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department of Dentistry

Prosthodontics
3rd year
التعويضات السنية
المرحلة الثالثة

Education bag
الحقيبة التعليمية

Prepared by

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”مسكنات الأوجاع : المشي الطويل و الانشغال بما يُفرح الإنسان“

ابُو عَلِيٍّ الحُسَيْنُ بْنُ عَبْدِ اَللَّهِ بْنِ اَلْحَسَنِ بْنِ عَلِيِّ بْنِ سِينَا
اَلمعروف بِابْنِ سِينَا

عُرف باسم الشيخ الرئيس وسماه الغربيون بأمير الأطباء وأبي الطب الحديث في العصور الوسطى

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Overview

General objectives

At the end of the school year, the student should be able to get acquainted with the concepts of dental prosthesis (partial removable dentures).

Introduction: This module will help students who wish to learn about the basics of partial denture for replacement of missing teeth. It is also meant for learners with little or no experience in treatment patients with partial missing teeth. As a result, the reader will be cognitively challenged as each new notion is introduced.

Specific objectives

The student will be able

1. To understand and define medical terminology for the prosthodontics department.
2. To know how to examine and to do treatment plan for patients whose suffer from teeth loss.
3. To be able to manufacture the entire movable denture in the dental laboratory with all the practical steps, including them only.
4. To be familiar with the methods of repairing the dentures in the event of a fracture.

Content list

Session	No	The Lectures	Contents
1	1	Introduction	• Partial dentures • Removable partial denture (RPD) • Objectives for RPD construction • causes of teeth loss • Indications of removable partial dentures • Fixed partial denture • Indications for fixed partial denture • Dental implant therapy • Contraindications for dental implant therapy • Terminology and re-finishing
2	2	Classification of Partially Edentulous Arches	* Need for classification. • Requirements of an acceptable method of classification • Removable partial dentures may be classifiedaccording to the type of support • Removable partial dentures may be classified according to the type of material • Removable partial dentures may be classified according to the type of treatment • Classification based on arch configuration • Kennedy – Applegate – Fiset classification system. • Applegate's rules governing the application of the Kennedy classification method
3	3,4	Surveying	• The ideal requirements for successful removablepartial denture • Purposes (Objective) of Surveying the Diagnostic Cast • Advantages of single path of placement (insertion) • Guiding planes • Dental surveyor • Types of dental surveyors • Parts of dental surveyor(Ney type surveyor) • Principles of surveying • Types of undercuts established by surveying • Factors that determine and affect the path of placement (insertion) andremoval of the RPD • Rules of surveying

7	7	Mandibular Major Connectors	• Special structural requirements • Types of mandibularmajor connectors ✓ Lingual bar ➢ Methods that may be used to determine the relative height ofthe floor of the mouth ✓ Lingual plate (linguoplate) ➢ The indications for the use of linguoplate ✓ Double lingual bar (lingual bar with cingulum bar) ➢ Indications for use of double lingualbar ✓ Labial bar ➢ Indications for useof labial bar ➢ Characteristics and location
8	8	Minor Connectors	• Definition • Functions • Form & location • Basic types of minor connectors • Tissue stops • Finishing lines • Reaction of Tissue to Metallic Coverage
4	5	Component Parts of a RemovablePartial Denture	• Main components ofRPD • Major connectors • Requirements of majorconnectors • Guidelines for design and location of majorconnectors • Characteristics of major connectors
5	6	Maxillary Major Connectors	• Special Structural Requirements for Maxillary MajorConnectors • Types of Maxillary MajorConnector • Single palatal bar • Single palatal strap • Anterior-posterior palatal bars • Combination anterior and posterior palatal strap– type connector • Palatal plate-type connector • U-shaped palatal connector

9	9	Rests and Rest Seats	• The purposes of the restin general • Occlusal Rest • Extended Occlusal Rest • Interproximal OcclusalRest • Internal Occlusal Rests • Occlusal Rest Seat Preparation • Occlusal Rests on Amalgam Restorations • Occlusal Rest on Crowns • Lingual Rests (CingulumRest) • Incisal Rests and RestSeats • Implants as a Rest
10	10	Retention and Removable Partial Denture Retainers	• Direct retainers • Indirect retainers • The extra coronal retainer (Clasp type) • Component parts, Function, and position of clasp assembly parts • Factors affecting the magnitude of retention • The basic principles of clasp design

14	14,15	Indirect Retainers	• The main factorsinfluencing the effectiveness of an indirect retainer • The auxiliary functions of indirect retainers • Forms of Indirect Retainers • Auxiliary occlusal rest • Lingual rest • Incisal rest • Canine extensions from occlusal rests • Cingulum bars (continuous bars) and linguo-plates • Modification areas • Rugae support
16	16,17,18	Laboratory procedures in RPD construction: Blockout and Relief	• Blockout and relief • Cast preparation • Types of blockout of master cast ✓ Parallel blockout ✓ Shaped blockout ✓ Arbitrary blockout • Relieving the master cast • Purpose of relief • Sites • Tissue Stops • Duplicating a stone cast • Duplicating material and flask • Impression • Refractory cast • Waxing the framework • Spruing • General rules for spruing • Investing the sprued pattern • Purpose of investment • Burnout • Casting • Casting recovery • Finishing the framework • Sprue removal

17	19	Denture Base in RPD	• The primary function of denture base • Types of denture base according to support • Types of the denture base according to materials • Advantages of metal denture base • Disadvantages of metal denture base • Design consideration of denture base • Periodontal considerationof denture base design • Types of artificial teeth
18	20	Record Bases, Occlusion Rims, Mounting and Arrangement of Teeth	• Record bases • Types of record bases according to materials constructed from it • Occlusion rims • Occlusion rims for static jaw relation records • Occlusion rims for recording functional or dynamic jaw relationship record • Mounting casts on the articulator • Arrangement of artificial teeth to the opposing cast • Principles that should be taken during arrangement of artificial teeth • Laboratory procedure of arrangement teeth (Example)

19	21,22	Biomechanics of Removable PartialDentures	• Biomechanical considerations • Possible movements of partial dentures • Tooth-tissue–supported prosthesis • Tooth-supported partial denture • Occlusal Rest Seat Preparation and Denture Movement • Impact of Implants on Movements of Partial Dentures
20	23	Principles of Removable PartialDenture Design	• Difference in Prosthesis Support and Influence on Design • Differentiation Between Two Main Types ofRemovable PartialDentures • Components of Partial Denture Design • Implant Considerations in Design Preparation • 3rd Phase: Support for Distal Extension Denture Bases • 4th Phase: Establishment and Verification of Occlusal Relations and Tooth Arrangements • 5th Phase: Initial Placement Procedures • 6th phase: Periodic Recall

21	24	Acrylic Removable Partial Dentures	• Acrylic removable partial dentures • Appearance • Maintenance of space • Reestablishment of occlusal relationships • Conditioning of teeth and residual ridges • Interim restoration during treatment • Conditioning the patientfor wearing a prosthesis • Clinical procedure for placement
22	25	Flexible Removable Partial Dentures	• Flexible removable partial dentures • Type of material used forthe flexible denture • Support • Retention
23	26	Repairs and Additions to RemovablePartial Dentures	• Broken clasp arms • Several reasons for breakage of clasp arms • Fractured occlusal rests • Distortion or breakage of other components – major and minor connectors • Addition of a new artificial tooth to a RPD • Repair by soldering

24	27	Digitally Designed & Fabrication Process of RPD Framework Using CAD/CAM System	

Session -1
Introduction

Objectives of session number -1

The student will be study:
1. Partial denture
2. Objective of Partial denture
3. General consideration in Partial denture construction
4. Partial denture component parts

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.
In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.
After you complete the studying, perform The post-test examination for checking.

❖Pre-Test

WRITE BRIEFLY ABOUT :

Q1- THE TYPES OF DENTAL PROSTHESIS?

Q2-CAUSES OF LOST OF THE TEETH ?

introduction to removable partial dentures

A removable partial denture or a fixed partial denture that restores a partially edentulous arch; a partial denture can be described as a removable partial denture or a fixed partial denture based on the patient's capability to remove or not remove the prosthesis, respectively.

I. Removable Partial Denture (RPD):

A removable denture that replaces some teeth in a partially edentulous arch; the removable partial denture can be readily inserted and removed from the mouth by the patient.

It is either acrylic type or metallic type (cobalt/chrome).

Acrylic RPD

Metallic type (cobalt/chrome) RPD

Partial denture construction: The science and techniques of designing and constructing partial dentures.

Removable prosthodontics: The branch of prosthodontics concerned with the replacement of teeth and contiguous structures for edentulous or partially edentulous patients by artificial substitutes that are readily removable from the mouth by the patient.

Objectives for RPD construction:

1.Restore esthetic (especially for anterior teeth).

2. Restore function (phonetic and mastication) for proper speech, proper occlusion and proper food mastication.

3. To prevent apposing teeth extrusion or migration and tilting of adjacent teeth.

4. To fill empty space or spaces.

5. Prevent disease atrophy by a form of stimulation to the underlying tissue and ridge.

6. For proper muscular balance.

7. To restore the psychological status of the patient

Causes of teeth loss:

1. Caries (main cause in a young people below 35 years).
2. Periodontal diseases (main cause in old people above 35 years).
3. Trauma or accident (such as receiving a blow or falling down on them).
4. Congenital missing teeth.

Indications of removable partial dentures:

1-Distal extension situations (free end situation).
2. Long span tooth-bounded edentulous area.
3. Need for cross-arch (bilateral) stabilization.
4. Excessive loss of the residual ridge.
5. Unusually sound abutment teeth
6. If the prognosis of remaining teeth is questionable or reduced periodontal support of remaining teeth (these teeth cannot support fixed prostheses).
7. After recent extraction (need immediate replacement of extracted teeth).
8. Patient younger than 18 years old.
9. Economic consideration.

II.Fixed partial denture:

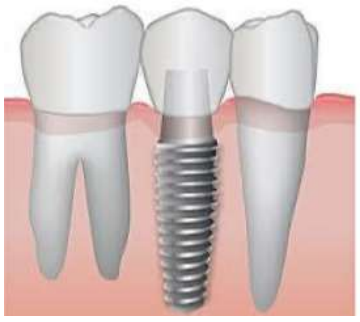
Any dental prosthesis that is luted, screwed, or mechanically attached or otherwise securely retained to natural teeth, tooth roots, and/or dental implants/abutments that furnish the primary support for the dental prosthesis and restoring teeth in a partially edentulous arch; it cannot be removed by the patient.

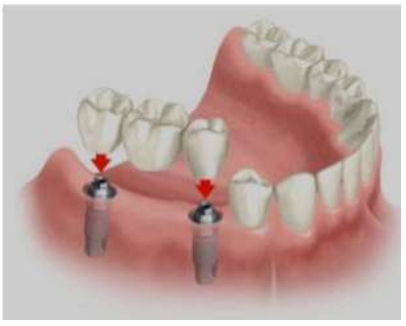
Indications for fixed partial denture:

1. Unilateral bounded edentulous short span.
2. Class IV Kennedy classification with normal loss of bone.
3. Modification area located anteriorly with Class I or with Class II Kennedy classification for simplifies the design of removable partial denture.

III. Dental implant therapy:

A prosthetic device made of alloplastic material(s) implanted into the oral tissues beneath the mucosal and/or periosteal layer and on or within the bone to provide retention and support for a fixed or removable dental prosthesis.





The dental implants are considered adjuncts in fixed and removable therapy. However, not all patients are candidates for dental implant therapy.

Contraindications for dental implant therapy

1. Unfavorable regional anatomy.
2. Uncontrolled systemic disease.
3. Extreme surgical risk.
4. High-dose head and neck radiation.

Terminology and definitions

Denture supporting structures: The tissues (teeth and/or residual ridges) that serve as the foundation for removable partial or complete dentures.

Diagnostic cast: A life-size reproduction of a part or parts of the oral cavity and/or facial structures for the purpose of study and treatment planning.

Support: The foundation area on which a dental prosthesis rests; with respect to dental prostheses, the resistance to forces directed toward the basal tissue or underlying structures.

Stability: The quality of a complete or removable partial denture to be firm, steady, or constant, to resist displacement by functional horizontal or rotational stresses.

Retention: That quality inherent in the dental prosthesis acting to resist the forces of dislodgment along the path of placement. (e. g., the force of gravity, the adhesiveness of foods, or the forces associated with the opening of the jaws).
Support, stability, and retention become more meaningful when they are thought of in terms of providing resistance to movement of a removable partial denture.

Interim, or provisional, denture: A fixed or removable dental prosthesis, or
maxillofacial prosthesis designed to enhance esthetics, stabilization, and/or function for a limited period of time, after which it is to be replaced by a definitive dental or maxillofacial prosthesis; often such prostheses are used to assist in determination of the therapeutic effectiveness of a specific treatment plan or the form and function of the planned definitive prosthesis.

Abutment: A tooth, a portion of a tooth, or that portion of a dental implant that serves to support and/or retain a prosthesis.
Height of contour: A line encircling a tooth and designating its greatest circumference at a selected axial position determined by a dental surveyor.

Undercut: The portion of the surface of an object that is below the height of contour in relationship to the path of placement. When used in reference to an abutment tooth, is that portion of a tooth that lies between the height of contour and the gingiva. When it is used in reference to other oral structures; the contour of a cross- sectional portion of a residual ridge or dental arch that prevents the insertion of a dental prosthesis.

The angle of gingival (cervical) convergence: The angle of gingival convergence is located apical to the height of contour on the abutment tooth; it can be identified by viewing the angle formed by the tooth surface gingival to the survey line and the analyzing rod or undercut gauge of a surveyor as it contacts the height of contour.

Path of insertion (placement): The specific direction in which a prosthesis is placed on the residual alveolar ridge, abutment teeth, dental implant abutment(s), or attachments.

Guiding planes: Two or more vertically parallel surfaces on abutment teeth and/or fixed dental prostheses oriented so as to contribute to the direction of the path of placement and removal of a removable partial denture, maxillofacial prosthesis, and overdenture. Guiding plane surfaces are parallel to the path of the placement (insertion) and parallel to each other; preferably these surfaces are made parallel to the long axes of abutment teeth.

Bounded edentulous area: It is an edentulous area that is bounded and supported by natural teeth at both ends.
Free-end edentulous area: It is an edentulous area that is bounded and supported by natural teeth at one end.

Extension base or free end extension RPD: It is a removable partial denture that is supported and retained by natural teeth only at one end of the denture base segment and in which a portion of the functional load is carried by the residual ridge, it is tooth - tissue - supported RPD.
Fulcrum line of rotation of a removable partial denture: A theoretical line around which the RPD tends to rotate.

Saddle or denture bases: The part of a denture that rests on the foundation tissues and to which teeth are attached.
Basal seat or denture foundation area: The oral anatomy available to
support a denture.

Retainer: Any type of device used for the stabilization or retention of a prosthesis.

Treatment plan: The sequence of procedures planned for the treatment of a patient after diagnosis.

Nesbit prosthesis: Eponym for a unilateral removable partial denture that restores missing teeth on one side of the arch only, without a cross-arch major connector.

Post test

Q1- choose the correct answer:-

1.Definite differ from intrem RPD in

A-support
B-stability
C-retention
D-non of above

2-Angle of convergence indicate what.

A-Tooth angulation
B-Tooth alignment
C-Tooth direction
D- non of above

3. Quality inherent dental prostheses the resistance to forces directed toward the basal tissue or underlyings structures

A-support
B-stability
C-retention
D-all of above

4. Removable partial dentures may be classified according to the type of material used into

A-Acrylic and Cr/Co (Chrome/Cobalt)
B-Cr/Co (Chrome/Cobalt) and ceramic
C-Acrylic and composite
D-non of above

5. Contraindications for dental implant therapy:

A-Unfavorable regional anatomy.
B-Controlled systemic disease.
C-No surgical risk.
D-Healthy oral hygiene

Session -2
Classification of Partially Edentulous Arch

Objectives of session number -2

The student will be study:

1. Classification of Partially Edentulous Arches
2. Removable partial dentures may be classified according to the type of support, arch configuration and type of treatment.
3. Kennedy – Applegate – Fiset classification system

Instructions:

❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

Pre test

Q- write briefly about :

1-Support.
2-Stability.
3-Retention.
4-Interim, or provisional, denture.
5-Abutment.

Need for classification:

1. To formulate a good treatment plan.
2. To anticipate the difficulties common to occur for that particular design.
3. To communicated with a professional about a case.
4. To design the denture according to the occlusal load usually expected for a particular group.

Reuirements of an acceptable method of classification:

1. It should permit immediate visualization of the type of partially edentulous arch that is being considered.
2. It should permit immediate differentiation between the tooth-supported and the tooth- and tissue supported removable partial denture.
3. It should be universally acceptable.
4. Serve as a guide to the type of design to be used.

***Removable partial dentures may be classified according to the type of support into:**

1. Tooth supported prosthesis:

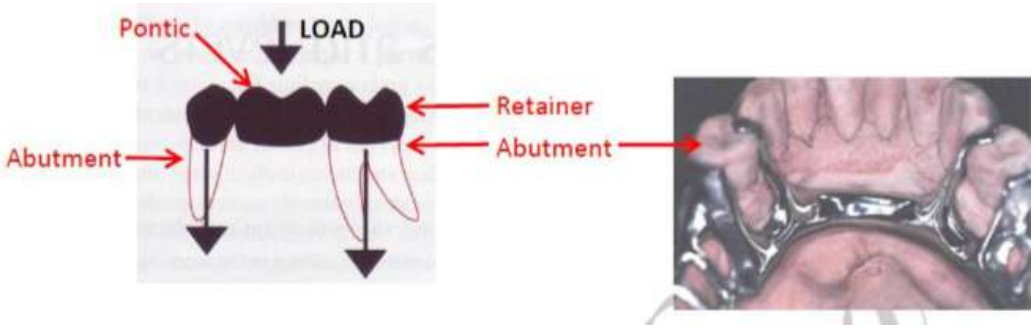
is a prosthesis or part of the prosthesis that depends entirely on the natural teeth (abutments) for support. For partially edentulous patients the prosthetic options available include:

A- Natural tooth - supported fixed partial dentures.

B- Natural tooth – supported removable partial dentures.

C- Implant - supported fixed partial dentures.

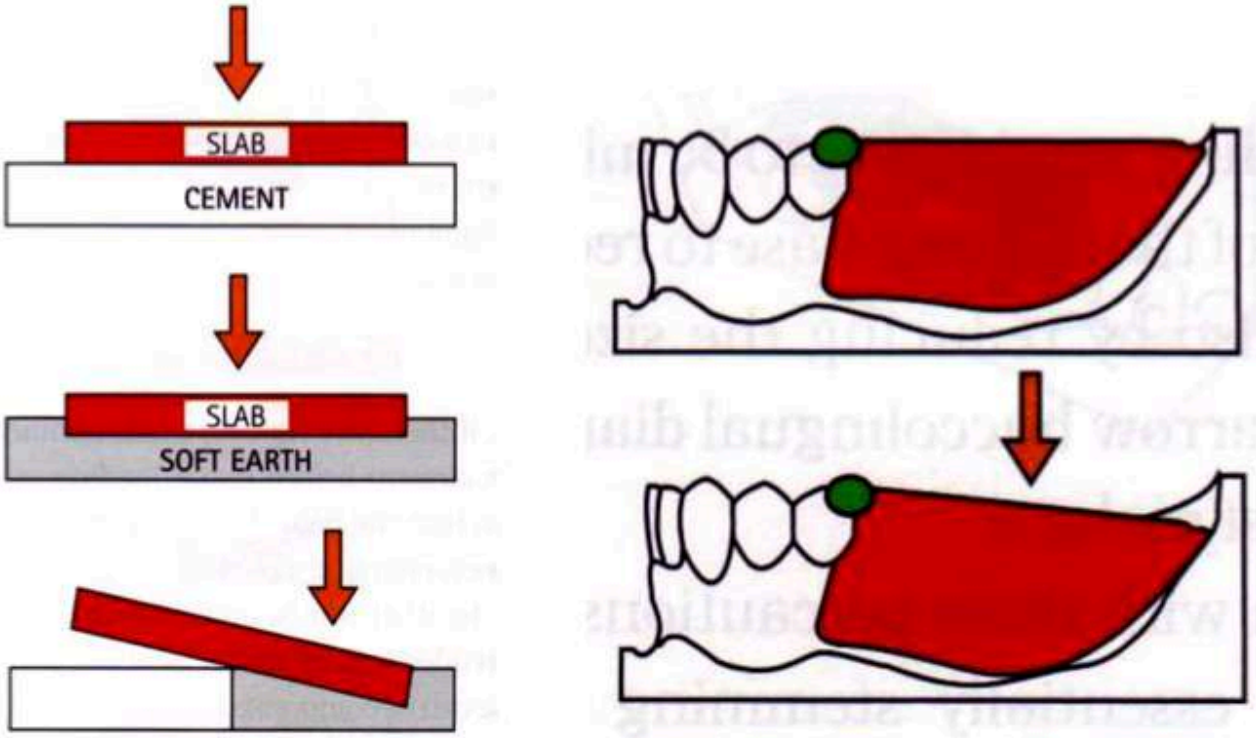
Retention is derived from direct retainers on the abutment teeth, tooth supported RPDs do not move appreciably in function.



2. Tooth - tissue supported prosthesis:

is a prosthesis or part of the prosthesis that depends on the natural teeth (abutment) as well as the residual ridge and tissue for support. Also called true partial denture, it includes a free end extension.

The tooth – tissue supported RPD supported at one end by natural teeth, which essentially do not move, and at the other end by the denture bearing tissues (mucosa overlying bone) which moves because of the resiliency of the mucosa.



3. Tissue supported prosthesis:

is one which is supported entirely by mucosa and underlying bone.

Tissue supported RPDs are primarily supported by tissues (mucosa overlying bone) of the denture foundation area. Tissue supported RPDs usually have plastic major connectors and are, therefore, usually interim RPDs. Tissue supported RPDs will move in function because of the resiliency of the mucosa.

Retention for tissue supported RPDs is customarily provided by wrought wire retentive clasp arms on selected natural teeth.

Tissue supported RPDs have the potential to cause soft tissue damage and periodontal attachment loss and accordingly should be used for only a short period of time.

Removable partial dentures may be classified according to the type of material used into:

1. Acrylic (Temporary RPDs): is the RPD made of acrylic and artificial teeth, retentive wires (clasp) may be used for retention.

2. Cr/Co (Chrome/Cobalt)-metal RPDs (Definitive RPDs): is the RPD made of metal or alloys and artificial teeth, acrylic may be used as a denture base.

Removable partial dentures may be classified according to the type of treatment:

1. Definitive RPDs:

Definitive RPDs are constructed after extensive diagnosis, treatment planning, and through preparation of the teeth and tissue for the prosthesis. The length of service of definitive RPDs is intended to be many years this meaning the cobalt chromium alloy removable partial dentures.

2. Interim RPDs:

Interim RPDs are usually constructed as part of the preparation of the mouth for definitive RPD, FPD or implant treatment. The length of service of interim RPDs is generally planned to be a year or less, they are frequently referred to as temporary RPDs example of that is the acrylic removable partial dentures.

Classification based on arch configuration:

The most widely accepted system of classification of RPDs and partially edentulous arches was proposed by Dr. Edward Kennedy in 1923. It is based on the configuration of the remaining natural teeth and edentulous spaces. This system was further defined and expanded upon by Dr. O.C. Applegate and Dr. Jacques Fiset.

The values of the Kennedy – Applegate – Fiset classification system are that:

1. It is relatively simple and easy to remember.

2. Extremely comprehensive and very practical.

3. Universally accepted.

4. It permits logical approach to the problem of design.

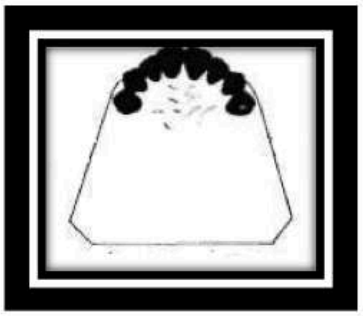
5. It permits immediate visualization of the partially edentulous arch or RPDs designed for that arch.

6. It indicates the type of support for the RPD, which suggest certain physiological and mechanical principles of treatment and RPD design.

Kennedy – Applegate – Fiset classification system

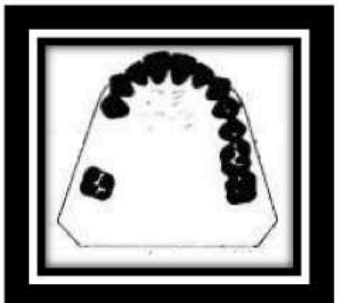
According to this classification system, partially edentulous arches are classified into four basic classes:

Class I: Bilateral edentulous areas located posterior to the natural teeth.

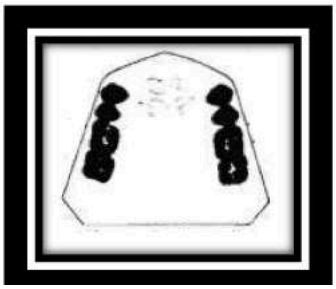


Class II: A unilateral edentulous area located posterior to the remaining natural teeth.

Class III: A unilateral edentulous area with natural teeth remaining both anterior and posterior to it.



Class IV: A single, but bilateral (crossing the midline), edentulous area located anterior to the remaining natural teeth.



Edentulous areas other than those determining the basic classes were designated as modification spaces and written as a number 1, 2, 3... depending on the number of the extra edentulous spans. Example:

Class III, modification 2

Applegate's rules governing the application of the Kennedy classification method:

*Rule 1

Classification should follow rather than precede any extractions of teeth that might alter the original classification.

* Rule 2

If a third molar is missing and not to be replaced, it is not considered in the classification.

* Rule 3

If a third molar is present and is to be used as an abutment, it is considered in the classification.

* Rule 4

If a second molar is missing and is not to be replaced, it is not considered in the classification (e. g., if the opposing second molar is likewise missing and is not to be replaced).

* Rule 5
The most classification. posterior edentulous area (or areas) always determines the classification.

* Rule 6

Edentulous areas other than those determining the classification are referred to as modifications and are designated by their number.

* Rule 7

The extent of the modification is not considered, only the number of additional edentulous areas.

*Rule 8

There can be no modification areas in Class IV arches. (Other edentulous areas lying posterior to the single bilateral areas crossing the midline would instead determine the classification; see Rule 5.)

Examples of different partially edentulous arches cases

EXAMINATION

Q1- choose the correct answer:-

1- **Upon examining a patient in your clinic you found out that all his upper left premolars were lost as well as all his right molars. According to kennedy's classification this case is:**

A) Kennedy's class I.

B) Kennedy's class II.

C) Kennedy's class III modification 1.

D) Kennedy's class II modification 1.

2-**In Kennedy's classification for partially edentulous arches class II is:**

a) Unilateral edentulous are located posterior to remaining teeth.

b) A unilateral edentulous area with natural teeth remaining both anterior and posterior to it.

c) A single edentulous area crossing the midline.

d) None of the above.

3 A case presented in your clinic with missing all mandibular molars and second premolars on both sides upon examination you decide that it is indicated for RPD: For this case:According to kennedy's classification it is considered:

a) Class II.

b) Class I.

c) Class I modification 1.

D) class III

Session -3
Surveying

Objectives of session number -3

Is achieved by a careful evaluation of a patient's study casts. The instrument used to aid the examination of the study casts is called a dental surveyor and the procedure is known as surveying.

Instructions:

❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q1- choose the correct answer:-

A patient came to your clinic , requesting a RPD . for the lower arch, upon examination, you found that: all the anterior teeth were missing .as well as the first , second& third molars on one side of the arch. This patient is considered ;

a. mandibular Kennedy class I.
b. mandibular Kennedy class III mod.2
c. mandibular Kennedy class III mod.1.
d. None of the above.

B- In Kennedy's classification, class III is;

a- Unilateral distal extension located posterior to remaining natural teeth.
b- Unilateral edentulous area with remaining natural teeth anterior &posterior to it.
c- Single edentulous area crossing midline located anterior to remaining natural teeth.
d- None of the above.

The ideal requirements for successful removable partial denture are:

1. Be easily inserted and removed by the patient.

2. Resist dislodging forces.

3. It should be aesthetically pleasing.

4. Avoid the creation of undesirable food traps.

5. Minimize plaque retention.

Surveying

It's the determination of the relative parallism of two or more surfaces of the teeth or other parts of the cast of the dental arch.

Survey.

It's the procedure of the locating and delineating the contour and position of the abutment teeth and associated structures before designing a removable partial denture.

Objective of surveying

In order to plane those modifications to fabricate a removable partial denture thus can be easily inserted in the mouth and retained in place during function.

Purposes (Objective) of Surveying the Diagnostic Cast

1. To determine the most desirable path of placement that will eliminate or minimize interference to placement and removal.

When the restoration (RPD) is properly designed to have positive guiding planes, the patient may place and remove the restoration with ease in only one direction.

Advantages of single path of placement (insertion):

A. Allows insertion and removal of prosthesis without interference.

B. Help to direct the force along the long axis of the tooth.

C. Provide frictional retention.

D. Minimize torque on the abutment teeth.

E. Cross arch stabilization.

F. Equalize retention.

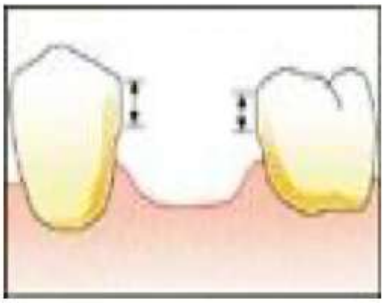
2. To identify proximal tooth surfaces that are, or need to be, made parallel so that they act as guiding planes during placement and removal.

Guiding planes: two or more vertically parallel surfaces on abutment teeth and/or fixed dental prostheses oriented so as to contribute to the direction of the path of placement and removal of a removable partial denture, maxillofacial prosthesis, and overdenture. They are:

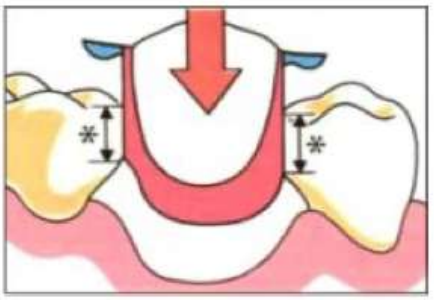
A. Flat surfaces parallel to the path of insertion.

B. Represent the initial contact of the RPD.

C. Help to stabilize, control and limit the movement of the RPD.



Guiding planes
(Vertically parallel surfaces on abutment teeth)



(The prosthesis during placement)

3. To locate and measure areas of the teeth that may be used for retention.

4. To determine whether tooth and bony areas of interference will need to be eliminated surgically or by selecting a different path of placement.

5. To determine the most suitable path of placement that will permit locating retainers and artificial teeth to the best esthetic advantage.

6. To permit an accurate charting of the mouth preparation to be made.

7. To delineate the height of contour (survey line) on abutment teeth and to locate areas of undesirable tooth undercut those are to be avoided, eliminated, or blocked out.

Undercuts could be:

A. Desirable undercut: this is useful in to retain RPD against dislodging forces.

B. Undesirable undercut: other than that used to retain the RPD; in most of the case undesirable undercut interfere with placement and removal of the prosthesis or produces damaging effects on the teeth and underlying structures. Such type of undercut can be eliminated by:

1- Block out with wax.

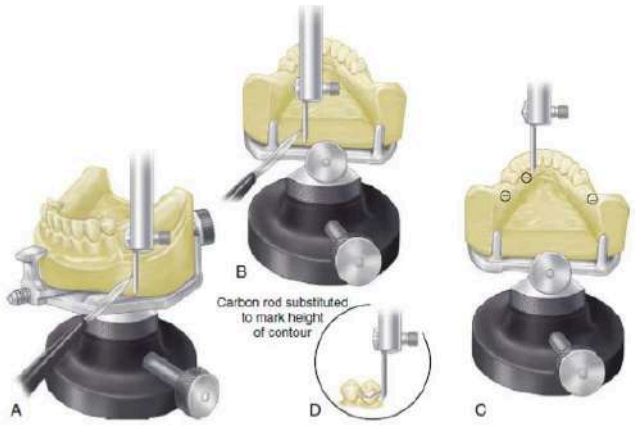
2-Preparation and alteration of the tooth surfaces (within a limit).

3-Crown restoration, in which the tooth surface can be reshaped to serve RPD functions and requirements.

8. To record the cast position in relation to the selected path of placement for future reference. This may be done by locating three dots (tripods) or parallel lines on the cast; three dotes or lines, one anterior and two posterior to permit its reorientation.

