

Implant Esthetics

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INTRODUCTION

Pre-implant esthetic consideration

In cases of anterior implants in the esthetic zone, certain specific esthetics criteria have to be considered. When esthetics is the prime reason for seeking implant prosthetic treatment, the patient's upper lip line will be of extreme importance for the planning of the definitive

Superstructure. In patients with a high lip line or requiring upper lip support from the prosthesis are movable over denture will more likely fulfill the demands of function and esthetics than an implant borne bridge construction.

The single tooth anterior implant situations are of great concern as the esthetic requirements and expectations have to be properly balanced keeping in mind anticipated post-surgical results. The dentist should analyse anterior single tooth implant situations considering the adjacent teeth, contra-lateral tooth, probable emergence profile and presence or absence of interdental papilla whenever the smile exposes enough of gingival tissues.²

There are many limitations and contra indications specific to the maxillary single tooth implant apart from the routine contra indications associated with implant therapy. The common causes of a missing maxillary tooth are traumatic loss, root fracture, agenesis and periodontal disease. All these leave some deficiency in the facial bone over the root of the missing tooth. Majority of the cases of maxillary single tooth implant in patients with high upper lip line require bone grafting for ideal esthetics while in some cases bone grafting would be necessary to provide adequate healthy peri-implant soft tissue to maintain optimal hygiene in the cervical region. Apart from the inadvertent deficiencies in the facial bone associated with various clinical situations, the soft tissue form also plays a major role in the esthetic outcome of single tooth implants.

In 1989, Misch reported 5 prosthetic options available in implant dentistry. The first three options are fixed prosthesis (FP). The next two options are removable prostheses(RP).

Prosthodontic classification

FP – 1 Fixed Prostheses, replaces only the crown, looks like a natural tooth.

FP – 2 Fixed Prostheses, replaces the crown and a portion of the root; crown contour appears normal in the occlusal half but is elongated or hyper contoured in the gingival half.

FP – 3 Fixed Prostheses; replaces missing crowns and gingival color and portion of the edentulous site; prostheses. Most often uses denture teeth and acrylic gingiva, but may be porcelain to metal.

RP – 4 Removable prostheses; over denture supported completely by implant.

RP – 5 Removable Prostheses; over denture supported by both soft tissue and implant.

Fixed Prostheses

FP – 1 Prosthesis is most often desired in the maxillary anterior region. However the width and / or the height of the crestal bone is frequently lacking, augmentation is often required before implant placement to achieve a natural looking crown in the cervical region because there are no interdental papillae in edentulous ridges, gingivoplasty is required after the abutment is positioned to improve the interproximal gingival contours. Ignoring this step causes open “back” triangular spaces (where papillae should usually be present) when the patient smiles. The bone loss and lack of interdental soft tissue complicates the final esthetic results, especially in the cervical regions of the crowns.

FP-2 fixed prosthesis restores the anatomic crown and a portion of the root of the natural tooth. The volume and topography of the available bone dictate a deficient vertical implant placement compared with the FP-1 prosthesis, which is more apical compared with the cement-enamel junction of a natural root. As a result the incisal edge is in the correct position, but the gingival third of the crown is over extended, usually apical and lingual to the position of the original tooth. If the high lip line during smiling or low lip line during speech are favourable and do not display the cervical regions, the longer teeth are usually of no consequence. FP -2 prosthesis that is not hidden by lip position during smiling or speech can be solved by using a removable soft tissue replacement device.

FP-3 is a fixed restoration that appears to replace the natural teeth crowns and a portion of the soft tissue. As with the FP-2 prosthesis, the original available bone height loss decreased by natural resorption or osteoplasty at the time of implant placement. To place the incisal edge of the teeth in proper position for esthetics, function, lip support and speech, the excessive vertical dimension to be restored required teeth that are unnatural in length. The patient having high maxillary lip line during smiling and low mandibular lip during speech will display the longer teeth which look unnatural. In the FP 3 the restored gingival colour and contour give the teeth a more natural appearance in size and shape and mimic the interdental papilla region. The addition of gingival tone acrylic or porcelain for a more natural appearance is often indicated.

RP-4 It is a removable prosthesis completely supported by implants and or teeth. It may draw the same appearance as an FP-1, FP-2 and FP-3 restorations.

RP -5 It is a removable prosthesis combining implant and soft tissue support. The prosthesis is very similar to traditional over denture.

