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## Case Report

# Rehabilitation of the patient with ceramic laminate veneers having midline diastema and rotated maxillary central incisors associated with highly attached maxillary labial frenum- A case report

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## ABSTRACT

IPS Emax is a lithium disilicate glass ceramic that has excellent translucency, longevity, durability and strength for all restorations. It is a unique system that fulfills all of your patient demands for minimally invasive dentistry. It is a choice for single anterior/posterior crowns, as it truly mimics the light refraction and natural translucency necessary for outstanding esthetic appearance. Maxillary midline diastema with associated rotation of maxillary incisors presents a very challenging situation for dentist to meet the esthetic requirements. The presence of highly attached labial frenum in such patients adds to the complexity of the outcome of the treatment. Labial frenectomy done with the Laser presents a very quick and early satisfactory healing with no postoperative patient discomfort. Presenting a one such case report of rehabilitation of maxillary midline diastema with the IPS Emax ceramic laminate veneers.

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## 1. Introduction

The success of any case is determined by a proper diagnosis of the underlying etiology and treatment planning. Management of large anterior interdental spaces requires a thorough treatment planning and often, a multidisciplinary approach is essential for patient aesthetics in order to achieve long-term stable clinical results.<sup>1</sup> Soft tissues play a vital role in creating a harmonious and aesthetic result between the restorations, hard tissues and neighbouring gingiva. Hence crown lengthening and frenectomy are required for creating an ideal soft tissue form and contour corresponding to the tooth. Maxillary midline diastema (MMD) associated with high frenum attachment is one of the most common clinical entity we encounter in day to day clinical dental practice.<sup>2</sup> The etiology of the MMD needs to be clearly understood before starting

clinical treatment. High labial frenum attachment is the one of the causative factor of MMD.<sup>3</sup> Recently, Lasers have very wide range of applications in dentistry both for soft tissues and hard tissues. Frenectomy done with the lasers have incredible fast healing and tremendous patient's postoperative comfort. In the above case the frenectomy was done with the laser and after satisfactory healing the restorative procedure of closing the diastema with IPS Emax ceramic laminate veneers was done.

## 2. Case Report

The above case reported to our institute with the complaint of maxillary midline diastema and unaesthetic appearance. Intraoral findings presented with the highly attached thick maxillary labial frenum with diastema of 3 mm in the midline with slightly mesially rotated both the maxillary central incisors having healthy marginal gingival and no underlying pathology (Figures 1 and 2). The interdental

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spacings were noted. The probing depth of 2 mm was noted with no gingival recession. The overjet and overbite was 3–4 mm. There was no evident history related to maxillary midline diastema.



**Fig. 1:** Preoperative view



**Fig. 2:** Preoperative diagnostic mounting showing high frenum attachment

The treatment options given to the patient were orthodontic closure of space, direct restoration by composite resin, and porcelain laminate veneers (PLV). The patient opted for the Porcelain laminate veneers due to its conservative approach and short duration. Patient advised to go for maxillary frenectomy as the frenum was highly

attached which may be one of the cause of midline diastema. The patient was little apprehensive of the minor surgical procedure but when suggested of Laser frenectomy which will be painless and had good postoperative healing, he opted for frenectomy.

The treatment plan was then finalized with:

1. Maxillary labial frenectomy with Laser.
2. Then restoring the maxillary centrals and lateral incisors with IPS Emax ceramic veneers.

Informed consent was taken prior to treatment that explained the benefits, drawbacks, and complications associated with the treatment.

The diagnostic impressions were made using irreversible hydrocolloid (Tropicalgin:Zhermack) and poured with Type III dental stone (Kalstone:Kalabhaikal), and the study casts were retrieved for treatment planning. One set of study casts was used for the diagnostic wax-up (Renfert:Germany) of the maxillary central incisors (Figure 3 and in the second set of study casts mock preparations of the maxillary central incisors.



**Fig. 3:** Diagnostic wax up

Shade selection was done using VITA Toothguide 3D-MASTER. Provisional veneers were fabricated intraorally using bis-acrylic composite (Protemp 4, 3M ESPE), which helped the patient to visualize a trial veneers smile before the preparations were started. The patient was satisfied with the trial run (Figure 4).

The Frenectomy was done immediately on that day after the trial veneers were cemented. All the fibres in the maxillary labial frenum were resected thoroughly with laser at 980 nm diode laser with MER-G15 dental laser (PIOON) (Figure 4). There was almost negligible postoperative discomfort and bleeding for the patient after laser frenectomy. The patient was then recalled after 1 week to see the postoperative healing.



