

3) Своевременная диагностика с правильным лечением позволяют улучшить качество жизни пациентов и отдалить сроки или даже вовсе избежать необходимость эндопротезирования.

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APPLICATION OF ULTRASOUND TECHNOLOGIES FOR INTRAVITAL VISUALIZATION IN CLINICAL ANATOMY

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Relevance. Clinical anatomy is a set of applied areas of modern anatomy that study the structure and topography of organs and areas in health and disease in the interests of various sections of clinical medicine. Clinical anatomy, which emerged as an applied science back in the days of N.I. Pirogov, began to develop intensively in the second half of the twentieth century. Its rapid development in the 1990s and 2000s was due to the widespread introduction of diagnostic methods of intravital visualization into clinical practice. Clinical anatomy has a complex multifaceted structure; it continues to develop as an independent and relevant scientific and practical area of modern human anatomy. A precise knowledge of clinical anatomy is a keystone to the diagnosis of various diseases [1].

The relevance of the study is confirmed by the presence of a number of national and international organizations uniting specialists in the field of clinical anatomy: American Association of Clinical Anatomists, British Association of

Clinical Anatomists, International Federation of Associations of Anatomists, European Association of Clinical Anatomy, etc.

The aim: a brief analysis of scientific publications on the topic of the application of ultrasound technologies for intravital visualization in clinical anatomy.

Research methods. The electronic database PubMed was used to search for information (<https://pubmed.ncbi.nlm.nih.gov>). PubMed comprises more than 37 million citations for biomedical literature from MEDLINE, life science journals and online books. Citations may include links to full text content from PubMed Central and publisher web sites. The publications that best matched the research topic were selected for analysis. The search data are presented as of March 06, 2025.

Results and conclusions. The database identified over 63,000 publications on various aspects of clinical anatomy over the last 10-year period alone. More than 855 publications were devoted directly to intravital visualization with ultrasound methods. This paper reviews individual publications directly related to the topic of the study.

It is gratifying to note that clinical anatomy widely uses modern methods of intravital visualization (ultrasound examination, computed tomography and its variety spiral computed tomography, magnetic resonance imaging, endoscopic examination) to study the intravital anatomy of body regions, internal organs, their structures and cavities. It has been shown that these methods provide objective information on the position, size and structure of the objects being studied. The use of these methods of intravital visualization provides objective quantitative indicators and allows us to identify the most common variants of the shape and size of anatomical structures under normal and pathological conditions. This was reported in the publication of the famous Russian anatomist I.I. Kagan back in 2008 [2].

Intravital imaging has found widespread use in both experimental and clinical settings. The advent of confocal and multiphoton microscopy has greatly increased the feasibility of intravital imaging, making it possible to obtain optical sections of tissues in a non-destructive manner. This paper discusses the various techniques used for intravital imaging, describes how intravital imaging provides information on cellular and tissue dynamics that cannot be obtained using other methods, and details several ways in which intravital imaging has a direct impact on the clinical care of patients [3].

A number of publications provide information on the great importance of the use of ultrasound technologies in clinical anatomy.

A large review article by a group of authors [4] deserves special attention: it provides a comprehensive analysis of the use of echocardiography in clinical practice. Some of the more common cardiac pathologies are discussed below, with regards to their echocardiographic findings/relevance. This review discusses the different modalities of echocardiography and their advantages and provides a comparison to other imaging modalities. It is emphasized that development of cardiac ultrasound (echocardiography) techniques has added greatly to the discipline. Ultrasound images do not only provide a means of diagnosis but allow for the development of treatment modalities and easy monitoring of disease progression. The article is illustrated with 6 color informative figures using echocardiograms,

contains 3 tables (Comparison of 2-D and 3-D echocardiography, Complications of transthoracic echocardiography, Comparison of echocardiography to other imaging modalities). The list of references contains 26 sources on the topic of the study.

The latest publication by Tsampras T. [5] indicates that one of the most promising areas of diagnostics and prognosis of cardiovascular diseases is radiomics – a science that combines radiology, mathematical modeling and deep machine learning. The main concept of radiomics is image biomarkers which are parameters calculated based on the texture analysis of digital images that characterize various pathological changes. With the help of image biomarkers, a quantitative assessment of the results of digital visualization methods computed tomography, cardiac magnetic resonance, echocardiography, and single-photon emission computed tomography) is carried out.

Automatic myocardial tissue segmentation using deep learning algorithms improves the efficiency and consistency of analysis of large patient populations.

Based on the literature review, it can be concluded that echocardiography, as previously established, has been evolutionary in the generation of non-invasive clinically useful cardiac images. This has allowed for greater diagnostic yield and thus, more precise clinical management. It allows for the assessment of cardiac diseases in a cost-effective and minimally invasive manner, making it attractive to both the patient and the physician. Three-dimensional imaging has allowed for a more accurate copy of the cardiac anatomy. Transthoracic echocardiography has become the preferred method for quantitative assessment of cardiac chambers, while transesophageal echocardiography is used to assess valvular diseases and posterior cardiac structures.

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