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PRECLINICAL MANUAL OF CONSERVATIVE DENTISTRY

V Gopikrishna

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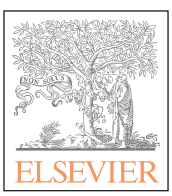

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PREFACE

It has been a labour of love, inspiration, hard work and perseverance in publishing this Preclinical Manual of Conservative Dentistry.

Conservative Dentistry forms the backbone and foundation of clinical dentistry. This subject is introduced to the students of dentistry in the first year of the curriculum. In the second year of the course, the students are required to identify instruments and equipment, understand and manipulate the various dental materials, and perform certain preclinical plaster and typhodont teeth exercises. They appear for a preclinical examination at the end of the second year before entering into the clinical work on patients in the third year.

In my own experience as an undergraduate student, I found it very difficult to comprehend this subject for two specific reasons: primarily, the student is expected to learn this from textbooks which are meant for the final year BDS student and secondly, all the available textbooks are theoretically oriented without any practical guidance. The inspiration to create this manual came from my admiration for the textbook *Fundamentals of Fixed Prosthodontics* (2nd edn) by Herbert T Shillingburg. As a postgraduate student, I was amazed at the clarity of images and illustrations which made learning complex clinical exercises simpler and learner friendly. I have employed a similar template for creating a step wise chairside manual from which a student can learn and refer to while performing the preclinical exercises.

This book consists of altogether 9 chapters.

Chapter 1: *Synopsis of Conservative Dentistry* discusses structure of teeth and supporting tissues, nomenclature and tooth numbering systems, dental caries, noncarious loss of tooth structure, types of restorations and introduction to endodontics.

Chapter 2: *Instruments and Equipment* includes clear description with illustration of every instrument and equipment a student is expected to know, identify and use before entering the clinical section.

Chapter 3: *Materials and Their Manipulation* provides details regarding the composition, properties, uses and manipulation of the various dental materials employed in the field of conservative dentistry.

Chapter 4: *Know Your Operating Field* includes clear description with images of the phantom head and typhodont teeth used in the preclinical laboratory along with a beginner's pictorial guide in using the airotor and micromotor rotary instruments.

Chapter 5: *Fundamentals of Cavity Preparation* discusses the various features, rules and fundamentals of cavity preparation for different restorations.

Chapter 6: *Preclinical Plaster Model Exercises* provides step-by-step pictorial representation along with explanation of all laboratory plaster model exercises a student has to perform.

Chapter 7: *Preclinical Typhodont Exercises* provides step-by-step pictorial representation along with explanation of all typhodont model exercises a student has to perform.

Chapter 8: *Common Viva Questions and Spotters* provides more than 200 commonly asked questions to help students prepare for their viva-voce examination along with the frequently asked spotters.

Chapter 9: *Glossary of Terms* contains a comprehensive list of commonly asked terms in conservative dentistry and endodontics.

This manual contains more than 1000 pictures, illustrations and original images taken under the dental operating microscope. Every attempt has been made to make this manual as simplified and student friendly as possible.

V Gopikrishna

ACKNOWLEDGEMENTS

"*Thank you*" are two little words which would probably never completely convey the sense of gratitude and regards which I feel for each of the following wonderful people who have made this *Preclinical Manual of Conservative Dentistry*, a reality.

My sincere gratitude to my friend, colleague and chief contributor, Dr G Vijayalakshmi whose contributions are invaluable. She is a teacher par excellence and her inputs both in the conception and execution of the preclinical exercises were priceless. I also thank Dr M Abarajithan for his valuable contribution.

I would like to compliment the wonderful team at Reed Elsevier for showing enormous faith and patience with me and for their sheer professionalism in giving life to this manual. Thank you Ritu Sharma, Nimisha Goswami and Anand K Jha.

My sincere thanks to each one of the following people at the places of my work for helping me in various ways during the genesis of this edition. Your support and help was indispensable and I could not have completed this task without each one of you.

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They say that *"The mediocre teacher tells, The good teacher explains, The superior teacher demonstrates while The great teacher inspires"*.

I have been fortunate to have had a string of wonderful teachers who have influenced my intellect and inspired me. I would like to acknowledge each and every teacher who taught, molded and inspired me in my journey as a student at…

- Baba Montessori School, Hyderabad
- Kendriya Vidyalaya, RK Puram, Sector IV, New Delhi
- Chinmaya Vidyalaya, Tirunelveli
- Rajah Muthiah Dental College, Chidambaram
- Meenakshi Ammal Dental College, Chennai

Last but not the least, my indebtedness to my family for their love, support and encouragement in all my endeavours…

V Gopikrishna

CONTENTS

SYNOPSIS OF CONSERVATIVE DENTISTRY

V Gopikrishna

1 CHAPTER

"I keep six honest servingmen (they taught me all I knew);
their names are What and Why and When and How and Where and Who..."
— Rudyard Kipling

Operative dentistry is the art and science of the diagnosis, treatment, and prognosis of defects of teeth that do not require full coverage restorations for correction. It involves the restoration of proper tooth form, function, and aesthetics while maintaining the physiologic integrity of the teeth in harmonious relationship with the adjacent hard and soft tissues. It is also referred as Restorative Dentistry or Conservative Dentistry.

Patients seek dental treatment for symptoms such as pain, sensitivity, trauma, decay, bleeding gums, discolouration of teeth and for aesthetic corrections. The management of most of these problems are under the purview of this branch of dentistry. Hence, restorative/conservative dentistry forms the core of any dental practice.

Restorative dentistry/conservative dentistry deals with:

- Prevention of dental diseases
- Interception of degenerative processes
- Preservation of the oral tissues
- Restoration of lost tooth structure
- Aesthetic correction of discoloured or malaligned teeth

INDICATIONS FOR CONSERVATIVE DENTISTRY

- Dental caries causing loss of tooth structure
- Noncarious loss of tooth structure
  - Attrition
  - Abrasion
  - Erosion
  - Abfraction
  - Developmental defects
- Traumatic injuries causing loss of tooth structure/s

- Aesthetic management/improvement of the colour and shape of teeth
- Repair or replacement of existing restorations.

STRUCTURE OF TEETH AND SUPPORTING TISSUES

A tooth has a crown portion seen clinically in the oral cavity and a root portion embedded in a bony socket surrounded by the periodontium (Fig 1.1).

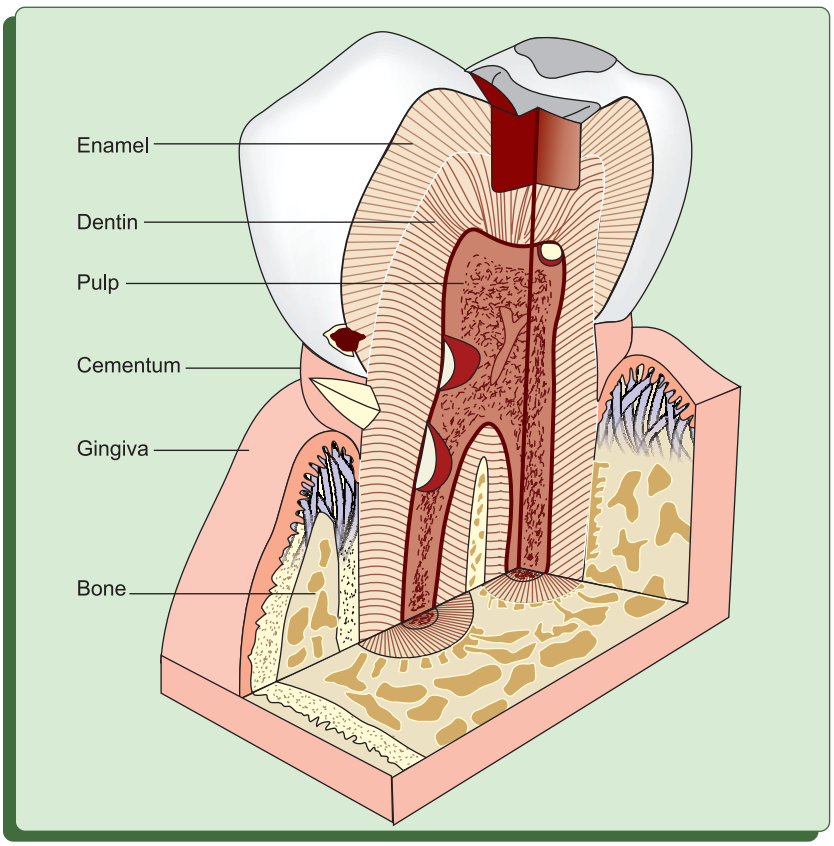


Fig 1.1 Component tissue and supporting structures of the tooth

ENAMEL

- The hardest substance of human body.
- It is a highly mineralized structure containing 95% to 98% inorganic matter predominantly hydroxyapatite (Fig 1.2).

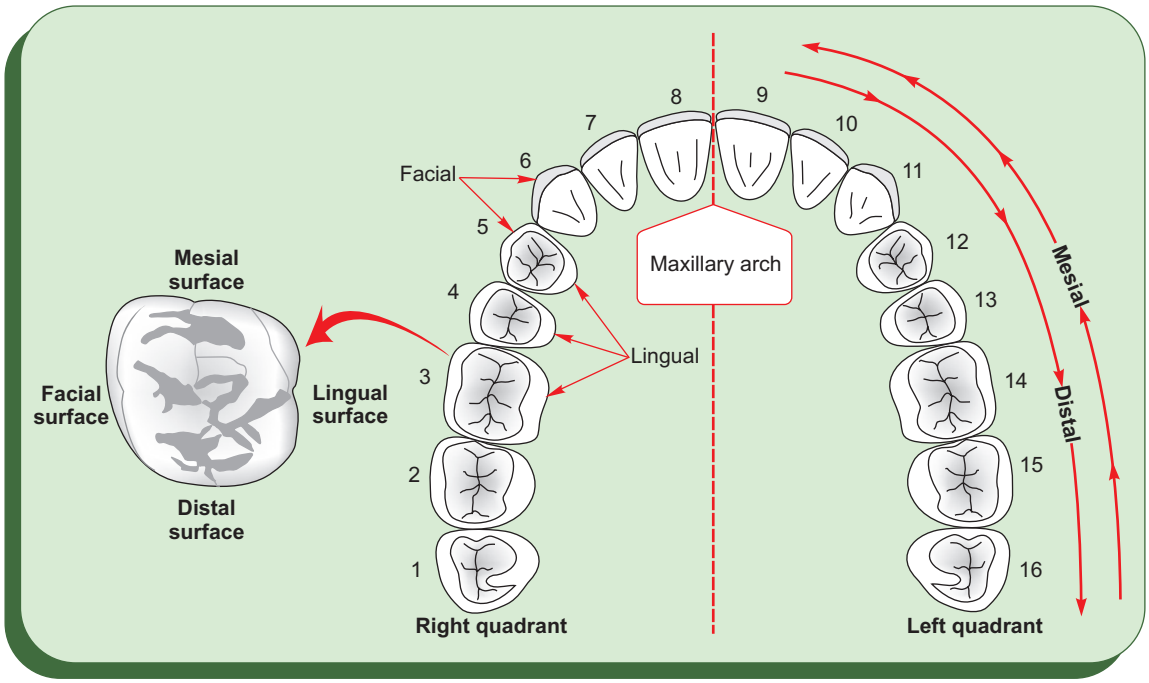


Fig 1.20 Nomenclature of the maxillary arch

Tooth Numbering System (Fig 1.20)

I. Zsigmondy—Palmer system (Fig 1.21)

- Permanent teeth are denoted by numbers 1–8 with central incisor indicated as 1 and progresses on to the third molar which is designated as 8.
- Also called as angular or grid system.
- Deciduous teeth are denoted by upper case English alphabets A to E with A representing central incisor and E representing second molar.
- Simple to use but not universal in application.
- Each tooth is not denoted by a specific number.
- No differentiation between the same tooth present in the right and left side of the same arch. For example the nomenclature is the same for both left and right maxillary teeth and so is the case for left and right mandibular teeth.