Three dots (tripoding)

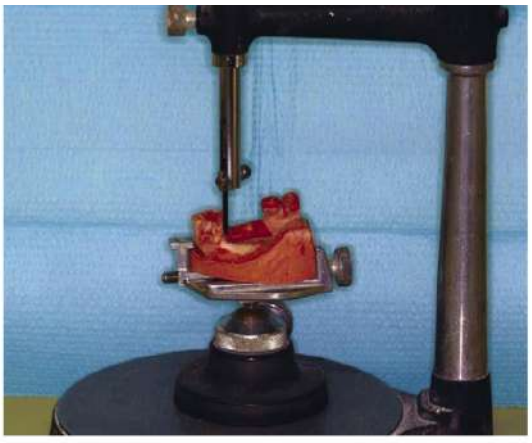
Parallel lines



A-B, The path of placement is determined, and the base of the cast is scored to record its relation to the surveyor for future repositioning. **C,** An alternate method of recording the relation of the cast to the surveyor is known as *tripoding*. A carbon marker is placed in the vertical arm of the surveyor, and the arm is adjusted to the height by which the cast can be contacted in three divergent locations. The vertical arm is locked in position, and the cast is brought into contact with the tip of the carbon marker. Three resultant marks are encircled with colored lead pencil for ease of identification. Reorientation of the cast to the surveyor is accomplished by tilting the cast until the plane created by three marks is at a right angle to the vertical arm of the surveyor. **D**, Height of contour is then delineated by a carbon marker.

Dental surveyor

It's as an instrument used to determine the relative parallelism of two or more surfaces of the teeth or other parts of the cast of a dental arch.
Types of dental surveyors
The most widely used surveyors are:
1. Ney surveyor with non swiveling horizontal arm.



The Ney surveyor is widely used because of its simplicity and durability.

2. ***Jelenko surveyor*** with swiveling horizontal arm and has spring mounted paralleling tool.

The Jelenko surveyor: Note the spring-mounted paralleling tool and swivel at the top of the vertical arm. The horizontal arm may be fixed in any position by tightening the nut at the top of the vertical arm.

Parts of dental surveyor (Ney type surveyor):

A. Platform on which the base is moved.

B. Vertical arm or upright column that supports the superstructures.

C. Horizontal arm from which surveying tools suspends.

D. Survey arm.

E. Mandrel for holding special tools.

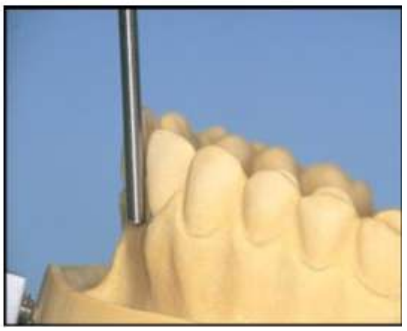
F. Tools which are used for surveying (in sequence) include: analyzing rod, carbon marker, undercut gauges, wax trimmer.

G. Table to which the cast is attached.

H. Base on which the table swivels.

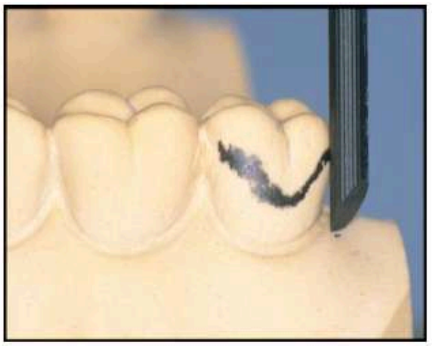
Analyzing rod

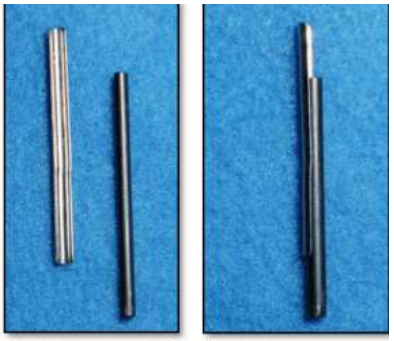
It's a rigid metal rod used for diagnostic purposes in the selection of the path of placement and to determine the undercut areas prior to scribing the height of contour with the carbon marker.



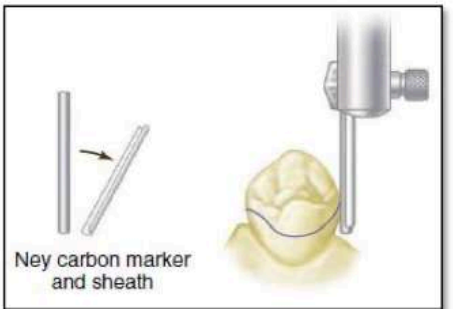
Carbon marker

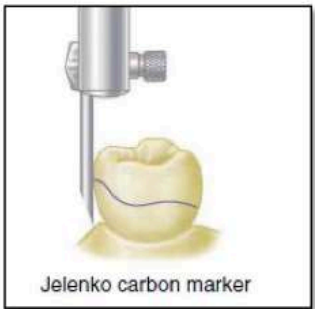
It's used for the actual marking of the survey lines on the cast. A metal shield is used to protect it from breakage.





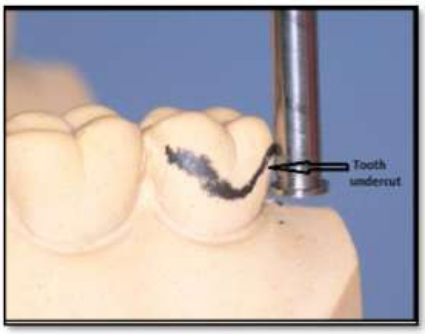
Carbon marker and metal shield



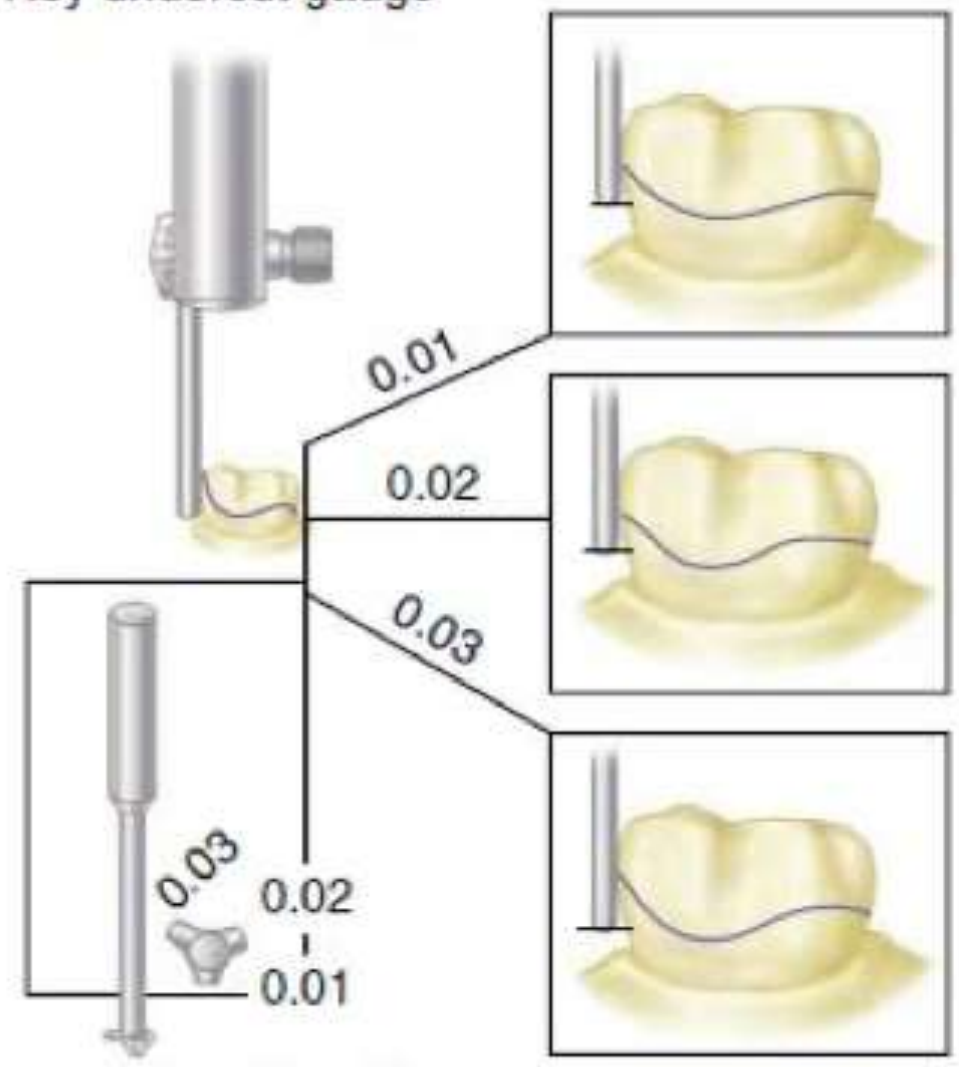


Undercut gauges

They are used to measure the extent of the undercuts on abutment teeth that are being used for clasp retention, usually there are available in three gauges: 0.01, 0.02, and 0.03 inch. Undercut dimensions can be measured on teeth by bringing the vertical shaft of the gauge in contact with a tooth and then moving the surveying arm up or down until there is also contact with the terminal tip.



Ney undercut gauge



Jelenko undercut gauge

Wax trimmer

It’s a knife used for trimming the excess wax which blocks out undesirable undercut in such away to be parallel to each other and to the pre-determined path of insertion.

Whenever possible, cast should be surveyed with the occlusal plane parallel to the base of the surveyor so that the path of insertion is vertical to the occlusal plane. Most patients will tend to seat the partial denture under force of occlusion. I f the path of insertions is other than vertical to the occlusal plane such seating may deform the clasps.

Principles of surveying

1 Surveying a tooth consist of locating accurately the height of its maximum contour in relation to the plane in which the cast is positioned.

2 Modifying the proximal tooth surfaces so that the prosthesis goes smooth in place without interferences.

3 The fact that the majority of the natural teeth crown s are bulbous in shape (have a suprabulge region), where this suprabulge region could occur anywhere between the occlusal surface and the gingival margin. When a vertical arm is brought into contact with the convex surface, they will contact only at one point that is the point of maximum convexity, where this surface is rotated, and is still in contact with the vertical arm, an imaginary line will be traced at the greatest circumference, when we substituted this vertical analyzing rod with a carbon marker then an actual line will be produced at the level of the maximum tooth bulge, this line is called the survey line.

The area of a tooth occlusal to the survey line is a non undercut area, while the area gingival to this line is an undercut area. When a tooth is tilted or rotated in relation to the analyzing rod, another survey line will be traced, as a r esult, the extent of non undercut area and the undercut area are consequently changed. That means the survey line can vary according to the angle formed by contact of the vertical analyzing rod with the tooth surface.

? Alteration of undercut area can be done by anterior or posterior tilting of dental cast. So that the effect of tilting a cast on the surveyor will be:

1. Redistribution of undercuts to the desired areas.
2. Allow a more favorable path of insertion.
3. Allow the use of a desired type of clasp for better function and esthetics.
4. Allow the use of a design to minimize food impaction, food entrapment and plaque accumulation.

Types of undercuts established by surveying

1. Contour: due to natural contour of the tooth.
2. Positional: due to tilting of cast on surveyor.
3. True: an undercut which is present in relation to the analyzing rod and to the path of displacement.
4. False: an undercut which present only in relation to the analyzing rod but not in relation to the path of displacement.

Path of placement (Insertion)

The specific direction in which a prosthesis is placed on the residual alveolar ridge, abutment teeth, dental implant abutment(s), or attachments.

Factors that determine and affect the path of placement (insertion) and removal of the RPD

1. Guiding Planes

Guiding planes are parallel surfaces of abutment teeth that direct the insertion and removal of a partial denture. The path of insertion should be parallel to the guiding planes. Proximal tooth surfaces that bear a parallel relationship to one another must either be found or be created to act as guiding planes.

To do so this, proximal plates (part of the RPD contact guiding planes) should, whenever possible, be the initial portions of the partial denture to contact the abutments.

The components of the denture that contact the guiding planes during placement of removable partial denture are:

Tooth surface which act as guiding planes	Component of the denture which contact this guiding planes
A- Proximal tooth surface	1. Minor connector that joins the occlusal rests and clasp to the saddle. 2. Proximal plates are used with I-bar or R.P.I. system.
B-Axial or lingual tooth surface	1. Reciprocal clasp arms. 2. Lingual plates that act as reciprocal arm. 3. Minor connector that joins the auxiliary rest to the major connector.

Function of guiding plane:

? The denture can be easily placed and removed by the patient without strain on the teeth contacted or on the denture itself and without damage to the underlying soft tissues.

? Can provide bracing or stabilization when placed in the axial tooth surfaces.

? Ensure clasp assembly function including retention and stabilization.

? The friction forces of contact of prosthesis with the guiding planes wall will contribute significantly to the retention of the RPD.

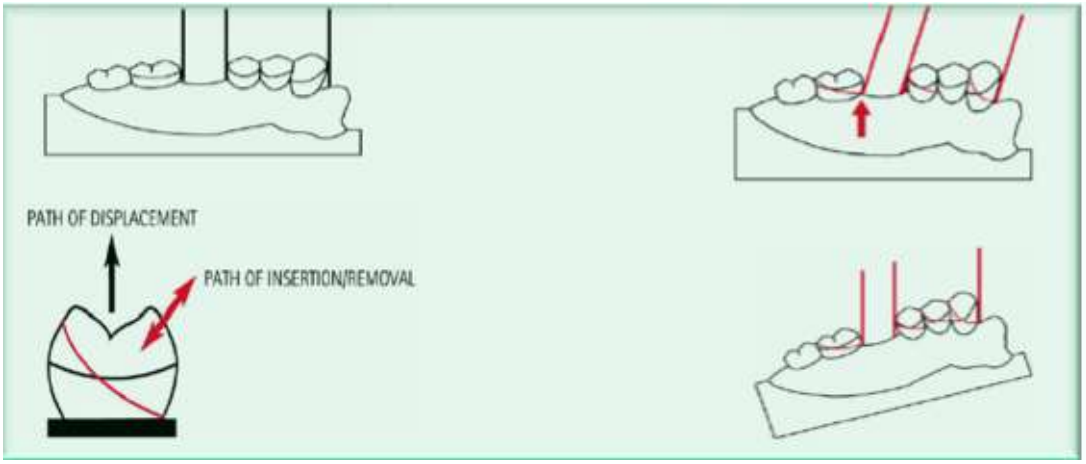
2. Retentive Areas

Retentive areas must exist for a given path of placement and must be contacted by retentive clasp arms that are forced to flex over a convex surface during placement and removal.

Fairly even retention may be obtained by one of two means:

? Change the path of placement to increase or decrease the angle of cervical (Gingival) convergence of opposing retentive surfaces of abutment teeth.

? Alter the flexibility of the clasp arm by changing its design, its size and length, or the material of which it is made.
For a clasp to be retentive; its path of escapement must be other than parallel to the path of removal of the denture itself; otherwise, it would not be forced to flex and thereby generate the resistance known as retention. Clasp retention therefore depends on the existence of a definite path of placement and removal.



3. Interference

The prosthesis must be designed so that it may be placed and removed without encountering tooth or soft tissue interference (areas of interference like the proximal tooth undercut, maxillary or mandibular lingually or labialy or buccally incline teeth, bony exesistosis and tissue undercuts).

A path of placement may be selected that encounters interference only if the interference can be eliminated:

? During mouth preparations.

? On the master cast by a reasonable amount of blockout.

Interference may be eliminated during mouth preparations by:

? Surgery.

? Extraction of the tooth or teeth.

? Modification of interfering tooth surfaces.

? Or alteration of tooth contours with restorations.

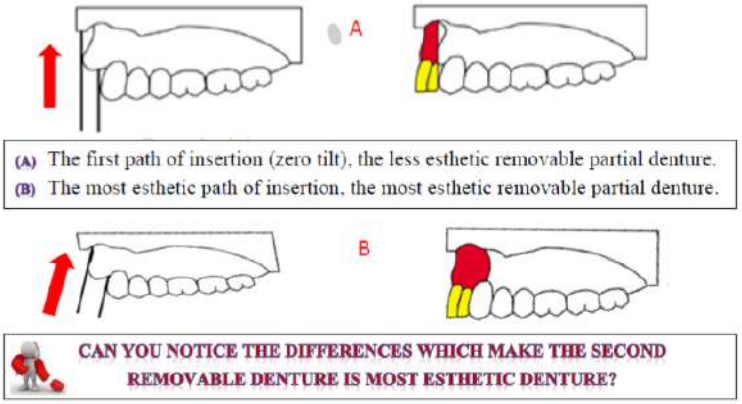
If the interferences cannot be eliminated or minimized, then a different path of insertion must be considered, even if less desirable guiding plane and retentive areas must be selected.

4. Esthetics

A path of insertion should be selected to provide the most esthetic placement of artificial teeth and the least amount of visible metal on the abutment teeth. Retentive areas must be selected to optimize retention purposes with esthetic requirements.

Metal component must be concealed. Less metal will be displayed (most esthetic location of clasps) if the retentive clasp is placed at a more distogingival area of tooth surface made possible either by changing the path of placement selected or by the contour of the restorations.

? Esthetics also may dictate the choice of path selected when missing anterior teeth must be properly positioned in the partial denture. In such situations so that neither the artificial teeth nor the adjacent natural teeth will have to be modified excessively.



Rules of surveying

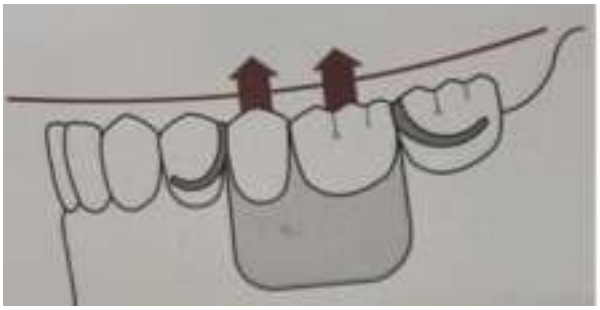
1. The undercut areas cannot be created or produced by tilting the cast.

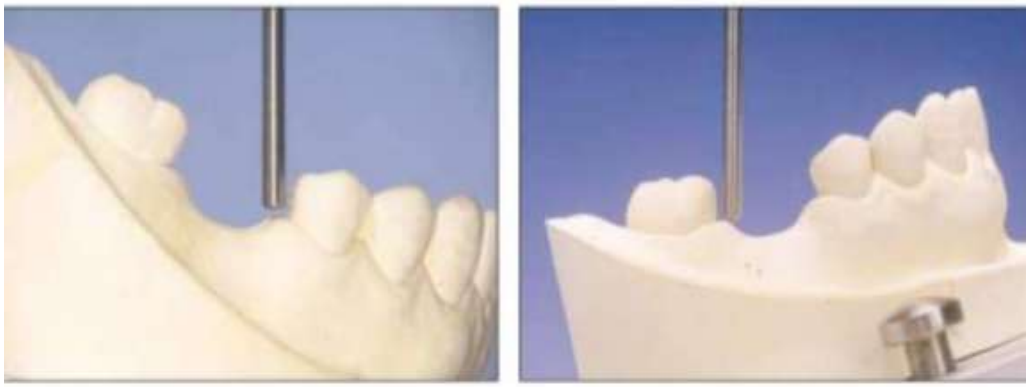
2. All casts are originally surveyed with the occlusal plane is parallel to the base of surveyor; this is what we called zero tilt, in which the retentive undercut must be present on the abutment teeth.

Most patients will tend to seat the partial denture under force of occlusion. If the path of insertion is other than vertical to the occlusal plane such seating may deform the clasps. Also dislodging forces are always directed perpendicular to the occlusal plane.
3. The retentive tip of the clasp must engage the undercut area, which are present when the cast is surveyed in certain position.

4. Wherever possible, the undesirable undercut and area of interference are removed during mouth preparation by recontouring teeth or making necessary restoration.

5. Anteroposterior tilt: anterior tilt will increase the mesial undercut, while the posterior tilt will increase the distal undercut. Such as in free end extension partial denture tilting the cast anteriorly will decrease or eliminate the distal undercut where the path of insertion will be changed, thus getting rid of undesirable undercut located distally, therefore the tilting of the cast is to minimize or equalize the undesirable undercut.

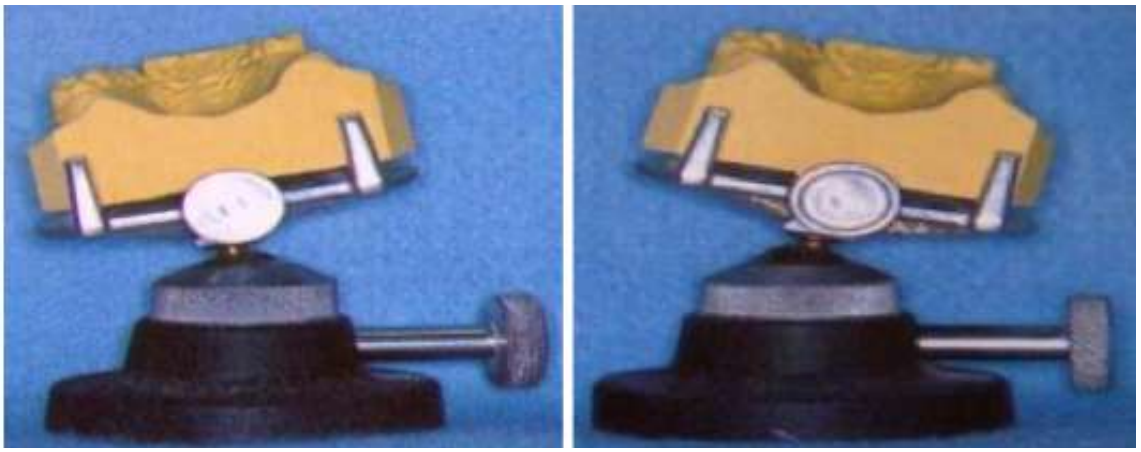




Anterior tilt ('heels up')

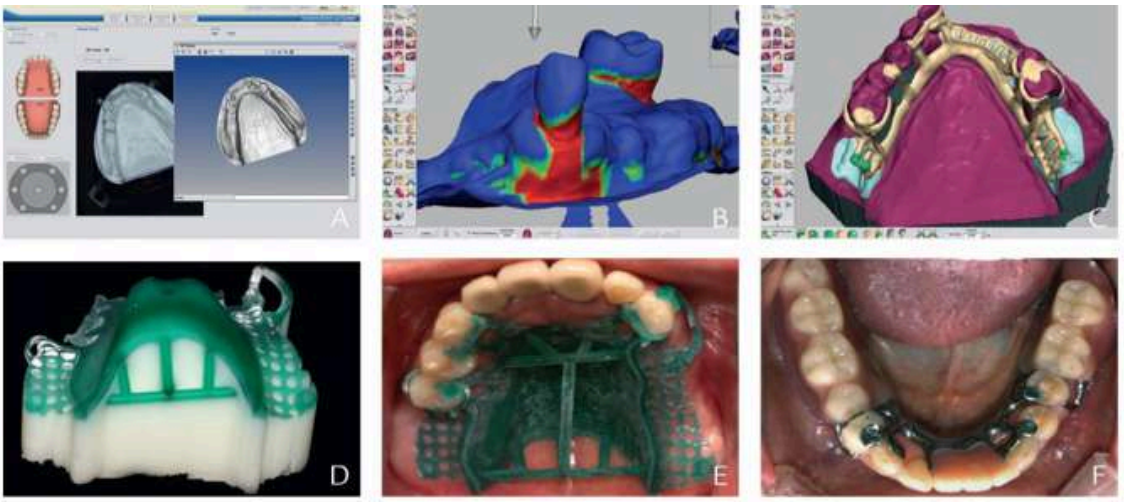
Posterior tilt ('heels down').

6. Lateral tilt: dealing with retentive undercut situated buccally or lingually on posterior teeth.



Computer aided designing and manufacturing (CAD - CAM) of removable partial dentures:
Digital surveying:

The framework of the RPD was designed by setting a surveying axis and computing the undercut to determine an ideal path of insertion and removal (B).



Procedure for digital removable partial denture fabrication. A, Model scanning. B, Electronic surveying. C, Definitive framework design. D, Pattern built with 3-dimensional printer. E. Intraoral view of pattern resin framework. F. Definitive prosthesis.

EXAMINATION

Q1- choose the correct answer:

1-The Surveyor tools are ;

a- Carbon marker & analyzing rod.

b- Carbon marker, analyzing rod & undercut gauges.

c- Wax trimmer & undercut gauge.

d- a & c.

2-The objective of surveying the diagnostic cast is:

a) To determine acceptable path of placement.

b) To identify proximal tooth surfaces that are parallel and can act as guiding planes.

c) To locate and measure areas of tooth that can be used for retention.

d) All of the above.

3-The uses of dental surveyor include:

A) Surveying the diagnostic cast.

B) Surveying the master cast.

C)Tripoding the cast.

D) All of the above.

Session -4

Component Parts of a Removable Partial Denture

Objectives of ssession number -4

The student will be study:

1. record base of complete denture.
2. techniques of making record base of complete denture.

3-occlusal rim of complete denture .

Instructions:

❖ Study the over view carefully.

❖ Perform the pre-test of this unit.

❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.

❖After you studying this modular unit.

❖The post-test you must do it.

❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q1- choose the correct answer:

1- Factors that determine and affect the path of placement and removal of the RPD

A-Guiding Planes and Interference
B-Retentive Areas and Esthetics
C-type of material of RPD and skills of dentist
D-A and B

2-Removable partial dentures may be classified according to the type of material used into:

A-Acrylic and Cr/Co (Chrome/Cobalt)
B-Cr/Co (Chrome/Cobalt) and ceramic
C-Acrylic and composite
D-non of above

3-Jelenko surveyor

A-with Swivelling horizontal arm
B-With non swiveling horizontal arm
C-With swiveling vertical arm
D-With non swiveling vertical arm

The removable partial denture consists of seven main components (Fig. 1) and these are essential for the success of the treatment for the partially edentulous patient.

1. Major connectors

2. Minor connectors

3. Rests

4. Direct retainers

5. Reciprocal components (as parts of a clasp assembly)

6. Indirect retainers (if the prosthesis has distal extension bases)

7. One or more bases (each supporting one to several replacement teeth)

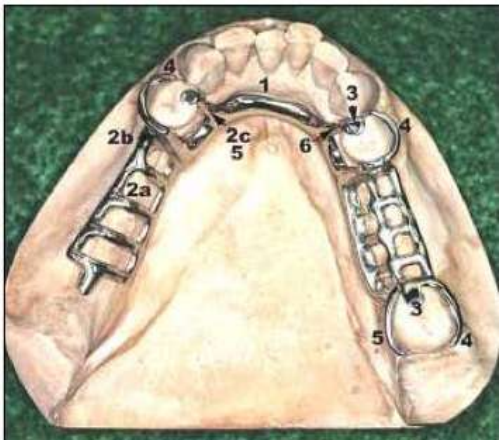


Figure 1: 1, lingual bar major connector; 2a, minor connector by which the resin denture base will be attached; 2b, minor connector, proximal plate, which is part of clasp assembly; 2c, minor connector used to connect rests to major connectors; 3, occlusal rests; 4, direct retainer arm, which is part of the total clasp assembly; 5, stabilizing or reciprocal components of clasp assembly

Major connectors

A major connector is the component of the partial denture that connects the parts of the prosthesis located on one side of the arch with those on the opposite side (Fig. 1). There are several designs for the maxillary and mandibular major connector and each serves for certain purposes (Fig. 2 &3)

Figure 2: Maxillary major connector

Figure 3: Mandibular major connector

The major connector is that of this partial denture to which all other parts are directly or indirectly attached. This component also provides cross arch stability to help resist displacement by functional stresses.

To function effectively and minimize potentially damaging

effects, all major connectors must:

1. Be rigid.

A flexible major connector may cause severe damage to the hard and soft tissues of the oral cavity. Flexibility allows forces to be concentrated on individual teeth and segments of the residual ridges. This may lead to tooth mobility or tooth loss. The concentration of forces upon small segments of the residual ridges may cause resorption of the hard and soft tissues. This may result in decreased ridge height and decreased support for the associated denture bases.

2. Protect the associated soft tissues.

The Major connector must not permit impingement upon the free gingival margins of the remaining teeth. The marginal gingivae are highly vascular and susceptible to injury from sustained pressure.

3. Provide a means for obtaining indirect retention where indicated.

Removable partial denture that is not supported at each end of an edentulous space tends to rotate about a fulcrum line. The most common method for controlling this movement is through the use of one or more indirect retainers. For practical purposes, indirect retainers will always take the form of rests. When properly positioned, these rests can minimize the rotational movements of prosthesis.
4. Provide a means for placement of one or more denture bases. Generally, the type of major connector will be dictated by the number and location of edentulous areas. Certain major connectors are indicated for anterior tooth replacement, while others are not. Some major connectors may be selected for tooth-supported removable partial dentures, but not for tooth-tissue-supported applications. In each instance, a major connector must allow appropriate placement of the associated denture base(s).

5. Promote patient comfort.

The edges of a major connector should be contoured to blend with the oral tissues. This is particularly true for major connectors that cross the anterior palate. The anterior border of a maxillary major connector should not end on the anterior slope of a prominent ruga (Fig 4a). The additional thickness produced by metal coverage will create a noticeable prominence on this section of the palate, and may interfere with the patient's comfort and speech. Instead, the anterior border of the major connector should be terminated on the posterior slope of a prominent ruga (Fig 4b).

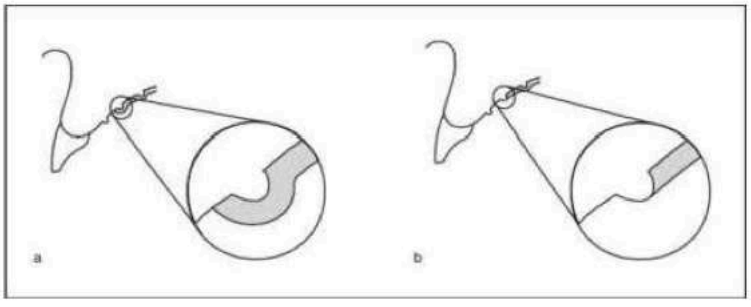


Figure 4: (a) the anterior border of a maxillary major connector should not end on the anterior slope of a prominent ruga. (b) The anterior border of the major connector should be terminated on the posterior slope of a prominent ruga

The major connector is a component part of the removable partial denture, as mentioned earlier. The ***chief functions of a major connector*** are to 1) unify the major parts of the prosthesis, 2) distribute the occlusal force throughout the arch to selected teeth and tissue, 3) cross-arch stabilization to minimize the torque to the teeth. It is through the major

connector that other components of the partial denture become unified and effective.
Major connectors should be designed and located with the following guidelines in mind:
1. Major connectors should be free of movable tissue.
2. Impingement of gingival tissue should be avoided.
It is recommended that the borders of the maxillary major connector be located a minimum of 6 mm away from and parallel to the gingival margins (Fig. 5). As for the mandibular major connector, there should be a minimum of 4 mm below the gingival margin (Fig. 6)

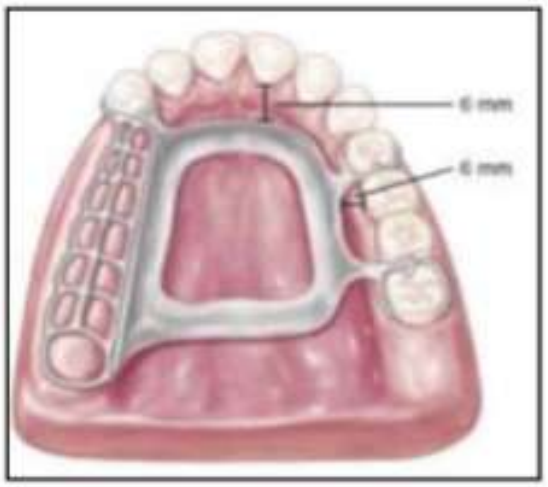


Figure 5: borders of a major connector should be positioned at least 6 mm from the free gingival margins

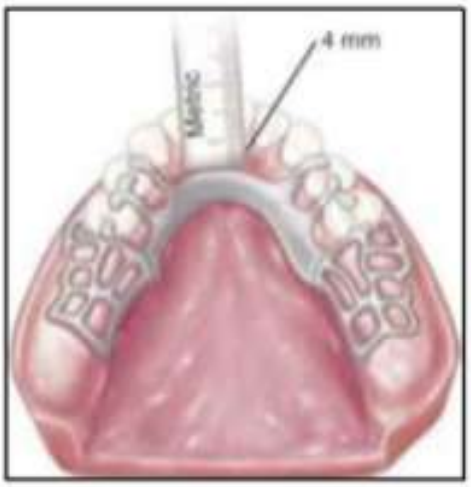


Figure 6: borders of the major connect should be positioned at least 4 mm fro the free gingival margins

3 The borders of the major connector should run parallel to the gingival margins of the remaining teeth (Fig 7)

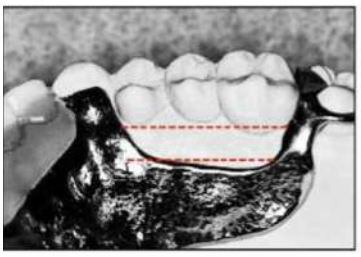


Figure 7: The border s of the major connector should run parallel to the gingival margins of the remaining teeth.

4- The major connector should be as a symmetrical as possible. In addition, the borders of a maxillary major connector should cross the palatal midline at right angles not obliquely (Fig. 8).

