

Analysis of perinatal coagulation function in preeclampsia

Chang Xu, MM, Yunhui Li, MM, Wen Zhang, MM, QiuShi Wang, PhD*

Abstract

To study the dynamic changes in perinatal coagulation function in patients with preeclampsia (PE).

The general data and coagulation indexes of 290 PE patients during the perinatal period (prenatal and 1 and 3 days postpartum) and 256 healthy pregnant women in the third trimester of pregnancy were investigated, and the data were analyzed.

Compared with healthy pregnant women, prothrombin time (PT), fibrinogen (FIB), platelet count (PLT), mean platelet volume (MPV), thrombocytocrit (PCT), maximum amplitude (MA), and coagulation index (CI) of PE patients decreased, and activated partial thrombin time (APTT), thrombin time (TT), D-dimer (DD), platelet distribution width (PDW) and K values increased before delivery ($P < .05$). APTT and FIB in PE patients were lower in the day 1 postpartum group than in the prenatal and postpartum day 3 groups, and TT, DD, and fibrin degradation products (FDP) were higher ($P < .05$). PCT and MPV were highest in the prenatal group ($P < .05$).

Compared with that of healthy pregnant women, the coagulation function of PE patients is in a relatively low-coagulation and high-fibrinolysis state on postpartum day 1, which increases the risk of postpartum hemorrhage and other adverse outcomes.

Abbreviations: APTT = Activated partial thrombin time, AT = antithrombin, CI = coagulation index, DD = D-dimer, FDP = fibrin degradation products, FIB = fibrinogen, LMWH = low molecular weight heparin, MA = maximum amplitude, MPV = mean platelet volume, PCT = thrombocytocrit, PDW = platelet distribution width, PE = preeclampsia, PLT = platelet count, PPH = postpartum hemorrhage, PT = prothrombin time, TEG = thrombelastogram, TT = thrombin time.

Keywords: coagulation function, low molecular weight heparin, postpartum hemorrhage, preeclampsia

1. Introduction

Preeclampsia (PE) is a common complication among pregnant women, with an incidence of approximately 5% to 8%.^[1] If uncontrolled, the disease can progress to adverse consequences such as disseminated intravascular coagulation (DIC) and multiple organ failure (MOF).^[2,3]

Vascular endothelial injury underlies the pathophysiological changes in PE patients.^[4] Placental and immunologic abnormalities lead to the release of inflammatory cytokines in PE patients. Inflammatory factors cause inflammatory reactions, vascular

endothelial injury, and exposure of collagen and tissue factors under the endothelium, leading to a series of changes in the coagulation, anticoagulation, and fibrinolytic systems, which then affect other systems,^[1–4] leading to fetal death in utero, dysontogenesis, and other adverse obstetrical outcomes.

The commonly used laboratory tests of coagulation function in clinical practice include routine blood cell counts, coagulation factors, plasma fibrin degradation products (FDP), antithrombin (AT), and other indicators of coagulation, anticoagulation, and fibrinolytic functions. In addition, thromboelastography (TEG) can continuously and dynamically monitor the whole process of formation and degradation of blood clots.^[7–9]

Administration of anticoagulants, such as low molecular weight heparin (LMWH) and AT, is an effective treatment for patients with severe PE complicated by DIC. It is gradually recognized clinically by blocking the malignant process of coagulation reaction.^[9]

Many clinical studies have demonstrated the hypercoagulable state of healthy pregnant women in the third trimester.^[10–11] To further assess coagulation function, postpartum hemorrhage (PPH), and risk of thrombosis in PE patients, we compared the third trimester coagulation function of PE patients and healthy pregnant women, assessed the changes of PE patients' coagulation function during the perinatal period. The report is as follows.

2. Materials and methods

2.1. Research subjects

The study subjects were 290 PE patients admitted to Sheng Jing Hospital of China Medical University from January to April 2018. General demographic and clinical data such as age, gestational week, number of gestation, and BMI were recorded, and the results of routine blood cell counts, blood coagulation

Editor: Roxana Gaval.

This work was supported by the Liaoning provincial department of Science & Technology and China Medical University (Study on the progress in the diagnosis, treatment and mechanism of maternal-fetal immunity-related diseases, grant numbers: 20152205088).

The authors have no conflicts of interest to disclose.

All data generated or analyzed during this study are included in this published article (and its supplementary information files).

