

# Partial Coverage Crown preparation





### www.caapidsimplified.com



# **Table of Contents**

- Introduction
- Difference between Inlay and Onlay Advantages and
- Disadvantages Indications and **Contraindications Principles of** tooth preparation
- Armamentarium
- Preparation steps for Inlay and Onlay Criteria for Amalgam Inlays and Onlays Nuances in Gold and Ceramic
- Tips and Tricks







# Introduction

- An extra coronal restoration that restores all but one coronal surface of either a tooth or an abutment, usually not covering the facial surface
- The one that covers only the labial surface is called a veneer.

| Anterior teeth                 | Poster                                    |
|--------------------------------|---|
| • 3/4th crown                  | <ul> <li>3/4th crown</li> </ul>           |
| <ul> <li>Pin-ledges</li> </ul> | <ul> <li>Modified 3/4th crown</li> </ul>  |
| Porcelain laminates            | • 7/8th crown                             |
|                                | <ul> <li>Reverse 3/4th: Intact</li> </ul> |
|                                | <ul> <li>Proximal 1/2</li> </ul>          |

### ior teeth

n: Proximal retentive grooves

and inclined lingual surface





### **3-quarter Gold** crowns



## 7/8 th Crown Prep

## **Proximal half Prep**



# **Inlays and Onlays**

| Inlays  |  |
|---|--|
| <ul> <li>Inlays are large restorations similar to CI II in teeth<br/>with moderate amount of decay</li> </ul> | <ul> <li>Onlays c<br/>top of tee<br/>cuspal a</li> </ul> |
| <ul> <li>Bonded within the cavity to increase the strength of<br/>overall tooth structure</li> </ul>          | <ul> <li>Protects<br/>fracture</li> </ul>                |

• They are made of composite resin(esthetic), gold (most strength and durable), porcelain in the dental laboratory, and then bonded to the tooth.

## **Onlays**

cover half the intercuspal distance at the eth and replace the chipped or fractured reas

thin areas/corners of tooth from stress and





| Indications  |   |
|--|---|
| <ul> <li>Moderate tooth structure loss in posterior teeth<br/>provided buccal wall is intact</li> </ul>  | <ul> <li>Short clinic</li> </ul>              |
| <ul> <li>As Retainers for FPDs</li> </ul>  | <ul> <li>Long span<br/>core restor</li> </ul> |
| <ul> <li>Alteration of Occlusal surface</li> </ul>   | <ul> <li>RCT'd Teet</li> </ul>                |
| <ul> <li>Anterior esthetics or Extensive crown length<br/>that has normal anatomic crown form</li> </ul> | <ul> <li>Active cari<br/>abrasion</li> </ul>  |
| • Splinting and to re-establish anterior guidance  | <ul> <li>Poorly alig</li> </ul>               |
| <ul> <li>Adequate labio-lingual thickness</li> </ul>   | <ul> <li>Bell-shape</li> </ul>                |

### Contraindications

- ical crowns
- FPDs or Thin teeth or with extensive pration
- th especially Anteriors or weekend cusps
- ies, Periodontal disease or Deep cervical
- gned abutment
- ed teeth



# **Principles of Crown Preparation**

- Preservation of tooth structure
- Resistance and Retention form
- Structural Durability
- Marginal Integrity
- Preservation of periodontium



# **Guidelines for Inlays/Onlays**

- Enamel margins support given by sound healthy dentin or filling material
- Smooth finish lines with rounded internal line angle given
- Preparation of axial walls should provide 10° to 15° of taper
- All proximal walls should be flared or diverged 5° to 15° (no undercuts)
- Shoulder, supragingival margins are a necessity
- Finish lines should be prepared at 90° angles and should not exceed 110
- Avoid Beveled and feathered edges



# **Guidelines for Inlays/Onlays**

- Gingival floor depth should be 1.0 mm to 1.5 mm to provide strength.
- Isthmus width should be 1.5 mm to 2.0 mm in the premolar region; molars require an isthmus width of 2.5 mm to 3.0 mm.
- Reduce Pulpal floor depth from 1.5 mm to 2.5 mm ideally to provide strength and ample space for aesthetic contours and characterization.
- For onlay restorations, all cusps should be covered with at least 1.5 mm to 2.0 mm of material while maintaining a minimum wall thickness of 1.0 mm to 1.5 mm for optimal strength.
- Occlusal margins should not coincide with occlusal contact points.

