Korean Academy of Esthetic Dentistry

Laser-assisted Flapless Esthetic Crown Lengthening Procedure : 3 Zones of concern

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Introduction

There is a growing interest in dental esthetic and increasing numbers of patients are visiting dental office seeking for improvement of smile esthetics.[1]

Excess gingival display, commonly described as the "gummy smile", is a descriptive term rather than a diagnosis, which would mandate the initiation of a specific therapy[2].

Various reasons causing excessive gingival display were explained in the literatures.[2,3] Short or hyperactive maxillary lip, altered passive eruption, dentoalveolar extrusion, vertical maxillary excess or combination of above could lead to excessive gingival display.

Many surgical techniques claiming superiority over another were described in the literatures. But studies evaluating gingival margin levels after healing from crown lengthening surgery have reported coronal gingival proliferation as a consistent finding.[4] Is it because of not enough ostectomy ? Maybe or maybe not!

Also, there is a concern that too much ostectomy could cause gingival recession or tooth hypersensitivity.

In this article, 1) laser-assisted flapless crown lengthening procedure focusing on 3 zones is described. 2) how to avoid the unwanted healing process such as gingival recession, hypersensitivity and relapse is discussed.

Relapse

Fig. 1. Relapse after 5 years

Fig. 2. Initial picture

Fig. 3. After crown lengthening

Fig. 4. 3 weeks after crown lengthening. Coronal migration of gingival is observed especially around the line-angle zone.

The patient in fig 1 had esthetic crown lengthening 5 years ago. The picture shows definite relapse showing cervical areas of #11, 21 are covered by gingiva.

Why did this happen? Wennstrom showed that tooth position affect the thickness of facial gingiva and also thickness and height of gingiva has 1/1.5 ratio[7]. Palatally positioned tooth has thick facial gingiva which in return lead to high gingiva during long healing process – "relapse"

Nozawa examined the cast of the patients and measured the thickness of facial gingiva and found that interdental gingival point critically affect the apical position of mid-buccal gingiva height.[9] By thickening the interdental gingival tissue thickness without grafting mid-buccal zone, he achieved the coronal migration of mid-buccal gingiva.

When crown lengthening is performed, diagnosis and surgical procedure should be done and evaluated not only in frontal view but also in occlusal view in order to achieve adequate facial tissue thickness. It should be not too thin, nor not too thick.

Gingival Recession/Cemental Hypersensitivity

Fig. 5,6,7,8. #12 recede more apically than it was planned.

Often times facial free gingival margin recede more apically than it should be at as healing process goes. This causes unpleasing smile and unpleasant cemental hypersensitivity for both the patient and the dentist.

Crestal bone loss occur after full-thickness or partial thickness flap elevation which ranges roughly from 0.5mm to 1mm.[5] Therefore in addition to the amount of ostectomy during the crown lengthening procedure, there is uncertain amount of additional bone loss which the dentist doesn't have any control.

Papilla Loss–Black Triangle

One of the most difficult dental soft tissue surgery, if not impossible, is "papilla regeneration" procedure. So, it is highly recommended not to skip every single precaution during and in advance to the crown lengthening surgery.

