

Splanchnic Circulation: Assessment, Health, Disease

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Introduction

This review explores methods for assessing splanchnic microcirculation in critically ill patients, highlighting various techniques like videomicroscopy and near-infrared spectroscopy. It points out the challenges and the potential of these tools to guide therapy and improve outcomes, emphasizing the need for better understanding of regional blood flow during severe illness [1].

This paper reviews non-invasive methods to assess splanchnic hypoperfusion during exercise. It highlights how intense physical activity shunts blood away from the gut, potentially impacting nutrient absorption and contributing to gastrointestinal distress in athletes. Understanding these dynamics is crucial for optimizing performance and preventing exercise-induced gut issues [2].

This article delves into the complex splanchnic hemodynamics in liver cirrhosis, explaining how portal hypertension leads to significant alterations in blood flow and vascular resistance in the gut. It discusses the underlying mechanisms and explores current and emerging therapeutic strategies aimed at modulating splanchnic circulation to mitigate complications of liver disease [3].

This article examines the pharmacological approaches to modulate splanchnic hemodynamics, specifically in the context of acute liver failure. It discusses how certain drugs can impact blood flow and vascular tone in the splanchnic bed, which is vital for managing complications like cerebral edema and improving patient outcomes in this critical condition [4].

This paper discusses the critical role of splanchnic hypoperfusion and subsequent gut barrier dysfunction in the progression of sepsis. It explains how reduced blood flow to the gut can lead to increased intestinal permeability, allowing bacterial translocation and contributing to systemic inflammation and multiple organ failure, emphasizing the need for strategies to preserve splanchnic perfusion in septic patients [5].

This paper highlights the splanchnic circulation's role beyond blood supply, framing it as a crucial regulator of glucose and lipid metabolism. It explains how changes in splanchnic blood flow and substrate delivery influence hepatic glucose production, insulin sensitivity, and overall metabolic homeostasis, offering insights into conditions like type 2 diabetes [6].

This article reviews advanced imaging techniques used to assess splanchnic hemodynamics, both in healthy individuals and in various disease states. It covers modalities like Doppler ultrasound, CT angiography, and MRI, discussing their capabilities in visualizing blood flow, vascular resistance, and tissue perfusion within the splanchnic bed, which is vital for diagnosis and monitoring [7].

This article explores the intricate relationship between the splanchnic circula-

tion and immune responses in inflammatory bowel disease (IBD). It details how changes in blood flow and microvascular integrity in the gut contribute to inflammation, oxidative stress, and immune cell trafficking, thereby exacerbating IBD pathology. Understanding this crosstalk offers new therapeutic avenues [8].

This paper explores the intricate neurohumoral mechanisms that regulate splanchnic circulation, highlighting the complex interplay between the autonomic nervous system and various vasoactive substances. It discusses how these regulatory processes maintain circulatory homeostasis in the gut during health and how their dysregulation contributes to pathological states like intestinal ischemia or portal hypertension [9].

This review focuses on the unique challenges of splanchnic perfusion in neonates, particularly in conditions like neonatal sepsis and necrotizing enterocolitis (NEC). It emphasizes that inadequate splanchnic blood flow is a key factor in the pathogenesis of NEC and discusses diagnostic methods and therapeutic strategies tailored for this vulnerable population to improve outcomes and prevent severe gut complications [10].

Description

Splanchnic microcirculation assessment in critically ill patients involves techniques like videomicroscopy and near-infrared spectroscopy, which are crucial for guiding therapy and improving outcomes, emphasizing the need to understand regional blood flow during severe illness [1]. Simultaneously, non-invasive methods help assess splanchnic hypoperfusion during exercise, illustrating how intense physical activity shunts blood away from the gut, potentially impacting nutrient absorption and causing gastrointestinal distress in athletes [2].

The complex splanchnic hemodynamics in liver cirrhosis demonstrates how portal hypertension significantly alters blood flow and vascular resistance in the gut, with ongoing research into therapeutic strategies to mitigate complications [3]. Pharmacological modulation of splanchnic hemodynamics, particularly in acute liver failure, shows how specific drugs can influence blood flow and vascular tone in the splanchnic bed. This is vital for managing complications like cerebral edema and improving patient survival in critical scenarios [4].

