Subject Index

Absorption, ultrasound attenuation  4
Acetazolamide, vasomotor reactivity and
transcranial Doppler sonography studies  227
Acoustic boundary, ultrasound behavior  5–7
Adolescent stretch syncope  243
Anterior cerebral circulation, ultrasound
examination  70, 71
Artefacts, B-mode sonography
beam deviation  9
shadowing and flaring  9, 10
speed of sound  9
Artery dissection, see Internal carotid
artery dissection; Vertebral artery
dissection
Atherosclerosis
endothelial function, see Endothelial
function
epidemiology  18
ultrasound imaging, see also Carotid
plaque; Intima-media thickness
sensitivity and specificity  19, 20
techniques  19
Attenuation, ultrasound in various tissues
3–5
Basal vein, see Cerebral veins and sinuses
Basilar artery, anatomy  59, 60
Blood-brain barrier (BBB),
permeabilization with ultrasound
265–267
B-mode sonography
artefacts
beam deviation  9
shadowing and flaring  9, 10
speed of sound  9
carotid plaque  21, 22, 38
internal carotid artery dissection findings
71, 72
intima-media thickness  20, 21
pulse repetition frequency  7, 8
transducers  8, 9
vertebral artery dissection findings  80
Cardiac syncope, features  242, 243
Carotid artery dissection, see Internal
carotid artery dissection
Carotid artery stenosis, microembolic
signals  199, 200
Carotid body tumor (CBT), ultrasound
findings  92, 93
Carotid-cavernous fistulae (CCF)
anatomy  86
classification  87
ultrasound findings  89, 90
Carotid plaque
B-mode sonography  21, 22, 38
definition  37
digital subtraction angiography  38, 39, 41
scoring  21, 22
surface characteristics
intraluminal thrombus  49
irregularities and ulceration  48
unstable plaque identification 23, 24
Carotid sinus syndrome, syncope 242
Carotid stenosis
calcifications with shadowing 46
cross-sectional area reduction 45, 46
frequency 37
indirect signs 41
internal carotid artery stenosis findings 119, 120
internal/common carotid artery mean velocity ratio 44
internal/common carotid artery peak systolic velocity ratio 43, 44
middle-range stenosis overestimation 47, 48
nearly occluded internal carotid artery detection 48
occlusion analysis with ultrasound criteria 49, 51
pitfalls and limitations 51
reliability 51
peak systolic velocity and Doppler spectrum analysis 41–43
stroke epidemiology 36, 37
treatment endarterectomy 36, 229, 230
stenting 52, 230
transcranial Doppler sonography monitoring with interventions intraoperative middle cerebral artery flow measurements 230, 231
microembolic signals 197, 231–233
postoperative hyperperfusion syndrome 234, 235
postoperative monitoring 233, 234
ultrasound measurement reliability 46
Cavernous sinus, see Cerebral veins and sinuses
Central venous thrombosis (CVT), diagnostic criteria 187, 190
Cerebral aneurysm, transcranial color-coded duplex sonography findings 171, 172, 174, 175
Cerebral arteriovenous malformation, transcranial color-coded duplex sonography findings 175–177
Cerebral blood flow (CBF)
autoregulation and transcranial Doppler sonography studies
dynamic autoregulation
carotid compression 223
leg-cuff method 221–223
transfer function method 224
mechanisms 217, 218
quasi-steady-state autoregulation 220
steady-state autoregulation 218–220
cerebral perfusion pressure regulation 216, 217
functional transcranial Doppler sonography, see Functional transcranial Doppler sonography postoperative hyperperfusion syndrome monitoring after carotid artery surgery 234, 235
syncope and interruption 239, 240
vasomotor reactivity and transcranial Doppler sonography studies acetazolamide injection 227
breath-holding test 227
overview 225
VMR range approach 225, 226
VMR slope approach 226, 227
Cerebral perfusion imaging
acute stroke patient studies 130–135, 138
kinetic models bolus kinetics 129
diminution kinetics 129, 130
overview 128
physical background 127, 128
Cerebral veins and sinuses
anatomy
basal vein 183
cavernous sinus 182, 183
deep middle cerebral vein 183
great cerebral vein 183
sphenoparietal sinus 182, 183
straight sinus 183
superior sagittal sinus 182, 183
transverse sinus 182, 183
arterio-venous transit time measurement 191
intracranial pressure changes 190, 191
Cerebral veins and sinuses (continued)
transcranial color-coded duplex
sonography
examination technique 184, 186, 187
normal flow velocities 187–189
transcranial Doppler sonography
examination technique 183, 184
normal flow velocities 187–189
Cerebrovascular resistance (CVR),
calculation 15, 16
Cerebrovascular syncope, features 243
Circle of Willis
anatomy 60
cross-flow assessment 122–124
CLOTBUST, sonothrombolysis trials 152, 153, 158, 159
Cold pressor stress, endothelial function
testing 33, 34
Color Doppler
internal carotid artery dissection findings 71, 72
paraganglioma findings 92
vertebral artery dissection findings 80
Color flow imaging, principles 13, 14
Contrast agent, see Microbubble;
Transcranial Doppler sonography
Cough syncope, features 244
Deep middle cerebral vein, see Cerebral
veins and sinuses
Doppler effect, overview 1, 2, 10
Doppler ultrasound
color flow imaging 13, 14
Doppler frequency 10
duplex scanning 13
power Doppler imaging 14
pulsed-wave Doppler 11, 12
target velocity equation 10
transcranial color-coded duplex
sonography, see Transcranial color-coded duplex sonography
transcranial Doppler ultrasound,
see Transcranial Doppler sonography
vertebrobasilar system,
see Vertebrobasilar system
‘wall-thump’ filters 11

