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CONNECTORS IN FIXED PARTIAL DENTURES: A REVIEW

BY

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Abstract

Fixed partial dentures (FPDs) are essential prosthetic solutions for restoring partially edentulous arches, with stability, aesthetics, and functionality. The design and choice of connectors, which bring retainers and pontics together, are crucial to the success of FPDs. The types, benefits, drawbacks, and clinical indications of rigid and non-rigid connections are reviewed in this article.Rigid connectors—such as cast, soldered, welded, and loop types—are preferred for cases requiring maximum load transfer to abutments, while non-rigid connectors—such as tenon-mortise, split pontic, and cross pin and wing—are indicated in complex cases involving pier abutments, misaligned teeth, or long-span prostheses.Appropriate connector choice, based on biomechanical and aesthetic considerations, is critical for the long-term success of FPDs.

Keywords: *Fixed partial denture, connectors, rigid connectors, non-rigid connectors, tenon-mortise, split pontic connector, loop connector*

Introduction

A fixed partial denture is 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. (GPT 10)[1]

The retainer, pontic, and connectors are the three main parts of a fixed partial denture. Usually in the form of crowns or metal frameworks that firmly adhere to the prepared teeth, the retainer connects the abutment(s) to the remainder of the prosthesis. The pontic fills in the gap left by the clinical crown and restores the function of the missing natural tooth. The connector is the part of the fixed partial denture that connects the pontic and retainer, making sure the whole thing is stable and harmonized. These elements work together to produce a long-lasting, useful, and aesthetically beautiful restoration that can successfully substitute lost teeth while maintaining the integrity of the surrounding natural teeth.[4]

Although casting techniques have advanced, the accuracy and resilience of multiple-unit fixed partial dentures (FPDs) continue to be essential concerns. The introduction of little faults that build up and merge during the fabrication process frequently leads to FPD failures. Length and complexity of casting can affect the stability of prosthesis and may lead to poor fit.[2,3]

CONNECTORS

Connector in fixed prosthodontics, is the portion of a fixed partial denture that unites the retainer(s) and pontic(s)GPT 10)[1]

The types of connectors are:

1. **Rigid connectors**
- Cast connectors
- Soldered connectors
- Loop connectors
- Welded connectors

2. **Non-rigid connectors**
- Tenon-mortise connectors
- Split pontic connector
- Cross-pin and wing connector [4,7]

1) RIGID CONNECTORS

These connectors prevent any movement making them recommended when the full masticatory load needs to be transferred to the abutments.[4]

- Cast connectors:

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Cast connectors are typically shaped in wax as part of a multi-unit wax pattern and casted during the fabrication of fixed partial dentures.[7]

Advantages:

- Convenient method
- Decreases laboratory procedural steps in fabrication.[7]
- Casting reduces the risk of excessive oxidation, which can otherwise compromise
- porcelain integrity and increase the likelihood of structural failure.[9]

Disadvantages:

- Increased chances of distortion.[7]

➢ Soldered connectors:

Soldering is a process that involves joining two or more pieces of metal by using an intermediary material known as solder, which has a lower melting point than the metals being joined.[3]

Advantages:

- high tensile strength.[3]

Disadvantages:

- Oxide layer formation which adversely effect soldering process
- Increased risk of fracture.[3]

➢ Welded connectors:

Welding is used to join metal parts by melting the surfaces of the adjacent materials, either with heat or pressure, without use of filler material.[7]

➢ Loop connectors:

These are the connectors used in case where existing diastema should be maintained in fixed partial denture.[4]

Advantages:

- enhance natural look of restoration
- preserve remaining abutement tooth structure

Disadvantages:

- difficult to maintain oral hygiene
- interfere tongue movement
- complex lab procedure.[12]