Splanchnic hypoperfusion and subsequent gut barrier dysfunction are critical in sepsis progression, where reduced blood flow to the gut increases intestinal permeability, leading to bacterial translocation, systemic inflammation, and multiple organ failure. Strategies to preserve splanchnic perfusion are thus essential for septic patients [5]. Beyond immediate health crises, the splanchnic circulation acts as a key metabolic regulator, impacting glucose and lipid metabolism. Changes in blood flow and substrate delivery influence hepatic glucose production, insulin sen-

sitivity, and overall metabolic homeostasis, offering insights into conditions such as type 2 diabetes [6].

Advanced imaging techniques, including Doppler ultrasound, CT angiography, and MRI, are employed to assess splanchnic hemodynamics in both healthy and diseased states. These modalities are vital for visualizing blood flow, vascular resistance, and tissue perfusion, aiding diagnosis and monitoring [7]. Furthermore, the splanchnic circulation intricately interacts with immune responses in inflammatory bowel disease (IBD). Changes in blood flow and microvascular integrity contribute to inflammation, oxidative stress, and immune cell trafficking, exacerbating IBD pathology and suggesting new therapeutic avenues [8]. Neurohumoral mechanisms also play a significant role, regulating splanchnic circulation through the autonomic nervous system and various vasoactive substances. This complex interplay maintains gut circulatory homeostasis and, when dysregulated, contributes to conditions like intestinal ischemia or portal hypertension [9].

A specific focus addresses the unique challenges of splanchnic perfusion in neonates, particularly in conditions like neonatal sepsis and necrotizing enterocolitis (NEC). Inadequate splanchnic blood flow is a key pathogenic factor, underscoring the importance of tailored diagnostic methods and therapeutic strategies for this vulnerable population to prevent severe gut complications [10].

Conclusion

One review explores methods for assessing splanchnic microcirculation in critically ill patients, highlighting various techniques like videomicroscopy and near-infrared spectroscopy. It points out the challenges and the potential of these tools to guide therapy and improve outcomes, emphasizing the need for better understanding of regional blood flow during severe illness. Another paper reviews non-invasive methods to assess splanchnic hypoperfusion during exercise. It highlights how intense physical activity shunts blood away from the gut, potentially impacting nutrient absorption and contributing to gastrointestinal distress in athletes. Splanchnic hemodynamics in liver cirrhosis has been explored, explaining how portal hypertension leads to significant alterations in blood flow and vascular resistance in the gut. It discusses the underlying mechanisms and explores current and emerging therapeutic strategies aimed at modulating splanchnic circulation to mitigate complications of liver disease. Pharmacological modulation of splanchnic hemodynamics is also relevant, specifically in the context of acute liver failure, where certain drugs can impact blood flow and vascular tone in the splanchnic bed, which is vital for managing complications like cerebral edema and improving patient outcomes in this critical condition. Further, the critical role of splanchnic hypoperfusion in sepsis is detailed, explaining how reduced blood flow to the gut can lead to increased intestinal permeability, allowing bacterial translocation and contributing to systemic inflammation and multiple organ failure, emphasizing the need for strategies to preserve splanchnic perfusion in septic patients. Beyond pathologies, splanchnic circulation regulates glucose and lipid metabolism, explaining how changes in splanchnic blood flow and substrate delivery influence hepatic glucose production, insulin sensitivity, and overall metabolic homeostasis, offering insights into conditions like type 2 diabetes. Advanced imaging techniques provide vital insights for diagnosis and monitoring splanchnic hemodynamics in health and disease, covering modalities like Doppler ultrasound, CT angiography, and MRI. The intricate relationship between splanchnic circulation and immune responses, especially in Inflammatory Bowel Disease (IBD), presents new therapeutic avenues by detailing how changes in blood flow and microvascular integrity contribute to inflammation, oxidative stress, and immune cell trafficking. Neurohumoral mechanisms intricately regulate splanchnic circulation, highlighting the complex interplay between the autonomic nervous system and various vasoactive substances, which maintains circulatory homeostasis in the gut and how their dys-

regulation contributes to pathological states. Finally, special attention is given to splanchnic perfusion challenges in neonates, particularly in conditions like neonatal sepsis and necrotizing enterocolitis, emphasizing inadequate splanchnic blood flow as a key factor in pathogenesis and discussing tailored diagnostic methods and therapeutic strategies.

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Conflict of Interest

None.

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