

Contents

1 Physiological Basis	1
1.1 Cerebral Vasculature	1
1.2 Haemodynamics	4
1.3 Regulation of Flow	5
1.3.1 Control of Arteriolar Tone	8
1.3.2 Control of Capillary Flow	9
1.3.3 Control of Venous Tone	10
1.3.4 Neurogenic Control	10
1.4 Effects of Blood Gas Levels	11
1.5 Neural Control	13
1.6 Conclusions	15
References	16
2 Measurement Techniques	19
2.1 Development of CBF Measurements	19
2.2 Transcranial Doppler	23
2.3 Near Infra-red Spectroscopy	27
2.4 MRI	29
2.5 Arterial Blood Pressure	30
2.6 Autoregulation Tests	31
2.7 Conclusions	34
References	34
3 Mathematical Models	39
3.1 Compartmental Models	39
3.1.1 Equivalent Electrical Circuits	40
3.1.2 Whole Brain Models	41
3.2 Biochemical Feedback Models	45
3.3 Network Models	48
3.4 fMRI BOLD Response Models	51

3.5	Parameter Fitting and Sensitivity Analysis	52
3.6	Conclusions	53
	References	54
4	Analysis Techniques.	57
4.1	Time Domain Analysis.	57
4.1.1	Rate of Regulation (RoR) and Autoregulation Index (ARI)	58
4.1.2	Impulse Response and Step Response.	61
4.1.3	Correlation Coefficient (Mx)	63
4.2	Frequency Domain Analysis	64
4.2.1	Univariate Analysis	64
4.2.2	Multivariate Analysis	67
4.3	Non-stationary Analysis	67
4.4	Non-linear Analysis	69
4.5	Conclusions	71
	References	72
5	Clinical Conditions	75
5.1	Static Autoregulation	75
5.2	Ageing/Fitness/Exercise	77
5.3	Pregnancy.	79
5.4	Neonates	79
5.5	Altitude	81
5.6	Diabetes	82
5.7	Obstructive Sleep Apnoea Syndrome	84
5.8	Orthostatic Hypotension/Autonomic Failure	84
5.9	Stenosis	86
5.10	Dementia	89
5.11	Anaesthetic and Other Drugs.	90
5.12	Cardiac Arrest and Surgery.	91
5.13	Stroke	92
5.13.1	Ischaemic Stroke	93
5.13.2	Haemorrhagic Stroke	95
5.14	Brain Trauma and Injury	97
5.15	Miscellaneous Conditions	101
5.16	Conclusions	103
	References	104
6	Conclusions.	121
6.1	Cerebral Autoregulation Today	121
6.2	Cerebral Autoregulation Tomorrow	123
	References	125



<http://www.springer.com/978-3-319-31783-0>

Cerebral Autoregulation

Control of Blood Flow in the Brain

Payne, S.

2016, XV, 125 p. 24 illus., 6 illus. in color., Softcover

ISBN: 978-3-319-31783-0