Duplex sonography
principles 13
vertebrobasilar system, see
Vertebrobasilar system
Dural arteriovenous fistulae (DAVF)
anatomy 86
classification 87
transcranial color-coded duplex
sonography findings 178–180
ultrasound findings 86, 88, 89
Endothelial function
carotid artery reactivity to isometric
handgrip exercise 34
cold pressor stress 33, 34
flow-mediated dilation assessment 30–33
gauge-strain plethysmography 33
invasive measurement with vasoactive
agents
intrabrachial infusion 29
intracoronary infusion 28, 29
nitroglycerin testing of endothelium-
independent vasodilation 33
risk factors in vasorelaxation dysfunction
28
vasodilators 27
Epilepsy, seizures and transcranial Doppler
studies 244–245
Flow-mediated dilation (FMD), assessment
30–33
Foramen magnum window, transcranial
insonation window 112, 113
Frequency
resolution relationship 2
transcranial Doppler ultrasound 14
ultrasound ranges 2
Frontal bony windows, transcranial
insonation window 113
Functional transcranial Doppler
sonography, see also Cerebral blood flow
comparison with other functional
imaging techniques 251, 252
data recording 253, 254
language function studies 258
neural activity measurement 254–256
neurovascular coupling 251

Subject Index 272
principles 252, 253
prospects 259
prototype examination setup and analysis 256–258

Gauge-strain plethysmography, endothelial function testing 33
Gene therapy, ultrasound mediation prospects 263–265
Giant cell arteritis, see Temporal arteritis
Glycoprotein IIb/IIIa receptor, molecular imaging 262, 263
Great cerebral vein, see Cerebral veins and sinuses

Hyperperfusion syndrome, see Postoperative hyperperfusion syndrome

Integrins, molecular imaging 262, 263
Internal carotid artery dissection
B-mode sonography findings 71, 72
color Doppler findings 71, 72
follow-up investigation 78, 79
pitfalls in ultrasound diagnosis 76–78
spectral Doppler findings 73, 74, 76
Intima-media thickness (IMT), B-mode sonography 20, 21
Intracranial pressure (ICP), ultrasound and change detection 190, 191