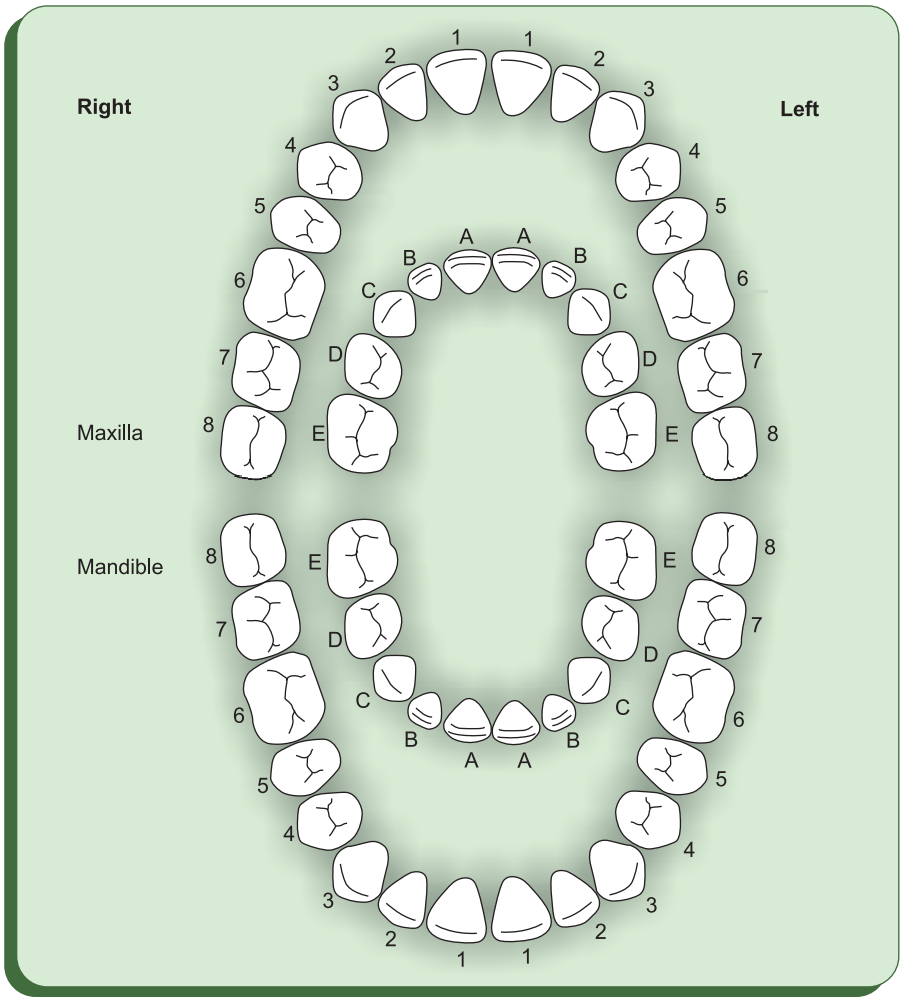


Fig 1.21 Zsigmondy–Palmer tooth numbering system

II. American Dental Association (ADA) system (Fig 1.22)

- It is also known as Universal system.
- Numbering begins from maxillary right posterior most tooth which is designated as 1 and proceeds to maxillary left posterior most tooth which is designated as 16, then to mandibular left posterior tooth which is designated as 17 and then proceeds to the mandibular right posterior most tooth which is designated as 32.
- Permanent teeth denoted by number 1–32.
- Deciduous teeth denoted by alphabets A–T.

INSTRUMENTS AND EQUIPMENT

V Gopikrishna, G Vijayalakshmi

2 CHAPTER

"A man who works with his hands is a... Labourer
A man who works with his hands and his brain is a... Craftsman
But a man who works with his hands and his brain and his heart is an Artist."
—McGhee

The shaping, removal and restoration of tooth structure are the three essential aspects of restorative dentistry. Instruments are small hand held devices which are used for various procedures while treating a patient, e.g. mouth mirrors, probes, tweezers, condensers. Equipment are larger devices which aid the clinician while treating a patient, e.g. dental chair, operating stool, x-ray unit, amalgamator.

MATERIALS USED FOR MANUFACTURING INSTRUMENTS

1. Carbon steel: They contain 0.5–1.5 % carbon in iron. They are harder and sharper than stainless steel but tend to corrode and are prone for fracture.
2. Stainless Steel
   a. Pure stainless steel: It is an alloy comprising of 70–85% Iron, 15–25 % of chromium and 1–2 % of carbon. They are the most commonly used material for the manufacture of dental instruments. Their main disadvantage is their tendency to lose their sharpness due to repeated usage.
   b. Stainless steel with teflon/titanium nitride coating: These are instruments which are specifically used for the placement and handling of dental composites. The advantage is that the composite does not stick to this coating and make the placement of composites simplified.
3. Carbide inserts: Some instruments are made with carbide inserts to provide more durable cutting edges.
4. Others: Other alloys of nickel, cobalt or chromium are used in the manufacture of hand instruments.

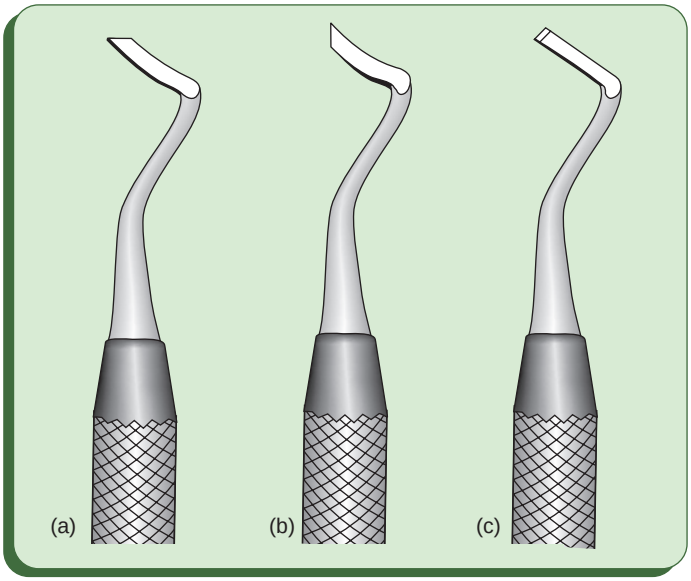


Fig 2.33 (a) Left cutting mesial gingival margin trimmer; (b) Left cutting distal gingival margin trimmer; (c) Right cutting bin-angle hatchet

- It is available as double ended (right and left) mesial or distal pair (Fig 2.34).

Fig 2.34 (a) Distal GMT; (b) Mesial GMT; (c) View of both the GMTs

Clinical Note:

1. Of the cutting edge tips, if the tip that is closer to the shaft forms an acute angle, it is the mesial GMT and if it forms an obtuse angle, it is identified as a distal GMT.
2. If the second number of the instrument formula is 75–85 then, it is a mesial GMT.
3. If the second number of the instrument formula is 90–100 then, it is a distal GMT.
4. The mesial 75–distal 100 pair of GMTs are used for inlay–onlay cavity preparations.
5. The mesial 85–distal 90 pair of GMTs are used for amalgam cavity preparations.

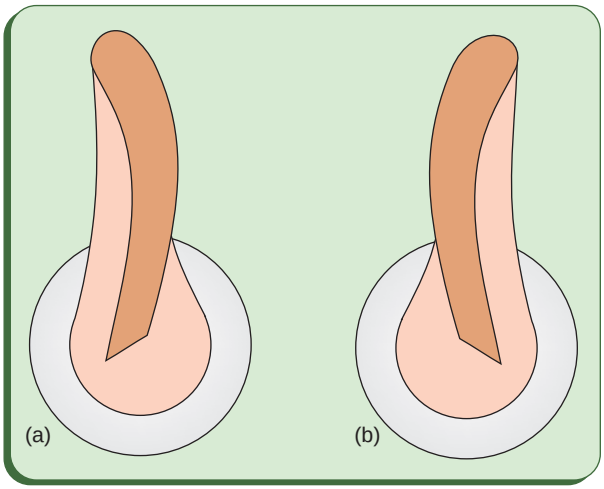


Fig 2.35 End view of gingival margin trimmers, paired (a) Right cutting; (b) Left cutting. A double ended GMT has both left cutting and right cutting ends. A complete set of GMT comprises of two double ended GMTs: one double ended mesial GMT and one double ended distal GMT

- The GMTs are designed to produce
  - Proper bevel on gingival enamel margins of proximoocclusal preparations.
  - Roundening or bevelling of the axiopulpal line angle.
- They are used in a lateral scrapping motion.

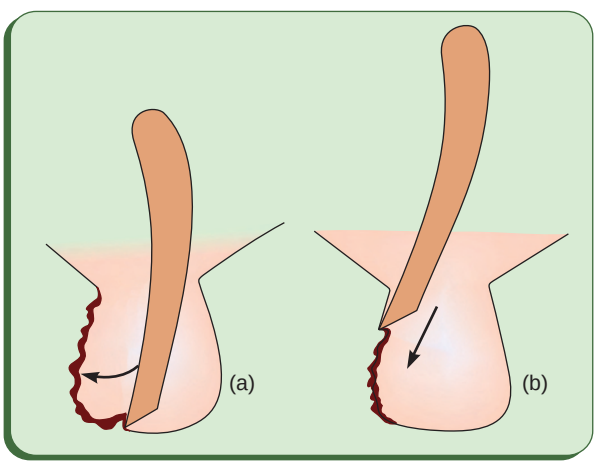


Fig 2.36 (a) Gingival marginal trimmer being used in a proximal box of a class II preparation with a horizontal (right or left) stroke to plane a gingival wall and margin; (b) Gingival marginal trimmer being used with a vertical, or chopping stroke to plane a facial or lingual wall and margin (A hatchet can also be used in a similar fashion)

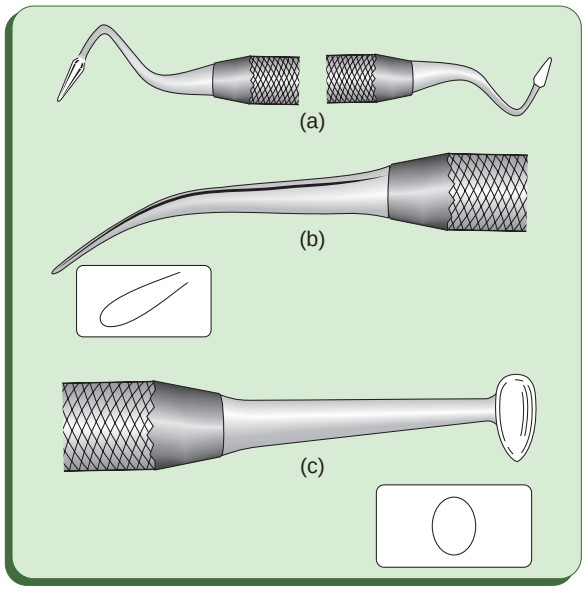


Fig 2.51 Burnishers: (a) PKT3 burnisher (Rounded cone shaped); (b) Beaver tail (no 2) burnisher; (c) Football or ovoid burnisher

- The pad of the middle finger is near the top side of the instrument for good control and cutting pressure.
- A balanced instrument design allows the application of suitable force without the instrument tending to rotate in the fingers.

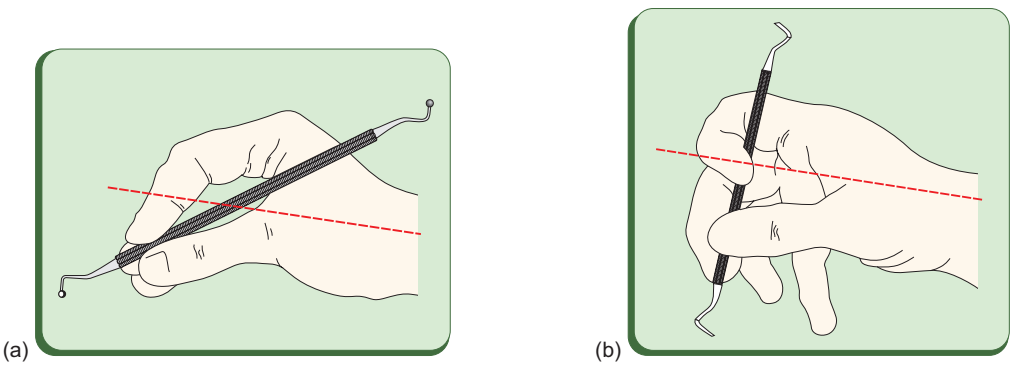


Fig 2.52 Basic difference between (a) Pen grasp and modified pen grasp; (b) Note the difference in angle formed by the shaft of the instrument and the long axis of the forearm. The typical pen grasp involves the wrist the modified pen grasp involves the forearm

2. Inverted pen grasp

- This is similar to the modified pen grasp except that the hand is rotated so that the palm faces more towards the operator (Fig 2.53).

