Transoesophageal Echocardiography

Transoesophageal echocardiography (TOE/TEE) in cardiac patients is now almost routine. Its use in cardiac monitoring has also extended to include critically ill patients for non-cardiac surgery and the intensive care setting. Specific accreditation is required prior to practice of TOE/TEE involving a written examination and a documented logbook of experience. This book has been specifically designed to help candidates pass the written exam and has been structured around the syllabus. Providing a summary of all relevant information, this is an invaluable study aid. Lists of further reading material are provided with every topic, including guidelines and safety, cardiomyopathies, heart disease, haemodynamic calculations and many more. Each chapter ends with a series of exam-style questions for self-assessment. An extremely useful book for trainee anaesthetists, intensivists, trainee cardiologists and cardiac surgeons.

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Study Guide and Practice Questions

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Contents

List of abbreviations

A	amplitude
AC	attenuation coefficient
AF	atrial fibrillation
AI	aortic incompetence
A/L	antero-lateral
AMVL	anterior mitral valve leaflet
AS	aortic stenosis
ASD	atrial septal defect
AV	aortic valve
A-V	atrio-ventricular
AVA	aortic valve area
AVC	aortic valve closes
AVN	atrio-ventricular node
AVO	aortic valve opens
BP	blood pressure
BSA	body surface area
BUR	beam uniformity ratio
CC	costal cartilage
CCF	congestive cardiac failure
CFD	colour flow Doppler
Cn	compliance
CO	cardiac output
CPB	cardiopulmonary bypass
CS	coronary sinus
CW	continuous wave
CWD	continuous wave Doppler
DBP	diastolic blood pressure
depT	depressurization time

DF	duty factor
DT	deceleration time
EF	ejection fraction
ERO	effective regurgitant orifice
ET	ejection time
f_D	Doppler frequency
FD	focal depth
FO	foramen ovale
FS	fractional shortening
HOCM	hypertrophic obstructive cardiomyopathy
HV	hepatic vein
HVLT	half value layer thickness
I	intensity
IAS	interatrial septum
ICU	intensive care unit
IHD	ischaemic heart disease
IPP	intrapericardial pressure
IRC	intensity reflection coefficient
ITC	intensity transmitted coefficient
IVC	inferior vena cava
IVRT	isovolumic relaxation time
IVS	interventricular septum
LA	left atrium
LAA	left atrial appendage
LAD	left anterior descending coronary artery
LAP	left atrial pressure
LARRD	longitudinal resolution
LATA	lateral resolution
LAX	long axis view
LBBB	left bundle branch block
LCA	left coronary artery
LCC	left coronary cusp
LCCA	left common carotid artery
LCx	left circumflex coronary artery
LGC	lateral gain compensation

LLPV	left lower pulmonary vein
LPA	left pulmonary artery
LSCA	left subclavian artery
LSE	left sternal edge
LUPV	left upper pulmonary vein
LV	left ventricle
LVEDP	left ventricular end diastolic pressure
LVEDV	left ventricular end diastolic volume
LVESV	left ventricular end systolic volume
LVH	left ventricular hypertrophy
LVIDd	left ventricular internal diameter in diastole
LVIDs	left ventricular internal diameter in systole
LVM	left ventricular mass
LVOT	left ventricular outflow tract
LVP	left ventricular pressure
LVSP	left ventricular systolic pressure
MAPSE	mitral annular plane systolic excursion
MG	mean gradient
MI	myocardial infarction
MM	motion mode
MR	mitral regurgitation
MRI	magnetic resonance imaging
MV	mitral valve
MVA	mitral valve area
MVC	mitral valve closes
MVL	mitral valve leaflet
MVO	mitral valve opens
NCC	non-coronary cusp
P	power
PA	pulmonary artery
PADP	pulmonary artery diastolic pressure
PAP	pulmonary artery pressure
PD	pulse duration
PDA	patent ductus arteriosus
PE	pulmonary embolism

P/E	piezo-electric
PFO	patent foramen ovale
PG	pressure gradient
PHT	pressure half-time
PI	pulmonary incompetence
PISA	proximal isovelocity area
PM	papillary muscle
P/M	postero-medial
PMVL	posterior mitral valve leaflet
PRF	pulse repetition frequency
PRP	pulse repetition period
PS	pulmonary stenosis
PV	pulmonary valve
PVs	pulmonary veins
PW	pulse wave
PWD	pulse wave Doppler
PZT-5	lead zirconate titanate – 5
RA	right atrium
RAP	right atrial pressure
RBBB	right bundle branch block
rbc	red blood cell
RCA	right coronary artery
RCC	right coronary cusp
RF	regurgitant fraction
RLN	recurrent laryngeal nerve
RLPV	right lower pulmonary vein
RPA	right pulmonary artery
RSE	right sternal edge
RUPV	right upper pulmonary vein
RV	right ventricle
RVH	right ventricular hypertrophy
RVOT	right ventricular outflow tract
RVP	right ventricular pressure
RVSP	right ventricular systolic pressure
RWMA	regional wall motion abnormality

