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Recommended Citation
Arce, Monica, "Vasoplegic Syndrome" (2018). Nursing Student Class Projects (Formerly MSN). 272.
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Vasoplegic Syndrome
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Introduction

What is Vasoplegic Syndrome?
- Vasoplegic syndrome is a loss of vasomotor tone and a medical emergency (Shaefi et al., 2018).

- It causes severe hypotension and hyperuria in vital organs (Abou-Arab, et al., 2018).

- Generally seen in post cardiac surgery patients or during shock (Shaefi, et al., 2018).

- Requires very high dose pressors and inotropic support

- May be non-responsive to medications or fluids and require further escalation of care

Why does it matter?
- As a CVICU nurse vasoplegia is frequently seen in patients undergoing cardiopulmonary bypass (CPB) or in long OR cases.
- Vasoplegia is difficult to manage and requires excellent nursing and physician knowledge and attention.
- Vasoplegia has a high mortality rate and is not well known.

- It is common in most shock states in intensive care patients

- CRNAs will experience vasoplegia and need to be familiar with it both in post op patients and in shock state emergencies

Presentation of Process

Risk Factors
- Cardiopulmonary bypass
- Blood transfusion
- Organ transplantation
- Sepsis
- Shock States
- Extended OR cases

Syndrome?

- The syndromes are: Vasoplegia, Shock States, and Vasopressor

Signs and Symptoms

Signs and symptoms of vasoplegia include:
- Arterial hypotension
- Elevated cardiac output
- Dephosphorylation
- Decrease in MAP
- Decrease in blood flow to the kidney

Underlying Pathophysiology

- Contact with the CPB circuit immediately absorbs plasma proteins into the biomembranes and directly activates the kinin, complement, and clotting pathways

- The kinin pathway leads to formation of bradykinin and kallikrein which lead to neutrophil activation

- Both the intrinsic and extrinsic clotting cascades produce thrombin which results in fibrin deposits

- Thrombin goes on to activate platelets which adhere to other platelets, neutrophils, and exposed basement membranes

- The complement pathway leads to formation of C3a which further activates neutrophils

- These neutrophils when activated release keratinocyte growth factor and reactive oxygen species (ROS) that adhere to membrane surfaces and to endothelial surfaces

- Multiple factors, including thrombin, C3a, and cytokines, activate endothelial cells that produce reactive substances, including nitric oxide (NO) and prostaclin, and express surface receptors.

- Following the acute responses to CPB the inflammatory response is exacerbated by reinforcement of the blood lost during surgery

- The consumed blood contains hemolyzed erythrocytes and macroglobulins such as denatured proteins, fat globules and platelet and leukocyte aggregates

- These fragments clog small capillaries further stimulating inflammation

- Additionally, reproduction syndrome of the heart and lungs causes neutrophil adherence and further ROS release which causes direct protein, lipid, and nuclear acid damage

- This increases capillary permeability causes interstitial edema and reduced intravascular volume

- All leading to decreased circulation and increasing NO levels further diluting arterial smoothness

- An efflux of potassium through ATP sensitive channels results in hypoperfusion of the cell causing inactivation of voltage gated calcium channels which cause further vasodilation and vascular dysfunction

- NO then causes dephosphorylation of the myosin light chain by increasing production of cyclic GMP which prevents muscle contractility by limiting actin and myosin interaction

(Sharawy, Arab, et al., 2018)

Significance of Vasoplegia

- Severe, persistent, refractory hypotension has a high morbidity and mortality (Lambides, Cough-Brown, Hunt, Summers, & Force, 2016)

- Multifactorial and difficult to manage

- “Vasoplegic syndrome has been attributed to a combination of endothelial injury, arginine-vasopressin system dysfunction, release of other vasodilatory mediators, and a muscle hypoperfusion state” (Sharawy, 2014)

- Without appropriate systemic vascular support even a high cardiac output has no where to go

- Leads to hyperfusion of organ and organ systems which in turn leads to end organ failure (Abou-Arab, et al., 2018)

- Understanding the pathophysiology of vasoplegia is of vital importance to promptly treat the cause and maintain adequate oxygenation to tissues

(Sharawy, Arab, Martineau, et al., 2018)

Implication for Nursing Care

Understanding the risk factors along with the signs and symptoms of vasoplegic syndrome is of utmost importance to ANPs

- Nurses play a vital role in identifying hypotension unresponsive to treatment

- Severe hypotension is a medical emergency and nurses at the bedside should be prepared to take further interventions to maintain tissue oxygenation such as fluids, oxygen, ventilatory support, and vasoactive medications

- Identification of possible high risk patients by CRNAs in post-op and post-op should have close observation and constant blood pressure monitoring

- Nursing should be prepared for end of life discussions and care should interventions not succeed

Conclusion

Understanding factors that lead to vasoplegia can help prevent and treat

- Multiple factors play a role in loss of vasomotor tone all of which lead to low organ perfusion

- Refractive to non-selective vasoconstrictive agents such as fluid and catecholamines

- Goals of therapy include: restoring MAP, maintaining adequate cardiac output, and restoring tissue perfusion (Sharawy, 2014)

- Prevention, assessment, and early treatment are all of great importance to decrease morbidity and mortality

References


Implication

Nursing should be prepared for end of life discussions and care should interventions not succeed