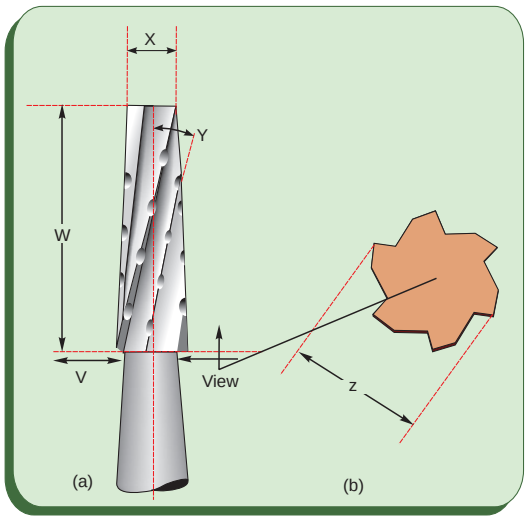


Fig 2.69 Design features of bur heads (illustrated using No. 701 bur). (a) Lateral view: neck diameter (v), head length (w), taper angle (x), and spiral angle (y); (b) End view: head diameter (z)

Bur blade design (Fig 2.70)

- The actual cutting action of a bur (or a diamond) takes place in a very small region at the edge of the blade.
- Each blade has two sides
  a. Rake face (towards the direction of cutting)
  b. Clearance face (away from the direction of cutting)
- Each blade has three important angles (Fig 2.71):
  a. Rake angle: The rake angle is the angle between the rake face and the radial line.

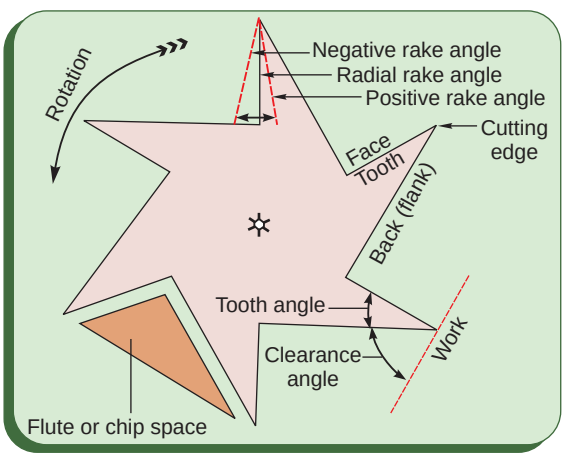


Fig 2.70 Bur blade design. Schematic cross-section viewed from shank end of head to show rake angle, edge angle, and clearance angle

MATERIALS AND THEIR MANIPULATION

V Gopikrishna, G Vijayalakshmi

3
CHAPTER

"Education is what remains after one has forgotten what one has learned in school."
— Albert Einstein

PROPERTIES OF AN IDEAL DENTAL RESTORATIVE MATERIAL

According to Anusavice, an ideal dental restorative material should have the following properties:

i. Biocompatible
ii. Bond permanently to tooth structure
iii. Match the natural appearance of tooth structure
iv. Exhibit properties similar to those of the enamel and dentin
v. Capable to initiating tissue repair or regeneration of missing or damaged tissues

However, there is not a single restorative material which would fulfil all of the above requirements. Hence, a student/clinician should be able to assess the given clinical condition and choose the right restorative material for the given clinical situation.

Technological advancements and improvements in the field of research in basic sciences have lead to the development of several new materials. Knowledge and understanding of composition, properties, behaviour, limitations of these materials are necessary for the proper selection of an appropriate material.

RATIONALE FOR STUDYING DENTAL MATERIALS

1. To understand the properties and behaviour of materials.
2. To be able to handle and manipulate the materials properly.
3. To be able to assess and use the appropriate material for the given clinical condition.
4. To be able to educate patients.

Properties of Materials

1. *Physical properties:* These involve reversible interactions of a material with the environment. This includes:

Acid Etching of Enamel/Dentin

It was conceived by Michael Buonocore in the 1950's.

This is one of the most effective ways of improving the bond and marginal seal between resins and the enamel/dentin.

It involves the application of 37% phosphoric acid (preferably in gel form) for 15 seconds over the tooth structure to be restored followed by rinsing with water for 10–15 seconds (Figs 3.54 and 3.55). It is supplied in a coloured gel form preloaded in a syringe (Fig 3.56).

It results in a frosty white appearance due to the removal of enamel prism cores and peripheries creating microporosity (Figs 3.57 to 3.59).

Fig 3.54 Unetched enamel

Fig 3.55 Application of the 37% phosphoric acid etchant for 10–15 seconds

Fig 3.56 Phosphoric acid gel (Courtesy: Ivoclar Vivadent)

Fig 3.57 Frosty white appearance of the etched enamel

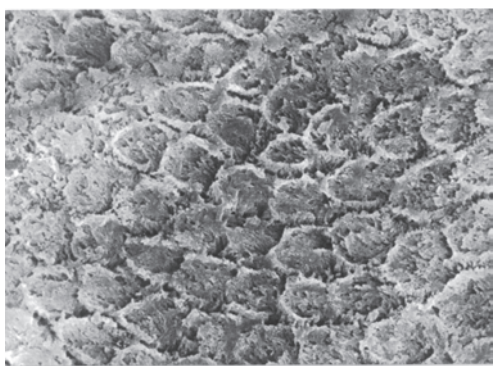


Fig 3.58 SEM image of etched enamel showing areas with preferential removal of prism core material and the prism peripheries relatively intact (SEMX2000)

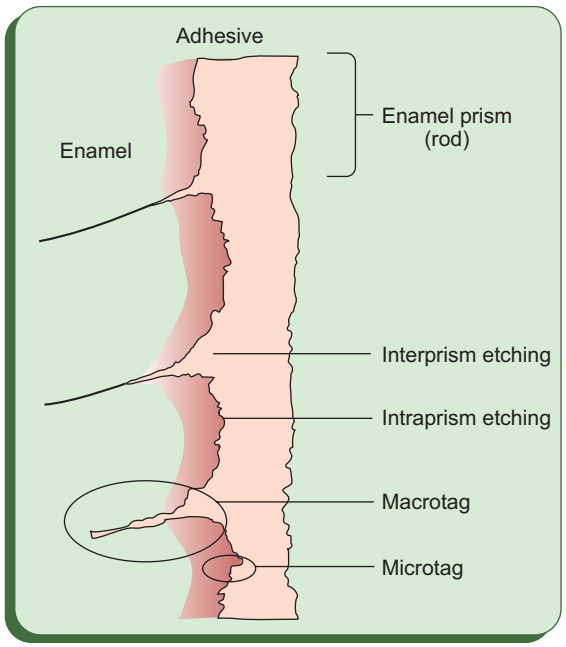


Fig 3.60 Cross-sectional views of micromechanical retention of enamel bonding systems

Mechanism

(i) They are adhesion promoting agents and contain hydrophilic monomers dissolved in solvents such as acetone, ethanol and/or water.

↓

(ii) The solvents displace water from the moist dentin surface thereby promoting the infiltration of the resin monomers into the etched and demineralised substrate.

↓

(iii) This zone of resin infiltrated demineralised dentin is commonly referred to as hybrid layer.

↓

(iv) Primers also contain hydrophobic monomers that would copolymerize with the adhesive resin.

B. Adhesive resin

The adhesive resin, also called as the bonding agent, is similar to the enamel bonding agents and consists of:

a. Primarily of hydrophobic resin monomers such as BIS-GMA and UDMA.
b. TEG-DMA as a viscosity regulator.
c. Hydrophilic monomers like HEMA.

Mechanism

(i) The hydrophilic resins present in the primers infiltrate the surface layer of collagen fibres in the demineralised dentin to form a hybrid layer consisting of resin-infiltrated dentin (Fig 3.61).

↓

(ii) The primary function of the adhesive resin is to coplymerize with the resins present in the primers thereby stabilizing the hybrid layer.

↓

(iii) They also form resin extensions into the dentinal tubules called as *resin tags* (Fig 3.62).

↓

(iv) These resins are then polymerized by light curing and/or auto curing mechanism.

↓

(v) The surface layer of the adhesive resin is now suitable to be copolymerized with the composite restorative resin.

Classification of Dental Adhesives

I. According to the chronology of development
II. According to the bonding mechanism

I. According to the Chronology of Development

First generation adhesives

It was based upon NPG-GMA and was bonded to enamel and dentin by chelation with calcium on the tooth surface.

Second generation adhesives

These were based on phosphorous esters of methacrylate derivatives and bonding was due to the ionic interaction between negatively charged phosphate groups and positively charged calcium.

Third generation adhesives

The basis of this generation was to modify the smear layer created on the tooth surface with the help of agents like EDTA or maleic acid followed by the application of the resin.

Fourth generation adhesives

They form part of the *etch and rinse* group of adhesives.

The basis of this generation of adhesives was the *Total etch concept* wherein a specific conditioning/etching of both enamel and dentin was advocated before the application of the primer and adhesive agent.

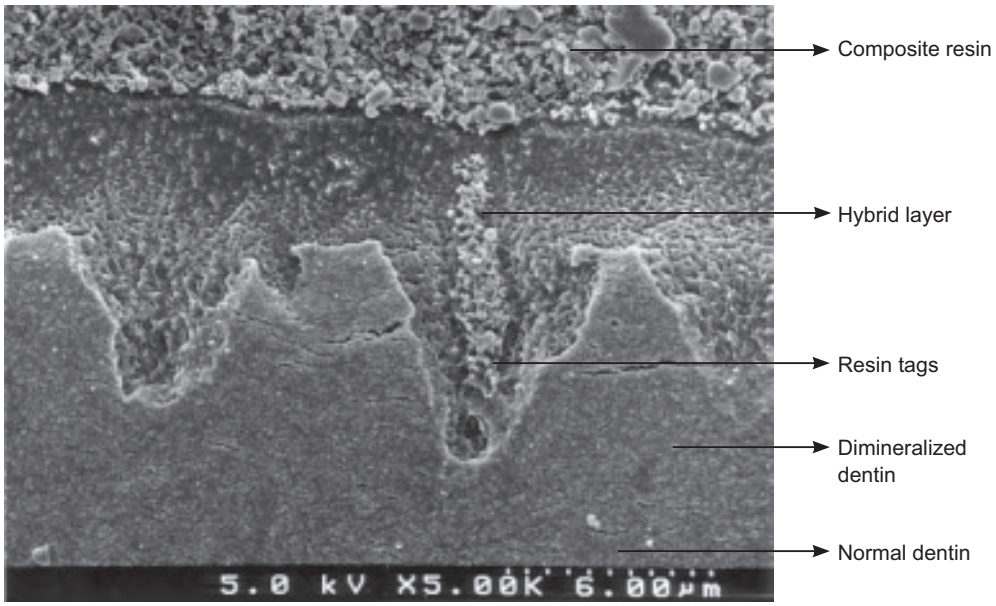


Fig 3.61 Hybrid layer and resin tag formation in dentin bonding

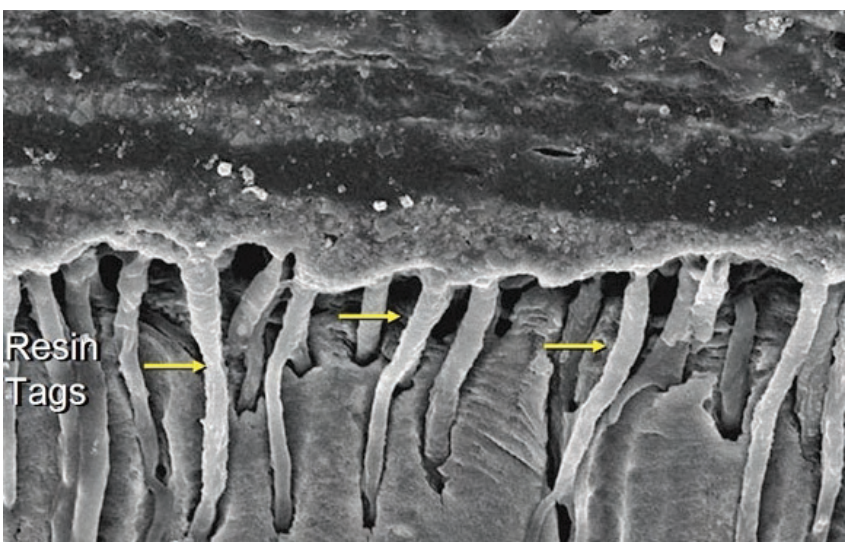


Fig 3.62 SEM image of resin tags penetration into the exposed dentinal tubules

They are also referred to as *Three step etch and rinse adhesives* as they had three distinct step (Fig 3.63):

Step 1 → Conditioning/etching of enamel and dentin

Step 2 → Primer application

Step 3 → Adhesive application

Inlay wax is a specialized dental wax that can be used for making direct and indirect patterns of the tooth prepared for inlays, onlays crowns and bridges, which is later converted into cast metal by the lost wax casting technique (Figs 3.71 and 3.72).