2) NON-RIGID CONNECTORS

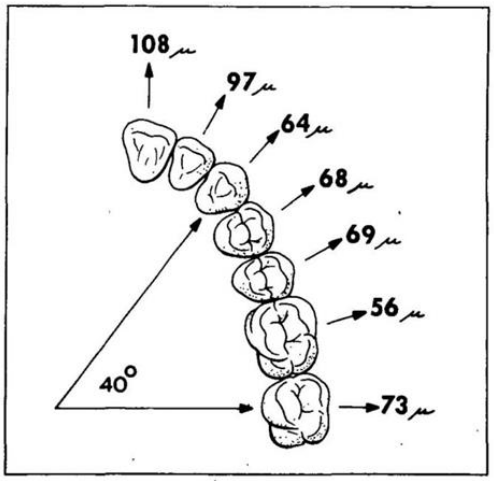
In fabricating fixed partial dentures (FPDs), rigid connectors between retainers and pontics are commonly preferred. However, their compatibility is limited in certain cases, such as when an edentulous space persist on either side of a pier abutment. Selecting the appropriate connector type during treatment planning is critical for prosthesis success.

Dental arch curvature alters tooth movement patterns, with varying directions across segments. Anterior teeth exhibit significant facio-lingual movement compared to molars. These movements generate stresses into long-span prostheses, transferring forces to retainers and abutments. In such cases, the central abutment acts as a fulcrum, potentially compromising the integrity of the weaker retainer.Rigid FPDs with pier abutments are more susceptible to debonding due to dislodging forces, leading to complications like marginal leakage and caries. To tackle these risks, non-rigid connectors are recommended, serving as stress breakers between retainers and pontics and offering flexibility.[5,8]

The three factors are: physiologic tooth movement, arch position of the abutments, and retentive capacity of retainers. All suggest a preference for using non-rigid connectors instead of rigid ones in certain fixed partial denture situations.

1. Physiologic Tooth Movement:

Although often unnoticed, healthy teeth exhibit measurable physiological movement. Studies show varying degrees of buccolingual and apical displacement, particularly during mastication due to the periodontal ligament's limited recoil capacity. Movement also occurs in an apical direction, with maxillary incisors showing intrusion of up to 28 µm. Intrusion is significantly evident during mastication and is likely caused by the periodontal membrane's inability to recoil due to repeated occlusal forces. Additionally, tooth mobility varies throughout the day and is mostly greatest in the morning.[5]



Faciolingual movement of teeth in maxillary arch in microns.

2. Arch Position of the Abutments:

Chayes observed that teeth in different segments of the arch exhibit movement in various directions. Due to the curvature of the dental arch, anterior teeth tend to move in a faciolingual direction at a greater angulation than the buccolingual movement observed in posterior teeth. Because these movements occur in varying magnitudes and directions, they can introduce significant stresses within long-span prostheses, particularly around central abutments acting as fulcrums. These stresses are transmitted to the abutment teeth, and the length over which these forces act—combined with the independent movement of abutments—can elevate stress levels on the retainers and supporting teeth to potentially destructive levels in rigid five-unit restorations.[6]

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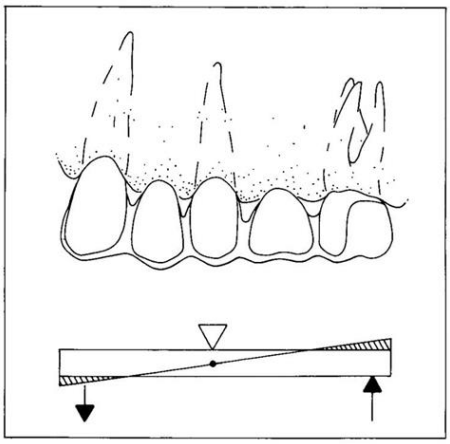

Middle abutement serving as fulcrum in rigid partial denture.