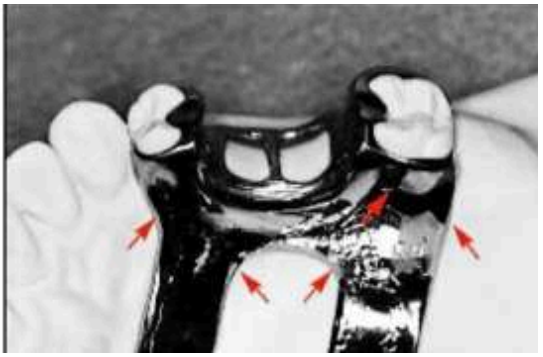
Figure 8: The borders of a maxillary major connector should always cross the palatal midline at 90 degrees.

5. Bony and soft tissue prominences should be avoided during placement and removal (Fig. 9).

Figure 9: Coverage of tori should be avoided if possible. The tissues covering tori are extremely thin and susceptible to irritation.

6. The major connector should show smooth, rounded contours (Fig. 10) Sharp angles and corners may cause patient discomfort and produce areas of stress concentration within a removable partial denture framework Areas of stress concentration may lead to structural fatigue and prosthesis fracture.

Figure 10: All major connectors should exhibit smooth, rounded contours (arrows).



7. Relief should be provided beneath a major connector to prevent its settling into areas of possible interference, such as an elevated median palatal suture.

8. Major connectors should be located and/or relieved to prevent impingement of tissue that occurs because the distal extension denture rotates in function in the mandible.

Characteristics of major connectors that contribute to the maintenance of health of the oral environment and the wellbeing of the patient may be listed as follows:

1. Made from an alloy compatible with oral tissue.
2. Rigid and provide cross-arch stability through the principle of broad distribution of stress.
3. Do not interfere with and are not irritating to the tongue.
4. Do not substantially alter the natural contour of the lingual surface of the mandibular alveolar ridge or of the palatal vault.
5. Do not impinge on oral tissue when the restoration is placed, removed, or rotated in function.
6. Cover no more tissue than is absolutely necessary. 7. Do not contribute to retention or trapping of food particles.
8. Have support from other elements of the framework to minimize rotation tendencies in function.
9. Contribute to the support of the prosthesis

EXAMINATION

Q1- choose the correct answer:-

A. Guiding Planes
B. proximal plates
C. Path of placement
D. path of insertion

2- The advantage of using a metal denture base is

A. Increase in tissue tolerance
B. Easy laboratory procedure
C. Rebasing and relining are quite easy
D. Increase in restorative cost

3-.the function of an occlusal rest seat is :

A. Stabilize the denture
B. To prevent the lateral forces acting on the tooth
C. To resist vertical force of occlusion
D. Increase retention of partial denture

Session - 5
Maxillary major connector

EXAMINATION

Objectives of session number -5

The student will be study:
1. ANATOMY AND PHYSIOLOGY OF TEMPOROMANDIBULAR JOINT
2. The movement of TMJ.

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

Q1- choose the correct answer:-

-The method used of determining the height of floor of the mouth :
A- use periodontal probe
B- use straight probe
C- use an individualized impression method.
D- both A and C
2- The border of maxillary major connector should cross palatal midline at :
A- right angle
B- obliquely.
C- scallop.
D- less than 90 degrees.
3-The maxillary major connector that provide maximum rigidity and minimum bulk :
A- single palatal bar .
B- single palatal strap .
C- combination anterior and posterior palatal strap .
D. Non all above.

Maxillary Major Connectors

P

Special Structural Requirements for Maxillary Major Connectors:

Beading: All maxillary major connectors should display minor elevations at those borders that contact the palatal soft tissues (Fig. 1). The elevations are termed ***bead lines*** and are intended to slightly displace the adjacent soft tissues. This displacement produces a 1) mechanical seal and prevents food particles from collecting under the major connector. In addition, 2) these elevations provide excellent visual finish lines for technicians who finish and polish removable partial denture frameworks.

Bead lines are created by carving shallow channels on the surface of a maxillary master cast before duplication in investment material. These lines are best prepared with a small spoon excavator or round bur rotating at slow speed. Each channel should have a width and depth of 0.5 to 1.0 mm. The depth of the beading should be reduced in areas of thin tissue coverage such as the midpalatine raphe or a palatal torus.

Figure 1: Maxillary major connector bead lines (arrows)

Relief should not be used under a maxillary major connector except in the presence of a palatal torus or a prominent median suture line. The intimate contact between the palatal soft tissues and the metal connector enhances the retention and stability of the denture.

Figure 3: Single palatal strap–type major connector.

Figure 4: The anteroposterior dimension of a palatal strap major connector should never be less than 8 mm.

Disadvantages of the palatal strap: In some cases, a patient may complain of excessive palatal coverage. Frequently, this complaint can be traced to improper positioning of the strap borders. Therefore, the anterior border of the major connector should be positioned posterior to the palatal rugae if possible. If this is not possible, the anterior border should be terminated on the posterior slopes of prominent rugae. The posterior border of the major connector should be positioned anterior to the junction of the hard and soft palates.

Note: To differentiate between a palatal bar and a palatal strap, a palatal connector component less than 8 mm in width is referred to as a bar.

3. Combination Anterior and Posterior Palatal Bar–type Connectors

Structurally, this combination of major connectors (Fig. 5) exhibits many of the same disadvantages as the single palatal bar. To be sufficiently rigid and to provide support and stability, these connectors could be too bulky and could interfere with tongue function.

Types of Maxillary Major Connector:

The are six types of maxillary major connectors used in RPD therapy:

1. Single palatal bar
2. Single palatal strap
3. Anterior-posterior palatal bars
4. U-shaped palatal connector
5. Combination anterior and posterior palatal strap–type connector
6. Palatal plate-type connector

1. Single Palatal Bar

The palatal bar is a narrow half oval with its thickest point at the center (Fig. 2). If used, the palatal bar should be limited to short-span Class III applications (replacing one or two teeth on each side of the arch). In addition, the palatal bar should not be placed anterior to the second premolar position; otherwise its bulk may produce noticeable discomfort and alteration of speech.

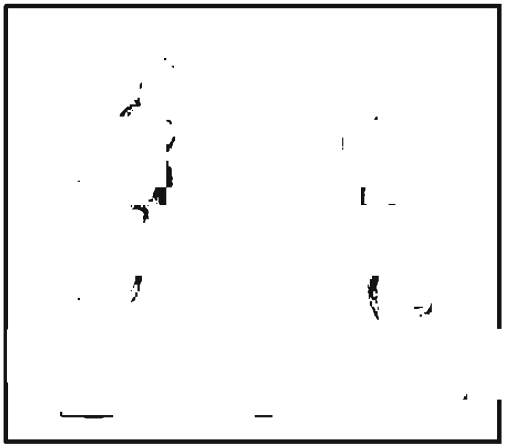
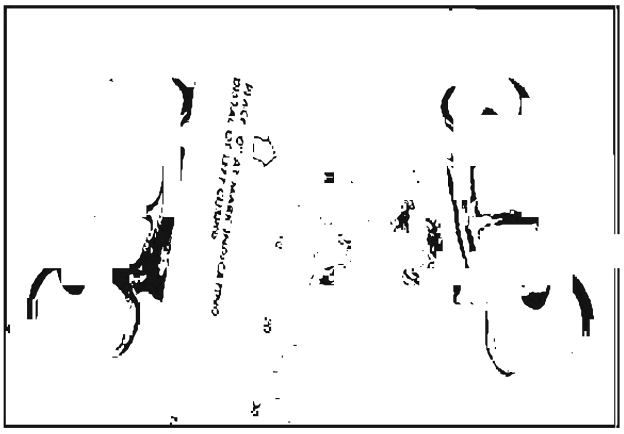


Figure 2: Single palatal bar major connector

2. Single Palatal Strap

The palatal strap consists of a wide band of metal with a thin cross-sectional dimension (Fig. 3). The anteroposterior dimension of a palatal strap major connector should not be less than 8 mm to avoid compromise of its rigidity (Fig. 4).

Figure 5: Combination Anterior and Posterior Palatal Bar–type Connectors



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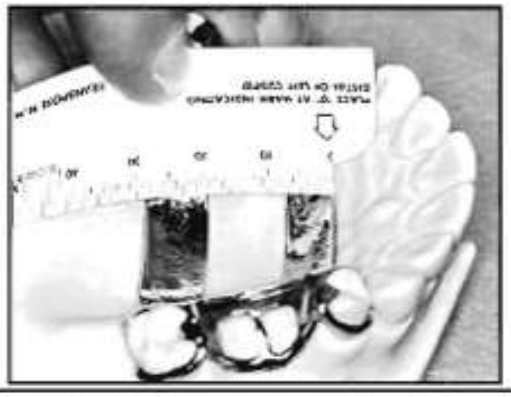


Figure 6: Both the anterior and posterior straps of an anteroposterior palatal strap major connector should be at least 8 mm in width

Figure 7: Anterior-posterior palatal strap–type major connector.

The anteroposterior palatal bar minimizes soft tissue coverage, yet provides exceptional resistance to deformation.

The disadvantages of the anteroposterior palatal bar is frequently uncomfortable. The bulk and contour of the connector may be bothersome to the tongue and may interfere with phonetics.

As a general rule, the anteroposterior palatal bar should not be considered the first choice for a maxillary major connector. It should be selected only after other choices have been considered and eliminated.

3. Combination Anterior and Posterior Palatal Strap–type Connector

The anterior-posterior palatal strap provides maximum rigidity and minimum bulk. It may be used in almost any maxillary partial denture design. The posterior palatal strap should be flat and a minimum of 8 mm wide (Fig. 6). Posterior palatal connectors should be located as far posterior as possible to avoid interference with the tongue but anterior to the junction of the hard and soft palates. The only condition that prevents their use is an inoperable maxillary torus that extends posterior to the soft palate.

The strength of this major connector design lies in the fact that the anterior and posterior components are joined together by longitudinal connectors on either side, which form a square or rectangular frame (Fig. 7). Each component braces the others against possible torque and flexure. Flexure is practically nonexistent in such a design.

The open area in the palatal region should be at least 20 x 15 mm. Otherwise, another type of major connector should be chosen

Figure 6: Both the anterior and posterior straps of an anteroposterior palatal strap major connector should be at least 8 mm in width

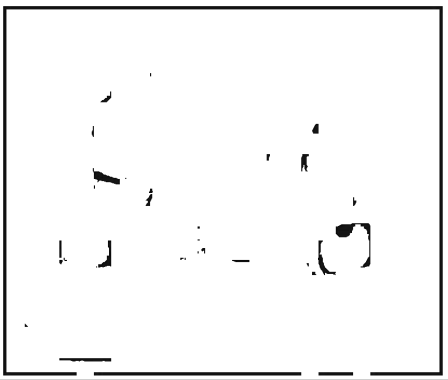


Figure 7: Anterior-posterior palatal strap–type major connector.

The combination anterior-posterior connector design may be used with any Kennedy class of partially edentulous arch. It is used most frequently in Classes II and IV, whereas the single wide palatal strap is used more frequently in Class III situations. The palatal plate–type or complete coverage connector is used most frequently in Class I situations.

All maxillary major connectors should cross the midline at a right angle rather than on a diagonal. It has been suggested that the tongue will accept symmetrically placed components far more readily than those placed without regard for symmetry.

Characteristics and Location:

1. Rectangle shaped and open in center portion.
2. Relatively broad (8 to 10 mm) anterior and posterior palatal straps.
3. Narrow lateral palatal straps (7 to 9 mm) parallel to curve of arch; minimum of 6 mm from gingival crevices of remaining teeth.
4. Anterior palatal strap: anterior border not placed farther anteriorly than anterior rests and never closer than 6 mm to lingual gingival crevices; follows the valleys of the rugae at right angles to the median palatal suture. Posterior border, if in rugae area, follows valleys of rugae at right angles to the median palatal suture.
5. Posterior palatal connector: posterior border located at junction of hard and soft palates and at right angles to median palatal suture and extended to hamular notch area(s) on distal extension side(s).
6. Anatomic replica or matte surface.

4. Palatal Plate–type Connector

The complete palatal plate is particularly indicated when maximum tissue support is required. In particular it should be the major connector of choice in long distal extension cases or where six or less anterior teeth remain. It should be selected where the primary abutments are periodontally involved, requiring maximum stress distribution. Where the edentulous areas are covered with flabby tissue or where there is a shallow palatal vault this connector also provides greater stability and stress distributing characteristics. The full palatal plate is usually not used in the presence of torus palatinus.

The words palatal plate are used to designate any thin, broad, contoured palatal coverage used as a maxillary major connector and covering one half or more of the hard palate (Fig. 8). This type is also named anatomic replica palatal major connector.

Figure 8: Palatal major connector covering two thirds of the palate.

The palatal plate may be used: 1) As a plate of varying width that covers the area between two or more edentulous areas, as a partial (Fig.8) or complete cast plate that extends posterior to the junction of the hard and soft palates (Fig. 9). Or 2) As an anterior palatal connector with a provision for extending an acrylic resin denture base in a posterior direction and this can be used when future relining is anticipated (Fig. 10).

The palatal plate should be located anterior to the posterior palatal seal area. The maxillary complete denture's typical posterior palatal seal is not necessary with a maxillary partial denture's palatal plate because of the accuracy and stability of the cast metal.

Figure 9: Complete coverage palatal major connector

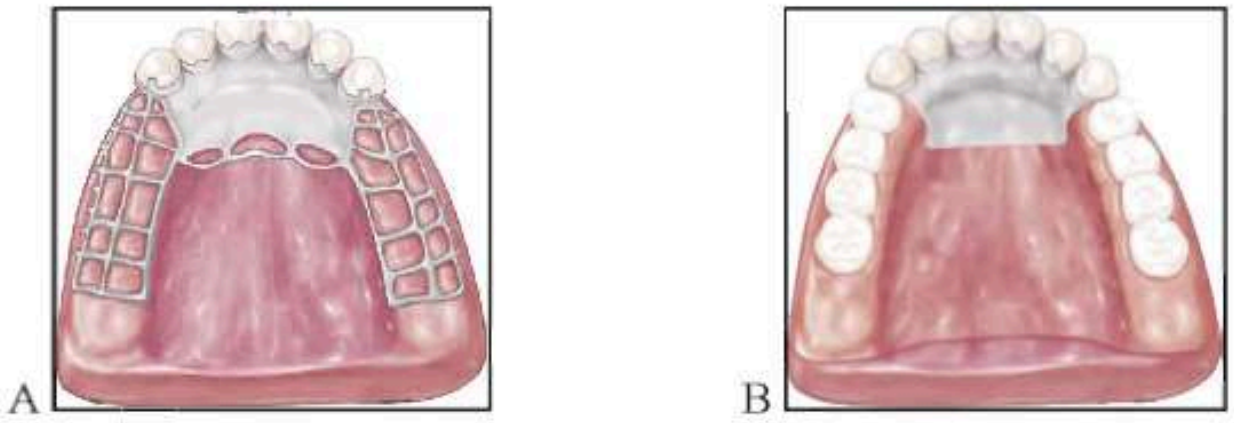


Figure 10: **A,** Palatal plate major connector with provisions for attaching the full-coverage resin denture base. **B,** Completed removable partial denture with resin base.

5. U-Shaped Palatal Connector (Horseshoe connector)

From both the patient's standpoint and a mechanical standpoint, the U-shaped palatal connector is the least desirable of maxillary major connectors.

The horseshoe connector consists of a thin band of metal running along the lingual surfaces of the remaining teeth and extending onto the palatal tissues for 6 to 8 mm (Fig.11). The medial borders of this connector should be placed at the junction of the horizontal and vertical slopes of the palate. Rigidity can be increased by extending the borders slightly onto the horizontal surfaces of the hard palate. The connector should display symmetry and should extend to the same height on both sides. All borders of the connector should be gently curved and smooth.

Figure (11): U-shaped palatal major connector

In the presence of a prominent median suture line or an inoperable torus, this major connector may offer distinct advantages. The horseshoe connector may be designed to avoid bony prominences without sacrificing vertical support.

The U- shaped Palatal Connector (Fig. 11) should never be used arbitrarily and may be indicated when a large inoperable palatal torus exists, and occasionally when several anterior teeth are to be replaced.

The following are the principal **objections** to use of the U-shaped connector that may lead to failure of many maxillary partial dentures:

1. Its lack of rigidity can allow lateral flexure under occlusal forces, which may induce torque or direct lateral force to abutment teeth.
2. Doesn't provide good support and may impinge underlying tissue when subjected to occlusal loading.
3. Increase in thickness, at the rugae area, to enhance rigidity may interfere with the freedom of the tongue.

A U-shaped major connector may be made more rigid with multiple tooth supported rests and a wider coverage of the major connector.

EXAMINATION

Q1- choose the correct answer:-

1-The open area in the palatal region in the design for a maxillary cast RPD framework with a double strap (anteriorly and posteriorly)should be at least :
A-5 *10 mm
B-7 *13 mm
C-20* 15 mm
D-25*35 mm
2-Most common complaint of the patient with a thick single palatal bar in a RPD is:
A-DistorAon under occlusal stress.
B-Discomfort and alteraAon of speech
C-Poor dissipaAon of force due to rigidity.
D-Loss of taste sensaAon.
3-Least preferred maxillary major connector is:
A. Single palatal strap
B. Anterior posterior bar
C. Horse shoe shaped major connector
D. Complete palatal coverage21-False undercuts:

Session - 6
Mandibular Major connector

Objectives of session number - 6

The student will be study:
1-Types of jaw relation Vertical jaw relation
2- Rest position Inter – occlusal distance
3- Importance of vertical dimension Increased vertical dimension Decreased vertical dimension4- Methods Of Recording Vertical Relation
5. Method of recording rest vertical dimension
6. Method of recording occlusal vertical dimension
7. Pre – extraction records Methods without pre – extraction record
8-Horizontal Jaw Relation Centric jaw relation
9- Importance of centric jaw relation Methods of recording jaw relation
10-Factors that complicates centric jaw relation
11-Methods of recording eccentric jaw relation

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.
In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.
After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q\ CHOOSE THE CORRECT ANSWER

1- The lingual bar should be used for mandibular RPD where sufficient space exists between the marginal ginigivae and the floor of the mouth:
A- less than 8mm B- more than 8mm C- more than 12mm D- less than 5mm

2. Single palatal bar major connector use for following cases
A-short span clas lll B- Short span class ll C-Long span class l D-Long span class ll

Mandibular Major Connectors

Special Structural Requirements

- In general, mandibular major connectors are long and relatively narrow. Therefore, special consideration must be given to the design of such connectors. Mandibular connectors must be rigid without being so bulky that they compromise patient comfort. Furthermore, mandibular major connectors must not impinge upon the movable floor of the mouth, the associated frena, or mandibular tori.
- Unlike maxillary major connectors, for which relief is infrequently required, mandibular major connectors often permit relief between the rigid metal surfaces and the underlying soft tissues. The amount of relief is dependent upon several factors. For an entirely tooth-supported prosthesis, little or no relief is needed because the denture does not tend to move in function. For a distal extension removable partial denture, however, a moderate amount of relief may be indicated because this type of prosthesis tends to rotate during function. Relief prevents the margins of the major connector from lacerating the sensitive lingual mucosa as a result of this movement.

  The slope of the anterior ridge also influences the amount of relief needed (Fig. 1). If the soft tissues are vertical, or nearly so, only minimal relief is required. Tissues that slope toward the tongue require the greatest amount of relief because any movement of the connector will bring it into contact with the adjacent soft tissues. If the anterior ridge is undercut, sufficient space may be created when the technician blocks out the undercut area.
- Bead lines are not used in combination with mandibular major connectors. Contact with the mucosa of the mandibular arch may cause irritation, ulceration, and patient discomfort.

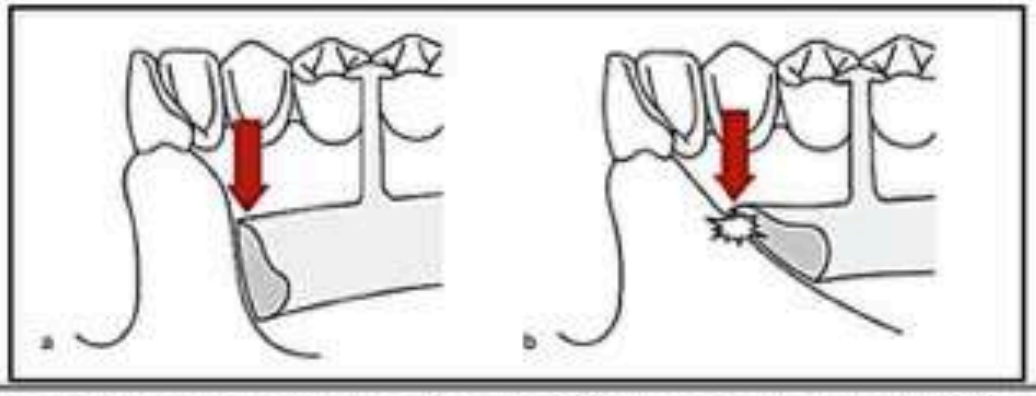


Figure 1: Slope of the anterior ridge also influences the amount of relief needed. (a) If the lingual soft tissues are vertical, or nearly vertical, minimal relief may be used. (b) Tissues that slope toward the tongue require the greatest amount of relief because any movement of the major connector will bring it into contact with the adjacent soft tissues.

Types of Mandibular major connectors

The following is a list of the different types of mandibular major connectors:

1. Lingual bar
2. Lingual plate (Linguoplate)
3. Double lingual bar (Lingual bar with cingulum bar, Kennedy bar)
4. Labial bar

Lingual bar and lingual plate major connectors are used in the majority of removable partial denture applications. Double lingual bar and labial bar major connectors are used for special applications in which lingual bars and lingual plates are contraindicated.

1. Lingual Bar

The lingual bar is possibly the most frequently used mandibular major connector (Fig. 2). Because of its simplicity in design and construction, a lingual bar should be used unless one of the other connectors offers a certain advantage. A lingual bar is indicated for all tooth-supported removable partial dentures unless there is insufficient space between the marginal gingivae and the floor of the mouth.

Figure 2: lingual bar major connector.

When viewed in cross section, a lingual bar is half-pear shaped. The broadest portion of the bar is located at its inferior border, nearest the floor of the mouth (Fig. 3). The bar should not have sharp margins that irritate the tongue. The superior border should be tapered toward the gingival tissue and the greatest bulk should be at the inferior border which should be slightly rounded, resulting in a contour that has a half-pear shape. A rounded border will not impinge on the lingual tissue when the denture bases rotate inferiorly under occlusal loads. The inferior border of a lingual mandibular major connector must be located free from the floor of the mouth.

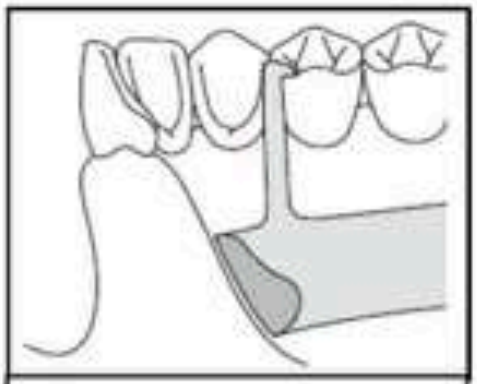


Figure 3: Sagittal section showing half-pear shape of lingual bar.

Indication for the Use of lingual Bar.

The lingual bar should be used for mandibular RPD where sufficient space exists, more than 8mm between the slightly elevated alveolar lingual sulcus and the lingual gingival tissue.

Methods for Determination the Height of the Floor of the Mouth.

In a clinical situation, the available space may be determined using a periodontal probe. The patient should be instructed to elevate and protrude the tongue so that its tip touches the vermilion border of the upper lip. This activates the floor of the mouth and raises the tissues to the height that occurs during function. While the patient maintains this position, a periodontal probe can be positioned gently in the oral cavity (Fig 4-A). The tip of the probe should rest on the floor of the mouth, and readings should be taken at the most apical portion of each gingival margin. Then, these readings should be transferred to the diagnostic cast or master cast (Fig 4-B). The lingual bar should be located in the most apical position the movable soft tissues will allow.

Another method may be by the using of a customized impression tray for which lingual borders are 3 mm short of the elevated floor of the mouth, and then use an impression material that will permit the impression to be accurately molded as the patient licks the lips.

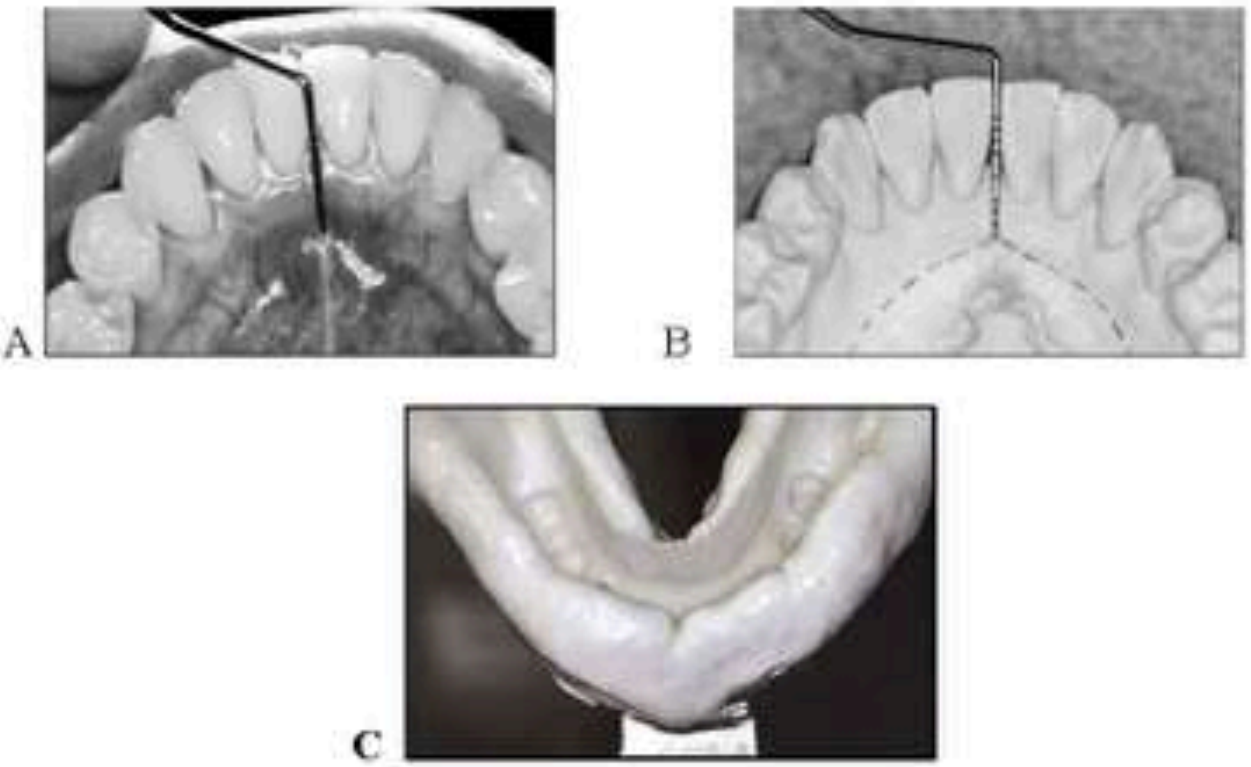


Figure 4: Methods for determination the height of the floor of the mouth. **A**, Height of floor of the mouth (tongue elevated) in relation to lingual gingival sulci measured with a periodontal probe. **B** Recorded measurements are transferred to a diagnostic cast and then to a master cast after mouth preparations are completed. *C* Impression made with functional movement of the tongue to demonstrate maximum shortening of the floor of the mouth.

2. Linguoplate (lingual plate)

The structure of a lingual plate is basically that of a half pear shaped lingual bar with a thin, solid piece of metal extending from its superior border (Fig.5). This thin projection of metal is carried onto the lingual surfaces of the teeth and presents a scalloped appearance.

Figure 5: Lingual plate major connector.

The inferior border of a lingual plate should be positioned as low as possible in the floor of the mouth, but should not interfere with the functional movements of the tongue and soft tissues. The superior border of a lingual plate must be contoured to intimately contact the lingual surfaces of the teeth above the cingula (Fig. 6).

Figure 6: Sagittal section through the linguoplate demonstrating a basic half-pear-shaped inferior border with the metallic apron extending superiorly.

In addition, the lingual plate must completely close the interproximal spaces to the level of the contact points. Sealing these spaces from the lingual aspect prevents food from being packed into these areas. As a result of this contouring, the lingual plate should display a scalloped appearance (Fig.7).

Figure 7: The superior border of a lingual plate major connector should display a scalloped appearance.

Indications for the use of a linguoplate.

1. When the lingual frenum is high or the space available for a lingual bar is limited (less than 8 mm).
2. In Class 1 situations in which the residual ridges have undergone excessive vertical resorption.
3. For stabilizing periodontally weakened teeth, splinting with a linguoplate can be of some value when used with definite rests on sound adjacent teeth.
4. When the future replacement of one or more incisor teeth will be facilitated by the addition of retention loops to an existing linguoplate.
5. In the presence of mandibular tori.

The lingual plate has a main disadvantage, because of its extensive coverage, which may contribute to decalcification of enamel surfaces and irritation of the gingival tissues in patients with poor oral hygiene.

The linguoplate does not in itself serve as an indirect retainer. When indirect retention is required, definite rests must be provided for this purpose. Both the linguoplate and the cingulum bar ideally should have a terminal rest at each end, regardless of the need for indirect retention. However, when indirect retainers are necessary, these rests may also serve as terminal rests for the linguoplate.

Sometimes a linguoplate is indicated as the major connector of choice even though the anterior teeth are quite spaced and the patient strenuously objects to metal showing through the spaces. The linguoplate can then be constructed so that the metal will not show through the spaced anterior teeth. This is a modification of the linguoplate and is named "***interrupted linguoplate***" *or* "**step backs**". To accomplish this, the superior border of a lingual plate should cover the cingulum of the individual tooth. The border should extend toward the contact area of the tooth and then turn apically, following the line angle to the level of the gingiva. The rigidity of the major connector is not greatly altered. However, such a design may be as much of a food trap (Fig.8).

Figure8: Interrupted linguoplate or "step backs".

3. Double lingual bar (Lingual bar with cingulum bar or Kennedy bar).

The connector consists of a lingual bar plus a secondary bar resting above the cingula of the anterior teeth. The upper and lower components of a double lingual bar are not joined by a continuous sheet of metal. As a result, the lingual surfaces of the teeth and the interproximal soft tissues are largely exposed (Fig. 9).

Figure 9: Double lingual

The lower component of this major connector should display the same structural characteristics as does a lingual bar. The upper bar should

be half oval in cross section. This bar should be 2 to 3 mm in height and 1 mm thick. The upper bar should not run straight across the lingual surfaces of the teeth but should present a scalloped appearance. The two bars should be joined by rigid minor connectors at each end. Rests should be placed at each end of the upper bar and should be located no farther posterior than the mesial fossae of the first premolars. Placement of these rests is intended to prevent the bar from moving inferiorly and causing orthodontic movement of the remaining anterior teeth.

The secondary bar supposedly acts as an indirect retainer and performs a role in the horizontal stabilization of periodontally involved teeth. The performance of these functions is questionable. Additionally, this major connector can create a food trap between the two bars. *The use of this type of connector is not encouraged.*

Indications for Use of Double lingual bar:

1. When a linguoplate is indicated but the axial alignment of anterior teeth is such that excessive blockout of interproximal undercuts would be required.

2. When wide diastemata exist between mandibular anterior teeth and a linguoplate would objectionably display metal in a frontal view.

The disadvantage of this type of major connector is the tendency of the upper bar to trap debris especially with crowding of the mandibular anterior teeth. This can be minimized by accurate impressions and good adaptation of the upper bar to the anterior teeth. Also, the double lingual bar may irritate the tongue and annoy the patient due to the multiple borders and the thickness of the upper bar. Thus, a modified lingual plate major connector may be preferred.

4. Labial Bar

As its name suggests, a labial bar runs across the mucosa on the facial surface of the mandibular arch (Fig. 10). Like other mandibular major connectors, a labial bar displays a half-pear shape when viewed in cross section. But, because of its placement on the external curvature of the mandible, a labial

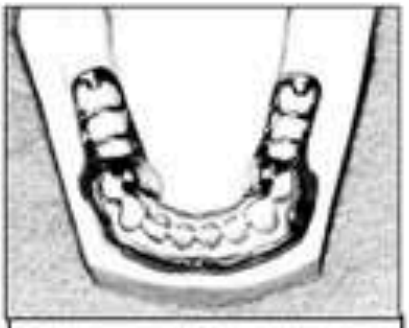


Figure 10: Labial Bar

bar is longer than a corresponding lingual bar, double lingual bar or lingual plate. To ensure rigidity, the height and thickness of a labial bar must be greater than those described for a lingual bar.

In only few situations when the extreme lingual inclination of the remaining lower premolar and incisor teeth prevent the use of a lingual bar major connector. With the use of conservative mouth preparations in the form of recontouring and block out, a lingual major connector can almost always be used. Lingually inclined teeth sometimes may have to be reshaped by means of crowns. Although the use of a labial major connector may be necessary in rare instances, this should be avoided by resorting to necessary mouth preparations rather than by accepting a condition that is otherwise correctable.

The same applies to the use of a labial bar when a mandibular torus interferes with placement of a lingual bar. Unless surgery is definitely contraindicated, interfering mandibular tori should be removed so that the use of a labial bar connector may be avoided.