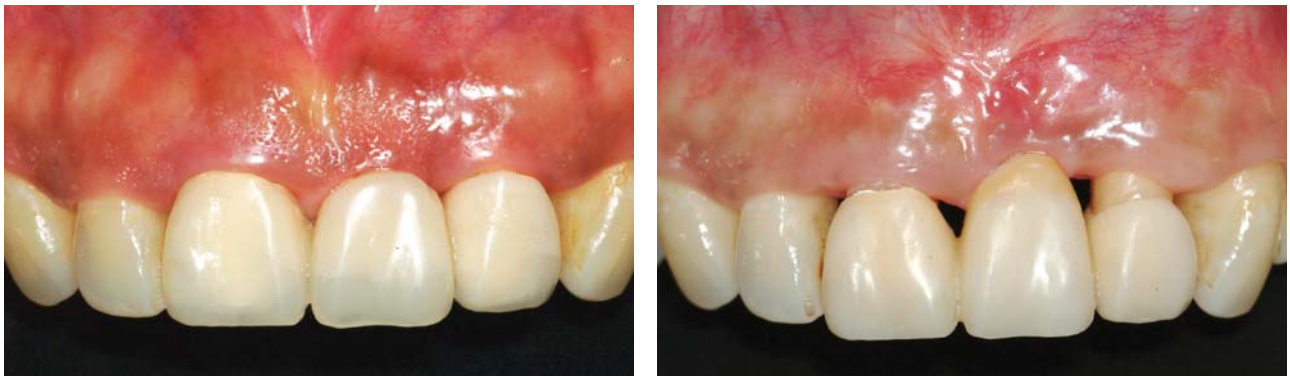


Fig. 9,10. Papilla loss after connective tissue grafting

3 adverse healing processes were mentioned.

– Mid-buccal gingival recession, relapse, and papilla loss.

3 adverse healing processes could be divided by area.

1) Mid – Buccal Zone

In this area, gingival recession/cemental hypersensitivity is most concerned. This adverse reaction occurs because healing process is hard to predict with great precision regarding healed gingival margin location. It is even harder to predict the healed gingival margin in thin biotype patient.

It would be nice that gingivectomy could be done without flap elevation and with minimal or no bone resection, nevertheless, bone modeling and remodeling follows to establish biologic width without coronal gingival margin migration.

Is it possible ? : Yes ! (if bone is not too thick)

How? : Mid-buccal facial gingival margin doesn't (or with minimum amount) migrate coronally when the bone in line angle zone is removed roughly by 3mm.

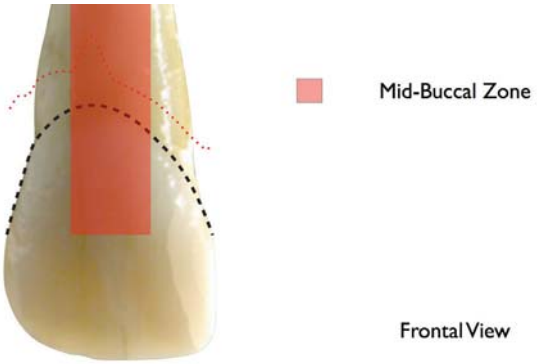


Fig.11. mid-buccal zone is recession risky zone.

2) Line-Angle Zone

Most dentists have fear of adverse healing process - especially removing too much bone. It is understandable considering disastrous result of over-ostectomy. But this zone usually doesn't remodel as apically as seen in mid-buccal zone. Frequent complication is not to remove enough! Be sure to remove 3mm bone around this zone.

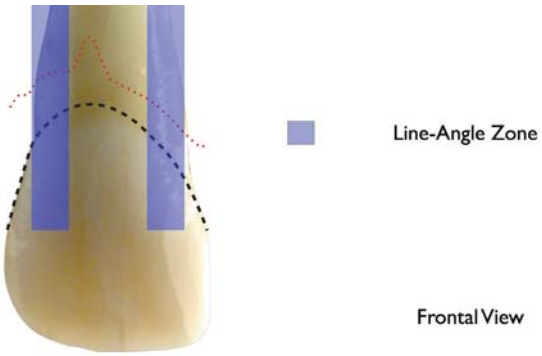


Fig. 12. Line-angle zone is "Bone-must-be-removed" zone.

3) Papilla Zone

Minimum procedure is always preferred.

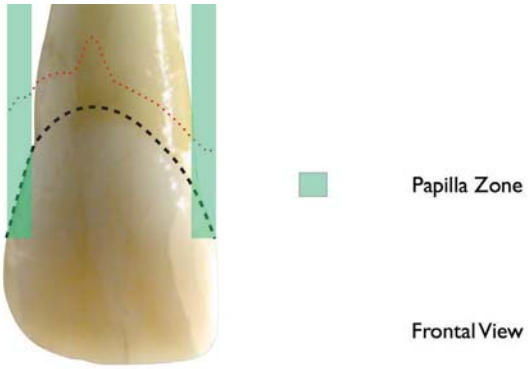


Fig. 13. The bone in papilla zone should be saved.

