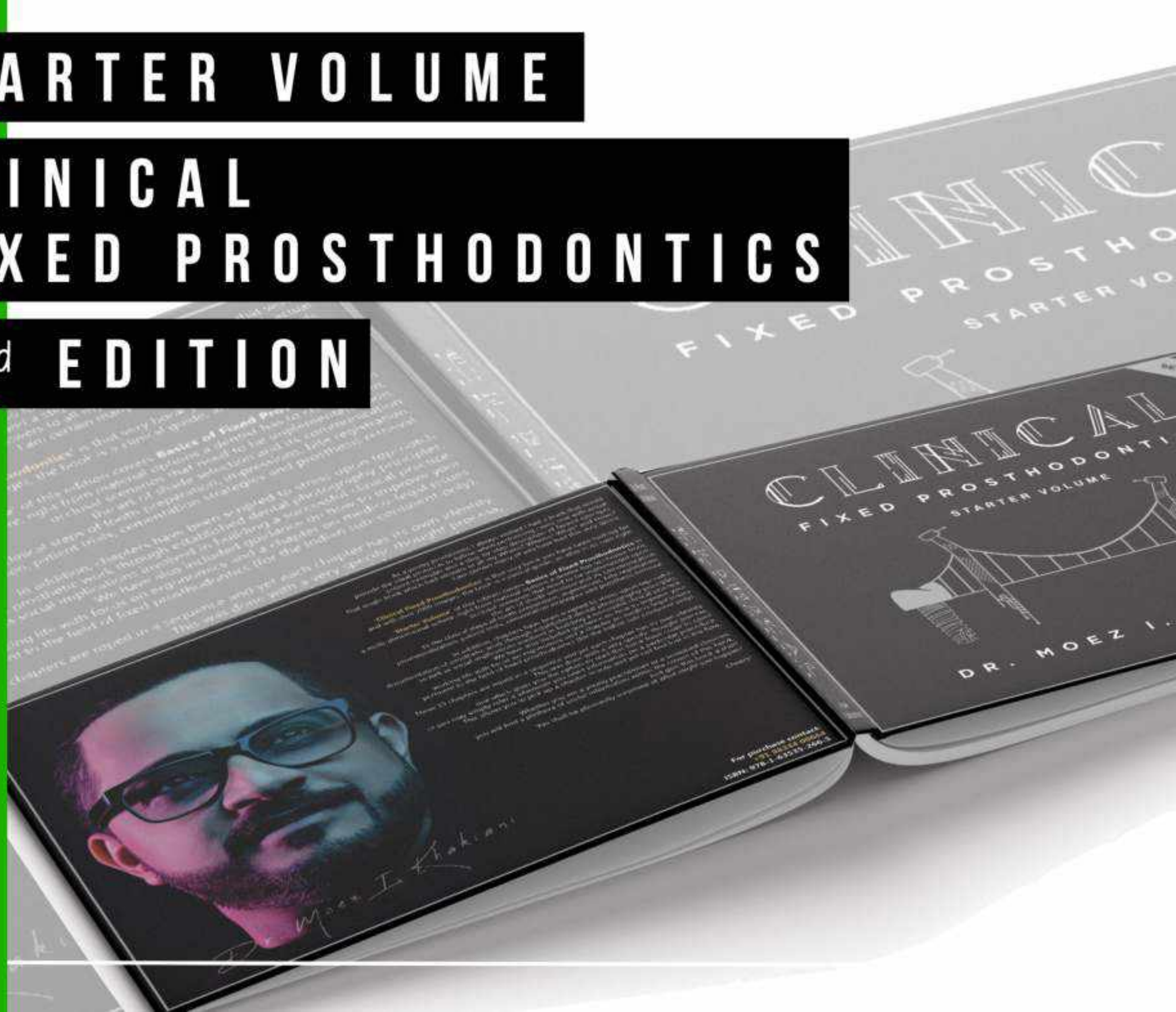
STARTER VOLUME

CLINICAL FIXED PROSTHODONTICS

2nd EDITION



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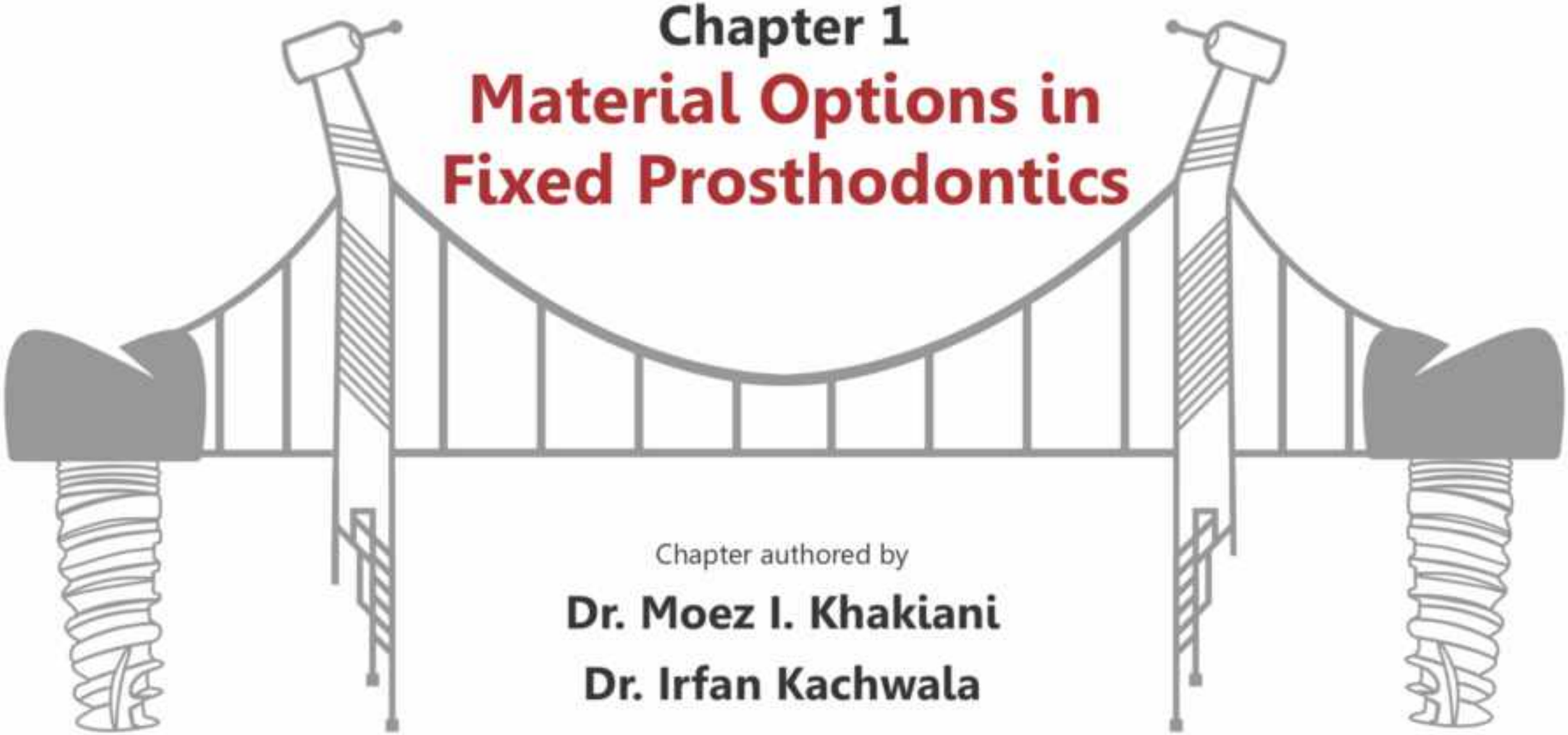

Chapter 1
Material Options in Fixed Prosthodontics

Chapter authored by

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PORCELAIN FUSED TO ZIRCONIA (PFZ) RESTORATIONS

Fig. 1.30: Cross-sectional anatomy of a PFZ crown.

In the late 1980's, zirconia was introduced to dentistry as an aesthetic substitute to metal and became synonymous with aesthetic dentistry. Alumina based restorations were the precursors to multilayered zirconia based restorations.

Advantages

- ▲ PFZ prostheses provide moderate strength coupled with moderate to high aesthetics.
- ▲ Zirconia exhibits superior mechanical properties and thus can be used in thinner sections, allowing for conservation of tooth structure.
- ▲ Zirconia copings are fabricated using the modern CAD/CAM technology.
- ▲ While the zirconium sub-structure is also opaque (white), it is much lighter in color and thus masking it is easier as compared to a PFM restoration.
- ▲ To cope with the aesthetic demands of society, zirconia core materials are now available in multiple core shades with varying translucencies. This reduces the dependence on surface staining to help achieve the desired outcome. This way, the shade matching process can begin from the core structure itself.
- ▲ If and when gingival recession occurs, the resulting visible margin would most likely be less offensive than the exposed margin of a PFM restoration.
- ▲ Zirconia is an extremely biocompatible material.

Drawbacks

- ▼ Being multi-layered, PFZ prostheses require greater preparation of the underlying tooth structure. These are however, comparatively more conservative than PFM preparations.
- ▼ Zirconia does not have a glassy phase and thus, it cannot be etched (and bonded) to the underlying tooth structure. In fact, etching with phosphoric acid worsens the prognosis (explained further on page no. 235).
- ▼ Chipping of the layered ceramic is a common occurrence with PFZ restorations (as the porcelain-to-zirconia bond is relatively weak). Anatomically reduced copings can be used to lower this possibility. Case 8 (next page) shows a PFZ coping fabricated using the anatomically reduced concept.
- ▼ PFZ bridges require large connectors to avoid failure in the form of breakages. This can have negative biological implications on the interdental papillae leading to recession and food lodgement.
- ▼ PFZ restorations are more expensive than PFM/LiDiSi prostheses.

Indications

- ▶ PFZ restorations are indicated for anterior crowns and bridges (tooth and implant supported) in patients with moderate to high aesthetic demands, especially in cases where PFM restorations do not meet the aesthetic requirements.
- ▶ PFZ restorations are indicated for posterior crowns and bridges in patients with low to moderate functional demands.
- ▶ They are indicated for teeth with compromised bonding surfaces (large restorative fillings).
- ▶ They are indicated for discolored teeth, teeth with metallic restorations (amalgam, cast post and core) or metal (implant) abutments. In such situations, a more opaque/white coping should be used rather than the more translucent zirconia alternatives.
- ▶ They are indicated for patients with base metal allergies.

Contraindications

- ◀ PFZ prostheses are contraindicated in patients with parafunctional habits owing to the high possibility of porcelain fracture.
- ◀ Contraindicated for partial coverage restorations such as veneers, inlays, onlays, maryland bridges (which ideally need bonding).

Table 1.1: Comparison between various prosthetic material options. ✔ Advantage/Indication; ✘ Drawback/Contraindication

	Tooth Preparation	Strength	Aesthetics	Multi-unit Bridge		Partial Coverage Restorations	Discolored Tooth	Bruxer	Decreased Inter-occlusal Space	Laboratory Cost	Ease of Adjustment	Retrievability
				A	P							
PFM	✘✘	✔	✔	✔✔	✔✔	✘✘	✔✔	✔	✘✘	✔✔	✔✔	✔
PFZ	✘	✔	✔✔	✔✔	✔✔	✘✘	✔✔	✔	✘✘	✘	✔✔	✘
Layered Lithium Disilicate	✔	✔	✔✔✔	✔	✘	✔	✘	✘	✘	✔	✔✔	✘
Monolithic Lithium Disilicate	✔✔	✔✔	✔✔	✔	✘	✔✔✔	✔	✔✔	✔	✔	✔✔	✘
Monolithic Zirconia	✔✔✔	✔✔✔	✔	✔	✔	✔	✔✔	✔✔	✔✔	✘✘	✘✘	✘✘
Monolithic Metal (base metal)	✔✔✔	✔✔✔	✘✘	✘	✔✔	✔	✔✔	✔✔	✔✔	✔✔✔	✘	✔✔

Lithium disilicate restorations are fabricated using one of the following two processes:

Fig. 1.47: IPS e.max CAD block.

a. CAD/CAM MILLING

This involves chairside designing and fabrication of prosthesis where a block of LiDiSi is subjected to subtractive milling. This is then stained and glazed to achieve the final restoration.

b. HEAT PRESSING

This method is similar to the lost wax technique. It involves the fabrication of a wax pattern, which is invested and burnt-out. This leaves a mould into which the molten lithium disilicate is pressed. The restoration is then retrieved, finished, stained and glazed prior to its insertion.

Fig. 1.48: Cental incisor fabricated using the heat pressing technique.

LiDiSi restorations can be used in one of the following three designs (Fig. 1.46) based on the clinical requirement:

✦ MONOLITHIC

These are homogeneous LiDiSi restorations and depend on surface staining for an aesthetic outcome. Owing to it's monolithic nature, they enjoy the best mechanical properties and are usually used for restoration of posterior teeth.

✦ LAYERED

In this type, a LiDiSi coping is first heat pressed and then layered with compatible porcelain. Although, layering helps achieve lifelike aesthetics, it does reduce the overall strength of the prosthesis. Thus, layered LiDiSi prostheses are usually restricted for use in high demand aesthetic cases with stable occlusion.

✦ CUT-BACK

In this type, the monolithic restoration is cutback at the incisal edge and layered with compatible porcelain (to achieve aesthetics). Thus, cut-back prostheses have advantages of both, the monolithic and the layered design.