Factors for favourable implant placement

The physiologic limits within which the implant can be placed are governed by the following. The space between implant and periodontal ligament of the adjacent tooth should be 1.25mm. The average width of periodontal ligament is 0.25mm. These natural periodontal components will require a space of 1.25mm on either side of the implant. Thus, mesio-distally the implant diameter is added to this minimum space required. For a 3.5mm implant placed in the anterior region a sufficient space mesio-distally has to exist to accommodate all related components. Ideally, the ridge should be 5-6mm wide labiolingually, to allow at least 1 mm of the cortical bone labially and lingually. However, to impart esthetics in the interdental papilla region, the distance between an implant and natural teeth is kept 2mm. The implant should be 3mm apical to the gingival margins of the adjacent teeth. Labio-lingual orientation of the implants helps to achieve desired emergence profile. Placing the implant slightly palatally helps the dentist to build up a proper emergence profile to the crown.

To obtain satisfactory peri-implant gingival morphology, tissue volume should be 20-25% more than the estimated need to allow adaptation of gingiva to the prosthetic reconstruction. Wider diameter implant will ease the transition of the implant head to the artificial crown as it emerges from its soft tissue housing. The wider diameter implants will not be required to be placed far apical to the cement-enamel junction of the adjacent tooth. Immediate implants help to preserve the hard and soft tissues, and maintain the emergence profile as in natural teeth.

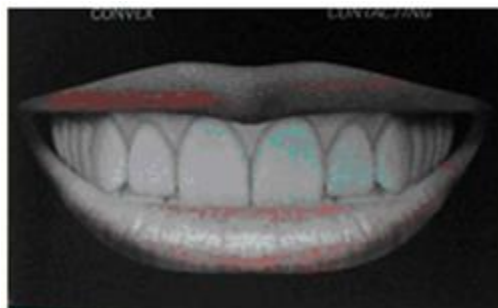


PERIO – ESTHETICS

Esthetic periodontal considerations:

Shape and position of the gingiva:

In an ideal esthetic relationship, the position of the gingival margin is dictated by the vertical limits of the active smile, the gingival margins of the maxillary central incisors and canines positioned at the vermillion border of the upper lip. The gingival margin of the lateral incisors is usually located 1 to 2 mm more incisally or at the same height of the central incisors and canines.



The gingival zenith is distal to the long axis of the tooth for both the maxillary central incisor and canine while it is situated on the long axis of the tooth for the maxillary lateral incisors.³



The horizontal limits as well as the vertical limits of the smile should be evaluated. Most patients show the maxillary teeth with or without the gingiva up to the first molar in an active smile. To provide for proper depth and harmony of the smile, the gingival display should be consistent and proportional from tooth to tooth, from the left first molar to the right first molar.



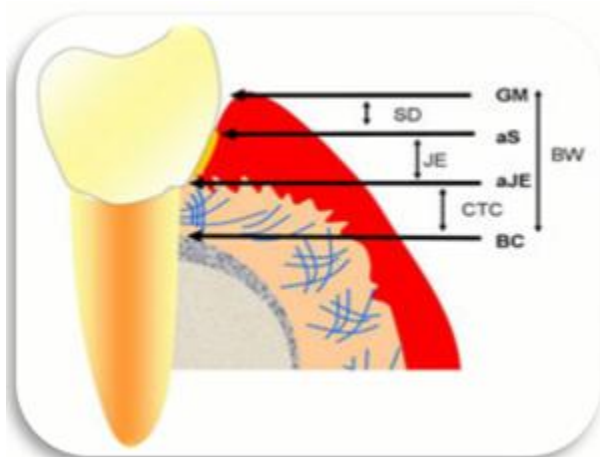
Embrasures

In healthy periodontium the interdental papilla blends into embrasure spaces completely from buccal to lingual which is an important esthetic factor assuring harmony in the dental composition. However, in cases of recession or post-periodontal therapy the embrasures may open up revealing a black triangle.²



Biologic width

It has been demonstrated from autopsy recordings that the mean sulcus depth is 0.69mm, mean length of the junctional epithelium is 0.97mm and connective attachment is 1.07mm; the combined width of the latter two is 2.04 mm and is called the 'biologic width'. This biologic width is always present, therefore restorative margins must maintain a distance from the alveolar crest that respects the biologic width, otherwise gingival recession or pocket formation ensues.^{1,8}



Esthetic periodontal defects and its correction

Periodontal defects posing an esthetic problem.

