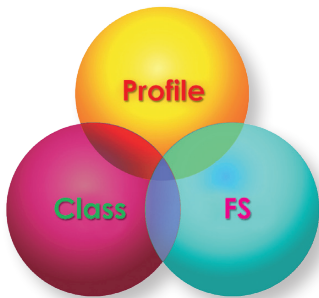


The Most Effective and Simplest Ways of Treating Severe Class III, without Extraction or Surgery

A. Differential Diagnosis (Fig. 1)

Using traditional edgewise brackets to treat a severe Class III or Class III open bite (Fig. 2), either extraction or surgical treatment would be considered.

Nowadays however, with the advancement of new technologies like Damon system (*Passive Self-Ligating System*) and TADs (*Temporary Anchorage Devices*), this is not the case. If after the 3-ring diagnosis¹ (Fig. 1) and the patient has an orthognathic profile, most of the severe Class III cases (*with the exception of 3rd molar extraction*) can be treated without requiring either extraction or surgery.



■ Fig. 1: The 3-ring diagnosis system

B. Treatment Options

Basically, the author uses the following ways to treat severe Class III malocclusion without extraction or surgery.

(1) Damon system only

If the patient has no or little crowding, good upper incisor angulation and a good nasolabial angle, a

standard torque bracket can be placed upside down on the upper incisors to achieve a super low torque, in order to prevent the upper incisors from flaring labially, while using Class III elastics to retract the whole lower dentition.

Since there is much less friction between the main archwire and the Damon brackets, the Damon system has the amazing MEAW effect^{2,3} (Fig. 2), which, without complicated wire bending, and just using Class III elastics is sufficient to correct severe / difficult Class III.



■ Fig. 2:

With Damon and TADs a severe Class III can be treated orthodontically without extraction and without surgery, as long as patient has orthognathic profile.

(2) Buccal shelf screw

For more severe Class III and open bite patients, whose upper incisors are a little proclined, in which case Class III elastics cannot be used too much, then buccal shelf screws³ (Fig. 3) will be used.

In a lot of situations, when the slope of the buccal shelf is very steep, it will be difficult to position the screw

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 Author of Creative Orthodontics



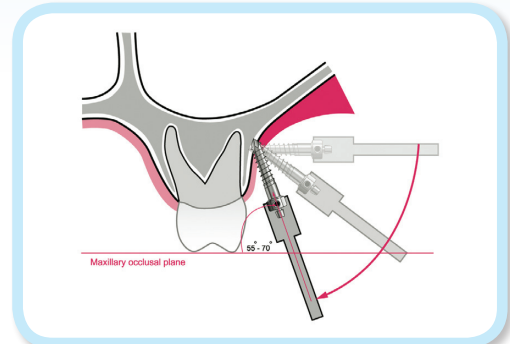
■ Fig. 3:
 Placement of the buccal shelf screws extraradically,
 note the screws are on the buccal side of molar roots not
 between the roots.

really outside the molar roots (*extra-radically*) when placing directly with self-drilling. It means, therefore, the screw will be placed between the molar roots (*inter-radically*). When this happens, due to the limited space between the lower molar roots, after retracting the whole lower dentition for a while, the distal root of the lower 1st molar will move distally and will come in to contact with the screw, stopping the retraction of the whole lower arch.

Whenever the slope of buccal shelf is steep, the author highly recommends placing the screw through an apically positioned flap.³ Pilot drilling enables the screw to be really placed extra-radically, then retraction of the whole lower arch will be possible and easy.

(3) IZC screw (*Infrazygomatic Crest screw*)

The original study of the IZC screw by Liu⁴ (Fig. 4) placed the screw over the buccal side of the upper



■ Fig. 4: Original IZC screw placement by Dr. Eric Liu.

1st molar's mesiobuccal root, which the author calls The Original IZC Screw. Since the volume of buccal bone outside the upper 1st molar's mesiobuccal root is much less than the volume of the buccal bone outside of the upper 2nd molar, the author prefers to place the IZC screw over the buccal side between the distal portion of the upper 1st molar and the mesial portion of the upper 2nd molar, and calls this technique The Modified IZC Screw⁵ (Fig. 5).



