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AN INNOVATIVE APPROACH TO MANAGE ANTERIOR DIASTEMA USING PUTTY INDEX AND FIBRE REINFORCED COMPOSITE PONTIC- A CASE REPORT

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ABSTRACT

Aim and objective: To present the management of diastema space closure in the maxillary and mandibular anterior teeth with Fibre – reinforced composite (FRC) bridge. **Background:** Maxillary and mandibular anterior spacing is a common aesthetic complaint of patients. Various treatment modalities are available for diastema closure. In a condition with moderate diastema space with teeth having proper orthodontic alignment, no preparation of the tooth structure is necessary and direct composite bonding may yield the desired result. The following case report shows a restorative protocol using direct composite resin build up using a putty index in the maxillary incisors and the FRC bridge as an innovative approach to esthetic management of mandibular anterior teeth. Despite the significant midline diastema, utilizing an FRC pontic proved to be an effective treatment option for closure, showcasing the case's uniqueness. **Case description**: This case report explains a restorative protocol using the FRC Bridge as an innovative

approach to esthetic management of large midline diastema of anterior teeth. FRC pontic was fabricated extraorally which has helped to overcome the increased chairside time necessary for this procedure**. Conclusion:** This case report along with the literature discusses and highlights the fact that the FRC resin pontic technique is an innovative solution for large diastema closures. Creating an adhesive FRC bridge by using a composite tooth pontic is a successful treatment option for the direct aesthetic management of spacing in anterior teeth. **Clinical significance**: The FRC pontic offer several clinical benefits including aesthetic appeal, minimally invasive, decreased treatment time and a direct technique. Hence, they provide significant clinical implication offering a conservative and effective solution.

KEYWORDS: Fiber reinforced composite, midline diastema, pontic, restorative treatment, minimally invasive.

INTRODUCTION

Anterior teeth spacing or tooth loss may be a catastrophic event for a patient and it may affect the facial esthetics, phonetics, and psychology of a patient. Midline diastema is defined as space between the mesial surfaces of the maxillary central incisors.[1] It is an evident part during normal development in primary and mixed dentition. Etiology of midline Diastema is multifactorial[2] and can be attributed to developmental anomalies, tooth-arch length discrepancy, and habits. In 1988, Moyers conducted a study involving 82 patients reported with midline diastema in upper anterior teeth and stated the following as etiological factors: a) midline diastema as part of development, b) supernumerary teeth erupted at the midline, c) congenitally missing upper lateral incisors, d) enlarged upper labial frenum, e) imperfect fusion at midline of premaxilla f) unusually small size teeth, g) Orthodontic treatment, as in cases of rapid palatal expansion or false teeth movement, h) rotated teeth, I) Para functional oral habits, such as thumb/finger sucking or abnormal tongue posture, j) distal or labial inclination of maxillary central incisors, k) increased anterior overbite, l) generalized spacing and m) pathologic teeth migration due to periodontal disease.[3] Angle in 1907 stated that the interdental diastema "always creates an unpleasant appearance and interferes with speech depending on its width".[4] The aesthetic management of diastema is a restorative challenge and may require multidisciplinary approach for a successful outcome. Thus, immediate management of the clinical condition is required. The treatment options include orthodontic correction, restorative correction using composites, prosthetic correction using veneers/ laminates or a combination of the above.

Metal-free, adhesive aesthetic dentistry has a new material due to the improvement of fibre-reinforced composite (FRC) technology. Fiber- Reinforced Composite (FRC) is predominantly advised today for their favourable elastic modulus and better adhesion of the composite luting agent to the framework. The possibility of direct chairside application and the ability to attach to tooth structure make FRC is an affordable option for single tooth replication.[5] Composite resin and FRC have been found to work well together in terms of mechanical qualities.[5] Improved aesthetics, the biocompatibility of restorative materials, and less tooth preparation is some of the aspects that are increasingly influencing dental treatments today. It is important to accurately assess the diastema's size and cause.