3. Retentive Capacity of Retainers:

Unnecessary stresses transmitted to the terminal retainers due to the middle abutment's fulcrum-like position can compromise the retainer integrity. This results in failure, often due to marginal leakage and caries that may remain undetected until they become extensive. The retention provided by a canine is typically less than that of a molar; hence, a canine retainer is more likely to fail. The canine retainer has weaker retention because it lacks the length and inner surface area that a molar provides—both of which are crucial for retaining a prosthesis. Since there are limits to increasing a retainer's ability to withstand these displacing forces, some means must be used to neutralize the destructive effects of these forces.[6]

- **Indications for non-rigid connectors:**
  - Pier abutment creates a fulcrum effect, compromising stability of terminal abutments and pier intrusion.
  - Malaligned abutments can lead to pulpal necrosis; intracoronal attachments can resolve this.
  - Multiple mobile tooth which can be splinted using fixed prosthesis.
  - Long-span FPDs may distort due to porcelain shrinkage; non rigid connectors resolve this.
  - Non rigid connectors can prevent repeating restoration of compromised distal anchorage when transitioning to removable partial dentures.
  - Non rigid connectors relieve tension on osseointegrated implants and surrounding tissues.[5,6]

- Tenon-mortise connector (dovetail connector)

It is a non rigid connector with a key-keyway system , which allows slight movement between the prosthesis and abutments, helping to reduce stress at the midspan of long pontics.[2]

- Split pontic connector

It is a connector placed inside a pontic ,used in case with tilted abutement.[2]

Advantages:

  - Conservative abutement preparation
  - Increased stability.[10]

- Cross pin and wing connector

It is a 2 piece pontic connector system that allow rigid fixation after cementing the retainers to corresponding abutements.[2]

FABRICATION OF CONNECTORS

The size, shape, and position of the connectors are key elements in succes of a fixed partial denture. Connectors must be large enough to resist distortion or fracture , but if they are too sized, they can hinder plaque control and contribute to periodontal issues. Additionally, bulky or poorly shaped connectors can result in metal exposure and compromise the aesthetics of the restoration.[7]

- Cast connectors

Connectors to be cast are typically waxed onto the definitive cast before reflowing and investing the pattern.[11]The connector is then cast using the same alloy as the original framework.Following investment retrieval , the connector is inspected for quality, and oxide formed during burnout is removed. The final connector is finished, concealing the oxide line, and prepared for the patient's try-in.[9]

Cast connectors can obstruct access to the proximal margin, making it difficult to hold the pattern during removal from the die. To overcome this issue, it is recommended to restrict cast connectors to complete coverage restorations that can be clutched bucco-lingually.[11]

- Soldered connectors

Similar to cast connectors, connectors to be soldered are first waxed and then sectioned using a thin ribbon saw. This guarantees that when the components are cast, the surfaces to be joined are flat, parallel, and a controlled distance apart, allowing for accurate soldering with least distortion. During soldering, molten solder flows to the area with the highest temperature. The flat surfaces created in the wax retain heat, ensuring that the connector area reaches the highest temperature for optimal solder flow.[11]

Soldering Gap Width:

The width of the gap between the components being joined affects soldering accuracy. As the gap width increases, the accuracy of soldering decreases. An even gap of about 0.25 mm is recommended for optimal results. If the gap width is uneven, achieving a connector with the proper cross-sectional dimensions without distortion becomes more challenging.[11]