Indications for Use of the Labial Bar.

1. When lingual inclinations of remaining mandibular premolar and incisor teeth cannot be corrected, preventing placement of a conventional lingual bar connector.
2. When severe lingual tori cannot be removed and prevent the use of a lingual bar or lingual plate major connector.
3. When severe and abrupt lingual tissue undercuts make it impractical to use a lingual bar or a lingual plate major connector.

Characteristics and Location of the Labial Bar.

1. Half-pear shaped with bulkiest portion inferiorly located on the labial and buccal aspects of the mandible.
2. Superior border tapered to soft tissue.
3. Superior border located at least 4 mm inferior to labial and buccal gingival margins and farther if possible.

4. Inferior border located in the labial-buccal vestibule at the junction of attached (immobile) and unattached (mobile) mucosa.

A labial bar can be used in association with the linguoplate as a modification for the linguoplate. This concept is incorporated in the Swing-Lock design, which consists of a labial or buccal bar that is connected to the linguoplate major connector by a hinge at one end and a latch at the other end, as shown in figure 10.

Support is provided by multiple rests on the remaining natural teeth. Stabilization and reciprocation are provided by a linguoplate that contacts the remaining teeth and are supplemented by the labial bar with its retentive struts. Retention is provided by a bar type of retentive clasp with arms projecting from the labial or buccal bar and contacting the infra-bulge areas on the labial surfaces of the teeth.

Figure 10: The Swing-Lock removable partial

Use of the Swing-Lock concept would seem primarily indicated when the following conditions are present:

1) Missing key abutments,

2) Unfavorable tooth contours,

3) Unfavorable soft tissue contours, &

4) Teeth with questionable prognoses.

Contraindications to the use of this hinged labial bar concept are poor oral hygiene or lack of motivation for plaque control by the patient, the presence of a shallow buccal or labial vestibule, & a high frenal attachment.

Review of Indications for Mandibular Major Connectors

- For a tooth-supported removable partial denture, the lingual bar generally is the mandibular major connector of choice.
- When there is insufficient room between the floor of the mouth and the gingival margins (< 8 mm), a lingual plate should be used. This major connector also is indicated for patients with large inoperable tori and patients with high lingual frenum attachments.
- When the anterior teeth have reduced periodontal support and require stabilization, a lingual plate is recommended.
- When the anterior teeth exhibit reduced periodontal support and large interproximal spaces, a modified lingual plate (ie, step-back design) or double lingual bar should be used.
- When a removable partial denture will replace all mandibular posterior teeth, a lingual plate should be used.
- A labial bar is rarely indicated.

  You have to correct the condition by extraction of severely malpositioned teeth, orthodontic correction of lingually inclined teeth, placement of crowns, or surgical intervention to remove tori.

EXAMINATION

Q\ CHOOSE THE CORRECT

1- The lingual bar should be used for mandibular RPD where sufficient space exists between the marginal ginigivae and the floor of the mouth:
A- less than 8mm
B- more than 8mm
C- more than 12mm
D- less than 5mm

2-In the case of extreme lingual inclination of the remaining lower premolar and incisor teeth, the type of major connector can be use :
A.lingual bar major connector
B.linguo palatal major connector
C.lingual bar and cingulum bar major connector
D.labial bar major connector

3-- The most frequently used mandibular major connector :
A-Lingual bar.
B-lingual bar with cingulum bar
C-Labial bar
D-Lingual plate
4-The lingual bar connector should be located at least how many millimeters below the gingival margin?
A. 2 B. 4 C. 6 D. 8
5-.If there is not enough space between lingual sulcus and gingival margin which major connector should be avoided
A-lingual plate B- lingual bar C-labial bar D-double lingual bar

Session - 7

Minor connector

EXAMINATION

Objectives of session number - 7

1- Dental articulator
Definition2-Functions of articulator
3-Requirements of articulator4- Types of articulator
5-Face- bow Definition
6-Parts of face – bow
7. Types of face – bow
8. Important of the face bow

Instructions:

❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q1 \ enumerate the following :-
1- MAXILLARY MAJOR CONNECTOR.
2- MANDI MAJOR CONNECTOR .

Minor connectors are those components that serve as the connecting link between the major connector or the base of a removable partial denture and the other components of the prosthesis, such as the clasp assembly, indirect retainers, occlusal rests, or cingulum rests.
In many instances, a minor connector may be continuous with some other part of the denture. For example, an occlusal rest at one end of a linguoplate is actually the terminus of a minor connector, even though that minor connector is continuous with the linguoplate. Similarly the portion of a partial denture framework that supports the clasp and the occlusal rest is a minor connector, which joins the major connector with the clasp proper. Those portions of a removable partial denture framework that retain the denture bases are also minor connectors.

Functions of Minor Connector

In addition to joining denture parts, the minor connector serves two other purposes.

1.Transfers functional stress to the abutment teeth.

This is a prosthesis-to-abutment function of the minor connector. Occlusal forces applied to the artificial teeth are transmitted through the base to the underlying ridge tissue if that base is primarily tissue supported. Occlusal forces applied to the artificial teeth are also transferred to abutment teeth through occlusal rests. The minor connectors arising from a rigid major connector make possible this transfer of functional stress throughout the dental arch.

2.Transfers the effects of the retainers, rests, and stabilizing components throughout the prosthesis.

This is an abutment- to-prosthesis function of the minor connector. Thus, forces applied on one portion of the denture may be resisted by other components placed elsewhere in the arch for that purpose. A stabilizing component on one side of the arch may be placed to resist horizontal forces that originate on the opposite side. This is possible only because of the transferring effect of the minor connector, which supports that stabilizing component, and the rigidity of the major connector.

Form and Location of Minor Connectors

Like the major connector, the minor connector must have sufficient bulk to be rigid; otherwise, the transfer of functional stresses to the supporting teeth and tissue will not be effective. At the same time, the bulk of the minor connector should not be objectionable.

Basic Types of Minor Connectors

A. **Minor connectors placed into embrasures between two adjacent teeth.**

These connectors should be somewhat triangular shaped in cross section to minimize intrusion into the tongue or vestibular spaces, while still providing adequate bulk for rigidity as shown in the Figure (1).

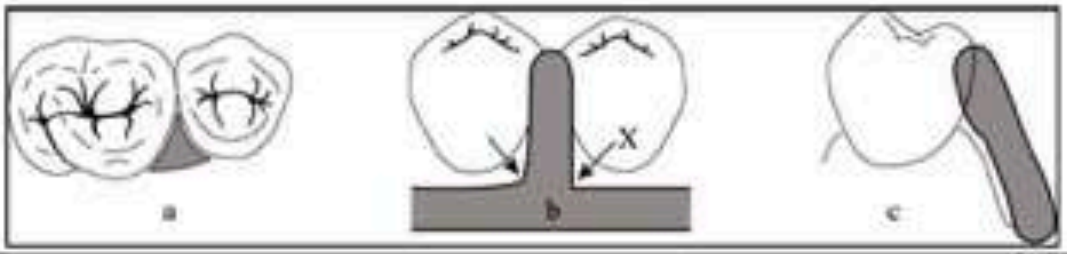


Figure 1: (a). A minor connector should join the major connector at a right angle and cover as small an area of tissue as possible (b). The juncture to the major connector should be rounded (arrow) not sharp (X) unless the juncture includes an acrylic finish line. Relief should be placed on the master

A minor connector should fill the embrasure space so that a smooth surface is presented to the tongue and so that areas where food can be trapped are minimized. Ideally, a minor connector should not contact the teeth gingival to the height of contour. If a minor connector fits tightly against an abutment below the height of contour, a wedging force may be created during functional movements of the framework. This wedging can result in increased tooth mobility. Alternatively, it may be difficult to seat or unseat the framework.

B. Gridwork minor connectors that connect the denture base and teeth to the major connector.

These minor connectors are adjacent edentulous spaces and usually connect the major connector to a clasp assembly as well. Gridworks can be an open lattice work or mesh type. The mesh type tends to be flatter, with more potential rigidity. Conversely the mesh has been shown provide less retention for the acrylic if the openings are insufficiently large. The lattice type has superior retentive potential, but can interfere with the setting of teeth, if the struts are made too thick or poorly positioned. Both types are acceptable if correctly designed.

Adequate mechanical retention of the denture base resin is gained by providing relief under the minor connector gridwork to allow the acrylic resin to flow under the gridwork. To allow for this space, relief wax is placed on the cast in the edentulous areas prior to making a refractory cast (for fabricating the framework). Usually, one thickness of baseplate wax is sufficient (about 1 mm of relief). After the framework has been waxed and cast on the refractory model and returned to the master cast, the space provided by the relief wax is available for the mechanical retention of the acrylic resin, Figure (2).

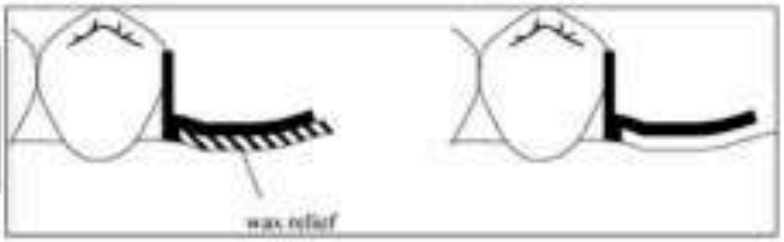


Figure 2: Relief under the minor connector gridwork.

Minor connectors originating from the gridwork in an edentulous area usually take the form of vertical metal plates (**proximal plates**) that make broad contact with prepared guiding planes. These proximal plates may or may not terminate in an occlusal rest, depending on the partial denture design. The plate is shifted slightly towards the lingual to increase rigidity, enhance reciprocation and improve esthetics, Figure (3).

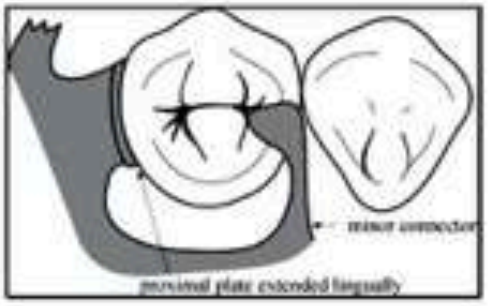


Figure 3: Minor connectors originating from the gridwork in an edentulous area (Proximal plates).

Tissue Stops

Tissue stops are integral parts of minor connectors. Mandibular distal extension gridworks should have a "tissue stop" at their posterior limit. This is an extension of the metal through the relief wax providing direct contact with the ridge. They provide stability to the framework during the stages of transfer and processing. They are particularly useful in preventing distortion of the framework during acrylic-resin processing procedures.

Another integral part of the minor connector is similar to a tissue stop but serves a different purpose. It is located distal to the terminal abutment and is a continuation of the minor connector contacting the guiding plane. Its purpose is to establish a definitive finishing index tissue stop for the acrylic-resin base after processing. Relief under the gridwork should not be started immediately adjacent to the abutment tooth but should begin 1.5 - 2 mm from the abutment tooth. This will create a metal to tissue contact immediately adjacent to the tooth. A metal surface is preferable since it wears less, and is less porous, thus facilitating hygiene, Figure (4).

Figure 4: Metal immediately adjacent to tooth on the left, Incorrect (acrylic of base is adjacent tooth) on the right.

Finishing Lines

The finishing line junction with the major connector should take the form of an angle not greater than 90 degrees, therefore being somewhat undercut, Figure (5). This provides for maximum bulk of the acrylic resin denture base at the metal junction, to prevent the creation of thin, weak, feather edges which can easily fracture or distort, Figure (6).

Figure 5: The internal angles of external finish lines should be slightly less than 90 degrees. This results in improved mechanical retention for acrylic resin components.

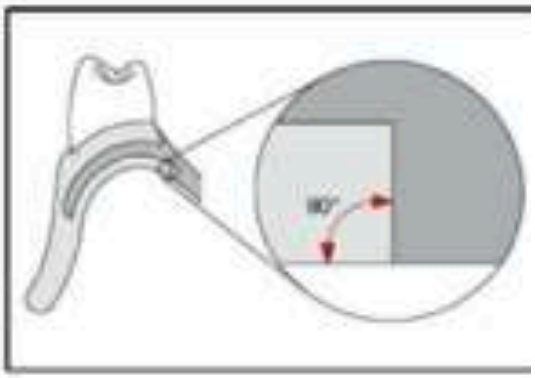


Figure 6: Finishing line junction.

Therefore, resin metal joints should be created only at the external surfaces. Thes interfaces are referred to as finish lines. If they are located on the outer surfaces of majo connectors, they are called external finish lines. If they are positioned on the inner or tissu surfaces, they are termed internal finish lines, Figure (7).

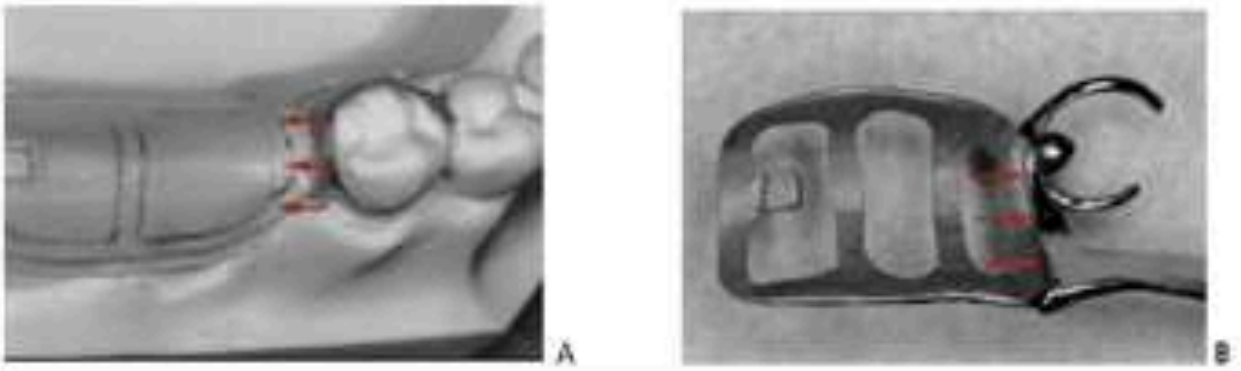


Figure 7: A. Internal finish lines result from relief wax placed on the master cast prior to duplication. Arrows indicate the presence of a well-defined vertical wall, which will produce an internal finish line. B. Properly contoured relief wax results in a sharply defined internal

The medial extent of the minor connector depends on the lateral extent of the majo palatal connector. If the finishing line is located too far medially, the natural contour of th palate will be altered by the thickness of the junction and the acrylic resin supporting th artificial teeth. If, on the other hand, the finishing line is located too far buccally, it will be mo difficult to create a natural contour of the acrylic resin on the lingual surface of the artificia teeth. The location of the finishing line at the junction of the major and minor connectors shoul be based on restoration of the natural palatal shape, with consideration given to the location o the replacement teeth, Figure (8).

Figure 8: Junction of the major connector and the minor connector at palatal finishing lines should be located 2 mm medial from an imaginary line that would contact the lingual surfaces of missing posterior teeth. The finish line on the right is too far toward midline of the palate. The natural contours of the palate will be altered.

Gridwork Minor Connector Design

The length of the gridwork minor connector for the mandibular distal extension base should extend posteriorly about two-thirds the length of the edentulous ridge of the distal extension in CL I & II cases, Figure (9). For the maxillary distal extension base, gridwork minor connector should extend the entire length of the distal extension in CL I & II cases, Figure (10).

Figure 9: Length of the gridwork minor connector.

Figure 10: Length of the gridwork minor connector. Note the extension of the finishing line to the area of the pterygomaxillary notch provides a butt-type joint for attachment of the border portion of the resin base through the pterygomaxillary notch (Circle).

EXAMINATION

Q1- Choose the correct answer :-

1. Hanau's articulator is
A.simple hinge articulator
B. condylar path articulator
C.fully adjustable condylar
D.semi adjustable condylar
E.all of the above

2. kinematic face bow
considerA.maxillary face bow
B.hinge axis locator face bow
C.arbitrary face bow
D.all of the above
E. none of the above

3. the simple hinge articulator
permitsA.only hinge like movement
B. only hinge like movement and lateral movement
C. opening and closing with protrusive
D. all of the above
E. non all above

Session - 8
Rests and Rest seats

Objectives of session number - 8

2. Preparation of articulator .
3. Preparation of the casts and mounting the upper cast on CL II articulator .

3-Mounting the lower cast .

4. Errors occurred during mounting .

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q1 \-Rests may be placed upon :
A. Sound enamel
B. Cast restorations
C. Silver amalgam
D. All of the above.
2-The angle between occlusal rest and vertical minor connector from which it originates is:
A. 90 degrees B. 100 degrees C. 120 degrees D. Less than 90 degrees
3-The Cingulum rest is used primarily on:
A-Maxillary central incisors B. Mandibular canines C. Mandibular incisors. D. Maxillary canines.

The component of a partial denture on a tooth surface that provides vertical support is called a ***rest***. The prepared surface of an abutment to receive the rest is called the ***rest seat***. The topography of any rest should restore the topography of the tooth that existed before the rest seat was prepared.

The relationship between a rest and a rest seat must be such that forces transmitted from the prosthesis to an abutment are directed apically down the long axis of the tooth. In this manner, stress can be absorbed by the fibers of the periodontal ligament without damaging the ligament or the supporting bone.

A rest that is part of a retentive clasp assembly is referred to as a ***primary rest***. The main purpose of a primary rest is to prevent vertical movement of a prosthesis toward the tissues and also helps transmit forces to the supporting teeth. A rest that is responsible for additional support or indirect retention is called an ***auxiliary rest*** or ***secondary rest***.

The purposes of the rest in general are:

1. Provide vertical support for the partial denture.
2. Directs and distributes occlusal loads to abutment teeth.
3. Maintains the components in their planned positions.
4. Maintains occlusal relationship by preventing settling of the denture.
5. Prevents impingement of soft tissue.
6. In addition, a rest may be used to close a small space between teeth, thereby restoring continuity of the arch and preventing food impaction.

Rests are designated by the surface of the tooth prepared to receive them. Thus, they are named as follows:

A. Occlusal Rest:

   1. Occlusal rest (conventional)
   2. Extended occlusal rest
   3. Interproximal occlusal rest
   4. Internal occlusal rest

B. Lingual Rest (Cingulum Rest)
C. Incisal Rest
D. Implants as a Rest

A. Occlusal Rest

This rest is associated with the posterior teeth; molars & premolars. The Form of the ***Occlusal Rest and Rest Seat*** should be as follows:

1. The outline form of an occlusal rest seat should be a rounded triangular shape with the apex toward the center of the occlusal surface (Fig. 1).
2. It should be as long as it is wide, and the base of the triangular shape (at the marginal ridge) should be at least 2.5 mm for both molars and premolars.
3. The marginal ridge of the abutment tooth at the site of the rest seat must be lowered to 1.5 mm to permit a sufficient bulk of metal for strength and rigidity of the rest and the minor connector. The most common mistake in occlusal rest seat preparation is insufficient reduction of the marginal ridge.
4. The floor of the occlusal rest seat should be apical to the marginal ridge and the occlusal surface and should be concave, or spoon shaped.
5. When viewed in cross section, the deepest part of an occlusal rest seat should be located near the center of the mesial or distal fossa. From its depth, the floor of the rest seat should rise gently toward the marginal ridge (Fig. 1).
6. The angle formed by the occlusal rest and the vertical minor connector from which it originates should be less than 90 degrees (Fig. 1). An angle greater than 90 degrees fails to transmit occlusal forces along the vertical axis of the abutment tooth. This also permits slippage of the prosthesis away from the abutment, with possible orthodontic tooth movement.

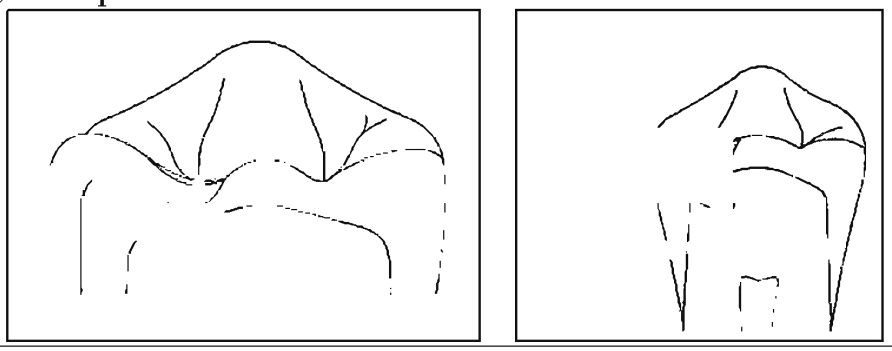


Figure 1: The deepest part should be should near the center of the mesial or distal fossa and should be inclined apically from the lowered marginal ridge with an angle less than 90 degrees.

When occlusal rest seats are prepared next to an edentulous space the morphology follows the conventional form (Fig. 2). On the other hand, when a single occlusal rest seat is prepared next to an adjacent tooth (Fig. 3) the lingual line angle is flared more to provide additional space for the minor connector.

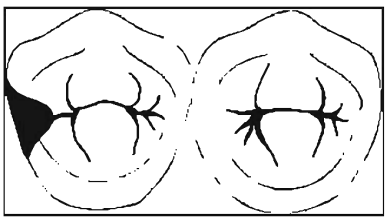


Figure 2: Occlusal rest seat prepared next to an edentulous space

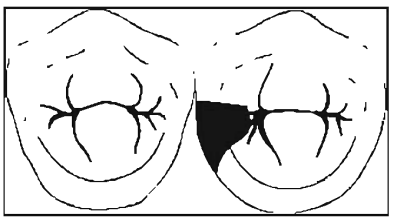


Figure 3: Single occlusal rest seat prepared next to an adjacent tooth

Extended Occlusal Rest

An extended occlusal rest should be used in situations in which the most posterior abutment is a mesially tipped molar, to minimize further tipping of the abutment and to ensure that the forces are directed down the long axis of the abutment. This rest should extend more than one-half the mesio-distal width of the tooth (Fig. 4).

Figure 4: Extended occlusal rest seat on the mandibular first molar.

Interproximal Occlusal Rest

The rest seats of this rest are prepared as individual occlusal rest seats (Fig. 5), with the exception that the preparations must be extended farther lingually and additional tooth structure is removed in the marginal areas to provide at least 1.5 mm of room for the embrasure clasps. The rest seats are flared more dramatically to the facial and the lingual line angles to provide additional space for the retentive arms and minor connector. The lingual interproximal area requires only minor preparation. Creation of a vertical groove must be avoided to prevent a torqueing effect on the abutments by the minor connector. This is especially true for RPDs with distal extension bases.

The advantages of such occlusal rests are: 1) Prevent interproximal wedging by the framework. 2) The joined rests shunt food away from contact points.

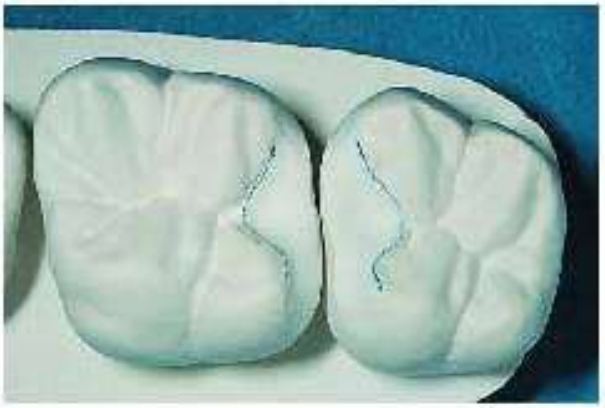


Figure 5: Preparations of interproximal occlusal rest extending lingually.

Internal Occlusal Rests

They are used for a partial denture that is totally tooth supported for both occlusal support and horizontal stabilization (Fig. 6). They must be used in association with a crown on the abutment tooth. An internal occlusal rest should not be confused with an internal attachment.

The main advantages of the internal rest are:

1) The clasp arm buccally is not visible. Retention is provided by a lingual clasp arm.
2) Permits the location of the rest seat in a more favorable position in relation to the tipping axis (horizontal) of the abutment.

Figure 6: Maxillary tooth-supported removable partial denture utilizing internal occlusal rests.

Occlusal Rest Seat Preparation

Occlusal rest seats should have smooth gentle curves and any sharp angles, walls, and ledges must be avoided. Any portion of the rest seat that restricts movement of the rest may transmit undesirable horizontal forces to the tooth.

Rest seat preparations should be made in sound enamel and should follow preparation of proximal tooth surfaces that are necessary to provide proximal guiding planes and eliminate undesirable undercuts.

Occlusal rest seats in sound enamel may be prepared with burs and polishing points that leave the enamel surface as smooth as the original enamel. The larger round bur is used first to lower the marginal ridge and to establish the outline form of the rest seat. A slightly smaller round bur then is used to deepen the floor of the occlusal rest seat and form the desired spoon shape.

The anatomy and depth of the rest seat preparation can be evaluated by using sheet wax. A small piece is firmly pressed into the rest seat and the patient is asked to occlude on the wax while the wax is in the rest seat. The surface of the wax is inspected to determine the anatomy of the rest seat preparation. The depth of the rest seat is determined by carefully measuring the thickness of the wax. Any corrections can be accompanied and the process can be repeated.

The preparation is smoothed by a polishing point of suitable size and shape. Fluoride gel should be applied to abutment teeth following enamel recontouring.

Occlusal Rests on Amalgam Restorations

It is always better to place an occlusal rest on sound enamel or cast restoration. Sometimes a conservative amalgam restoration may be used to support removable partial denture, but advantages and disadvantages of such treatment should be carefully considered.

As for a large amalgam restoration, it is easier to place an occlusal rest on a large amalgam restoration because an amalgam restoration costs less than a crown. However, the disadvantages are greater than the benefits so this is not advisable.

The flow characteristics and poor tensile characteristics of amalgam increase the possibility of restoration failure. Amalgam alloys tend to deform when a sustained load is applied and this may result in fracture of the material and failure of the restoration. In addition, future replacement of a defective restoration under an existing removable partial denture is difficult, and the results are not always good. Retreatment may need restoration of the abutment and a construction of a new removable partial denture.

Occlusal Rest on Crowns

All-ceramic restorations should not be used to support removable partial dentures, via rests, because of the undesirable physical characteristics of ceramics. Ceramic materials are relatively strong in compression, but weak in tension and any wedging or elongation of a ceramic surface often lead to fracture. If the rests bind against the walls of the rest seat, this will result in a wedging effect and create tensile forces that cause fracture of the ceramic. Also, the interaction between a ceramic rest seat and the associated metal rest is not desirable because of the different material properties.

Metal-ceramic restorations can be used but it is recommended that rest seats be constructed entirely in metal. The metal borders should extend at least 1 mm beyond the borders of the rest (in all directions).

Occlusal rest seat preparations in existing restorations (crown) may be widened to compensate for shallowness, but the floor of the rest seat should still be slightly inclined apically from the marginal ridge. When this is not possible, a secondary occlusal rest should be used on the opposite side of the tooth to prevent slipping of the primary rest.

Occlusal rest seats that will be located in new restorations, crowns, and inlays should be known when the tooth is prepared so that sufficient clearance may be provided for the rest seat within the preparation (Fig. 7).

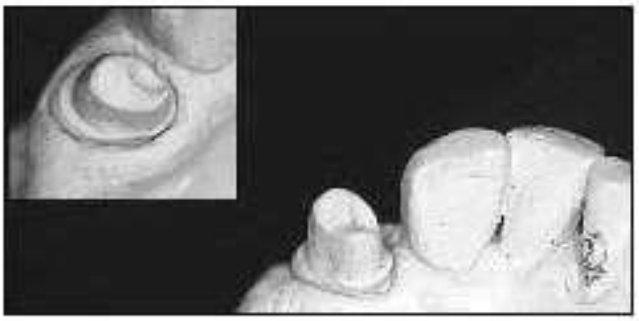


Figure 7: Adequate occlusal reduction to accommodate the depth of the rest seat in the abutment crown.

An occlusal rest seat on a posterior tooth is preferred over a cingulum or incisal rest seat on an anterior tooth. Because of its size and position, an occlusal rest seat permits forces to be directed along the long axis of the tooth in a better manner. Posterior teeth also present large divergent roots that can withstand more loading than the small conical roots of anterior teeth.

There are situations where a lingual rest is used because an anterior tooth may be the only abutment available for occlusal support of the denture. Also, an anterior tooth may be used as an indirect retainer or an auxiliary rest. In such cases a canine is preferred over an incisor for this purpose due to the greater root length, root surface area, and crown morphology.

Lingual rests are used primarily on maxillary canines. The normal crown morphology of a maxillary canine permits preparation of a satisfactory rest seat with minimal tooth reduction. Lingual rests are not usually placed on mandibular canines because of the lack of sufficient enamel thickness for appropriate preparation of the rest seat. Also, mandibular canines do not have a prominent cingulum and appropriate depth for a rest seat may expose the underlying dentine.

When a canine is not present, multiple rests over several incisor teeth are preferable to distribute the stresses over a number of teeth because a single incisor doesn't provide adequate support.

The preparation of an anterior tooth to receive a lingual rest is accomplished in two ways:

First method: A slightly rounded V-shape prepared on the lingual surface at the junction of the gingival and the middle one third of the tooth (Fig. 8). The apex of the V is directed incisally. The mesio-distal length of the preparation should be a minimum of 2.5 to 3 mm, labio-lingual width about 2 mm, and incisal-apical depth a minimum of 1.5 mm. This preparation of the tooth starts with an inverted cone shaped bur and progresses to a smaller tapered bur with a round end to complete the preparation.

Figure 8: Three views of lingual rest seat prepared in enamel of the maxillary canine.

Second method: A ball type of rest may be used in a prepared seat (Fig. 9). Round rest seats are occasionally prepared on the mesial side of the canine when the use of a typical cingulum rest is contraindicated (i.e. large restoration, lack of clearance with

the opposing teeth, poorly developed cingulum). The seats of these rests are prepared in the same manner as that of the occlusal rest seats.

Figure 9: Ball type rest seat on canine.

There are several modifications to lingual rest seats prepared in natural teeth:

1. Lingual (Cingulum) Rest Seat in a New Cast-Metal or Metal Ceramic Restoration Cast Restoration (Crown)

The most satisfactory lingual rest from the standpoint of support is one that is placed on a prepared rest seat in a cast restoration (crown). When a fixed restoration is to be placed on an anterior abutment, a cingulum rest seat should be incorporated into the wax pattern. This rest seat should exhibit ideal contours and should direct forces along the long axis of the abutment.

2. Cast Alloy Rest Seat Forms

Also, individually cast alloy rest seat forms are used on teeth with unacceptable lingual contours using minimal tooth preparation. They are attached to lingual surfaces by the use of composite resin cements (Fig. 10).

A limited area on the lingual surface of the abutment is prepared to a depth of 0.5 to 0.7 mm. This minimizes tooth reduction and permits the surface of the casting to be positioned at the level of the adjacent tooth structure. Two or three circular indentations are then prepared within the borders of the tooth reduction. The indentations assist in placement of the restoration and also provide vertical support for the cast. The casting is cemented using an appropriate luting agent.

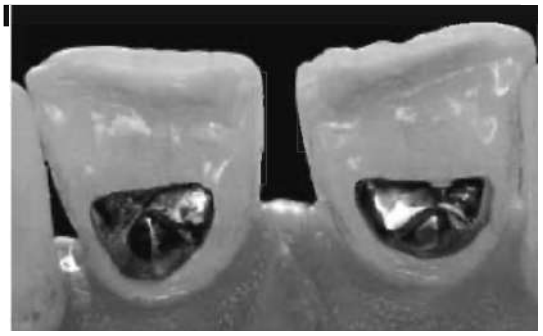


Figure 10: cast alloy lingual rest seat on mandibular canine.

3. Bonded Composite Cingulum Rest Seats

Bonded composite cingulum rest seats with composite resin have also been successfully used as a conservative approach to forming rest seats (Fig. 11).

This is accomplished by bonding composite resin to the lingual surface of the tooth, then shaping the resin in the manner described for rest seats prepared in enamel. The disadvantage of these rest seats is that they are susceptible to wear and may lose their effectiveness over a relatively short period. Thus, they are not always desired.

Figure 11: Composite resin rest seat.

4. An Alternative Cingulum Rest Seat

The alternative cingulum rest seat may be described as a crescent-shaped depression located in the middle and gingival thirds of the crown (Fig 12). This type can be used for mandibular canines with insufficient enamel that prevents preparation of conventional cingulum rest seats.

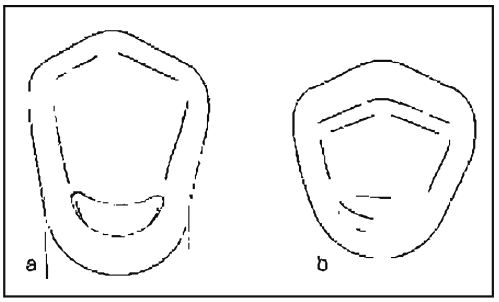


Figure 12: Alternative Cingulum Rest Seat.

Attempts to create adequate depth often result in exposure of the underlying dentin. Therefore, the alternative cingulum rest seat should be used very carefully.

