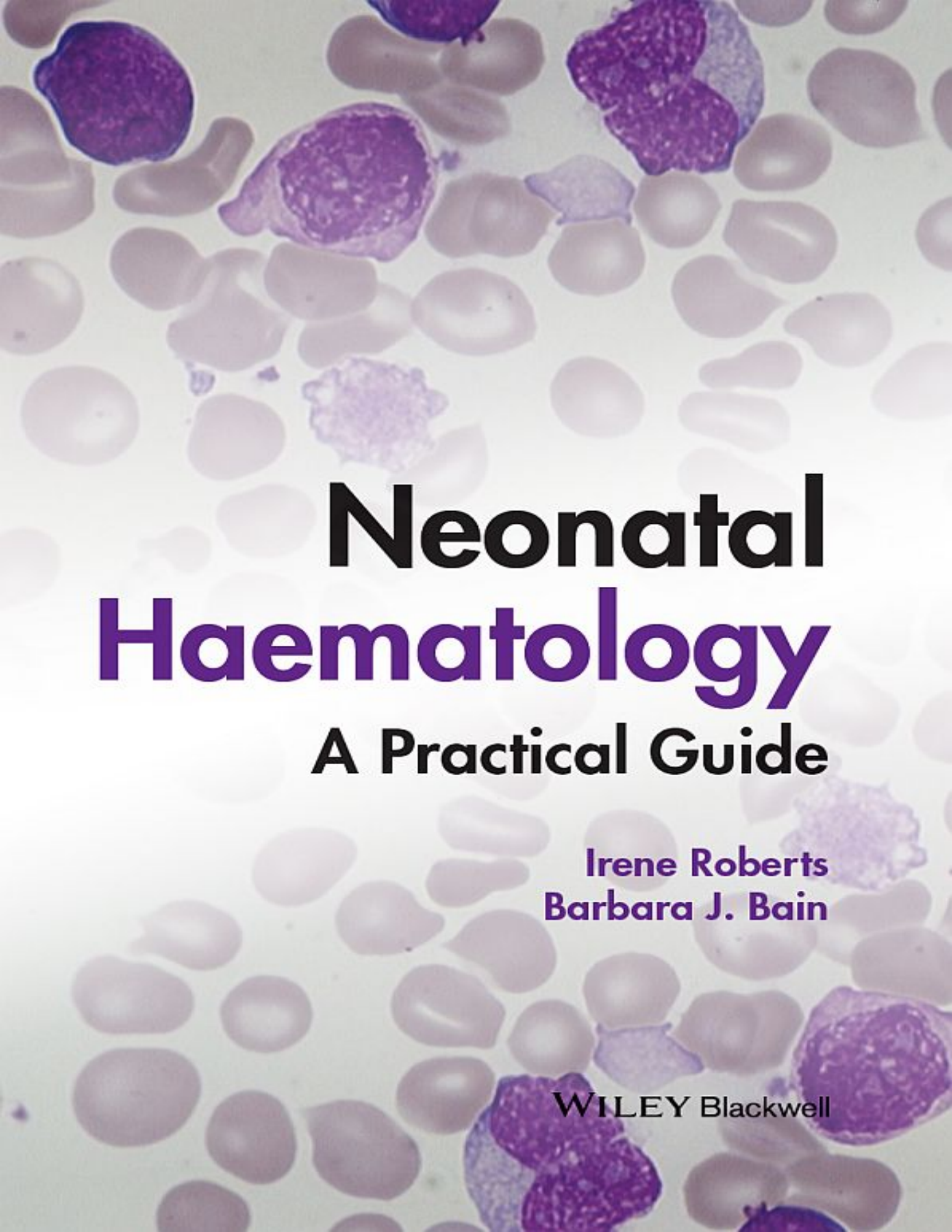

Neonatal Haematology

A Practical Guide

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WILEY Blackwell

Table of Contents

List of Tables

List of Illustrations

Neonatal Haematology: A Practical Guide

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Preface

This neonatal haematology guide aims to fill a gap in an important, but often poorly understood, area of diagnostic haematology by focusing particularly on common blood problems in this unique group of patients, although not neglecting the rarities that can also be important. We specifically chose to use a text-atlas format because the starting point for so many haematological problems in neonates is the information to be found through careful evaluation of a blood film in conjunction with an automated blood count. Given that many neonates with haematological abnormalities weigh less than 1000 g at birth and have an estimated blood volume at birth of 40–80 ml with very precarious vascular access, there is huge practical value in being able to extract the maximum amount of diagnostic information from a single drop of blood.

The book has been organised into four chapters based on the most frequently occurring clinical problems: interpretation of normal results and blood film appearances (Chapter 1); anaemias and haematological causes of jaundice (Chapter 2); diagnosis of systemic disorders, such as infection, and less common leucocyte disorders, such as leukaemia and storage disorders (Chapter 3); and disorders of coagulation and thrombosis, including common causes of thrombocytopenia and their investigation (Chapter 4). We hope that this handbook will be a core resource for haematologists on call in any hospital with a maternity unit who may not be neonatal experts, and that it will act as a core text for neonatal and paediatric haematologists. It is very much aimed to be a practical resource, based on real-life experience of neonatal haematology in large teaching hospitals and contains algorithms, tables and illustrative

cases with full colour images. While the focus is on common problems, we also describe when to look for, and how to spot, rare haematological disorders presenting in the neonatal period.