- Loop connectors

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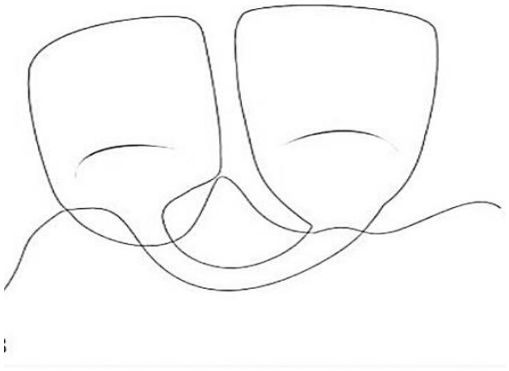
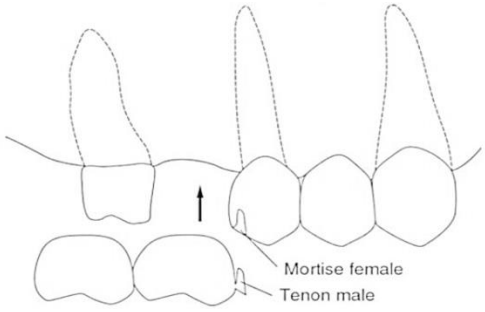
The loop connectors can be cast from sprue wax or from platinum-palladium-gold alloy.[11]The wax pattern can be invested in phosphate bonded investment and cast can be polished to high shine.[12]The design is require maintainance of good oral hygiene.[11]



- Tenon-mortise connector

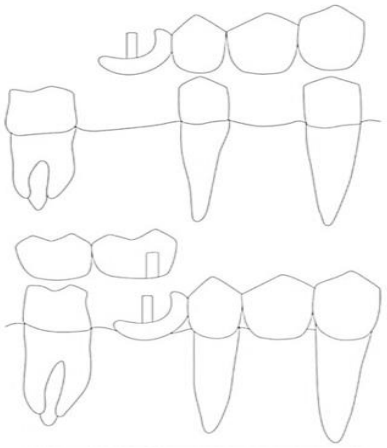
A deep box is carved into the distal surface of the wax pattern to hold a plastic keyway for creating a retainer for a pier abutment. The key and keyway are aligned parallel to the insertion path using a surveyor once the working cast with the wax pattern is in place. Sticky wax is applied to secure the plastic key, and the design is completed. Any extra keyway material is trimmed after investment, burnout, and casting. The pontic wax pattern is then added, shaped, invested, and cast after the plastic key is properly fitted. Final adjustments ensure the key and keyway fit flush, providing secure retention.[2]



- Split pontic connector

To fabricate a three-unit anterior segment (mesial retainer, pontic, and pier retainer), the process starts with creating a wax pattern for the mesial segment, which includes a distal arm connected to the pier retainer. The underside of this arm is shaped like the tissue-contacting area of a pontic. Next, the key or keyway of the FPD design is positioned using a surveyor to ensure it aligns properly with the distal abutment preparation. After investing, burnout, and casting, the mesial portion is placed on the working cast for further processing.

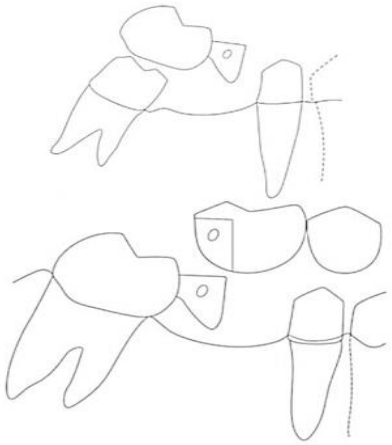
The plastic pattern is positioned on the cast, depending on whether the keyway is in the casting or the key faces upward on the pontic base. The pontic is made of metal-ceramic with a thin metal collar around its ceramic edges. The distal retainer and the back half of the pontic are then waxed. After trying the segments in the patient's mouth, any adjustments are made. The mesial segment is cemented first, followed by the distal segment. Care is taken to avoid getting cement between the two parts of the pontic.[2]



- Cross pin and wing connector

A vertical wax wing is cut from a baseplate and attached to the mesial side of the distal retainer, aligning with the abutment's insertion path. This assembly is then invested, burned out, and cast. A small 0.7-mm hole is drilled through the wing, and a pencil lead is used to keep the hole open while the wax pattern is built around it. Once the wax is removed, the pattern is reassembled on the cast.