90 - 120 degrees

A



# Armamentarium

- Narrow (approximately 0.8 mm), round-tipped, tapered diamond (regular or coarse grit): 856-012
- Regular-size (approximately 1.2 mm), round-tipped, tapered diamond (fine grit): 856-016
- Football-shaped or wheel-shaped diamond (regular grit): 379-014
- Tapered and straight carbide fissure burs: 169L
- Small, round carbide bur: H1
- Finishing stones
- Diagnostic Instruments: Mirror, Explorer, and Probe
- Chisels, Hatchet, GMTs, Excavators, Articulating film







# Class I Inlay

**330** bur to an approximate depth of 1.5mm.

• Straighten the bur to avoid encroaching the marginal ridges as extending the marginal ridge weakens the tooth.

• If the tapered fissure bur is held upright, it produces a desired minimal taper preparation.

• Make the initial cut in the defective central groove with a no.



ridge The width of the isthmus should be 1mm wide

- Flatten the pulpal floor with a no. 847-012 end cutting bur
- end.
- form.

Extend the cut from the central groove to the other marginal

• The occlusal view of the outline form reveals 0.5mm extensions into the facial and lingual grooves with a small dovetail at each

• These extensions provide additional retention and resistance



• The occlusal bevel is initially placed with a flame diamond. It extends one-third of the way down the side of isthmus walls and has a 15-20° inclination.

 Finishing the occlusal be bur

 Occlusal view of Class I inlay preparation

• Finishing the occlusal bevel with a flame carbide finishing



# **Class II Inlay**

Make Putty index

central groove of the occlusal surface.

• Initial entry into the enamel is done with the tapered fissure bur 330/169L; once a cut is made, drag the bur through the



- approx. 1.5mm wide
- nearest occlusal contact.



- Completed occlusal outline
- To provide maximum resistance, the pulpal floor should be flat, at an even depth, and perpendicular to the path of insertion of the restoration.



### Follow any developmental grooves making the isthmus

### • The penetration should end at least 1.0mm from the



inside the CEJ interproximally

- Sharp enamel chisel (hatchet) used to breakout tooth structure and undermined expedite the preparation of the proximal box.
- A hand instrument will break this enamel out very cleanly in the mouth.



# • Begin the proximal box by running a 245/169L bur just







- Use a no. 169L bur to extend the box facially and lingually to break contact with the adjacent tooth (keep it parallel)
- Create facial and lingual line angles to define the box

- The completed proximal wall should barely break contact with the adjacent tooth, with extension merging with the facial and lingual flares.
- bur

• Plane the gingival floor of the proximal box with an end cutting





box (Minnesota Ditch), enhancing resistance to displacement forces

- Give flare with flame diamond.
- Take care to blend the gingival bevel with facial and result in an undercut.

• Use a sharp gingival margin trimmer to create a V-shaped groove at the junction of the axial and gingival floor of the



lingual bevels to avoid a scooped-out area, which would





- Bevel placed around the entire periphery of the occlusal portion of the preparation.
- Ingraham et al. recommended a 15-20° bevel beginning at the junction of occlusal 1/3rd and the pulpal 2/3rd of the isthmus wall.



Retention and resistance Structural durability

> **Proximal flare** Marginal integrity

Retention and resistance Structural durability

Retention and resistance Structural durability

Marginal integrity



• Flame bur produces the most consistent bevel

# What do bevels do?

- Has to be 0.5mm wide
- Increases enamel strength
- Improves marginal seal
- Burnishable margins







# **Class III Inlay**

- Class III inlay has drastically diminished in use.
- Conzett (1910) stated that Class III inlays were contraindicated for
  - use on any tooth because of the amount of tooth destruction
  - required for its cavity preparation.
- Redfern recommends teeth with extensive caries or for replacing failed resin restorations.
- It is an excellent restoration for the distal surface of canines.