May include:

- Violations of biologic width
- Gingival asymmetries
- Excessively gingival display
- Localized gingival recessions
- Deficient pontic areas
- Abnormal frena
- Excessive gingival pigmentation
- Inadequate interproximal papilla
- Restorations which are over extended in the cervical region should be carefully removed and proper cleaning of the teeth is recommended with excavation of deep carious lesions in the cervical region. Provisional restorations should then be fabricated with proper contouring in the cervical region. The pockets should be probed and isolated areas of excessive bone loss should be marked and regenerative procedures instituted.⁶

Surgical technique for establishing proper biologic width involves recontouring the osseous crest so that a minimum of 3 mm of the flap can be placed coronal to the position of the recontoured osseous crest. This will take into consideration the average biologic width of 2mm. In accidental tooth fractures or any other clinical situations where the restorative margins may violate the biologic width, bone removal in the adjacent teeth might be necessary to get desired esthetic result.^{6,8}

Gingival asymmetries

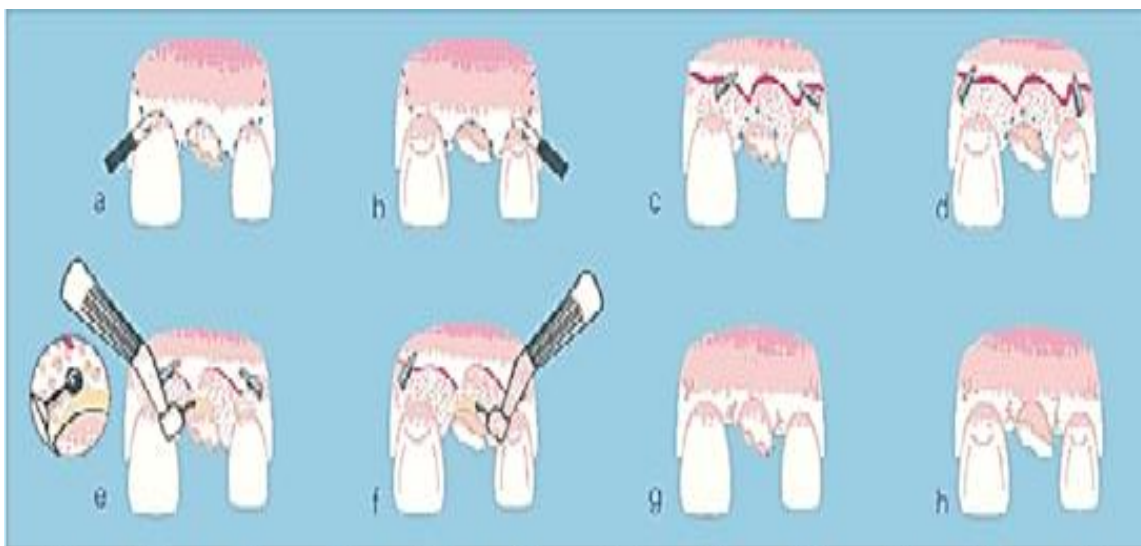
Whenever the facial gingiva of the anterior teeth does not follow a symmetrical pattern, crown length discrepancies are perceived; some teeth appear longer while others appear shorter. Correcting these discrepancies to an esthetic gingival pattern becomes the main goal of the esthetic or restorative dentist.

The possible causes of gingival asymmetries are :

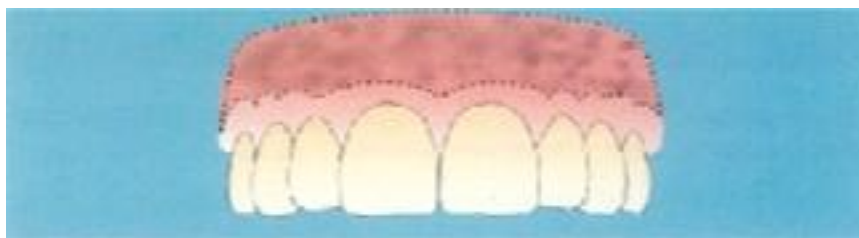
- Gingival hyperplasia
- Altered passive eruption
- Tooth or teeth malpositioning
- Overzealous tooth brushing
- Periodontal disease

Esthetic crown lengthening

When a disparity in the clinical crown length exists between contra lateral teeth resulting in a left/right side height discrepancy, esthetic surgical correction can be provided to enhance the cosmetic result before restorative measures.^{1,2}



In such cases 'esthetic crown lengthening' may be carried out by performing Gingivectomy and or osseous resection only on the facial aspect, for better esthetics. Root exposure is often a common complication and intentional root canal or post-surgical treatment with veneers or crowns may be required.^{4,5}



Excessive gingival display (gummy smile)

A gingival display of more than 3mm in active or moderate smile may be termed "gummy". Excessive gingival display or gummy smile can be caused by any of three factors.