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How to cite this article: Xu C, Li Y, Zhang W, Wang Q. Analysis of perinatal coagulation function in preeclampsia. *Medicine* 2021;100:25626–25632.

Received: 15 January 2021 / Received in final form: 26 May 2021 / Accepted: 28 May 2021

<https://dx.doi.org/10.1097/MD.0000000000002562>

Perinatal Coagulation

**Kathleen Rice Simpson, Patricia A.
Creehan**



Perinatal Coagulation:

Perinatal Thrombosis and Hemostasis Shigenori Suzuki, William E. Hathaway, John Bonnar, Anton H. Sutor, 2012-12-06

This book is unique in that it is probably the first occasion in which obstetricians pediatricians hematologists physiologists and biologists met in a closed workshop to analyse current knowledge and understanding of hemostasis and its disorders in pregnancy and the newborn

Perinatal Nursing Kathleen Rice Simpson, Patricia A. Creehan, 2008 Co published with the Association of Women's Health Obstetric and Neonatal Nurses AWHONN this book is a comprehensive clinical resource for practicing perinatal nurses and an excellent staff educator's guide and textbook It provides commonly accepted guidelines for practice and evidence based care and includes algorithms to support decision making Numerous photographs complement the text and summary boxes highlight key points Appendices provide patient care examples and practice guidelines This edition has been extensively revised and updated New features include more than 650 end of chapter review questions and answers and selected AWHONN protocols

Fetal and Neonatal Physiology E-Book Richard Polin, Steven H. Abman, David H. Rowitch, William Benitz, 2016-05-11 Fetal and Neonatal Physiology synthesizes this knowledge into definitive guidance for today's busy practitioner Offers definitive guidance on how to effectively manage the many health problems seen in newborn and premature infants Chapters devoted to clinical correlation help explain the implications of fetal and neonatal physiology Allows you to apply the latest insights on genetic therapy intrauterine infections brain protection and neuroimaging and much more Expert Consult eBook version included with purchase This enhanced eBook experience allows you to search all of the text figures images and references from the book on a variety of devices Features a fantastic new 4 color design with 1 000 illustrations 170 chapters and over 350 contributors 16 new chapters cover such hot topics as Epigenetics Placental Function in Intrauterine Growth Restriction Regulation of Pulmonary Circulation The Developing Microbiome of the Fetus and Newborn Hereditary Contribution to Neonatal Hyperbilirubinemia Mechanistic Aspects of Phototherapy for Neonatal Hyperbilirubinemia Cerebellar Development Pathophysiology of Neonatal Sepsis Pathophysiology of Persistent Pulmonary Hypertension of the Newborn Pathophysiology of Meconium Aspiration Syndrome Pathophysiology of Ventilator Dependent Infants Pathophysiology of Hypoxic Ischemic Brain Injury Pathophysiology of Neonatal White Matter Injury Pathophysiology of Meningitis Pathophysiology of Preeclampsia and Pathophysiology of Chorioamnionitis New Pathophysiology of Neonatal Diseases section highlights every process associated with a disease or injury all in one place In depth information combined with end of chapter summaries enables deep or quick use of the text

Disorders of Thrombosis and Hemostasis in Pregnancy Hannah Cohen, Patrick O'Brien, 2015-06-18 In this second edition of Disorders of Thrombosis and Hemostasis in Pregnancy A Guide to Management the content has been thoroughly updated with a particular focus on strengthening the management sections to ensure that advice on management represents state of the art

Fetal and Neonatal Physiology Richard A. Polin, William W. Fox, Steven H. Abman, 2011-01-01 Fetal and

Neonatal Physiology edited by Drs Polin Fox and Abman focuses on physiologic developments of the fetus and newborn and their impact on the clinical practice of neonatology A must for practice this 4th edition brings you the latest information on genetic therapy intrauterine infections brain protection and neuroimaging and much more You ll also have easy access to the complete contents and illustrations online at expertconsult com Gain a comprehensive state of the art understanding of normal and abnormal physiology and its relationship to disease in the fetus and newborn premature infant from Dr Richard Polin and other acknowledged worldwide leaders in the field Understand the implications of fetal and neonatal physiology through chapters devoted to clinical correlation Apply the latest insights on genetic therapy intrauterine infections brain protection and neuroimaging and much more Effectively manage the consequences of intrauterine infections with three new chapters covering intrauterine infection and preterm birth intrauterine infection and brain injury and intrauterine infection and chronic lung disease Access the complete contents and illustrations online at expertconsult com fully searchable Get the latest developments and a full understanding of the distinct physiology of the fetus and newborn so you can treat and manage sick newborns and preemies **Fetal and Neonatal Physiology E-Book** Richard A. Polin, Steven H. Abman, 2011-08-13