Large-vessel giant cell arteritis
clinical presentation 97
ultrasound findings 100, 101

Longitudinal wave, formation 2

Mechanical index (MI), ultrasound safety 17, 127, 128
Microbubble
enhancement of sonothrombolysis efficacy 159
gene therapy mediation prospects 263–265
molecular imaging prospects 262, 263

Microembolic signals (MES)
acute stroke patients 200
angioplasty monitoring 198
anticoagulation therapy monitoring 201
autoimmune disease patients 200
cardiac surgery monitoring 195–197
carotid artery stenosis patients 199, 200
carotid surgery monitoring 197, 231–233
catheterization and angiography monitoring 199
patent foramen ovale patients 199, 211, 212
potential cardioembolic source patients 198, 199
prosthetic heart valve patients 198
ultrasound diagnostic criteria 194, 195
Middle cerebral artery (MCA)
intraoperative flow measurements 230, 231
microembolic signal detection, see Microembolic signals
occlusion 120, 121
stenosis 119

Molecular imaging, ultrasound prospects 262, 263

Nitroglycerin, testing of endothelium-independent vasodilation 33

Occipital bony window, transcranial insonation window 113, 114
Orbital window, transcranial insonation window 105, 107, 108–110

Paraganglioma
features in head and neck 91, 92
ultrasound findings 92–94
Patent foramen ovale (PFO)
anatomy 207, 208
clinical manifestations 206, 207
contrast-enhanced transcranial Doppler ultrasound diagnosis
contrast agents 209, 210
examination technique 209–213
microembolic signals 199, 211, 212
sensitivity 212
Valsalva maneuver 211, 212
microembolic signals 199
pathophysiology 208, 209
right-to-left shunt detection 207
Peak systolic velocity (PSV), carotid stenosis 41–43
Perfusion imaging, see Cerebral perfusion imaging
Posterior cerebral artery
anatomy 60
circle of Willis cross-flow assessment 123, 124
stenosis 119
Posterior communicating artery
anatomy 60
circle of Willis cross-flow assessment 122–124
Postoperative hyperperfusion syndrome, transcranial Doppler sonography monitoring after carotid artery interventions 234, 235
Postural related syncope, features 240–242
Power Doppler imaging, principles 14
Psychogenic syncope, features 246, 248
Pulsed-wave Doppler, principles 11, 12
Pulse-echo scanning, see B-mode sonography
Pulse repetition frequency (PRF), B-mode sonography 7, 8
Reflection, ultrasound 5, 6
Safety, ultrasound 16, 17
Scattering
ultrasound attenuation 4
ultrasound behavior at acoustic boundaries 7
Sonothrombolysis, see also Transcranial color-coded duplex sonography
animal studies 141, 143–145
clinical trials
administration and monitoring 157, 158
CLOTBUST trials 152, 153, 158, 159
kHz frequencies 151, 152
microbubble enhancement of efficacy 159
endovascular application 146
historical perspective 162, 163
in vitro studies 141, 142
limitations 146, 147
prospects 147
rationale for use with tissue plasminogen activator 141, 151
skull attenuation 145, 146
Sound, speed in various tissues 2, 3
Speed, ultrasound in various tissues 2, 3
Sphenoparietal sinus, see Cerebral veins and sinuses
Straight sinus, see Cerebral veins and sinuses
Stroke, see Carotid stenosis; Cerebral perfusion imaging; Sonothrombolysis; Transcranial color-coded duplex sonography; Transcranial Doppler sonography
Subclavian artery
Doppler/duplex sonography 62
stenosis and occlusion findings 65, 67, 68
Superior sagittal sinus, see Cerebral veins and sinuses
Syncope
cardiac syncope 242, 243
causes 239
cerebral blood flow interruption 239, 240
cerebrovascular syncope 243
cough syncope 244
epileptic seizures and transcranial Doppler studies 244–245
features 239
