Fixed Prosthodontics (Crown & Bridge)

Lecture

Introduction and definition

Prosthodontics (prosthetic dentistry or prosthodontia)

- The dental specialty that concerned with restoring and maintaining oral functions, comfort, appearance and health of the patients by making artificial replacements for missing parts of the mouth and jaw.

Branches of Prosthodontics

- 1. Fixed Prosthodontics FPDs
- 2. Removable Prosthodontics
  - a) Complete Denture
  - b) Removable Partial Denture RPDs
- 3. Implant Prosthodontics
- 4. Maxillofacial Prosthodontics

Fixed prosthodontics (Crown & Bridge)

- It's a branch of dental science that deals with restoring damaged teeth with artificial crown and replacing the missing natural teeth by a dental prosthesis permanently cemented in place (fixed partial denture).

Types of Fixed Prostheses

- 1) Extra-coronal: It involves all restorations that seat over the tooth such as all types of crown restorations (Full metal crown, partial crown, PFM, all ceramic crown) & direct or indirect veneer restoration.
- 2) Intra-coronal: It involves all restorations that seat inside the tooth such as inlay, onlays, pinlage.

1. Fixed prosthodontics (Crown)

- It's a fixed extra-coronal artificial restoration for the coronal portion of a natural tooth. It must restore morphology, function and the contour of the damaged portion of a tooth and must protect the remaining tooth structure from further damage.

Types of crowns: (Classifications)

A. According to the coverage area

- **1. Complete crown:** It covers the coronal portion of the tooth, such as full metal crown, All- ceramic crown (made of ceramic material).
- **2. Partial Crown:** It is covers part of the coronal portion of the tooth such as 3/4 Crown, 7/8 Crown.
- **3. Complete replacement:** it involves those which replace the natural crown entirely while retains itself by means of a metal extended inside the root canal space of the tooth such as a post crown.

Types of crowns: (Classifications)

B. According to materials used in the construction of C and B restorations

- **1. Metal Crowns:** Gold alloy and its alternatives
- **2. Non-Metal crowns:** Acrylic resin, Zirconium or Porcelain as in jacket crown.
- **3. A combination:** of metal and plastic materials as in PFM crown restorations.

2. Fixed prosthodontics (Bridge)

- It is a fixed dental prosthesis (appliance) which replaces and restores function and aesthetic of one or more missing natural teeth. It cannot be removed from the mouth by the patient and primarily supported by natural teeth or root.

Components of the bridge

- **1. Retainer:** It's the part that seat over (on or in) the abutment tooth connecting the pontic to the abutment. It is either major or minor retainer, it could be crown, inlay, post and core.
- **2. Pontic:** It is the suspended member of fixed partial denture that replaces the missing tooth or teeth, usually it occupies the position of the missing natural tooth.
- **3. Connector:** It's the part that join the individual components of the bridge together (retainer and pontics), which could be fixed (rigid) or movable (flexible) connector. When the retainer is attached to a fixed connector, it's called a major retainer. When it is attached to a flexible (movable) connector, it is called a minor retainer.

Definitions (terminology)

- **Abutment**: a tooth to which a bridge is attached.
- **Span:** is the space between natural teeth that is to be filled by pontics.
- **Saddle:** is an area of the edentulous ridge over which the pontic lies.
- **Pier:** is an abutment standing between two abutments and supporting two pontics, each pontic being attached to further abutment.
- **Unit:** when applied to bridgework, means either a retainer or a pontic, thus a bridge that replaces a premolar using two abutments is referred as three units bridge.
- **Path of insertion:** An imaginary line along which the restoration can be inserted and removed, without any interferences or causing lateral force on the abutment.

Types of bridges (Classification)

A. Depending on the materials used

- **1.** Cast metal FPDs
- **2.** Metal-ceramic FPDs
- **3.** All-ceramic FPDs
- **4.** Resin-veneered FPDs

B. Depending on the location: Anterior FPDs, and posterior FPDs

C. Depending on the number of teeth: Two units FPDs, three units FPDs.

Types of bridges (Classification)

D. Depending on the tooth reduction

- **1. Conventional** (Conventional preparation) bridges: where a substantial tooth reduction is necessary for the abutment teeth.
- **2. Minimally-prepared bridges**: (adhesive, acid etched, resin-bonded bridge): These bridges are luted to the unprepared or minimally prepared surfaces of the abutments with resin adhesives.
- **3. Hybrid bridges**: A combination of conventional and minimally prepared teeth.