Fetal and Neonatal Physiology edited by Drs Polin Fox and Abman focuses on physiologic developments of the fetus and newborn and their impact on the clinical practice of neonatology A must for practice this 4th edition brings you the latest information on genetic therapy intrauterine infections brain protection and neuroimaging and much more Gain a comprehensive state of the art understanding of normal and abnormal physiology and its relationship to disease in the fetus and newborn premature infant from Dr Richard Polin and other acknowledged worldwide leaders in the field Understand the implications of fetal and neonatal physiology through chapters devoted to clinical correlation Apply the latest insights on genetic therapy intrauterine infections brain protection and neuroimaging and much more Effectively manage the consequences of intrauterine infections with three new chapters covering intrauterine infection and preterm birth intrauterine infection and brain injury and intrauterine infection and chronic lung disease Fetal & Neonatal Hematology,

Oncology and Immunology MR Lokeshwar, Anupam Sachdeva, 2017-07-17 This book is a comprehensive guide to the diagnosis and treatment of blood and immunological disorders and cancer in foetuses and newborns Divided into eight sections the text begins with detailed discussion on foetal haematology antenatal diagnosis of disorders red blood cell disorders and anaemia in the newborn and coagulation and platelet conditions The following chapters cover foetal and neonatal malignancies and blood transfusion followed by a final section on immunological disorders Each topic explains new advances all current treatment protocols new drugs and management approaches Chapters are further enhanced by clinical images and tables Key points Comprehensive guide to diagnosis and treatment of blood and immunological disorders and cancer in foetuses and newborns Presented in an easy to follow format explaining new advances treatment protocols new drugs and management approaches Includes discussion on neonatal malignancies and blood transfusion Highly illustrated

with clinical images and tables Fanaroff and Martin's Neonatal-Perinatal Medicine E-Book Richard J. Martin,Avroy A. Fanaroff,Michele C. Walsh,2014-08-20 Tackle your toughest challenges and improve the quality of life and long term outcomes of your patients with authoritative guidance from Fanaroff and Martin s Neonatal Perinatal Medicine Drs Richard J Martin Avroy A Fanaroff and Michele C Walsh and a contributing team of leading experts in the field deliver a multi disciplinary approach to the management and evidence based treatment of problems in the mother fetus and neonate New chapters expanded and updated coverage increased worldwide perspectives and many new contributors keep you current on the late preterm infant the fetal origins of adult disease neonatal anemia genetic disorders and more a valuable reference book and a pleasure to read Reviewed by BACCH Newsletter Mar 2015 Consult this title on your favorite e reader conduct rapid searches and adjust font sizes for optimal readability Be certain with expert dependable accurate answers for every stage of your career from the most comprehensive multi disciplinary text in the field See nuance and detail in full color illustrations that depict disorders in the clinical setting and explain complex information Obtain more global perspectives and best practices with contributions from international leaders in the field of neonatal perinatal medicine Get comprehensive guidance on treating patients through a dual focus on neonatology and perinatology Spot genetic problems early and advise parents of concerns with a completely new section on this topic Make informed clinical choices for each patient from diagnosis and treatment selection through post treatment strategies and management of complications with new evidence based criteria throughout Stay at the forefront of your field thanks to new and completely revised chapters covering topics such as Principles and Practice l Immune and Non immune Hydrops Fetalis l Amniotic Fluid Volume l Enhancing Safe Prescribing in the Neonatal Intensive Care Unit l Role of Imaging in Neurodevelopmental Outcomes of High Risk Neonates l Patent Ductus Arteriosus l Gastroesophageal Reflux and Gastroesophageal Reflux Diseases in the Neonate Find and grasp the information you need easily and rapidly with indexing that provides quick access to specific guidance Shnider and Levinson's Anesthesia for Obstetrics Samuel C. Hughes,Gershon Levinson,Mark A. Rosen,Sol M. Shnider,2002 The leading reference on anesthesia during pregnancy and delivery is now in its thoroughly updated Fourth Edition This volume provides complete information on anesthesia for vaginal delivery cesarean section obstetric complications anesthetic complications anesthesia for nonobstetric disorders during pregnancy and management of the fetus and newborn This edition provides expanded coverage of infectious diseases during delivery including HIV herpes chorioamnionitis labor epidural fever and sepsis The section on anesthetic complications includes a new chapter on the difficult airway failed intubation and cardiac arrest There is a revised chapter on evaluation of the neonate and more information about CT ultrasound and MRI

