



**ORIGINAL RESEARCH PAPER**

**Dentistry**

**AESTHETIC SPACE MANAGEMENT: A CASE SERIES**

**KEY WORDS:** Aesthetics, Space Management, Excess Space, Pontic Site, Malpositioned Implant, Pink Esthetics, White Esthetics

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**ABSTRACT**

A smile is one of the most critical components of aesthetic rehabilitation. Various anterior rehabilitation cases present in routine clinical practice with excess space, deficient ridge anatomy and malpositioned implant placement, one of the major challenges in any form of aesthetic dentistry is the efficient use of available space, enhancing function and conservation of components that are already available. Taking into consideration these factors we need to optimise treatment modalities, enhance clinical knowledge, balancing the available resources and time so that a scientifically driven yet uncompromised treatment is embarked upon the patient leading to a long term dental and a systemic treatment; uplifting the patients dental health having a positive impact on the patients psychologic and general health.

**INTRODUCTION:**

Uneven spacing or tooth size discrepancy between the anterior teeth is a major aesthetic problem for many patients. Ridge defects possess a major challenge for the restorations in the anterior maxillary esthetic zone. Trauma, improper tooth extraction, advance periodontal diseases or congenital in nature can lead to formation of ridge defects. Seibert in 1983 classified these as, class I: Buccolingual loss of tissue, class II: apicocoronal loss of tissue and class III: combination of buccolingual and apicocoronal loss of tissue.<sup>1</sup> The modified Seibert's classification given by Allen in 1985 depending upon quantification of the amount of tissue lost, where, type A-apicocoronal loss of ridge, type B-buccolingual loss of ridge contour and type C-combined buccolingual and apicocoronal loss of the ridge. The ridge is further described by assessing the depth of the defect: Mild; less than 3 mm; Moderate; 3 to 6 mm; Severe; is greater than 6 mm.<sup>2</sup>

The pontic designs like ridge lap and modified ridge lap were used earlier in the anterior region. Rather than emergence from within the alveolar process they simulated as they rest on the top of the ridge. Black triangles are visible as they lack interdental papillae in the embrasure area between the abutments and the pontics, leading to an unaesthetic restoration and an unsatisfied patient. Ovate pontic is the choice of pontic in the anterior esthetic zone so as get a good emergence profile and help in building up the interdental papilla.<sup>3</sup>

In 1977, Stein and Kuwata<sup>4</sup> were the first to use the term "emergence profile" to describe the contours of tooth and crown as they traversed through soft tissue and rose interproximally towards the contact area and height of contour facially and lingually.<sup>4</sup> An ideal emergence profile is utmost important for maintaining gingival health and developing esthetics. If emergence profile is not established adequately it leads to a protected area that encourages plaque accumulation which is more difficult to clean, leading to marginal inflammation whereas contralateral teeth that have not been restored remain healthy. Formation of emergence profile in the final restoration will help to reduce plaque retentive areas and will thus reduce iatrogenic inflammation. This, in turn, prevents the unsightly dark spaces and triangles in the area near the gums and between the teeth.<sup>5</sup>

lamine veneers (PLVs) are one of the most conservative and aesthetic techniques that can be applied. The longevity of the veneers is good and they are durable, especially if the right indications are in place and the correct techniques are applied (Horn HR, 1983). Conservation of the sound tooth structure is the fundamental concept in any esthetic restorative case.

At the dentine-enamel junction (DEJ), a complex fusion occurs that can be regarded as a fibre-reinforced bond that plays a crucial role where the DEJ meets in terms of the structural strength of the tooth (Lin CP, Douglas WH, Erlandsen SL, 1993). There would be insufficient flexibility in the teeth if preparation is limited to the enamel, (Magne P, Douglas WH, 1997)<sup>6</sup>.