Ideal Requirements

- The wax should be uniform when softened.
- The colour should contrast with the die for better identification and finishing of margins.
- It should not be flaky or rough during moulding after softening.
- The wax pattern should be completely rigid and dimensionally stable.
- It should vaporize completely without residue during burn out.

Classification

Type I medium wax used for direct technique.
Type II soft wax used for indirect technique (Figs 3.73 and 3.74).

Fig 3.71 Inlay wax

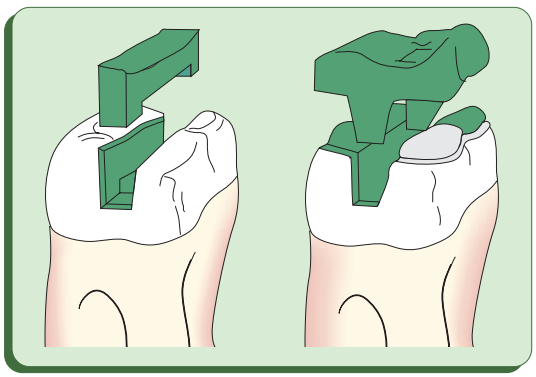


Fig 3.72 Inlay wax being used for the fabrication of wax patterns for (a) inlay and (b) onlay restorations

Fig 3.73 Fabrication of a direct inlay wax pattern

Fig 3.74 Inlay wax pattern

KNOW YOUR OPERATING FIELD

V Gopikrishna

4 CHAPTER

"The differences between a competent person and an incompetent person are demonstrated in the knowledge of his surroundings."

— Ron Hubbard

Dental Chair

- This clinical equipment comprises of an electrically operated, retractable patient seating chair to which compressed air, water line, micromotor, spittoon bowl and an overhead light is attached to (Fig 4.1).
- It also is accompanied by a dental operator stool on which the clinician sits while handling the patient procedures.

Fig 4.1 Dental operating chair (Courtesy: Confident Dental Equipments Ltd)

Phantom Head

- In the preclinical training area instead of a dental chair a phantom head is employed which simulates the environment present in the patients oral cavity (Fig 4.2).

Three Way Syringe

- Three way syringe is a chair side metal syringe connected to an air-water line (Fig 4.10).
- It comprises of two buttons; one designated for water spray while the other one is for air spray.
- If both the buttons are pressed simultaneously, then the resultant spray is an air-water spray.
- It is a useful device to cleanse the tooth preparation.

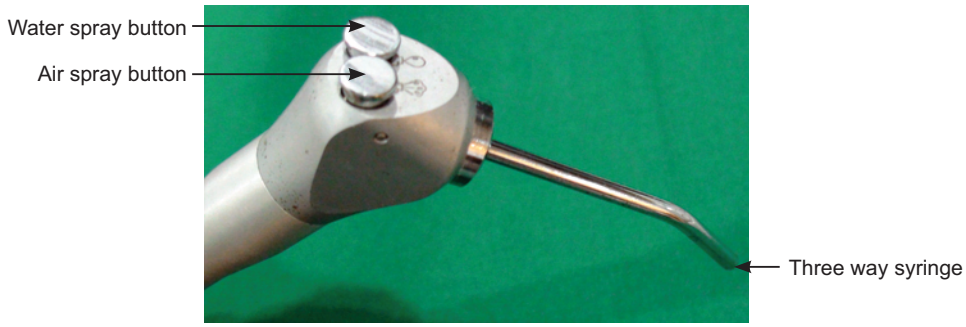


Fig 4.10 Three way syringe

Cavity Holder

- Cavity holder is an extension from the tray holder and would be in close proximity to the operator (Fig 4.11).
- It would hold the following:
  - Either one/two air-water lines to which airotor handpiece/s can be attached.
  - Three way syringe.
  - Airmotor/micromotor base to which the latch type contra angled or straight hand piece can be attached.

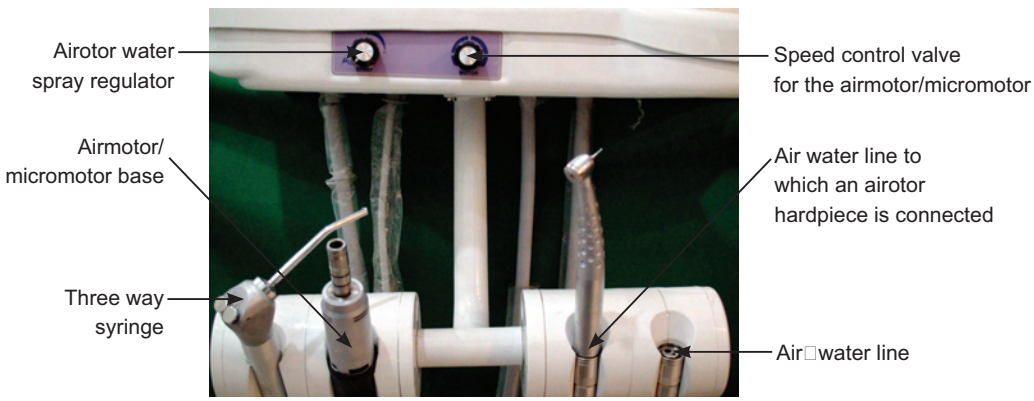


Fig 4.11 Cavity holder and its attachments

BEGINNERS' GUIDE FOR USING INSTRUMENTS AND EQUIPMENT

I. Connecting the Airotor Handpiece to the Air-Water Line

The air-water line is attached to the airotor handpiece with the help of a coupling.

Step 1 → *Appreciation of air-water line and airotor nozzle morphology (Fig 4.12).*

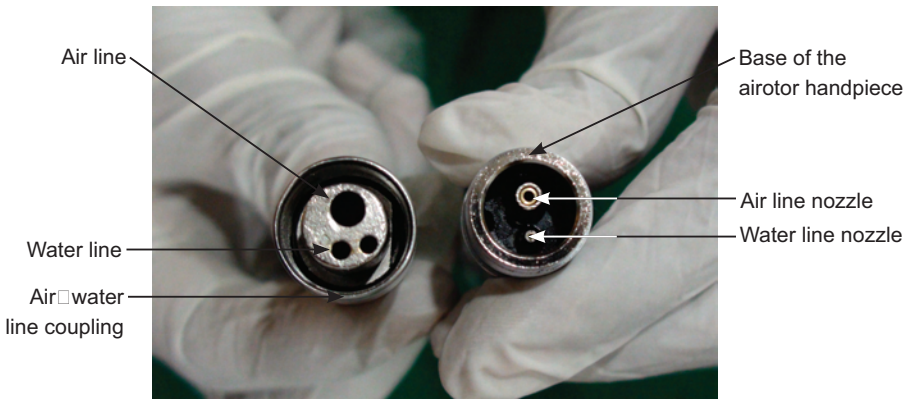


Fig 4.12 Left: the air-water line consisting of a larger opening which is the air line and one or two smaller opening/s which brings in the water line. Right: the connecting end of the airotor handpiece which has a larger nozzle for the air line and a smaller one to which the water line is connected

Step 2 → *Retraction of air-water line coupling (Fig 4.13).*

Fig 4.13 Keep the air line and water line in alignment with the nozzles at the base of the airotor handpiece. The coupling surrounding the top of the air-water line is then gently retracted

Step 3 → *Insertion of air-water line into the handpiece (Fig 4.14).*

Fig 4.14 Keeping the alignment of the corresponding sized air-water line and the nozzles in the handpiece, the air-water line is snugly slided into the handpiece

Step 4 → *Locking the air-water line coupling ((Fig 4.15).*

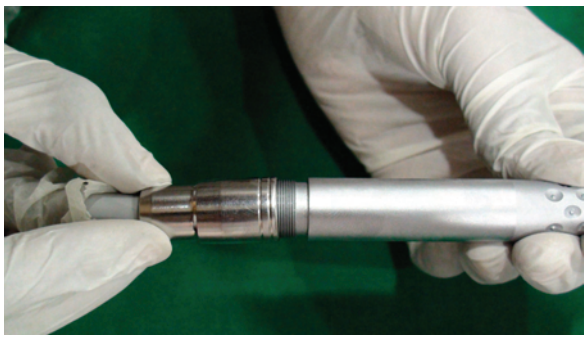


Fig 4.15 The coupling surrounding the air-water line is then gently pushed forward and then rotated in a clockwise direction onto the threads present at the base of the airotor handpiece

Step 5 → *Assessment of the connection (Fig 4.16).*

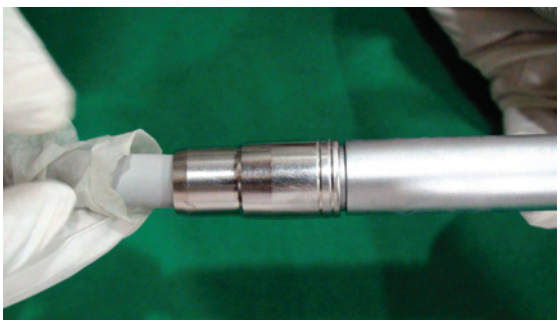


Fig 4.16 A proper fit is confirmed when the coupling completely covers the threads present on the base of the handpiece. Improper fit would lead to water leakage from the back of the handpiece along with reduced air pressure

Step 10 → *Unlocking the handpiece from the airmotor head (Figs 4.32–4.34).*

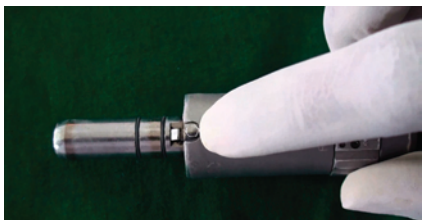


Fig 4.32 There is a small push button on the side of airmotor head which when pushed would unlock the head from the handpiece

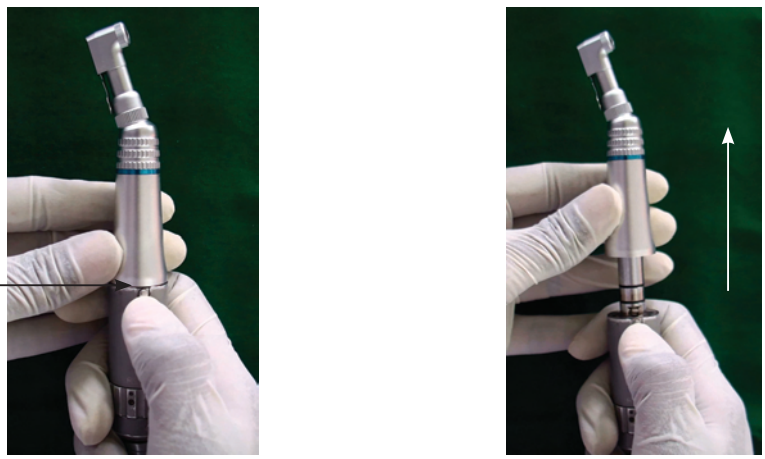


Fig 4.33 The push button lever is pressed and the latch type contra-angled handpiece is then pulled gently upward to release it from the airmotor head

