Contents

Contributors *vii*
Foreword by Dr A Parameswaran *ix*
Preface to the Sixth Edition *xi*
Preface to the First Edition *xiii*

1. Introduction to Restorative Dentistry 1–9

Evolution of operative dentistry 1
Beginning of dental science 2
Dentistry in 20th century 4
Chronology of major events in operative dentistry 4
Aims and objectives 6
Indications 6
Future of operative dentistry 8

2. Nomenclature and Terminology 10–28

Systems having similar notation in each segment 10
System with different notation in each segment 11
FDI system 13
Terminology related to caries 14
Defects in tooth structure 16
Nomenclature related to tooth surfaces 18
Anatomical clinical crown 19
Nomenclature related to cavity preparation 19
Walls in a cavity preparation 20
Angles in a cavity preparation 23
Bevel 25
Classification of cavities 25
Dr GV Black classification 25
Modification of Black's classification 25
Dr GJ Mount classification 26
Dr Vimal Sikri classification 28

3. Dental Caries 29–60

Classification of caries 29
Etiology of dental caries 32
Worm theory 33
Humoral theory 33
Chemical theory 33
Parasite theory 33
Acidogenic theory 33
Proteolytic theory 33
Proteolysis chelation theory 34
Bioelectric phenomena 34
Levine's theory 34
Bandlish's theory 37
Systemic theory 38
Caries balance concept 39
Genetic theory 39
Autoimmune theory 40
Contributory factors in dental caries 40
Histopathology of dental caries 47
Caries of enamel 49
Caries of dentin 52
Root caries 54
Arrested caries 55
Secondary caries 56

4. Functional Occlusion 61–80

Terminology 62
Centric relation 64
Centric occlusion and maximal intercuspal position 65
Occlusal designs 66
Occlusion and restorative dentistry 67
Interocclusal records 70
Principles of EDEC 71
Restoring individual tooth 72
Role of contact areas 75
Role of contours 76
Role of marginal ridges 76
Recording occlusal relations for indirect restorations 76
Transferable records 77
Non-transferable records 78
Checking casting for occlusion 78

5. Contacts, Contours and Periodontium 81–93

Dentogingival unit 81
Preservation of periodontium 82
Contour 82
Height of epithelial attachment 83
Proximal contact areas 83
Embrasures 85
Occlusal surface 85
Margins 86
Surface finish and texture 86
Trauma from occlusion 86
Occlusal equilibration 90
Sequence of occlusal adjustments 92

6. Case Selection: Treatment Planning 94–106

Case selection (history) 94
Formulating treatment plan 94
Clinical examination 96
Caries risk assessment 99
Caries activity tests 101
Systemic diseases influencing treatment planning 104
Maintenance phase 106

7. Diagnosis and Diagnostic Aids 107–136

Caries diagnosis 107
Diagnostic tools 108
Visual examination 108
Tactile examination 108
Radiographic methods 115
Electrical resistance 121
Optical detection methods 123
Endoscopic/videoscopic methods 132
Dye penetration method 132
Miscellaneous 132

8. Instruments, Instrumentation and Operating Position 137–162

Hand cutting instruments 137
Metallurgy 137
Classification 137
Designing characters 138
Instrument nomenclature 139
Instrument formula 139
Cutting planes (instrument beveling) 139
Non-cutting instruments 144
Instrument grasps 146
Sharpening of hand instruments 148
Rotary-driven instruments 149
Dental handpieces 149
Dental burs 151
Abrasive instruments 156
Mechanism of cutting 158
Patient and operator positions 159

9. Sterilization and Infection Control 163–182

Terminology 163
Categorization of instruments 163
Presterilization 163
Methods of sterilization 165
Physical method 165
Chemical method 169
Radiation method 173
Causes of sterilization failures 174
Control of sterilization 175
Sterilization of headpieces 175
Sterilization of burs 176
Infection control 176
Methods for infection control 177

10. Matrices, Retainers and Wedges 183–195

Tooth separation 183
Matrices 184
Matrices for Class II, MOD and complex restorations 185
Matrices for Class III restorations 188
Matrices for Class IV restorations 188
Matrices for Class V restorations 189
Matrix retainers 190
Wedges 191
Wedging system 193

11. Isolation of the Operating Field 196–213

Isolation from moisture (direct methods) 196
Rubber dam 196
Cotton rolls and cotton roll holders 204
Gauge pieces 205
Absorbent pads 205
Evacuation systems 205
Gingival retraction cord 206
Indirect methods 208
Isolation from the soft tissue 208
Management of cheeks, lips and tongue 208
Management of gingival tissues 208

12. Principles of Cavity Preparation 214–234

Outline form 214
Modification of outline form 216
Enameloplasty 217
Resistance and retention forms 218
Convenience form 223
Removal of remaining carious dentin 224
Pulp protection 224
Finishing the enamel walls and margins 225
Toilet of the cavity 225
Present concept of principles 226
Conservative cavity preparation 228
Forces exerted during functional occlusion 229
Marginal ridge and occlusal forces 231
Stresses distribution in individual restorations 233

