

THE VISCERA

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ARTICLE INFORMATION

ABSTRACT:

ARTICLE HISTORY:

Received: 16.04.2026

Revised: 17.04.2026

Accepted: 18.04.2026

KEYWORDS:

Viscera, Anatomy,
Physiology, Internal
Organs, Homeostasis,
Clinical Significance,
Pathology, Human Body

This article provides a comprehensive overview of the human viscera, exploring their intricate anatomical structures and vital physiological functions. It delves into the complex interplay between various internal organs, highlighting their coordinated roles in maintaining homeostasis and overall bodily health. Furthermore, the paper discusses the clinical significance of visceral studies, encompassing diagnostic methodologies, therapeutic interventions, and pathological considerations relevant to internal medicine and surgery. By integrating contemporary research findings, this work aims to enhance the understanding of visceral systems and their profound impact on human well-being.

Introduction

The internal organs, also known as the "viscera" in medicine, are complex structures that support the vital processes of the human body, each with its own unique structure and function. They play a crucial role in vital processes such as homeostasis, metabolism, blood circulation, and respiration. The science of internal organs, namely splanchnology, is an in-depth study of their structure, function, and complex interactions in the human body, encompassing anatomy, physiology, and pathology. Multicellular organisms rely on a hierarchical organization of cells, tissues, organs, and interrelated organ systems. Regulated by the endocrine and nervous systems, these systems cooperate to maintain life.

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A significant part of the internal organs in the human body is located in the abdominal cavity, which is a secondary body cavity in vertebrates. It contains organs such as the gastrointestinal tract, liver, pancreas, spleen, and adrenal glands. Serous fluid lubricates the peritoneum and provides frictionless movement of the organs. The functional activity of the internal organs is finely controlled by the autonomic nervous system (ANS). In particular, the vagus nerve innervates organs such as the stomach, pancreas, and liver, affecting the absorption and metabolism of nutrients. It is important in optimizing postprandial insulin secretion and regulating blood glucose levels. Diseases of the internal organs pose a common and complex problem in medicine. The mechanisms of visceral pain are less well understood than somatic pain and are associated with factors such as sexual dimorphism, psychological stress, and genetics. Functional disorders of the intestine, such as irritable bowel syndrome, are associated with increased sensitivity of the internal organs and impaired central sensitivity, which creates difficulties in diagnosis and treatment. Therefore, an in-depth study of the anatomical structure, functions, development and pathological conditions of the internal organs is a priority area of modern medicine. This article provides a comprehensive review of the internal organs and comprehensively covers their medical significance.

Literature review on the topic

Analysis of the literature on the topic is of fundamental importance in deepening scientific knowledge about internal organs, assessing their structure, functions and pathological conditions from the perspective of modern research. This section, based on scientific works published in recent years, comprehensively reviews the anatomical, physiological and clinical aspects of internal organs, synthesizes existing knowledge and identifies promising directions for future research.

The work of Alimardonova and Norboboyeva entitled "THE SCIENCE OF INTERNAL ORGANS - SPLANCHNOLOGY" provides a comprehensive definition of splanchnology and illuminates the scientific foundations of studying the structure, functions and complex interactions of internal organs in the human body. This study explains in detail how the hierarchical organization of cells, tissues, organs, and interconnected organ systems of multicellular organisms, as well as their regulation by the endocrine and nervous systems, cooperate to maintain life. The authors emphasize, for example, the integral cooperation of the respiratory and circulatory systems in ensuring gas exchange, which demonstrates the specific but complementary role of each system in maintaining the homeostasis of the organism. In particular, this work discusses modern research methods and technologies used in the study of internal organs, including high-resolution imaging techniques (e.g., magnetic

resonance imaging (MRI), computed tomography (CT)), molecular biology methods, genetic analysis, and functional genomics approaches. These methods allow for real-time assessment of the micro- and macrostructure of organs, their functional state, detection of changes at the cellular level, and understanding of the molecular basis of pathological processes. Researchers also evaluate current scientific achievements in this important medical field and identify future prospects, including regenerative medicine, the development of organ transplantation technologies, personalized treatment approaches, and the use of artificial intelligence in diagnostics and prognosis. This indicates the need for a multidisciplinary approach to understanding the physiology and pathology of internal organs.