IPS e.max from Ivoclar Vivadent is the most widely used LiDiSi material globally. It is available in various translucencies and opacities:

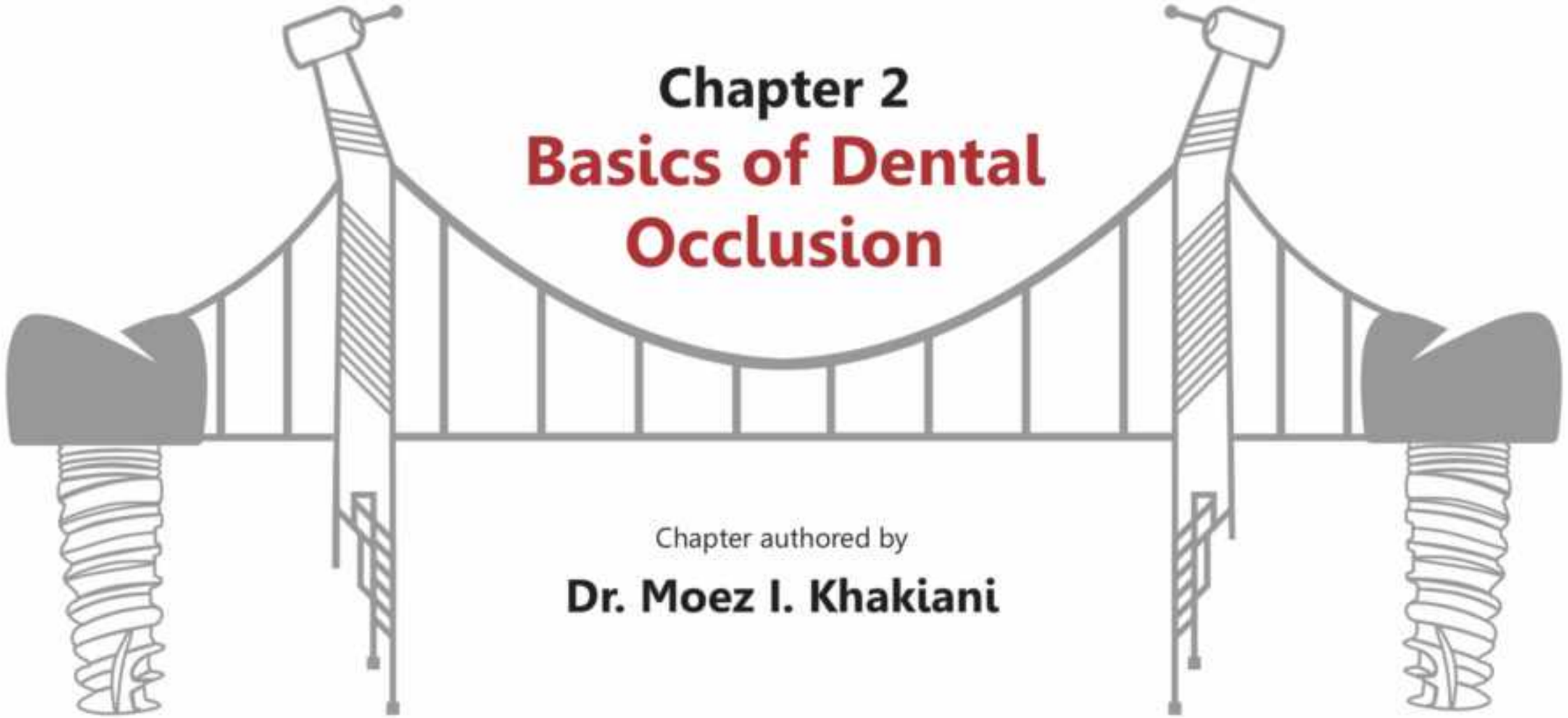
- HT (High translucency).
- MT (Medium translucency).
- LT (Low translucency).
- MO (Medium opacity).
- HO (High opacity).
- Impulse: Exhibits increased opalescence.
- Multi: Has a natural gradation of shade (from enamel to dentin).

Opacity of the ingot is chosen on the basis of the color of the prepared tooth, the thickness of the restoration and the desired optical properties.

CASE 10: COSMETIC REHABILITATION USING LiDiSi RESTORATIONS

Fig. 1.49: Pre-treatment view. Anterior teeth are planned for a combination of partial and full coverage restorations as part of a full mouth rehabilitation. Crown lengthening was planned on 21 and 22.

Fig. 1.50, 1.51: Maxillary and mandibular wax patterns ready for heat pressing.



Chapter 2
Basics of Dental Occlusion

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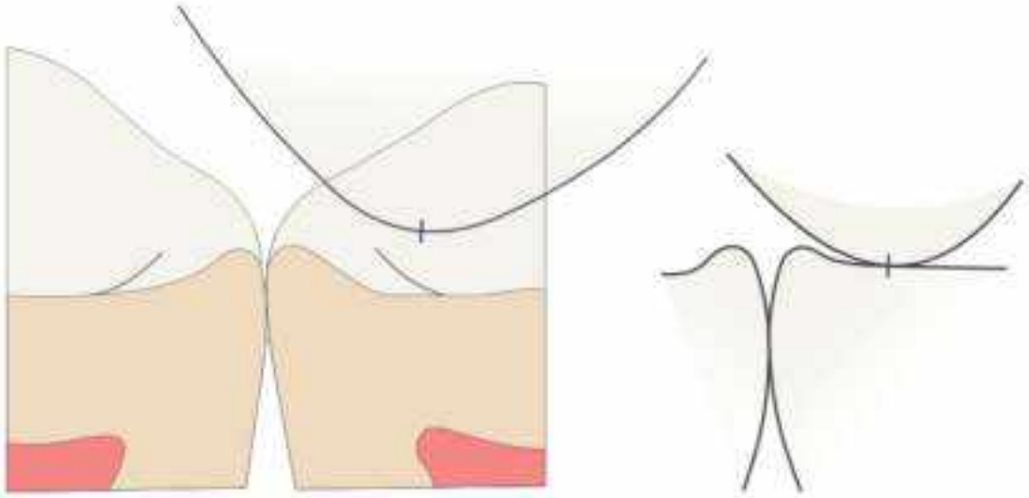

Fig. 2.4, 2.5: Cusp tip-to-central fossa and cusp tip-to-marginal ridge contact amongst posterior teeth at MIP.

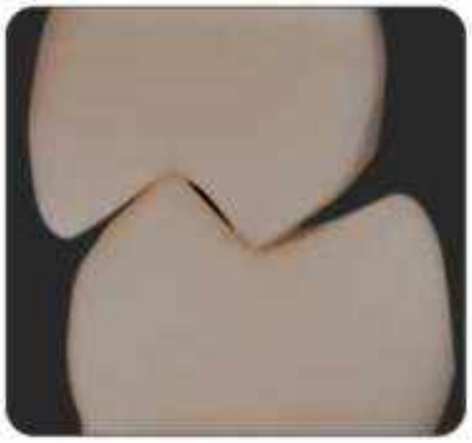

Fig. 2.6: Cusp tip-to-central fossa contact. Note, incline surfaces of teeth do not physically contact each other and that contact occurs only at the cusps tip and the fossa base.

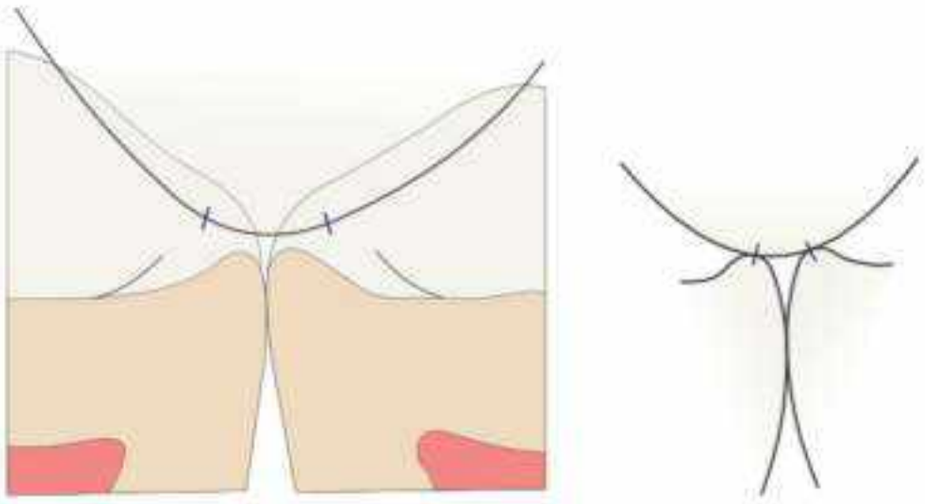

Fig. 2.7, 2.8: Alternately, cusp tip-to-central fossa and cusp tip to occlusal embrasure contact may occur amongst posterior teeth at MIP.

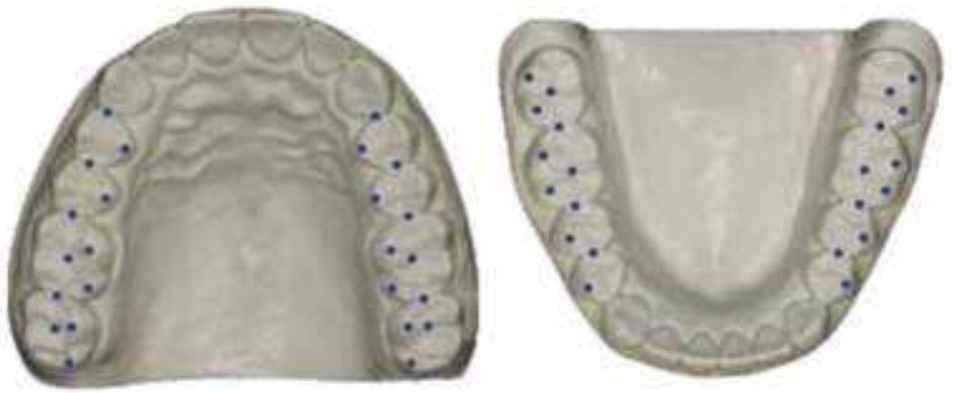

Fig. 2.9, 2.10: Cusp tip-to-central fossa and cusp tip-to-occlusal embrasure contact amongst posterior teeth at MIP.

Chewing strokes always begin and conclude at these static stops. Thus the presence of these stops is paramount to ensure functional efficiency, to maintain the stability of every individual tooth and to maintain the overall vertical dimension of occlusion.

Although MIP is a fundamental concept, paradoxically it is not a position where teeth meet for a considerable period of time. Assuming that one is in a reasonably relaxed state of mind, empirical data suggests that the teeth meet in MIP for a mere 17.5 minutes per day. This includes approximately 1800 chewing and about 500 swallowing contacts. At other times through the day (and night) the mandible is at rest, thereby leaving a gap between the teeth (freeway space).

b. ANTERIOR TEETH

It is important that anterior teeth also contact at MIP in order for them to provide **immediate** functional disclusion of posterior teeth during all excursive movements. However the intensity of this contact is usually slightly less, in order to avoid over-loading them.

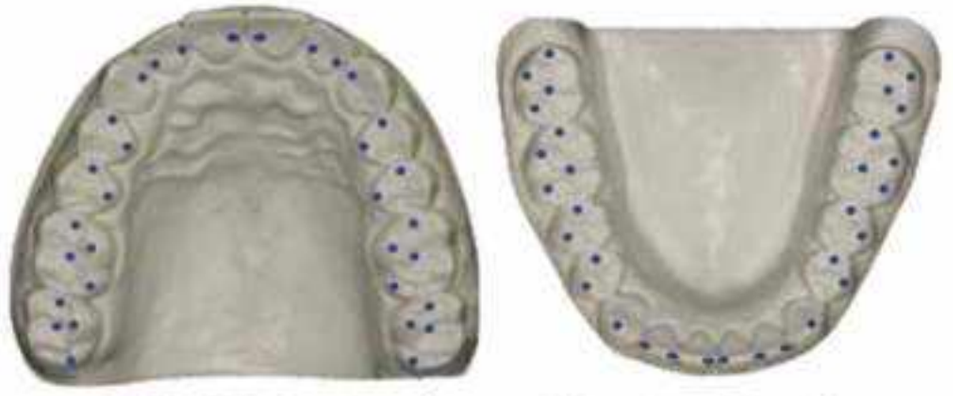

Fig. 2.11, 2.12: Anterior tooth contact (of lesser intensity) at MIP.

Fig. 2.24, 2.25: In Mutually Protected Occlusion, the posterior teeth meet only during MIP (dots), while in all excursive movements, the maxillary and mandibular anterior teeth bring about immediate disclusion of all posterior teeth (lines). Thus, MPO is characterized by 'dots at the back and lines in the front' and is considered to be the most physiologic form of occlusion for the natural dentition.

Chapter 3
Shade Selection and Communication

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ATTRIBUTES OF COLOR

There are three attributes by which color can be identified and communicated.

Hue is what one normally thinks of when describing color. Red, purple, blue, etc.

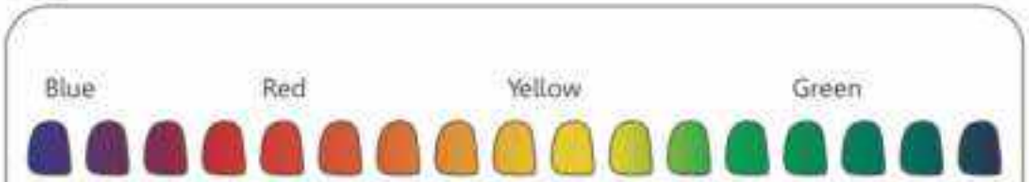


Fig. 3.4: Hue

Chroma (Saturation) describes the strength or dominance of the hue.

Fig. 3.5: Chroma

Value describes how bright or dull a color is. If a material reflects most of the light falling on its surface, it appears bright, i.e. it has a high Value. Conversely, a dark object absorbs most of the incident light and appears dull, i.e. it has a low Value.

Between the two extremes (white and black), a gradation of Value exists and is termed as the 'grey-scale'. Value is the only dimension of color that can exist by itself and is **the most important** determinant when selecting a shade in the patients mouth.