13. Interim Restorations 235–244

Interim restorative materials (rationale) 235
For intracoronal preparation 236

Guuta-percha 236
Dental cements 236
For extracoronal preparation 241
Prefabricated crowns 241
Indirect acrylic restorations 243

14. Silver Amalgam 245–266

Composition of silver alloy 245
Effect of constituent metals 246
Alloy mercury reaction 246
Cavity preparation 247
Manipulation of silver amalgam 256
Failures of dental amalgam 259
Gallium alloys 261
Modified silver restorations 262
Bonded amalgam restorations 262
Fluoridated amalgam 263
Amalgam restorations and oral environment 263
Mercury and its management 264

15. Direct Filling Gold 267–280

Properties of pure gold 267
Types of direct filling gold 267
Annealing/degassing 270
Condensation/compaction 270
Biologic effects of pure gold restoration 273
Indications 274
Contraindications 274
Cavity preparation and restoration 275

16. Cast Metal Restorations 281–306

Noble vs base metals 281
Indications 282
Contraindications 283
Advantages and disadvantages 283
Cavity design for cast restorations 283
Types of margins in cast restoration 286
Bevels 287
Flares in cast restorations 288
Cusp capping/onlay 289
Tucker's technique 289
Fabrication of cast restorations 290
Casting the pattern 298
Procedure of casting 299
Thermal expansion casting technique 299
Hygroscopic expansion technique 300
Finishing and polishing 300
Casting defects 303

17. Complex Restorations 307–317

Extra retentive devices 307
Pin-retained restorations 309
Indications 309
Advantage/disadvantage 309
Classification 309
Principles of pin placement 311
Pinhole preparation 313
Pin, stresses and tooth 313
Factors affecting retention of pins 314
Complication during pin placement 315
Effects of pins on pulp 316
Amalgapins 316

18. Dentin Hybridization: Bonding Agents 318–349

Common terms: Definitions 318
Factors affecting Adhesion 319
Tooth as a substrate for bonding 320
Bonding to enamel 320
Bonding to dentin 323
Dentin bonding agents 326
Classification (evolution) of dentin bonding agents 328
Alternative classification (evolution) of bonding agents 333
Categorization of adhesives based on their action on smear layer 335
Resin–dentin bond: Degradation and management 337
Bonding in other clinical situations 339
Additives for bonding agents 342
Role of water in the bonding process 343
Water treeing phenomenon 343
Nanoleakage and water treeing 345
Success/failure of adhesives 345

19. Composite Restorations 350–386

Composition 350
Evolution of composites 352
Properties of composites 352
Advances in composites 352
Curing of composites 356
Light-curing units 357
Cavity preparation 360
General consideration 360
Placement of composites 364
Establishing proximal contacts 369
Failures in composite restorations 369
Composite laminates and veneers 372
Componeers 373
Composite inlays 376
Classification of composite inlay 376

Evolutionof composite inlay material 377
Cavity preparation 377
Repair of composite restorations 382

20. Glass-Ionomer Cement 387–405

Composition 387
Classification 388
Uses of glass-ionomer cement 388
Setting reaction 389
Physical and mechanical properties 390
Modified glass-ionomer cements 392
Metal modified glass-ionomers 392
Resin modified glass-ionomer cements 393
Compomer 393
Giomers 394
Antibacterial glass-ionomer 394
Glass carbomer 395
Zirconomer 396
Low pH smart materials 396
Placement of glass-ionomer cement 396
Clinical applications 400
Failure of glass-ionomer restoration 403

21. Ceramic Restorations 406–434

Terminology: Definitions 406
Composition 407
Classification 409
Properties of porcelain 409
Strengthening of ceramic 410
Condensation of porcelain 411
Firing procedure 412
All ceramic systems 413
Ceramic restorations 418
Ceramic inlays/onlays 418
Cavity preparation 418
Fabrication of a porcelain inlay 421
Cavity considerations for CAD-CAM inlays 426
Ceramic laminates/veneers 428
Repair of ceramic restorations 430

22. Microleakage 435–450

Clinical implication of microleakage 435
Restorative material and microleakage 436
Role of smear layer 437
Factors controlling bacterial penetration at tooth–restoration gap 438
Microleakage and restorative materials 438
Microleakage around amalgam restorations 438
Microleakage around glass-ionomer restorations 439
Microleakage around composite restorations 440
Microleakage around direct gold restorations 443
Microleakage around cast restorations 443
Microleakage around porcelain restorations 444
Methods to detect microleakage 444
Nanoleakage 448

23. Finishing and Polishing 451–468

Definitions 451
Objectives of finishing and polishing 452
Finishing and polishing instruments 452
Abrasive materials 453
Adjunct finishing modalities 454
Microabrasion 454
Burnishing 454
Finishing and polishing of individual restorations 455
Amalgam restorations 455
Composite restorations 456
Glass-ionomer restorations 458
Direct gold restorations 461
Cast gold restorations 461
Non-precious alloy restorations 462
Porcelain restorations 463
Concept of finishing polish 465
Hazards of finishing and polishing 465