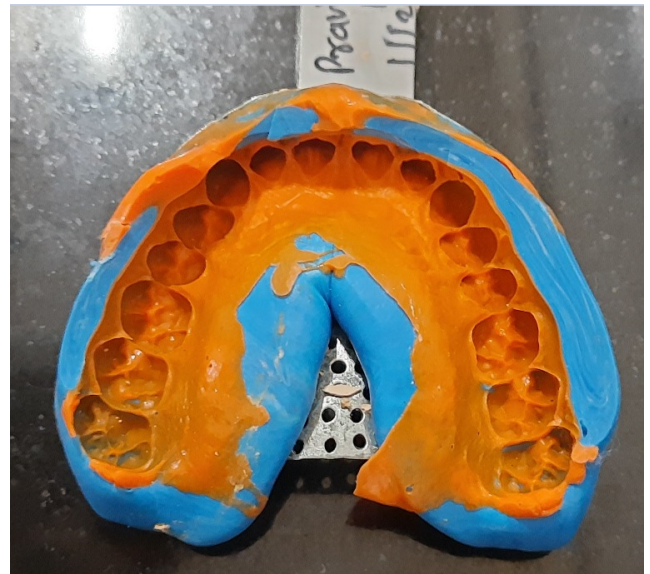


**Fig. 4:** Frenectomy done with Laser and Temporary veneers placed

After 1 week the healing was satisfactory with no patient discomfort (Figure 5). The final preparation were then started for the laminate veneers on 11,21,31,32 with slightly more reduction on distal half of 11 and 21 as they are slightly mesially rotated in order to achieve the proper alignment with respect to 12 and 32 (Figure 6). Preparation design involved the incisal overlap to end on palatal butt joint. The preparation was then evaluated with the putty index. The shade selection was done with 3D Vita master shade guide. The prepared tooth were isolated and the gingival retraction was done with retraction cord of 00 thickness (Ultrapack:Ultradent-US). The final impression was then made with addition silicone impression material (putty and light body) (Aquasil:Densply-US) (Figure 7). The temporary veneers were fabricated introrally with the putty index using Protemp tooth colored composite resin material with the similar shade of adjacent teeth. The temporary resin veneers were then checked for any heavy contacts in centric occlusion and no contacts in lateral excursions. It was then finished and polished. The patient was happy with overall esthetic outcome of temporary resin veneers.



**Fig. 5:** Healed frenum after 1 week



**Fig. 6:** Final impression



**Fig. 7:** Final preparation for veneers

Try in of the IPS Emax ceramic veneers were done using the try in transparent gel and was evaluated for the overall contour, size and shape, the adjacent contacts and fit, palatal smooth finish line shade change and any shade change with tryin gel(Callibra:Densply Sirona). The patients consent was taken with respect to size and shape and shade of the ceramic veneers. The cementation of veneers was then started with the 11 and 21 first and the 21 and 22 respectively. The adjacent teeth were isolated with Teflon tape tp protect from the etchant. The luting resin cement (Callibra light cure clear veneer: Densply Sirona) was used to cement the ceramic veneers. The excess cement was removed thoroughly removed in and around the veneers and from the gingival sulcus. The patient was satisfied and content with the overall esthetics and shade of the IPS Emax ceramic veneers (Figure 8).



**Fig. 8:** Final smile pic

### 3. Discussion

Maxillary midline diastema, mild rotation, spacing in the anterior teeth esthetic zone are common esthetic concerns among adults. MMD is common amongst most patients, so to determine the etiologic factors is crucial.<sup>1–3</sup> Various factors included are mostly high labial frenum attachment, tooth size or shape discrepancy, congenitally missing lateral incisors. While a great majority of diastemas close after the eruption of maxillary canines, patients with diastemas greater than 2 mm and generalized spacing are at risk of not closing with normal development.<sup>3,4</sup> The pretreatment relationship between a clinically "abnormal"-appearing maxillary midline frenum and a midline diastema showed a strong, but not absolute, correlation. A certain percentage of patients demonstrated a diastema but not an abnormal frenum or no diastema but an abnormal frenum.<sup>4</sup> A persistent frenum was also described as an etiologic factor for reopening of a diastema following orthodontic treatment, but the causative role of the frenum for this recurrence remains controversial.<sup>5</sup> Diastema, recently considered a malocclusion, has been described as a space equal to or greater than 0.5 mm interdentally and present in most cases between the anterior teeth in the maxilla more than the mandible.<sup>6</sup> Several treatment options employed to close the midline diastemas due to tooth-size discrepancy include direct restorations using composite resins, indirect restorations such as PLV, full contour porcelain crowns, and orthodontic treatment. This case presented with 3 mm of midline diastema with mild mesial rotation of central incisors which was rehabilitated with the IPS Emax ceramic laminate veneers on 11, 12, 21 and 22 with the incisal overlap design.