Fig. 3.6: Value

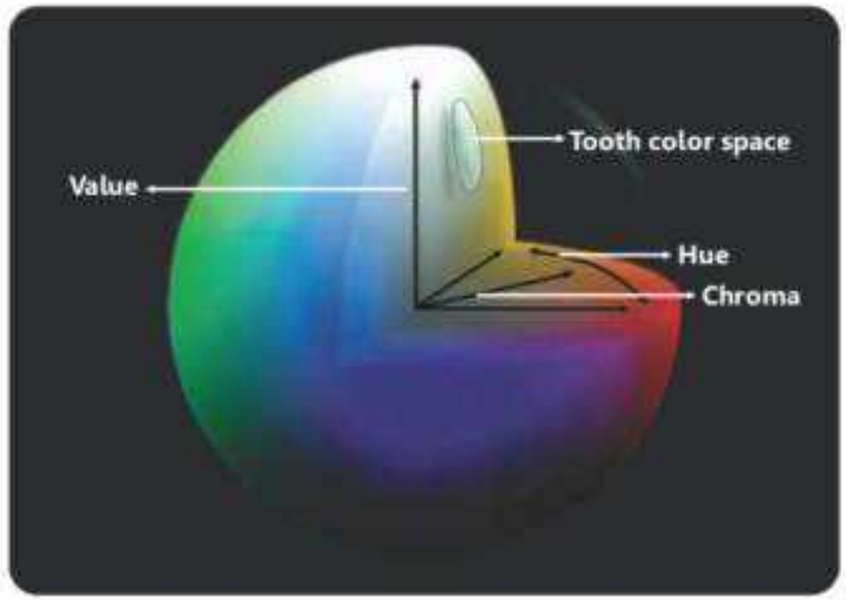
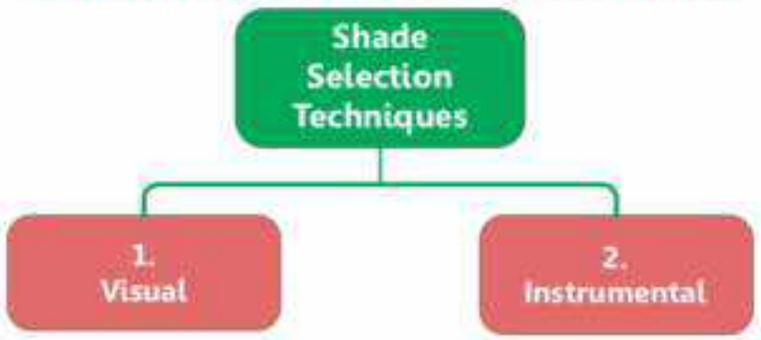


Fig. 3.7: Value, Chroma and Hue are those characteristics on the basis of which all natural shades can be uniquely defined. The entire color spectrum can be represented as a sphere; wherein the natural tooth shades fall into a small section in the yellow-red range, as shown above.

TECHNIQUES FOR SHADE SELECTION



1. VISUAL METHOD

SHADE GUIDES

The role of a shade guide is to help standardize the perception of tooth color and facilitate its communication with the dental laboratory. Although shade guides are not exact replicas of natural teeth, they have a similar distribution in the color space; allowing the technician to fabricate prostheses that can resemble the reference tooth.

In order to avoid confusion, it is important that the clinician and the laboratory technician use the same shade guide.

e. Natural Die Material Shade Guide

When using LiDiSi or translucent zirconia (for a crown or a PLV), communicating the shade of the prepared dentin is of paramount importance, especially if the underlying tooth is discolored.

Fig. 3.27: IPS Natural Die Material Shade Guide from Ivoclar Vivadent.

The Natural Die Material shade guide from Ivoclar Vivadent has 9 shade tabs to help communicate the stump shade with the laboratory. The company provides die stone in each specific shade (hence the name of the guide). Such a provision allows the technician to gauge the optical properties of the final restoration as influenced by the underlying tooth shade.

Unlike other shade guides, the dentin shade guide is to be used after the tooth has been prepared. This is because, certain discolorations darken as the tooth is prepared deeper into dentin, while others show a decrease in chromacity.

Fig. 3.28: Natural die material shade guide being used to record the stump shade. Note: Three different tabs used to communicate the complex underlying tooth shade.

GENERAL PRINCIPLES FOR SHADE SELECTION

Innumerable variables can influence the shade selection process. Thus, standardization of certain aspects can help eliminate or reduce the possibility of errors.

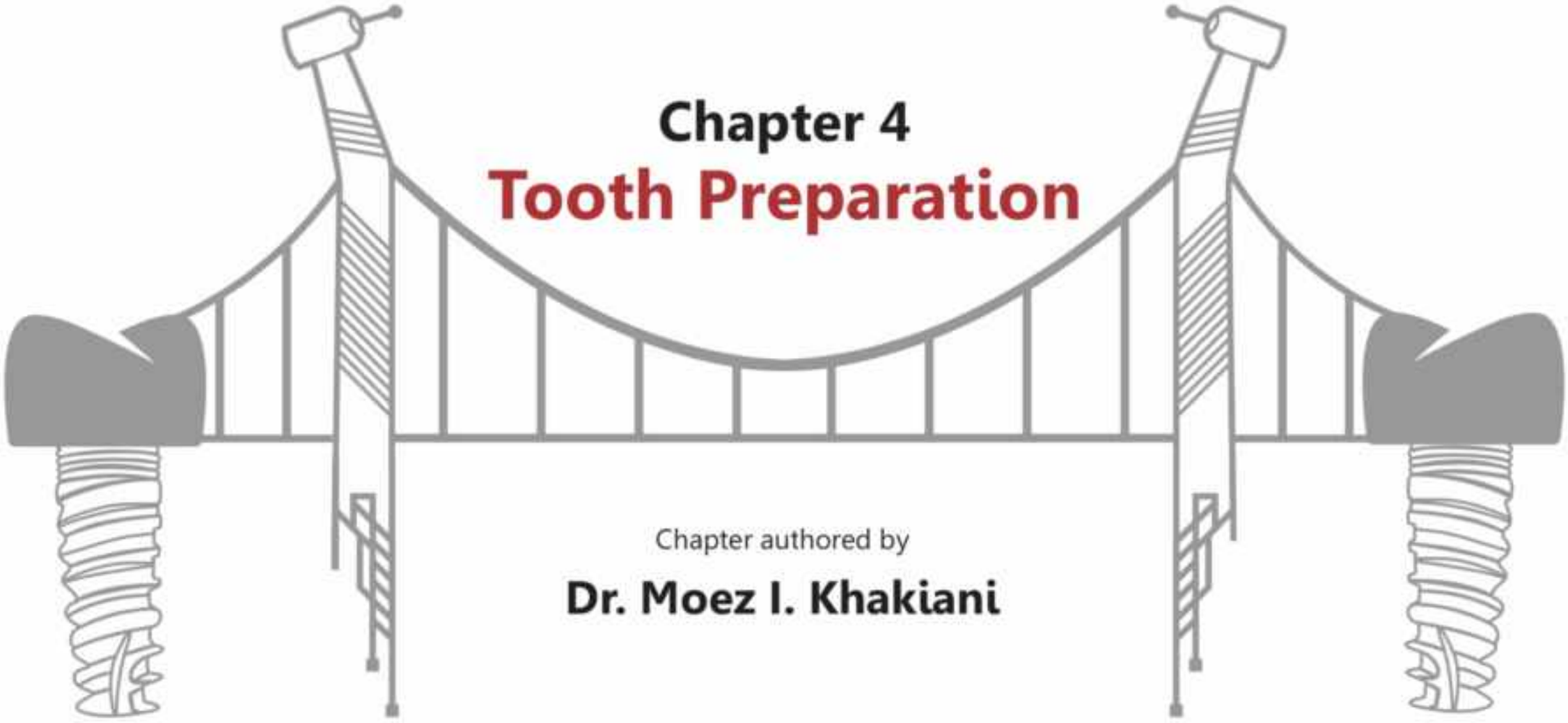
It is prudent to select shade at the start of the appointment. This is because:

- Through the duration of treatment, teeth tend to dehydrate as the mouth is kept open. This alters the value and chroma of the tooth. Desiccated teeth often take more than 24 hours to regain their normal color.
- Through the duration of treatment the eyes tend to fatigue, thereby compromising our ability for correct shade selection. The dental chair light can cause glare, adding to the fatigue.

This is exactly the reason why shade selection chapter has been sequenced before the chapter on tooth preparation in this book.

STANDARDIZATION PRIOR TO SHADE SELECTION

- The chair light should be turned off or pointed in another direction.
- Patient should be draped with a neutral colored bib (grey/blue).
- Teeth must be cleaned, as the presence of plaque or stains can mask the true shade of the tooth.
- Shade selection should ideally be done in natural day light. If this is not possible, color corrected light must be used which have a temperature of 5000-6000° K.
- It benefits to have a chair-side associate who can help confirm the shade (especially helpful for clinicians who may suffer from color blindness).
- Lipstick, eye wear or other make-up should be removed, because any color (which is not neutral) has the potential to cause chromatic adaptation, leading to an error in shade selection; as shown in Fig. 3.29 on the right.



Chapter 4
Tooth Preparation

Chapter authored by

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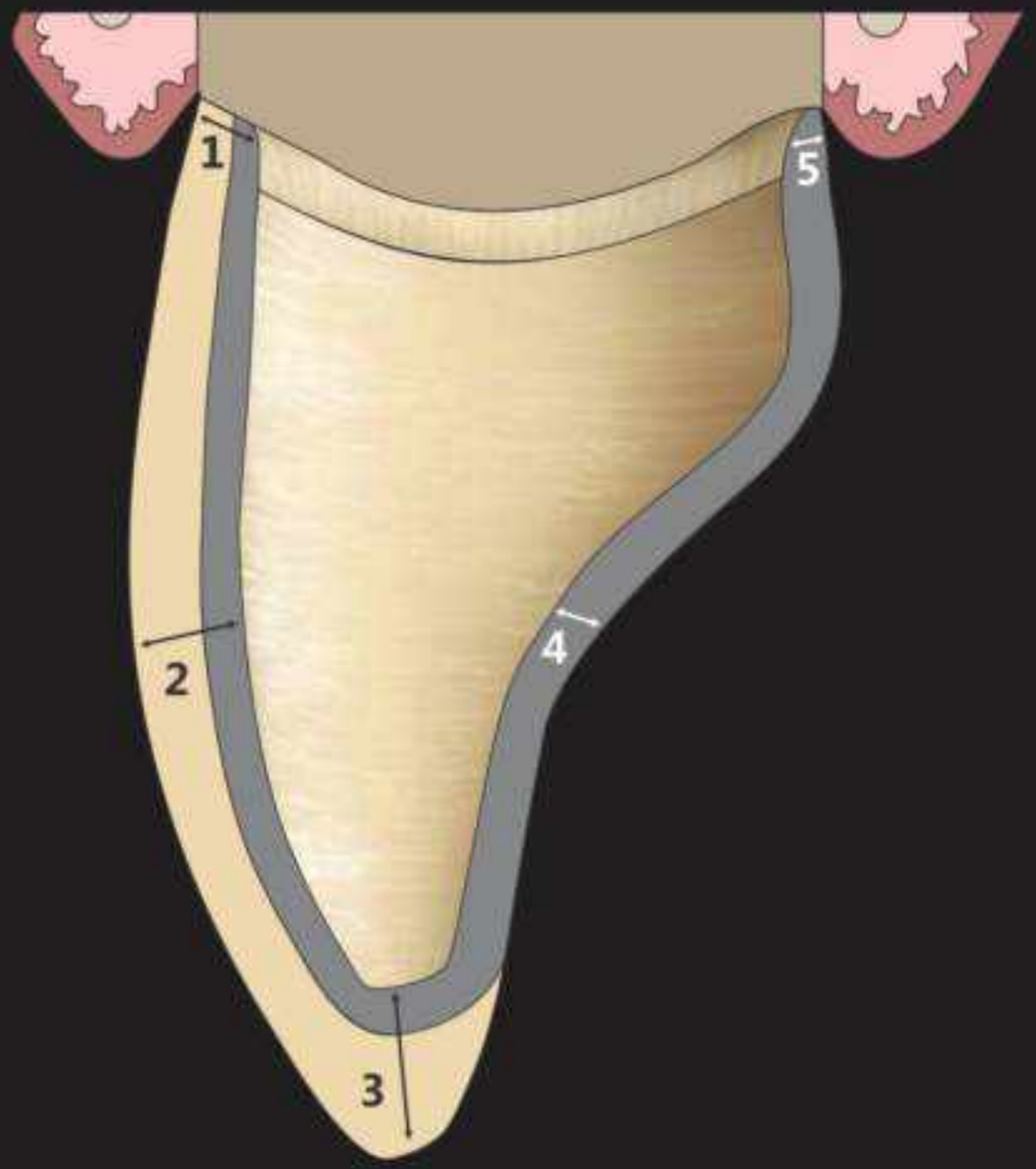
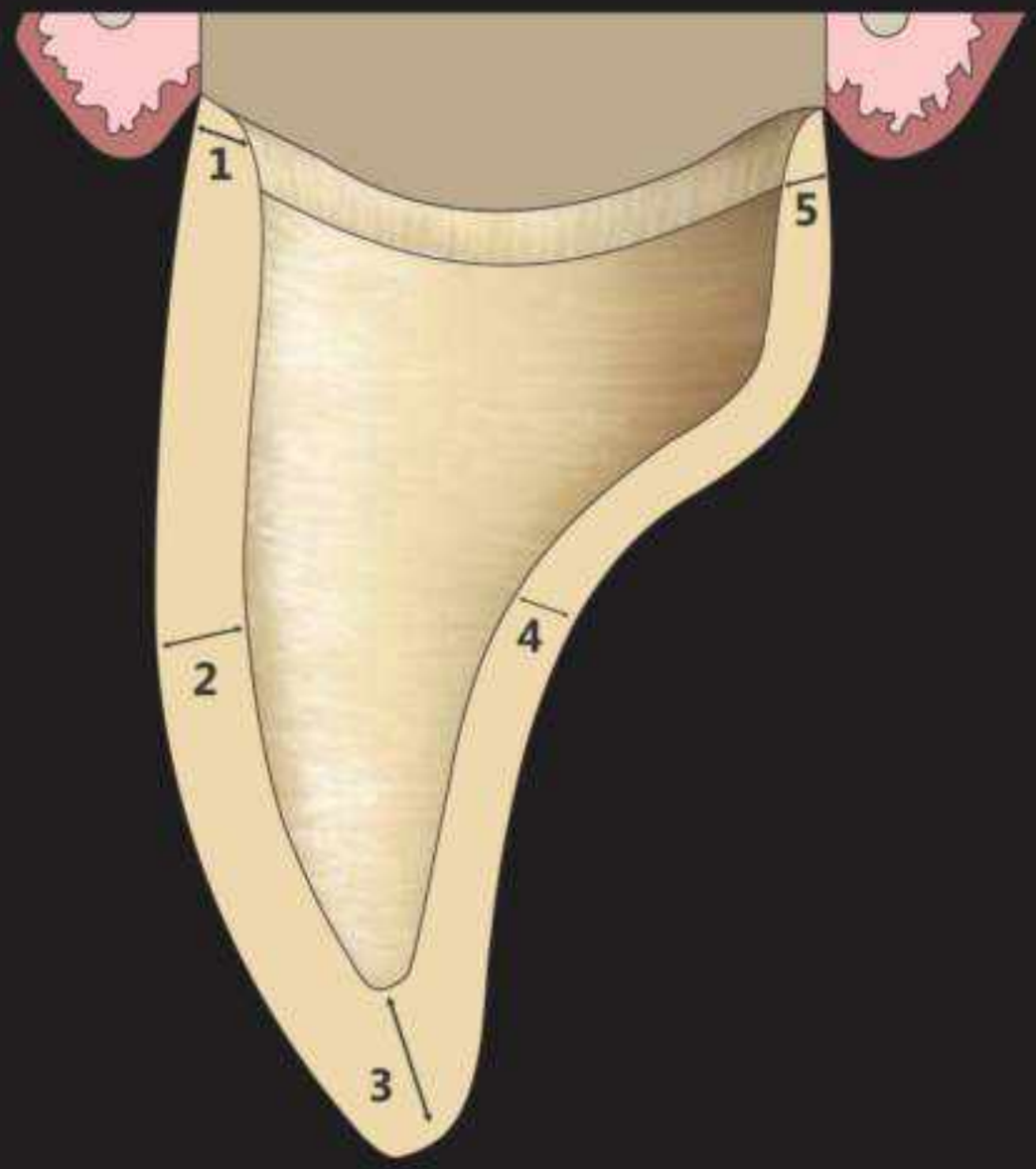
Fig. 4.2: **AVERAGE REDUCTION REQUIRED FOR A PFM FACING CROWN: ANTERIOR TOOTH**