Types of bridges (Classification)

D. Depending on the tooth reduction

- **4. Implant-Supported FPDs**: Bridges that are totally supported by implant fixers, usually are not attached to the adjoining natural teeth, which are either can be removed by the dentist only, or can be removed by the patient for cleaning or any other reasons.
- **5. Removable bridges**: Bridges that are totally supported by teeth which differ from the RPDs. They are either be removed by the dentist only, or can be removed by the patient for cleaning or any other reason. They are designed to overcome problems associated with long span FPD, such as Andrew's bridge system that is indicated for edentulous ridges with sever vertical defect. The prosthesis consist of a fixed and a removable component.

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **1. Fixed-fixed bridge:**
- The most common type used anteriorly and posteriorly.
- Preferred for long-span bridges
- Have rigid connector at both end of the pontic.
- Maximum retention & strength.
- All retainers are major which require extensive tooth reduction.
- Un-conservative, more destruction of the tooth structure & trauma to the pulp.
- The pontics are connected rigidly to the retainers at both ends of the bridge, so it has only one path of insertion (the preparations of both abutments need to be parallel).

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **1. Fixed-fixed bridge (the most common type):**
- The entire occlusal surfaces of both abutments must be covered with retainers otherwise the occlusal forces will be directed on the unprepared area which depress the tooth downward & break the connectors.
- All retainers must have approximately the same amount of retention reducing the risk of dislodgement when the force is applied on weak retainers.
- Abutment teeth are splinted together (adequate in case of mobile teeth).
- Cemented as one piece.

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **2. Fixed- mobile design:**
- Have rigid connector (major) at the distal end of pontic (the pontic attached to fixed retainer) and mobile (minor) connector mesially.
- More conservative to tooth structure than fixed-fixed design, because minor retainers need less tooth reduction.
- It allows minor tooth movement (lateral & vertical).
- Limited to one missing tooth (limited length of span).
- Parts of the bridge can be cemented separately.
- Lab. construction is complex and difficult.

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **2. Fixed- mobile design:**
- Preparation of abutment does not need to be parallel.
- It is indicated to be used in divergent abutment teeth (un-parallel), whenever a pier abutment is present (complex bridge), and for aesthetic consideration (class III inlay on distal of canine).

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **3. Simple cantilever:**
- The support for the pontic at one end only.
- Pontic may attach to one or two retainer.
- Abutment tooth is either mesial or distal to the span.
- It is the most conservative design.
- Limited cases, as in lateral incisor replacement using the canine as abutment when the occlusion is favourable.
- The design can be used to replaced upper or lower first premolar and second molar.

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **4. Spring cantilever**
- The pontic attaches to a long metal arm (flexible bar) run into the palate and terminates with rigid connector on the palatal side of a single retainer on upper 4 or pair 4 and 5.
- Tooth retained and tissue borne.
- Forces are absorbed by the springing of the arm and by displacement of the soft tissue of the palate.
- The abutments are usually posterior teeth (tooth need restoration is better to be used).

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **4. Spring cantilever**
- Contraindicated in V-shape palate and in the lower arch.
- It is indicated only for replacing missing upper incisor when the adjacent teeth are sound, midline diastema, spacing of anterior teeth, or posterior teeth need crown.
- It not advised for the lower arch due to:
  - 1. The instability of the sub-mucosal tissue and instability of the spring.
  - 2. Tongue discomfort.
  - 2. The potential for plaque and calculus deposition.