If the preparation line passes through the DEJ margin and enters into dentine, while it won't create a major problem, number of difficulties may occur if one ends up finishing the preparation on large amounts of dentine. This will not only create complex bonding issues on dentine but will also free the 'flexing' factor on the tooth structure (Noack MJ, Roulet J-F, 1987; Van Meerbeek B et al, 1996; Van Meerbeek B et al, 1998).<sup>7</sup>

Some cases have been compromised due to spatial considerations like tooth morphology, specifically tooth size and shape as a result of dental deterioration however In attempting to provide a restorative solution for such cases that, clinicians have traditionally opted for an orthodontic approach that did not provide optimal aesthetics.

With the advent of contemporary aesthetic materials and reparation techniques, clinicians and technicians are now empowered to deliver a penultimate result with minimal compromise to the surrounding dentition.<sup>8</sup> This case report highlights on the clinical and laboratory considerations that must be addressed when providing an esthetic prosthetic restoration with anterior spacing keeping in mind suitable proportion and rendering optimal esthetics.

**Clinical Report:**

Case Report 1: This clinical report describes 4 patients with anterior aesthetic space management concerns that were treated with variations of tooth supported fixed partial denture as treatment modalities due to factors they presented with during the treatment procedure.

When restoring the mouth for improved aesthetics; porcelain

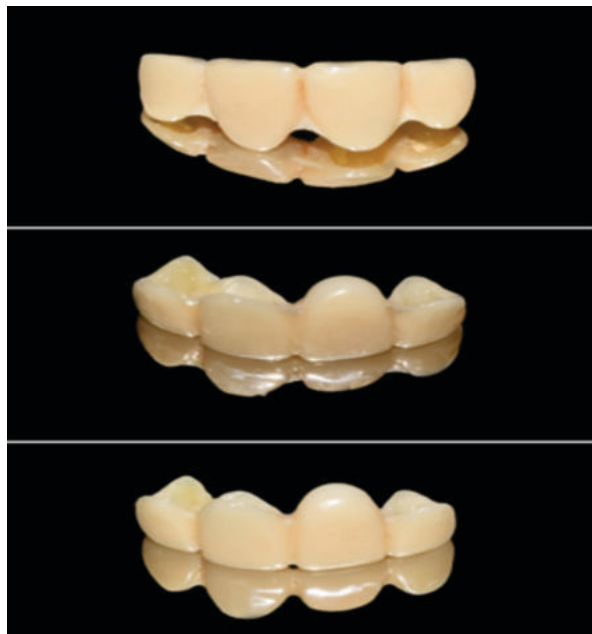


**Fig. 1A:** Pre-operative extraoral view with overcontoured prosthesis

When there is excess space available, we must take look at the clinical scenario presented with, in this case a 34 years old healthy female patient presented with excess spacing seen in the maxillary esthetic zone that crossed the midline asymmetrically with missing maxillary left central incisor and had a long standing history of edentulism.

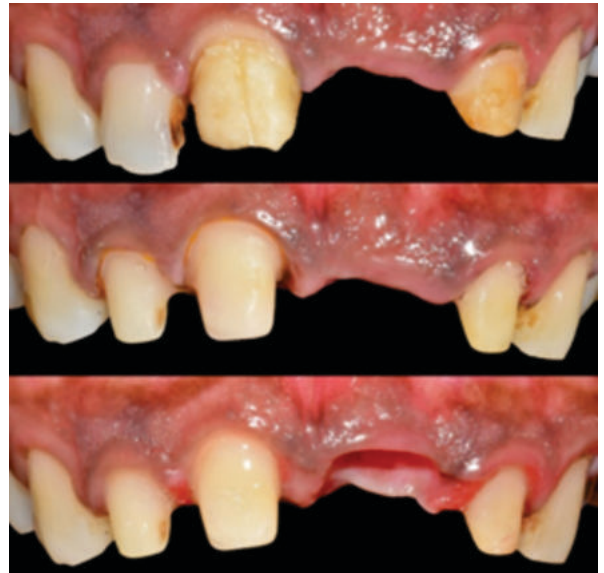


**Fig. 1B:** Broken prosthesis with deep bite



**Fig. 1C:** Autopolymerising acrylic resin temporaries used for development of pontic site

prosthesis replacing the missing maxillary left central incisor (pontic) that was fabricated over the right maxillary central incisor (retainer) and left maxillary lateral incisor (retainer) 2 years back (Fig. 1A). It was noted that the patient had a squarish maxillary arch form with deep bite (Fig. 1B), having a vertical overlap of 5mm and generalised attrition with her mandibular anterior teeth.



