CASE REPORT OPEN ACCESS | PEER REVIEWED

Utilization of minimally invasive principles in restoring congenitally malformed teeth

Julia J. Ma, Ram M. Vaderhobli

ABSTRACT

Introduction: Congenital agenesis of incisors often results in compromised dental and facial esthetics that require clinical application of minimally invasive dental procedures. Case Report: The aim of this clinical case report is to discuss a combination of treatment approaches to esthetically restore congenitally malformed maxillary lateral teeth, also known as peg-shaped lateral incisors. A 24-year-old female patient presents with a chief complaint of "sharp-looking and small" bilateral maxillary lateral teeth. The case began with diagnostic models and wax-ups, followed by soft and hard tissue crown lengthening, veneer preparations with ultra-fine finish lines, and final restorations with indirect porcelain ceramic veneers. Conclusion: Esthetic results were achieved with a comprehensive approach utilizing principles of minimally invasive dental procedures. Patient satisfaction in clinical outcomes was achieved by addressing patient's opinions and concerns at all stages of the treatment.

Keywords: Anodontia therapy, Dental veneers, Esthetics

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INTRODUCTION

The high demand for an esthetic smile has propelled the use of minimally invasive dental procedures and advanced technology. This leads to creating a smile that can closely mimic that of natural teeth. This article presents a case report where both function and esthetics of peg shaped maxillary lateral teeth were restored by recontouring the gingival zenith using both soft and hard tissue crown lengthening procedures and restoring with conservative indirect porcelain veneers.

CASE REPORT

A 24-year-old female patient presents with a chief complaint of "sharp-looking and small" bilateral maxillary lateral teeth on mesial, distal, coronal, and incisal surfaces. Patient had good oral hygiene, no remarkable findings from the extraoral and intraoral examination, no signs of temporomandibular joint diseases, no reported or clinical symptoms of parafunctional habits, no existing dental diseases, and no history of periodontal or oral

surgery other than third molar extractions. Periodontal charting was completed and tooth #7 (upper right lateral incisor) facial measurement revealed 4 mm in depth, otherwise no pockets were clinically noted. Patient has completed invisalign treatment and planned to complete porcelain ceramic veneers for the peg-shaped lateral teeth prior to fabricating permanent orthodontic retainers as shown in Figure 1.

Diagnostic approach and treatment planning

Patient had a facial symmetry and a favorable overjet and overbite. There was minimal wear on incisal edges of the anterior teeth. Patient had a thick biotype of attached gingiva with lack of clinical crown exposure at tooth #7 site, but otherwise ideal gingival architecture on anterior teeth. Risks, benefits, alternatives, and costs were discussed with the patient and patient was very motivated to begin treatment of tooth #7 and tooth #10 (upper left lateral incisors) to improve her smile. Periapical radiographs revealed no lesions as shown in Figure 2. Treatment plan consisted of recontouring the gingival zenith for tooth #7 to match that of tooth #10, and preparations for porcelain veneers.

Diagnostic models and wax-ups

Maxillary and mandibular full arch alginate impressions with bite registration were taken to fabricate models of the patient's existing dentition and mounted on a semi-adjustable articulator for wax-ups as shown in Figure 3. Wax-ups were completed on #7 and #10, using #10 gingival zenith as the reference for #7 as shown in Figure 4.

Periodontal treatment

As per surgical treatment protocol, gingival recontouring was performed using a soft tissue laser (DC laser 980 nm, DC International, Florida) to remove 2mm of excess gingival tissue at #7 site at 2W continuous pulse utilizing all safety precautions according to the Academy of Laser Dentistry. At the two-week post-operative visit, evaluation of tooth #7 site revealed that crown elongation utilizing hard tissue crown lengthening technique would create a more esthetic outcome for the gingival contour to match that of #10. Bone sounding was completed around #7, which revealed that the existing biologic width was 2mm.

The ideal clinical crown length for #7 was marked on the cast and an Essix of the marked cast was fabricated to use as a guide during the crown lengthening procedure. During the surgical procedure a full thickness envelope flap with no vertical-releasing incisions was reflected. The Essix was used to mark the desired clinical crown height of tooth #7, as indicated by the yellow line in Figure 5. To reestablish the patient's biologic width on tooth #7, 4 mm of alveolar crestal bone around the facial aspect of #7 had to be removed apical to the yellow line, as indicated by the green line in Figure 5. With the removal of 4 mm of bone, the most apical portion of the buccal crestal bone happens to be at the level of the buccal cemento-enamel junctions of teeth #6 and #8. A periodontal probe was placed horizontally from #6 to #8 and the depicted green line shows that this was used as a reference for the removal of bone at #7 site. Utilizing this reference

Figure 1: Intraoral photo depicting bilateral peg-shaped maxillary lateral teeth.