1.	Labial margin	1.0-1.2 mm
2.	Labial surface	>1.5 mm
3.	Incisal edge	about 2.0 mm
4.	Palatal/lingual surface	0.5 mm
5.	Palatal/lingual margin	0.5 mm

Fig. 4.3: **AVERAGE REDUCTION REQUIRED FOR A METAL FREE (LiDiSi/PFZ) CROWN: ANTERIOR TOOTH**



1.	Labial margin	0.8-1.0 mm
2.	Labial surface	1.2-1.5 mm
3.	Incisal edge	about 2.0 mm
4.	Palatal/lingual surface	0.5-0.8 mm
5.	Palatal/lingual margin	0.5-0.8 mm

IMPORTANCE OF FINISHING THE PREPARATION

Regardless of the bur used (medium or coarse grit) to prepare the tooth, it is imperative to finish the preparation with a red ring bur. This bur helps in achieving a smooth surface finish to the preparation and also helps in rounding off all point and line angles.

Smooth axial walls allow the impression material to flow and record the details of the preparation with accuracy, while also reducing the sensitivity that immediately follows cementation. In addition, a smooth preparation margin helps to minimize the marginal opening (which is common with the use of layered porcelain that undergoes shrinkage when fired). A rough margin would result in a larger amount of microleakage at the tooth-prosthesis interface which in turn compromises the long term prognosis for the tooth.

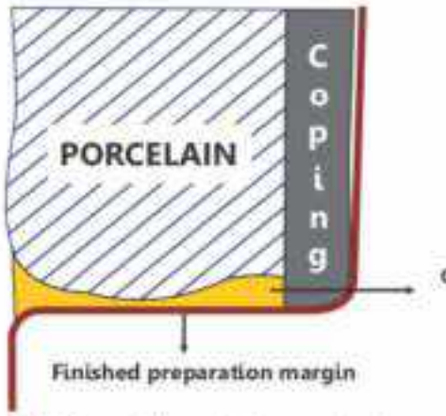


Fig. 4.57: A small marginal opening is a common clinical finding with most porcelain based prostheses. With a smooth margin, this gap can be kept within acceptable limits.

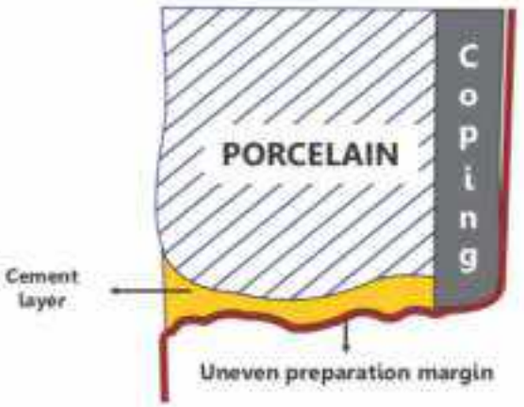


Fig. 4.58: When the preparation margin is uneven, it is difficult to achieve the desired margin seal. In such situations, the cement layer is exposed to the oral cavity where it could undergo dissolution, thereby resulting in a frank open margin overtime. Such a margin is an ideal incubation center for plaque, that in time results in deleterious effects like sensitivity, periodontal breakdown, secondary caries, pulpal inflammation and possibly even abutment tooth fracture in long-standing cases.

NOTE: Polishing the preparation with a yellow ring bur is not advisable (except for Partial Bonded Restorations). This is because, a glassy smooth tooth surface cannot generate the frictional resistance required to retain a cemented prosthesis, thereby increasing the possibility of frequent decementation of the luted restoration.

PREPARING A MARGIN IN DIFFICULT TO ACCESS AREAS OF THE ORAL-CAVITY

One of the primary concerns when working in difficult to access areas of the oral cavity or in patients with decreased mouth opening is the interference caused (to the head of the handpiece) by the occlusal surface of the antagonist tooth.

In such situations, a common mistake made by the dentist is to ask the patient to open their mouth as wide as possible. With time as the elevator muscles tire, the mouth opening progressively decreases. In addition, with the mouth open wide clinicians often find themselves trying to overpower the stretched masseter and buccinator muscles (with their retracting arm), in an attempt to gain access to the buccal aspect of the tooth. All-too-common an occurrence in such a scenario, is the bur slipping off the tooth and lacerating the buccal mucosa, further compromising the work field.

There are three approaches to help counter this common clinical situation. These can be used alone or in combination:

Approach 1: Instead of opening wide, have the patient open their mouth about half way and then move the mandible laterally (towards the same side as the tooth being prepared). This takes the antagonist tooth away from the long axis of the hand piece head, thereby providing adequate access. In addition, as the patient moves the mandible sideways, the masseter and buccinator muscles are also drawn away from the tooth in question. This reduces the effort made by the non-working hand and almost completely eliminates the possibility of inadvertent damage to the buccal soft-tissue.

Approach 2: Use the DC 1.0SS bur. This is a super short shank bur (shortest bur in the MIK Dental kit), where the total length of the bur has been reduced to allow greater access in difficult to reach areas of the oral cavity.

Approach 3: Use of a hand piece where the head is angled in relation to the long axis of the body, as seen in Fig. 4.59 on the right.

4. OCCLUSAL PREPARATION

Desired amount of preparation: Functional Cusp: about 2mm; Non-Functional Cusp: about 1.5 mm

Burs used: OR 1.6 and OR 1.2 (Cluster 4)

It is often said, a preparation should look like a miniature of the original and this mainly holds true for the occlusal aspect.

When reducing the occlusal aspect, it is imperative to follow the pre-existing cuspal inclines and contours.

The occlusal surface of a mandibular first molar has a small distal cusp. This cusp often gets reduced as part of the proximal preparation and no special efforts are made at recreating this cusp during the preparation.

For those who find working this aspect of the preparation difficult, it would help to visualize (or even mark) the occlusal ridges and desired reduction contours on the tooth.

Fig. 4.93: Two dots are marked on the buccal aspect which represent the future cusp tips.

Fig. 4.94: These two dots are joined together in the form of a valley. This represents the outline of the desired reduction in this area.

Fig. 4.95: The marks then are extended towards the proximal surface to develop a two mountain pattern that roughly represents the architecture of the final occlusal reduction desired.

Fig. 4.96: Three marks are made on the occlusal aspect along the mesiobuccal cusp ridge, the buccal developmental groove and the distobuccal cusp ridge. We shall be using these three marks to make depth grooves by sinking the bur along their length.

Fig. 4.97: All markings made as seen from an angular view. Once all the marks are made, it is time to use these to help anatomically reduce the occlusal aspect.

1. LABIAL PREPARATION

Desired Amount of Preparation: Margin: 0.8-1 mm; Axial Surface: 1.2-1.5 mm

Margin Architecture: Deep Chamfer

Bur used: DC 1.4 (Cluster 2)

The labial surface of a maxillary central incisor has two planes- the gingival plane and the incisal plane. It is imperative to ensure that the final preparation has adequate reduction in both these planes.

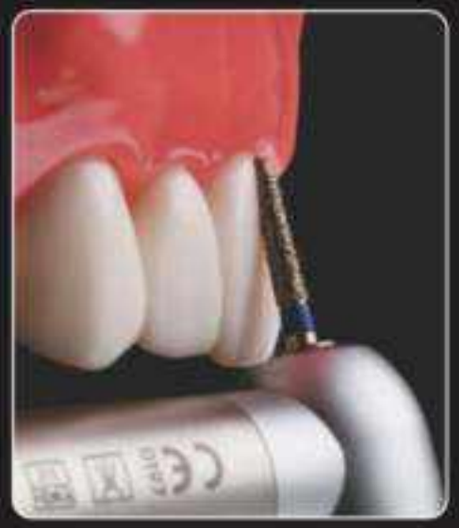


Fig. 4.135: Using a DC 1.4 bur, a depth groove is made in the gingival plane (in the center of the tooth) by sinking the bur tip to half its diameter.

Sinking the bur any deeper carries the risk of developing a lip of unsupported enamel at the margin.

Placing depth grooves before embarking on larger areas of tooth reduction helps achieve controlled removal of tooth structure.

Fig. 4.136: Two additional grooves are then made (in the gingival plane) along the mesial and distal line angles of the tooth. Note, how the depth grooves shallow out (and eventually fade away) as they approach incisally where the facial curvature of the surface is the greatest.

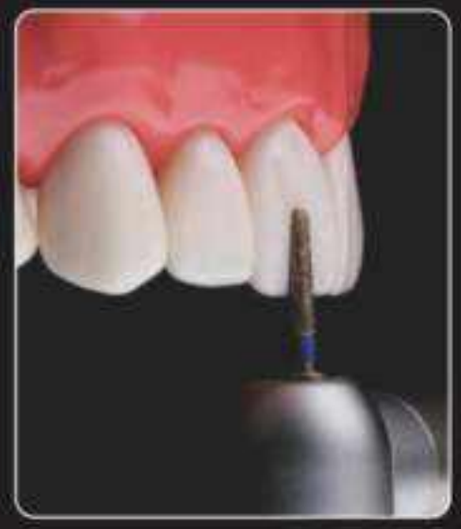
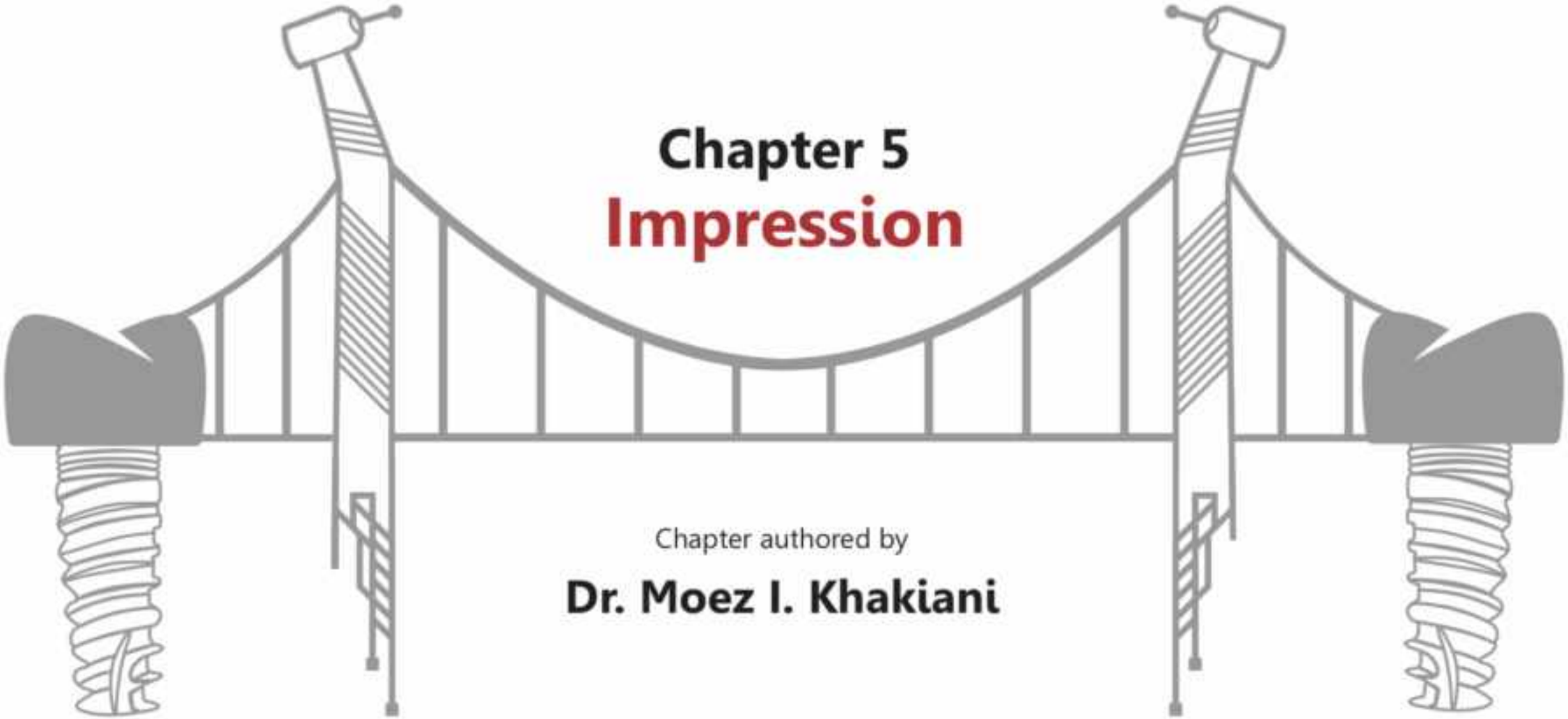


Fig. 4.137: Using the same bur, a depth orientation groove is then made in the incisal plane. Here again, the bur tip is sunken to only half its diameter.