The causes include:

- Maxillary over growth
- Tooth malposition

Delayed apical migration of the gingival margin or altered passive eruption. Crown lengthening procedures can correct the latter two defects. Usually a surgical and orthodontic correction may be needed in these cases.

Abnormal frenal treatment

For diastema closure. A resection (frenectomy) or a repositioning (frenotomy) may be necessary. Whenever there is excessive pressure caused by the frenum, then a frenectomy may be the best procedure, however when esthetics is the only factor then a frenotomy may be necessary to give the desired result.³

Excessive gingival pigmentation

Gingival pigmentation is due to the deposition of melanin pigments in the basal layer of the mucosa. In mammals it is brown, black or blue black. The saturation of these pigments causes an unesthetic dark or gingival display. In people with fair skin and high lip lines. The pigmentation usually occurs in diffuse patches; sometimes a continuous area is seen.

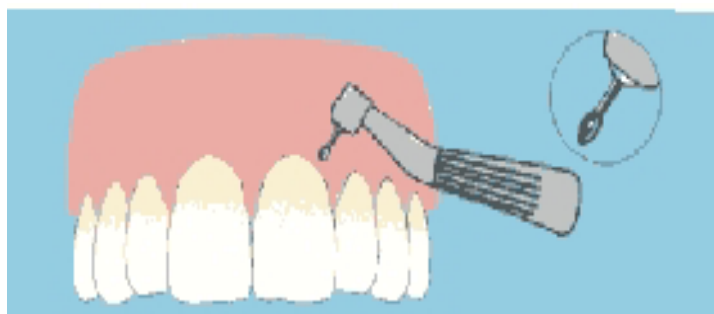


The surgery can be performed under local anesthesia with the following techniques:

- Gingivo-abrasion technique
- Split thickness epithelial excision
- Combination technique which involves gingivo-abrasion and split thickness epithelial excision.

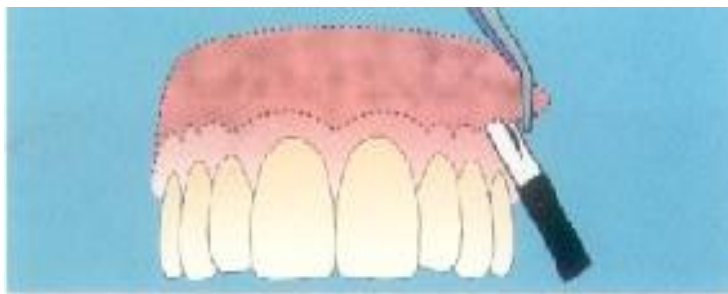
Gingivo-abrasion technique:

A medium grit football shaped diamond bur is used at high speeds on the epithelium to denude it. Care should be taken not to abrade the periosteum. A periodontal pack is placed over the denuded epithelium.



Split thickness epithelial excision technique

A split thickness island of epithelium is removed on the attached part of the mucosa. A periodontal pack is then placed and left for a week.



Combination technique:

In cases where pigments are present very close to the marginal gingiva and where the gingival pattern as areas of depression and elevations on the facial aspect, a combination technique is advised. Gingivo-abrasion is used near the marginal gingiva and areas where a split excision of difficult.

Open inter proximal spaces:

The interdental gingiva occupies the gingival embrasure which is the interproximal space beneath the area of tooth contact. The shape of the gingival in a given interdental space depends on the contact point between the two adjacent teeth and the presence or absence of some degree of recession. Open inter-proximal space may be caused due to diverging roots, abnormal clinical crownshape and absence of inter proximal papilla. The first two can be corrected orthodontically and by the reshaping of the clinical crown respectively. While the last is the most difficult to manage, because currently there are no predictable methods to regenerate the inter-proximal papilla.

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