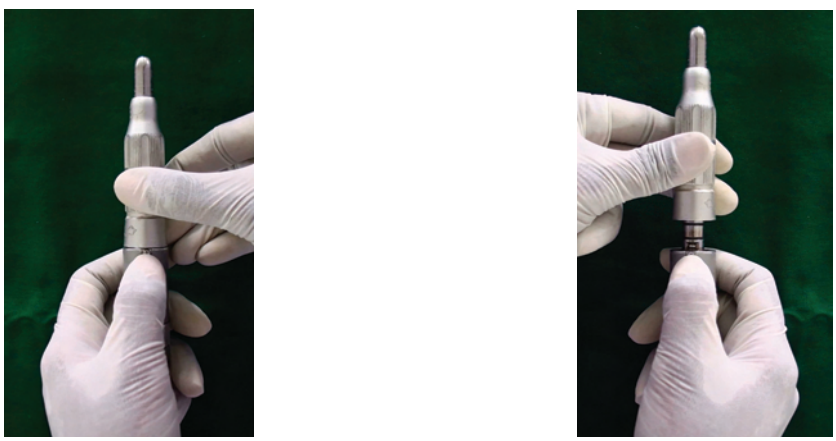


Fig 4.34 The push button lever is pressed and the straight handpiece is then pulled gently upward to release it from the airmotor head

IV. Placement of Bur into the Latch Type Contra-Angled Handpiece

Step 1 → *Identifying the latch at the back of the contra-angle handpiece (Fig 4.35).*

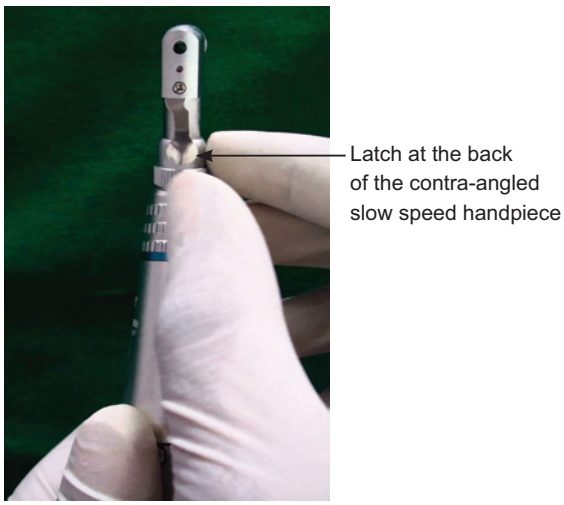


Fig 4.35 The contra-angled handpiece has a latch which is present on the back side of the head of the handpiece

Step 2 → *Opening of the latch (Fig 4.36).*

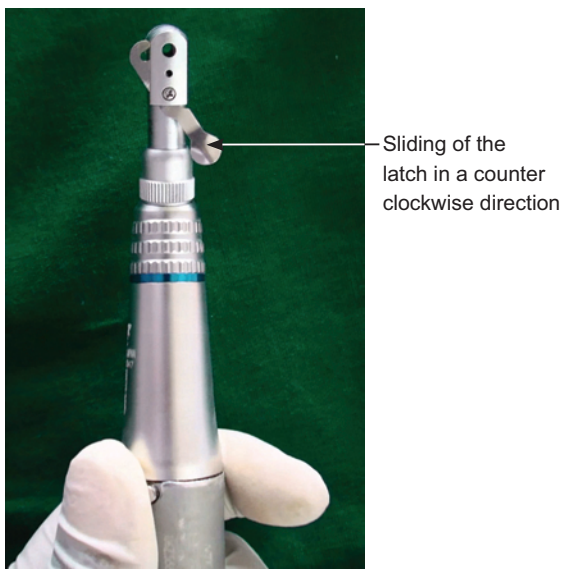


Fig 4.36 The latch can be opened by laterally rotating the latch handle in a counter clockwise direction

Step 3 → *Insertion of the bur into the handpiece (Fig 4.37).*

Fig 4.37 The bur is inserted into the head of the handpiece and then the bur is rotated in a clockwise direction for it to snugly fit into the head of the contra-angled handpiece

Step 5 → *Assessment of proper bur placement (Fig 4.38).*

Fig 4.38 The bur head should be seen at the back of the handpiece and the latch head should be rotated back in a clockwise direction for the bur to be firmly gripped inside. Now gently tug the bur out to check whether the bur placement is properly done. If the bur is loose, then replace it into the channel and then redo step 4

FUNDAMENTALS OF CAVITY PREPARATION

V Gopikrishna, M Abarajithan

5 CHAPTER

"Never let anything discourage you…
Everyone who got where he is had to begin where he was…"
— Richard L Evans

INTRODUCTION

Initially, the operator should assess the clinical condition of the tooth and formulate an appropriate treatment plan. This involves the proper diagnosis and finalization of the kind of restorative treatment in consultation with the patient's needs and aspirations.

The preparation of the tooth structure for a restoration varies according to the kind of restorative material being chosen. However, there are certain core fundamental principles which an operator has to follow immaterial of the kind of restoration. This chapter would give an overview of the basic principles and nomenclatures involved during cavity preparation.

Cavity Nomenclature (Figs 5.1–5.6)

- ***External wall*:** A prepared cavity wall that extends to the cavity margin or the external tooth surface.
- ***Internal wall:*** A prepared cavity wall that does not extend to the cavity margin or the external surface.
- ***Axial wall:*** An internal wall parallel to the long axis of the tooth.
- ***Pulpal floor/wall:*** An internal surface of the cavity perpendicular to the long axis of the tooth.
- ***Floor:*** A Floor or a seat is a prepared wall that is reasonably flat and perpendicular to the occlusal forces that are directed occluso-gingivally, e.g. pulpal floor and gingival seat.
- ***Line angle:*** Junction of two planar surface of different orientation along a line.
- ***Point angle:*** Junction of three planar surface of different orientation.

Class I cavity: line angle-8; point angle-4 (Fig 5.1)
Class II cavity: line angle-11; point angle-6 (Fig 5.2)
Class III cavity: Proximal approach: line angle-3; point angle-3.
Palatal approach: line angle-5; point angle-2

Class IV cavity: Proximal approach: line angle-6; point angle-3 (Fig 5.3).
Palatal approach: line angle-7; point angle-3
Class V cavity: line angle-11; point angle-6 (Fig 5.4)
Class VI cavity: line angle-8; point angle-4

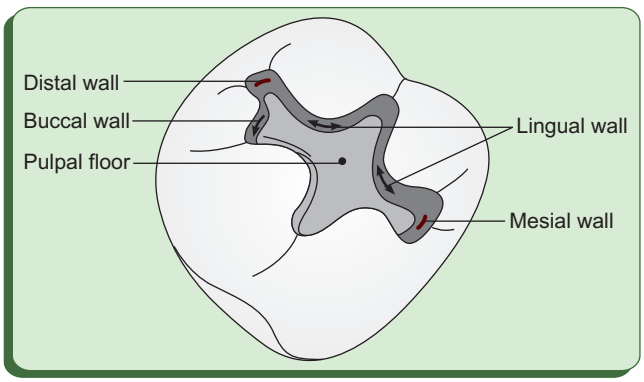


Fig 5.1 Nomenclature of cavity walls in a class I cavity

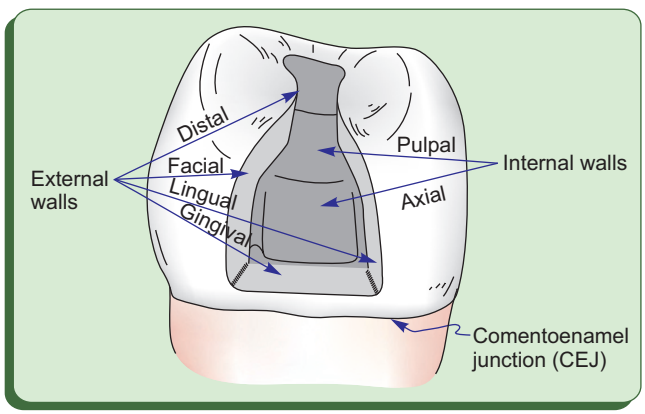


Fig 5.2 Nomenclature of cavity walls in a class II cavity

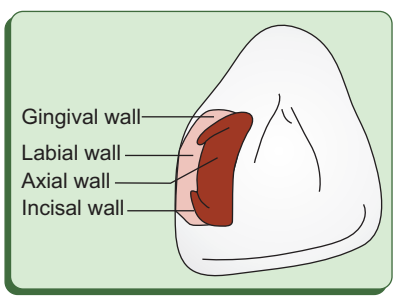


Fig 5.3 Nomenclature of cavity walls in a class IV cavity

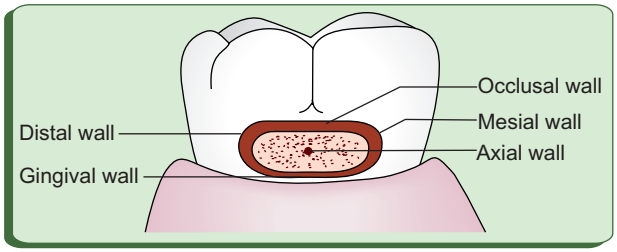


Fig 5.4 Nomenclature of cavity walls in a class V cavity

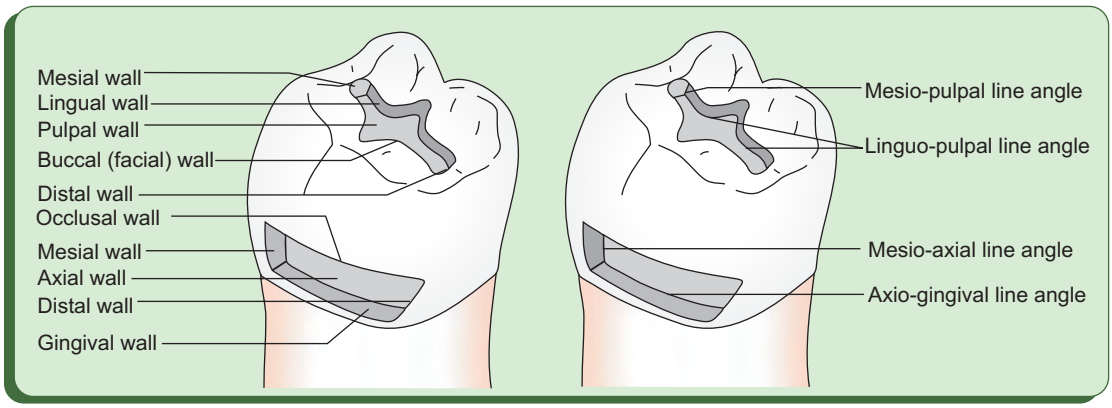


Fig 5.5 Nomenclature of cavity walls and line angles in a class I and class V cavity

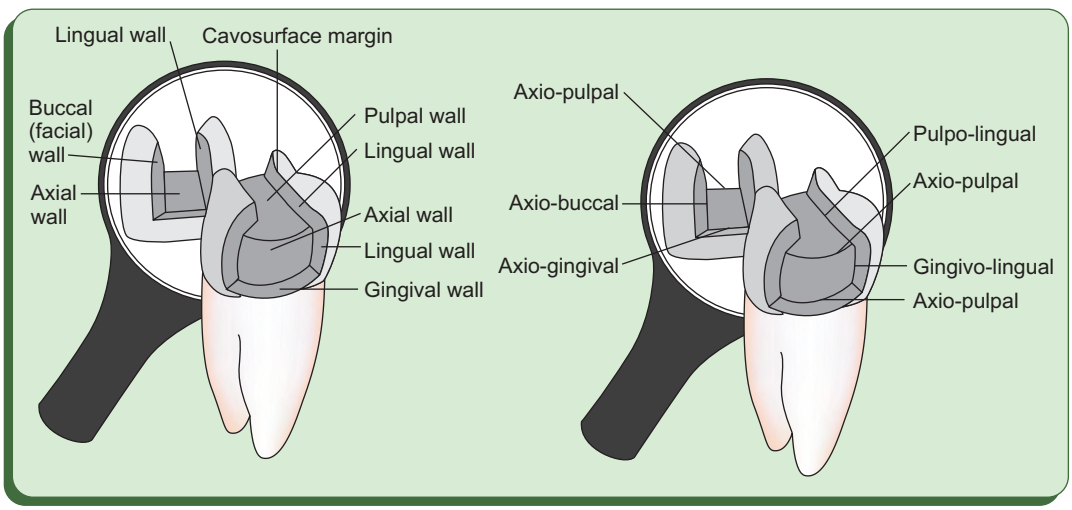


Fig 5.6 Nomenclature of cavity walls and line angles in a class II cavity

Cavosurface margin and cavosurface: It is the outer margin of the cavity and the angle formed by the junction of a prepared cavity wall and the external surface of the tooth is called cavosurface angle (Fig 5.7).