**Fig. 1D:** Post removal of existing prosthesis; Tooth preparation; Development of pontic site

On clinical evaluation a treatment plan involving a secondary abutment as the right maxillary lateral incisor was decided after removal of existing prosthesis and tooth preparation was done. To compensate the unesthetic excess spacing present the development of pontic site in relation to the missing central incisor was decided.

Post tooth preparation temporisation was done using auto polymerising acrylic resin maintaining the ovate contour of the pontic tooth at the gingival zenith level of the adjacent right maxillary central incisor. Post 1 week patient was recalled and evaluated after which an incremental addition 0.5mm of auto polymerising acrylic resin was done to the ovate pontic and the temporary prosthesis was recemented. Patient was recalled again post 1 week and another incremental addition of 0.5mm of auto polymerising acrylic resin was done (Fig. 1C), after which the final impression was made on completion of the pontic site (Fig. 1D) and the final prosthesis delivered (Fig. 1E). Due to excellent tissue remodelling no rotary gingival curettage or secondary soft tissue surgery was required in this case.



**Fig. 1E:** Final prosthesis with ovate pontic

She presented with a compromised and over contoured fixed





**Fig. 1F:** Post-operative extraoral view

**Case Report 2:**

On various occasion patient who have a history of trauma present with angular ridge defects, they may range from vertical to horizontal defects or a combination of both. The second patient was a 28 years old healthy male who presented with a severe ridge defect in both



**Fig. 2A:** Pre-operative extraoral view with Andrew's Bridge

horizontal and vertical direction (Siebert's Class III) with missing right maxillary central, lateral and canine due to pan facial trauma. Initially the patient had been prosthetically rehabilitated using a combination type removable prosthesis i.e. Andrew's Bridge, taking maxillary right first premolar and left central incisor as abutments with a bar and clip attachment (Fig 2A). Due to the debilitating condition; esthetic management with the use of secondary abutments, well contoured metal



**Fig. 2B:** maxillary ridge showing Siebert's Class 3 ridge defect with preparation of teeth



**Fig. 2C:** Framework trial and pontic away from tissue surface

framework and a long span splinted prosthesis involving gingival ceramic was decided. Removal of the old prosthesis preceded the tooth preparation of maxillary right second premolar and left central incisor to be used as secondary abutments (Fig. 2B). During the framework trail contour of the pontic area was kept away from the underlying tissue (Fig 2C), that was later contoured to a modified ridge lap pontic design using gingival ceramic.



**Fig. 2D:** Bisque trial with gingival ceramic

After the ceramic layering, approximation of the intaglio surface of the prosthesis was checked in the pontic area and a definitive contact was assured. Gingival ceramic was layered to match the tooth contours and gingival zenith as per esthetics (Fig. 2D). After which the final prosthesis was delivered (Fig. 2E).

**Case Report 3:**

Sometimes the clinical scenario presents with a somewhat compromised situation where the treatment with maximum longevity is to be considered. The third patient was a 28 year



**Fig. 2E:** Cementation of final prosthesis with gingival ceramic to compensate for the defect



**Fig. 2F:** Post-operative extraoral view

old health male who had experienced avulsion with his mandibular left central incisor 4 years ago. He had a constricted arch form in both maxillary and mandibular arches (Fig. 3A) and refused to undergo orthodontic correction for the same. Upon evaluation he was considered for pre-prosthetic surgical phase with the use of muco-graft so as to achieve root coverage in relation to the mandibular right central incisor. But due to the active mandibular labial frenum, the post-surgical results were not satisfactory (Fig. 3B) and considering the radiographic evaluation it was decided to extract the mandibular right central incisor and use the left and right mandibular lateral incisors as abutments for the



