Pathophysiology of Myocardial Reperfusion Injury after Ischemia

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Signs and Symptoms

- **Reperfusion Arrhythmias**: The most common reperfusion arrhythmia is accelerated idioventricular rhythm (AIVR), however, premature ventricular contractions, sustained or non-sustained ventricular tachycardia, A-V re-entrant tachycardia, and supraventricular tachycardia are also reported.

- **Acute Myocardial Edema**: Resulting from increased intracellular volume and decreased perfusion, myocardial edema can result in hypoperfusion and loss of function.

- **Hyperemic Heart**: Increased blood flow to the myocardium can cause discomfort and palpitations.

- **Cardiogenic Shock**: A state where the heart fails to pump enough blood to meet the body’s metabolic needs.

- **Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)**: A disease characterized by degeneration of the myocardium, often associated with arrhythmias.

- **Remote Ventricular Infarction**: Occurs when reperfusion is not achieved or when reperfusion is delayed.

- **Mitochondrial dysfunction**: Impaired mitochondrial function can lead to decreased ATP production and cellular dysfunction.

- **Oxidative stress**: Increased production of reactive oxygen species (ROS) can lead to cellular injury and dysfunction.

- **Cytokine release**: Increased production of pro-inflammatory cytokines can contribute to tissue damage.

- **Neutrophil infiltration**: Neutrophils play a key role in the inflammatory response and can contribute to tissue damage.

- **Calcium overload**: Disruption of the intracellular calcium balance can lead to cell death.

- **Apoptosis**: Programmed cell death can occur in response to reperfusion.

- **Mitochondrial transition pore opening**: Opening of this pore can lead to mitochondrial dysfunction and cell death.

- **Cardiomyocyte death**: Death of cardiac muscle cells can occur during reperfusion.

Underlying Pathophysiology

- **Remote Infarction**: Reperfusion injury does not occur in new ischemia but is widely recognized as an important source of mortality.

- **Ivanov et al, 2013**: This study demonstrated that reperfusion in the previously ischemic area.

- **Multiple factors contribute to the development of reperfusion injury, including oxidative stress, calcium overload, and mitochondrial dysfunction.

- **Neutrophils**: These cells contribute to the inflammatory response and can cause tissue damage.

- **Calcium balance**: Disruption of intracellular calcium homeostasis is a key factor in reperfusion injury.

- **Mitochondrial function**: Impaired mitochondrial function contributes to cellular dysfunction and death.

- **Oxidative stress**: Increased production of ROS can lead to cellular injury and dysfunction.

- **Cytokine release**: Increased production of pro-inflammatory cytokines can contribute to tissue damage.

Implications for Nursing Care

- **STEMI patients**: The treatment of STEMI patients with reperfusion therapy is crucial to prevent ischemic injury.

- **Invasive vs. conservative strategies**: The choice between invasive and conservative strategies depends on patient-specific factors such as age, comorbidities, and clinical presentation.

- **Thrombolysis**: This treatment involves the administration of a drug to dissolve clots and restore blood flow to the heart.

- **Primary PCI**: An emergency procedure for patients presenting with STEMI, where a catheter is inserted directly into the artery to remove clots.

- **Secondary prevention**: Strategies to prevent future events include lifestyle modifications, medication, and follow-up care.

- **Collaborative care**: A multidisciplinary approach involving nurses, physicians, and other healthcare providers is essential.

- **Nutrition and hydration**: Adequate nutrition and hydration are important for recovery.

- **Psychosocial support**: Addressing emotional needs and providing support is crucial.

- **Follow-up**: Regular follow-up visits are necessary to monitor patient progress and adjust treatment plans as needed.

Conclusion

- **Importance of reperfusion**: Early and effective reperfusion is critical in improving patient outcomes.

- **Clinical implications**: Understanding the mechanisms of reperfusion injury can guide the development of new therapeutic strategies.

- **Research opportunities**: Further research is needed to identify novel targets for reperfusion injury prevention.

References