# Inlays vs Onlays



MOD inlays: cracks at 40 to 50 degrees apically from the corner of the cavity preparation Onlays distribute forces over a wide area and reduce potential for breakage



# Inlays vs Onlays



Stress producing potential in an ordinary inlay



Stress producing potential in an inlay with overextended bevel



Stress producing potential in an inlay that is too wide

///



The use of an onlay keeps stresses at a low level

### Creates no hazard to the remaining tooth structure



# Onlays

- Capping refers to the complete coverage of the cusps of a tooth with sufficient extension of the bevel onto the buccal and lingual surfaces to carry the margins of the restoration into areas where stresses cannot be brought to bear directly into them. Done on functional cusps.
- Shoeing refers to veneer coverage of the tooth's cusp with only a slight finishing bevel on the crest of the cusp. The bevel is extended either to the right angle to the long axis of the tooth or in a little reverse direction.
- Done on the non-functional cusps.





# Why 2mm thickness?

- Some studies suggest that very thin restorative material becomes weaker and more likely to fracture, although other studies show that strong materials such as lithium disilicate and zirconia can perform well when thinner, or when bonded with resin cement.
- Thus a 2 mm space or reduction should be the goal, on the understanding that sometimes, during occlusal adjustment, porcelain will be removed and the final thickness will be less.













# Steps

- Planar Occlusal with Round end tapered diamond
- fossa and one in each developmental groove
- functional cusps
- functional side is visible



• Depth orientation grooves at the crest of each triangular • 1.5 mm over functional cusps and 1.0 mm over non-

• 0.5 mm depth at facio-occlusal line angle as maxillary non-



- surface in the process
- the functional cusp

- surface
- seating of the restoration

### Round-off and follow the original contour of the cusps reproducing basic geometry of inclined planes to the occlusal

• Depth orientation cuts made on the outward-facing inclines of

1.5 mm at the cusp tip, fades away to the occlusal shoulder

• Reduction is completed by removing inter-groove enamel • Functional cusp Bevelling to approximate the opposite cuspal incline angle by holding the bur at a 450 angle to the occlusal

Smoohen both the planes: occlusal and bevel to ensure better



line angle or point angle

• Check for the occlusal clearance by: Visual Inspection for labial to occlusal





# • Place the shoulder roughly to eliminate any sharp

• Utility wax/Thickness gauge for lingual cusps



## • Follow the termination line of the functional cusp bevel on the axial surface of the functional cusp • Create 1mm wide shoulder from mesial to distal



### Chamfer/Shoulder:

with a nearby bulk of metal

# Shoulder with bevel:

• Easier to prepare



• Ensures acute edge in the restoration margin







- Isthmus and Proximal box by No. 245/169L bur
- 1mm shallower than an inlay as the occlusal surface is already reduced
- Narrow Isthmus is created to provide for retention and resistance

- Barely break contact with the adjacent teeth with a smaller preparation on both sides. 1mm wide gingival floor
- Accentuate facio-axial and linguo-axial line angles with 169L
- Less conservative Facial extension









- Contacts are broken with a 1mm Enamel resistance form
- bevel of 1mm width





• Ensure occlusal divergence of facial and lingual walls and occlusal convergence of the axial walls

hatchet Smoothen the walls to ensure

• End cutting carbide bur or no. 957 to plane the isthmus and occlusal shoulder of functional cusp

• Finish the gingival floor to resist displacement of restoration against compressive occlusal forces



- Flame shaped bur for proximal flare
- damage
- pleasing aesthetics
- Follow with sandpaper disk to polish the proximal flare
- box
- without any undercut
- Distinct finish line with smoothened bevel and flares



### • Enter the restricted embrasure space without adjacent tooth

### • Follow with a hatchet to shape mesiofacial flare to ensure

• Gingival bevel 0.5mm to 0.7mm given along the gingival floor • Bend into the flares of facial and lingual walls of the proximal