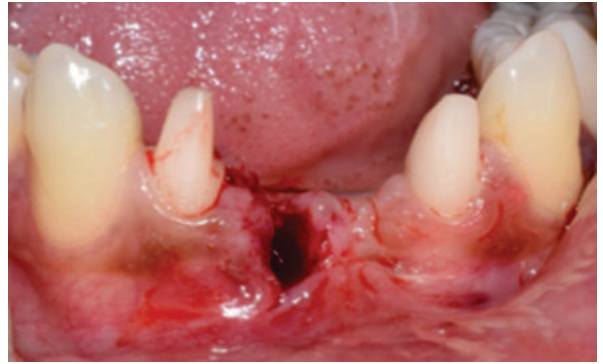
**Fig. 3A:** Pre-operative extraoral view with unesthetic smile



**Fig. 3B:** unsatisfactory root coverage procedure with anterior cross bite

prosthetic rehabilitation. The patient was explained the significance of the treatment and tooth preparation was done after which the central incisor was extracted (Fig. 3C). Temporisation was done and the patient was kept on routine follow-up to check for extraction socket healing. As the

patient presented with a vertical ridge defect (Siebert's Class II) we needed to mask it



**Fig. 3C:** Extraction of central incisor post tooth preparation



**Fig. 3D:** Making the final impression post healing



**Fig. 3E:** Final prosthesis with gingival ceramic

with gingival ceramic to attain the best esthetic outcome for patient's satisfaction. Upon healing of the extraction socket, the final impression was made and the prosthesis was fabricated (Fig. 3D). Bisque trial was done and the shade for gingival ceramic was taken, upon layering it was again checked into the patient's mouth for shade matching after which it was finished and polished. The final prosthesis was bonded on to the surface of the teeth and a balance of pink and white esthetics was achieved (Fig. 3E).



**Fig. 3F:** Post-operative extraoral view



**Case Report 4:**

Due to recent advancements in implant supported fixed prosthesis clinicians readily place implants without meticulous planning which leads to compromised prosthetic situations. Our fourth patient was a 26 years old healthy male patient who had undergone implant placement in the left maxillary lateral incisor region 10 years ago and had an esthetically compromised prosthetic rehabilitation (Fig. 4A). On examination the patient had a labially placed implant with excess spacing available which could not be managed with adjacent teeth alone, the previous faulty prosthesis had been splinted to the natural tooth leading to an occlusal deficit in turn causing a periapical lesion in the natural tooth (Fig 4B). We began the treatment by removal of the splinted prosthesis over the natural tooth to provide access for the endodontic treatment to be initiated (Fig. 4C). After the regression of the endodontic lesion the patient was evaluated for the prosthetic phase.



**Fig. 4A:** Pre-operative extraoral view with compromised esthetics



**Fig. 4B:** Pre-operative intraoral view with compromised esthetics

He was planned for full coverage veneers over maxillary left central incisor (endodontically treated) and the implant abutment in the maxillary left lateral incisor region. The anterior segment was planned for rehabilitation from maxillary right canine to left canine with partial coverage veneers that would mask the excessive



**Fig. 4C:** After removal of existing prosthesis, root canal

treated central incisor and malpositioned implant abutment in position of lateral incisor



**Fig. 4D:** Aesthetic pre-evaluative temporaries



**Fig. 4E:** Tooth preparation as per treatment plan

space and generalised spacing present in the maxillary anterior teeth region. A wax-up of the desired tooth proportions was done considering the treatment plan and a trial approval of the patient following the Aesthetic pre-evaluative temporaries was taken (Fig. 4D). Tooth preparation was carried out as per the treatment plan after a base shade selection and temporisation was done (Fig. 4E). Bisque trial was carried out for the final corrections, characterisation of the prosthesis was done and then they were finished and polished. The full coverage



**Fig. 4F:** Bonded final prosthesis in place



**Fig. 4G:** Post-operative extraoral view

crowns were bonded over the maxillary left central incisor

and the implant abutment in the maxillary left lateral incisor region and the rest of the partial coverage veneers were bonded using dual cure resin cement over the rest of the teeth (Fig. 4F)

**DISCUSSION:**

A treatment plan is necessary as an aid in communicating to the patient what is planned off the treatment. A diagnostic wax- up is an initial visualization tool useful in representing the desired final outcome of the treatment. The wax-up model can be used as a guide to communicate with the patient. The diagnostic wax-up was used to explain how a proportional balance of dental and gingival tissues influences the beauty in facial hard and soft tissue, especially the perception of tooth size that can result in an unpleasing smile when excessive gingival tissue is displayed.