Almost all the images and cases described in this book derive from more than 25 years' experience as a 'neonatal haematologist', which involved daily examination of blood films from neonates in a number of neonatal intensive care units and special care baby units and daily conversations with the clinical teams responsible for their care. This was only possible with the support, open-mindedness and enthusiasm of the neonatalogists on the one hand and the dedication and rigour of the highly skilled biomedical scientists of the diagnostic haematology labs on the other. Particular thanks go to David Roper, Andrew Osei-Bimpong and the late Corinne Jury of the Hammersmith and Queen Charlotte's Hospitals Haematology Laboratories, who made possible the delivery of a daily 'baby films' service in the face of increasing NHS demands; to David Roper and the late Dr David Swirsky, former consultant haematologist at Hammersmith Hospital, for their help with the photomicrographs in the earliest years of the neonatal haematology service; to countless biomedical scientists whose pride in delivering the highest quality 'baby films' on a daily basis was an inspiration to me; to paediatric haematology colleagues in London and Oxford who posed fascinating questions to keep me on my toes; and to the long-suffering haematology trainees who usually managed to look interested in this niche subject and helped to deliver the clinical advice.

This book would never have been written without the help and support of a number of other people. Above all, I am hugely indebted to my co-author, Professor Barbara Bain. She brought to the book her 50 years' experience of diagnostic haematology. Her expertise, experience,

diligence and patience, as well as her friendly advice, were invaluable. I am similarly hugely grateful to Mandy Collison at Wiley who never gave up on the project despite repeated delays on my part. Finally, I have to thank my family (Allan, Duncan and Ewan), who accepted the neonatal haematology geek in their midst, and supported the whole project from the beginning.

