



UNIVERSITY OF AGRONOMICAL SCIENCES AND VETERINARY MEDICINE BUCHAREST
FACULTY OF VETERINARY MEDICINE

HABILITATION THESIS

ABSTRACT

**STUDY REGARDING THE SIGNIFICANCE OF ULTRASOUND
CHANGES IN THE COMPLEX DIAGNOSIS OF CAVITARY
ORGANS IMPAIRMENT IN SMALL ANIMALS**

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***Field of research:*BIOMEDICAL SCIENCES, VETERINARY MEDICINE**

The present Habilitation Thesis reflects the authors' activity achieved after ending PhD studies (1994-1999). It is based on professional assemblage, original scientific contributions and university residential courses/internships, following the postdoctoral period, within the University of Agronomical Sciences and Veterinary Medicine Bucharest, as follows: Postuniversity Studies of Veterinary Medicine School (2002-2004), University Clinic Hospital "Sfantul Ioan" Bucharest and within the residential courses/internships at the University of Kentucky (USA) – 2006, Purdue University (USA) – 2008, Szent University Budapest – 2009.

The approached area of interest has been focused on the multidisciplinary complex diagnosis of internal diseases in small animals, with the purpose of streamlining and implementation of the most novel and efficient means of therapeutical approach.

Among the physio-pathological injuries, the clinical expression and the ultrasound changes registered at parenchymatous and cavitory organs' level are in strong relation, able to suggest, to confirm the existence, type and gravity of the pathological process. The simplistic character of approach and identification of the structural parenchymatous and parietal components, along with the specificity of parietal changes and/or of content, along with the high relevance of ultrasound detectable alterations, transforms the ultrasound examination a day to day extremely efficient means of diagnosis.

The preclinical means of diagnosis, especially based on the ultrasonography technique: bidimensional clinical echography (Bmode), color Doppler and interventional echography (for diagnosis and therapy purpose) and endoscopy, as well as the stadial and progressive implementation of the advanced techniques of imagistic diagnosis, have brought new opportunities of non-invasive diagnosis and fundamental and applied research in the branch of small animals internal medicine.

During this period of time, the main activity has been centered on the identification and implementation of clinical and interventional clinical echography techniques in the area of internal diseases. The studies, internships and residency courses in this field of expertise have taken shape through publishing the first books and expertise papers (over 130) in the field of ultrasonography, scientific papers published in ISI and BDI quoted journals.

The first editorial release in Romania in ultrasound field of expertise is represented by the paper "Ultrasound diagnosis of internal diseases in animals", written by yours truly in 2000, this being followed by a number of other works: "Ultrasound diagnosis in small animals" – authors Codreanu M.D., Diaconescu Al (2003), "Ultrasound guide in small animals" – authors Codreanu M., Birtoiu A., Diaconescu Al (2005, electronic format) and "Ultrasonography in veterinary medicine" – authors Codreanu M., Mircean M., Diaconescu Al, Serdean C., SolcanGh, Morar I. (2012, electronic format).

The most representative studies and original papers in the area of ultrasonography are focused on the relevance and significance of this technique in the complex multidisciplinary diagnosis of internal diseases in small animals, especially of the cavitory organs (stomach, intestines, gallbladder, urinary bladder, uterus), as well as those of parenchymatous organs (liver, kidneys, spleen) in small animals.

The complementary character of the obtained results, the accuracy and significance of the structural changes at the level of parietal components and of the echo structure of the parenchymatous organs of interest, along with the non-invasive character upon the patient and the examiner, have built arguments for the step by step implementation of this technique in the current diagnosis of the internal diseases in small animals in Romania.

The progressive passage from the classic ultrasonography diagnosis (Bmode) to that of color Doppler echography, ultrasound guided and interventional echography has encompassed an important stage in the non-invasive imagistic diagnosis for the modern veterinary medicine.

In approaching of the interest area I had confidence that, overall, the cavitory organs impairments

(stomach, small and large intestine, gallbladder, urinary bladder, uterus) have important clinical expression for obtaining a presumptive diagnosis, less quantifiable clinically and functionally, in comparison with the impairments of the parenchymatous organs; for this reason I have deemed opportune a thoroughgoing study and finding integrative-correlative means of ultrasound diagnosis in the multidisciplinary complex diagnosis of the latter. In this context, the ultrasound evaluation allows obtaining data regarding the identification and evaluation of the cavitory organs and their parietal structure, the topography (in relation with the organs serving as echo-guide), the type and quantity of the content, along with the tonus/presence and intensity of specific contractions. The changes in cavitory organs, especially those regarding the specific parietal architecture (emphasizing and maintaining ratio between the specific constitutive elements), the wall thickness, can be easily highlighted and evaluated: maintaining structural uniformity, maintaining specific architecture (parietal stratification), parietal thickening – homogenous type, preserving parietal stratification (inflammatory changes) – or non-homogenous (neoplastic changes), infiltrative changes (especially those of neoplastic nature), edematous changes (vascular stasis).