The “golden proportion” is one of the most popular dental proportion theories in maxillary anterior teeth restoration. It is based on the relationship between natural beauty and mathematics. Based on this proportion, from the frontal view, the maxillary lateral incisor should be approximately 62% of the width of the maxillary central incisor, and the width of the maxillary canine should be approximately 62% of the width of the respective lateral incisor. The golden proportion is preferred in order to achieve an esthetic smile in the case of long maxillary central incisors. On the other hand, Ufuk and colleagues (2005) found that there was no statistical significance in the golden ratio or any other continuous proportion for the anterior teeth in the population.<sup>15</sup> This was in agreement with Mahshid and colleagues (2004)<sup>9</sup>, who reported that the golden proportion was not observed in all esthetic smiles.

Maintenance of the biological width of approximately 2mm is important. Violating the biological zone will result in gingival inflammation, pocket formation and eventually alveolar bone loss. Maintaining a 3-mm distance from the marginal gingiva to the alveolar bone crest is highly recommended to ensure an adequate biologic width when placing the restoration 0.5 mm under the gingival margin soft tissue can mature within about 7 weeks whereas the hard tissue can take up to 6 months.

In the 1<sup>st</sup> case report, an ovate pontic was used to mimic the emergence profile of a natural tooth. The advantage of ovate pontic is to achieve maximum esthetics along with positive tissue contact, sufficient facio-lingual width and apico-coronal thickness are required for housing the ovate pontic hence autopolymerising resin was added in increments of 0.5mm till pontic site was developed which was added in span of 14 days. No surgical intervention, rotary curettage or gingival modification was done.<sup>10</sup>

In the 2<sup>nd</sup> case report, secondary abutments were used along with modified ridge lap pontic so as to provide a "T" shaped positive tissue contact in the ridge defect area (Siebert's class III). Secondary abutments were used to satisfy the Ante's Law of pericemental area of the teeth we were replacing prosthetically hence a long span fixed partial denture with gingival porcelain was used to cover the ridge defect area. The gingival porcelain was layered in the pontic area and the adjacent retainers so as to maintain the esthetics. The glazed part of the prosthesis was kept in positive tissue contact with the ridge defect area so as to achieve a modified ridge lap contour.<sup>11</sup>

In our 3<sup>rd</sup> case report with the intention of long term prognosis the adjacent central incisor was extracted as more than half of the bone support was lost and it had a compromised periodontal prognosis, as root coverage procedure did not yield satisfactory results due to a hyperactive frenum, hence a decision of extraction of tooth was made. After the healing a spheroidal pontic was delivered to the patient with glass

ceramic extending gingivally to cover up the ridge defect (Siebert's Class II). To maintain the esthetic quotient, gingival porcelain was used in the pontic area of the bonded prosthesis.

In the last case report, generalized anterior spacing with a malpositioned implant prosthesis was managed by prosthesis spanning from canine to canine for the space management. Taking into consideration the various esthetic proportions the minimally invasive veneers approach by Galip Gurel was advocated and a wax-up of the proposed treatment plan was done. Aesthetic pre-evaluative temporaries were fabricated and shown to the patient and on approval the tooth preparation was done, here due to the excess spacing the extent of the prosthesis had to be till the canines to manage an optimum esthetic outcome.<sup>12</sup>

**CONCLUSION:**

The case series presents with different clinical situations where one needs to focus on various aspects of space management. Most of the time we need to work in synchronous with the patients' esthetic demands curtailed with financial constrains to provide the most optimum and satisfying results in terms of function, esthetics, longevity and biomechanics. A thorough scientific knowledge along with sound clinical expertise are required to overcome these multitude of challenging cases presented to achieve the most optimum prosthetic rehabilitation to restore the patients oral, physical and mental health.

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