SAM	systolic anterior motion
SAN	sino-atrial node
SAPA	spatial average, pulse average
SATA	spatial average, temporal average
SATP	spatial average, temporal peak
SAX	short axis view
SBP	systolic blood pressure
SCA	sickle cell anaemia
SLE	systemic lupus erythematosus
SPL	spatial pulse length
SPPA	spatial peak, pulse average
SPTA	spatial peak, temporal average
SPTP	spatial peak, temporal peak
STJ	sino-tubular junction
SV	stroke volume
SVI	stroke volume index
SVR	systemic vascular resistance
TA	truncus arteriosus
TAA	thoracic aortic aneurysm
TAPSE	tricuspid annular plane systolic excursion
TAPVD	total anomalous pulmonary venous drainage
TB	tuberculosis
T_d	time delay
TDI	tissue Doppler imaging
TGA	transposition of great arteries
TGC	time gain compensation
TMF	transmitral flow
TOE	transoesophageal echocardiography
TR	tricuspid regurgitation
TS	tricuspid stenosis
TTE	transthoracic echocardiography
TTF	transtricuspid flow
TV	tricuspid valve
TVA	tricuspid valve area
TVC	tricuspid valve closes

TVL	tricuspid valve leaflet
TVO	tricuspid valve opens
TX	transducer
U/S	ultrasound
Vcf	velocity of circumferential fibre shortening
VSD	ventricular septal defect
VTI	velocity–time integral
WPW	Wolfe–Parkinson–White syndrome
Z	impedance

Foreword

Over the past decade there has been a dramatic increase in the use of transoesophageal echocardiography (TOE) in the perioperative setting among all disciplines caring for the cardiac patient. Where TOE used to be used mainly by cardiologists in the echocardiography laboratory, we now recognize its value in the operating theatre, cardiac catheter laboratory, and intensive care unit. TOE has become the gold standard perioperative cardiac monitor and diagnostic tool for certain cardiac surgical procedures. Its role has also been extended to critically ill or unstable patients for non-cardiac procedures and the general intensive care arena. The increasing involvement of anaesthetists and of other specialities at an advanced level has promoted the team approach to perioperative patient care. The rapid advances in the use of this technology have also resulted in a critical need for interdisciplinary training.

The development of training and certification in echocardiography has been a long and intensive process in Europe and the USA. Excellent comprehensive TOE courses have been available and working groups on TOE have published extensive practice and training guidelines on both sides of the Atlantic and in Japan. The American Society of Cardiovascular Anesthesiologists (SCA) developed the first formal examination in perioperative TOE in 1998. The SCA and the American Society of Echocardiography (ASE) then combined forces to establish the National Board of Echocardiography (NBE), which had the responsibility to further administer examinations and develop a certification process in clinical echocardiography. Europe followed a similar route with the Association of Cardiothoracic Anaesthetists (ACTA) joining forces with the British Society of Echocardiography

(BSE) to establish an accreditation process in TOE with its first examination held in the UK in 2003. Since then the European Association of Cardiothoracic Anaesthesiologists (EACTA) and the European Society of Echocardiography (ESE) produced its own European TOE examination and accreditation process in 2005. In 2004, the Japanese Society of Cardiovascular Anesthesiologists launched their first TOE competency examination.

The purpose of these accreditation processes is to enable recognition of special competence in perioperative echocardiography against an objective standard, and all of them consist of two parts. With the *practical part*, the candidate must demonstrate adequate training and competency through a supervised residency program or logbook. The *theoretical part* requires the successful completion of a multiple choice and image clip examination.

With his experience in learning, practicing and teaching perioperative echocardiography in North America and in the UK, the author fills a certain niche with this book. It is not intended to be a comprehensive reference book. In contrast to the vast amount of information on echocardiography already available both in print and online, this book provides the aspiring echocardiographer with a valuable summarized resource to prepare for any of the perioperative echocardiography examinations. It gives any examination candidate a convenient framework onto which further knowledge can be added. Both the American and the European perioperative TOE examination syllabus is well covered in a concise manner. The *Perioperative Transoesophageal Echocardiography Exam Notes* contains all the critical physics equations, standard values and plenty of diagrams in a highly absorbable way. Each chapter also concludes with a series of exam-style self-assessment questions to emphasize important facts and practice for the exam.

Cardiac surgery and anaesthesia have come a long way since the late 1970s when TOE was introduced into the perioperative arena. The development of many surgical procedures and the reduction in perioperative morbidity and mortality can be directly related to the use

of TOE. There rests a great responsibility on any clinician performing a diagnostic perioperative TOE. This book will certainly contribute not only to help preparation for the examinations, but also to raise the standard of our practice and patient care.

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