■ Fig. 5: Modified IZC screw placement by Dr. John Lin

For upper anchorage or minor upper arch retraction, the original IZC screw is fine. For major whole upper arch retraction, the amount of retraction while using the original IZC screw will quite often be limited, due to the root hitting the screw after a certain amount of upper arch retraction. So, for a greater amount of upper arch retraction, like a big Class II non-extraction treatment, the author prefers the modified IZC placement over the buccal side between the distal portion of upper 1st molar and the mesial portion of the upper 2nd molar (Fig. 6).

	IZC screw	Modified IZC screw
Original report	Eric Liou	John Lin
Buccal bone volume	Less	More
Position	buccal side of upper 2 nd premolar and 1 st molar	Buccal side between distal portion of upper 1 st molar and mesial portion of 2 nd molar
Chance of hitting the root	More	Less
Amount of whole upper arch retraction	Less	More
Maximal anchorage	Yes	Yes

* For larger amounts of upper arch retraction, without extraction treatment like in a big Class II malocclusion, the use of modified IZC screws is better.

■ Fig. 6: Comparison of IZC screw placements

The author has used the buccal shelf screw for whole lower arch retraction (*this technique was learned from Dr. Johnny Liaw's amazing case*) for more than 7 years and has got used to using it on the treatment of severe Class III. On July 3rd 2011, the author attended Dr. Jae Hyun Sung's "Orthodontics Is Getting Smarter" Course in which, Dr. Sung showed many impressive Class III cases treated with IZC screws and Class III elastics, the results were great. Since then the author has used more and more IZC screws and Class III elastics to treat difficult Class III cases, with very encouraging results.

Originally the author thought, Class III elastics from the IZC screw would not be as efficient as retraction of the whole lower arch using buccal shelf screws. Actually it's quite effective. Nowadays, only on a really severe Class III, will the author use the buccal shelf screws for retraction. In a lot of Class III malocclusions, there is also upper arch crowding or proclined upper incisors due to the dental compensation, therefore the IZC screw is very helpful in retracting the upper dentition distally and solving the crowding and problem of upper incisor proclination.

Technically, IZC screws are much easier to place than buccal shelf screws, because in a lot of situations, for a good extra-radicular buccal shelf placement, flap surgery is required, which is a much more sensitive technique. The author always refers to a periodontist to carry out the apically positioned flap for placing buccal shelf screws when the slope of the buccal shelf is very steep (Fig. 7).

	IZC	Buccal shelf
Upper dentition retraction	Yes	Less
Lower dentition retraction	Yes	Yes, more
For extra-radicular placement	Easy	More difficult
Flap surgery	No	Sometimes needed

* For larger amounts of whole arch retraction the buccal shelf screw is more effective

* For reducing upper incisor proclination or upper arch crowding alignment, IZC is more effective

* For severe Class III Tx, a combination of IZC and buccal shelf screws may be needed.

■ Fig. 7: Comparison of TADs for difficult Class III Tx

Case Discussion

■ Case 1



A severe Class III with upright upper incisor and well aligned dentition. Chin point deviated to the right side, an orthognathic profile, and good nasolabial angle.

Diagnosis

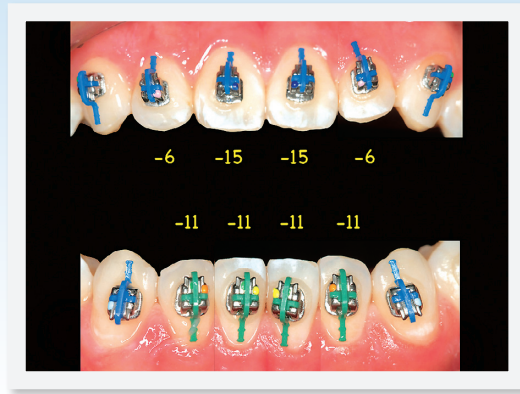
A severe Class III asymmetry case with orthognathic profile, left side severe Class III, right side moderate Class III, lower dental midline and chin point deviated to the right side. Upper and lower dentition well aligned, good nasolabial angle and lip position.