Fig. 4.138: Two or more depth grooves are placed in the incisal plane (depending on the width of the labial surface).

Fig. 4.139: Depth grooves along the two planes can be clearly distinguished.



Chapter 5
Impression

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Preparing the light body cartridge

Syringe delivery of light body involves the use of a hand dispenser, a mixing tip, an intraoral tip and a light body cartridge. This section describes the steps to prepare the light body cartridge.

Fig. 5.57: First, the lever at the back end of the dispenser is pushed upwards to release the plunger. Holding the release lever in position, the plunger is pulled as far back as possible.

Fig. 5.58: Next, the cartridge lock on the dispenser is lifted up.

Fig. 5.59: The V-Notch on the dispenser is located.

Fig. 5.60: The cartridge is then inserted into this V-notch.

Fig. 5.61: The cartridge lock is then pushed down. The cartridge is now secured in position.

Fig. 5.62, 5.63: To remove the cartridge cap, it is rotated 90° counter clockwise.

Fig. 5.64: The cap is then released from the cartridge using firm downward pressure.

Fig. 5.83: First, putty is mixed and loaded into the tray. The pre-cut sheet is then placed on top of it and the assembly is seated into the patient's mouth. Portion of the sheet that extends beyond the tray should be folded to prevent tissue irritation while seating. Variotime from Heraeus Kulzer was used for this documentation.

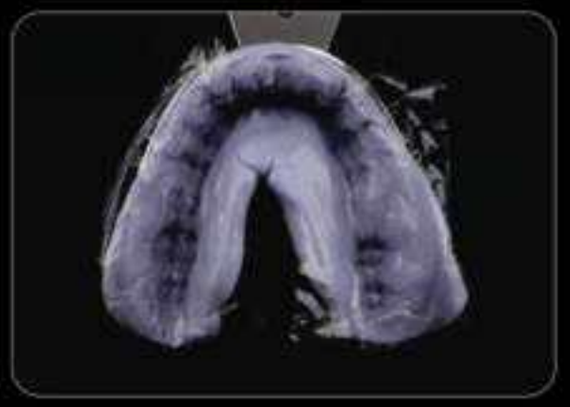

Fig. 5.84: The set putty material records the prepared teeth with the foil interposed between them.

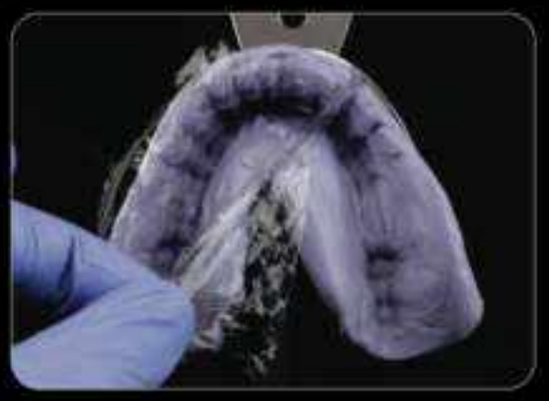

Fig. 5.85: The foil spacer is then peeled off, creating a custom tray in putty.

Fig. 5.86: Following intra-oral isolation, the space created in the impression is then filled with light body and the tray is re-inserted into the patient's mouth slowly. Excessive pressure should not be applied as this can displace the light body, causing putty-tooth contact. This would defeat the very purpose of recording a two-step impression.

Fig. 5.87: The final impression shows all hard and soft tissues recorded in detail by the light body material.

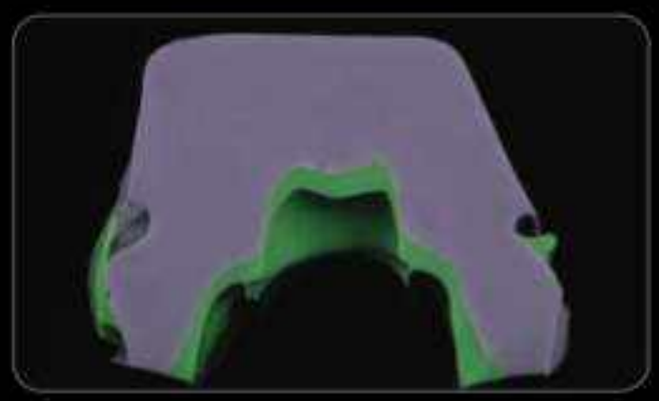

Fig. 5.88: Cross section of the two-step impression shows how details are recorded by the light body material, while the putty/heavy body comprises bulk of the impression.

Chapter 6
Bite Registration

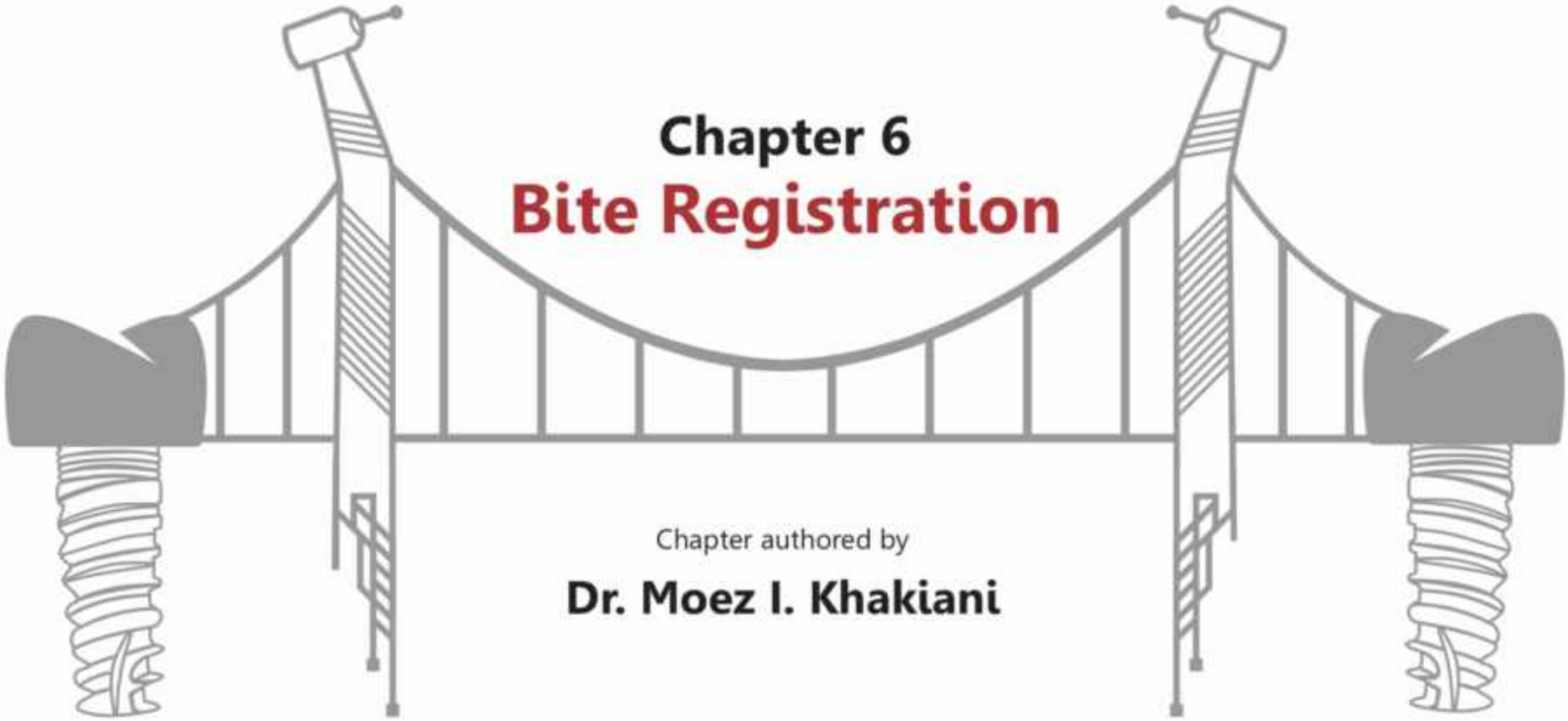

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Fig. 6.4: **Scenario 2:** The two distal most teeth are prepared.

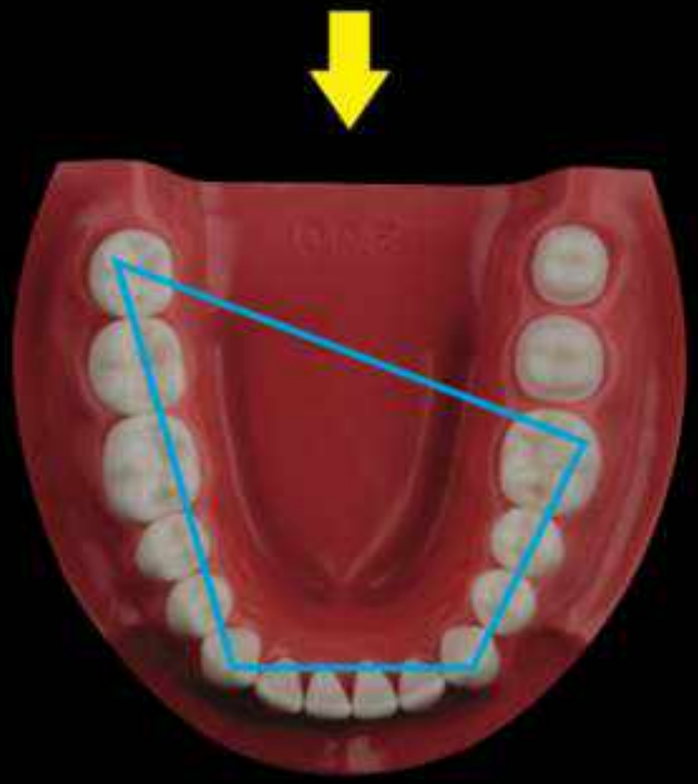

Fig. 6.5: In this situation, there is no occlusal contact posterior to the distal most prepared tooth. Hence, the desired stability during mounting of the cast is deficient and such a case would benefit from bite registration.

Fig. 6.6: **Scenario 3:** In this situation, all three molars in one quadrant have been prepared. Here, the stability on the prepared side is grossly deficient making it difficult for the technician to judge the amount of clearance provided; thereby significantly increasing the possibility of erroneous mounting. Such cases would definitely need a bite registration.

Fig. 6.7: **Scenario 4:** In this situation, teeth have been prepared to receive a bridge. However, there is a tooth distal to the posterior abutment providing a stable occlusal stop. Thus, the four points of contact for accurate mounting are present and such cases would not need bite registration.

Chapter 7
Provisionalization

Chapter authored by

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Technique for use

Fig. 7.14: The polymer and monomer are mixed in a flexible silicone cup (provided with the kit).

Fig. 7.15: The creamy mix is then loaded into the index.

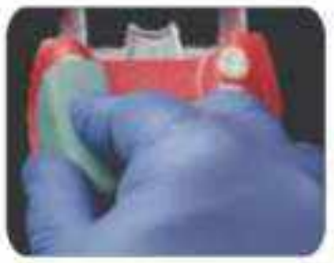

Fig. 7.16: The index is seated intra-orally and held under positive pressure for about 3-4 min.

Fig. 7.17: The provisional is removed before complete polymerization and dipped in and out of hot water several times to prevent shrinkage.

Fig. 7.18: Excess material is then trimmed using carbide burs and the provisional is finished/polished using composite discs/spirals.

Fig. 7.19: Final provisional is luted intra-orally using a temporary cement.

PASTE-PASTE FORMULATION

The paste-paste formulation was introduced into the dental market as an attempt to overcome the various drawbacks associated with the use of the powder-liquid formulation. Over the years, this system has become the global standard for chair-side fabrication of provisional restorations.

Fig. 7.20: Few provisionalization materials available in the paste-paste form.

A: Protemp 4 from 3M;
B: Structur 2 SC from Voco;
C: Cool Temp from Coltene;
D: Luxatemp from DMG;
E: Integrity from Dentsply.

Advantages

- ▲ The material is associated with minimal heat generation during polymerization.
- ▲ It undergoes considerably less polymerization shrinkage.
- ▲ As no powder-liquid is used there is no monomer smell.
- ▲ It has good edge strength and aesthetics.
- ▲ It is less porous, thereby shows less bacterial contamination.
- ▲ The auto-mix delivery option assures consistent mixing.
- ▲ It can be patch repaired using regular composite resins.

