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7-31-2019

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Recommended Citation

Bah, Hussainatu, "Sepsis-Induced Dissemination Intravascular Coagulation" (2019). *Nursing Student Class Projects (Formerly MSN)*. 381.

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Sepsis-induced Dissemination Intravascular Coagulation

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Topic/Introduction

As an emergency room RN, understanding the pathophysiology of sepsis and its complications providing safe, quality and evidenced-based nursing care. It is this thirst for knowledge that triggers an interest in the topic as it is crucial in hand "Sepsis Induced Dissemination Intravascular Coagulation (Sepsis Induced DIC).

Why did you choose it

Sepsis-Induced Dissemination Intravascular Coagulation was chosen as a topic of investigation, because of the severe complications and morbidity associated with it. The nurse in the emergency department frequently observes patients in sepsis and or severe sepsis which can lead to coagulopathy requiring ICU admission. Sepsis protocols must be implemented immediately when a patient meets criteria for sepsis to prevent further complications such as Sepsis-Induced DIC. This is an important area of focus for the advanced practice registered nurse (APRN) in the acute care settings and ambulatory settings. Understanding the complications and appropriate adjunct treatment towards Sepsis and Sepsis-Induced DIC enable the APRN to carry and implement life-saving treatments to prevent complications and death.

Presentation of Case/Process

A 72 year old female arrives in the Emergency Department with cellulitis of the lower extremities, redness, and bleeding to her extremities. Upon physical assessment, patient was noted to have temperature of 103.0 F, HR 110, RR 20, BP 90/55, sepsis alert was initiated, WBC 14.0, lactic acid 4.16. Further testing revealed hemoglobin 6.0 g/dL reticulocytosis (8.5%) and an increased in (MCV) of 95 fL, Platelets were decreased (8000/ μ L) with platelet volume (MPV) of 12.3 fL, PT of 47 seconds and an aPTT of 75 seconds. A fibrinogen level <76 mg/dL, D-dimer 9.0 μ g/mL indicating DIC secondary to sepsis.

- According to Faloon (2018) 250,000 Americans die from sepsis every year and 1.5 million Americans get sepsis each year. Moreover, one in three patients who die in hospital has sepsis (p. 7).
- In one of the studies during these investigations, the author referenced that patients with DIC had a 20% lower survival rate than patients without DIC (Levi, 2017, p. 581).
- In 2011, it cost the United States 20 million in sepsis-related diagnosis and treatment (Carleo & Vallejos, 2016 p. 24).
- 1% of hospitalized patients have DIC (Schub & Balderrama, 2018 p. 2). Mobility and mortality are greatly affected by the extent of the coagulopathy (Schub & Balderrama, 2018 p. 2).
- According to Schub & Balderrama, "In severe cases of DIC such as one associated with septic abortion, clostridial infections, major trauma, or shock, mortality rates can exceed 50% (2018, p. 2).
- When DIC is associated with Sepsis, the risk of death is increased by 1.5-2 (Schub & Balderrama, 2018 p. 2).

Signs and Symptoms

- "One of the first signs of DIC can be oozing or explicit bleeding.
- Bleeding from multiple sites (e.g., nose, gums, vagina, venipuncture sites, wounds).
- Sudden onset of bruising; thrombosis; hematemesis; jaundice; severe muscle, back, and/or chest pain; tachycardia; hypotension; oliguria; shortness of breath, cough; confusion; and disorientation.
- In postoperative DIC, bleeding can occur in surgical sites and drains.
- Patients with low-grade DIC might be asymptomatic with abnormal coagulation study results" (Schub & Balderrama, 2018 p. 2).



Farkes, J. (2016).