Irene Roberts

Abbreviations

2,3-DPG
: 2,3-diphosphoglycerate

ADA
: adenosine deaminase

ADP
: adenosine diphosphate

AGM
: aorto-gonado-mesonephros

aHUS
: atypical haemolytic uraemic syndrome

AIHA
: autoimmune haemolytic anaemia

ALL
: acute lymphoblastic leukaemia

ALPS
: autoimmune lymphoproliferative syndrome

AML
: acute myeloid leukaemia

APTT
: activated partial thromboplastin time

ATD
: asphyxiating thoracic dystrophy

ATRUS
: amegakaryocytic thrombocytopenia and radio-ulnar synostosis

BCG
: bacille Calmette–Guérin

BCSH

British Committee for Standards in Haematology

BHFS
Bart's hydrops fetalis syndrome

BPI
bactericidal/permeability-increasing protein

BSS
Bernard–Soulier syndrome

CAMT
congenital amegakaryocytic thrombocytopenia

CDA
congenital dyserythropoietic anaemia

CHS
Chédiak–Higashi syndrome

CMV
cytomegalovirus

CNS
central nervous system

COVID-19
coronavirus disease 19

DAT
direct antiglobulin test

DBA
Diamond–Blackfan anaemia

DIC
disseminated intravascular coagulation

DNA
deoxyribonucleic acid

ECMO
extracorporeal membrane oxygenation

EDTA
ethylene diaminetetra-acetic acid

ELP
early lymphoid progenitor

EMA
eosin-5-maleimide

EOS
early-onset sepsis

EPO
erythropoietin

ERFE
erythroferrone

FFP
fresh frozen plasma

FNAIT
fetal/neonatal alloimmune thrombocytopenia

FPD/AML
familial platelet disorder with propensity to acute myeloid leukaemia

FRC
fragmented red cell

G6PD
glucose-6-phosphate dehydrogenase

G6PT1
glucose-6-phosphate transporter 1

G-CSF
granulocyte colony-stimulating factor

Gp
glycoprotein

GPI
glucose phosphate isomerase

Hb
haemoglobin concentration

HDFN

haemolytic disease of the fetus and newborn

HELLP
haemolysis, elevated liver enzymes and low platelets

HIE
hypoxic ischaemic encephalopathy

HIV
human immunodeficiency virus

HK
hexokinase

HLH
haemophagocytic lymphohistiocytosis

HNA
human neutrophil antigen

HPA
human platelet antigen

HPFH
hereditary persistence of fetal haemoglobin

HPLC
high performance liquid chromatography

HPP
hereditary pyropoikilocytosis

HS
hereditary spherocytosis

HSC
haemopoietic stem cell

HUS
haemolytic uraemic syndrome

IBMFS
inherited bone marrow failure syndromes

ICH
intracranial haemorrhage

IG%
immature granulocyte percentage

IGF
insulin-like growth factor

IgG
immunoglobulin G

IgH
immunoglobulin heavy chain

IgM
immunoglobulin M

IL-6
interleukin-6

IPF
immature platelet fraction

IRF
interferon regulatory factor

ITP
autoimmune thrombocytopenia

IUGR
intrauterine growth restriction

IUT
intrauterine transfusion

IVH
intraventricular haemorrhage

IVIg
intravenous immunoglobulin

JAK2
Janus kinase 2

JMML
juvenile myelomonocytic leukaemia

KHE
Kaposiform haemangioendothelioma

KMP
Kasabach–Merritt phenomenon

LAD
leucocyte adhesion deficiency

LDH
lactate dehydrogenase

LOS
late-onset sepsis

MAHA
microangiopathic haemolytic anaemia

MAIPA
monoclonal antibody-specific immobilisation of platelet antigens

MCA
middle cerebral artery

MCH
mean cell haemoglobin

MCHC
mean cell haemoglobin concentration

MCV
mean cell volume

MDSC
myeloid-derived suppressor cell

ML-DS
myeloid leukaemia of Down syndrome

MPAL
mixed phenotype acute leukaemia

MPV
mean platelet volume

NA
not applicable

NADPH

nicotinamide adenine dinucleotide phosphate

NEC
necrotising enterocolitis

NETs
neutrophil extracellular traps

NICE
National Institute for Health and Care Excellence

NICU
neonatal intensive care unit

NLR
neonatal leukaemoid reaction

NRBC
nucleated red blood cell

NS/MPD
Noonan syndrome-associated myeloproliferative disorder

PCC
prothrombin complex concentrate

PCR
polymerase chain reaction

PFK
phosphofructokinase

PGK
phosphoglycerate kinase

PK
pyruvate kinase

PMN
polymorphonuclear

PT
prothrombin time

RNA
ribonucleic acid

u

v

W

X

y

z