Drawbacks

- ▼ It is more costly than acrylic materials.
- ▼ It shows formation of a sticky oxygen inhibited layer that can result in plaque accumulation and surface staining.
- ▼ It is more brittle than acrylics.
- ▼ It has limited working time, especially for multi-unit prostheses.

Technique for use

SINGLE UNIT PROVISIONAL

Fig. 7.21: Index fabricated using C-Silicone putty prior to preparation of tooth no. 11. Optosil; C-Silicone from Heraeus Kulzer was used for this documentation.

Fig. 7.22: Following tooth preparation, the index is prepared by slicing off the unwanted soft-tissue portion.

Chapter 8
Coping Trial

Chapter authored by

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Fig. 8.13, 8.14: In a bridge scenario, the copings are to be evaluated for any rocking on the cast, as shown above. Any lack of stability calls for the framework to be re-fabricated.

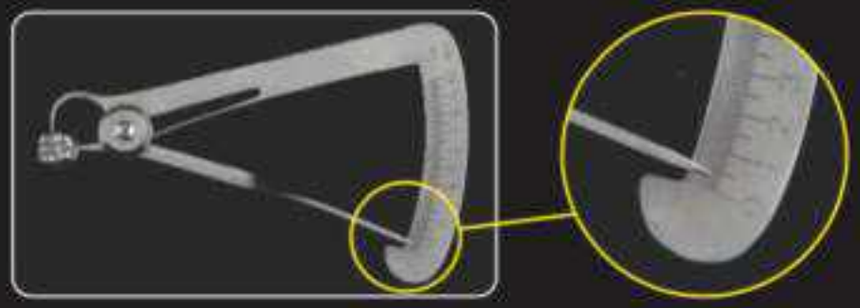


Fig. 8.15: The average coping is between 0.3 to 0.5 mm in thickness and is to be evaluated using a metal calliper (Iwanson gauge). Thinner copings tend to flex under function (especially multi-unit bridges), increasing the possibility of porcelain fracture (which is brittle and does not flex). On the other hand, an excessively thick coping encroaches into the space designed for porcelain, again increasing the possibility of fracture.

Only once the pre-appointment evaluations are completed and the coping is deemed fit for trial, should the patient be scheduled for the coping trial appointment.

AT THE COPING TRIAL APPOINTMENT: First, the provisional restoration is to be retrieved and all residual provisional cement is to be removed completely. Any left-over cement prevents seating of the coping and can give erroneous findings.

Here again three aspects need to be evaluated:

A. MARGIN FIT

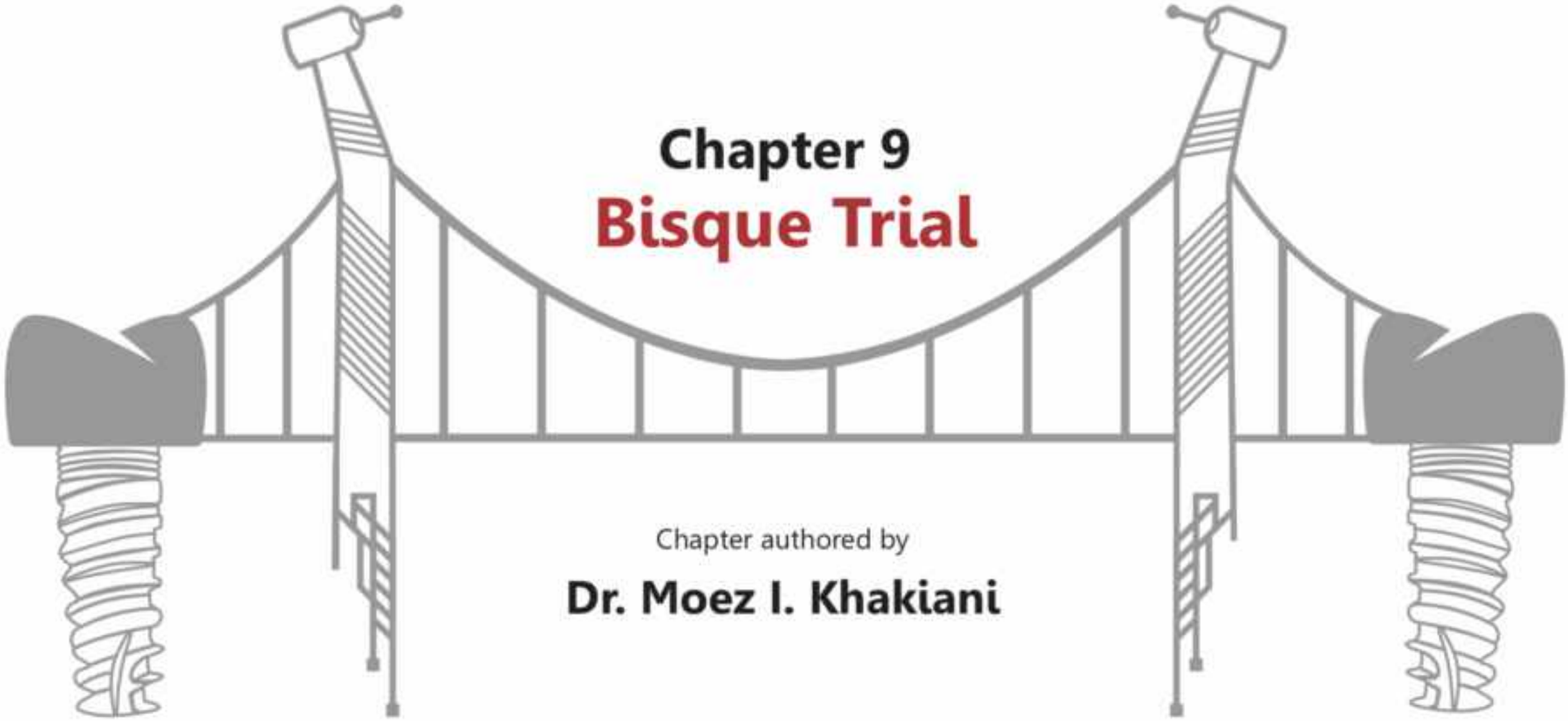
Fig. 8.16, 8.17: Left: Buccal view; Right: Lingual view of the coping on the prepared tooth. A coping that fits the cast should ideally fit the prepared tooth as well.

In case the coping does not seat as desired, the fitting surface is to be checked for any offending area(s). This can be done with the help of disclosing agents (e.g. Fit Checker from GC), paints (e.g. Arti-Spot from Bausch), sprays (e.g. Arti-Spray from Bausch) or with silicone light body.

CASE OF AN ILL-FITTING CROWN ADJUSTED USING DISCLOSING AGENT
Images courtesy: Dr. Irfan Kachwala, Mumbai, India.

Fig. 8.18: IPS e.max crown displaying resistance to seating. Note, the buccal margin is wide open upon initial placement (yellow arrow).

Fig. 8.19: Fit Checker Black from GC is loaded into the crown and the prosthesis is seated onto the prepared tooth.



Chapter 9
Bisque Trial

Chapter authored by

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Thicker articulating papers tend to register pseudo-positive marks, which can result in over-reduction of the occlusal surface.

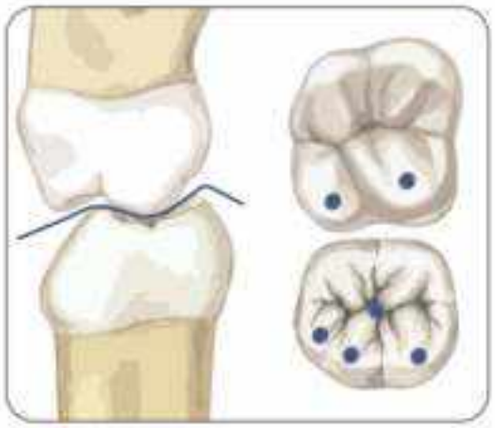


Fig. 9.29: Thin articulating films leave marks selectively only at areas of true physical contact.

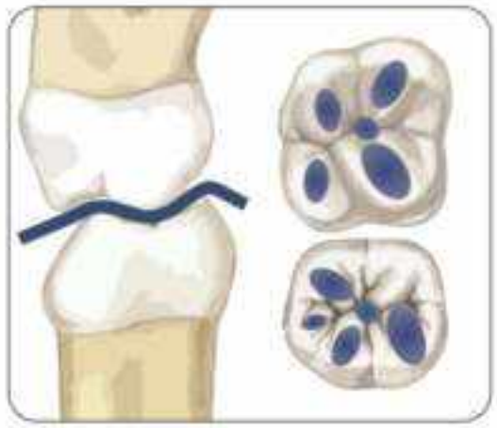


Fig. 9.30: On the other hand, thick articulating papers tend to leave marks over larger areas and often even on areas that may not be in true physical contact, resulting in infra-occlusion.

Leaving the prosthesis slightly under-occluded is a deliberate ploy used by some laboratories to eliminate the clinical need for occlusal adjustment. This may seem like an innocuous act, perhaps even a desirable practice. However I would advise you to refrain from such temptations, as this can result in serious long-term damage. Lack of contact can affect the stability of the pre-existing occlusion, while destructive contacts (during excursive movements) may develop as the tooth erupts back into occlusion.

The following aspects should be followed, when recording static occlusion:

- Articulating paper of the correct thickness should be used.
- Articulating paper should be fresh.
- It should be held positively with the help of Miller forceps.
- Teeth should be completely dry using air from 3-way syringe.
- Patient should be instructed to perform rapid tapping (as on a cold winter morning).

The act of 'rapid tapping' ensures that the mandible closes onto the exact same occlusal contact points each time. This results in the transfer of dark and well defined marks on areas of true contact. Smudge marks are usually pseudo-contacts that get registered lighter in intensity, helping an astute clinician differentiate between the two.

Fig. 9.31: Miller forceps should regularly be used as they prevent the articulating paper from crumpling during use.

A. ADJUSTING A SINGLE UNIT PROSTHESIS

POSTERIOR CROWN

When adjusting static occlusion for a premolar prosthesis, attempt should be made to achieve two points of stable occlusal contact. Similarly, when adjusting the occlusion for a molar prosthesis, effort should be made to achieve three/four points of stable occlusal contact.

It is essential that these contact points lie on relatively flat surfaces like cusp tips, marginal ridges or occlusal embrasures.

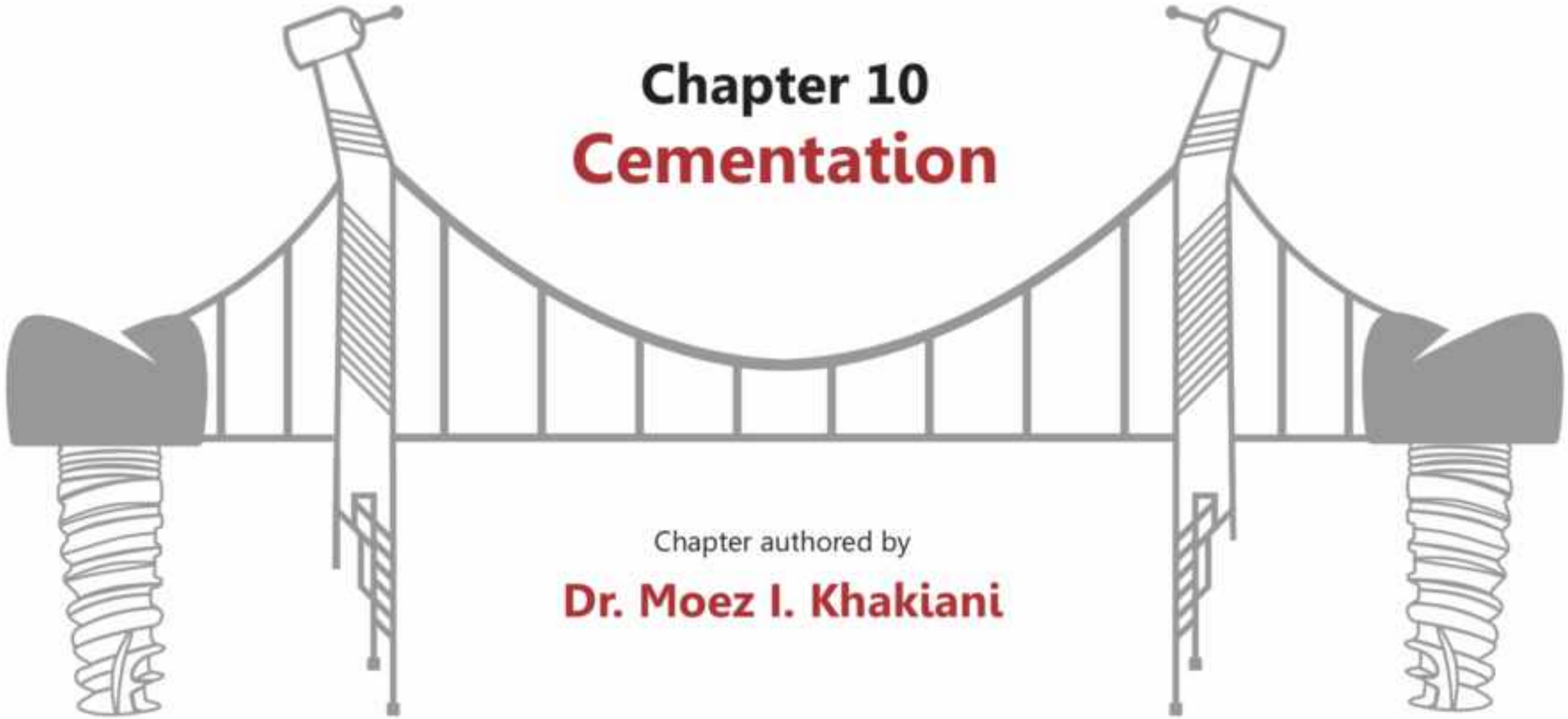
Such contacts provide bucco-lingual and mesio-distal stability to the restored tooth. Any contact on an inclined surface would cause the mandible to deviate and is thus unacceptable.

