

OK on DARK

**Effect of Aprotinin, Tranexamic Acid, and
Desmopressin on Blood Loss and Coagulation
Patterns in Patients Undergoing Open Heart
Surgery (Comparative Study)**

**Thesis Submitted for Partial Fulfillment
of M.D. Degree in Anesthesiology**

BY

Hesham Fathy Soliman

M.B.B.Ch., M.Sc., Anesthesia, Ain Shams University

Supervised By

Prof. Dr. Mohamed Reda Abdel-Gawad

*Professor and head of Anesthesia and Intensive Care Department
Faculty of Medicine - Ain Shams University*

Prof. Dr. Abdel-Salam Mourad Kassem

*Professor of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University*

Prof. Dr. Mostafa Kamel Fouad

*Professor of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University*

Ass. Prof. Dr. Fahani Ali El-Kerdani

*Assistant Professor of Clinical Pathology
Faculty of Medicine - Ain Shams University*

**Faculty of Medicine
Ain Shams University**

***** 1999 *****





Acknowledgment

I would like to express my deepest gratitude and sincere appreciation to **Prof. Dr. Mohamed Reda Abdel-Gawad**, Professor and Head of Anesthesia and Intensive Care Department, Faculty of Medicine, Ain Shams University, for the great encouragement and continuous support he offered me. It is a great honor to work under his supervision.

I am very grateful to **Prof. Dr. Abdel-Salam Mourad Kassem**, Professor of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, for his precious advice, fruitful discussions, and distinguished cooperation without which the accomplishment of this work would have been impossible.

I am deeply indebted to **Prof. Dr. Mostafa Kamel Fouad**, Professor of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, for his wise guidance, enormous help, and very patient supervision I have received throughout this work.

I am very thankful to **Ass. Prof. Dr. Tahani Ali El-Kerdani**, Assistant Professor of Clinical Pathology, Faculty of Medicine, Ain Shams University, for her sincere efforts and the great help she offered me through the laboratory part of this study.

Hesham Fathy

List of Contents

	PAGE
Introduction	1 - 3
Aim of the Work	4
Review of Literature	5 - 55
Physiological Considerations of Hemostasis	5 - 8
Cardiopulmonary Bypass-Related Hematological Abnormalities	9 - 16
Assessment of Coagulation Using Thromboelastograph	17 - 19
Assessment of Coagulation Before, During, and After CPB	20 - 26
Pharmacologic Inhibition of Coagulation Cascade Pathway: Heparin	27 - 36
Pharmacological Considerations of Aprotinin, Tranexamic Acid, and Desmopressin	37 - 44
Blood Conservation Techniques in Cardiac Surgery	45 - 55
Materials and Methods	56 - 61
Results	62 - 130
Discussion	131 - 146
Conclusion	147
Summary	148 - 150
References	151 - 173
Arabic Summary	1 - 3

List of Figures

No.	Figure	Page
Figure (1):	Schematic representation of the hemostatic system depicting the vascular, platelet, and coagulation components.	8
Figure (2):	Schematic diagram of the plasma coagulation pathway.	12
Figure (3):	Fibrinolytic system simplified.	14
Figure (4):	Structural components of the thromboelastograph and normal measured parameters.	18
Figure (5):	Schematic depiction of coagulopathy as reflected by TEG.	19
Figure (6):	Why cardiac surgical patients bleed.	26
Figure (7):	Prophylaxis against bleeding and conservation of blood.	55
Figure (8):	Hematocrit changes in the four groups of the study.	71
Figure (9):	Hemoglobin changes in the four groups of the study.	72
Figure (10):	Platelet count changes in the four groups of the study.	79
Figure (11):	Bleeding time changes in the four groups of the study.	80
Figure (12):	Thrombin time changes in the four groups of the study.	88
Figure (13):	Prothrombin time changes in the four groups of the study.	89
Figure (14):	Activated partial thromboplastin time changes in the four groups of the study.	90
Figure (15):	Changes in fibrin degradation products in the four groups of the study.	98
Figure (16):	Changes in activated clotting time in the four groups of the study.	105
Figure (17):	Comparison between the 5 study groups as regard total blood loss.	108

No.	Figure	Page
Figure (18):	Comparison between the 5 study groups regarding transfused packed RBCs in units.	109
Figure (19):	Comparison between the 5 study groups regarding transfused fresh frozen plasma in units.	110
Figure (20):	Comparison between group I and group II as regard transfused packed RBCs and transfused FFP in units.	112
Figure (21):	Comparison between group I and group III as regard transfused packed RBCs and transfused FFP in units.	114
Figure (22):	Comparison between group I and group IV as regard transfused packed RBCs and transfused FFP in units.	116
Figure (23):	Comparison between group I and group V as regard transfused packed RBCs and transfused FFP in units.	118
Figure (24):	Comparison between group II and group III as regard transfused packed RBCs and transfused FFP in units.	120
Figure (25):	Comparison between group II and group IV as regard transfused packed RBCs and transfused FFP in units.	122
Figure (26):	Comparison between group II and group V as regard transfused packed RBCs and transfused FFP in units.	124
Figure (27):	Comparison between group III and group IV as regard transfused packed RBCs and transfused FFP in units.	126
Figure (28):	Comparison between group III and group V as regard transfused packed RBCs and transfused FFP in units.	128
Figure (29):	Comparison between group IV and group V as regard transfused packed RBCs and transfused FFP in units.	130