C. Incisal Rests and Rest Seats

An incisal rest seat is usually placed on the disto-incisal angle for esthetic purposes, but the mesio-incisal may also be used (Fig. 13). It is predominantly used as an auxiliary rest or an indirect retainer.

An incisal rest is inferior to a lingual rest. 1) Esthetically, the metal of the rest shows at the incisal edge, 2) mechanically the lingual rest is placed nearer to the center of rotation of the tooth and has fewer tendencies to tip the tooth, 3) may interfere with

occlusion, and 4) has a higher possibility for breakage and distortion. Although, it may be used successfully for selected patients when the abutment is sound and when a cast restoration is not otherwise indicated.

Incisal rest seats are commonly used on mandibular canines, but may be used on other anterior teeth as well. The placement of incisal rest seats on incisors should be considered a last resort because of the esthetic and mechanical compromises that must be made.

The incisal rest seat is prepared in the form of a rounded notch at the incisal edge of the teeth, with the deepest portion of the preparation apical to the incisal edge. The rest seat should be approximately 2.5 mm wide and 1.5 mm deep so that the rest will be strong without having to exceed the natural contour of the incisal edge.

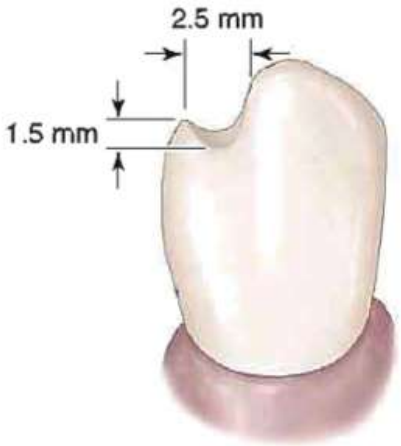


Figure 13: Incisal rest seat preparation and dimensions.

D. Implants as a Rest

Implants can serve as a rest, since they resist tissue-ward movement and are useful for retentive needs as well. Their use allows a low profile connection (i.e., close to the ridge), and less torque to the implant.

EXAMINATION

Q1-A REST SEAT PREPARED AS

A. SPOON SHAPED DEPRESSION WITH THE APEX TOWARDS CENTRE OF THE TOOTH
B. CONCAVITY WITH HEMISPHERE SHAPE
C. ELLIPTICAL SHAPE
D. RHOMBOID DEPRESSION LIMITED TO ENAMEL

Q2-THE FLOOR OF OCCLUSAL REST IS :

A. LEDGE SHAPED
B. HALF PEAR SHAPED
C. SPOON SHAPED
D. HALF MOON SHAPED

Q3- NCISAL REST :

A. MOST FREQUENTLY USED ON MANDIBULAR CANINES
B. ITS SHAPE IS HALF MOON SHAPE
C. IT HAS A BAD ESTHETIC.
D. ALL OF THE ABOVE.

Q4. FOR THE PREPARATION OF THE REST SEAT, THE MARGINAL RIDGE OF A MOLAR TOOTH TOOTH IS REDUCED BY 2 MM TO ACHIEVE THE CORRECT WIDTH OF REST SEAT .THE MARGINAL RIDGE IS THEN ROUNDED IN ORDER TO :

A. BETTER CLASP RETENTION
B. DECREASE FOOD IMPACTION
C. FOR BETTER DISTRIBUTION OF VERTICAL LOAD
D. REDUCE THE CHANCES OF FRACTURE OF METAL CAST

Session - 9
Retention and
Removable Partial DENTURE

Objectives of session number - 9

1-Selection of anterior teeth
2 The factors of shade selection
3-The factors of Size selection a. Length b. Width
4-The factors of Form selection
5. Materials of anterior teeth
6. Difference between acrylic and porcelain teeth
7. Selection Of Posterior Teeth Shade Bucco-lingual width Mesio-distal length Occluso-gingival height Occlusal form
8. Advantages of casp form teeth
9. Advantages of non- cusp form teeth

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q1 \ DEFINE THE FOLLOWING

1- support
2- stability
3- retention

In general, a removable partial denture should have these requirements :

Support: The support derived from the abutment teeth through the use of rests and from the residual ridge through the use of well-fitting bases .

Stability: Removable partial denture must be stable against horizontal movement through the use of rigid components like the reciprocal arm of the circumferential clasp and minor connector. The removable partial denture must also be stable against rotational movements through the use of rigid connectors and indirect retainers.

Retention: Retention is the quality of the removable partial denture that resists forces acting to dislodge components away from the supporting tissues. Sufficient retention is provided by two means. Primary retention for removable partial denture is accomplished mechanically by placing retaining elements (direct retainers) on the abutment teeth. Secondary retention is provided by the intimate relationship of the minor connector contact with the guiding planes, denture bases, and major connectors (maxillary) with the underlying tissue. The latter (secondary retention) is similar to the retention of complete denture. It is proportionate to the accuracy of the impression registration, the accuracy of the fit of the denture bases, and the total involved area of contact.

Retainers can be divided into:

I. Direct retainers .

II. Indirect retainers.

Direct retainers

A direct retainer: is any unit of a removable dental prosthesis that engages an abutment tooth to resist displacement of the prosthesis away from basal seat tissue.

The direct retainer's ability to resist this movement is greatly influenced by the stability and support of the prosthesis provided by major and minor connectors, rests, and tissue bases.

There are basically two types of direct retainers:

1. Intracoronal in conjunction with the fabrication of a single crown or fixed bridge. Precision or semi-precision attachments are usually premanufactured and either machined or cast in the laboratory.

There is a male-female union between the abutment tooth and the RPD framework. The primary advantage of using attachments as direct retainers is esthetics as the retentive clasp arm is eliminated from the design. A disadvantage of using these attachments is they can be costly, they are difficult to use, and they require more maintenance than a conventional clasp design.

2. Conventional extra coronal cast clasp, where the retention is usually provided by a flexible arm that flexes over the area of greatest contour into an area of lesser contour. This is usually called a clasp.

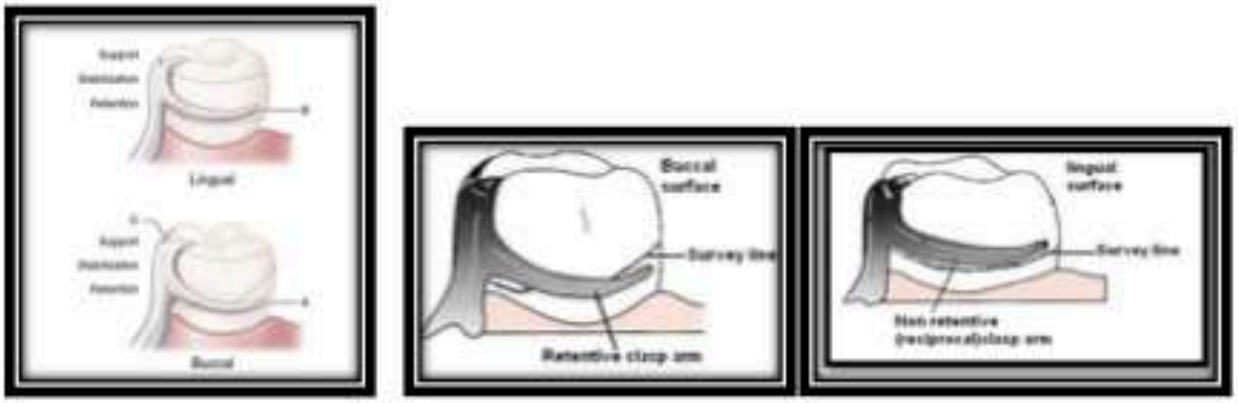
The extra coronal retainer (Clasp type): Most mechanical retention is derived from the use of direct retainers (clasp assemblies) utilizing tooth undercuts.

The extra coronal retainer is the most commonly used retainer for removable partial dentures, which uses mechanical resistance to displacement through components placed on

the external surfaces of an abutment tooth in an area cervical to survey line or in a depression created for this purpose. Usually, a flexible arm is forced to deform, so there will be resistance to removal.

Component parts, Function, and position of clasp assembly parts

Component Part	Function	Location
Rest	**Support**	Occlusal, lingual and incisal rests.
Minor connector	**Stabilization**	Proximal surfaces extending from a prepared marginal ridge to the junction of the middle and gingival one-third of abutment crown.
Clasp arms	**Stabilization (Reciprocation)**	Middle one-third of the crown.
	Retention	Gingival one-third of the crown in the measured undercut.



Extracoronal circumferential direct retainer Assembly consists of: (A) the buccal retentive arm; (B) the rigid lingual stabilizing (reciprocal) arm; and (C) the supporting occlusal rest. The terminal portion of the retentive arm is flexible and engages measured undercut. Assembly remains passive until activated by placement or removal of the restoration, or when subjected to masticatory forces that tend to dislodge the denture base.

No single component of a clasp assembly is solely responsible for prosthesis retention. Rather, it is the effective design and accurate construction that make the removable partial denture retentive. Each part contributes to some critical features. For example :

1. The retentive arm must be designed so that only the clasp terminus engages the prescribed undercut .
2. The accompanying rest must provide support so the clasp terminus is maintained in an optimal location .
3. The minor connector must be sufficiently rigid to ensure proper stability and function of parts of the clasp assembly.
4. The reciprocal element must contact the abutment slightly before the retentive element contacts the tooth to protect the abutment from destructive lateral forces.
5. Components must provide sufficient encirclement; otherwise, retention will be lost.
6. Indirect retainers must resist forces acting to dislodge the prosthesis from its fully seated position.

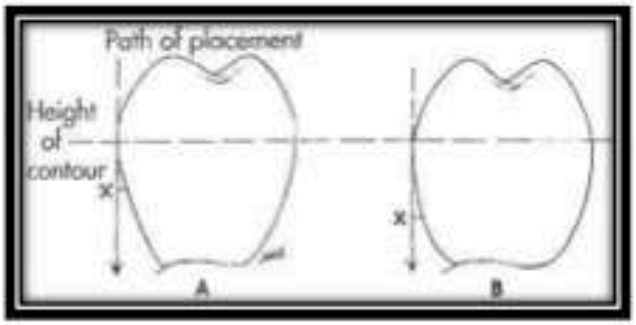
Factors affecting the magnitude of retention: Clasp retention is based on resistance to the deformation of the metal. For a clasp to be retentive, it must be placed in an undercut area of the tooth, it is forced to deform upon application of a vertical dislodging force. The amount of retention depends on various factors.

I. Size of and distance into the angle of cervical (gingival) convergence and how far into the angle of convergence the clasp terminal is placed: To be retentive, a tooth must have an angle of convergence cervical to the height of contour. When it is surveyed, any single tooth will have a height of contour or an area of greatest convexity. Any areas cervical to the height of contour may be used for the placement of retentive clasp components, whereas areas occlusal to the height of contour may be used for the placement of nonretentive, stabilizing, or reciprocating components. So, only flexible components may be placed gingivally to the height of contour because rigid elements would not flex over the height of contour or contact the tooth in the undercut area.

The location and depth of a tooth undercut available for retention are therefore only relative to the path of placement and removal of the partial denture. The most suitable path of placement is generally considered to be the path of placement that will require the least

amount of mouth preparation necessary to place the components of the partial denture in their ideal position.

When the angle of convergence between two abutments differs, uniformity of retention can be obtained by placing the clasp arms into the same degree of undercut (i.e. both 0.01"). A guiding principle of partial denture design is that retention should be uniform in magnitude and bilaterally opposed amongst abutments.

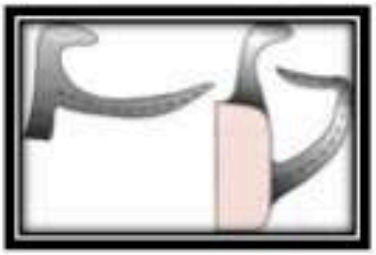


The greater angle of cervical convergence on the tooth (A) necessitates placement of clasp terminus, (X), nearer the height of contour than when a lesser angle exists, as in (B).

II. The flexibility of the clasp arm: This is influenced by the following factors:

1. **Length of clasp arm:**

- Increase the length of the clasp arm increase the flexibility of it, all other factors being equal, (increasing clasp curvature increases length).



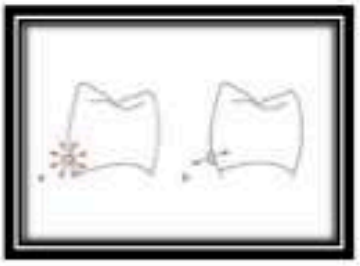
- The length of the clasp arm is measured from the point where the taper begins.
- The length of the clasp arm may be increased by using curving rather than straight retentive arms.

2. **The diameter of clasp:**

- The greater the average diameter of a clasp arm the less flexible it will be .
- If it's taper is absolutely uniform, the average diameter will be at a point midway between its origin and its terminal end. If its taper is not uniform, a point of flexure and therefore a point of weakness will exist .
- The clasp should always taper from the body to the tip, being thicker where the body is attached to the denture base metal or acrylic and thinnest at the end of the arm.

The rigid clasp shoulder (S) originates from the minor connector and projects across the axial surface of the abutment. The relatively flexible midsection of the clasp arm (M) continues along the abutment surface and approaches the height of the contour. The flexible clasp terminus (T) crosses apical to the height of contour, contacting the abutment on a surface undercut relative to the path of prosthesis insertion and removal.

3. Cross-sectional form of the clasp arm: Flexibility may exist in any form, but it is limited to only one direction in the case of the half-round form (bidirectional flexure). The only universally flexible form (omnidirectional flexure) is the round form, which is practically impossible to obtain by casting and polishing.



When viewed in cross-section, a round clasp (a) can flex in all directions, while a half-round clasp (b) is restricted to bidirectional flexure.

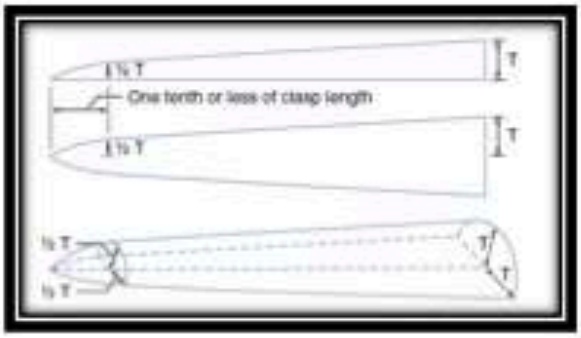
4. Clasp material:

- Whereas all cast alloys used in partial denture construction possess flexibility; their flexibility is proportionate to their bulk.
- Greater rigidity with less bulk is possible through the use of chromium-cobalt alloys.
- Gold clasps are not as flexible or adjustable as wrought wire.
- Cast gold alloys may have greater resiliency than doing cast chromium- cobalt alloys.
- Wrought wire clasp has greater tensile strength than cast clasps and hence can be used in a smaller diameter to provide greater flexibility without fatigue fracture.

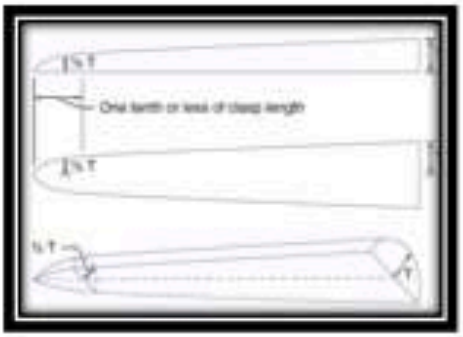
5. The relative uniformity of retention: Having reviewed the factors inherent to a determination of the amount of retention from individual clasps, it is important to consider coordination of relative retention between various clasps in a single prosthesis.

6. Stabilizing-reciprocal cast clasp arm:

- When the direct retainer becomes active, the framework must be stabilized against horizontal movement. This stabilization is derived from either cross-arch framework contacts or a stabilizing or reciprocal clasp in the same clasp assembly.
- To provide true reciprocation, the reciprocal clasp must be in contact during the entire period of retentive clasp deformation. This is best provided with lingual- palatal guide-plane surfaces.
- Its average diameter must be greater than the average diameter of the opposing retentive arm to increase desired rigidity.



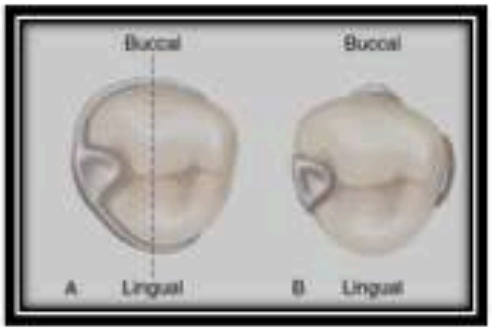
(Cast retentive arm)

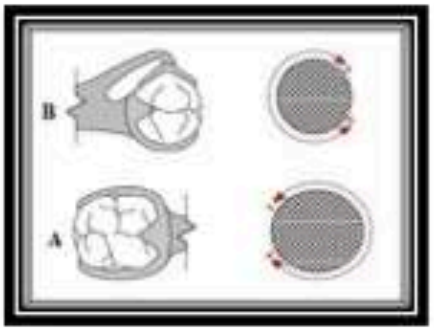


(Cast reciprocal arm)

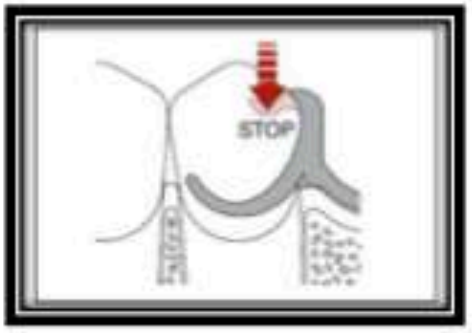
The basic principles of clasp design:

1. **Encirclement:** The principle of encirclement means that more than 180 degrees in the greatest circumference of the tooth must be engaged by the clasp assembly. The engagement can be in the form of continuous contacts, such as in a circumferential clasp (A), or discontinuous contact, such as in the use of a bar clasp (B). Both provide tooth contact in at least three areas encircling the tooth: the occlusal rest area, the retentive clasp terminal area, and the reciprocal clasp terminal area.





2. Support: The occlusal rest must be designed to prevent the movement of the clasp arms toward the cervical.

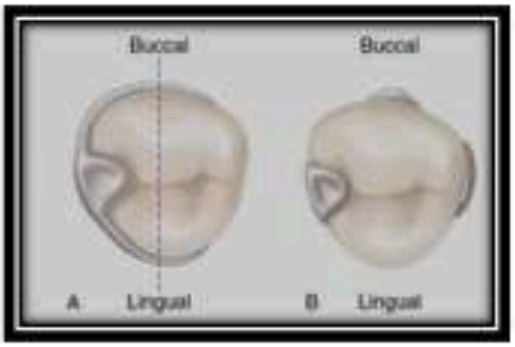


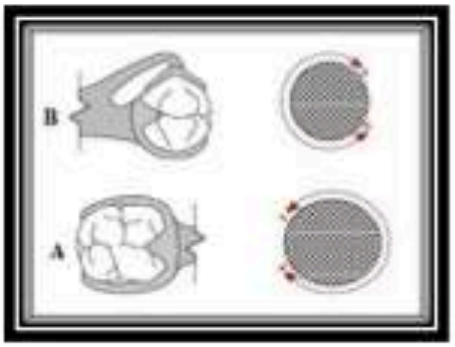
A rest must prevent the apical displacement of the prosthesis. If this is not accomplished, the underlying hard and soft tissues may be damaged.

3. **Reciprocation:** Each retentive terminal should be opposed by a reciprocal component capable of resisting any transient pressures exerted by the retentive arm during placement and removal.

The basic principles of clasp design:

1. **Encirclement:** The principle of encirclement means that more than 180 degrees in the greatest circumference of the tooth must be engaged by the clasp assembly. The engagement can be in the form of continuous contacts, such as in a circumferential clasp (A), or discontinuous contact, such as in the use of a bar clasp (B). Both provide tooth contact in at least three areas encircling the tooth: the occlusal rest area, the retentive clasp terminal area, and the reciprocal clasp terminal area.





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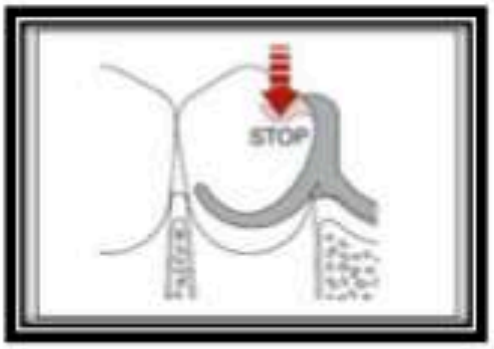

A rest must prevent the apical displacement of the prosthesis. If this is not accomplished, the underlying hard and soft tissues may be damaged.

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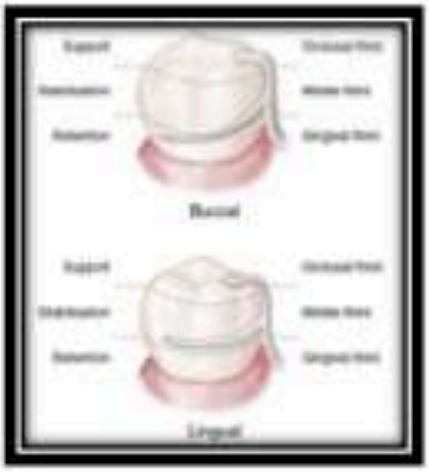
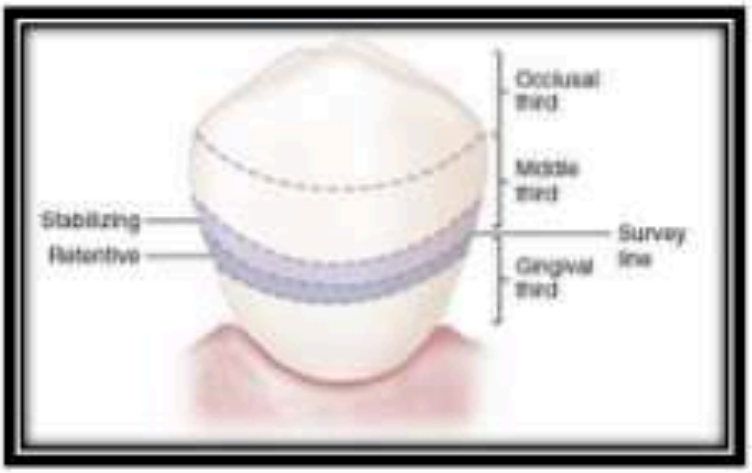
permit better resistance to horizontal and torquing forces because of a reduction in the effort arm.





8. **Passivity:** When the clasp is in its place on the tooth surface, it should be at rest, the retentive tip of the clasp arm must be passive and remain in contact with the tooth ready to resist vertical dislodging force, so when a dislodging force is applied the clasp arm should immediately become active to engage tooth surface to resist vertical displacement.

Types of clasp assemblies:

They are of two types:-

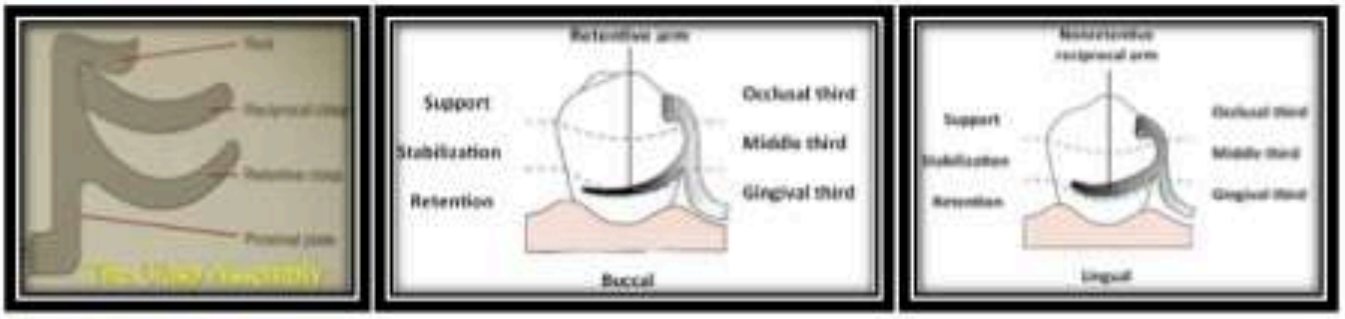
1. **Clasps designed without movement accommodation.**
2. **Clasps designed to accommodate distal extension functional movement.**

Clasps designed without movement accommodation: It is also named suprabulge clasp or occlusally approach clasp since the clasp approaches the retentive undercut from the occlusal direction.

Clasps for tooth-borne partial dentures (Class III and IV) have one function to prevent dislodgment of the prosthesis without damage to the abutment teeth. Since there is little or no rotation caused by tissue ward movement of the edentulous area (as happens in distal extension cases) stress releasing properties are usually not required. These clasps can also be used in modification spaces for tooth and tissue supported removable partial dentures (Class I and II).

Circumferential (Circle or Akers) clasp:

- The circumferential clasp will be considered first as an all-cast clasp and it is the simplest one.
- The basic form of the circumferential clasp is a buccal and lingual arm originating from a common body (principle occlusal rest and minor connector).
- The circumferential clasp has only one retentive clasp arm, opposed by a nonretentive reciprocal arm on the opposite side.
- It approaches the undercut area from an occlusal direction so it is called (occlusally approaching clasp) since it is coming to the undercut area from above the bulge area so-called (suprabulge clasp) and since it is pulling the tooth during action also called pull clasp and also called Aker clasp.
- The retentive arm begins above the height of contour, and curves and tapers to its terminal tip, in the gingival 1/3 of the tooth, well away from the gingival.
- The bracing (nonretentive reciprocal) arm is in the middle 1/3 of the tooth, and is broader occlusal – gingivally, does not taper and is either entirely above the height of contour or completely on a prepared guiding plane – it should never be designed into an undercut, as it is a rigid element.
- Support is provided by occlusal rest; stabilization is provided by occlusal rest, proximal minor connector, lingual clasp arm and rigid portion of buccal retentive clasp arm occlusal to the height of contour; retention is realized by the retentive terminal of buccal clasp arm; reciprocation is provided by nonflexible lingual clasp arm. Clasp Assembly engages more than 180 degrees of abutment tooth's circumferences.



Indications:

- It is a most logical clasp to use with all tooth-supported partial dentures because of its retentive and stabilizing ability.
- On free end extension when minimal undercut is utilized.

Contraindication:

- When the retentive undercut may be approached better with a bar clasp arm.
- When esthetics will be enhanced by using bar clasp arm.

Advantages:

- Excellent bracing qualities.
- Easy to design and construct.
- Less potential for food accumulation below the clasp compared to bar clasps.

Disadvantages:

- More tooth surface is covered than with a bar clasp arm because of its occlusal origin.
- On some tooth surfaces, particularly the buccal surface of mandibular teeth and the lingual surfaces of maxillary teeth, its occlusal approach may increase the width of the occlusal surface of the tooth.
- In the mandibular arch, more metal may be displayed than with the bar clasp arm.
- Its half-round form prevents adjustment to increase or decrease retention. True adjustment is impossible with most cast clasps.

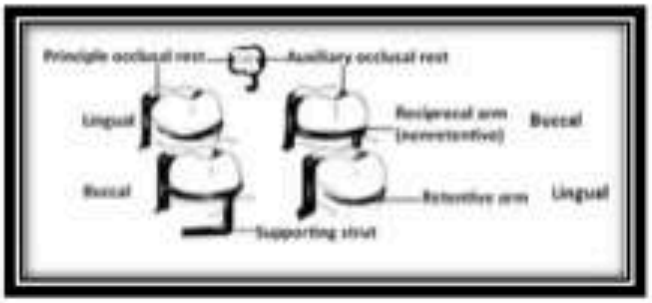
The circumferential type of clasp may be used in several forms:

1. Ring-type clasp:

- Ring clasp, which encircles nearly all of a tooth from its point of origin.
- Usually used with mesially and lingually tilted mandibular molars or the undercut is on the same side as the rest seat (i.e. adjacent to edentulous span).
- The clasp should never be used as an unsupported ring because if it is free to open and close as a ring, it cannot provide either reciprocation or stabilization. Instead, the ring-type clasp should always be used with a supporting strut on the nonretentive side, with or without an auxiliary occlusal rest on the opposite marginal ridge. The advantage of an auxiliary rest is that further movement of a mesially inclined tooth is

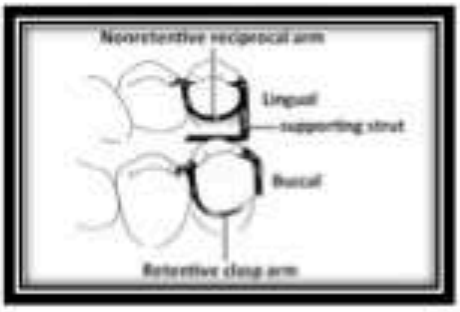
prevented by the presence of a distal rest. In any event, the supporting strut should be regarded as being a minor connector from which the flexible retentive arm originates.

- Reciprocation comes from the rigid portion of the clasp lying between the supporting strut and the principal occlusal rest.
- The ring-type clasp should be used on protected abutments whenever possible because it covers such a large area of the tooth surface.



Indications:

- It is used when a proximal undercut cannot be approached by other means. For example, when a mesiolingual undercut on a lower molar abutment (isolated lower molar such as in Class II modification one) cannot be approached directly because of its proximity to the occlusal rest area and cannot be approached with a bar clasp arm because of lingual inclination of the tooth.
- It may be used in reverse on an abutment located anterior to a tooth-bounded edentulous space when a distobuccal or distolingual undercut cannot be approached directly from the occlusal rest area and/or tissue undercuts prevent its approach from a gingival direction with a bar clasp arm.



Contraindication:

- Excessive tissue undercuts prevent the use of a supporting strut.

Advantages:

a. Excellent bracing (with supporting strut).
b. Allow the use of an available undercut adjacent to the edentulous area.

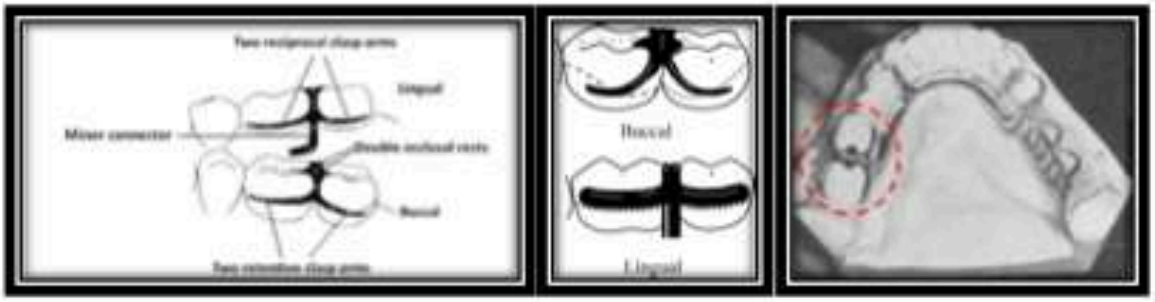
Ring clasp (s) encircling nearly the entire tooth from its point of origin. A Clasp originates on the mesiobuccal surface and encircles the tooth to engage the mesiolingual undercut. B, Clasp originates on the mesiolingual surface and encircles the tooth to engage the mesiobuccal undercut.

Disadvantages:

- Covers a large area of the tooth surface, therefore requiring meticulous hygiene.
- Very difficult to adjust due to the extreme rigidity of the reciprocal arms.
- The lower bracing arm should be at least 1mm from the free gingival margin and relieved to prevent impingement of the gingival tissues.

2. Embrasure (double Akers) clasp:

- The embrasure clasp always should be used with double occlusal rests, even when definite proximal shoulders can be established. This is done to avoid interproximal wedging by the prosthesis, which could cause separation of the abutment teeth and result in food impaction and clasp displacement.
- In addition to providing support, occlusal rests also serve to shunt food away from contact areas.
- Embrasure clasps should have two retentive clasp arms and two reciprocal clasp arms, either bilaterally or diagonally opposed.



Example of use of embrasure clasp for a Class II partially edentulous arch: Embrasure clasp on two left molar abutments were used in the absence of posterior modification space.

Indications:

Used in a quadrant where no edentulous area exists, In an unmodified Class II or Class III partial denture, where there are no edentulous spaces on the opposite side of the arch to aid in clasping.

Occlusal and proximal surfaces of adjacent molar and premolar prepared for embrasure clasp. Note that rest seat preparations are extended both buccally and lingually to accommodate retentive and reciprocal clasp arms.

Disadvantages:

- Extensive interproximal reduction is usually required.
- Covers large area of tooth surface – hygiene considerations.

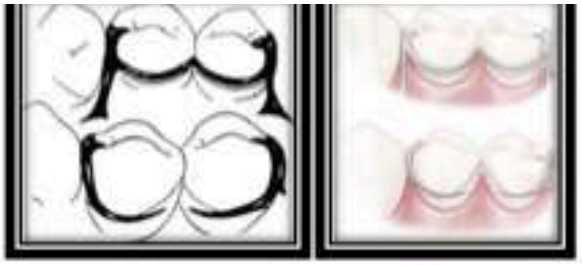
Other less commonly used modifications of the cast circumferential clasp are:

1. Back action clasp:

- The back-action clasp is a modification of the ring clasp.
- It is used on premolar abutment anterior to edentulous space.
- The undercut can usually be approached just as well using a conventional circumferential clasp, with less tooth coverage and less display of metal.
- Its use is difficult to justify.

