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Kahl Knapke  
*Otterbein University, knapke2@otterbein.edu*

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Disseminated Intravascular Coagulation
Kahl Knapke, BSN, RN, CCRN, SRNA
Otterbein University, Westerville, Ohio

Introduction: Disseminated Intravascular Coagulation

- Disseminated Intravascular Coagulation (DIC) is a deadly disorder that can arise from a secondary illness (Schub & Balderrama, 2018).
- In all hospitalized patients admitted to the intensive care unit (ICU), DIC accounts for roughly 1% (Boral et al., 2016).
- The mortality rate for the most severe form of DIC is brought up to 70% (Boral, 2016).
- Determining the onset and duration of DIC can be tricky and often prolonged.

Why Disseminated Intravascular Coagulation?

- DIC was first clinically observed in the 19th century, but only over the past few decades has there been a comprehensive understanding of its pathological mechanisms (Papageorgiou et al., 2018).
- DIC can emerge from normally not seen diagnostic in the health care setting.
- Severe trauma, malignancy, complications from obstetrics, renal failure, disseminated intravascular coagulation, and immunological reactions, and post-surgery recovery are most notably linked as precipitating conditions leading to DIC (Levy & Foster, 2016).
- DIC is only scrutinized by health professionals when there is a prominent presentation of substantial, uncontrolled bleeding, even though organ dysfunction from intravascular coagulation may rise to DIC too (Thachil, 2016).
- As anesthesiologists and nurses, DIC must be taken seriously, identified early and be able to intervene promptly.

Pathophysiological Processes

- Signs & Symptoms
  - Distinct bleeding and ooze is often times the first discovered sign of DIC (Schub & Balderrama, 2018).
  - Uninformed bruising, bleeding from multiple areas (e.g., nose, gums, vagina, wounds and venipuncture sites) can be a few (Schub & Balderrama, 2018).
  - Severe pain in the back, chest and intestines (Schub & Balderrama, 2018).
  - Tachycardia, hypotension, shortness of breath, and altered mental state have been noted (Schub & Balderrama, 2018).
  - Patients can have abnormal lab values and be asymptomatic with low grade DIC (Schub & Balderrama, 2018).
  - There is not one definitive laboratory test for DIC (Boral, 2016).
- Underlying Pathophysiology
  - DIC is a condition where clotting activation overcomes the body’s own natural anticoagulants to produce excessive thrombosis which leads to the depletion of essential coagulation factors and platelets leading to excessive bleeding (Ley, 2018).
  - DIC can be differentiated as either Acute or Chronic (Boral & Levy, 2020).
  - Acute DIC is a consumption coagulopathic state caused by creating a surplus of thrombin that outnumbers normal anticoagulants as a result of elevated tissue factor in the intravascular space (e.g., intracranial, infection reactions, trauma/crash injury, burns, transplant rejection) to last a few (Boral, 2016).
  - Chronic DIC precipitates from prolonged exposure to smaller amounts of thrombin (e.g., malignancies, metastasis, intravascular fetal death, hemorrhage, amniotic fluid and vascularity) to name a few (Boral et al., 2016).
  - Diagnosis test such as prolonged prothrombin time (PT), and activated partial thromboplastin time (APTT), low fibrinogen, elevated D-dimer, and thrombocytopenia aid in DIC diagnosis (Smith, 2017).

Significance of Physiology

- To comprehend DIC, one must understand normal physiological hemostasis. Normal physiological hemostasis is achieved through formation of a platelet plug from platelet adhesion and aggregation, then followed by the activation of the coagulation cascade to form a fibrin clot. A sequence of enzymatic steps allow for thrombin to form. Next, thrombin is converted to soluble fibrinogen and then to an insoluble fibrin clot that forms a mesh including the previously noted platelet plug (Boral et al., 2016).
- The normal physiological coagulation cascade is made up of two pathways, intrinsic and extrinsic. The intrinsic pathway is comprised of factor XII, XI, IX, and VIII. The extrinsic pathway is initiated by Tissue Factor (TF) or Factor VII and then to Factor VII. Both pathways lead to the final common pathway activating Factor X, V, II (Boral et al., 2016).
- Intraoperative Society on Thrombosis and Haemostasis (ISTH) is one of several scoring systems used to aid in DIC diagnosis (Smith, 2021).
- World Health Organization (WHO) has adopted as the gold standard guidelines for DIC diagnosis (Bora, 2020).
- Diagnostic algorithm for acute DIC developed by the Scientific Subcommittee on the ISTH uses common coagulation tests and the patients needs to have a disease associated with DIC. The algorithm has a 93% sensitivity and 97% specific for acute DIC (Boral et al., 2016).

Implications for Nursing Care

- For nurses and anesthesiology professionals, it is imperative to perform a thorough history and physical assessment for each patient (Smith, 2021).
- Nurses and anesthesiology professionals should display high-level clinical expertise and understanding to be able to quickly identify DIC as well as interpreting vital lab results (Smith, 2012).
- Being proactive and advocating with the multidisciplinary team for timely and appropriate interventions (Smith, 2018).
- Providing exceptional patient and family education allows for better understanding of current situation which will allow them to be better prepared for the treatment (Smith, 2021).
- Effective on-going communication between treatment team, patient, and their families is something that cannot be taken lightly.

Treatment

- The first initial step in treating DIC is to remove the underlying causative source (e.g., trauma, infection, malignancy, reactions, etc.) (Papageorgiou et al., 2018).
- Next, treatment strategy and options should closely be reflective of the most recent set of lab values such as PT/INR, PTT, platelet count, fibrinogen, and D-dimer (Papageorgiou et al., 2018).
- The use of new coagulation assays such as whole blood thromboelastography/thromboelastography (TEG) drives optimal treatment (Papageorgiou et al., 2018).
- Administer blood components: fresh frozen plasma (FFP) for INR >3.5, platelets for platelet count <50,000/mcL, cryoprecipitate (cryo) for fibrinogen level <100 mg/dL and red blood cells (RBC) for hematocrit <21% (Boral, 2016).
- For patients with continued bleeding after blood component administration with evidence of hyperfibrinolysis syndrome, administer an antifibrinolytic like tranexamic acid (FXA). Careful therapy may also be considered in hypercoagulability states with deep vein thrombosis (DVT) or pulmonary embolism (PE) (Boral et al., 2016).

Conclusions

- DIC is identified as a life threatening medical condition that includes extensive activation of coagulation factors, leading to thrombotic events and organ dysfunctions as well as simultaneous depletion of those coagulation factors contributing to massive, uncontrolled hemostasis (Levy & Scuderi, 2019).
- DIC is always a secondary complication from an underlying medical condition (Levy & Scuderi, 2018).
- The occurrence of DIC is uncommon in the average hospitalized patient but accounts for around 9-19% of ICU admitted patients which carry a mortality rate between 65-79% (Boral et al., 2016).
- Prompt identification of DIC is vital in aiding to life-saving interventions (Smith, 2021).
- Nursing should be knowledgeable and aware in the current interventions based on all critical indicators.

References


Koll & Prentzerius, 2014, Figure 3

(Thachil & Levy, 2019, Figure 2)

(Bora et al., 2019, Figure 1)