24. Color Perception 469–483

Source of light 469
Optical characteristics 469
Color 471
Structure and function of eye 472
Perception of color 472
Additional features in color perception 473
Metamerism 473
Fluorescence 473
Opalsescence 473
Basic color schemes 474
Color harmonies 474
Additive color theories 474
Subtractive color theories 474
Color systems 474
Munsell color system 475
CIE system 476
CIE (modified) L*a*b* color space 476
CIE (modified) L*C*h° color difference 477
Optics of natural teeth 477
Dental shade guides 478

Shade-taking devices 479
Guidelines for clinical shade selection 479
Procedure for shade matching in porcelain restorations 481

25. Esthetics and Smile Designing 484–496

Principles of esthetics 484
Esthetic smile designing 486
Facial analysis 486
Lip analysis 487
Incisal display 487
Gingival tissue analysis 488
Treatment planning 490
Cosmetic contouring 491
Diastema closure 492
Adhesive restoration 493
Lasers 495
Ethics in esthetic dentistry 495

26. Tooth Substance Loss 497–519

Attrition 497
Biocorrosion 499
Bruxism 499
Cervical lesion 499
Carious cervical lesions 500
Non-carious cervical lesions 500
Abrasion 501
Erosion 502
Abfraction 507
Biomechanics of a Class V cavity 510
Measuring tooth substance loss 511
Treatment of tooth substance loss 512
Treatment of carious cervical lesions 512
Treatment of non-carious cervical lesions 512
Treatment of attrition 515
Dahl concept 517

27. Geriatric Restorations 520–533

Age changes in dental tissues 520
Mechanism of aging 521
Aging and dental tissues 521
Age changes in enamel 521
Age changes in dentin 521
Age changes in pulp 522
Age changes in cementum 523
Age changes in bone 523
Age changes in periodontium 524
Age changes in salivary glands 524
Clinical implications 524
Treatment planning for elderly 525
Management of common oral diseases in elderly 529
Considerations for prescribing medications to the elderly 532

28. Minimal Intervention Dentistry 534–552

Core principles 534
Components of minimal invasive approach 535
Early diagnosis of caries 535
Caries risk assessment 535
Strategies to arrest existing carious lesions 536
Remineralization of existing lesions 537
Restoring cavitated lesions 539
Caries inhibition by resin infiltration 549
Repair rather than replacement of defective restorations 550

29. Dentin Hypersensitivity 553–564

Incidence and prevalence 553
Etiopathogenesis 553
Factors affecting hypersensitivity 555
Measuring tooth hypersensitivity 555
Diagnosis 556
Management of hypersensitivity 557
Treatment modalities 557
Newer materials 560
Prevention 561

30. Management of Deep Carious Lesions 565–575

Arrested caries 565
Repair of pulp–dentin complex 566
Treatment modalities of deep caries lesions 567
Indirect pulp capping 567
Direct pulp capping 568
Pulp curettage 573
Partial pulpotomy 573
Pulpotomy 574

31. Pulpal Reactions 576–588

Terminology 576
Pulp–dentin organ 576
Pulpal response to restorative materials 578
Intensity of pulpal response 578
Stages of pulpal inflammation 579
Evaluation of biocompatibility 581
Pulpal reaction to commonly used restorative materials 581
Pulpal reaction to tooth preparation 584

Pulpal reaction to caries 585
Pulpal reaction to trauma 586
Orthodontic movement and pulpal reaction 586
Pulpal reaction to vital bleaching 588

32. Tooth Discoloration and Bleaching 589–608

Tooth discoloration and staining 589
Bleaching of teeth 590
Bleaching agents 591
Bleaching modalities 592
Vital tooth bleaching 593
Non-vital bleaching 598
Laser-assisted tooth whitening 600
Bleaching with non-thermal atmospheric plasma 603
Over the counter products 603
Advanced techniques 604
Adverse effects of bleaching 604

33. Laser in Restorative Dentistry 609–622

Principle of laser 609
Laser device 609
Laser delivery system 610
Laser emission modes 610
Mechanism of action 611
Laser–tissue interaction 611
Classification 611
Conventional categorization of lasers 612
Routinely used lasers 613
CO_2 laser 613
Argon laser 613
Nd:YAG laser 614
Er:YAG laser 614
Excimer laser 614
Uses of lasers in operative (conservative) dentistry 615
Laser hazards 619
Laser safety 620

34. Magnification in Restorative Dentistry 623–633

Magnifying tools 623
Ergonomics 625
Components of microscope 626
Use of operating microscope in restorative dentistry 630
Advancements in magnification 632

35. Digitalization in Restorative Dentistry 634–648

Digital dental photography 634
Intraoral imaging 634
Principles of digital photography 636
How to choose a camera 637
Essence of photography 639
Types of reflectors 640
Intraoral photography 641
Extraoral photography 642
Digital scanners 643

Appendix 649
Index 651