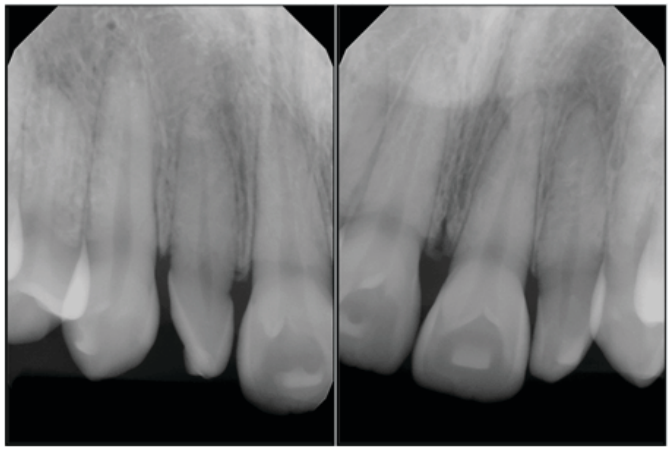

Figure 2: Periapical radiographs of peg-shaped lateral teeth.

Figure 3: Diagnostic models of the maxillary and mandibular arches.

technique, the bone around #7 was recontoured and scalloped to maintain the positive boney architecture. Patient returned after six-week post op and second stage gingivectomy was completed with the same diode laser using similar settings as done previously. This was then followed by a scalpel to scallop and recontour tooth #7 facial gingiva at the same visit as preparing the teeth for veneers, as shown in Figure 6.

Veneer preparation

Prior to preparing the maxillary lateral teeth for veneers, occlusion was marked to confirm that both lateral teeth naturally occluded with the mandibular anterior teeth. Ultra-fine finish lines (0.2 mm) were completed on the facial aspect of the maxillary lateral teeth and provisional veneers were fabricated for the patient to wear for two weeks to confirm patient satisfaction with the size and shape of the mock up veneers, while the gingiva at tooth #7 site continued to heal as depicted in Figure 7.

Final impressions

Patient wore provisional veneers for two weeks and was satisfied with esthetics and function as shown in Figure 8. She returned four weeks after placement of provisional veneers for reevaluation of the gingival health and to confirm that she was ready for final impressions. Upon confirming a smooth surface on the prepared teeth, a thin retraction cord size 000 (Ultrapak, Ultradent, UT) was positioned into the sulcus of the maxillary lateral teeth, and a second retraction cord size 00 was placed on top for better visualization of the veneer finish lines. Retraction cords were soaked with a hemostatic agent aluminum chloride. Comprecap (Coltene, Switzerland) was used for retraction cord retention and tooth isolation. A full arch impression utilizing Polyvinyl Siloxane (3M, Minnesota) heavy and light body material was taken in a medium stock tray. Mandibular alginate impressions were taken to fabricate a model for articulation and all materials including a blue mousse bite registration were sent to the laboratory for final processing.

Figure 4: Completed wax-up of the maxillary teeth used as a surgical template.

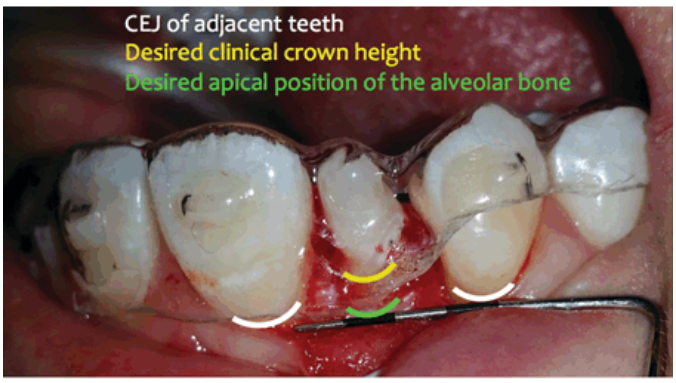

Figure 5: Essix appliance used as a surgical index to assist with desired clinical crown height.

Figure 6: Scalloping and recontouring the gingiva at #7 site after preparing #7 and #10 for veneers.

Figure 7: Healing stage of the gingiva after both soft and hard tissue contouring with provisional veneers in place.

Figure 8: Provisional veneers during the healing phase.

Evaluation of the veneers

The lithium disilicate veneer restorations were returned and evaluated on the die and casts for their margins, contacts, and occlusion. The veneers were tried intraorally, and an explorer was used to evaluate the margins. No plus, sub, or open margins were detected clinically. Patient was satisfied with the shade and shape of the veneers.