postural related syncope 240–242
psychogenic syncope 246, 248
Takayasu arteritis
clinical presentation 97, 101, 102
ultrasound investigation and findings 101–103
Temporal arteritis
clinical presentation 96, 97
epidemiology 96
ultrasound
comparison with other imaging techniques 100
findings 97, 98
investigation sequence 99
machine adjustments 99
sensitivity and specificity 99, 100
sonographer training 99
technical requirements 99
treatment monitoring 98
Temporal bony window, transcranial insonation window 110–112
Thermal index, ultrasound safety 17
Thrombolytic therapy, see Sonothrombolysis
Tissue plasminogen activator, see Sonothrombolysis; Transcranial color-coded duplex sonography
Transcranial color-coded duplex sonography (TCCS)
cerebral aneurysm findings 171, 172, 174, 175
cerebral arteriovenous malformation findings 175–177
cerebral veins and sinuses
  central venous thrombosis diagnostic criteria 187, 190
  examination technique 184, 186, 187
  normal flow velocities 187–189
circle of Willis cross-flow assessment 122–124
dural arteriovenous fistulae findings 178–180
intracranial occlusion findings 120–122
intracranial stenosis findings 117–120
sonothrombolysis
  clinical studies 164
  monotherapy 167, 168
  overview 163
  prospects 168
  tissue plasminogen activator combination 165, 166
Transcranial Doppler sonography
cerebral blood flow autoregulation studies, see Cerebral blood flow
cerebral veins and sinuses
  central venous thrombosis diagnostic criteria 187, 190
  examination technique 183, 184
  normal flow velocities 187–189
cerebrovascular resistance calculation 15, 16
color-coded sonography 16
embolus detection 16
flow changes 15
frequency 14
functional transcranial Doppler sonography, see Functional transcranial Doppler sonography
intracranial occlusion diagnosis
  criteria 153, 154
  fast-track insonation protocol 156, 157
  grading system to measure residual flow 154–156
  secondary supportive findings 156
intracranial stenosis findings 117–120
microembolic signal detection, see Microembolic signals
patent foramen ovale diagnosis, see Patent foramen ovale
postoperative hyperperfusion syndrome monitoring after carotid artery surgery 234, 235
safety 17
syncope studies, see Syncope
velocity measurement 15
Transcranial insonation windows
  foramen magnum window 112, 113
  frontal bony windows 113
  occipital bony window 113, 114
  orbital window 105, 107, 108–110
  temporal bony window 110–112
Transducers, B-mode sonography 8, 9
Transverse sinus, see Cerebral veins and sinuses
Transverse wave, formation 2
Vasomotor reactivity, see Cerebral blood flow
Vasovagal syncope, features 241, 242
Vertebral artery
anatomy 59
  Doppler/duplex sonography
    V0 segment 60, 61
    V1 segment 61
    V2 segment 61
    V3 segment 61
    V4 segment 63, 65
  stenosis and occlusion findings 65, 67, 68, 119
Vertebral artery dissection
   B-mode sonography findings 80
   color Doppler findings 80
   examination technique 79, 80
   follow-up investigation 82
   pitfalls in ultrasound diagnosis 82
   spectral Doppler findings 80–82
Vertebrobasilar system (VBS)
   anatomy
      basilar artery 59, 60
      circle of Willis 60
      overview 58, 59
      posterior cerebral artery 60
   posterior communicating artery 60
   vertebral artery 59
   Doppler/duplex sonography
      subclavian artery 62
      vertebral artery
         V0 segment 60, 61
         V1 segment 61
         V2 segment 61
         V3 segment 61
         V4 segment 63, 65
   stenosis and occlusion findings 65, 67, 68
   ‘Wall-thump’ filters, Doppler ultrasound 11