2. Multiple clasps:

The multiple clasps are simply two opposing circumferential clasps joined at the terminal end of the two reciprocal arms.



Indications:

- It is used when additional retention and stabilization are needed, usually on tooth-supported partial dentures.
- It may be used for multiple clasping in instances in which the partial denture replaces an entire half of the dental arch.
- It may be used rather than an embrasure clasp when the only available retentive areas are adjacent to each other.

Disadvantage:

- Its disadvantage is that two embrasure approaches are necessary rather than a single common embrasure for both clasps.

3. Half-and-half Clasp:

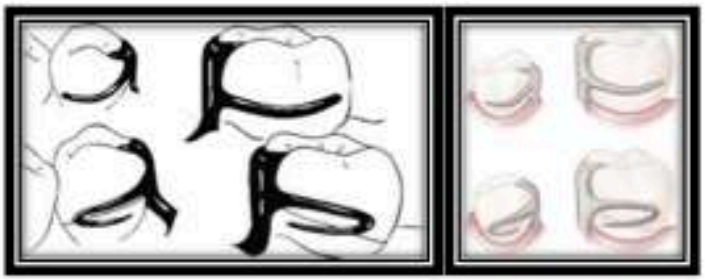
- It is consists of a circumferential retentive arm arising from one direction and a reciprocal arm arising from another.
- The second arm must arise from a second minor connector, and this arm is used with or without an auxiliary occlusal rest.
- Its design was originally intended to provide dual retention, a principle that should be applied only to unilateral partial denture design.
- Reciprocation arising from a second minor connector usually can be accomplished with a short bar or with an auxiliary occlusal rest, thereby avoiding so much tooth coverage.
- There is little justification for the use of the half-and-half clasp in bilateral extension base partial dentures.

4. Reverse-action clasp (Hairpin):

- Ring clasp or bar clasp originating on the opposite side of the tooth can be used with the same result getting from reverse- action clasp.
- The upper part of the arm of this clasp should be considered a minor connector, giving rise to the tapered lower part of the arm. Therefore only the lower part of the arm should be flexible. With the retentive portion beginning beyond the turn, only the lower part of the arm should flex over the height of the contour to engage a retentive undercut.
- The bend that connects the upper and lower parts of the arm should be rounded to prevent stress accumulation and fracture of the arm at the bend.

Advantage:

- Clasp arm is designed to permit engaging a proximal undercut (undercut adjacent to edentulous space) from an occlusal approach.



Disadvantages:

- Esthetically objectionable when using an anterior abutment.
- The clasp covers a considerable tooth surface and may trap debris.
- Almost impossible to adjust.
- Difficult to fabricate.
- Insufficient flexibility on short crowns due to insufficient clasp arm length.

Indications:

- When a proximal undercut must be used on a posterior abutment and when tissue undercuts, tilted teeth or high tissue attachments prevent the use of a bar clasp arm.
- When lingual undercuts may prevent the placement of a supporting strut (of ring clasp) without tongue interference.
- May be used on abutments of tooth-supported dentures when proximal undercut lies below the point of origin of the clasp.

Disadvantages of circumferential clasps in summary:

- A large amount of tooth surface is covered by clasp assembly.
- It alters the gross morphology of the clinical crown.

Clasps designed to accommodate distal extension functional movement:

Two strategies are adapted to either:

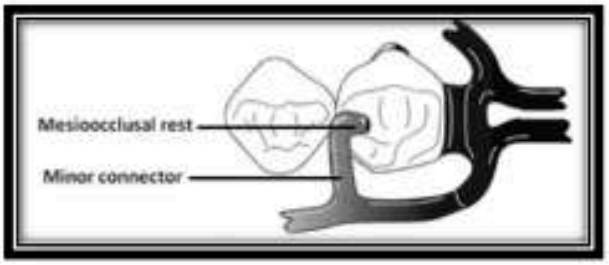
- Change the fulcrum location and subsequently the "resistance arm" engaging effect (mesial rest concept clasp assemblies).
- Minimize the effect of the lever by use of a flexible arm (wrought-wire retentive arm).

Change the fulcrum location and subsequently the "resistance arm" engaging effect: Mesial rest concept clasps assemblies (RPI, RPA, and Bar clasp): These are proposed to accomplish movement accommodation by changing the fulcrum location to prevent harmful tipping or torquing of the abutment tooth and prevent more denture base movement. This is concept includes RPI and RPA clasps.

RPI clasp:

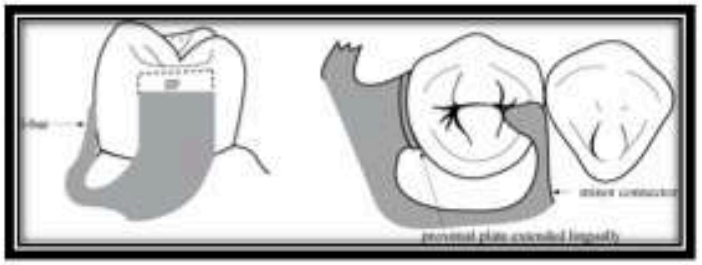
RPI clasps are referring to the: R = Rest always mesial, P = Proximal plate, and I = I-bar. These are component parts of the clasp assembly. Basically, this clasp assembly consists of:

- A mesiooocclusal rest of a premolar or mesiolingual surface of a canine with the minor connector placed into the mesiolingual embrasure, but not contacting the adjacent tooth (prevents wedging).

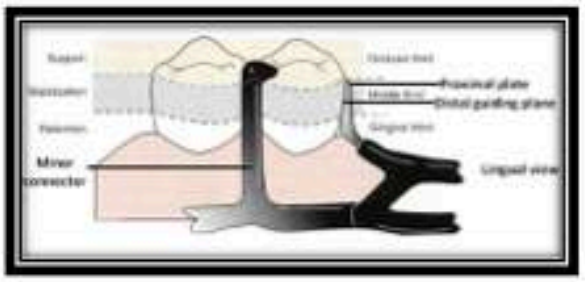


Occlusal view

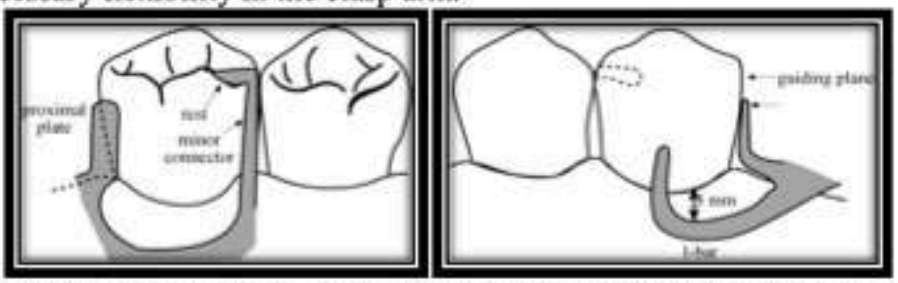
- A distal guiding plane, extending from the marginal ridge to the junction of the middle and gingival thirds of the abutment tooth, is prepared to receive a proximal plate. The buccolingual width of the guiding plane is determined by the proximal contour of the tooth.



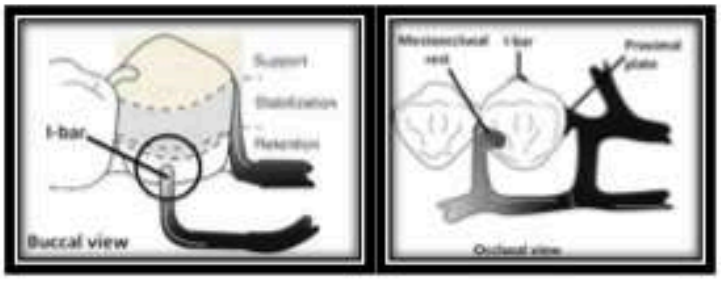
- The proximal plate (essentially a wide minor connector) is located on a guide plane on the distal surface of the tooth. The plate is approximately 1 mm thick and joins the framework at a right angle.
- The I-bar in conjunction with the minor connector supporting the rest provides the stabilizing and reciprocal aspects of the clasp assembly.



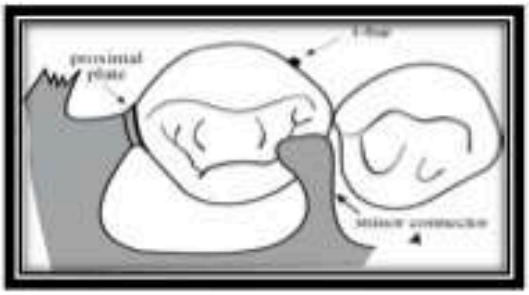
- I-bar should be located in the gingival third of the buccal or labial surface of the abutment in a 0.01-inch (0.25mm) undercut. The whole arm of the I-bar should be tapered to its terminus, with no more than 2 mm of its tip contacting the abutment. The retentive tip contacts the tooth from the undercut to the height of the contour. This area of contact along with the rest and proximal plate contact provides stabilization through the encirclement. The bend in the I-bar should be located at least 3 mm. from the gingival margin. This distance will prevent food entrapment and provide the length for the necessary flexibility in the clasp arm.



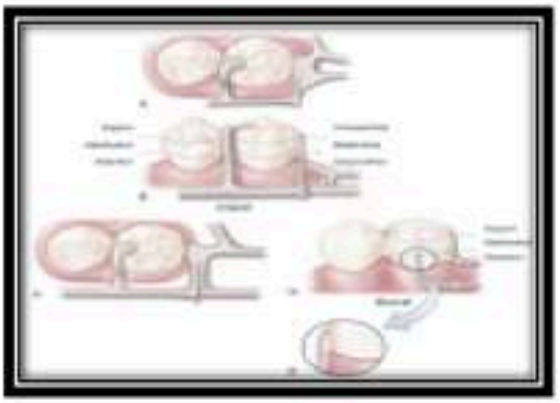
- The clasp is usually cast and is placed just below the height of the contour line.



- On the canine, the I-bar is located in the mesiobuccal undercut and is reciprocated directly by the proximal plate.

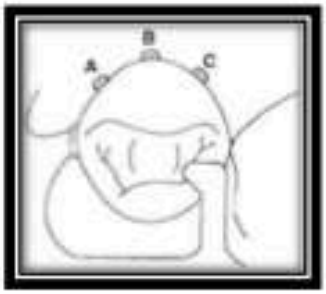


The horizontal portion of the approach arm must be located at least 4 mm from the gingival margin and even farther if possible.



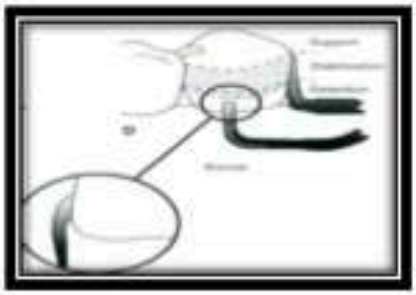
Bar-type clasp assembly:

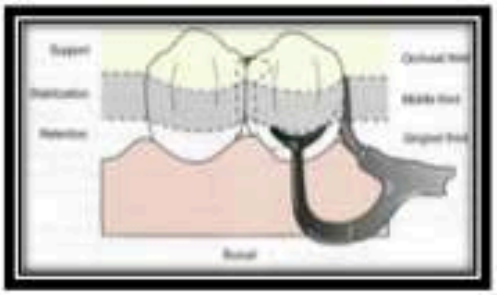
A: Occlusal view. Component parts :(proximal plate minor connector, rest with minor connector, and retentive arm) tripod the abutment to prevent its migration. B: The proximal plate minor connector extends just far enough lingually so that it combines with the mesial minor connector to prevent the lingual migration of the abutment. C: On narrow or tapered abutments (mandibular first premolars), the proximal plate should be designed to be as narrow as possible but still sufficiently wide to prevent lingual migration. D: I-bar retainer located at the greatest prominence of the tooth in the gingival third. E: Mesial view of I-bar illustrating the retentive tip relationship to the undercut and a region superior to the height of contour, which serves stabilization function in the encirclement.



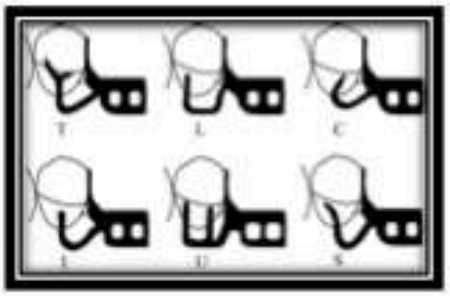
Occlusal view of RPI bar clasp assembly. Placement of l-bar which is depending on the position of proximal plate in relation to guiding plan on proximal tooth surface: (A) On the distobuccal surface. (B) At greatest mesiodistal prominence. (C) On the mesiobuccal surface.

The bar clasp arm arises from the denture framework or a metal base and approaches the retentive undercut from a gingival direction.





The bar clasp arm has been classified by the shape of the retentive terminal. Thus it has been identified as T, Y, L, I, U and S. I shape bar is preferred than other shapes because this shape being biologically and mechanically sound.



If the abutment teeth demonstrate contraindications for a bar-type clasp a modification should be considered for the RPI system (the RPA clasp; Akers clasp).

Contraindications:

- Deep cervical undercuts - food trap or impingements result.
- Severe soft tissue or bony undercuts - food trap or impingements result.
- Insufficient vestibular depth for approach arm, because this reduces the advantageous length of the arm and made the clasp too close to the gingival margin it (requires 4 - 3 mm from the free gingival margin, 1 mm for the thickness of the approach arm).
- Pronounced frenal attachments area – impingement.
- The excessive buccal or lingual tilt of the abutment tooth.

RPA clasp; Akers clasp:

This clasp assembly is similar to the RPI design (consists of a mesial occlusal rest, proximal plate, except a wrought wire circumferential clasp (Akers) is used instead of the I-bar. This clasp arises from the proximal plate and terminates in the mesiobuccal undercut. It is used when there is insufficient vestibule depth or when a severe tissue undercut exists.

There are several other types of bar clasps; for example:

Infrabulge clasp:

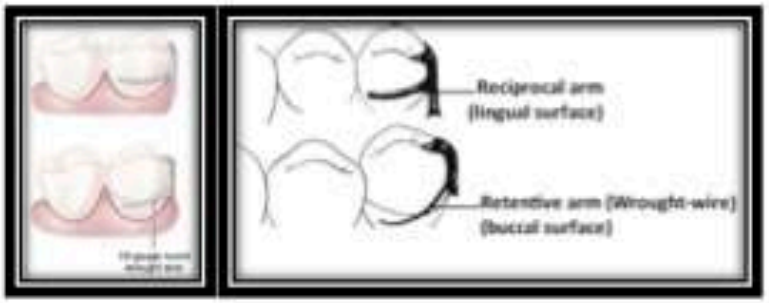
It is designed so that the bar arm arises from the border of the denture base, either as an extension of a cast base or attached to the border of a resin base. It is made more flexible than the usual bar clasp arm.

Advantages:

- Its interproximal location, which may be used to esthetic advantage. And Increased retention without tipping action on the abutment.
- Less chance of accidental distortion resulting from its proximity to the denture border.
- Minimize the effect of the lever by use of a flexible arm (wrought- wire retentive arm).

Combination clasp:

- Another strategy to reduce the effect of the Class I lever in distal extension situations is to use a flexible component in the "resistance arm," which is the strategy employed in the combination clasp. The combination clasp consists of a wrought-wire retentive clasp arm (round, uniformly tapered 18-gauge platinum-gold-palladium alloy or chrome- cobalt alloy wrought- wire) and a cast reciprocal clasp arm.
- The retentive arm (wrought-wire) is almost always circumferential, but it also may be used in the manner of a bar, originating gingivally from the denture base.
- The cast reciprocal arm may be in the form of a bar clasp arm, it is usually a circumferential arm.



Advantages:

- The flexibility.
- The adjustability.
- The esthetic appearance of the wrought-wire retentive arm over other retentive circumferential clasp arms).
- Minimum of tooth surface covered because of its line contact with the tooth, rather than having the surface contact of a cast clasp arm.
- A less likely occurrence of fatigue failures.

Disadvantages:

- It involves extra steps in fabrication, particularly when high-fusing chromium alloys are used.
- It may be distorted by careless handling on the part of the patient.
- Because it is bent by hand, it may be less accurately adapted to the tooth and therefore provide less stabilization in the suprabulge portion.
- It may distort with function and not engage the tooth.

Indications:

- When maximum flexibility is desirable, such as on an abutment tooth adjacent to a distal extension base where only a mesial undercut exists on the abutment or a weak abutment or where a large tissue undercut, contraindicates a bar- type direct retainer.
- It may be used for its adjustability when precise retentive requirements are unpredictable and later adjustment to increase or decrease retention may be necessary.
- When esthetic required overcast clasps, because wrought -wire is round, light is reflected in such a manner that the display of metal is less noticeable than with the broader surfaces of a cast clasp.

The various types of cast circumferential clasps may be used in combination with bar clasp arms. Circumferential and bar clasp arms may be made either flexible (retentive) or rigid (reciprocal) in any combination as long as each retentive clasp arm is opposed by a rigid reciprocal component.

EXAMINATION

Q-Choose the correct answer.

1- RPI stands for :
A. Rest, proximal plate, indirect retainer
B. Cingulum rest, proximal plate and I bar
C. Rest, proximal guide plane, I bar
D. Occlusal rest, proximal plate and I bar
2- Bar clasp assembly mostly used is
A. Mesio-occlusal rest
B. Disto-occlusal rest
C. Buccal approach
D. Choice of the dentist 1
3-Combination clasp consist of
A.wrought wire, reciprocal arm and cast retentive arm
B. Wrought wire retentive arm and cast reciprocal arm
C. Wrought reciprocal and Wrought retentive arm
D. cast retentive and cast reciprocal arm
4-A ring clasp is used
A. In Kennedy class I case
B. Always with a supporting strut
C. On titled molars
D. Both B and C
5-multiple clasping is used when
A.the remaining natural tooth are not periodontally strong enough to act as separate abutments
B. More retention is necessary
C.The patient wants an expensive partial denture
D. The dentist tries to conserve tooth structure

Session -10
Internal attachment and stress breaker

Objectives of session number -10

The student will be study:
1-arrangement Guideline of artificial teeth
arrangement2-Arrangement of anterior teeth
3. Arrangement of upper anterior teeth
4. Arrangement Of Posterior Teeth
5-Curve of Spee
6. Compensatory curves
7. Arrangement of lower posterior
teeth8-Arrangement of upper posterior
teeth
9-Common errors in arrangement of teeth
10-Waxing And Carving
11-Definition Requirements of waxing the polish surfaces
12-The procedure of waxing
13-Establishing the posterior palatal seal area
14Procedure for carving of posterior palatal seal area
15Advantages of posterior palatal seal
16-Esthetic consideration in complete denture

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q1 \ DEFINE the following :-

1- internal attachment

2-external attachment

3-direct retainer in RPD.

An internal attachment (intracoronal direct retainer) is a type of precision attachment located within the normal contours of an abutment and functions to retain and stabilize a removable partial denture.

Usually the internal attachment consists of two components (Fig. 1). The first component, ***matrix***, is a metal receptacle (holder) contained within the normal clinical contours of a fixed restoration. The second component, ***patrix***, is attached to the corresponding removable partial denture.

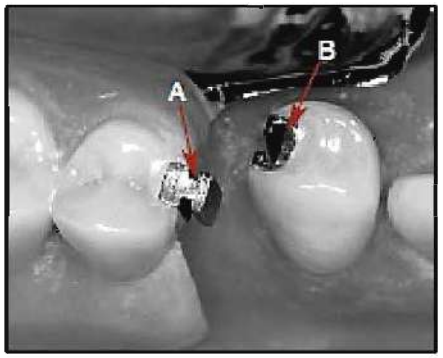


Figure 1: Internal attachment demonstrating the patrix (A) and the matrix (B).

Internal attachments (intracoronal direct retainers) may be subdivided into two categories based on the method of fabrication and tolerance of fit between components. If components are fabricated in metal using high-precision manufacturing techniques, they are considered ***precision internal attachments***. These attachments usually exhibit long, parallel walls and excellent surface adaptation that fit together with tolerances of about 10 microns. These are ready-made attachments made by specialized companies and are more preferable from any fabricated by the dental technician due to the alloys used and precision in make them.

The second category shows a less intimate fit between matrix and patrix components. These are termed ***semi-precision internal attachments***. Components usually originate as wax or plastic patterns, which are subsequently cast in metal. Unlike precision attachments, semi-precision attachments often display gently tapering walls. These are fabricated by dental technicians as a cast dovetail fitting into a counterpart holder in the abutment crown.

Internal attachments differ from ***internal occlusal rests*** because they use a securing device for retention without a visible clasp. Also, internal attachments provide horizontal stabilization similar to that of internal occlusal rests, but additional extracoronal stabilization is usually desirable.

The internal attachment has two major advantages over the extracoronal attachment:

1. Elimination of visible retentive and support components.
2. Better vertical support through a rest seat located more favorably in relation to the horizontal axis of the abutment tooth.

Some of the ***disadvantages*** of internal attachments include the following:

1. They require prepared abutments and castings.
2. They require somewhat complicated clinical and laboratory procedures.
3. They eventually wear, with progressive loss of frictional resistance to denture removal.
4. They are difficult to repair and replace.
5. They are effective in proportion to their length and are therefore least effective on short teeth.
6. They are difficult to place completely within the circumference of an abutment tooth because of the size of the pulp.
7. They are considered more costly.

Internal attachments do not permit horizontal movement. Thus, all horizontal, tipping, and rotational movements of the prosthesis are transmitted directly to the abutment teeth. Therefore, internal attachments should not be used in combination with tissue-supported distal extension denture bases unless some form of stress-breaker is used between the movable base and the rigid attachment. Although stress breakers may be used, they do have some disadvantages and their use adds to the cost of the partial denture.

Precision Attachments

A precision attachment is "an interlocking device, one component of which is fixed to an abutment or abutments, and the other is integrated into a removable partial denture to stabilize and/or retain it." (GPT-9)

There are many types of precision attachments for partial dentures that ***cannot*** be classified as primarily of the intracoronal or extracoronal type. Neither can they be

classified as relying primarily on frictional resistance or placement of an element in an undercut to prevent displacement of the denture. However, all of these use some type of retentive means, located intracoronally or extracoronally, for providing retention without visible clasp retention.

Intracoronal direct retainers (internal attachments) of the locking or dovetail type are not recommended for distal extension removable partial dentures because of excessive leverages often associated with these attachments that may generate torque and tipping stresses on the abutment.

The non-locking type of the intracoronal direct retainers can be used in many cases of Class I and Class II partially edentulous situations. However, unless the cross-arch axis of rotation is common to the bilaterally placed attachments, torque on the abutments may be experienced.

Some indications for precision attachments are as follows: **(Arti, 2018)**

1. Esthetics zone.
2. Nonparallel abutments present.
3. Improved retention.
4. As stress breaker in free end saddles and bridges.
5. Intracoronal attachments as effective direct retainers for removable partial dentures.
6. As a connector for sectional dentures.
7. To lock a connector joining saddles in the opposite side of the arch.
8. To retain hybrid dentures.

Some of the contraindications for precision attachments are as follows: **(Arti, 2018)**

1. Along one precise path of insertion, the patient must possess an average degree of manual skill.
2. Patients with severe periodontitis.
3. Patients with abnormally high caries rate.
4. Where there is inadequate space (teeth that are very narrow faciolingually).

The ***main types of precision attachments*** are as follows:

1. Internal attachments (intracoronal direct retainer):

These attachments are in the form of key and keyway (Fig. 2) and they are incorporated entirely within the cast crown. They are mainly used in connecting a fixed prosthesis

with a removable partial denture. Stern attachment & Ney attachment are examples of such types of attachments.

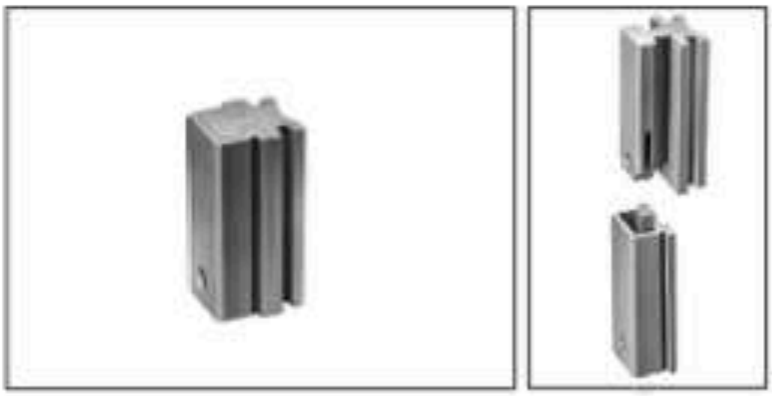


Figure 2: Stern attachment

2. Extracoronal attachments:

They are situated external to the crown and can provide stability and retention for removable prostheses. These are less rigid attachments that can be used with distal extension partial dentures. The main disadvantage with extracoronal attachments is that more space is required within the removable partial denture as they are bulky. Examples of these attachments include the Dalbo (Fig. 3) and Ceka attachments. (**Nigam, 2013**).

Figure 3: Dalbo extracoronal precision attachment incorporated in the denture (left). Male and female components (right).

3. Stud or anchor attachments:

These attachments are either intra-radicular or extra-radicular. Such attachments can be made in rigid form for bounded saddle situations and in resilient forms for free end saddles. Stud attachments consist of a post like male secured to the diaphragm of coping female which engages the male post. Retention is obtained by frictional fit or snap like action (**Nigam, 2013**). One of their advantages is that the crown root ratio is improved with low profile stud attachments. Zest anchor (Fig. 4), Rotherman, and Gerber (Fig. 5) are examples of stud attachments.

walls provides retention. In Dolder bar units paralleling of bars is more important which is provided with a special paralleling mandrill. (**Nigam, 2013**)

Selection of an Attachment for a Removable Partial Denture (Arti, 2018).

1. The first decision that must be made is whether to use an intracoronal or extracoronal attachment.
2. The second decision to be made is whether to use a resilient or a non-resilient type.
3. The third consideration is that the largest attachment can be used within the given space should be chosen to gain maximum stability, retention, and strength for the prosthesis.

Stress-Breakers (Stress Equalizers)

Distal extension partial dentures should be designed in a manner to prevent the damaging effect of the rigid connection between the denture base and the abutment teeth. This rigid connection is through the rigid major and minor connectors. The stress on the abutment teeth and residual ridge is minimized through the use:

1. Denture bases constructed from functional impressions.
2. Broad coverage of the denture base.
3. Harmonious occlusion
4. Correct choice of the direct retainers.

Types of stress breakers:

1. Types of clasp assemblies used for distal extensions because of their stress-breaking design.

Cast retentive clasp arms that engage undercuts on the abutment teeth in such a manner that tissue-ward movement of the extension base transmits only minimum leverage to the abutment and this is represented by the RPI & RPA systems. Or tapered wrought-wire retentive clasp arms should be used because of their greater flexibility such as the combination clasp assembly. The tapered, round wrought-wire clasp arm acts somewhat as a stress-breaker between the denture base and the abutment tooth by reducing the effects of denture base movement on the tooth through its flexibility.

Dolder Bar is also available in two types, (1) Pear shaped which allows a degree of resilience of movement between it and the sleeve and (2) Parallel bar which allows no movement. Dolder bar units are tooth supported and non-rotational and are indicated where numerous attachments are present (four in three planes). Friction between the

2. Stress breakers that separate the actions of the direct retainers from the movement of the denture base through independent movement of the denture base (or its supporting framework) and the direct retainers

This form of stress-breaker is also referred to as a stress equalizer and an example is the split bar major connector (Fig. 7), which is a commonly used stress breaker.

Figure 7: Split bar major connector.

All stress-breakers effectively disperse damaging vertical stresses to the abutment teeth, which is the main purpose of their use. However, this is achieved with the following disadvantages:

1. Reduced horizontal stability
2. Excessive ridge resorption
3. Tissue impingement
4. Inefficient mastication

It is the rigid nature of the conventional removable partial denture that allows satisfaction of all requirements for support, stability, and retention without overemphasis on only one principle to the damage of the oral tissues.

EXAMINATION

1-.The direct retainer of choice when the principle abutment tooth has lost its periodontal support is: A. embrasure clasp

B. Ring clasp

C. Multiple circlet clasp

D. Only clasp

2-The mean action of reciprocal arm is

To provide stability to the denture

b. Reciprocation of vertical displacement

c. Reciprocates the action of the retentive arm

d. Non of the above

3.the primary indication for precision attachment of RPD when abutment teeth well supported when the patient is :

A. Abutment teeth require restoration

B. esthetically concerned

C. When teeth are present on both ends of the edentulous area

D. No posterior abutment teeth are present

Session -11

İndirect retainer

Objectives of session -11

The student will be study:

1. Occlusion
2. Occlusion of complete denture
3. Centric occlusion Centric relation4-Eccentric occlusion 5-Concepts of complete denture occlusion6-Try-in appointment

Instructions:

❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

Q1 \ ANEWER the following :-

1-among the requirements of a clasp is that; it should provide;

a- Retention by means of the flexible clasp tip in the undercut area.
b- Bracing by means of the rest.
c- Support by means of the rigid arm in the non undercut area.
d- A & B only.
e- all of the above.
f- B & C only.
g- A & C only.

2-The following clasps are considered modifications of Aker's clasp, Except;

a- Butterfly clasp.
b- Extended arm clasp.
c- Ring clasp.
d- Half and half clasp.

Partial denture movement can exist in three planes; horizontal, frontal, and sagittal. ***Tooth-supported partial dentures*** use teeth to control movement away from the tissues. ***Tooth-tissue–supported partial dentures*** have at least one end of the prosthesis free to move away from the tissue. This may occur because of the effects of gravity in the maxillary arch or adhesive foods in either arch. Thus, there is an axis or line about which the denture will rotate when the bases move away from the residual ridge and this is associated with tooth-tissue supported partial dentures. A ***fulcrum line*** is a theoretical line around which a removable dental prosthesis tends to rotate when subjected to forces towards or away from the residual ridge.

This movement away from the residual ridge around the fulcrum line can be prevented by the action of an indirect retainer, (Fig. 1). Thus, an ***indirect retainer*** is the component of a removable partial denture that assists the direct retainer(s) in preventing displacement of the distal extension denture base by functioning through lever action on the opposite side of the fulcrum line when the denture base moves away from the tissues in pure rotation around the fulcrum line. Therefore, the ***main function of the indirect retainer*** is to prevent movement of a distal extension base away from the tissues.

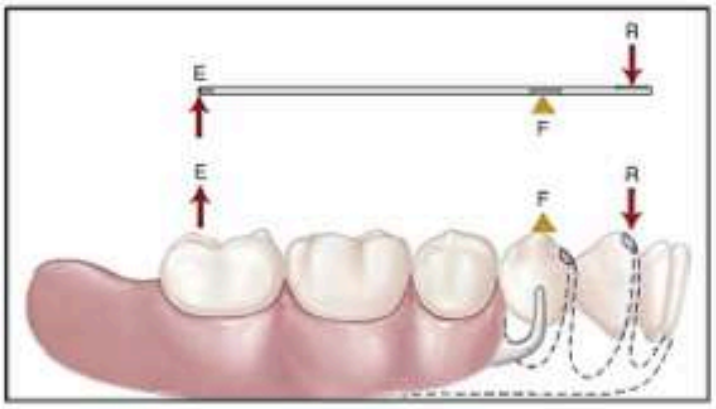


Figure 1: Action of the indirect retainer where E: Effort (e.g. sticky food), F: fulcrum line, & R: Resistance (indirect retention).

An indirect retainer consists of one or more rests and the supporting minor connectors and should be placed as far from the distal extension base as possible in a prepared rest seat on a tooth capable of supporting its function. The proximal plates, adjacent to the edentulous areas, also provide indirect retention. Although it is customary to identify the entire assembly as the indirect retainer, it should be remembered that the rest is actually the indirect retainer united to the major connector by a minor connector.

The most effective location of an indirect retainer is in the area of an incisor tooth, but this tooth may not be strong enough may have steep inclines that cannot support a rest. Thus, the nearest canine or the mesio-occlusal surface of the first premolar may be the best location for the indirect retention and on both sides of the arch closer to the fulcrum line are used to compensate for the compromise in distance.

In the absence of indirect retainers for distal end extension dentures subjected to posterior dislodging forces, two undesirable events may take place: (1) the denture base moves away from the supporting tissues, and (2) the anterior segment of the major connector impinges upon the underlying soft tissues (Fig. 2a). This results in transmission of destructive forces to the hard and soft tissues of the dental arch.

When an indirect retention is included in distal extension dentures, (1) forces acting to dislodge the distal extension bases are neutralized (Fig. 2b). Also, (2) the rotational axis shifts from the abutment teeth to the indirect retainers and as long as the clasp assemblies resist the vertical dislodging forces, the prosthesis remains in place. As dislodging forces become greater than the retentive capacities of the clasp assemblies, the prosthesis moves away from the underlying tissues.

