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Modalities for Oral Hygiene Maintenance in Fixed Partial Denture Wearers

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Abstract

Edentulism and dental disease have been shown to affect patients adversely for decades. Patients with the dental disease suffer from an altered self-image, feel socially less competent and lowered self-esteem. Dento-facial problems have known effects on patient's satisfaction with their dentition as they affect esthetics, performance, and function. Fixed partial dentures (FPDs) have been the treatment modality for the replacement of missing teeth for decades. Over 700 articles are available in the dental literature in context to FPDs. Studies have investigated the influence of fixed partial dentures (FPDs) on the health of alveolar mucosa underneath pontics. Patients with average to poor oral hygiene maintenance, plaque accumulation occurs underneath the pontics in comparison to axial surfaces of FPDs. Even with a desirable pontic design and favorable material selection, applying oral hygiene measures is necessary for removing the bacterial plaque and preventing mucosal inflammation or any failure. In addition to regular tooth brushing, the use of special aids such as super floss, interdental brush, and water flossers can improve the biological maintenance of fixed prostheses. This article focusses on the means of hygiene maintenance in FPD wearers.

Keywords: Interdental aid, FPDs hygiene, Proxa brush, Dental water jet, Unitufted brush, Super floss.

Introduction

Tooth decay, gingival disease, and periodontal inflammation are the common biological complications of the fixed dental prosthesis which can be prevented by meticulous hygiene regimen and regular maintenance.[1] [2] Among these, tooth decay is the most frequent reason for failure.[3] It is well known that these conditions are caused by bacteria settled in the dentogingival plaque accumulated due to insufficient oral hygiene, and consequently, for oral health the appropriate hygiene regime is crucial.[4] Especially in patients with fixed prosthodontic appliances the physiological self-cleaning process can be restricted or hindered. In these cases, dental plaque accumulation is facilitated and these areas

require more care to remove all food remains and accumulated plaque.

Studies have investigated the influence of fixed partial dentures (FPDs) on the health of alveolar mucosa underneath pontics.[5][6] In patients with average to poor oral hygiene maintenance, plaque accumulation occurs underneath the pontics in comparison to axial surfaces of FPDs.[7] Even with a desirable pontic design and favorable material selection, applying oral hygiene measures is necessary for removing the bacterial plaque and preventing mucosal inflammation or any failure.[8] The clinician's role is to clear all the excess cement while FPD fixation. Patient education and motivation by the dentist to maintain good oral hygiene is the key factor for the success of FPDs.[9]

A detailed explanation of proper/daily practice of dental aids (such as floss, special end-tufted, and interdental brushes) along with strengthening the instructions by demonstrations on models and live demo on patient itself will improve the patient acceptance. As a result, the condition of the alveolar mucosa will improve and remain healthy.[10][11] Furthermore, patients with FPDs require life-long professional scaling for maintenance on an interval of 6 months period. Providing repeated oral hygiene interventions, and reinstructions regarding maintaining proper oral hygiene around fixed prosthesis is the key to success. In addition, the use of special aids such as electric toothbrush, interdental brush, and water flossers can improve the biological maintenance of fixed prosthesis.[12][13][14][15][16] In clinical practice, it is still unclear especially in the general dental practitioners to provide accurate post instructions for the hygiene aids in an FPD wearer. Special attention should be given to the oral aids along with tooth brushing in the FPD wearers for the maintenance of soft and hard tissue harmony. Thus, the purpose of the current study is to describe the means of oral hygiene maintenance aids available for FPD wearers.