Types of bridges (Classification)

E. Depending on the connectors (Basic bridge designs)

- **5. Combination designs (complex or compound bridge)**
- It is a combination of two or more of conventional designs incorporated in the general design of bridge, such as:
- Fixed-fixed with simple cantilever.
- Fixed-fixed with fixed-mobile.
- **Benefits:**
- Simplify the construction of the prosthesis.
- Unfavourable angulation of abutments.
- Simplify the preparation and conserve tooth tissues.
- Easily repaired after fracture.
- Precision retainers permit the separation of two or more components.

Purposes (benefits) of fixed partial denture

- 1. Correcting abnormal oral conditions.
- 2. Restoring mastication to full functional efficiency.
- 3. Maintaining the health of the remaining dentition and prevent further injury.
- 4. Restoring appearance and aesthetic.

Advantages of fixed partial denture

- 1. Restoring the psychological demand of patient (aesthetic, appearance, function, phonetic).
- 2. To restore fracture and badly carious tooth by retainer part of bridge.
- 3. Replacing missing teeth to provide function and aesthetic.
- 4. As a space maintainer following extraction to prevent over eruption of opposing tooth.
- 5. Maintain periodontal health of abutment by the retainer.
- 6. Maintain the occlusal stability, provide periodontal splinting, and restore occlusal vertical dimension.

Disadvantages of fixed partial denture

- May induce tooth and pulp damage, potential secondary caries, periodontal problem added to the high cost.
  - 1. Poor retention of the retainer due to excessive cutting of abutment.
  - 2. Over preparation and heat generation during cutting can cause pulp irritation or even pulp exposure.
  - 3. Secondary caries attacking the abutment due to open margin.
  - 4. Periodontal problem due to poor pontic design or under preparation for facing area
  - 5. Loss or fracture of the facing material due to technical errors or poor occlusal diagnosis by the dentist.

Indications of fixed partial denture

- 1) The bridges are indicated wherever there are properly distributed healthy teeth that serve as abutments.
  - Vital tooth or endodontically treated with no radiographic evidence of pathology.
  - Adequate crown/root ratio.
  - Good periodontal condition.
  - Root configuration and angulations.
- 2) Tooth suitable as abutment which require cast restoration (the same tooth lie adjacent to edentulous space and suitable as abutment).

Indications of fixed partial denture

- 3) Un-favourable angulations of teeth for removable prosthesis (badly tilted teeth).
- 4) It is advisable to restore edentulous space with fixed rather than RPD, because the force of occlusion transmitted to periodontium, then to the alveolar bone (natural), while in the RPD the occlusal force is transmitted to muco-periostium, and then the underlying bone (which is not designed for this function).

Contraindications of fixed partial denture

- 1. Long span edentulous area.
- 2. Free end extension area (absence of distal abutment).
- 3. Abutment related factors (tooth not suitable as abutment: length, shape, caries, and periodontal support), or abutment teeth with unstable bone support (a considerable bone loss).
- 4. Limited inter jaw space.
- 5. Patient with dry mouth (xerostomia), because of great risk of recurrent caries.

Comparison of FPD with RPDs:

- **1)** More stable and comfortable, because it covers less tissue surface (there is no acrylic base, flanges or clasps).
- **2)** Better aesthetics.
- **3)** More stable occlusion with even distribution of the occlusal forces.
- **4)** Provide a splinting action, while the RPDs push the teeth and cause mobility.
- **5)** Easier cleaning using tooth brushes and dental floss (when there is a point contact between pontic & the underlying tissue), in contrast, the RPD must be removed to be cleaned.
- **6)** Do not irritate tissues or apply pressure on them.

Comparison of FPD with RPDs:

- **7)** Psychological patients can easily tolerate FPD rather than removable one.
- **8)** The FPDs are preferred for handicapped, epileptic patients, and patient with Parkinson disease due to the possibility of fracture or inhalation of the RPD.
- **9)** No speech difficulty in FPDs.
- **10)** Badly tilted abutment teeth may interfere with the construction of PD (due to the presence of undercut that lead to food stagnation). A telescopic bridge with metal coping, or fixed-movable bridge or proximal half-crown can be used.
- **11)** Anatomical limitation of RPDs such as abnormally large tongue, muscular disorder, mandibular tori (torous), and palatal surface tissue.

Thank you