the corpse and on eviscerated organic blocks, modern imaging methods, as well as plastic injection on the renal vessels and on the pyelocaliceal system. For injection, we used several substances, such as vinyl polychloride (having cyclohexanone solvent) as well as different types of polyester oils, but the most commonly used was *"technovit"* (a plastic mass produced by a German company). The use of the technovit was the best injection method, the obtained parts were superior quality compared to the other materials used. From the morphological point of view, these casts provided three-dimensional anatomical details, with a precise emphasis on the relationship between the elements of the pyelocaliceal system and the vascularization area of each arterial ram. This fact has led me to broaden the scope of these materials, to deepen the information obtained and to use them in a series of interdisciplinary studies. 1.2 "*Influence of metals on the teeth and structures of the periodontium"* Starting from the fact that any achievement is based primarily on the experiences of the past, first of all, the points of view and the working methods for certain research directions. In this subchapter there are presented experimental studies on the contact of some metal compounds with the oral cavity, given that these metals can reach the oral cavity in different ways (saliva, blood transport after intestinal absorption, dental implants). Several batches of rats were used that were followed: (a) the pathological consequences of nickel (Ni) on teeth and gums*;* it has been found that in case of chronic poisoning with compounds containing this metal, the dental-gingival device should be considered a potential target. Subsequently, we aimed to attenuate the histopathological changes produced by nickel by concomitant administration of magnesium. It has been found that this element indeed produces a decrease in destructive effects but can not completely neutralize them. (b) Histopathological characteristics of dental pulp in case of acute poisoning with zinc (Zn). Generally, oral cavity tissues are the first to contact zinc compounds in endodontic treatments, and there may be direct absorption through dentin into the dental pulp. The HE colored sections showed numerous branched, anastomized and dilated capillaries filled with red amorphous deposits mainly located in the central portion of the dental pulp. These conglomerates formed by overlapping acellular sediments were not identified in dentin or enamel. (c) evaluation of bone integration

of the surfaces of dental implants and peri-implantation in diabetic rats, by electronic scanning microscopy (SEM) and histomorphometry. Large-grained and acid-engraved (SLA) grafted implants and SLActive implants have been used. It has been assumed that diabetes has pathological effects on the osteointegration of dental implants and there was a BIC% (percentage of bone-implant contact) deficient in the diabetic group, as expected. The use of the hydrophilic SLActive surface has had positive effects in healthy and diabetic animals. Therefore, this surface seems particularly suited for its use in compromised patients. 1.3 Use of resins in prosthetic restorations (interdisciplinary research in dental medicine). The major significance of the biological compatibility of the dental materials used is in reference to their placement in direct contact with the hard and soft dental tissues in the oral cavity. The response of the dental tissues involved to these materials can be with negative or positive effects on the final result.

The deficiencies and differences between fixed FMPR mixed prosthetic restorations with two types of resins commonly used in Romania - Superpont C + B (Spofadental) and Royaldent (Palatine Foggyart) were analyzed. The result of the study showed that both materials wear out in time, in terms of physical appearance and aesthetics, and induce gingival inflammation, but the restorations made with Royaldent resin have caused less irritation in the gum tissues.

The second part of this thesis includes the directions and prospects of developing my professional, scientific and academic career. Future research activities will continue with previous studies and will focus mainly on the following directions:

(a) studying anatomical variants of arterial and venous vascularization in the head and neck, by injection of vascular systems with methacrylate and subsequently preserving the obtained vascular casts, thus revealing the different types of vascularization. This study will mainly focus on the maxillary artery and its branches (b) studies of anatomy imaging (CT, MRI, CBCT) of skull skeletal structures and temporomandibular joints, and assessment of alveolar bone loss in chronic periodontitis; (c) continue research on animal experiments to study the impact of other metals used, in different forms, in the implants (d) Three-dimensional Evaluation of the Maxillary Sinus by Computed Tomography with Conical Beam in dentate and edentulous persons, and the creation of a database for the Department of Maxillofacial Surgery (d) interdisciplinary collaborations that provide opportunities for the development of new clinical and scientific competencies. Based on my experience in university education, I wish to develop the discipline of Anatomy by extending the laboratory of Applied Anatomy and Experimental Surgery to introduce imaging anatomy and experimental embryology.

The third part contains the totality of the bibliographical references related to the two previous parts of the thesis.

Finally, I mention that the empowerment thesis was drafted respecting the provisions of the Order of the Ministry of Education and Scientific Research no. 3121/2015 and the Regulation "Ovidius" University of Constanţa no. 24 / 26.02.2018 regarding the organization and carrying out of the process of obtaining the attestation certificate.

Assoc. Prof. Dr. ŞAPTE ELENA