Underlying pathophysiology

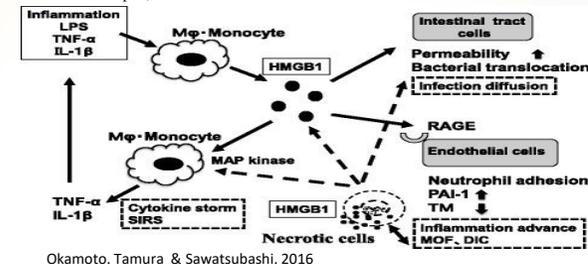
- Dissemination Intravascular Coagulation (DIC) is a result of a decreased fibrinolysis at the beginning of sepsis but as the infection spreads, there is a marked increase in fibrinolysis leading to septic complications such as hemorrhage and DIC (Panigada, Zaccchetti, Cressoni, Anzoletti, Bader, Gattinoni, 2015, p. 2).
- Sepsis induced DIC is often caused by an infection that spread systemically. As a result, the immune system own defense mechanism is triggered resulting in "oxidative damage, hyper-inflammation, immune dysfunction, poor tissue oxygenation, and hyper-coagulation" (Faloon, 2018, p. 7).
- These combinations of reactions are known as a syndrome (Faloon, 2018, p. 7).
- DIC can be acute or chronic. In acute DIC, there is a trigger in the immune system such as infection that causes the alteration in the coagulation pathway leading to hemorrhage.
- In chronic DIC, it is the exposure to tissue factor that causes DIC. Also, clot formation is common in chronic DIC which block small and medium vessels.
- Hyper-coagulation of the immune response often caused Dissemination Intravascular Coagulation (DIC).
- Coagulation is a normal response of the body immune system to fight bacterial infection and stop bleeding. However, when the immune system failed to target pathogens, the uncontrolled inflammatory response can occur.
- This increased inflammatory response and demand lead to overuse of platelet and clotting factors.
- A reduction in platelet synthesis and clotting factors leads to DIC secondary to bleeding cascade. The most important inflammatory mediator in DIC is tumor necrosis factor (TNF- α), Interleukin IL-1, Interleukin IL-6 (Levi, 2018, p. 18).
- Factor VII (a) pathway leads to Xa and IXa which are important in clot formation are disrupted during DIC (Levi, 2018, p. 18).

Significant of Pathophysiology

- Early detection of DIC involves assessing laboratory parameters such as platelet count, prothrombin time, a fibrin-related marker such as D-dimer, fibrinogen, and assay such as thromboelastography (Levi, 2018, p. 18)
- while the goal is to prevent severe multiorgan dysfunction and death, it is clear that there is no cure for DIC which makes the treatment of sepsis very challenging for healthcare provider (Greco, Lupia, Bosco, Vizio, & Montrucchio, 2017, p. 4)
- Recognizing patients at risk for extreme multiorgan dysfunction and death may receive lifesaving intervention when changes in coagulopathy parameters are recognized sooner (Levi, 2018, p. 18).
- The potential treatment of sepsis maybe foreseeable with antiplatelet inhibitor. According to the author, the anti-inflammatory property of antiplatelet can reduce C-reactive protein and leukocytes-platelet aggregation which has been considered in the treatment of sepsis (Levi, 2018, p. 18)
- There is no guarantee that this is an effective treatment but it is worth the consideration in severe sepsis (Levi, 2018, p. 18)
- Early treatment of infection and antithrombin (rTM) administration were observed in two groups of participants. Sequential/Sepsis Organ Failure Assessment (SOFA) score was recorded to determine the effectiveness of treatment. The aimed of this study was to investigate the relationship between early changes in SOFA scores within 48 hours upon treatment of infection with antibiotic versus treatment with an anticoagulant. After the analysis of the study, the result showed that when sepsis is not treated adequately in the early stages, there was a poor outcome for these patients. (Mochizuki, Mori, Nakamura, Uchimido, Kamijo, Takeshige, Imamura, 2018, p. 333)

Implications of Nursing care

- Implication of nursing care may include educating patients and family members that DIC is a serious and highly complicated condition that needs close observation and care in an ICU.
- Educating patients and family members to report to the nurse any signs of bleeding e.g., oozing around I.V. insertion site, difficulty breathing, change in mental status (Schub & Balderrama, 2018 p. 2).
- The nurse also play a key role in the psychological and emotional support of patients and families affected by Sepsis-Induced DIC such as assessing anxiety level and coping ability (Schub & Balderrama, 2018 p. 2).
- Another important role of the nurse is educating patients and family members about DIC, adverse treatment effects, treatment risks and benefits, and individualized prognosis (Schub & Balderrama, 2018 p. 2).
- The role of the nurse may also include setting up referral to a clergy person, mental health clinician or mental health clinician for counseling and support (Schub & Balderrama, 2018 p. 2).
- The nurse may have to get other interdisciplinary team such as social worker and case manager during such difficult time (Schub & Balderrama, 2018 p. 2).
- The nurse need to observe patients closely for signs and symptoms of airway compromise (e.g., acute respiratory distress syndrome [ARDS], pleural friction rub), severe hemorrhage, and shock and immediately intervene as appropriate. Monitor vital signs for hypotension and tachycardia, tachypnea, monitor coagulation factors which are complications of bleeding and provide supportive treatments such as fluid and medications (Schub & Balderrama, 2018 p. 2).



Okamoto, Tamura & Sawatsubashi, 2016

Conclusion

From the above presentation, it is clear that Sepsis Induced DIC is a life threatening condition that can lead to mortality and morbidity. Early recognition and treatment of sepsis is important to prevent complications such as DIC. 35% of sepsis cases are further complicated by DIC (Okamoto, Tamura & Sawatsubashi, 2016).

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