The identifiable and quantifiable parietal changes are as follow: assessment of parietal width, maintaining/losing the specific parietal architecture, possible parietal modifications, discontinuity (i.e. bladder rupture), hyper representations (i.e. adherent block), homogenous thickening (inflammatory processes), non-homogenous thickening (neoplastic processes), infiltrative changes (neoplastic nature processes), edematous changes (stasis phenomena).

As correlative approach character, in the general appreciation and with differential character, I had in view the following: quantitative changes/depression/stasis of the content, which could denote the existence of some morphological disorder at the parietal level; the qualitative changes of irreversible/reversible temporary progressive type of the cavitory organs contents (constantly identified during the dynamic evaluation) guides the existence of their morphological alterations (i.e. gastric hemorrhage, melena, hematuria, uterine accumulate appearance); parietal contour changes show the existence of parietal lesions (parietal tonus changes); diffuse infiltrative type changes (difficult to identify and differentiate from the inflammatory changes).

With high specificity and diagnostic significance, the inflammatory processes with parietal interest at the cavitory level are invariably ultrasound dominated by parietal hyper-representation with maintaining the specific architecture and parietal tonus (with superficial parietal reaction), characterizes acute inflammatory processes, while diminishing/losing parietal tonus (affecting the medium and superficial layers) characterizes chronic inflammatory processes. From ultrasonographic point of view, the most important and easy to identify is the destruction of parietal architecture, for every one of the cavitory organs.

For a more accurate diagnosis, comparative evaluations emphasize and recommend further investigations with convex/micro convex or linear probes, with a frequency of 5-18 MHz. For confirmation of clinically identified changes, these have been correlated with the preclinical investigations results (hematology, blood and urine biochemistry, molecular biology techniques) and imagistic (radiographic, endoscopic).

In order to optimize the ultrasound diagnosis and adequate appreciation regarding the topography, tonus, motility, integrity and homogeneity of the parietal components of the cavitory organs, it is recommended to avoid artifacts, pending on the examiner, and diminishing those due to fullness, position, preliminary preparation etc., changes that intervene in ultrasound image quality, implicitly in the accuracy of the ultrasonographic investigation.

The stasis of cavitory organs contents can be easy to assess and correlated with ultrasonographic alteration, especially in gastric and/or intestinal stasis (intestinal ileus), with a specific digestive symptomatology in strong relation with the degree of obstruction and motility and contraction

alterations. In what concerns cholestasis and urinary retention, the distension is much easier to highlight, with a relative clinical correspondent and not always specific, and minimal concern of the architecture or parietal representation. In such cases, the type, quantity and aspect of contents can be easily appreciated by ultrasound. The sludge and cellular detritus or sanguine cells appear as corpuscular particles/elements in suspension, without a tendency to sediment. In small animals, cholestasis is not always accompanied by the specific dyskinesia/biliary stasis symptomatology, rarely being described vomit episodes, with biliary character and/or lack of appetite. The accumulate can be homogenous or non-homogenous, echoic or hypo-echoic, in strong relation with its type and quantity.

Parietal changes can be discrete or even absent, rarely homogenous (with parietal reaction), as is the case of the intestinal ileus, of urinary retention or cholestasis.

In case of urinary retention (neurological bladder), changes due to chronic urinary infection are egregious (secondary cystitis), with homogenous parietal reaction (thickening) and diminished specific parietal tonus. Foreign bodies found at gastric level, respectively intestinal level, are, also, easily highlighted, appearing as echoic masses/structures (with different degrees of posterior shadowing), in direct correlation with gastro-intestinal obstruction symptoms. In such cases, the parietal architecture (in early stages) is less to not at all affected.

Bladder or cystic calculi appear as echoic masses, with homogenous form and acoustic shadow well defined (clean shadow cone). In the majority of cases, the parietal reaction is present, dominated by homogenous thickening, specific to inflammatory processes.

Localizes changes are much more easy to identify, being dominated, usually, by loss of specific parietal architecture (with hyper representation of some parietal component), and a high degree of specificity for neoplastic processes.

Acute and chronic cystitis and gallbladder inflammation, are dominated by the same changes, ultrasound highlighted, the reactive process being similar to that described at gastrointestinal level, consisting, mainly, in the obvious parietal hyper representation (thickening), associated with non-homogenous aspect of the bladder/biliary contents and with different lesional degrees of parietal tonus and contractibility and with the clinical expression.

After the postdoctoral period, I was involved, as research project director, respectively member, in different national and international research projects, as well as POSDRU projects, in close relation with the theme of the present habilitation thesis.

After sustaining my PhD dissertation, I have published a considerable number of papers (over 300), as sole author or co-author, books, handbooks and monographies, ISI (9) and BDI (234).

In concordance with the information included in the present Thesis, my scientific activity has been credited also by being invited and my participation as speaker in different congresses, conferences and scientific manifestations, national and international, reviewer and member in the editorial collective of different scientific publications.

I have obtained the quality of clinical and interventional echography specialist, member, and respectively coordinator, in national, European and international professional association in the field of national imagistic area.

The last chapter of my thesis is represented by the perspectives of professional development, scientific and university career.