- Facial and Lingual bevel is produced with 169L (occlusal finishing bevel): 0.5mm wide
- Perpendicular to the long axis of the tooth
- transitional area
- margin.
- the lingual flare
- Do not extend far gingivally



• Facial: Outer edge of the occlusal bevel continues with the outer edge of the facial flare as a smooth finish line in the

Avoid any sharp projections to ensure a gapless casting

• Lingual: The occlusal shoulder of 0.5mm blends well with





Occlusal lingual bevel Marginal integrity

**Occlusal shoulder** Structural durability

Functional cusp bevel Structural durability

## **Onlay on Molars**

## Depth orientation cuts





### Occlusal step after FCB







### Functional cusp shoulder

### Non-functional cusp bevel



- Non-functional cusp bevel
  - Uniform 1.0 mm







- Gingival bevels
  - Bevels continuous





![](_page_39_Picture_5.jpeg)

# Modifications of Onlay tooth preparations

- Facial/Lingual surface groove extension Enhancement of **Retention and Resistance form Collars**
- Slots

![](_page_40_Picture_3.jpeg)

![](_page_40_Picture_5.jpeg)

| Class II Amalgam   | Amalgam Inlay  |
|--|--|
| <ul> <li>Outline form is narrow as no surface involvement and depth is 1.5-2mm.</li> </ul> | <ul> <li>Outline form is wide as the<br/>surface involvement is more<br/>and depth can be less.</li> </ul> |
| <ul> <li>The walls converge</li></ul>  | <ul> <li>The walls diverge or parallel</li></ul>   |
| occlusally: 169L or 245  | occlusally: 245 or 169L  |
| <ul> <li>The isthmus is 1/4th of the intercuspal distance.</li> </ul>                      | The isthmus may increase<br>upto 1/3rd of intercuspal<br>distance  |
| • The occlusal   | The occlusal cavosurface   |
| cavosurface angle is 90  | angle is 135-145 degrees to  |
| degrees (Butt joint)   | achieve the sliding fit  |
| <ul> <li>Gingival bevel: 15-</li></ul>   | <ul> <li>Gingival bevel is steeper:</li></ul>  |
| 20 degrees   | 20-30 degrees  |

### Amalgam Onlay

- Outline form covers the involved cusps and depth remains as shallow as ~0.5mm
- The walls diverge by 6-10 degrees except the axial wall that converge occlusally
- The isthmus is narrower to maintain cuspal integrity
- The occlusal bevel blends in another plane to occlusal shoulder
- Gingival bevel is steeper and blends with proximal flare

| Class II Amalgam   | Amalgam Inlay  |  |
|--|--|--|
| Undercuts improve retention of the restoration   | <ul> <li>No undercuts should<br/>be present.</li> </ul>  |  |
| <ul> <li>Proximal clearance &lt;0.5mm</li> </ul>   | <ul> <li>Proximal clearance<br/>can exceed &gt;0.5mm.</li> </ul>   |  |
| <ul> <li>The gingival seat should<br/>be placed supra-gingivally.</li> </ul>                     | <ul> <li>Subgingival gingival seat is<br/>acceptable</li> </ul>  |  |
| <ul> <li>Gingival cavosurface margin<br/>is beveled to remove<br/>unsupported enamel.</li> </ul> | <ul> <li>Gingival and occlusal<br/>cavosurface margin beveled<br/>to provide frictional retention</li> </ul> |  |

### Amalgam Onlay

- No undercuts should be present. Overall flaring prep
- Proximal clearance >0.5mm