Fig. 9.32, 9.33: Illustration depicting ideal static occlusal contacts on a premolar (left) and a molar (right) prosthesis, as described in chapter no. 2.

Technique for adjusting static occlusion

First, the prosthesis is removed from the mouth and one tooth on either side of the abutment is identified as the reference teeth, termed as 'index teeth'.

Next, the patient is instructed to bite onto articulating paper with a rapid tapping motion (generally, a blue color articulating foil is used for this purpose). This helps evaluate the exact location and intensity of static contacts on the index teeth (with no influence from the fabricated prosthesis). A mental picture of these contact points is made, following which these marks are removed.



Chapter 10
Cementation

Chapter authored by

Dr. Moez I. Khakiani


Fig. 10.21, 10.22: The second increment of powder is then spatulated until a smooth uniform mix is obtained.

Fig. 10.23: The mix obtained should have a stringy consistency. Mixing time for luting GIC is about 20-30 seconds only. Any delay causes the material to thicken up which then gives resistance to seating, with a high possibility of rebound (as the material enters into its rubbery stage).

Fig. 10.24: GIC should be loaded into the crown as a thin coating. Overloading should be avoided as this can prevent complete seating of the prosthesis, owing to increased hydrostatic pressure.

In order to achieve clinical success with glass-ionomer cements, early protection from both, moisture contamination and desiccation is indispensable. Thus, adequate moisture control should be maintained until the cement has set at the prosthesis margin.

A full contour metal crown for a maxillary first molar was used for this documentation.

Fig. 10.25: Upon final seating, the excess cement is to be left undisturbed until the cement has set completely. If removed prematurely, the material may pull through from under the margin, thereby leaving it open. Once set, the large chunks of cement can be removed using a sharp universal scaler.

Fig. 10.26: Following this, a thin probe or a curved explorer is run over the margin. This helps remove any fine cement pieces that may have been left behind.

Fig. 10.27: Next, proximal contacts are cleaned with the help of dental floss to ensure complete removal of the luting cement. It is important for an IOPA radiograph to be taken post-cementation to check for any excess cement, especially interproximally.


Fig. 10.28, 10.29: Final prosthesis post luting. Left: Occlusal view; Right: Buccal view. Note, the prosthesis margin is flush with the prepared supra-gingival margin.

DUAL-CURE RESIN CEMENTS

This cement group is polymerized via light activation and also by chemical interaction within their components. Once the resin has been photo-activated the cement immediately adjacent to the light gets cured, while also initiating a self-cure activation in the remaining cement (that has not been illuminated).

Advantage

- ▲ Ensures curing even in areas that cannot be light cured.

Drawbacks

- ▼ Weaker bond strength than light cure cements.
- ▼ Lack of color stability and can darken over time.

Indications

- ▶ Where light access to the cement is questionable:
  - ◆ Thick glass ceramic restorations.
  - ◆ Opaque core based restorations, like PFM, PFZ.
  - ◆ Ares that are difficult to access, like post space.

CHEMICAL-CURE RESIN CEMENTS

These cements are not reactive to light and polymerize by a chemical reaction only when their components are physically mixed together.

Advantages

- ▲ Not dependant on light for their activation.

Drawbacks

- ▼ Do not offer much selection in terms of shade and translucency.
- ▼ Have very low early bond strength and require hours to reach full maturity, making immediate post bonding care essential.
- ▼ Lower bond strength as compared to the light-cure and dual-cure resin cements.

Indication

- ▶ Areas where light-curing is not possible.

Table 10.1: Cementation options for various prosthetic materials.

	GIC	RMGIC	Total Etch	Self Adhesive	Self Adhesive with Selective Etch
Full Metal/ PFM Prostheses	✔	✔✔	✔	✔✔	✔✔
Monolithic Zirconia/ PFZ Prostheses	✔	✔✔	✔	✔✔	✔✔
LiDiSi Prostheses	✘	✔	✔✔	✔	✔✔✔
Prostheses with poor retention form	✘	✘	✔✔✔	✔	✔✔✔
Posterior Partial Bonded Restorations	✘	✘	✔✔	✔	✔✔✔
PLVs	✘	✘	✔✔✔	✘	✔✔
Metal Posts	✔	✔	✔	✔✔	✔✔✔
Fiber Posts	✘	✘	✔	✔✔	✔✔✔

SURFACE TREATMENT OF PROSTHETIC MATERIALS PRIOR TO CEMENTATION/BONDING

Surface treatment of prosthesis can play a vital role in improving the longevity at the tooth-cement interface. This treatment is subjective to the material being used:

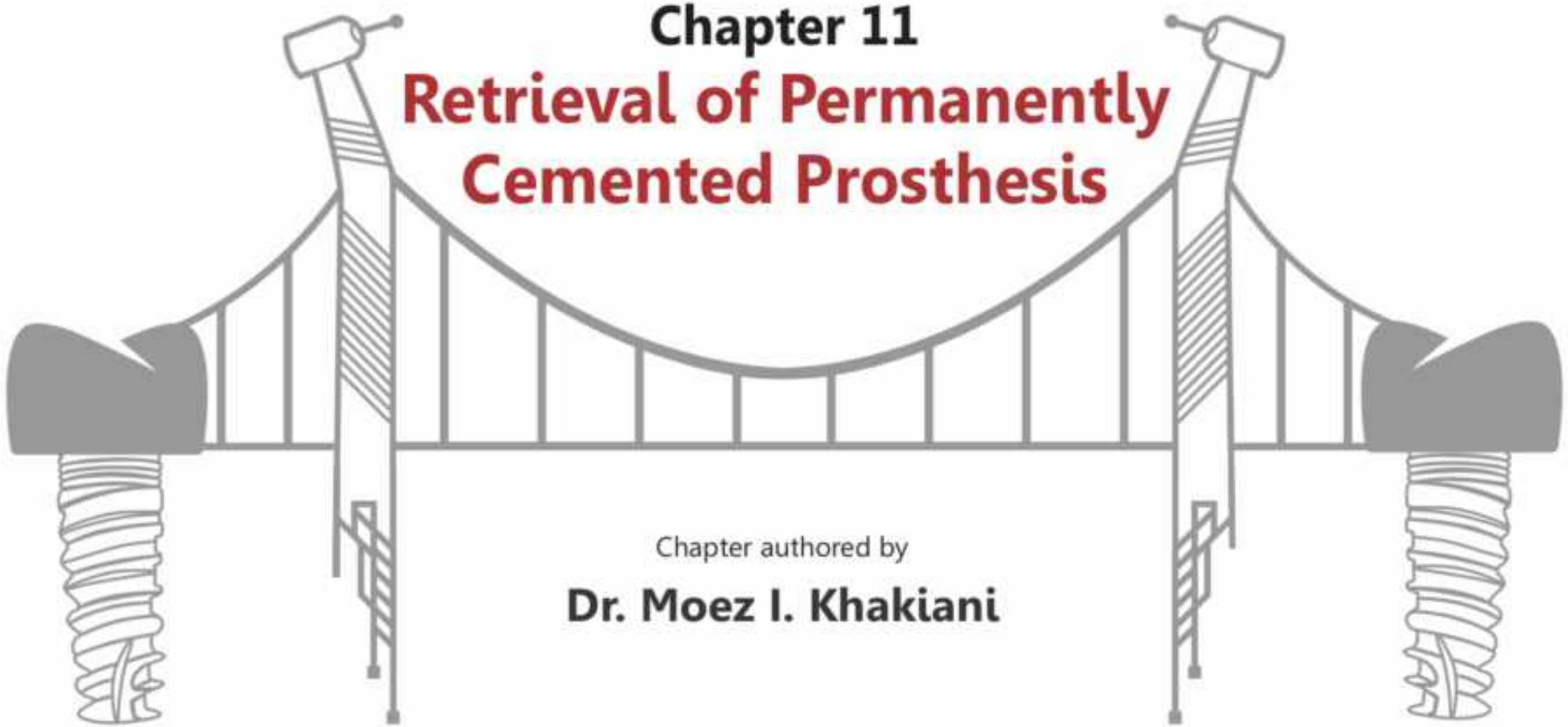
METAL BASED PROSTHESES

Sandblasting helps increase the micro-irregularities and the surface area of the fitting surface of the prostheses, thereby increasing their frictional resistance to dislodging forces.

Prostheses are usually sandblasted in the laboratory. However, sandblasting can also be performed chair-side with an air polisher using fine grit aluminum oxide particles.

Chapter 11

Retrieval of Permanently Cemented Prosthesis



Chapter authored by

Dr. Moez I. Khakiani

RETRIEVAL USING THE CHRISTENSEN CROWN REMOVER

Fig. 11.24: An imaginary line can be drawn along which the prosthesis is to be sectioned.

Fig. 11.25, 11.26: A diamond bur is first used to cut through the porcelain, until the metal coping is exposed. The cut is initially made on the labial surface only.

Fig. 11.27: By altering the orientation of the bur, the cut is then extended through the incisal edge.

Fig. 11.28: A carbide bur is then used to slice through the metal coping, taking care not to overtly hurt the abutment tooth.

Fig. 11.29: The metal coping is cut until the underlying tooth is visible on the labial and incisal surfaces.

Fig. 11.30: Christensen Crown Remover is then placed into the slit and rotated. The straight design is used for anterior teeth.

Fig. 11.31: As the two slit edges get pushed apart, the instrument exerts a tensile force on the luting cement (causing it to give way).

Fig. 11.32, 11.33: Although such a technique destroys the prosthesis rendering it useless, the abutment tooth is subjected to hardly any trauma.

Chapter 12
Basics of Dental Photography

Chapter authored by

Dr. Mayur Davda

SECTIONAL VIEWS

Sectional images form the most important part of our protocol and are also the most routinely used. Both dental arches are divided into an anterior quadrant and a left and right posterior quadrant. These images are usually made with the help of sectional mirrors at a magnification ratio of 1:1.5-1:2, with the focus point in the center.

Here, it is extremely vital to be perpendicular to the occlusal surface (of the image on the mirror) and to ensure that not a lot of the buccal or palatal surface is seen in the posterior segment images.

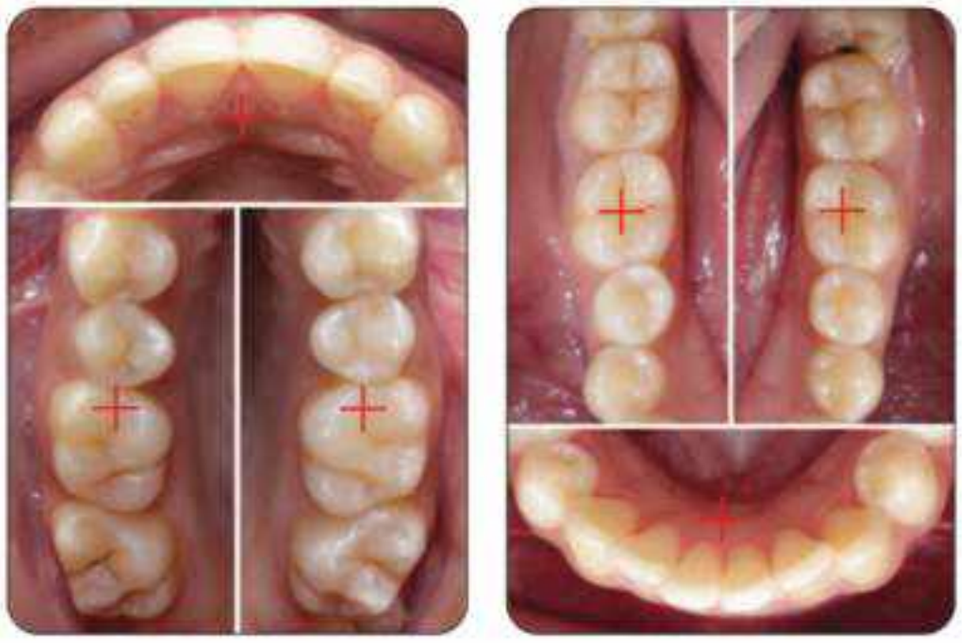


Fig. 19.49-19.50: Sectional/quadrant images. Left: Maxillary; Right: Mandibular.

Fig. 19.51: Image to record the overjet and over bite.

Image is taken from a lower angle, almost parallel to the mandible. It is taken at a magnification ratio of 1:1.5, with the focus point in the center. Because this is a mirror image it has to be flipped.

Fig. 19.52-19.53: Images showing the relation of teeth with respect to the vermillion border of the lower lip.

Conclusion

Dental photography is important to uplift one's dental practice. Ideal equipment for documentation is an entry level DSLR, a 100 mm macro lens and a twin flash. It is advisable to avoid use of mobile phones for dental documentation.

Developing a habit of using cameras in their manual mode is vital to achieve consistent results with respect to composition and exposure of the images. Following specific imaging protocols in daily practice helps save time and effort spent in recording the views. If practiced on a routine basis, documentation becomes easy and is a great source of inspiration to help us become better health care providers.

This text provides the basic understanding of all essential settings, equipment and intra-oral appliances and in doing so it attempts to set a constant, so that dental images can be taken accurately and quickly.

Fig. 19.54: Glam shot.

Chapter 13
Ergodontics

Chapter authored by

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Dr. Ruchi Chhabria

2 B. USE OF MAGNIFICATION

Magnification can improve visualization, postural habits, as well as productivity. Properly selected and adjusted magnification devices can help prevent the clinician from gradually tilting their head and leaning forward.

Dental loupes are the most frequently used form of magnification. As with all microscopes, the higher the magnification the shorter is the depth of field and narrower is the field of vision. Thus, choosing which type of loupes to use is a personal decision based on the procedural requirements and comfort level of the clinician.