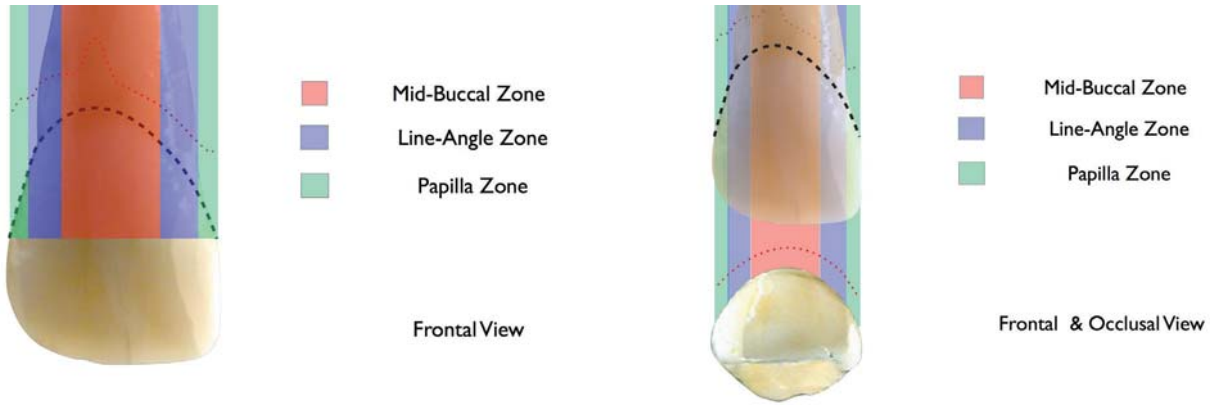


Fig.14,15. 3 zones frontal and occlusal view

It is recommended to get used to open flap surgery then, to perform the flap-less surgery.

Fig. 16,17,18,19, 20. Right side : Open flap surgery, Left side : Flap-less surgery
It is recommended to get used to open flap surgery and feel the tactile sensitivity of removing bone with laser tip.

Not all cases could be executed with flap-less surgery.

Fig. 21,22,23,24. Case with too thick bone is not indicated for flap-less surgery.

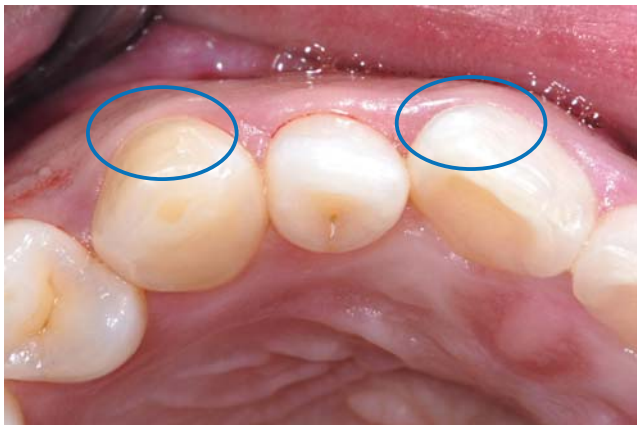
Following is the step-by-step procedure of laser-assisted flap-less crown lengthening in altered passive eruption case.

Fig. 25. Initial

Fig. 26. 1 wk after surgery

Fig. 27. 3 wks after surgery

1. Analyze the case in frontal view and also in occlusal view. Sense the facial gingival thickness. Thin area is easier to recede.



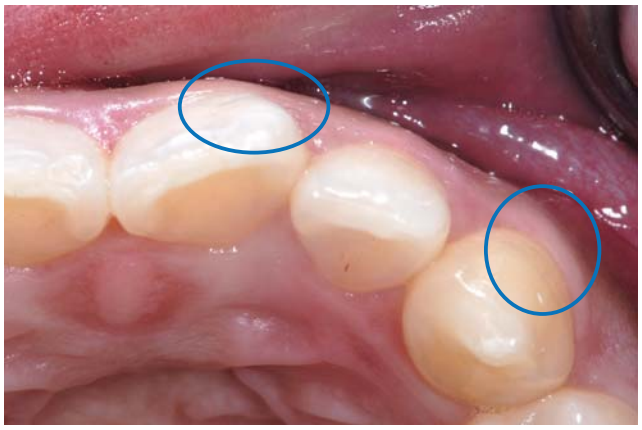


Fig. 28,29,30. Thin area should be evaluated in occlusal view since it should not be thinned down any more.