- Supragingival only
- Gingival, Occlusal, margins beveled

Proximal

| Class II Amalgam  | Amalgam Inlay  |
|---|--|
| <ul> <li>Secondary<br/>retention: Grooves,<br/>slots, pins</li> </ul>                   | <ul> <li>Secondary retention:<br/>Grooves, slots, pins, internal<br/>boxes, collars, reverse<br/>bevel, skirts.</li> </ul> |
| <ul> <li>Proximal walls have a<br/>primary flare</li> </ul>                             | <ul> <li>The proximal wall has both<br/>primary and secondary<br/>bevels.</li> </ul>                                       |
| <ul> <li>Internal line angles rounded<br/>beveled Axiopulpal line<br/>angle.</li> </ul> | <ul> <li>Internal line angles are well-<br/>defined but rounded<br/>Axiopulpal line angles.</li> </ul>                     |
| <ul> <li>The reverse curve may<br/>be present</li> </ul>                                | Reverse curve absent   |

### Amalgam Onlay

- Secondary retention: Grooves, slots, pins, internal boxes, collars, reverse bevel, skirts.
- The proximal wall has both primary and secondary flares.
- Internal line angles are welldefined but beveled Axiopulpal line angle.
- Reverse curve absent

![](_page_44_Picture_0.jpeg)

### • Primary Flare:

 Divergence of the buccal and lingual proximalbox at an angle of 45 degrees

- Secondary Flare:
- Bevelling of cavosurface wall peripheral to the primary flare
- Mandatory to leave walls in a self-cleansable area interdentally

![](_page_44_Figure_6.jpeg)

| Gold Partial Restorations                                       | Cerami  |
|---|---|
| <ul> <li>Parallel cavity walls for primary retention</li> </ul> | <ul> <li>Over-tapered cavi</li> <li>Primary by cemen<br/>divergence)</li> </ul> |
| <ul> <li>Parallel or straight axial wall</li> </ul>             | <ul> <li>10-12 degrees of<br/>is beveled</li> </ul>                             |
| <ul> <li>1mm pulpal depth, 1-1.5mm cuspal reduction</li> </ul>  | • 0.5 mm of pulpal o  |
| <ul> <li>Gingival bevel placed subgingivally.</li> </ul>        | <ul> <li>Gingival bevel are</li> </ul>  |
| <ul> <li>Margins are chamfer</li> </ul>                         | <ul> <li>Margins be deep</li> </ul>   |

### c Partial Restorations

- ity walls for secondary retention; It lute (Greater than 10 degrees
- axial wall convergence and
- depth, 2mm cuspal reduction
- supragingival.
- chamfer or shoulder.

![](_page_45_Picture_7.jpeg)

# **Tips and Tricks**

- Give orientation cuts 0.5mm lesser than the required dimensions to leave space for finishing
- Always prepare cusps first in an onlay, and then move to the occlusal and the proximal segment
- Use an enamel hatchet to break the enamel shell
- Occlusal divergence is best given by no. 169L bur
- If you damage the adjacent tooth, polish it with composite strips
- Bevels are best given by flame-shaped bur kept at 45 degrees
- Use no.245 bur to keep line angles and point angles well-defined

![](_page_46_Picture_13.jpeg)

# Summary

![](_page_47_Picture_1.jpeg)

1.0-mm to 1.5-mm wide gingival floor

![](_page_47_Picture_3.jpeg)

Talent you have naturally. Skill is only developed by hours and hours and hours of beating on your craft!

-Will Smith

![](_page_48_Picture_2.jpeg)

![](_page_48_Picture_3.jpeg)

# References

Marzouk MA, Simonton AL, Gross RD. Operative DentistryModern theory & practice, 1itionst edition
Roberson ™, Heymann HO, Swift EJ.Sturdevant's Art & Science of Operative Dentistry, 5th Edition

Anusavice, Shen, Rawls. Phillips' Science of Dental Materials, 12th edition Summit JB, Robbins JW, Schwartz RS. Fundamentals of Operative dentistry. A contemporary approach, 2nd edition

• Schulein <sup>™</sup>. Significant events in the history of Operative dentistry. Journal of history of dentistry. Vol 53. No 2.2005.-63-72

![](_page_49_Picture_4.jpeg)

![](_page_50_Picture_0.jpeg)

# Thank You

![](_page_50_Picture_2.jpeg)

![](_page_50_Picture_3.jpeg)

![](_page_50_Picture_4.jpeg)