Principles of Medical Therapy in Pregnancy Norbert Gleicher,2012-12-06 Prefaces of textbooks are generally meant to give editors an opportunity to express the rationale for the creation of yet another textbook It is rare to find an author or editor who does not believe that his her book fills a very specific need This editor is no exception With the incredible

proliferation of medical textbooks in recent years it has become difficult to find an empty niche for yet another text. Nevertheless the editors and authors of *Principles of Medical Therapy in Pregnancy* have been impressed by one very clearly appreciated void. While the association of medical disorders with pregnancy is increasing in frequency as improved medical care allows more patients with medical diseases to conceive, an authoritative text covering the issue comparable to an authoritative text in internal medicine has been missing. With pregnancy representing a very specific disease situation different from the nonpregnant state in diagnosis, management and course of disease, a detailed textbook addressing all these issues for both the internist and the obstetrician seemed urgently needed.

Nathan and Oski's Hematology and Oncology of Infancy and Childhood E-Book Stuart H. Orkin, David G. Nathan, David Ginsburg, A. Thomas Look, David E. Fisher, Samuel Lux, 2014-11-14. Written by the leading names in pediatric oncology and hematology, *Nathan and Oski's Hematology and Oncology of Infancy and Childhood* offers you the essential tools you need to overcome the unique challenges and complexities of childhood cancers and hematologic disorders. Meticulously updated, this exciting full color set brings together the pathophysiology of disease with detailed clinical guidance to provide you with the most comprehensive authoritative up to date information for diagnosing and treating children. Form a definitive diagnosis and create the best treatment plans possible with comprehensive coverage of all pediatric cancers including less common tumors as well as all hematologic disorders including newly recognized ones. Develop a thorough understanding of the underlying science of diseases through summaries of relevant pathophysiology balanced with clear practical clinical guidance. *Nathan and Oski's* is the only comprehensive product on the market that relates pathophysiology in such depth to hematologic and oncologic diseases affecting children. Quickly and effortlessly access the key information you need with the help of a consistent organization from chapter to chapter and from volume to volume. Stay at the forefront of your field thanks to new and revised chapters covering topics such as paroxysmal nocturnal hemoglobinuria, lysosomal storage diseases, childhood genetic predisposition to cancer and oncology informatics. Learn about the latest breakthroughs in diagnosis and management making this the most complete guide in pediatric hematology and oncology. Discover the latest in focused molecularly targeted therapies derived from the exponential growth of knowledge about basic biology and genetics underlying the field. Rely on it anytime anywhere. Access the full text, images and more at Expert Consult.

Nathan and Oski's Hematology of Infancy and Childhood E-Book Stuart H. Orkin, David G. Nathan, David Ginsburg, A. Thomas Look, David E. Fisher, Samuel Lux, 2008-12-16. To address the exponential growth in the fields of pediatric hematology and oncology, this classic reference has been separated into two distinct volumes. With this volume devoted strictly to pediatric hematology and another to pediatric oncology, you'll keep you on the cutting edge of these two specialties. The completely revised 7th edition of *Nathan and Oski's Hematology of Infancy and Childhood* is now in full color and provides you with the most comprehensive authoritative up to date information for diagnosing and treating children with hematologic disorders. It brings together the pathophysiology of disease with detailed

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Neurology of the Newborn Joseph J. Volpe,2008-01-01 Provides the insights in neonatal neurology This title describes from the discoveries in genetics through the advances in the diagnosis and management of neurologic disorders It delivers clinical guidance you need to provide effective care for neonates with neurological conditions