Effective case selection is crucial to a successful treatment. The most often used choices for space closure are implants, fixed partial dentures, and temporary acrylic prostheses. A contemporary conservative choice is resin-bonded bridges. Strength, durability, and quick convenience have been made possible by the combination of fibre reinforced composite resin and adhesive processes. Ultrahigh molecular weight polyethylene fibres, Ribbond (Ribbond, USA), Connect (Kerr), glass fibres (GlasSpan), fibre splint ML(Polydentia), fibres pre-impregnated with resin Vectris (Vivadent), etc. are examples of bondable reinforced fibres that are frequently utilized in therapeutic settings.[6]

The use of silicone index is one of the biggest innovatory techniques in dentistry for anterior composite build up. Putty index perfectly defines the sagittal dimensions, the length, and the incisal edge position of the desired final restoration, the incisal thickness, mesial and distal line angles and the labial curvature of the restoration. Hence, the practitioner can easily reproduce details without any hassles.[7]

History

A 25-year-old Indian woman, working for an MNC, reported to the Department of Conservative Dentistry and Endodontics, with the chief complaint of spacing between the upper and lower front teeth. Her medical history was non-contributory. On clinical oral examination, multiple spacing (diastema) were seen in the maxillary and mandibular anterior regions. Patient had a history of tongue thrusting habit since her childhood. Spacing between her anterior teeth in the upper arch was around 1-2mm while the lower central incisors showed a diastema of 5mm. The lower anteriors exhibited grade I mobility and a broken splint extending from canine to canine was clinically present. The patient was diagnosed with Class III midline diastema according to anatomic and therapeutic approach

classification given by Saeralaathan et al in 2021.[8]

TREATMENT PLANNING

Various treatment options were considered during treatment planning and the Orthodontic management, implant and fixed partial dentures were ruled out due to the non-favorable periodontal status of the teeth.

The patient demanded an immediate and affordable treatment. Hence diastema closure with putty index was presented as the treatment option for spacing in upper arch. Diastema closure with fibre reinforced composite pontic was the treatment option chosen for the lower arch. Treatment procedures were explained to the patient.

CASE DESCRIPTION

Informed consent was obtained from the patient. Pre-operative intraoral photographs and diagnostic impressions were taken (Fig. 1). The shade selection was made with Vita shade guide A2. Wax mock-up was done for the space closure in the upper arch followed by fabrication of putty index (Fig. 2).

In the next visit, isolation was implemented using Teflon tape and cotton rolls. After etching and bonding, with the help of putty index the palatal shelf was built for tooth number 11 and 21 (Fig 2 & Fig. 3). Diastema closure in the maxillary incisors was achieved using Composite layering technique once the palatal shelf was made, A2 (3M Filtek Z350 XT Composite) dentine shade was used initially followed by A2 enamel shade. Mylar strips were used to get intact proximal wall contacts. After restoring 11 and 21 same procedures were repeated for 12 and 22. Final finishing and polishing were done using Shofu Super snap kit. Post-operative intraoral photograph of composite diastema closure between maxillary central incisors were recorded (Fig. 3).

Pre-operative intraoral photographs and diagnostic impressions were taken in the lower arch (Fig. 1). The shade selection was made with Vita shade guide. For the lower arch, the broken splint was removed. On the diagnostic cast the Ribbond was attached between 31 and 41 (Fig. 4). With the fibre reinforced splint as the support, composite pontic (3M Filtek Z 350 XT Composie kit) was fabricated on the cast (Fig.4). After cotton roll isolation in the patient's mouth, etching and bonding was done from lower arch right canine to left canine. The fibre reinforced splint with composite pontic was bonded between 31 and 41 using

flowable composite (3M ESPE Filtek) (Fig. 5). Post-operative intraoral photograph of composite pontic bonded in between mandibular central incisors were recorded. (Fig. 6).

Fig. 1: pre-operative intraoral photograph of the maxillary incisors with diastema.

Fig. 2: Wax mockup done (highlighted with arrow marks) and putty index template made in the maxillary incisors teeth.

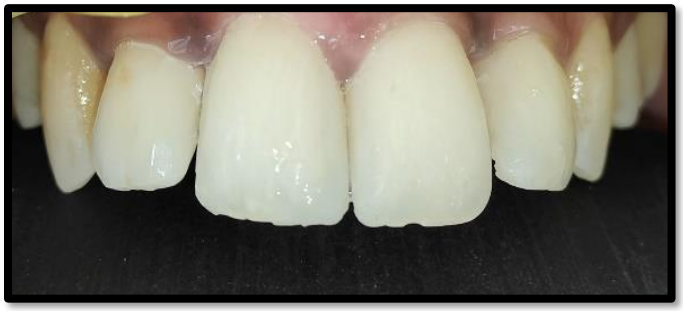

Fig. 3: Composite buildup done in the maxillary Central and lateral incisors teeth.

Fig. 4: Fabrication of composite pontic with Ribbond in between the mandibular central incisors on cast.

Fig. 5: Composite Pontic bonded between mandibular central incisors to correct the diastema space.