To refine the hole, a tapered machinist reamer is used, and a pin made from the same alloy as the casting is crafted and checked for fit. The winged retainer is cemented in place first, followed by the retainer-pontic segment. Finally, the pin is inserted with a punch and mallet, and any excess is trimmed off. This method creates a sturdy prosthesis while allowing for easy disassembly if needed.[2]



CONCLUSION

Connectors play a crucial role in the overall performance of fixed partial dentures by contributing to their stability, function, and esthetics. Rigid connectors are suitable for simple prosthetic designs due to their robust support and load-bearing capacity. However, in more complex clinical scenarios—such as those involving pier abutments,

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misaligned teeth, or long-span prostheses—non-rigid connectors are preferred. These connectors act as stress breakers, effectively distributing occlusal forces and minimizing stress concentration on the abutments.

A thorough evaluation of physiologic tooth movement, abutment positioning, and the retentive ability of each retainer should inform the selection of connector type. Additionally, precise design and fabrication—whether through casting, soldering, or systems like tenon-mortise or split pontics—are essential for the long-term success of the restoration. By carefully tailoring connector selection to individual clinical needs, dental professionals can achieve restorations that are not only functional and long-lasting but also esthetically and biologically harmonious for the patient.

References

1. The Glossary of Prosthodontic Terms 2023: Tenth Edition. J Prosthet Dent. 2023 Oct;130(4 Suppl 1):e1-e3. doi: 10.1016/j.prosdent.2023.03.003. PMID: 37914441.
2. Shillinburg HT jr, Sather DA, Wilson EL, Cain JR, Mitchell DL, Blanco LJ, et al. Fundamental of fixed Prosthodontics. Chicago: Quintessence; 2012;4:91-2.
3. Lima Verde MA, Stein RS. Evaluation of soldered connectors of two base metal ceramic alloys. J Prosthet Dent. 1994 Apr;71(4):339-44. doi: 10.1016/0022-3913(94)90091-4. PMID: 7910852.
4. .Rangarajan V, Padmanabhan TV. Textbook of Prosthodontics. Second edition. Elsevier India; 2017
5. Akulwar RS, Kodgi A. Non-Rigid Connector for Managing Pier Abutment in FPD: A Case Report. J Clin Diagn Res. 2014 Jul;8(7):ZD12-3. doi: 10.7860/JCDR/2014/9710.4572. Epub 2014 Jul 20. PMID: 25177650; PMCID: PMC4149156.
6. Shillingburg HT Jr, Fisher DW. Nonrigid connectors for fixed partial dentures. J Am Dent Assoc. 1973 Nov;87(6):1195-9. doi: 10.14219/jada.archive.1973.0552. PMID: 4591664.
7. Dr. T.JeyanthiKumari MDS, "Review Article on Connectors in Fixed Partial Dentures. " IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 11, 2018, pp 60-64
8. Yaqoob A, Rasheed N, Ashraf J, Yaqub G. Nonrigid semi-precision connectors for FPD. Dent Med Res 2014;2:17-21.
9. Fehling AW, Sansom BP, Meiser ET, Johnson PF. Cast connectors: an alternative to soldering base metal alloys. J Prosthet Dent. 1986 Feb;55(2):195-7. doi: 10.1016/0022-3913(86)90341-0. PMID: 2870183.
10. O'Connor RP, Caughman WF, Bemis C. Use of the split pontic connector with the tilted molar abutment. J Prosthet Dent 1986;56:249–251
11. Rosenstiel, S.F., Land, M.F. and Fujimoto, J. (2006) Contemporary fixed prosthodontics. 4th Edition, Mosby, St Louis, 323-327.
12. Nayar S, Jayesh R, Venkateshwaran, Dinakarsamy V. Loop connectors in dentogenic diastema. J Pharm Bioallied Sci. 2015 Apr;7(Suppl 1):S279-81. doi: 10.4103/0975-7406.155956. PMID: 26015732; PMCID: PMC4439692.

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