Frenectomy involves the complete removal of the frenulum, including its attachments to the underlying alveolar process. Any abnormalities in the size and location of the frenulum can cause functional and esthetic problems which requires surgical excision.<sup>7</sup> It can be performed using various surgical techniques such as the V-shaped

incision and its modifications, the Z-plasty incision, and the use of lasers.<sup>8</sup> The most common location for the development of frenum abnormalities are maxillary and mandibular central incisors and canine and premolar areas.<sup>9</sup> With the CO<sub>2</sub> laser, many advantages have been described, such as minimal bleeding, no need for sutures, minimal swelling and discomfort following intervention, and less scarring.<sup>9–11</sup> Various lasers such as Nd:YAG, CO<sub>2</sub>, and Er: YAG had been used for frenectomy procedures. In this case, Nd:YAG laser has been used because of its ability to penetrate deep into the tissue which makes this laser ideal for soft-tissue procedures such as frenectomy, gingival curettage, and depigmentation.<sup>12,13</sup> The incision was carried out with diode laser at a wavelength of 940 nm and the frenum mucosa and the deep tissue constitute of connective fiber and muscle fiber were dissected and removed. Butchibabu et al. who suggested that laser-assisted frenectomies result in greater patient acceptance due to reduced pain perception during the procedure and during the postoperative periods.<sup>13</sup> Decreased pain perception may be attributed to coagulation of protein at the wound surface which acts as a biological dressing, thus sealing the ends of the sensory nerves.<sup>14</sup>

Progress in adhesive material technologies has made possible a variety of more conservative indirect restoration techniques.<sup>15</sup> Ceramic laminate veneers represent a more popular treatment method for many esthetic dental problems, such as diastema closure, due to their high esthetic properties, superior color stability, biocompatibility, documented clinical performance, and good mechanical properties than direct resin composite restoration.<sup>16</sup> IPS E-max remains one of the most studied and tested lithium disilicate materials in the dental industry as it combines the biocompatibility, longevity, and good esthetic results.<sup>17</sup> IPS e.max restorations are either milled from a pre-manufactured block or pressed from a pre-manufactured ingot. We have used pressable IPS Emax ceramic veneers in this case. The IPS E-max press technique that utilizes heat-process in which the Lithium Disilicate ingots are subjected to hot-pressing by means of pneumatic ram inside the porcelain furnace to press ceramic bars into the molds.<sup>18</sup>

In this case, the treatment options given to the patient were orthodontic closure of space, direct restoration by composite resin, and porcelain laminate veneers (PLV). The patient opted for the Porcelain laminate veneers due to its conservative approach and short duration. The challenges in this case were the mesial rotation of both the central incisors which led to more preparation on distal half of labial surface of central incisors to make up for the proper alignment of veneers. More bulk of veneers were present on the distal surfaces of central incisors. The existing clinical situation majorly influence the type of veneer design, the existing condition of the incisal edge and its translucency, the type of extension of the restoration to be made and the



stress distribution expected at the veneer tooth interface.<sup>19</sup> In this case the design preparation included the incisal overlap as there was a need to correct both the alignment and diastema. Although Meijering<sup>20</sup> found no difference between coverage and no incisal coverage, greater survival rate for incisal coverage (almost 96%) was noticed by Smales<sup>19</sup> compared with no incisal coverage (85%).

#### 4. Conclusion

The success and long-term survival of porcelain laminate veneers depends upon several key factors which include careful case selection, comprehensive treatment planning, design of preparations, proper material selection, suitable techniques, and a skilled ceramic technician. Various treatment options, such as composite restoration, Porcelain Laminate Veneer, full-contour porcelain crowns, and orthodontic treatment, have been used in the literature to treat midline diastemas. In this case Lithium Disilicate IPS E-max ceramic veneers was considered the best treatment option instead of orthodontic treatment or composite restoration as orthodontic treatment take longer time and composites can get discoloured over a period of time.

#### 5. Source of Funding

None.

#### 6. Conflict of Interest

None.

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