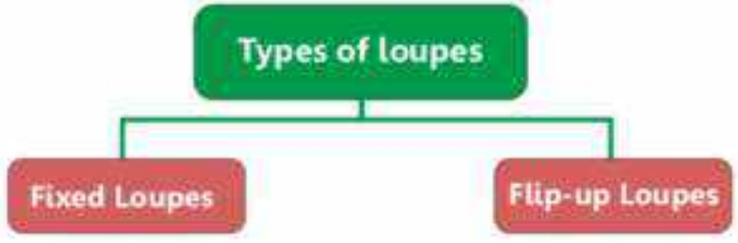
An accommodation period may be required when first using loupes and some eye fatigue or headache may be experienced initially. When first adopting loupes, wearing them for just two to three hours per day and progressively extending the wearing time over a couple of weeks helps with the adjustment process.

Large frames, while less elegant than small oval frames are superior as they sit low on the cheek. This enables lower scope placement relative to the pupils and better head position.

Working distance is quantified as the distance between the front of the clinician's eye and the patient's maxillary central incisor.

The difference in working distance ranges from less than 14 inches to greater than 20 inches. Too short a working distance can lead to hunching and too long a working distance can result in stretching. Thus, it is prudent to select loupes that meet your personal working distance (which is subjective to your height).

There are two primary designs for magnification loupes, depending on the mode of attachment of the magnification telescope.



THROUGH THE LENS TYPE	FLIP-UP TYPE
The optical magnification barrels are built on to the carrier lens itself (thus the name).	The optical magnification barrels are mounted on a hinge mechanism that flips in front of the carrier lens.
	
As the distance between the eyes and the optical barrels is less, these provide wider field of view in the same magnification	The presence of an additional hinge increases the distance between the eyes and the magnification barrels, thereby narrowing the field of view.
These types of loupes are lighter in weight and hence can be used for a relatively longer period of time.	These loupes are comparatively heavier because of the hinge and barrels that protrude further. This also creates an uneven balance, requiring the body to compensate for it by pressurizing the neck muscles, especially when looking down. Such a system often requires a cord to be tied around the head in order to stabilize the framework.
The barrels cannot be moved and thus when communicating with the patient, the loupe may have to be removed or the clinician may have to look over the lens (which could be inconvenient).	The barrels can be flipped out of site when not working or when wearing gloves, changing burs, talking to the patient, etc. This makes it convenient for use.
They are individually customized according to the clinician's working distance, angle of declination and inter-pupillary distance (at the most ergonomic position suitable to the user). Hence is user specific.	They allow adjustable angle of declination and adjustable inter-pupillary distance, making it convenient for multiple users.
Angle of declination is customized and fixed to the user's requirement and cannot be increased if desired (which is a disadvantage for this system).	The angle of declination is adjustable on the basis of the clinicians focal distance.
It also serves as an advantage, as the user does not have to adjust the telescope each time to reach his/her best ergonomic position.	This can be a disadvantage, as the flip-up mechanism can be knocked out of position and needs readjustment.

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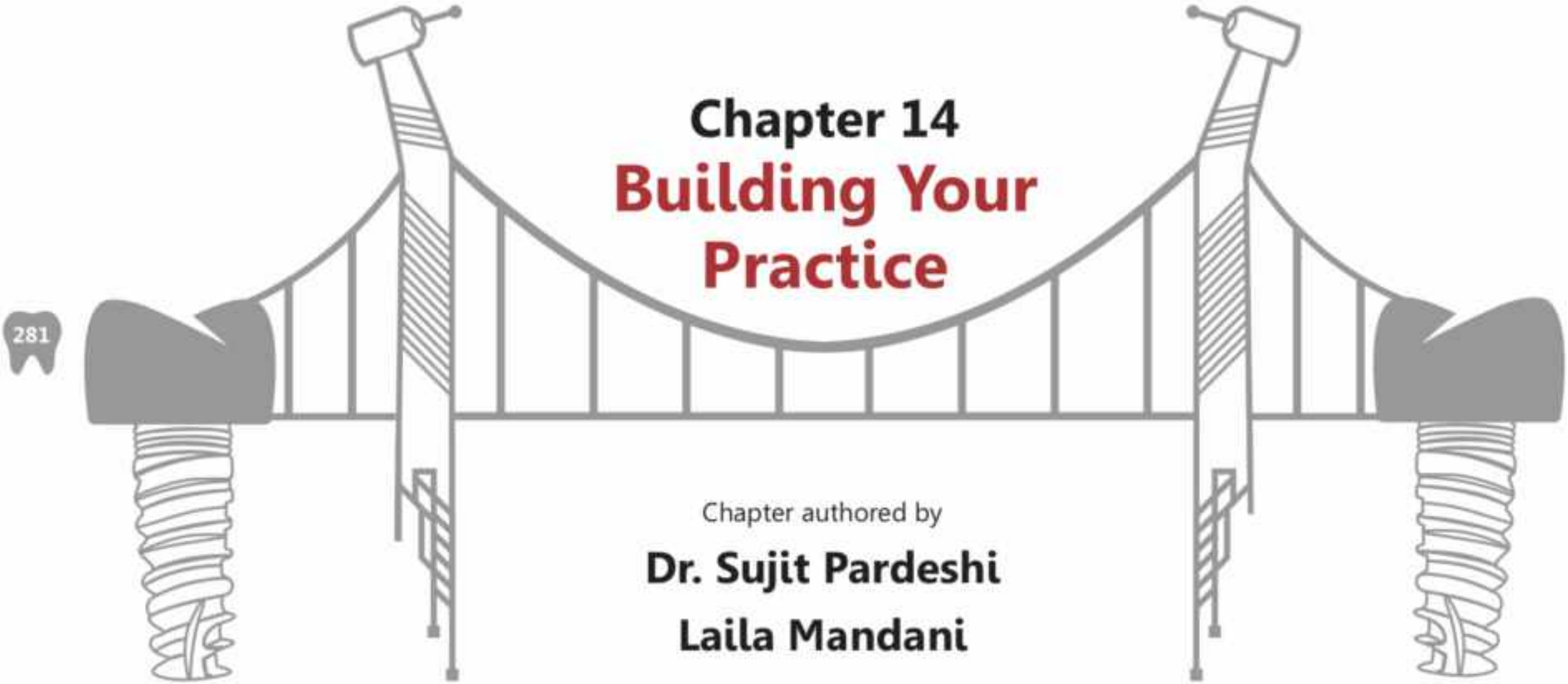

Chapter 14
Building Your Practice

Chapter authored by

Dr. Sujit Pardeshi

Laila Mandani

Image courtesy: Anchal Agarwal

★ Have you heard your patients say "Okay, let me think about it"?.

★ Do you find yourself in a position where you are unable to convince the patient to undergo timely treatment?

★ Do you find yourself at a loss for words when justifying your treatment fees?

★ Do you suffer from no shows, cancellations and/or pending treatment plans/fees?

Often, professional growth is not influenced solely by one's clinical skills and work ethics, but is also subject to how you present yourself and your practice to the patients.

With increasing number of private dental practices and commercial dental set-ups, survival of new dental clinics has become increasingly difficult.

Often dentists compete with each other on the basis of treatment fees and not treatment standards. Unfortunately, such competition often culminates into the use of compromised materials and delivery of sub-standard treatment.

In such testing times, it would be beneficial for clinicians to channelize their focus towards enhancing both, clinical as well as soft (communication) skills, in an attempt to rise above the competition.

While all previous chapters were focused upon broadening your treatment perspective and improving your clinical skills, the primary objective of this chapter is to help improve patient engagement and elevate the overall patient experience in your practice.

WHY PATIENTS SAY "YES" (OR "NO") TO TREATMENT?

The first direct contact between a dentist and the patient is usually the consultation appointment and it is often in this very appointment, that the patient decides whether to undergo treatment with you or not. Thus in order to answer the title question, let us make an attempt to think from a patient's perspective and understand what a patient feels and how they respond when you propose a treatment plan to them.

The science of human behavior states, that when presented with a treatment plan, two distinct aspects of the patient's thought process gets activated:

1. RATIONAL THOUGHT PROCESS

This aspect is based on reason and logic. It works to understand and analyze facts as they are being explained. Studies indicate that patients remember only a small fraction of the factual information you share with them and forget most of it over a period of time. Thus, this thought process plays only a minuscule role during the decision making.

Dentists communicate with multiple patients every day and in doing so, often forget that each patient has a different level of knowledge and understanding about dental diseases and treatments.

Few of them may even wrongly interpret what is explained (as depicted), but are possibly embarrassed to inquire further (and thus you don't come to know).

In addition, the clinician here explains only the treatment required, without addressing the complaint that the patient may have reported with.

Dentists must consider presenting the particular problem(s) first, followed by the procedure required to correct them.

In addition, the correct way to do so would be to use patient education photos and models to improve communication.

Such explanations are best done over the consultation desk (where the patient is less anxious), as compared to the dental chair (where the patient may still be apprehensive). This impacts the patient's emotional thought process.

Chapter 15

MEDICO-LEGAL ASPECTS IN DENTISTRY

Chapter authored by

Dr. Vishwas Puranik

Teeth receiving indirect restorations or acting as bridge abutments should be thoroughly assessed for the following:

- Tooth morphology and anatomy.
- Quantity and location of the residual tooth tissue.
- State of the existing restorations, including core build-ups.
- The periodontal status and bone support.
- The pulpal and peri-radicular status.
- In the event that the tooth is non-vital, the quality of the endodontic treatment.
- The static and functional occlusal relationships.
- The patient's cosmetic requirements.
- Prognosis of the tooth following restoration.

In addition, one must also check for any musculoskeletal or neurological disorders that can cause changes in the functional and/or parafunctional jaw movements, as such findings significantly impact the treatment planning and treatment outcomes.

Patients today have become more conscious about their appearance and believe that teeth form an integral part of their self-image, self-confidence, physical attractiveness and employability. Not surprisingly, more and more patients seek cosmetic dental treatment solely on aesthetic grounds; without fully understanding the irreversible and possibly damaging consequences of such treatments. With the rise in patient demand, more and more dentists are venturing into the practice of aesthetic/cosmetic dentistry. Inevitably, there is an increased risk of litigation when ambitious dentists embark on such treatments with little clinical training or without undertaking appropriate steps in examining, assessing and understanding the clinical condition, the patient's concerns, demands and expectations. Often these cases turn out to be more difficult than they might appear at first sight.

Conclusion

The provision of indirect restorations is associated with more complaints and litigations than other areas of dentistry. Dentists therefore need to be aware of potential pitfalls, how to avoid them and how to react, if in the unfortunate situation something were to go wrong.

INFORMED CONSENT for CROWN AND BRIDGE PROSTHETICS

I UNDERSTAND that treatment of dental conditions requiring CROWNS and/or FIXED BRIDGEWORK includes certain risks and possible unsuccessful results, including the possibility of failure. Even though care and diligence is exercised in the treatment of conditions requiring crowns and bridgework and fabrication of the same, there are no promises or guarantees of anticipated results or the longevity of the treatment. Nevertheless, I agree to assume the risks, possible unsuccessful results and/or failure associated with, but not limited to the following:

1. Reduction of tooth structure: In order to replace the decayed or otherwise traumatized teeth, it is necessary to modify the existing tooth or teeth so that crowns (caps) and/or bridges may be placed upon them. Tooth preparation will be performed as conservatively as possible.

2. Local anesthesia: In order to reduce tooth structure without causing undue pain during the procedure, it will be necessary to administer local anesthesia.

3. Sensitivity of teeth: Often after the preparation of teeth for either crowns or bridges, they may exhibit sensitivity. This can range from mild to severe and may last only for a short period of time or sometimes even longer.

4. Following crown preparation and placement of prosthesis, the involved tooth or teeth may require root canal treatment: The tooth or teeth may have been traumatized from an accident, deep decay, extensive preparation, or other causes. Such teeth, after being crowned may develop a condition known as 'pulpitis' or 'pulpal degeneration'. Usually this cannot be pre-determined and it is often necessary to perform root canal treatment for such teeth, particularly if they remain appreciably sensitive/painful for a long-period of time following crowning.

5. Breakage: Crowns and bridges may chip or break. Many factors can contribute to this situation, such as chewing excessively hard materials, changes in biting forces exerted, traumatic blows to the mouth, etc. Unobservable cracks may develop in the crowns from these causes, but the crowns/bridges may not actually break until chewing soft foods, or for no apparent reason at all.

6. Uncomfortable or strange feeling: This may occur because of the differences between natural teeth and the artificial replacements. Most patients usually become accustomed to this feeling in time.

7. Gingival recession: Periodontal (gum) disease can occur at any age, with or without these restorations. Generally, crown or bridge work does not cause or prevent any gum disease. Dark lines at the gumline may appear in crowns or fixed bridges lined with metal, especially if the gum recedes after placement.

8. Esthetics or appearance: You will be given the opportunity to observe the appearance of the crowns or bridges in your mouth prior to final fixation.

9. It is the patient's responsibility to seek attention from the dentist, should any undue or unexpected problems occur. The patient must diligently follow any and all instructions, including the scheduling and attending of all appointments. Failure to keep the cementation appointment can result in ultimate failure of the crown/bridge which fails to fit properly and an additional fee may be required to correct the situation.

INFORMED CONSENT:

I have been given the opportunity to ask questions regarding the nature and purpose of the crown and/or bridge treatment and have received answers to my satisfaction. I voluntarily assume any and all possible risks, including the risk of substantial harm, if any, which may be associated with any phase of this treatment in hopes of obtaining the desired results, which may or may not be achieved. No guarantees or promises have been made to me concerning the results. The fee for this service have been explained to me and is satisfactory.

By signing this form, I am freely giving my consent to allow and authorize Dr. _____ and his/her associates to render the treatment pertaining to crown and bridge prosthetics considered necessary and/or advisable for my dental conditions, including the prescribing and administering of any medications and/or anesthetic deemed necessary for my treatment.

Date: _____

Patient's name: _____

Signature of patient
or legal guardian.

Readers are urged to get this consent form printed on their own case paper sheets and have your patients sign it prior to starting any irreversible tooth reduction in their mouth.