After placement and cementation of fixed prosthesis, patient treatment continues with a carefully structured sequence of postoperative appointments designed to:

- Regular monitoring of the patient's dental health on periodic basis
- Stimulate the meticulous plaque control habits
- Identification of any incipient disease: dental caries and periodontal disease
- Immediate corrective treatment provided before irreversible damage occurs

Available dental literature on prevalence of oral hygiene maintenance in FPD wearer:

- Study regarding the oral hygiene maintenance and awareness measures on 200 patients wearing FPDs (93 males, and 107 females) showed that the most patients (n = 166, 83%) did not use any special aid to maintain hygiene underneath pontics. The majority of them (n = 178, 89%) reported that their dentist did not inform them about these aids. In addition, 150 patients (75%) reported that they were not advised by the dentist to book recall visits.[17]
- Another study evaluated, patient satisfaction with fixed prosthesis following placement and assessed the oral health and oral hygiene practices awareness by survey questionnaire. A total of 192 survey were collected and the data suggested that a significant number of patients did not use any form of interdental aids to clean their fixed prosthesis (94%). The main reason for not using any dental aids' (91.1%) was a lack of post fixed prosthodontics instructions and not been informed by the dentist.[18]
- In a study, the oral hygiene and gingival condition in 50 patients after placement of fixed dental prosthesis for a period of six months was assessed. It was analyzed that

factors like type of fixed dental prosthesis (Single crown, fixed partial denture) and material (Metal, Porcelain fused to metal) are statistically associated with oral hygiene and gingival health. Results revealed no significant difference in plaque and gingival index among patients with single crown whereas fixed partial denture showed statistical significance. No significant differences were found for type of material.[19]

- Yet another study estimated the oral hygiene and gingival condition in 60 patients (39 females and 21 male) with fixed prosthodontic restorations for a period of 3 months with reinforced post-fixed partial restoration instruction given on 14th recall visit. Results confirmed that the Plaque and Gingiva index had higher values in the first visit than that found in the other periods. Patients with crowns had better oral hygiene levels compared to fixed dental prosthesis wearers.[20]
- A study assessed the oral hygiene and gingival condition in 93 patients (60 women, 33 men; age range 21-95years) before and after fixed prosthodontic therapy through a 12-month period in combination with oral hygiene instructions. No significant difference in oral hygiene status among patients with FPDs made of different materials ($p = 0.083$). The worst hygiene levels were found in patients with fixed prosthodontic appliances in both jaws ($p = 0.012$). Younger patients showed better hygiene levels than the older ones ($p = 0.002$). An educational and motivational measures can lead to improved oral hygiene, even after FPD placement.[21]
- In a systematic review on 19 studies from 1966 up to March 2004, the 10-year risk for caries and periodontitis leading to FPD loss was 2.6% and 0.7%, respectively. The 10-year risk for loss of retention was 6.4%, for abutment fracture 2.1% and for material fractures 3.2%. [22]

Various oral hygiene aids available in the maintenance of FPDs:

Powered Toothbrush

Powered toothbrushes may be prescribed for patients to thoroughly clean around the abutments and interproximal areas under the prosthetic tooth or appliance. Brushes can be dipped into 0.12% chlorhexidine gluconate and used. The motion of the brush should follow the curvature of the prosthesis along the gingiva. Power brushing is recommended one or two times daily.

Figure 1: Powered Toothbrush

A study suggested that patients who are not adept at manual toothbrushing may potentially improve their removal of plaque from the fitting surfaces of FPDs by using electric toothbrushes.[23]

Another study suggested the use of a powered toothbrush with interchangeable brush heads permits effective cleaning of the most access-challenging prosthesis contours. Powered toothbrush presents a useful personal oral hygiene regimen for the long-term maintenance of various implant-supported fixed dental restorations.[24]