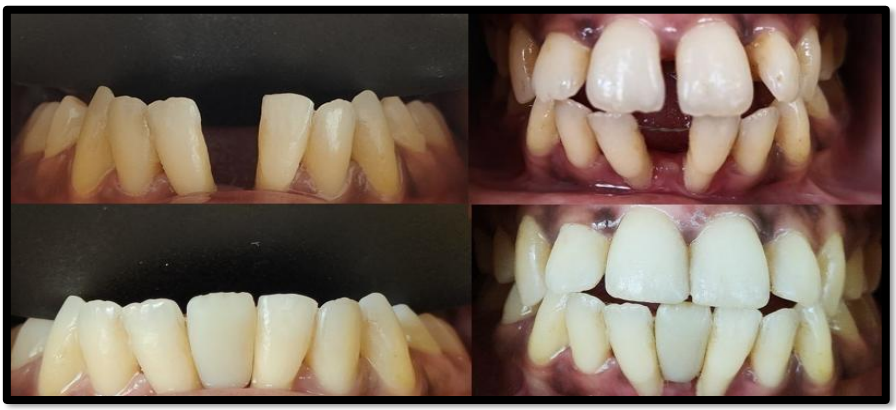

Fig. 6: Pre-operative and post operative intraoral photograph of maxillary and mandibular anterior teeth diastema space correction.

DISCUSSION

Diastema closure can be treated via a variety of methods. Over the past three decades, adhesive procedures have been used in fast, efficient, and dependable ways.[9] Continuous advancements in methods, materials, and technology have made it feasible to create aesthetic restorations using composite resins.[10]

In the present case, for upper arch spacing, diastema closure with putty index was proposed as therapeutic option. For the lower arch, diastema closure with fiber- reinforced composite pontic was the selected treatment option. According to clinical research, fibre-reinforced composite fixed prosthetic dentures (FRCFPD) do significantly better clinically than FPDs with metal frames, with an overall survival rate of 75% after around 5 years.[11]

The Ribbond (Ribbond, USA) is a ultra-high molecular weight polyethylene fibre connector FRC material exhibiting outstanding bonding properties to the composite resin. Lenoweave pattern effectively distributes stresses throughout the material and offers higher resilience. With an FRC bridge, little preparation is needed for the abutment teeth.[7] Since the diastema was around 5mm in lower arch a pontic was fabricated using composite resin which gave optimum esthetic result. This was best achieved with 3M Filtek Z350 XT Composite which was available in wide variety of shades to incrementally buildup the enamel and dentin layers of tooth.

In a four–year clinical research, Jiang and colleagues found that FRC FDPs have 89.7% survival rate and were a good alternative for up to three lost front teeth with reduced periodontal support on neighboring teeth.[12] Given our circumstance of reduced periodontal support on lower arch; this seems like a suitable choice. To provide the best aesthetics for resin composite pontic, natural layering procedures with different shades of composite were used.[6]

The cumulative success rate of FRC FDPs was 84.32% and the survival rate was 92.7% after two years, according to a recent study by Malmstrom and colleagues.[13] This suggests that this alternative is a good, conservative, and economical treatment choice.[12] In this case, FRC pontic was fabricated extraorally which has helped to overcome the increased chairside time necessary for this procedure. Few other cases of diastema management done with FRC bridges have been reported in literature.[13,14]

The use of silicone putty index on upper arch facilitated reconstruction of the tooth structure by serving as a guide.[15] The selected treatment option was non- invasive and economical using composite resins. This conservative technique takes less time because it is a chairside procedure. One of the largest breakthroughs in dentistry for many dentists working on anterior composite builds is the use of silicone index. The palatal silicone index is a wax-up impression that transfers necessary information into the mouth during treatments.[10]

There are not many FRC bridge cases in the literature. Despite being recommended as an interim fix, studies indicate that this kind of treatment can last up to five years.[12] After a year of follow-up; the current case was determined to be stable. The authors predict several more years of successful retention based on the satisfactory performance of this form of restoration for more than a year. Additional research is required to assess the long-term viability of FRC bridges.

CONCLUSION

Resin-based composite restorations are single-visit procedures. The creation of a stratified restoration in the mouth with the same form as a previous wax-up is possible with the putty index. Also, the FRC resin pontic technique is an innovative solution for large diastema closures. The promising results of this technique also make it a definitive restorative treatment option since it is effective and minimally invasive.

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The authors deny any conflicts of interest related to this study.

Author contribution

All authors have contributed significantly to this manuscript, and all authors are in agreement with the manuscript.

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