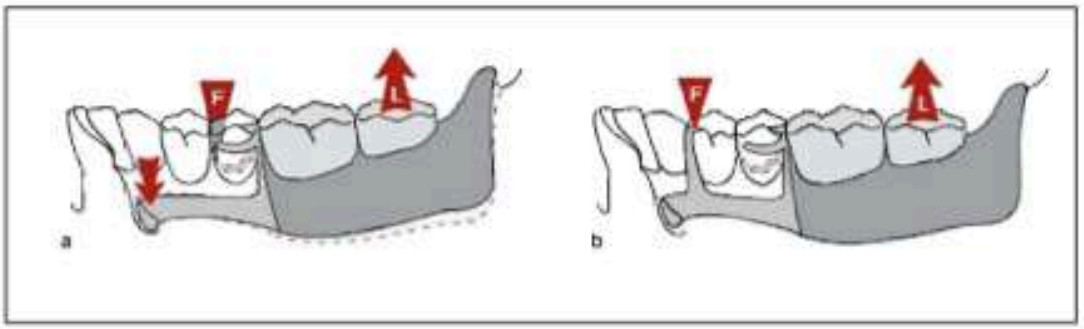


Figure 2: Movement of a distal extension denture in the absence (a) and presence (b) of an indirect retainer.

The following are the ***main factors influencing the effectiveness*** of an indirect retainer:

1. The principal occlusal rests on the primary abutment teeth must be held in their seats by the retentive arms of the direct retainers. If rests are held in their seats, rotation about an axis should occur, which subsequently would activate the indirect retainers. If total displacement of the rests occurs, no rotation about the fulcrum would occur, and the indirect retainers would not be activated.
2. Distance from the fulcrum line. The following three areas must be considered:
   a. Length of the distal extension base.
   b. Location of the fulcrum line.

c. How far beyond the fulcrum line the indirect retainer is placed.

3. Rigidity of the connectors supporting the indirect retainer. All connectors must be rigid if the indirect retainer is to function as intended.
4. Effectiveness of the supporting tooth surface. Tooth inclines and weak teeth should never be used to support indirect retainers.

In addition to the main function there are ***auxiliary functions*** which the indirect retainer may serve to achieve and these are as follows:

1. It tends to reduce antero-posterior tilting forces on the principal abutments. This is particularly important when an isolated tooth is being used as an abutment—a situation that should be avoided whenever possible. Ordinarily, proximal contact with the adjacent tooth prevents such tilting of an abutment as the base lifts away from the tissues.
2. Contact of its minor connector with axial tooth surfaces aids in stabilization against horizontal movement of the denture.
3. Anterior teeth supporting indirect retainers are stabilized against lingual movement.
4. It may act as an auxiliary rest to support a portion of the major connector, facilitating stress distribution. For example, a lingual bar may be supported against settling into the tissues by the indirect retainer acting as an auxiliary rest.
5. It may provide the first visual indications for the need to reline an extension base partial denture. Deficiencies in basal seat support are revealed by the dislodgment of indirect retainers from their rest seats when the denture base is depressed and rotation occurs around the fulcrum.

An indirect retainer is an auxiliary occlusal, cingulum, or incisal rest that contacts a properly designed rest seat when the removable partial denture is in place. In order to be effective, the indirect retainer must be rigid. If the indirect retainer is flexible, the prosthesis will not function as intended. In fact, potentially destructive forces may be amplified because of this lack of rigidity.

An occlusal rest is the preferred component for indirect retention. Because of its location and orientation, an occlusal rest permits forces to be directed within the long axis of the corresponding abutment.

Forms of Indirect Retainers:

The indirect retainer may take several forms and theses are:

1. Auxiliary Occlusal Rest

The most commonly used indirect retainer is an auxiliary occlusal rest located on an occlusal surface and as far away from the distal extension base as possible. As mentioned earlier, this is the best form of indirect retention.

In a Class I arch this location is usually on the mesial marginal ridge of the first premolar on each side of the arch. The ideal position for the indirect retainer perpendicular to the fulcrum line would be in the area of the central incisors, which are too weak and have steep lingual surfaces. Bilateral rests on the first premolars are quite effective, even though they are located closer to the axis of rotation (Fig. 3). This is advantageous because 1) not only are they effective without jeopardizing the weaker single-rooted teeth, but 2) interference with the tongue is far less when the minor connector can be placed in the embrasure between canine and premolar rather than anterior to the canine teeth.

Figure 3: Auxiliary occlusal rests on the first premolars to prevent settling of the anterior portion of the major connector and to provide stabilization against horizontal rotation.

Indirect retainers for ***Class II partial dentures*** are usually placed on the marginal ridge of the first premolar tooth on the opposite side of the arch from the distal extension base (Fig. 4).

Figure 4: Class II design showing a favorable location for the indirect retainer on the mesio-occlusal of the first premolar. This location is at 90 degrees to the fulcrum line.

2. Lingual rest

A cingulum rest also can be used as an effective indirect retainer. A cingulum rest on the adjacent canine tooth may be used when the mesial marginal ridge of the first premolar is too close to the fulcrum line or when the teeth are overlapped. Modifications

of the lingual rest can be applied for anterior teeth when the conventional cingulum rest is inapplicable.

3. Incisal rest

An incisal rest also may provide indirect retention where other rests are contraindicated. This is particularly true for maxillary and mandibular incisors, as well as mandibular canines. Because of the unfavorable lingual anatomy of these teeth, incisal rests may be the only acceptable option. Unfortunately, incisal rests are esthetically objectionable and exhibit long approach arms that may transfer harmful tipping forces to abutments. A better solution would be to use one of the modifications for a lingual rest on these teeth.

4. Canine Extensions from Occlusal Rests

A finger extension from a premolar rest is placed on the prepared lingual slope of the adjacent canine tooth (Fig. 5) when the first premolar must serve as a primary abutment.

Figure 5: Canine extensions from occlusal rests as indirect retainers.

5. Cingulum Bars (Continuous Bars) and Linguoplates

In Class I & II partial dentures, a cingulum bar or linguoplate may act as an indirect retainer. Technically, cingulum bars (continuous bars) and linguoplates are not indirect retainers because they rest on unprepared lingual inclines of anterior teeth. The indirect retainers are actually the terminal rests at either end that occur in the form of auxiliary occlusal rests or canine rests.

Even when there is no need for indirect retention, continuous bar (cingulum bar) or linguoplate major connector should never be used without terminal rests because of the resultant forces on inclined planes of the anterior teeth.

6. Modification Areas

The occlusal rest on a secondary abutment in a Class II partial denture may serve as an indirect retainer. A secondary abutment is an abutment adjacent to a bounded edentulous span other than the free end extension. If the modification space were not present, as in

an unmodified Class II arch, auxiliary occlusal rests and stabilizing components would be essential to the design of the denture. However, the presence of a modification space conveniently provides an abutment tooth for support, stabilization, and retention.

If the occlusal rest on the secondary abutment lies far enough from the fulcrum line, it may serve as an indirect retainer. Its dual function then is tooth support for one end of the modification area and support for an indirect retainer.

If the secondary occlusal rest is too close to the fulcrum line to be effective than an auxiliary rest farther from the fulcrum line should be placed, both for indirect retention and for support for an otherwise unsupported major connector.

7. Rugae Support

The rugae area of the maxillary arch can be used as a means of indirect retention because the rugae area is firm and usually well situated to provide indirect retention for a Class I removable partial denture. Although this is true, rugae coverage is undesirable and should be avoided if possible.

The use of rugae support for indirect retention is usually part of a U shaped maxillary major connector (palatal horseshoe design). Posterior retention is inadequate due to absence of posterior palatal seal and the requirements for indirect retention are greater than avoiding rugae coverage.

In a maxillary arch, where only anterior teeth remain, full palatal coverage is usually necessary. In fact, with any Class I maxillary removable partial denture that extends distally from the first premolar teeth, except when a maxillary torus prevents its use, palatal coverage may be used to advantage.

EXAMINATION

Q\ ANSWER THE FOLLOWING :

1. A stress breaker is :

a- Unit of P.D. that rest on tooth surface to provide vertical support

b- Unit of P.D. that rest on the ridge & carry the artificial teeth.

c- Device that allow movement between the saddle and the clasp.

2.The effectiveness of indirect retainer is influenced by the following factor:

a) Effectiveness of direct retainer.

b) Distance from the fulcrum line.

c) Effectiveness of supporting tooth surface.

d) All of the above.

3-..... Theoretical line around which a RPD tend to rotate

A.Retainer line

B.Survey line

C.Fulcrum line

D.None of the above

Session -12
Laboratory procedures in RPD construction

Objectives of session number -12

The student will be study:
1. Flasking of the
denture2-Flasking
techniques

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

WRITE BRIEFLY ABOUT :

Q1- Flasking in partial denture ?

Q2-blockout types ?

Laboratory procedures in RPD construction:

***Blockout and relief*:-**

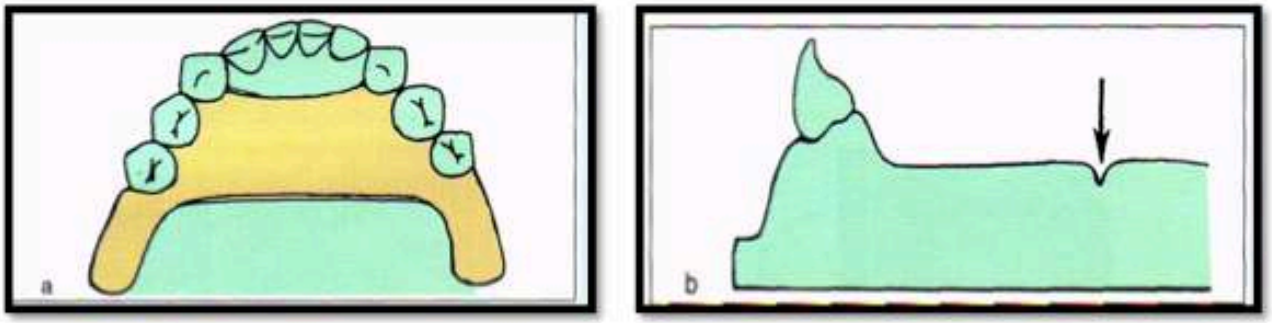
Blocking out is the act of placing wax and other materials into undesirable undercuts on the master cast. Since the framework is waxed and cast on a duplicate of the master cast, undercuts that would prohibit the framework from going into place must be eliminated.

Cast preparation:

Before the addition of the blockout wax, a maxillary cast is beaded. Beading is the act of scraping the outline of the major connector into the master cast. The bead line is approximately 0.5 mm deep and becomes less distinct as it approaches the gingival margins.

The bead line produces a raised edge at the border of the major connector and ensures positive contact of the major connector with the palatal tissues. This feature reduces packing of food beneath the major connector.

Bead lines are not used in conjunction with mandibular major connectors because these connectors rest on thin gingival tissues that cannot tolerate the associated pressures.

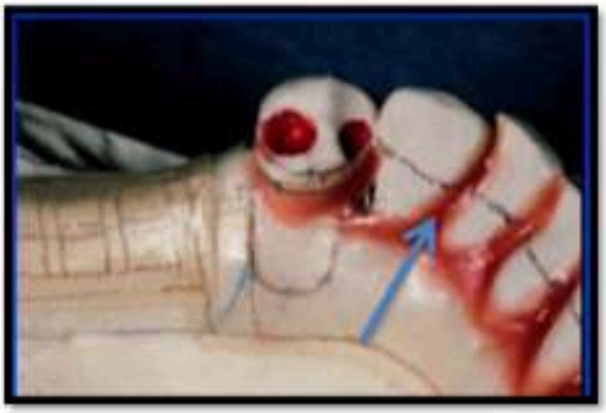


A maxillary cast is beaded

Specifics of the blockout process are described in the following sections.

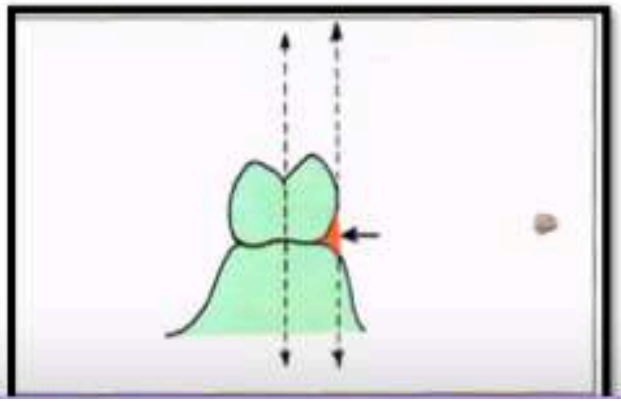
Types of blockout of master cast:

- Deep interproximal spaces to be covered by minor connectors or linguoplates.



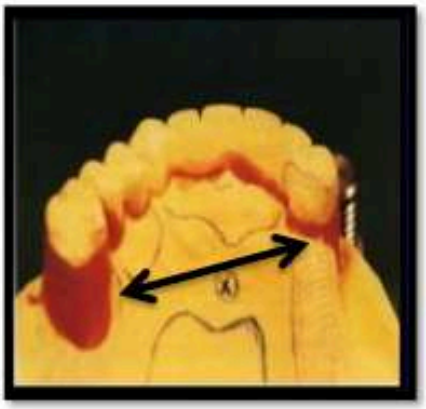
- Beneath bar clasp arms to gingival crevice.

All guiding plane areas must be parallel to path of placement, and all other areas that will be contacted by rigid parts of denture framework must be made free of undercut by parallel blockout.



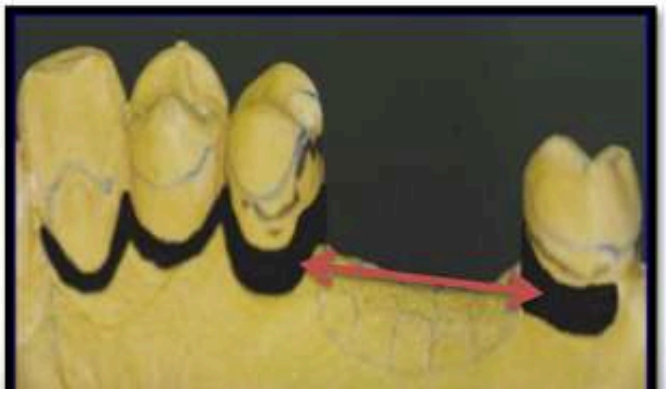
1-PARALLEL BLOCKOUT:

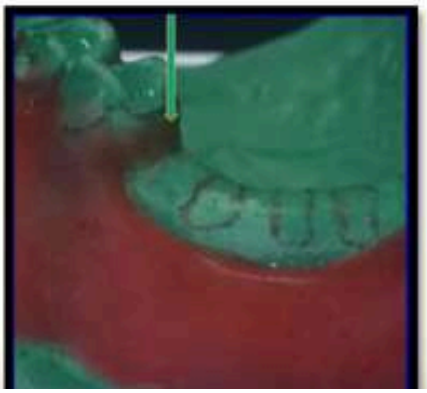
Parallel blockout is necessary for areas that will be used as guiding plane surfaces and over all undercut areas that will be crossed by major or minor connectors. Hard inlay wax may be used satisfactorily as a blockout material. It is easily applied and is easily trimmed with the surveyor blade.



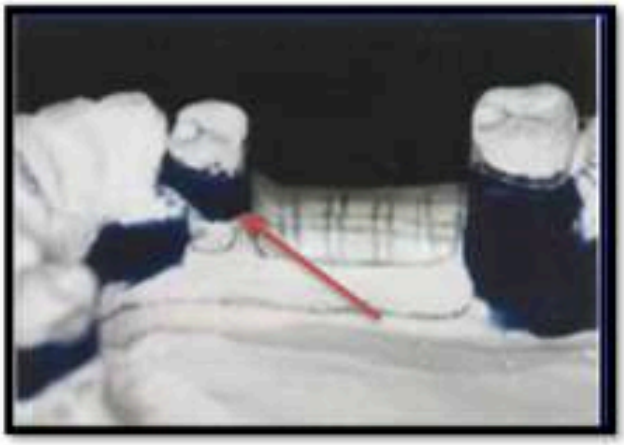
Trimming is facilitated by slightly warming the surveyor blade with an alcohol torch:

- Proximal tooth surfaces to be used as guiding planes.





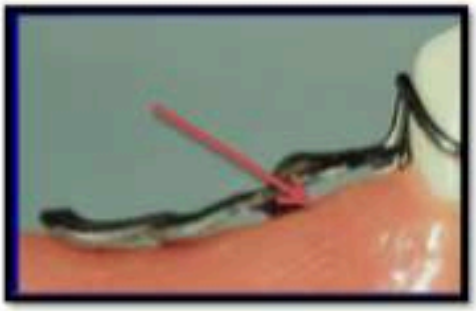
- Beneath all minor connectors.



- Tissue undercuts to be crossed by rigid connectors.

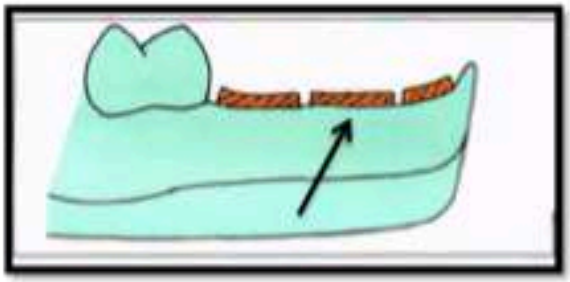
- Tissue undercuts to be crossed by origin of bar clasps.

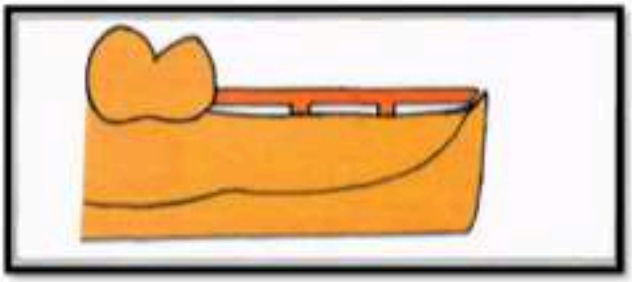
- To create space for the acrylic resin (beneath the retentive ladder).



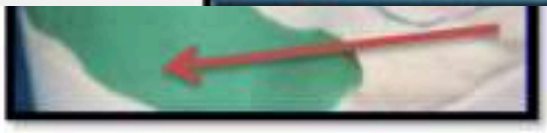
Sites:

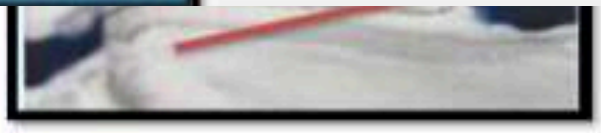
- Areas in which major connectors will contact thin tissue, such as hard areas so frequently found on lingual or mandibular ridges and elevated palatal raphes and tori.
- Beneath the ladder minor connectors for attachment of resin bases.





Mandibular major connectors often warrant relief between the rigid metal surfaces and the underlying soft tissues.





Relief prevents the margins of the major connector from lacerating the sensitive lingual mucosa as a result of this movement.

The slope of the anterior ridge also influences the amount of relief needed. If the soft tissues are vertical, or nearly so, only minimal relief is required. Tissues that slope toward the tongue require the greatest amount of relief because any movement of the connector will bring it into contact with the adjacent soft tissues. If the anterior ridge is undercut, sufficient space may be created when the technician blocks out the undercut area.

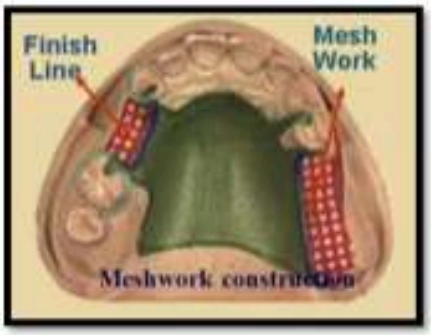
Tissue Stops:

- Tissue stops are represented as (2 mm x 2 mm) square cut in the relief wax over the ridge in distal extension areas.

- Tissue stops are integral parts of minor connectors designed for retention of acrylic resin bases. They provide stability to the framework during the stages of transfer and processing. They are particularly useful in preventing distortion of

the framework during acrylic resin processing procedures, by holding the retention area of the framework (retentive ladder) away from the tissue while packing force is being applied.

- Another integral part of the minor connector designed to retain the acrylic resin denture base is similar to a tissue stop but serves a different purpose. Spacer, one margin of the relief wax forms the internal finish line of the framework.
- It is essential that this finish line be sharply defined. A properly formed internal finish line permits formation of a butt joint between the framework and the acrylic resin denture base.



- This allows a smooth transition from metal to resin and minimizes the likelihood of trauma to the adjacent soft tissues. As a rule, the finish line should be placed 1.5 mm from the neighboring abutment or abutments.
- This distance ensures that the porous resin will not contact the marginal gingivae; it is a continuation of the minor connector contacting the guiding plane.

Figure 2: master cast after completing relief and block out.

Duplicating material and flask:

- Colloidal material: are made fluid by heating and return to gel when cooling.
- Silicone material.

Figure 3: Right (Silicone material), Left (Colloidal material).

The cast to be duplicated must be placed at the bottom of a suitable flask, called a *duplicating flask.* Care must be taken that the temperature of the duplicating material is not higher than that recommended by the manufacturer to prevent melting and distortion of the blackout material.

Impression:

To make the impression, a blocked-out master cast is placed on the base of a duplicating flask and the flask is assembled.

Figure 4: Left (duplicating flask), Middle (blocked-out master cast placed at the base of a duplicating flask), Right (duplicating flask is assembled).

And a steady stream of reversible hydrocolloid is poured into the flask, once filled the flask is placed in a regulated cooling tank up to an hour may be required to fully set the colloid.

Figure 5: Left (boiler for melting reversible hydrocolloid), Middle (reversible hydrocolloid is melted), Right (reversible hydrocolloid is poured into the flask).

The flask is then disassembled. The master cast is carefully removed with the aid of two knife blades engaging the sides of the cast.

Laboratory procedures in RPD construction:

Duplicating a stone cast:-

***A stone cast may be duplicated for several reasons*:**

- Preserve the original one.
- Fitting an RPD framework without danger of fracture or abrasion of the origina master cast.
- Allow an investment cast to be formed for framework fabrication.

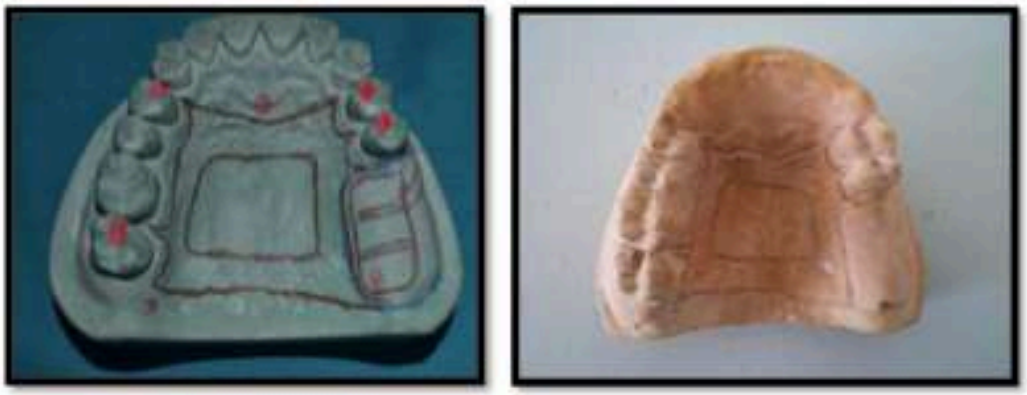


Figure 1: Right (refractory cast), Left (master cast).

Careful preparation of the master cast for the production of this investment cas involves consideration of the:

- Defined path of insertion.
- Height of contour.
- Retentive and stabilization areas designed into the mouth preparation.

Figure 6: Left (flask is removed), Right (the master cast is removed, and mold is ready for pouring the investment material).

Duplicating colloids can be reused repeatedly, most laboratories have special equipment to remelt and store the colloid. Colloids also can be prepared with less sophisticated equipment. To employ such techniques, a clean colloid is cut into small pieces and heated in a double boiler until the material reaches a fluid consistency. The resulting sol is then allowed to cool to working temperature, ensuring a suitable flow of the material without melting the Blockout wax. A breakdown temperature of 100°C (212°F) and a working temperature of 63°C (145°F) are suitable for most duplicating materials.

Figure 7: Left (clean colloid is cut into small pieces), Middle (heated in a boiler), Right (material reaches a fluid consistency).

Refractory cast: This is made from

Refractory materials (also termed investments) must be measured and mixed according to the manufacturer's instructions.

Figure 8: investment materials measured and mixed according to the manufacturer's instructions.

The mold expansion is to match the shrinkage of the associated alloy; the investment material is allowed to harden before removal from the mold.

Figure 9: Left (investment material is poured in the mold), Middle (material is allowed to harden), Right (cast removal from the mold).

The duplicated model is allowed to dry by placing it in a drying cabinet;

At the appropriate time, the outer layer of refractory material is removed by tapping it with a mallet.

Figure 21: The refractory material is removed by tapping with a mallet.

The remaining investment is then removed by airborne particle abrasion in a self-contained machine manufactured for this purpose.

Figure 22: Left (airborne particle abrasion device), Middle (remaining investment is removed by airborne particle abrasion), Right (the casting after finishing abrasion).

Subsequently, the casting is examined for defects. If the casting is deemed satisfactory, finishing and fitting procedures begin.

Finishing the framework:

Sprue removal:

Using high-speed lathes and large abrasive disks, the sprue leads are cut from the casting.

Figure 10: Duplicated model is placed in a drying cabinet.

Then the refractory cast is dipped in hot beeswax to ensure a smooth, dense surface and to eliminate the need for soaking the cast before the investment process.

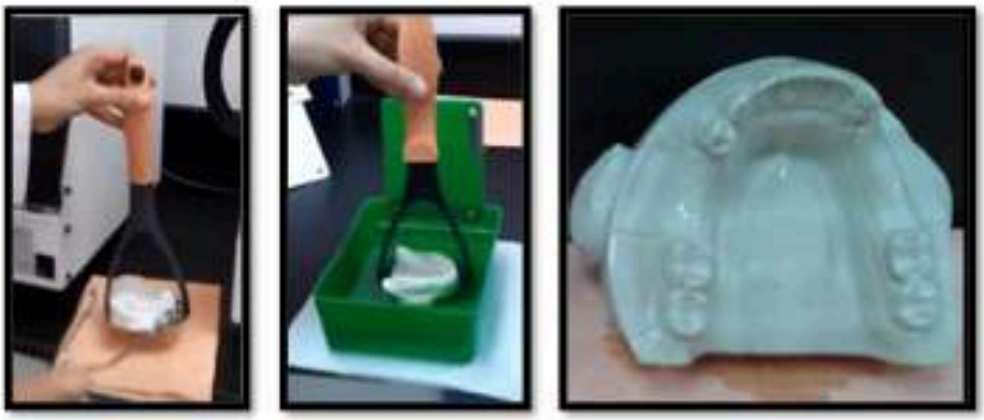


Figure 11: Left (refractory cast removed from dryness cabinet), Middle (the refractory cast is dipped in hot beeswax), Right (the refractory cast is allowed to dry).

Waxing the framework:

Before waxing can begin, the design must be transferred from the master cast to the refractory cast. Every effort is made to precisely transfer the outline of the framework to the refractory cast.

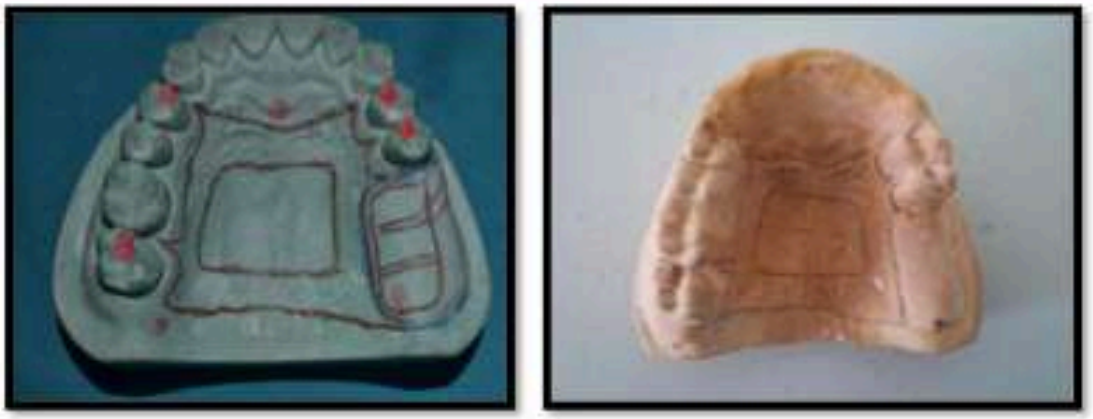


Figure 12: Design transferred from the master cast to the refractory cast.

Care is taken to draw with a minimum of pressure, so the surface of the refractory cast is not damaged. The position of individual clasp tips is the most critical part of the transfer. If appropriate ledges were created during blockout procedures, the placement of retentive clasp tips is much easier and more precise.

Spruing:

The sprue channel is the opening that leads from the crucible to the cavity in which the framework is to be cast.

Figure 13: Sprue is attached to the waxed framework on the refractory cast.

General rules for spruing:

- Sprues should be large enough that the molten metal in them will not solidify until after the metal in the casting proper has frozen (8-12 gauge round wax) is usually used for multiple spruing of RPD casting.

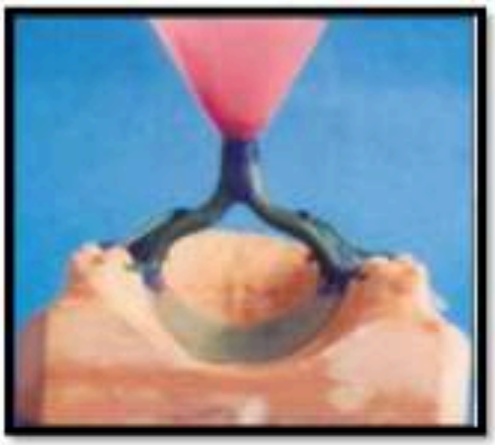


Figure 14: Multiple Sprues is attached to the crucible from above and the waxed framework from below.

- Sprues should lead into the mold cavity as directly as possible and still permit a configuration that will induce a minimal amount of turbulence in the stream of molten metal.

Figure 15: Sprues lead into the mold cavity directly.

- Sprues should leave the crucible form a common point and be attached to the wax pattern at its bulkier section, that is, no thin sections of casting should intervene between two bulky, unsprued portions.

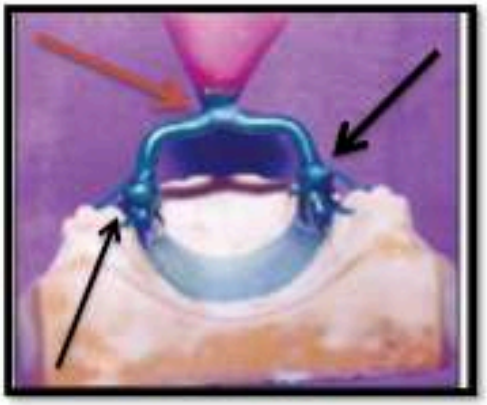


Figure 16: Sprues leave the crucible form a common point (red arrow) and attached to the wax pattern at the bulkier section (black arrows).

Investing the sprued pattern:

The investment must conform accurately to the shape of the pattern and must preserve the configuration of the pattern as a cavity after the pattern itself has been eliminated through vaporization and oxidation.

Figure 17: Left (sprued pattern on the refractory cast is poured with investment materials), Right (the refractory cast is completely poured with investment materials).

Purpose of investment:

- It provides the strength necessary to hold the forces exerted by the entering stream of molten metal until this metal has solidified into the form of the pattern.
- It provides a smooth surface for the mold cavity so that the final casting will require as little finishing as possible.
- It provides an avenue of escape for most of the gases entrapped in the mold cavity by the entering stream of molten metal.
- It, together with other factors, provides necessary compensation for the dimensional changes of the alloy from the molten to the solid, cold state.

Burnout:

The burnout has three reasons:

- Drives off the moisture in the mold.
- It vaporizes and thus eliminates the pattern, leaving a cavity in the mold.
- It expands the mold to compensate for the contraction of the metal on cooling.

The mold should be placed in the oven with the sprue hole down.

Figure 18: Mold is placed in the burnout oven with the sprue hole down.

The temperature should be maintained for the period recommended by the manufacturer to ensure uniform heat penetration.

Figure 19: Mold is placed in the burnout oven for uniform heat penetration.

Casting:

It is the process of quickly injecting the metal into the mold cavity, the force may be centrifugal or air pressure, in any case too much or too little pressure is undesirable; if too little force is used the mold is not filled before the metal begins to freeze. If too much force, excessive turbulence may result in the entrapment of gases in the casting.

