

Role of thrombocytopenia as an independent prognostic marker in critically ill patients with multi organ failure

An essay submitted for partial fulfillment
of master Degree in critical care

By

Wedad Amin Ahmed Atia Sorour

M.B.B.CH. Faculty of Medicine Zagazig University

Under supervision of

Prof. Dr. Nabila Abd El Aziz Fahmy

Professor of Anesthesia and Intensive Care

Faculty of Medicine – Ain Shams University

Dr. Alfred Maurice Said

Assistant Professor of Anesthesia and Intensive Care

Faculty of Medicine – Ain Shams University

Dr. Mahmoud Hassan Mohammed

Lecturer of Anesthesia and Intensive Care

Faculty of Medicine – Ain Shams University

Faculty of Medicine

Ain Shams University

(2013)

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿يُؤْتِي الْحِكْمَةَ مَنْ يَشَاءُ^ج وَمَنْ يُؤْتَ الْحِكْمَةَ فَقَدْ
أُوتِيَ خَيْرًا كَثِيرًا^ق وَمَا يَذَّكَّرُ إِلَّا أُولُو الْأَلْبَابِ ﴿

ACKNOWLEDGMENT

First and foremost, thanks to Allah, the most beneficial and merciful.

In few grateful words, I would like to express my greatest thanks to all my professors who helped me throughout this work.

*I wish particularly to express my deepest gratitude and appreciation for unfailing support; valuable advice; generous help and patience rendered me by **Prof. Dr. Nabila Abd El Aziz Fahmy**, Professor of Anesthesia & Intensive Care, Ain Shams University. He sacrificed a great deal of her precious time and effort guiding me throughout the preparation of this essay.*

*Also, I want to thank **Dr. Alfred Maurice Said**, Assistant Professor of Anesthesia & Intensive Care, Ain Shams University for his great help and advice.*

*I am indeed immensely indebted and deeply grateful to **Dr. Mahmoud Hassan Mohammed**, Lecturer in Anesthesia & Intensive care, Ain Shams University, for his sincere care, untiring effort, and his great assistance during every step and every detail in this essay.*

Finally, I give all the thanks; grateful feelings and gratitude to my family for their unlimited support and help they offered me throughout my life.

Wedad Amin

List of contents

• Introduction.	1
• Platelet Physiology and Function.	3
• Thrombocytopenia in Critically Ill Patient (Etiology and Pathophysiology).	11
• Management of Thrombocytopenia	36
• Prognostic Markers in Multi Organ Failure Patient	46
• Role of thrombocytopenia as a prognostic marker in multi organ failure	72
• Summary	91
• References	94
• Arabic summary	١

List of Tables

Table	page
Table (1) Categories of Thrombocytopenia.	13
Table (2): Main Features of Disseminated Intravascular Coagulation in Series of 118 Patients.	21
Table (3): Japanese Association for Acute Medicine (JAAM) Scoring System for DIC.	24
Table (4): Comparison of DIC, TTP-HUS, and HELLP Syndromes.	26
Table (5): Nonchemotherapeutic Drugs Commonly Used in the ICU Associated With Thrombocytopenia.	28
Table (6): Laboratory Diagnosis of von Willebrand Disease by Type.	34
Table (7): Coagulation tests.	38
Table (8): Common Etiologies of Thrombocytopenia with Clinical Findings and Suggested Treatment.	42
Table (9): Criteria for Organ Dysfunction.	70
Table (10): Causes of new-onset thrombocytopenia (n=69).	89
Table (11): Comparison between patients with and without new onset thrombocytopenia.	90

List of Figures

Figures	page
Figure (1). Some of the key platelet constituents	5
Figure (2). Mechanisms of platelet activation	6
Figure (3). Platelets role in thrombus formation and stabilization	10
Figure (4). Acute respiratory distress syndrome (ARDS)	67
Figure (5). Acute respiratory distress syndrome (ARDS)	67
Figure (6). Organizing phase of diffuse alveolar damage (ARDS) secondary to septic shock	68
Figure (7). Organizing diffuse alveolar damage in a different location	68
Figure (8). A high-power view of organizing diffuse alveolar damage (ARDS)	68
Figure (9). Typical platelet count courses in ICU patients.	74-75
Figure (10). Study flow chart.	89



Introduction



Introduction

Platelet disorders fall into two categories: those characterized by abnormal numbers of circulating platelets and those characterized by abnormal platelet function.

Platelets form the first line of defense when endothelial surfaces are breached. Exposure of the subendothelial layer of vessels results in exposure of tissue factor, collagen, and von Willebrand factor (vWF), which promote platelet aggregation. In rapid succession, platelets change shape, degranulate, and expose surface phospholipids that generate small amounts of thrombin, triggering clotting amplification. Hence, the deficiency or dysfunction of platelets represents a serious hemostatic problem **(Crowther et al., 2005)**.

Independent of bleeding, studies have consistently demonstrated an association between thrombocytopenia and poor clinical outcomes **(Shalansky et al., 2002)**.

The frequency of thrombocytopenia varies according to the definition used, the type of critical care population involved and the time of determination. Thrombocytopenia is usually defined as a platelet count $< 150 \times 10^9/L$, while a count of $\leq 50 \times 10^9/L$ is taken to represent severe thrombocytopenia **(Strauss et al., 2002)**.

Thrombocytopenia is one of the most common laboratory abnormalities in ICU patients. Thrombocytopenia can be a result of increased (non immune or immune) platelet destruction, hemodilution, platelet sequestration (as in hypersplenism), or decreased platelet production. The cause of a low platelet count in ICU may be difficult to be determined and is often multifactorial **(Vanderschueren et al., 2000)**.

Thrombocytopenia in critically ill patients is likely a marker of illness severity. This is supported by the observation that critically ill patients with thrombocytopenia have higher Multiple Organ Dysfunction Scores (MODS), Simplified Acute Physiology Scores (SAPS), and Acute Physiology and Chronic Health Evaluation (APACHE) scores compared with patients admitted with normal platelet counts at the time of ICU admission. Nearly all studies analyzing thrombocytopenia as a prognostic marker in ICU patients found an inverse correlation of the platelet count with the risks for a prolonged ICU stay and mortality. Notably, the platelet count pattern over time provides important information about the likely underlying reasons for thrombocytopenia. Differentiation of the causes of thrombocytopenia is essential for efficient and appropriate treatment (**Vanderschueren et al., 2000**).



Review of Literature