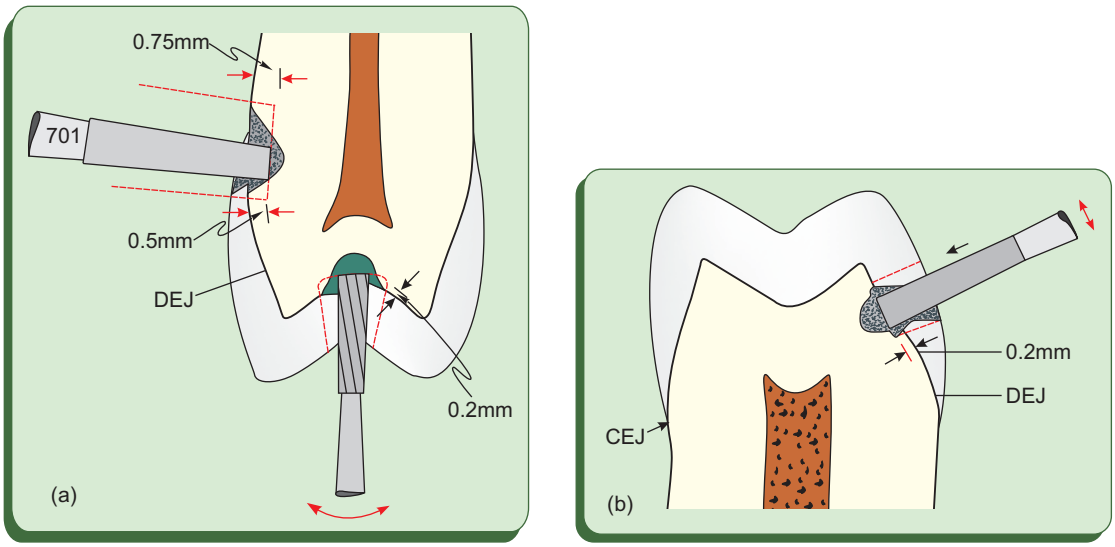


Fig 5.8 Initial tooth preparation. Note in (a) and (b) that extensions in all directions are to sound tooth structure while maintaining a specific limited pulpal or axial depth regardless whether end (or side) of bur is in dentin, caries, old restorative material, or air. DEJ and CEJ indicated in (b). Note in (a) that initial depth is approximately two thirds of 3 mm bur head length, or 2 mm, as related to prepared facial and lingual walls, but is half the No. 245 bur head length, or 1.5 mm, as related to central fissure location

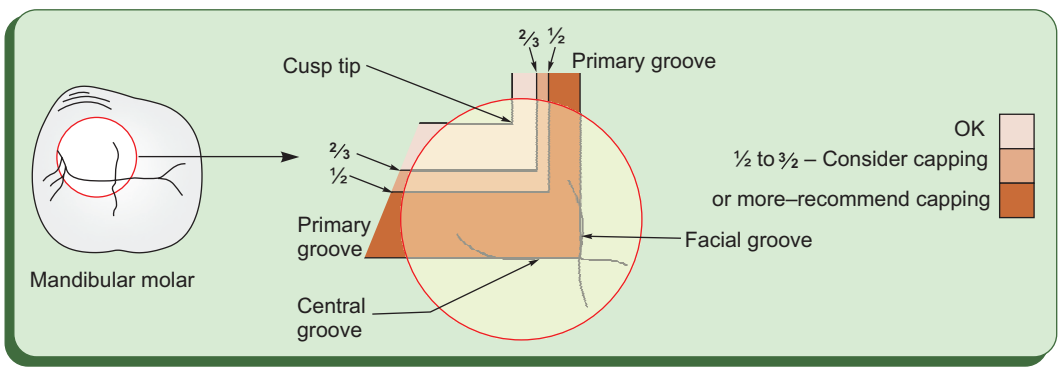


Fig 5.9 Rule for cusp capping: If extension from a primary groove toward the cusp tip is no more than half the distance, then no cusp capping; if this extension is from one half to two thirds of the distance, then consider cusp capping; if the extension is more than two thirds of the distance, then usually cap the cusp

- **Rule 4** → Extend the preparation margin to include the entire fissure that cannot be eliminated by appropriate enameloplasty (Fig 5.10).

PRECLINICAL PLASTER MODEL EXERCISES

G Vijayalakshmi, V Gopikrishna

6 CHAPTER

"A person who never made a mistake never tried anything new."
— Albert Einstein

INTRODUCTION

Plaster model exercise deals with preparation of cavities from class I to class V in plaster models of different teeth which are three times the size of the natural teeth.

Cavities are prepared with the help of an enamel chisel and the cavity dimensions are measured with a graduated probe (Williams probe).

These exercises are meant to make the student:

i. Appreciate the tooth morphology better
ii. Understand the nomenclature of the cavity walls and surfaces
iii. Understand the basic principles of cavity preparation including outline, resistance, retention and convenience forms.

CLASS I CAVITY: WALLS, LINE ANGLES AND POINT ANGLES

Exercise I: Class I in Maxillary First Premolar (Figs 6.1–6.14)

Dimensions

- Width of the cavity: 2 mm at the centre and 3 mm at the dovetail region
- Depth of the cavity: 4–5 mm
- Mesiodistal extension of the cavity: 8–10 mm

CLASS II CAVITY: WALLS, LINE ANGLES AND POINT ANGLES (Figs 6.132 and 6.133)

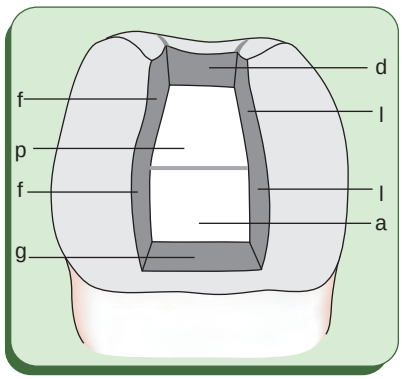


Fig 6.132 Tooth preparation walls: facial (f) of proximal and occlusal portions, gingival (g), lingual (l) of proximal and occlusal portions, distal (d), pulpal (p) and axial (a)

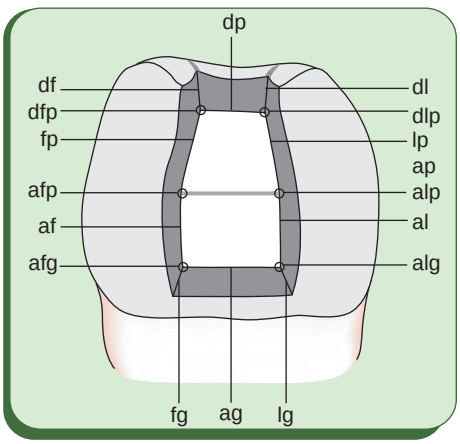


Fig 6.133 Line angles are distofacial (df), faciopulpal (fp), axiofacial (af), faciogingival (fg), axiogingival (ag), linguogingival (lg), axiolingual (al), axiopulpal (ap), linguopulpal (lp), distolingual (dl) and distopulpal (dp). Point angles are distofaciopulpal (dfp), axiofaciopulpal (afp), axiofaciogingival (afg), axiolinguogingival (alg), axiolinguopulpal (alp) and distolinguopulpal (dlp)

Exercise X: Class II Mesio-Occlusal (MO) Cavity in a Mandibular First Molar (Figs 6.134–6.162)

Dimensions

- Width of the occlusal cavity: 2–3 mm
- Depth of the occlusal cavity: 5 mm
- Width of the proximal flare: 4–5 mm
- Depth/height of the axial wall: 3 mm

- Width of the gingival seat (mesiodistal): 3 mm
- Depth of the gingival seat (buccolingual): 5–6 mm