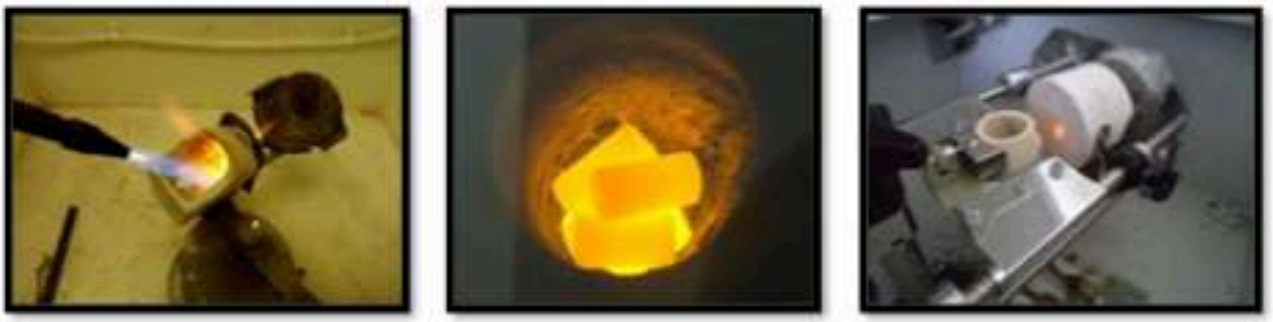


Figure 20: Left (metal is heated to melt), Middle (metal is started to melt), Right (the metal is ready to be injected into the mold cavity).

Casting recovery:

When the casting process is complete, the mold is removed from the casting machine and allowed to cool according to the manufacturer's instructions.

Figure 23: Left (abrasive disks), Right (the sprues are cut from the casting).

Rough finishing and shaping, before fitting the framework to the master cast, the following are several rules for finishing:

- High speed is preferable to low speed.

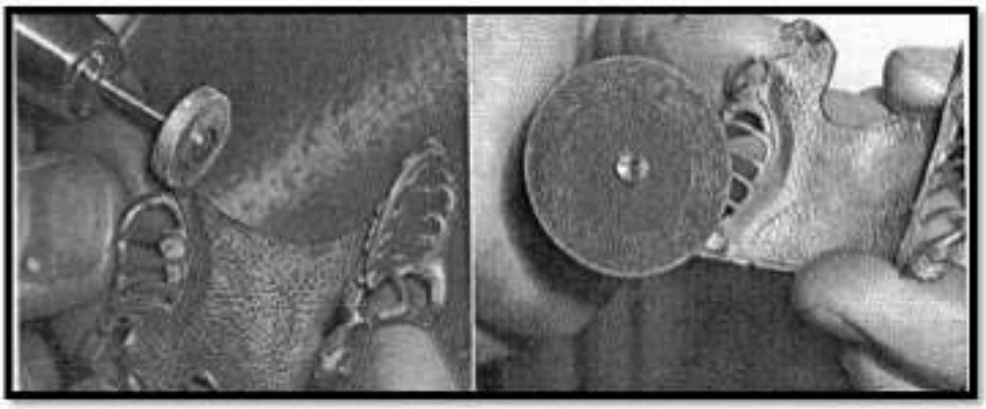


Figure 24: High-speed cutting disks used for sprues removal.

- The wheels or points were used and the speed of their rotation should do the cutting.

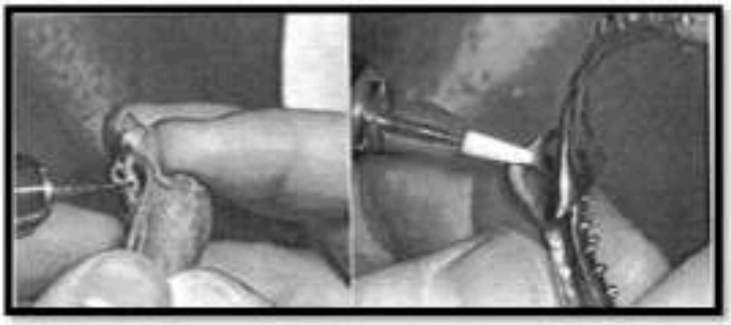


Figure 25: The cutting points for casting finishing.

- A definite sequence for finishing should be adopted and followed for every framework part.

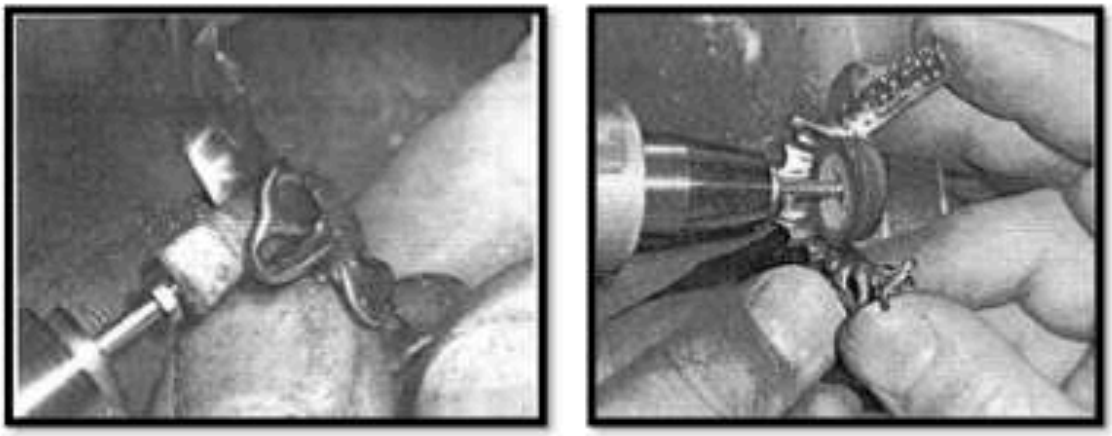


Figure 26: For every metal framework part a sequence for finishing should be used.

- Clean polishing wheels should be used.

Figure 27: Clean polishing wheels used for metal framework polishing.

- Be sure that each finishing would entirely remove all scratches left.

Figure 28: Metal framework free from all scratches were obtained.

- **Fitting the framework:** The fit the framework is checked by seating the casting on the master cast carefully and attempts to identify the interferences.

Figure 29: The finished metal framework is seated on the master cast.

EXAMINATION

1-A complete clasp assembly consist of a :
RetenAve arm and a reciprocal arm “
B. CircumferenAal arm and a bar type arm
C. Proximal plate and a retenAve arm"
D. RetenAve arm , an occlusal rest and reciprocaAng elements
2-The direct retainer of choice when the principle abutment tooth has lost its periodontal support is:
A. embrasure clasp"
B. Ring clasp
C. MulAple circlet clasp"
D. Only clasp

Session -16
DENTURE BASE

Objectives of session number -13

The student will be study:

1. Causes of errors in occlusion
2. Selective grinding
3. Correction of occlusal errors
4. Disadvantages of intra – oral correction5-Advantages of extra – oral correction
6-Rules for selective grinding

Instructions:

❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

Denture Base in RPD

Denture base: The part of a denture that rests on the foundation tissues and to which teeth are attached.

The primary function of denture base:

1. Masticatory function as the denture base transfers the occlusal stresses to the underlying supporting oral structures.
2. Esthetic or cosmetic function: this is related to reproduction of natural looking contours.
3. Stimulation of the underlying tissue by massaging action during vertical movement of the denture base under functional stresses, as this will maintain the form and health of underlying tissue.

Types of denture base according to support:

1. Tooth supported partial denture base.
2. Tooth tissue borne partial denture base.

1. Tooth supported partial denture base

In tooth supported prosthesis, the denture base is primarily a span between two abutments supporting teeth. Thus the occlusal forces are transferred directly to abutment teeth through rests; also the denture base and the supplied teeth serve to prevent horizontal migration of all of the abutment teeth in partially edentulous arch and vertical migration of teeth in opposing arch.

Q1-Choose the correct answer :-
1-The advantage of using a metal denture base is
A. Increase in tissue tolerance

Tooth supported partial denture base

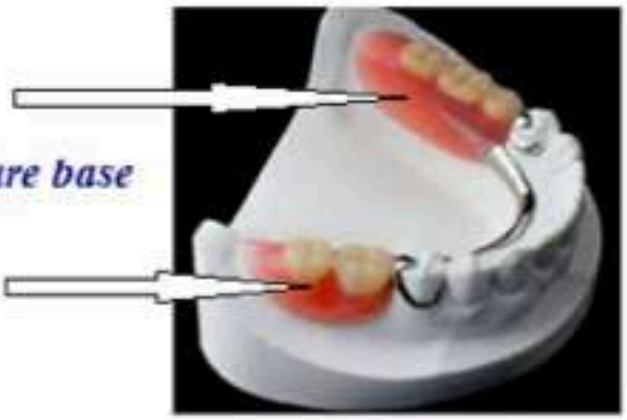
B.B.
Easy

When posterior teeth only to be replace, function are of primary importance than esthetic, while when anterior teeth needed to be replaced the esthetic is of primary importance. Also of importance is elimination of undesirable food traps (oral cleanliness) and stimulation of underlying tissue.

2. *Tooth tissue borne partial denture base*

In distal extension partial denture, the base other than those in tooth supported modification must contribute to the support of the denture.

Tooth tissue borne partial denture base



Tooth supported partial denture base

Tooth tissue borne partial denture base

laboratory

procedure

C. C. Rebasing and relining are quite easy
D. D. Increase in restorative cost

The edentulous area close to the terminal abutments is supported primarily by the occlusal rest on the abutment teeth however; farther from the abutment the support from the underlying ridges tissue becomes increasingly important.

Maximum support from the residual ridge may be obtained by:

1. Using broad denture base.
2. Using accurate denture base.

Both spread the occlusal load equitably over the entire area available for such support. This maximum support can be obtained through good impression of the distal extension ridges, also the distal extension base required relining and rebasing in future, so the material being used for tooth tissue supported partial denture should allow relining and rebasing which is not necessary in tooth borne partial denture as its supported at each end on a tooth through the rest, while the condition where relining is required where gross tissue changes (bone resorption) have been occurred beneath tooth borne base to the point that poor esthetic and food accumulation result.

Types of the denture base according to materials:

1. *Resin type (acrylic denture base).*
2. *Metal type denture base.*

1. Resin type (acrylic denture base):

Its most widely used type of denture base because of easy of fabrication and easy of attachment to metal framework. The resin denture base attached to metal framework by mechanical mean (throughout the hole present in meshes or ladder area) in addition, the resin denture base having the advantage of future relining or rebasing therefore it's of main choice in:

a. Distal extension ridges: The resin denture base is indicated for distal extension cases (Cl I and Cl II) because of the support of the denture by tissue and there will be continuous bone resorption creating a space between residual ridge and denture base, so there will be need for relining.

b. Long span ridges: In (Cl III and Cl IV) edentulous cases because of possibility of tissue changes underneath the denture base and there will be need for future relining.

c. In cases of immediate partial denture: Since after healing period there will be need for relining so that resin denture base will be needed for such cases.

2. *Metal type denture base:*

It's made of either:

a. Gold and platinum but these materials are so expensive.

b. Stainless steel or chrome cobalt that are more being in use now day.

c. Recently, the titanium being used as a denture base and in oral implant because of its excellent properties.

The metal type denture base has the ability to stimulate the underlying tissues that will maintain the integrity of the bone by preventing osseous tissue resorption, but it principle disadvantage its difficulty to reline in future, therefore the metal type denture base will be indicated in:

- Short span (tooth borne removable partial denture).
- When there is no enough space for artificial teeth (inadequate intermaxillary space) because of over eruption of opposing teeth.

Over erupted upper 2nd premolar and 1st molar

Anterior artificial teeth attached to metal denture base

Advantages of metal denture base:

1. ***Accuracy and permanency of form:*** The metal alloys take accurate form and don't permit changes by internal factors (internal strains that may be released later to cause distortion are not present). Because of accuracy, the metal base provides an intimacy of contact that contributes considerably to the retention of denture prosthesis. Permanence of form of the cast base is also ensured because of its resistance to abrasion from denture cleaning agents.

2. ***Comparative tissue response:*** Clinical observation have demonstrated that the inherent cleanliness of the cast metal base contributes to maintain the health of oral tissues when compared with acrylic resin base, this is may be due to greater density and bacteriostatic activity contributed by ionization and oxidation of metal base, while acrylic resin tends to accumulates mucineous deposits, bacteria may accumulate and producing harmful enzymes to underlying tissues.

3. ***Thermal conductivity:*** Temperature changes are transmitted through the metal base to the underlying tissues, thereby helping to maintain the health of these tissues, while acrylic denture base has an insulating properties that prevents interchange of temperature between denture base and underlying tissues, therefore the metal denture base gives more natural feeling from resin denture base.

4. ***Weight and bulk:*** Metal alloys may be casted much thinner than acrylic resin and still have adequate strength and rigidity; therefore, the metal denture base will be less weight and bulk than the resin denture base.

Disadvantages of metal denture base:

1. Difficult to reline and rebase.
2. Expensive.
3. The error that occur in posterior palatal seal area (post dam) can't be corrected with metal denture base, while if same error occurred in resin denture base ***repostdaming*** is the choice for this problem.

Design consideration of denture base:

1. Support: Maximum support from denture base depending on limiting anatomical structures and their movement during function and on accuracy of denture base.
2. Esthetic and stimulation of underlying tissues.
3. Whether we have a free end extension or bounded saddle edentulous cases.
4. Type of metal alloy being used in fabrication of denture base.
5. Thickness required of denture base.

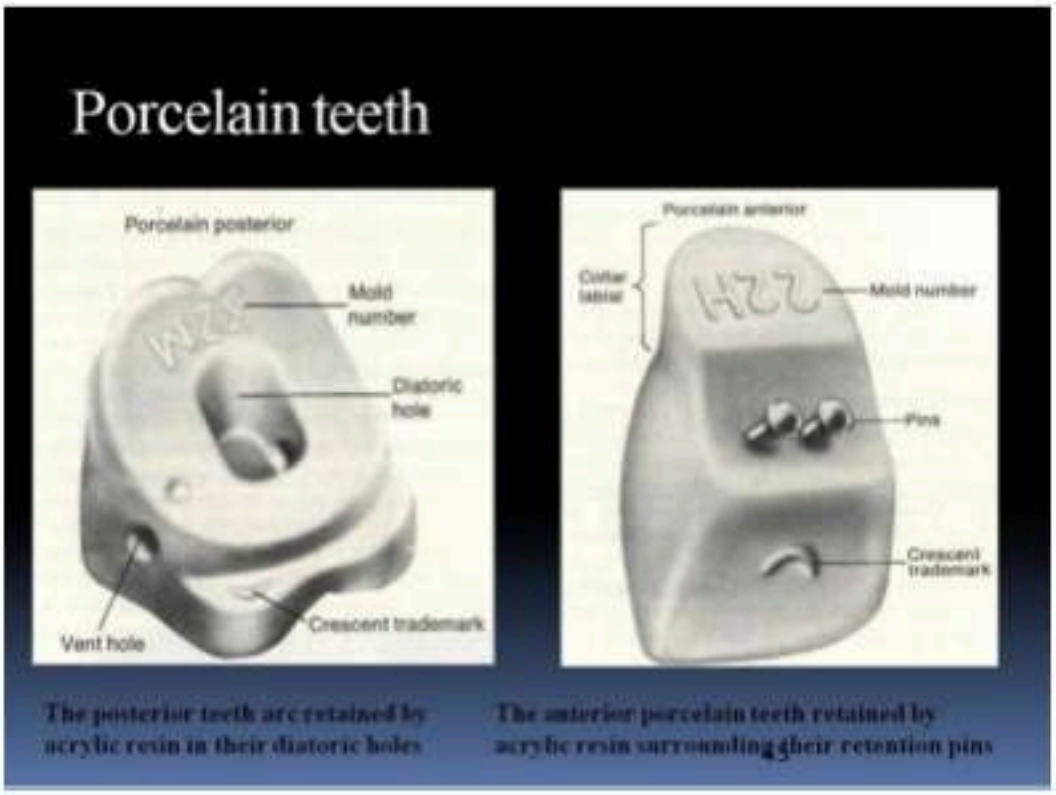
Periodontal consideration of denture base design:

1. It should be of optimal extension and thickness to reduce stresses on abutment teeth.
2. It should not impinge on gingival tissue.
3. It should expose the gingival tissue (relief in area that not involved in periodontal disease).

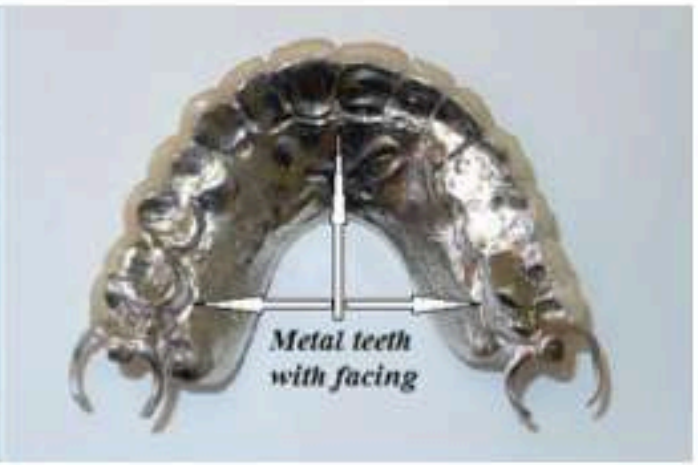
Types of artificial teeth:

1. ***Acrylic teeth:*** Artificial teeth that have been made of acrylic resin, it has the ability to be attached chemically to denture base.

2. *Porcelain teeth:* Is made of feildspathic porcelain material, its attached to denture base by mechanical mean, either by pin that will be processed in denture base and a hole is presenting the base of the tooth allowing its attachment by cementation.



3. *Metal teeth:* Some cases the anterior or posterior teeth may be processed as part of the denture base by casting procedure this is indicated in cases of limited intermaxillary spaces.



EXAMINATION

Q1-In the case of extreme lingual inclination of the remaining lower premolar and incisor teeth, the type of major connector can be use :
A.lingual bar major connector
B.linguo palatal major connector
C.lingual bar and cingulum bar major connector
D.labial bar major connector
Q2-Least preferred maxillary major connector is:
A- Single palatal strap
B. Anterior posterior bar
C. Horse shoe shaped major connector
D. Complete palatal coverage
Q3-False undercuts: 43-The method used of determining the height of floor of the mouth :
A- use periodontal probe
B- use straight probe
C- use an individualized impression method.
D- both A and C
Q4- The border of maxillary major connector should cross palatal midline at :
A- right angle
B- obliquely.
C- scallop.
D- less than 90 degrees.
Q5-The maxillary major connector that provide maximum rigidity and minimum bulk :
A- single palatal bar .
B- single palatal strap .
C- combination anterior and posterior palatal strap .

Session -16

Record bases, occlusion rims, mounting and arrangement

Objectives of session number -12

The student will be study:
1. Flasking of the denture2-Flasking techniques

Instructions:
❖ Study the over view carefully.
❖ Perform the pre-test of this unit.
❖ If you have at least (5) degrees. This modular unit will not be required of you. However, if you receiveless than a (5) degree on this test, you will need to continue learning this modular unit.
❖After you studying this modular unit.
❖The post-test you must do it.
❖If you get (5) degree or more, you must go to learn the second modular unit.

In case you get less than (5) degree, you must return to the same unit in order to learn and understand the steps which you need.

After you complete the studying, perform The post-test examination for checking.

EXAMINATION

WRITE BRIEFLY ABOUT :

Q1- Flasking in partial denture ?

Q2-blockout types ?

Record bases:

Bases for jaw relation records should be made either of materials possessing accuracy or those that can be relined to provide such accuracy. The ideal jaw relation record base is one that is processed (acrylic resin bases) or cast (cast metal bases) to the form of the master cast, becoming the permanent base of the completed prosthesis.

Bases for jaw relation records must have maximum contact with the supporting tissue. The accuracy of the base will proportionate to the contact provided to the total area of intimate tissue. Those areas are most often undercut and require blockout of ***the distolingual and retromylohyoid areas of the mandibular cast, the distobuccal and labial aspects of the maxillary cast, and, frequently, small multiple undercuts in the palatal rugae***.

For permanent denture base: When undercut are present, the master cast will be destroyed during removal of the base, then existing undercuts must be blocked out inside the denture base before dental stone is poured into it to make a cast for articulator mounting. A second cast, which includes the undercuts, must be poured against the entire base to support it when processing the overlying acrylic resin that supports the teeth and establishes facial contours.

For temporary denture base: These undercut areas and any others are blocked out with a minimum of clay or wax, to obliterate as little of the surface of the cast as possible. A close-fitting base may then be made that will have the necessary accuracy and stability and yet may be lifted from and returned to the master cast without abrading it. Then the cast and the blockout or reliefs are coated with a separating medium before making the record base.

Types of record bases according to materials constructed from it:

1. Visible light- cured bases (VLC).
2. Autopolymerizing acrylic resin bases (using sprinkled acrylic resin technique).
3. Cast metal bases.
4. Compression molded or processed acrylic resin bases.

In distal extension base dentures the support, connectors, and retainers must be designed and executed more carefully because of the movement of tissue-supported denture base areas. In addition, three other factors have to be placed in mind:

1. The best support must be obtained from the resilient tissues that cover the edentulous ridges. This is accomplished by a) the impression technique more than by the partial denture design and b) the area covered by the denture base

2. The method of direct retention must take into account the tissue-ward movement of the distal extension base. Direct retainers must be designed so that occlusal loading will result in direct transmission of this load to the long axis of the abutment teeth instead of as leverage.

3. The partial denture, with one or more distal extension denture bases, must be designed so that movement of the extension base away from the tissues will be minimized through indirect retention. Also, retention of the denture base itself can be made to help prevent this movement.

A. Tooth Support

The dentist may evaluate the abutment teeth and decide whether they will provide adequate support. Having decided on the abutments, the dentist is responsible for preparation and restoration of the abutment teeth to accommodate the most ideal design of the partial denture.

The support provided by an abutment tooth is dependent on:

1. Periodontal health.
2. Crown and root morphologies.
3. Crown-to-root ratio.
4. Location of the tooth in the arch.
5. Relationship of the tooth to other support units (length of edentulous span)
6. The opposing dentition.

B. Ridge Support

Ridge support plays an essential role in distal extension partial dentures. The support available from edentulous ridge areas depends on:

Occlusion rims:

Occlusion rims are added to allow recording of jaw relation records. Placement of wax record is dictated by the opposing tooth position and the supporting ridge character. When possible, the occlusion rim should allow recording of the jaw position within the primary bearing area of the ridge.

Occlusion rims may be made of several materials according to method used for recording jaw relation.

Occlusion rims for static jaw relation records:

The materials of occlusion rims that are used to establish static occlusal relationships include:

1. **Hard baseplate wax:** most commonly used to establish static occlusal relationship.
2. **Wax occlusion rim:** registration made on wax occlusion rims using a wax registration material must be handled carefully and mounted immediately on the articulator. As with wax rims, an adjustable frame also may be used to support the final record.
3. **Modeling plastic (compound):** has several advantages and may be used rather than wax for occlusion rims.

Occlusion rims for static jaw relation records should be so shaped that they represent the lost teeth and their supporting structures. An occlusion rim that is too broad and is extended beyond where prosthetic teeth will be located will lead to:

1. Alter the shape of the palatal vault.
2. Alter arch form of the mandibular arch.
3. Crowd the patient's tongue.

4. Have an unwelcome effect on the patient.
5. Offer more resistance to jaw relation recording media than will a correctly shaped occlusion rim.

Occlusion rims for recording functional or dynamic jaw relationship record:

Occlusion rims must be made of a hard wax like inlay waxes. It used for this purpose:

1. Because they can be carved by the opposing dentition.
2. Because most of them are hard enough to support occlusion over a period of hours or days.

The construction of this type of occlusion rim consider as chair side procedure rather than a laboratory procedure because it corrected at clinic.

Mounting casts on the articulator:

Mounting the maxillary and mandibular casts on adjustable articulator in same relationship as they are on the patient by using a face-bow transfer and an accurate centric occlusal relationship record on accurate record bases at establish correct vertical dimension of occlusion.

Arrangement of artificial teeth to the opposing cast:

Before arrangement of teeth, the denture base on which the jaw relation record has been made must first be removed and discarded (by heating the acrylic resin over a properly adjusted burner and using a pliers to remove the softened material away from the metal framework) unless metal bases are part of denture framework, or heat- polymerized acrylic resin bases were used.

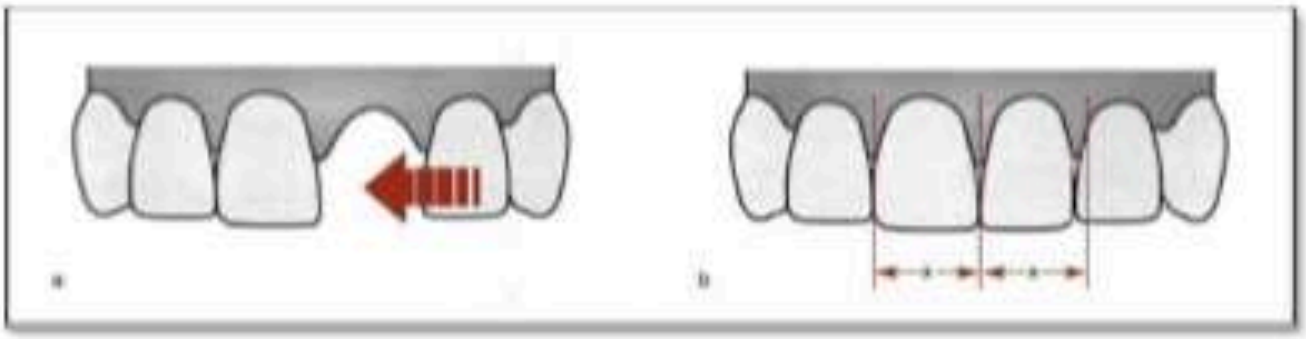
Principles that should be taken during arrangement of artificial teeth:

1. In general, the same rules which apply to complete dentures also apply to partial dentures in regard to the arrangement of posterior artificial teeth, however, since the occlusal surfaces of most natural teeth have been altered by wear, artificial teeth should be altered with suitable stones and acrylic burs so that they will properly intercuspate with the natural teeth. So it was preferring to use resin teeth since they are more easily modified and reshaped.
2. The teeth are usually arranged for intercuspation with the opposing teeth in a normal cuspal relationship. Whenever possible, the mesiobuccal cusp of the maxillary first molar should be located in relation to the buccal groove of the

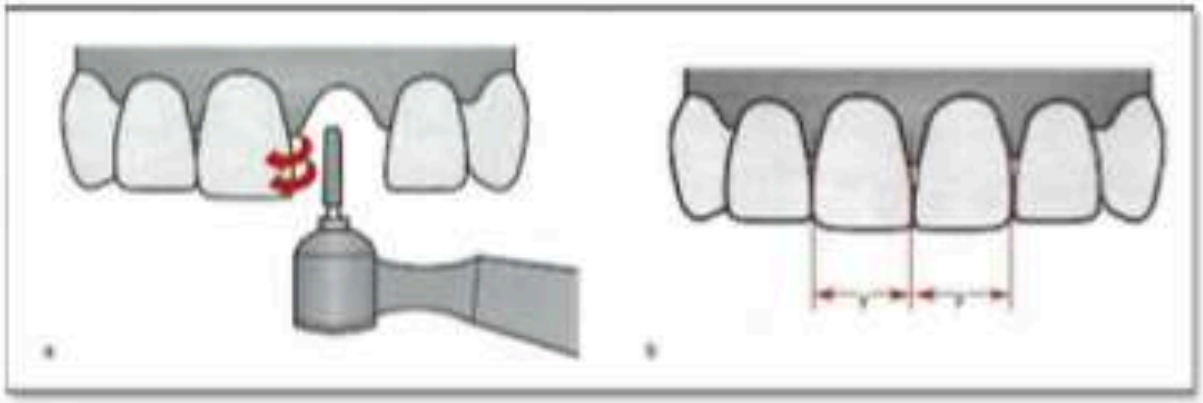
Mandibular posterior teeth should not be arranged distal to the upward incline (ascending ramus) of residual ridge. The molar tooth has been placed just anterior to a mark on the cast land area designating the beginning incline.

8. Sometime it may be necessary to select teeth other than those lost by the patient. For example, an artificial second premolar and first molar may be indicated for a space occupied by two molars (first and second molars). Fewer or smaller teeth are often necessary in a tooth – bounded edentulous space because the abutments may have drifted toward one another.
9. Esthetic is often a factor in the selection of teeth for partial dentures. The artificial teeth must be at least as long occlusogingivally as the abutment teeth to prevent unwanted display of denture base material. This is particularly important on maxillary partial dentures.
10. Anterior teeth on removable partial dentures are concerned primarily with esthetics and the function of incising. These are best arranged when the patient is present because an added appointment for try-in would be necessary any way.
11. Anterior artificial teeth should be matched as closely as possible to the adjacent natural teeth or fixed restorations. The matching process should be accomplished using natural light and should be completed as quickly as possible to prevent eye fatigue.
12. The selection of teeth for partial dentures replacing anterior teeth is essentially the same as anterior tooth selection for complete dentures. The shade and mold are selected to match the remaining teeth and /or compliment the patient feature. Arrangement of anterior teeth for partial dentures follows the same principles as for arrangement anterior teeth for complete dentures.
13. As a general rule, the most difficult part of arranging anterior denture teeth is directly related to a loss of restorative space. Unless anterior teeth are replaced immediately following their extraction, the natural teeth adjacent to the space will either drift or tilt into the space. The drifting or tilting produces a noticeable decrease in the restorative space and forces the selection of one or more prosthetic teeth that are narrower than their natural counterparts.

During the mouth preparation appointment, an attempt should have been made to regain the original width of the space by ***reshaping*** the proximal surfaces of the adjacent teeth. If the entire width cannot be recovered, consideration should be given to ***overlapping*** the artificial teeth so that a normal-sized tooth may be used to harmonize with the patient's face and remaining teeth.



(a) When an anterior tooth is lost, adjacent teeth often drift or tip into the space. (b) This produces a noticeable decrease in restorative space and forces the selection of a replacement that is too narrow.



***(a)* When space has been lost, reshaping of adjacent teeth is indicated. *(b)*This permits the practitioner to achieve an improved esthetic result.**

14. If the maxillary central incisors are missing, it is essential that these teeth be set first. This allows the practitioner to reestablish the maxillary midline in the center of the face.

Laboratory procedure of arrangement teeth:

Example: arrangement of artificial teeth for chrome cobalt removable partial denture in case of class II (missing first and second molars):

- The teeth are selected for the mandibular partial denture to fill the existing space.
- The partial denture framework is placed on cast and stabilized by wax while the teeth are being set.
- Drop the incisal pin 1mm. This will open the articulator 1mm at the incisal table.

- The first molar is set into position. The gingival side of the tooth may need to be reduced but should be "hollow-ground" to preserve the facial surface.

- Adapt by grinding the mesial surfaces of the first molar so that they fit around the distal of the minor connector; a piece of articulating paper is inserted between the tooth and minor connector and the tooth is wiggled slightly. The marks on the tooth are then reduced. This procedure is repeated untilled the tooth is adapted to the minor connector.

- The buccal cusp tips of the mandibular first molar are set in the central groove of the opposing tooth. Check to make sure the lingual cusps are in tight contact.

- After the tooth has been properly positioned, the incisal pin should be returned to its original position and the occlusal surface of the artificial tooth altered with suitable stones and acrylic burs until the incisal pin touches the incisal table (the occlusal surface is altered by reducing the area marked by the articulating paper).

- Then second molar is set in similar fashion. The second molar is checked for occlusion. Note that the occlusal alteration is done tooth by tooth.
- Spaces between the mandibular posterior artificial teeth may result during their anteroposterior placement. These spaces are usually dictated by the maxillary natural teeth and are not to be considered undesirable unless they interfere unreasonably with esthetics. Then a compromise position must be selected.

EXAMINATION

1-Block out use to elimination :
A-Desirable undercuts”
B- Undesirable undercuts
C-Soft tissue interferences only "
D-excess Wax on the cast
2-The angle between occlusal rest and vertical minor connector from which it originates is:
A. 90 degrees B. 100 degrees C. 120 degrees D. Less than 90 degrees
3-Retainer: Any type of device used for the ..... of a prosthesis
A-Retention B- Retention or Stabilization C- Stabilization D-All of above
4-In RPD Class III is necessary to use
A-Direct retainer B- Rest C-Cross arch connector (stabilizer) D-All of above
5..... is a theoretical line around which a removable dental prosthesis tends to rotate when subjected to forces towards or away from the residual ridge

A-Retainer line” B- Survey line C-Fulcrum line “ D-All of above
6.Is Indicated for all tooth-supported removable partial dentures unless there Is Insufficient space between the marginal gingivae and the floor of the mouth
A-Lingual bar" B- Lingual plate C-Double lingual bar " D-All of the above
7-Patient lost his anterior teeth and 1st molar on both sides which kennedy classification
A-Class I mod 2 B- Class IV mod 2 C-Class III mod 2 D-Class II mod 2
8. the retentive terminal of a clasp should always point
A. Facial surface" B. Gingiva C. Occlusal surface “ D. Lingual surface
9.The basic principles of clasp design encirclement “
B. support C. reciprocaTIon" “ D. all of the above
10.the function of an occlusal rest seat is :
A. Stabilize the denture “ B. To prevent the lateral forces acTIng on the tooth
C. To resist vertical force of occlusion#" “ D. Increase retention of partial denture

INDEX

REFERENCES

1- McCracken’s Removable Partial Prosthodontics13th Edition - November 3, 2015

2- Robert, W. L. (2018) Removable Partial Denture Manual. Dalhousie University