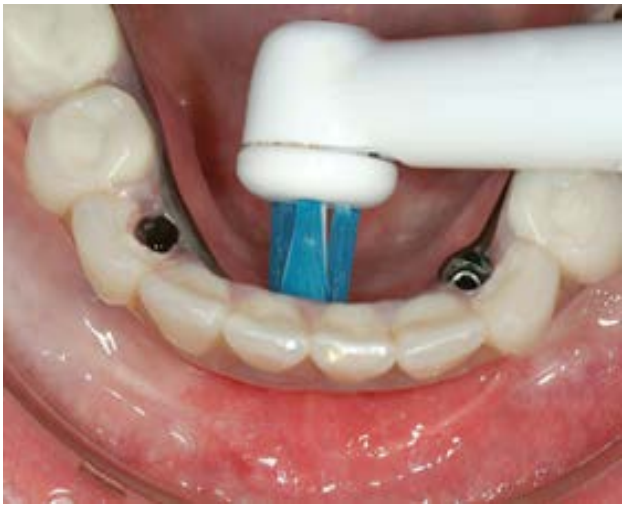

Figure 2: Powered toothbrush application underneath the FPD

Interdental Brushes

Interdental brushes are small cylindrical or cone-shaped bristles on a thin wire that may be inserted between the teeth. They have soft nylon filaments aligned at right angles to a central stiffened rod, often twisted stainless steel wire, very similar to a bottle brush. They are available in a range of different widths to match the interdental space and their shape can be conical or cylindrical. Most are round or triangular in cross-section. Originally, interdental brushes were recommended by dental professionals to patients with large embrasure spaces between the teeth caused by the loss of interdental papilla mainly due to periodontal destruction.[16] Interdental brushes are used for cleaning underneath the bridge and pontic design.

Figure 3: Interdental Brushes

Conventional toothbrushing alone is not very effective at removing plaque between teeth. Dental floss has been used for many years together with toothbrushing for removing dental plaque in between teeth. However, recently, interdental brushes to use between the teeth have been developed and many people find them easier to use than floss. Daily dental flossing adherence is low among patients because it requires a certain degree of dexterity and motivation [25], whereas interdental brushes have been shown as being easier to use and are therefore preferred by patients [26][27]. Furthermore, when compared to dental floss, they are thought to be more effective in plaque removal because the bristles fill the embrasure and can de-plaque the invaginated areas on the tooth and root surfaces.[26-31] However, there are conflicting study results regarding the efficacy of interdental brushes in the reduction of clinical parameters of gingival inflammation[30][32] and whether they are only suitable for patients with moderate to severe attachment loss and open embrasures, or whether they are a suitable aid for healthy patients to prevent gingivitis who have sufficient interdental space to accommodate them.[33][29]

Figure 4: Interdental brush in application underneath the FPD

Dental Floss

Dental floss is the most frequently recommended product for cleaning proximal tooth surfaces with normal gingival contour and embrasure spaces. Most types of dental floss are made of nylon, and some are impregnated with flavoring, fluoride, or antimicrobial or whitening agents. It can be waxed or unwaxed; braided or tufted and dental tape form. The first dental floss was a waxed silk thread that was designed to pass between the teeth to remove the irritants that the toothbrush could not reach. Nowadays, dental floss is made of nylon waxed or unwaxed multifilament's, coatings of polytetrafluoroethylene (PTFE) that slides easily and does not fray. The multifilament type allows for the separation of the fibers and is either thick or thin. Studies have shown no difference in the effectiveness of unwaxed versus waxed dental floss. Recommendations are based on the patient's ease or preference.

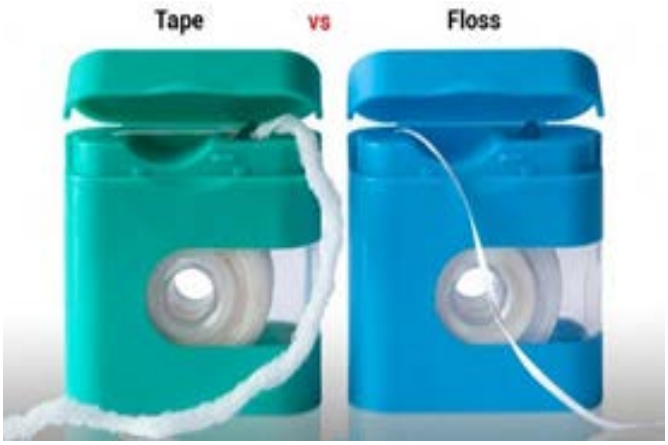

Figure 5: Dental Floss

Dental tape or ribbon is a waxed floss product that is wider and flatter than conventional dental floss. The flat-sided surface of the dental tape is preferred by some, particularly when the surface area to be flossed is large.