List of Tables

No.	Table	Page
Table (1):	Pathways that could lead to increased fibrinolysis during ECC.	15
Table (2):	Release of t-PA during ECC.	16
Table (3):	A screening hemostatic profile.	20
Table (4):	Comparison between the 5 groups regarding age and weight.	62
Table (5):	Comparison between the 5 groups regarding operative time and CPB time.	63
Table (6):	Comparison between the four study groups and the control group regarding hematocrit, hemoglobin, platelet count, bleeding time, thrombin time, prothrombin time, activated partial thromboplastin time, fibrin degradation products, and activated clotting time.	64
Table (7):	Comparison between group I and group II as regard hemoglobin and hematocrit.	65
Table (8):	Comparison between group I and group III as regard hemoglobin and hematocrit.	66
Table (9):	Comparison between group I and group IV regarding Hb and Hct.	67
Table (10):	Comparison between group II and group III regarding Hb and Hct.	68
Table (11):	Comparison between group II and group IV regarding Hb and Hct.	69
Table (12):	Comparison between group III and group IV regarding Hb and Hct.	70
Table (13):	Comparison between group I and group II as regard platelet count and bleeding time.	73
Table (14):	Comparison between group I and group III as regard platelet count and bleeding time.	74

No.	Table	Page
Table (15):	Comparison between group I and group IV as regard platelet count and bleeding time.	75
Table (16):	Comparison between group II and group III as regard platelet count and bleeding time.	76
Table (17):	Comparison between group II and group IV as regard platelet count and bleeding time.	77
Table (18):	Comparison between group III and group IV as regard platelet count and bleeding time.	78
Table (19):	Comparison between pre- and postoperative TT, PT, and APTT in group I and group II.	82
Table (20):	Comparison between pre- and postoperative TT, PT, and APTT in group I and group III.	83
Table (21):	Comparison between pre- and postoperative TT, PT, and APTT in group I and group IV.	84
Table (22):	Comparison between pre- and postoperative TT, PT, and APTT in group II and group III.	85
Table (23):	Comparison between pre- and postoperative TT, PT, and APTT in group II and group IV.	86
Table (24):	Comparison between pre- and postoperative TT, PT, and APTT in group III and group IV.	87
Table (25):	Comparison between pre-, intra- and postoperative FDPs in group I and group II.	92
Table (26):	Comparison between pre-, intra- and postoperative FDPs in group I and group III.	93
Table (27):	Comparison between pre-, intra- and postoperative FDPs in group I and group IV.	94
Table (28):	Comparison between pre-, intra- and postoperative FDPs in group II and group III.	95
Table (29):	Comparison between pre-, intra- and postoperative FDPs in group II and group IV.	96
Table (30):	Comparison between pre-, intra- and postoperative FDPs in group III and group IV.	97

No.	Table	Page
Table (31):	Comparison between pre-, intra- and postoperative ACT in group I and group II.	99
Table (32):	Comparison between pre-, intra- and postoperative ACT in group I and group III.	100
Table (33):	Comparison between pre-, intra- and postoperative ACT in group I and group IV.	101
Table (34):	Comparison between pre-, intra- and postoperative ACT in group II and group III.	102
Table (35):	Comparison between pre-, intra- and postoperative ACT in group II and group IV.	103
Table (36):	Comparison between pre-, intra- and postoperative ACT in group III and group IV.	104
Table (37):	Comparison between the five study groups as regard total blood loss, transfused packed RBCs and transfused fresh frozen plasma.	107
Table (38):	Comparison between group I and group II regarding total blood loss, transfused packed RBCs and transfused fresh frozen plasma.	111
Table (39):	Comparison between group I and group III regarding total blood loss, transfused packed RBCs and transfused fresh frozen plasma.	113
Table (40):	Comparison between group I and group IV regarding total blood loss, transfused packed RBCs and transfused fresh frozen plasma.	115
Table (41):	Comparison between group I and group V regarding total blood loss, transfused packed RBCs and transfused fresh frozen plasma.	117
Table (42):	Comparison between group II and group III regarding total blood loss, transfused packed RBCs and transfused fresh frozen plasma.	119
Table (43):	Comparison between group II and group IV regarding total blood loss, transfused packed RBCs and transfused fresh frozen plasma.	121

