Book Review

Anticoagulation, Hemostasis and Blood Preservation in Cardiovascular Surgery

Edited by Roque Pifarré, MD
Hanley & Belfus Inc. Medical Publishers
Philadelphia, PA
To order: (800) 962-1892

Price: $60
26 chapters; 395 pages
53 contributing authors

As its title suggests, *Anticoagulation, Hemostasis and Blood Preservation in Cardiovascular Surgery* chiefly examines aspects of hemostasis and anticoagulation. The fundamentals of their pharmacology and physiology, as well as their monitoring, are studied. Also presented is a history of anticoagulation and hemostasis management, which includes current strategies. Although the book's use is not specifically directed toward perfusion, its content is invaluable to the field. It is not essential to read the chapters in order, as one is not followed by the other out of necessity; yet, the book is well-organized and the chapters flow from one to another with ease. This book is loaded with tables for easy-to-reference summaries, and the chapters are short and concise, often concluding with a summary. Despite the authors' occasional biases, they usually clarify the specific management style as part of the protocol at their hospital. Finally, the book concludes with an informative chapter about multiple legal aspects of transfusing blood.

The first chapter examines the general principles of normal and abnormal hemostasis. The coagulation cascade is described and shown in an understandable manner. Natural anticoagulation is discussed, as is the pharmacology of oral and intravenous anticoagulants. The chapter concludes with a short discussion of the prospective anticoagulants of the future.

Chapter 2 is concerned chiefly with the alteration of hemostasis during cardiopulmonary bypass. Starting with the physiology, Dr. Roger Bick describes the three "compartments" of hemostasis: vascular, platelet and coagulation proteins. Having explained the functions, he proceeds to elucidate the common and not so common hemostasis pathologies and management of the same during cardiac surgery. He summarizes this section by stating the primary reason for the majority of nontechnical hemorrhagic events in patients after cardiopulmonary bypass (CPB) remains unchanged throughout years of research and experience: platelet dysfunction. He expands on this, saying that regardless of the cause of bleeding, all patients having undergone CPB have significant platelet dysfunction, which is, at a minimum, additive to the problem. In additional sections addressing the diagnosis and management of hemorrhage during bypass, Dr. Bick lists the predisposing factors, the kinds of excessive bleeding seen with cardiopulmonary bypass, and the laboratory evaluations that can be made to diagnose them.

Chapters 3 and 4 are short and address the protocols and monitoring of anticoagulation during cardiopulmonary bypass. Pifarré discusses in moderate detail the functions and possible adverse responses of heparin and protamine. He concludes with protocols for their administration. Chapter 4 looks at available anticoagulation monitoring methods, and the primary considerations used for their testing. This chapter ends with the familiar resolution that conclusive guidelines for administration cannot be established until further studies are done. In the meantime, relying on activated clotting times during CPB and thrombelastography before and after CPB remain the most useful tests.

Chapters 5 and 6 elaborate on blood preservation techniques: the cell saver, autologous transfusion, preoperative blood preservation, and diminishing post-bypass blood loss. Written by contributing authors Dr. Maureen Ball and Dr. Brian Bull, Chapter 5 emphasizes salvaged blood syndrome. Caused by platelet and leukocyte interactions in the cell saver, they explain why it is more commonly seen in patients with short bypass times, rather than in patients with longer pump run times.

Chapter 7 outlines thrombosis mechanisms: platelet adhesion, platelet aggregation, activation of the coagulation system, and thrombus formation. It describes antithrombotic therapies for several acute coronary syndromes such as unstable angina pectoris, acute myocardial infarction, and the acute thrombus formation often formed after coronary artery bypass grafting. The chapter concludes with a segment about new, prospective selective thrombin inhibitors.

Chapter 8 gives a detailed overview of the use of current anticoagulant versus antithrombotic agents. The authors investigate heparin carefully, and elaborate on the differences in the high and low molecular weights, including the differences in laboratory evaluations such as ACTs and activated partial thromboplastin times (aPTTs). They also address the advantages of using low molecular weight heparins in heparin-resistant patients. Oral anticoagulants and considerations for future anticoagulants in surgeries such as open heart surgery are also considered. Because fibrinolysis is problematic, and is frequently seen in post-cardiopulmonary bypass patients, drugs which are used to counteract it are reviewed here. Other antifibrinolytic agents, such as hemodilution and hypothermia, are also carefully reviewed.

Chapters 9 and 10 address the antifibrinolytic aprotinin directly. With a slight overlap in review of CPB, the authors give a condensed overview of other agents used in reducing blood loss, and take a careful look at the effect of aprotinin on attenuating blood loss after CPB. They assess risks and benefits, while Chapter 10 confronts the controversies in the practical use of aprotinin.

Chapter 11, less than six pages in length, also concerns an antifibrinolytic: desmopressin acetate (DDAVP). It includes more tables than text, and again reviews the issues of platelet dysfunction and intraoperative and postoperative bleeding in CPB patients. The authors discuss the use of DDAVP, and conclude that it may well be beneficial to patients included in the high risk for bleeding category, but at this point in time aprotinin seems to be the better choice.

Chapters 13 and 14 address the commitment to the prophylaxis of bleeding, as opposed to the treatment of bleeding. Chapter 13 pertains to the diagnosis, management and prevention of heparin-induced thrombocytopenia, while Chapter 14 refers to the monitoring of platelet function and includes the causes of lowered platelet count, dysfunction, and their effects during and after surgery, particularly in the cardiopulmonary bypass surgery patient. The prophylactic use of the platelet reactivity test prior to cardiac surgery for perioperative bleeding and postoperative risk of thromboembolism, and identifying those patients with hyporeactive platelets and those with hyperactive platelets, is particularly interesting.

The title of Chapter 15 is deceiving in its inferred limited application to the transfusion medicine specialist. This limitation is not the intent of the highly informative chapter, which is concerned with allogenic blood transfusions. Because 10 percent of the nation's blood supply of red blood cells is used in cardiopulmonary bypass surgeries, it is of particular interest to perfusionists.

Chapter 19, although labeled to be written for cardiac surgeons, is highly pertinent to the perfusionist. The chapter admittedly overlaps information contained in other chapters, but the overlap is minimal and fitting to the subject. Postoperative bleeding in adults is looked at by incidence and causes. Preoperative evaluations and medications are reviewed in terms of what may be expected intraoperatively and postoperatively, and finally, patterns of postoperative bleeding are identified. Chapter 20 also addresses speculations for postoperative bleeding, but in pediatric, as opposed to adult, cardiopulmonary bypass patients.

I recommend this book to anyone seeking a better understanding of hemostasis and anticoagulation. These subjects deal with a plethora of detailed and confusing information, and this book presents them clearly and understandably. It applies particularly well to cardiac surgeons, anesthesiologists, cardiologists and perfusionists.

Anita Vogelzang, BS
Perfusion Technology Program
University of Iowa Hospitals and Clinics
Iowa City, Iowa

ERRATUM

In the article "Continuous Venous Oximetry: A Comparative Study Between the CDI 100 and Bentley OxySat II" (J Extra-Corpor Technol. 1994;26(4):185-188), the following corrections should be made. In the abstract (page 185), hemoglobin should be expressed in g/L, and not in g/dl. In Table 3 (page 186), hematocrit should be expressed in %, not in g/dl.