The benefit of daily flossing is the reduction or prevention of inflammation caused by the presence of interdental plaque biofilm. Studies show that flossing reduces plaque biofilm, bleeding, and gingivitis. It is commonly accepted that flossing reduces the incidence of interproximal caries especially the root caries under the abutment tooth of the fixed prosthesis. However, in some studies, when fluoride was impregnated in the dental floss and used, there was no additional benefit from flossing.[34][35]

Dental flossing is highly recommended for those who have fixed prosthesis in their mouth. It will help to clean the area that can't be reached by toothbrushing alone, for example the interdental area and beneath the bridge pontic. Many people neglect proper flossing habits. Unfortunately, not cleaning between one's teeth with dental floss can lead to plaque and calculus buildup that increases the risk of gum disease, root decay, and other oral health hazards.

With marked contact between the pontic and the mucosa, it is necessary to use regular floss or super floss. It is important, to maintain healthy periodontal conditions of abutments for fixed partial dentures, that the tooth surfaces and the under surface of the pontic are kept clean. Floss under the bridge at least once daily is recommended.

Figure 6: Super Floss use underneath the FPD

Figure 7: Dental Tape in application underneath the FPD

Super floss produces excellent results for plaque control around the fixtures and abutment cylinders, as well as the cervical aspect of the prosthesis. Super Floss (Oral-B) works well, but if the firm end softens too quickly, patients have to tie the Super Floss to a floss threader. Some patients prefer the curved and firmer bridge threaders.

Figure 8: Super Floss (Oral-B)

End-/Uni-Tufted Brush

End-tufted or Uni-tufted toothbrushes are indicated for type II and III embrasures, for difficult-to-reach areas and around the fixed dental appliances. They are designed with a smaller brush head that has a small group of tufts(end-tufted) or a single tuft(single-tufted). The bristles are directed into the area to be cleaned and activated with a rotating motion, similar to the vibratory motion of Bass toothbrushing. End tufted brushes have been shown to be effective adjuncts to toothbrushing in controlling gingivitis in adults.

Figure 9: Super Floss use underneath the FPD

Figure 10: Dental Tape in application underneath the FPD.

Dental Water Jet

Studies have shown that patients with orthodontic appliances, fixed prosthesis, implants, and gingivitis, the use of a dental water jet that produces pulsating streams of fluid has been reported to reduce plaque biofilm, bleeding, gingivitis, pocket depth, pathogenic microorganisms and calculus.[36][37][38] In addition, studies have shown that daily water irrigation can reduce inflammatory mediators that promote or enhance the periodontal disease process. These improvements to the inflammatory response may potentially extend to

systemic health, as documented by a study on persons with diabetes in which systemic measures of inflammatory mediators were reduced by the addition of oral irrigation to the self-care routine.[37][38]

On the other hand, dental water jets that produce a steady stream of fluid as seen with such devices that are attached to a shower or faucet have not been testes clinically for efficacy in reducing clinical parameters.

Figure 11: Unitufted brush application underneath the FPD metal bars

Mechanism of action: a dental water jet that produces a pulsating stream of fluid works by impacting the gingival margin with the pulsed irrigant (impact zone) and the subsequent flushing of the gingival crevice or pocket (flushing zone). This hydrokinetic activity produces a compression and decompression action that allows the irrigate to reach sub gingivally. The majority of studies demonstrating safety and efficacy have been done with devices that deliver 1200 pulsations per minute and pressure settings between medium and high (50-90 pounds per square inch). Irrigation pressure can be controlled on most devices.