Veneer cementation

Multilink Automix resin (Ivoclar, Buffalo) cement in a transparent shade was selected for cementation. The steps for cementation followed the protocol for cementing lithium disilicate all-ceramic restorations as recommended by the manufacturer. The bonding surface of the veneers were cleaned with Ivoclean for 20 seconds using a microbrush, then thoroughly rinsed with water spray and dried with an air syringe. The restorations were etched with 5% hydrofluoric acid for 20 seconds, rinsed with water spray, and wiped with a moist cotton pellet to remove ceramic dust, then dried with an air syringe. Monobond Plus was applied to the treated bonding surface with a microbrush for 60 seconds and dispersed with a stream of air from an air syringe to reveal frosty appearance. Residual cement and oils on the tooth surfaces were removed with a polishing brush and pumice. The teeth were rinsed with water and dried with an air syringe. Multilink Primer A and B were mixed in a 1:1 ratio and scrubbed on to the prepared tooth surfaces with a microbrush for 30 seconds. The excess were dispersed with air from an air syringe until no longer visible. A thin layer of Multilink Automix luting cement was dispensed onto the veneers and veneers were seated onto the prepared teeth with firm pressure. The excess luting materials were rapidly removed with a microbrush, floss, explorer, and periodontal scaler from the teeth. Firm pressure and thorough cleaning around the margins of the restorations were continued for three minutes, then light cured for 20 seconds on all surfaces. Excess cement was removed and contacts flossed to reveal optimal final esthetics to the patient's satisfaction as shown in Figure 9.

DISCUSSION

A functional and successful restorative treatment was achieved by matching patient's expectations with clinical outcomes. This began with understanding patients' perspectives on facial evaluation. A systematic review by Del Monte et al., found that the face is the most important anatomic region that determines a person's attractiveness; and following the role of the eyes, dental appearance is the second most important feature for facial attractiveness [1]. From a patient's perspective, the esthetic smile probably stems initially from the nature of teeth [2]. However, from a dental provider's perspective, there is both a facial and a dental component consisting of not only the golden proportions of teeth, but also the gingiva and the lip support [3, 4]. In this case, patient was not concerned about establishing an ideal dental smile with golden proportions in dentistry, but rather, having two maxillary lateral teeth recontoured so that the teeth filled the spaces naturally with no sharp cusps. This was also consistent with a study by Pini et al., where they found that when recreating smiles for patients with lateral incisor agenesis, many of the smiles are pleasing but not necessarily exhibiting the golden proportions [5].

Figure 9: Final veneers cemented in place.

There are many factors that can come into play when patients evaluate their own facial attractiveness, especially maxillary anterior teeth [6]. A study by Žagar investigated how a few esthetic dental and facial measurements may correlate with the variability of patients' ratings of their satisfaction with maxillary anterior teeth appearance [7]. Some of the dental factors that can be an important aspect of facial attractiveness include tooth color, position, shape, size, gingival morphology, upper lip height, maxillary incisal display at rest and at smile, and intercommissural width at rest and at smile [8]. Thus, with a multitude of factors that can contribute to an esthetic smile, it is always challenging in creating the ideal smile as perceived by the dental patient.

When evaluating the maxillary lateral teeth, studies have shown that these are one of the two groups of teeth that have the highest variability in its size and shape [9]. It has been reported that macrodontia occur more often in men and microdontia occur more often in women, both of which are genetically predetermined [10]. Another study examined pediatric patients and revealed that about 1.7% of the population has peg-shaped lateral incisors [11]. Thus, the peg shape of lateral teeth could present as an esthetic challenge for many patients.

The gingival architecture may also be affected with peg laterals. The gingival zeniths in maxillary central incisors are typically distally displaced, while more centralized in maxillary lateral incisors and canines [12]. When examining solely on maxillary lateral teeth, the average gingival zenith displacement from the bisecting line of the long axis of the tooth is approximately 0.44 mm for women and 0.66 mm for men [7]. Thus, when shaping gingival architecture for peg lateral teeth, the location of the gingival zenith could vary depending on gender and patient's preferences. When treating patients with peg lateral teeth, these additional factors must also be evaluated along with the size, shape, and appearance of the teeth themselves. Changing the gingival architecture

requires either soft or hard tissue periodontal procedures of the gingiva. During the periodontal phase of treatment it would be imperative to maintain the biologic width of teeth to allow for proper healing and gingival health after restorative procedures. Thus, with any crown lengthening procedure, biologic width must be taken into planning when establishing the new clinical crown [13].

CONCLUSION

Treatment planning with an approach to restore not only esthetics, but also function, and biologic health of both hard and soft tissues involved multidisciplinary fields of dentistry. In this case report, in addition to clinical considerations, the patient's opinions and concerns were addressed at all stages of the treatment. This allowed the patient to recognize any limitations, given the timeline and financial allowances, and led to achieving patient satisfaction in clinical outcomes.

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Author Contributions

Julia J. Ma – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Ram M. Vaderhobli – Substantial contributions to conception and design, Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor of Submission

The corresponding author is the guarantor of submission.

Source of Support

None

Consent Statement

Written informed consent was obtained from the patient for publication of this case report.

Conflict of Interest

Authors declare no conflict of interest.