Fig 6.134 Outline form—occlusal view

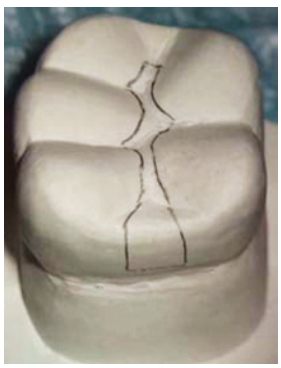


Fig 6.135 Outline form—mesio-occlusal view

Fig 6.136 Entering the grooves-extension for prevention

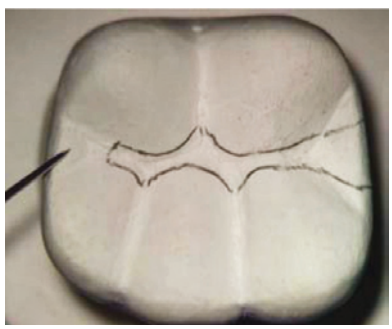


Fig 6.137 Preserving the marginal ridge on the uninvolved side

Fig 6.138 Proximal flare

Fig 6.139 Punch cut given with a chisel

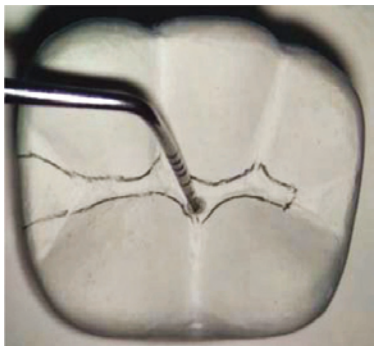


Fig 6.140 Measuring the depth of the punch cut with a graduated probe

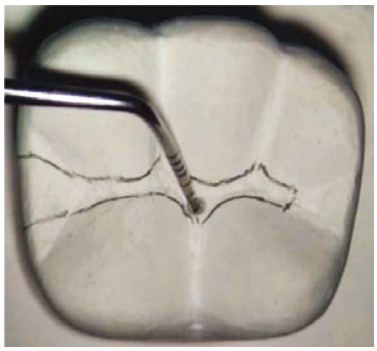


Fig 6.141 Entering the cavity with a chisel

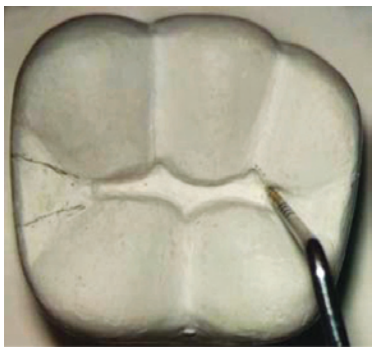


Fig 6.142 Cavity extended mesiodistally and checking the occlusal convergence

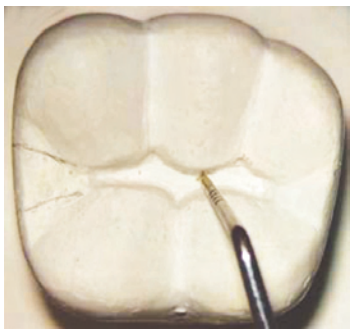


Fig 6.143 Placing undercuts

Fig 6.144 Buccoproximal flare

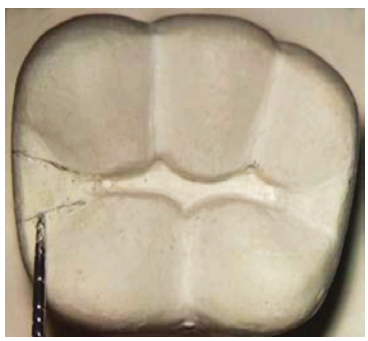


Fig 6.145 Linguoproximal flare

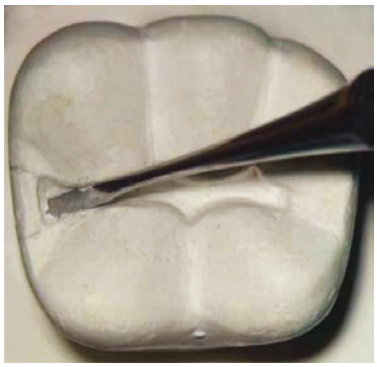


Fig 6.146 Cavity extended mesially leaving thin proximal wall

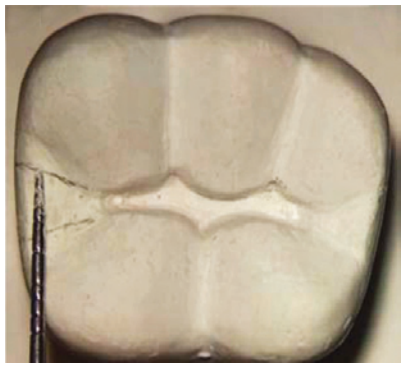


Fig 6.147 Width of the proximal flare

Fig 6.148 Isolation of proximal enamel wall

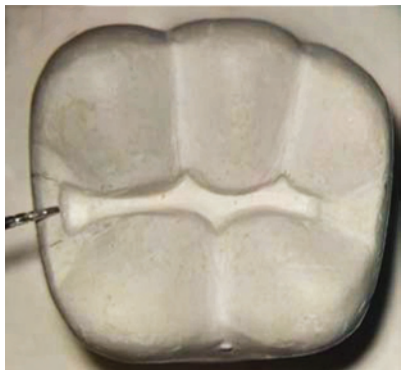


Fig 6.149 Occlusal and proximal box preparation with intact proximal wall

Fig 6.150 Dovetail given on the distal margin

Fig 6.151 Proximal ditch cut made

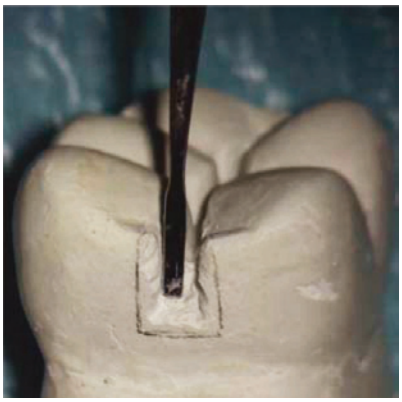


Fig 6.152 Proximal wall broken with the chisel

Fig 6.153 Defining the gingival seat and measuring the axial wall height

Fig 6.154 Measuring the buccolingual width of the gingival seat

Fig 6.155 Measuring the mesiodistal width of the gingival seat

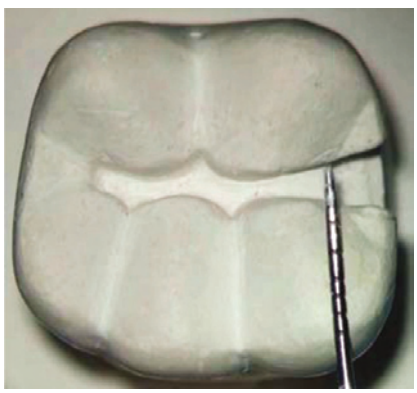


Fig 6.156 Isthmus region

Fig 6.157 Axiopulpal line angle

Fig 6.158 Axiogingival line angle roundened

Fig 6.159 Measuring the final depth

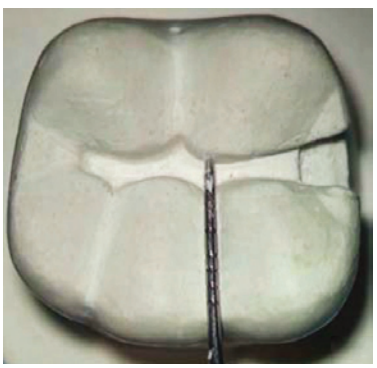


Fig 6.160 Measuring the final width of the cavity

Fig 6.161 Completed cavity preparation

Fig 6.162 Completed preparation—occlusoproximal view

PRECLINICAL TYPHODONT EXERCISES

V Gopikrishna, G Vijayalakshmi

7 CHAPTER

"I've missed over 9,000 shots in my career. I've lost almost 300 games. 26 times I've been trusted to take the game-winning shot… and I've missed, I've failed over and over and over again in my life. And that is why I succeed."

— Michael Jordan

PRECLINICAL EXERCISES

- Class I cavity for amalgam restoration
  - Mandibular first molar
  - Mandibular first premolar
  - Maxillary first molar
  - Mandibular first molar with buccal extension
- Class II cavity for amalgam restoration
  - MO– Mesio-occlusal cavity in mandibular first molar
  - DO– Disto-occlusal cavity in maxillary first molar
  - MO– Mesio-occlusal cavity in mandibular first premolar for composite restoration
  - DO– Disto-occlusal cavity in mandibular first premolar
  - MOD– Mesio-occlusal-distal cavity in mandibular first molar
- Class III cavity for glass ionomer restoration
- Incisal build up (class IV) of maxillary central incisor for composite restoration
- Class V cavity for glass ionomer restoration in mandibular first molar
- Cast metal inlay cavity preparation, fabrication of wax pattern and casting technique in a mandibular second molar

I. CLASS I CAVITY PREPARATION FOR AMALGAM RESTORATION

Definition of Class I

Cavities occurring in one or more of the following locations:

a. Pits and fissures of occlusal surfaces of molars and premolars

Class II Cavity Preparation (MO - Mesio Occlusal) for a Mandibular First Molar

I. Cavity Preparation (Figs 7.88–7.102)

Fig 7.88 Occlusal anatomy of a mandibular first molar

Fig 7.89 Occlusal preparation completed

Fig 7.90 Occlusal preparation extended mesially without breaking the proximal enamel wall

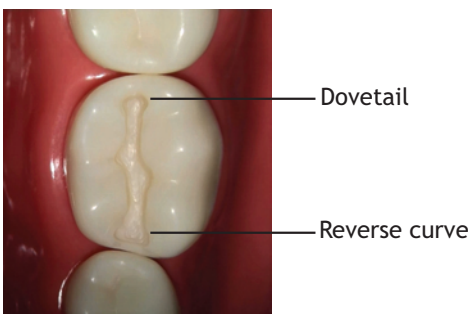


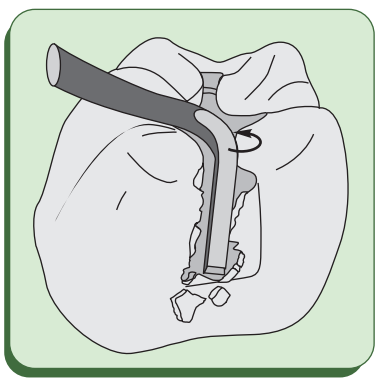
Fig 7.91 Dovetail given on the uninvolved proximal side. Reverse curve and proximal flare given on the mesial side

Fig 7.92 Bur placed extracoronally to ascertain the proposed depth of the proximal box

Fig 7.93 Proximal ditch cut prepared with an intact margin after placement of matrix band to prevent the inadvertent nicking of the adjacent tooth

Fig 7.94 Refining the axial wall and the gingival seat

(a)



(b)

Fig 7.95 (a, b) Removal of the thin shell of enamel wall with a chisel or hatchet

Fig 7.96 Contact broken in all three planes–facially, lingually and gingivally

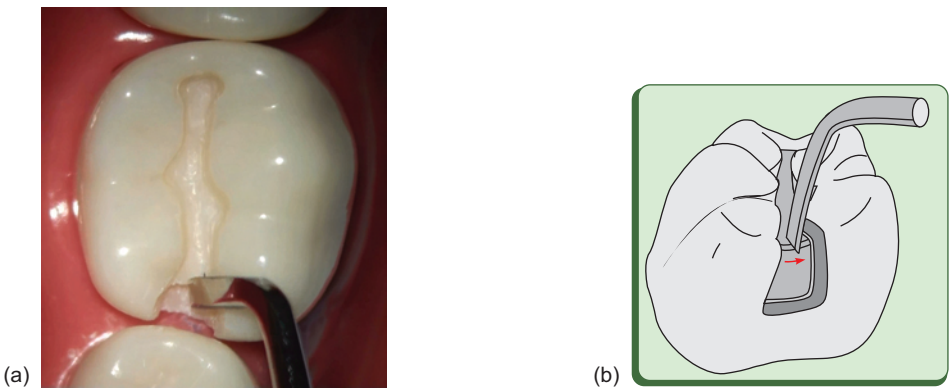


Fig 7.97 (a, b) Gingival marginal trimmer used to rounden the axiopulpal line angle

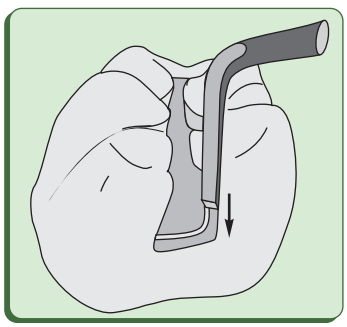


Fig 7.98 Cleaving the marginal enamel and planing the walls with a hatchet

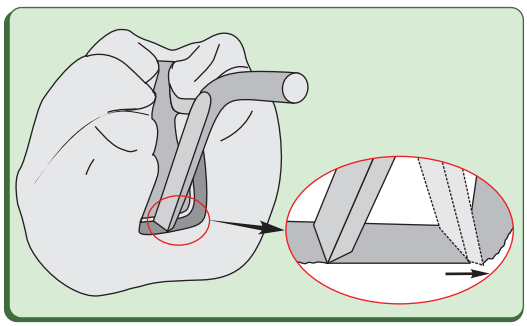


Fig 7.99 Planing the gingival floor to render it smooth and free from irregularities with a hatchet

Fig 7.100 Using a gingival marginal trimmer to plane the gingival seat margin

Fig 7.101 The round end of the plastic instrument is moved along the pulpal floor in order to check the convenience form

- Step 5 → The smaller outer knurled nut is moved clockwise to tighten the pointed spindle against the band.

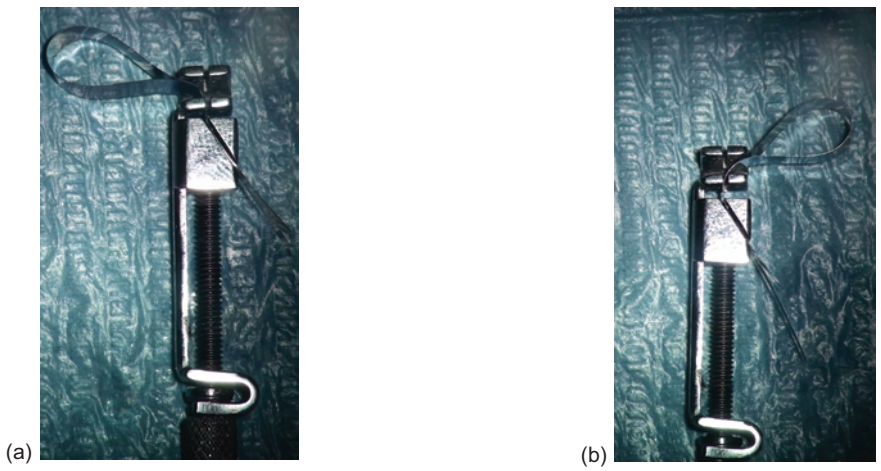


Fig 7.118 Step 6 (a, b) → The loop of the matrix band can be placed either left or to the right side of the locking vise depending on the tooth to be restored

- Step 6 → The large inner knurled nut is rotated clockwise to secure the band snugly around the tooth.