Figure 12: Dental water jet application underneath the FPD

Depth of delivery of a solution: The dental water jet has the ability to reach deeper into the periodontal pocket than a toothbrush, interdental-aid, or rinsing. This penetration allows for better subgingival cleaning and deeper delivery of antimicrobial agents. The depth to which the solution can reach is dependent on the tip used. A standard jet tip has been shown to reach 71% in pockets 0 to 3 mm, 44% in pockets 4 to 7mm, 68% in pockets greater than 7mm. specialty tips designed to be placed slightly below the gingival margin deliver a solution up to 90% in pockets 6mm deep and 64% in pockets 7mm or greater.

Table1: Shows various Interdental Oral Aids recommended for the FPD wearers [39]

Interdental oral mechanical physiotherapy aids	Description/types	Indications	Contraindications/ Limitations	Common problems associated on use/misuse
Floss	Unwaxed/ waxed Dental tape PTFE coated G-floss Plain vs flavored Therapeutic engressed (fluoride, calcium inhibitors)	Type I embrasures Braided, G-floss and Dental tape are used under the pontics of fixed partial dentures, abutment teeth, under the implant. Floss reaches 2 to 3.5mm sub gingivally	Type II and III embrasures	Floss cuts Floss clefts Inability to reach posterior teeth in some cases
Tufted dental floss (known as Super Floss, Nu Floss)	Regular floss Yarn Floss threader combination	Type II and III embrasure Mesial and distal of abutment teeth Under pontics of fixed partial dentures Under orthodontics appliances	Type I embrasures	Trauma from forcing threader into tissues Yarn portion may catch on appliances and become stuck if appliances are rough and may damage the appliance
Floss Threader	Flossing aid Clear plastic with closed eye Tinted plastic with open eye Soft plastic loop Flexible wire Twisted wire	Type I embrasures Passes easily under the tight contacts Floss between and under abutment teeth and pontics of fixed prosthesis floss under bars for implants	Type I and III embrasures	Unable to maintain tension of floss Need to unwrap and rewrap floss to move to new area of floss after each tooth Need to set fulcrum to avoid floss cuts
Interdental brush (also known as Proxa brush)	Bristle inserts: tapered (conical) or straight	Type II and III embrasures Diastemas		Trauma to tooth surface or gingiva from sharp wire c

	Variety of sizes With or without handle	Exposed root furcation's Orthodontic and fixed prosthodontic appliances Difficult access areas		
End- or single-tufted brush	Manual as well as special attachment for powered toothbrush	Type II or III embrasure depending on design (tapered or flat) Fixed dental prosthesis (e.g., implants, pontics, orthodontic appliances) Difficult to reach areas (e.g. lingual surface of mandibular molars, abutment teeth, distal surface of terminal teeth, crowded teeth)	Type I embrasure	Tissue trauma Similar to problems associated with improper brushing technique
Dental Water Jet	Motor driven pulsating or non-pulsating device with a reservoir and specially designed tips to deliver the irrigant Nonpulsating devices attach to a faucet or showerhead	Indicated for all patient types. Inaccessible areas of the fixed prosthesis Underneath the pontics	Children need to have the ability and dexterity to use the product	Directing the stream of water under the tongue may damage the soft tissue

Conclusion

Lack of awareness among FPD wearers regarding the specific measures needed to maintain proper hygiene underneath FPDs leads to secondary caries, periodontal involvement and ultimately loss of the prosthesis. Dentists should be obligated to educate their patients and advise them to maintain proper oral hygiene under their

prostheses and book regular recall visits. Patient education, motivation and demonstration of various means of hygiene maintenance aid is the key factor for the success of the treatment. Unfortunately, we as dentists seemed to neglect this aspect and the majority of the patients did not seem to be aware of the importance of post-treatment maintenance and recall visits. Hence an attempt should be made to educate the patients well at every recall visit and train them for proper hygiene maintenance using various available oral hygiene aids as discussed above.

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