Nathan and Oski's Hematology of Infancy and Childhood Stuart H. Orkin,David G. Nathan,2009-01-01 To address the exponential growth in the fields of pediatric hematology and oncology this classic reference has been separated into two distinct volumes With this volume devoted strictly to pediatric hematology and another to pediatric oncology you ll keep you on the cutting edge of these two specialties The completely revised 7th edition of Nathan and Oski s Hematology of Infancy and Childhood is now in full color and provides you with the most comprehensive authoritative up to date information for diagnosing and treating children with hematologic disorders It brings together the pathophysiology of disease with detailed clinical guidance on diagnosis and management for the full range of blood diseases that you encounter in everyday practice Written by the leading names in pediatric hematology this resource is an essential tool for anyone involved in caring for children with hematologic disorders And as an Expert Consult title this thoroughly updated 7th edition comes with access to the complete contents online fully searchable Balances summaries of relevant pathophysiology with clear practical clinical guidance to help you thoroughly understand the underlying science of diseases Offers comprehensive coverage of all hematologic disorders including newly recognized ones along with the latest breakthroughs in diagnosis and management Uses many boxes graphs and tables to highlight complex clinical diagnostic and management guidelines at a glance Presents an all new full color design that includes clear illustrative examples of relevant science and clinical problems for quick access to the answers you need Provides access to the complete contents online fully searchable enabling you to consult it rapidly from any computer with an Internet connection Your purchase entitles you to access the web site until the next edition is published or until the current edition is no longer offered for sale by Elsevier whichever occurs first If the next edition is published less than one year after your purchase you will be entitled to online access for one year from your date of purchase Elsevier reserves the right to offer a suitable replacement product such as a downloadable or CD ROM based electronic version should access to the web site be discontinued

Neonatal Haematology Irene Roberts,Barbara J. Bain,2022-09-06

Neonatal Haematology This unique handbook contains comprehensive coverage of neonatal haematology and aids diagnosis via high quality images diagnostic algorithms case studies and tables With illustrations accompanying the diagnosis at each stage and clear explanations provided throughout the book is ideal for trainees and experts alike Authored by two of the world s leading haematologists Professor Irene Roberts and Professor Barbara Bain this book provides a depth of knowledge that is unequalled in other texts To aid in reader comprehension it is neatly organised by clinical problems and covers sample topics such as Red cells morphology membrane enzymes and changes over the first 4 weeks of life Haemolytic anaemias causes of neonatal haemolysis diagnostic clues and immune haemolysis haemolytic disease of the newborn Neonatal anaemia due to blood loss causes of blood loss diagnostic clues fetomaternal haemorrhage and twin to twin transfusion Haematological signs of neonatal infection causes of neutrophil left shift leucoerythroblastosis and toxic granulation Paediatric haematologists consultant haematologists and trainees in haematology can use the succinct well written content in this book as a useful helping hand during consultation Biomedical scientists will also value the work as a laboratory reference

Medical and Health Related Sciences Thesaurus National Institutes of Health (U.S.),1985 Indexing terms used in CRISP Computer Retrieval of Information on Scientific Projects and in Research grants index Alphabetical arrangement Cross references under terms Bibliography of Medical Reviews ,1976 **Neonatal Hematology and Transfusion Medicine, An Issue of Clinics in Perinatology** Robert D. Christensen,2015-11-12 Recent advances in neonatal hematology largely made by the authors of these chapters are likely to generate wide spread and long term improvements in outcomes as well as reductions in costs of care Publication of these advances in a single volume will facilitate dissemination of these techniques and practices The advances include neuroprotection from erythropoietic stimulators improved guidelines for platelet transfusions evidence based guidelines for FFP administration improved diagnostic methods for genetic causes of severe neonatal jaundice more accurate definitions of hematological perturbations in necrotizing enterocolitis and sepsis and reduction in transfusions and in IVH rates by cord milking delayed clamping **Maternal, Fetal, & Neonatal Physiology - E-Book** Susan Blackburn,2012-04-30 Provide the best care possible with expert insight and clinically relevant coverage of the physiologic changes that occur throughout all major periods of the perinatal experience prenatal intrapartum postpartum and neonatal Maternal Fetal anatomic and functional development of the fetus and developmental physiology of preterm and term neonates Pharmacology tables offer quick access to key pharmacology information and drug effects with clinical examples Coverage of pathophysiology and interventions for the pregnant woman fetus and newborn for selected abnormal events provides a solid understanding of physiologic adaptations and developmental physiology relating to major body systems and metabolic processes Comprehensive tables diagrams and illustrations highlight important concepts and summarize key information Thoroughly updated content offers the very latest evidence based information contemporary research and clinical developments related to maternal fetal and neonatal physiology New coverage on the late pre term

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Perinatal Coagulation Introduction

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