2. Probe to locate the base of the gingival sulcus.
3. Gingivectomy is performed with laser. Most of times gingival margin after gingivectomy is roughly coincident with CEJ because there is no connective tissue attachment into the enamel.

Fig. 30. Probing to locate the base of gingival sulcus

Fig. 31. Gingivectomy with laser to the base of gingival sulcus

4. Bone sounding is performed to locate bone height
5. Blind ostectomy is performed to establish biologic width with laser.
   A. For thick facial tissue : ostectomy is on mid- facial and line-angle zone – 3mm
   B. For thin facial tissue : ostectomy is only on line-angle zone, / or on line-angle zone with minimum on mid-facial zone.

Fig. 32. Bone souding

Fig. 33, 34. After gingivectomy, marginal gingiva becomes thick.
Re-evaluation in occlusal view is needed.

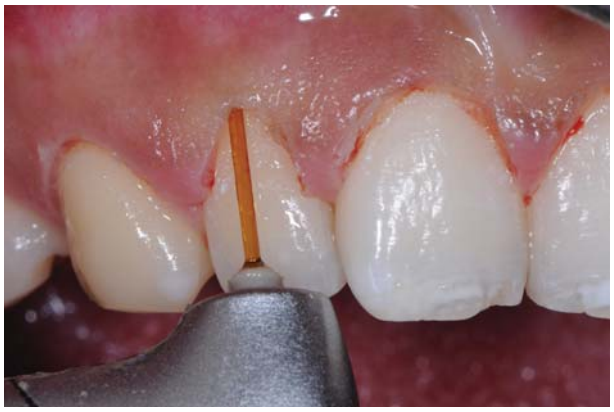


Fig. 35. #12 mid-buccal zone has thick gingiva. Blind ostectomy is performed with laser to remove roughly 3mm bone

Fig. 36. #21 mid-buccal zone has thin gingiva. No ostectomy is performed in this zone, only the bone in line-angle is removed.

6. Evaluate the facial tissue thickness. After ostectomy this tissue becomes thin.

Fig. 37, 38. The facial tissue thickness becomes thin after blind ostectomy. Compare with Fig 33,34

7. For the area where the tissue is already thin enough, thinning tissue is no longer needed. For the area where the tissue is not thin enough, thinning of the tissue is performed with laser starting from interproximal area. Over-thinning would expose the connective tissue which might cause the recession of the tissue.


Fig. 39, 40. Facial gingiva is thinned down with laser starting from interproximal tissue.

Fig. 41. Before additional thinning

Fig. 42. After additional thinning


Fig. 43, 44. Initial and 3 weeks healing

Discussion

Not all cases could be treated in flap-less procedure. When excessive bone reduction is needed, flap-less surgery is limited and more likely to have relapse.

Flap-less surgery indications
1) Adequate amount of attached gingiva is present
2) Thin or moderate thickness alveolar bone
3) Thick or thin gingiva

Flap-less surgery contraindication
1) Thick alveolar bone

Flap-less surgery is preferred when flap-less surgery is not contraindicated.
Flap-less surgery's advantages
1. More stable gingival margin could be obtained than flap elevation surgery.
2. Effective, simple, less morbidity and patient satisfaction
3. Less postoperative swelling, bleeding and pain
4. Although healing of laser wounds is slower than scalpel wounds, laser wounds are sterile and less likely to become inflamed.

There is no study found to show the destiny of mid-facial bone when no ostectomy is performed in this zone whereas the bone in line-angle zone is removed by 3mm. It is the author's clinical experience that thin facial tissue doesn't migrate coronally when the bone in line-angle zone is removed by 3mm.

Conclusion

1. For thick bone case, blind technique is not indicated
2. Blind technique is preferred over open technique when it is indicated.
3. The bone in line-angle zone should be removed enough for both the open flap technique and the flap-less technique.
4. Mid-facial bone doesn't need to be removed by 3mm, if it is thin already and the bone in line-angle zone is removed by 3mm.

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