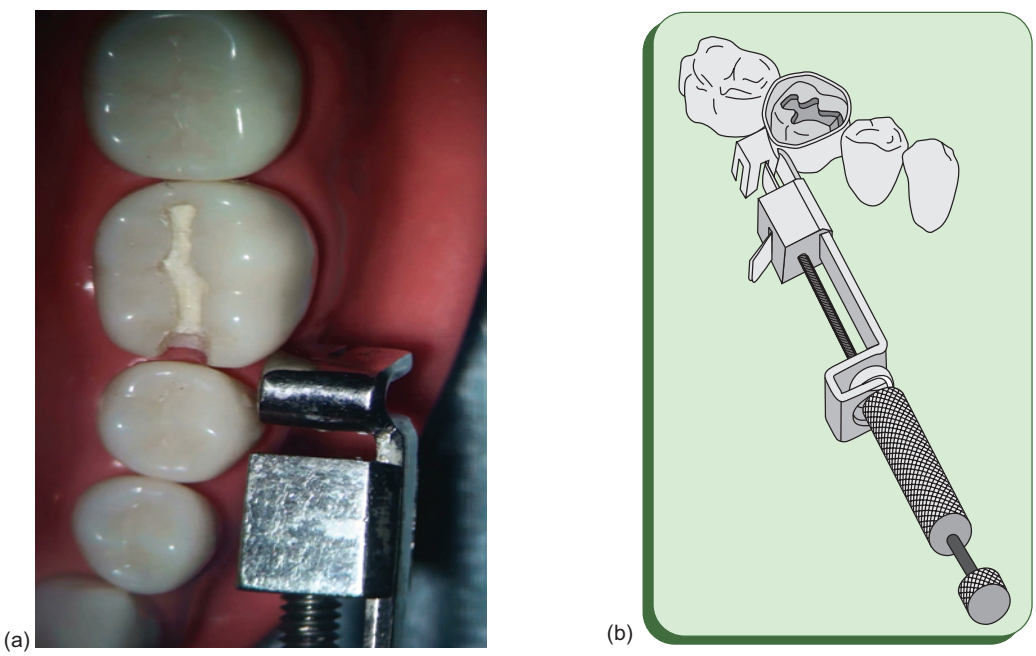


Fig 7.119 (a, b) Right placement of the retainer with the open end of the retainer head facing gingivally and the closed head facing occlusally

Common errors in placement of the tofflemire retainer (Figs 7.120–7.123)

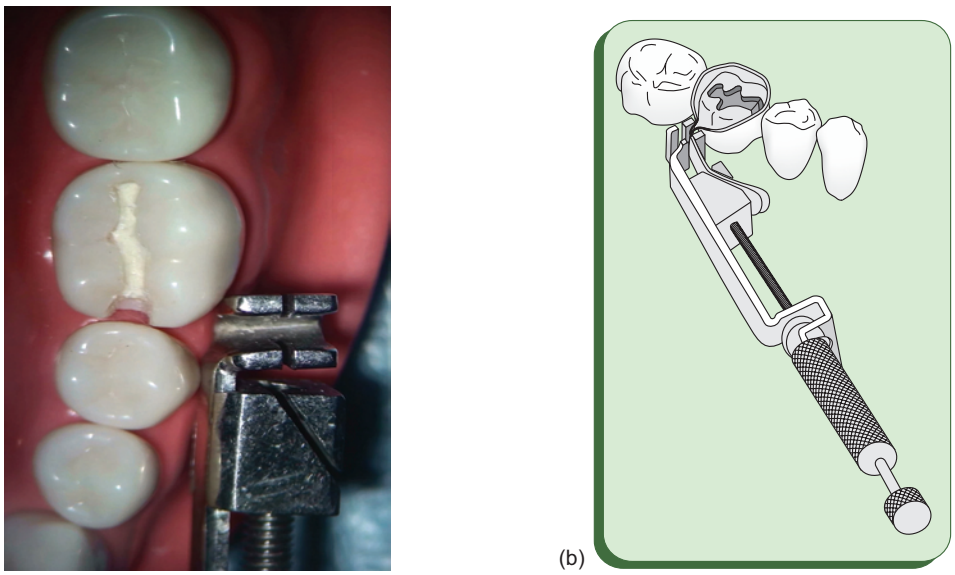


Fig 7.120 (a, b) Error I → Wrong placement of the retainer with the open end of the retainer head facing occlusally and the closed head facing gingivally

Fig 7.121 Error II → Placement of retainer in the opposite direction with the head of the retainer facing the operator and the small knurled nut away from the operator

Fig 7.122 Error III → Lingually placed retainer. This should not be attempted in a clinical situation wherein the retainer might injure the tongue of the patient

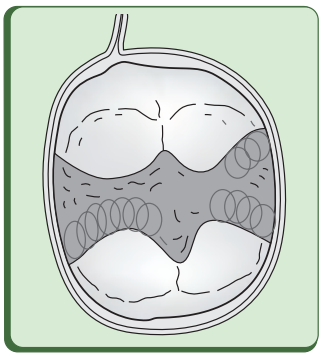


Fig 7.132 "Stepping" the amalgam. The condenser is moved systematically forward and sideways to cover the previous location with half the face of the condenser. Each particle is thereby insured of being condensed at least twice

Fig 7.133 Excess amalgam after the condensation procedure is being removed with the help of a sickle explorer

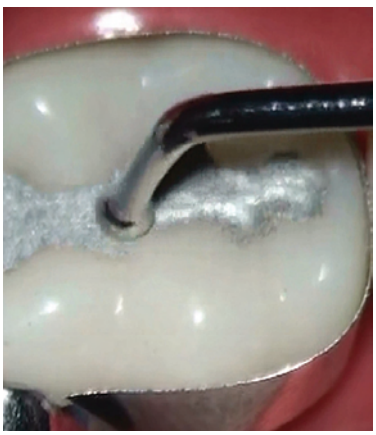
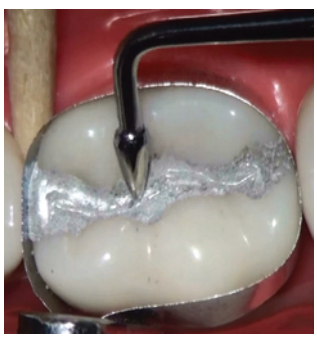


Fig 7.134 Precarve burnishing being done with a round burnisher

(a) 

(b) 

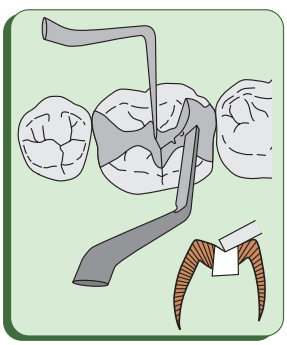
(c) 

Fig 7.135 (a, b, c) Carving of occlusal contour using the cuspal incline as guidance

Fig 7.282 Application of the separating media with the help of an applicator brush. Care should be taken to allow for the evaporation of the separating media before the molten inlay wax is inserted into the inlay cavity preparation

(a) 

(b) 

Fig 7.283 (a, b) Placement of molten inlay wax with the help of a heat carrier inside the prepared cavity

(a) 

(b) 

Fig 7.284 (a, b) Fabrication and carving of the inlay wax pattern

II Sprue former attachment (Figs 7.285–7.287)

- Sprue former is the mould channel through which the molten/alloy flows into mould cavity.
- Sprue former can be of:
  - Metal coated with wax

- Plastic
- Entirely of wax

- The length of the sprue former depends on the length of the casting ring and it should be as thick as the thickest areas of the pattern.
- A reservoir should be added to the sprue to prevent localized shrinkage porosity.
- The attachment of the sprue former to the wax pattern is flared. It is attached at 45 degree angulation to the wax pattern in its thickest portion.

Fig 7.285 Wax sprue former being attached at an angle of 45 degrees to the thickest portion of the wax pattern

Fig 7.286 (a, b, c) Wax reservoir being created on the sprue channel at a distance of 2 mm away from the wax pattern

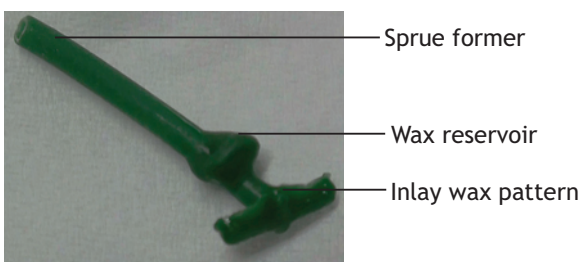


Fig 7.287 Prepared wax pattern with the attached sprue former and reservoir

III Investment procedure (Figs 7.288–7.303)

A. Fabrication of crucible former for the investment ring

COMMON VIVA QUESTIONS AND SPOTTERS

G Vijayalakshmi

8 CHAPTER

"He who asks a question is a fool for five minutes,
He who does not ask a question remains a fool forever."
— Chinese Proverb

CAVITY PREPARATION

Define operative dentistry.

Operative dentistry is a subject that deals with the diagnosis, prevention and treatment of problems and conditions of natural teeth, both vital and nonvital, so as to preserve the natural dentition and restore it to the best state of teeth, function and aesthetics (*Gilmore*).

Operative dentistry is the art and science of the diagnosis, treatment and prognosis of teeth that do not require full coverage restoration for correction. Such treatment should result in the restoration of proper tooth form, function and aesthetics while maintaining the physiologic integrity of the teeth in harmonious relationship with the adjacent hard and soft tissues, all of which should enhance the general health and welfare of the patient (*Sturdevant*).

Define tooth preparation or cavity preparation.

Tooth preparation or cavity preparation is defined as the mechanical alteration of a defective, injured or diseased tooth to best receive a restorative material that will reestablish a healthy state for the tooth, including aesthetic corrections where indicated, along with normal form and function.

What are the types of tooth preparation?

- **Conventional:** A preparation where apart from removal of diseased portion, extension is also made so as to include all pits and tissues, unsupported areas to prevent further caries formation, for specific restorations, e.g. amalgam, direct filling gold, cast restoration.

Spotter 3

Amalgam Capsule

- Amalgam capsule is a preproportioned capsule containing amalgam alloy and mercury in two compartments separated by a diaphragm and a pestle.
- It is used in mechanical triturator called amalgamator.
- It helps in proper proportioning of amalgam alloy and mercury and prevents mercury spillage.
- It reduces working time.

Spotter 4

Amalgam Finishing Kit

- Amalgam finishing kit contains various grades of finishing stones from coarse to fine in different sizes.
- It is fitted to slow speed handpieces and used for finishing amalgam restoration after 24 hours.

Spotter 5

Acid Etchant

- Acid etchant is supplied in a syringe as a gel form.
- It comprises 37% of phosphoric acid.
- It is used to etch the tooth surface for removal of smear layer, better wetting of resin and to increase the mechanical retention of the restoration.
- On application, it produces a white frosty appearance on the tooth surface.

Spotter 6

Dentin Bonding Agent

- Dentin bonding agent is supplied in a liquid form in a bottle.
- Main components of dentin bonding agents are HEMA and Bis-GMA.
- It penetrates into the etched tooth surface and forms resin–dentin interface called hybrid layer.

GLOSSARY OF TERMS

M Abarajithan

9 CHAPTER

"A rose is a rose is a rose."

— Gertude Stein

Operative dentistry is the art and science of the diagnosis, treatment and prognosis of defects of teeth that do not require full coverage restorations for correction. Such treatment should result in the restoration of proper tooth form, function and aesthetics while maintaining the physiologic integrity of the teeth in harmonious relationship with the adjacent hard and soft tissues, all of which should enhance the general health and welfare of the patient.

ANATOMICAL LANDMARKS

Crown: The part of a tooth that is covered with enamel or an artificial substitute for that part.

Neck: The slightly constricted part of a tooth between the crown and the root.

Root: The part of the tooth below the neck covered by cementum and attached by the periodontal ligament to the alveolar bone.

Dentinoenamel junction (DEJ): The dentinoenamel junction (DEJ) is the junction of the enamel and dentin.

Cementoenamel junction (CEJ): The cementoenamel junction (CEJ) is the junction of the enamel and cementum.

Anatomic tooth crown: The anatomic tooth crown is the portion of the tooth covered by enamel.

Clinical tooth crown: The clinical tooth crown is the portion of the tooth crown which is exposed to the oral cavity.

- **Cusp**—A cusp is an elevation or mound on the crown portion of a tooth making up a divisional part of the occlusal surface.

Preclinical Manual of Conservative Dentistry

A must-buy for every 2nd year BDS student!

This manual provides step-by-step pictures and illustrations of the various laboratory exercises, which students have to learn and perform in their 2nd Year BDS course for the preclinical conservative dentistry examination. This is the only book of its kind that would serve as a guide for learning as well as practicing the exercises on the model in the preclinical laboratory.

Segregated into nine well-defined chapters, the book:

- Provides synopsis of topics related to conservative dentistry and endodontics
- Includes clear description with illustrations of every instrument and equipment
- Provides details regarding the composition, properties, uses and manipulation of the various dental materials
- Includes clear description with images of the phantom head and typhodont teeth used in the preclinical laboratory along with a beginners' pictorial guide in using the airotor and micromotor rotary instruments
- Discusses the various features, rules and fundamentals of cavity preparation
- Provides step-by-step pictorial representation along with explanation of all laboratory plaster and typhodont model exercises
- Provides more than 200 commonly asked questions to help students prepare for their viva-voce examination along with the frequently asked spotters
- Includes an exhaustive glossary of conservative dentistry and endodontic terms

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