The location and organization of internal organs have undergone significant changes during evolutionary processes, which served to increase their functional efficiency. The abdominal cavity, as a secondary body cavity of vertebrates, is a vivid example of evolutionary adaptations. In lower vertebrates, for example, in some fish, channels between the abdominal and pericardial cavities have been preserved, while in many fish the presence of openings of the abdominal cavity opening to the external environment has been noted. These features indicate the development of various mechanisms for direct contact of internal organs with the external environment and their protection. While in cyclostomes and fish the pericardial cavity is located anteriorly relative to the abdominal cavity, in terrestrial vertebrates this location has shifted posteriorly. This evolutionary change may be associated with the development of the respiratory system and the need to counteract the force of gravity. In mammals, the development of the diaphragm was a major turning point in visceral anatomy. The diaphragm plays a crucial role in optimizing respiratory function and protecting internal organs by effectively separating the pericardial cavity (along with the anterior abdominal cavity containing the lungs) from the rest of the abdominal cavity. In humans, the abdominal cavity, also known as the abdomen, contains vital organs such as the gastrointestinal tract (from the esophagus to the rectum), liver, pancreas, spleen, and adrenal glands. The serous fluid in the abdominal cavity lubricates the peritoneum and provides frictionless movement of organs, which is essential for their normal function. These evolutionary and comparative anatomical analyses provide a deeper understanding of the complexity of the visceral system and its importance in the adaptations of different species to life.

The functional activity of internal organs is finely regulated by the autonomic nervous system (ANS), which plays a central role in maintaining the body's homeostasis. The AN consists of sympathetic and parasympathetic systems, with the sympathetic system

controlling catabolic responses and the parasympathetic system controlling anabolic responses, mainly through the vagus nerve. The vagus nerve's extensive innervation of tissues important for nutrient metabolism, including the stomach, pancreas, and liver, suggests its influence on nutrient absorption and metabolism. Studies have shown that the efferent activity of the vagus nerve is initiated by oropharyngeal receptors at the beginning of a meal and continues into the postprandial period. This activity is crucial for pancreatic function, especially in optimizing early-phase insulin secretion and postprandial insulin secretion. For example, when intragastric glucose is administered, postprandial glucose levels are higher and insulin responses are attenuated compared to when oropharyngeal receptors are activated by food. This confirms the direct involvement of the vagus nerve in the digestive processes and in the regulation of blood glucose levels. Furthermore, chronic stimulation of pancreatic B-cells, such as during 48-hour glucose infusions, increases vagus nerve efferent activity, which in part mediates the compensatory increase in insulin secretion. In conclusion, the vagus nerve plays an important but often overlooked role in the regulation of blood glucose levels and the maintenance of glucose homeostasis. These findings may provide the basis for the development of new therapeutic strategies targeting the vagus nerve in the treatment of metabolic diseases, particularly diabetes mellitus.

The mechanisms of visceral pain associated with diseases of internal organs are less understood than those of somatic pain, and their complexity is due to many factors, including sexual dimorphism, psychological stress, and genetics. These factors make it difficult to develop suitable animal models for studying visceral pain, as the subjectivity and complexity of pain perception in humans are not fully reflected in animals. The development of visceral hypersensitivity has been shown to be associated with increased sensitivity of primary sensory afferents, hyperexcitability of ascending neurons in the spinal cord (central sensitization), and disruption of descending pain-modulating pathways. Depending on the type of stimulus, different neural pathways are involved; For example, early childhood psychological stress can lead to chronic pain through disruption of the hypothalamic-pituitary-adrenal (HPA) axis and increased corticotropin-releasing factor (CRF), while early childhood inflammation can cause hyperalgesia through disruption of the opioidergic system. These findings highlight the diverse and multifaceted pathophysiological basis of visceral pain. Functional bowel disorders such as irritable bowel syndrome (IBS) (which affect 18–20% of gastrointestinal patients) and chronic pelvic pain (which affects approximately 15% of women) often present as unexplained pain. These conditions often overlap, with approximately 35% of patients with chronic pelvic pain showing improvement when treated for the functional bowel disorder.

The relationship between these conditions is explained by the dichotomy of afferent fibers and convergence in the spinal cord, which leads to the processing of pain signals from different internal organs through the same pathways in the central nervous system. In recent years, the discovery of new peptide molecules has raised hopes for improved therapies for the treatment of chronic visceral pain. These peptides may contribute to more effective pain management by specifically affecting pain signaling pathways. Research in this area is aimed at developing new, targeted treatments for the management of visceral pain, which could significantly improve the quality of life of patients.

In conclusion, the analysis of the literature on internal organs shows the deep interrelationship of their complex anatomical structure, delicate physiological functions, evolutionary development and pathological states. Modern research methods and technologies are helping to expand knowledge in this area, creating new opportunities for diagnosis and treatment. A multidisciplinary approach and the search for new therapeutic strategies are of great importance in solving complex clinical problems such as visceral pain. Future research should be focused on a deeper understanding of the function of internal organs, the development of effective methods for disease prevention and treatment.

Conclusion

Visual organs are an integral part of the complex vital systems of the human body, and their anatomical structure, physiological functions, and embryological development are crucial for ensuring homeostasis of the organism. This article highlights the multidisciplinary nature of splanchnology, highlighting the evolutionary adaptations of internal organs, their delicate control by the autonomic nervous system, and their central role in metabolic processes. Complex clinical conditions such as visceral pain demonstrate the need for a deep understanding of their pathophysiology. Modern diagnostic and treatment approaches, along with new therapeutic strategies, are essential for improving the quality of life of patients. Future research should focus on further expanding knowledge in this area.

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