Treatment Plan

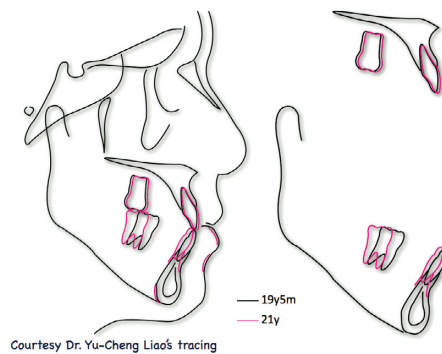
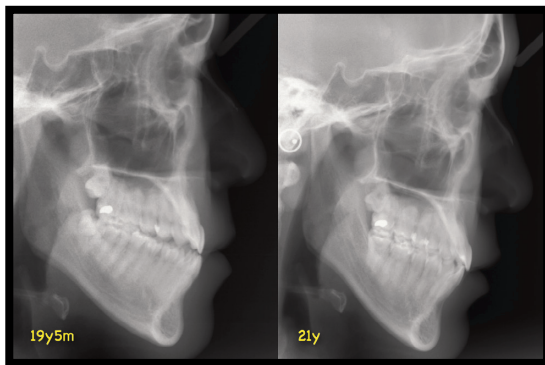
The upper incisors were quite upright, so there was no need to retract. Only Damon system and Class III elastics were used in this case. Special torque selection on anterior teeth maintained a good incisor position while using a lot of Class III elastics.

Treatment Result

This severe Class III was treated purely with the Damon system's MEAW effect and variable torque options of Damon Q.



Standard Damon Q brackets were placed upside down over the upper anterior teeth to make the upper anterior bracket super low torque. Low torque brackets were placed upside down to make the lower anterior bracket high torque.



Courtesy Dr. Yu-Cheng Liao's tracing

The cephalometric tracing shows the upper incisors remained upright. Lower dentition was tipped back a lot by the use of Class III elastics. The occlusal plane counterclockwise rotated and the Class III malocclusion was corrected



Post Damon system treatment, the Class III asymmetry malocclusion was corrected to Class I and midline on without premolar extraction. The original good nasolabial angle and orthognathic profile have both been maintained.

■ Case 2



A severe Class III malocclusion, with functional shift. On the CR profile is orthognathic. Relative procline upper incisor before treatment.

Diagnosis

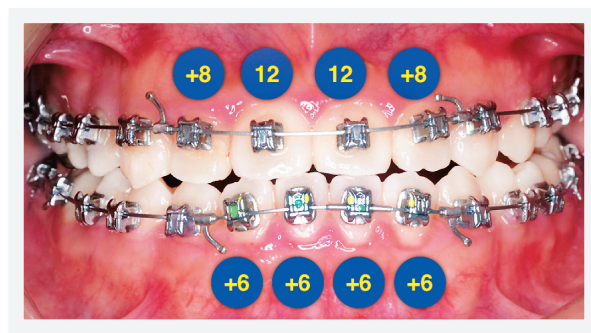
A severe Class III malocclusion with a functional shift. The upper incisor was already a little labially proclined. Upper lip was in a quite normal position, and the patient had an orthognathic profile in the CR position.

Treatment Plan

Used the Damon system's MEAW effect and Class III elastics only.

Treatment Result

The standard Damon 3MX brackets on the upper incisors were not enough to counter the labial protrusion effect of Class III elastics. Even though there was enough distal tip back of the lower molars and Class III was treated to Class I.



Standard Damon 3MX brackets were used on the upper anteriors. And low torque D3MX brackets were placed upside down on the lower anteriors to get a high torque effect, (compared to upside down lower anterior Damon Q (+11), it's a lesser high torque effect (+6).

The upper incisors were flared labially due to the long term use of Class III elastics. Fortunately, the lateral profile was about the same as CR profile before the treatment. There was a good nasolabial angle, and the patient accepted the proclined upper incisor without any complaints at all.

If This Case Were To Be Retreated

The upper incisor bracket would be placed upside down to achieve a super low torque effect to counter the upper incisor protrusion effect of Class III elastics, or also would be combined with an upper IZC screw to prevent flaring of the upper incisors.



Post treatment profile remained orthognathic and good Class I occlusion. The cephalometric super imposition shows severe flaring of upper incisors occurred due to using Class III elastics.

Case 3



Mild crowding in the upper dentition with proclined upper incisors. Class III open bite malocclusion, severely protruded lower lip.

Diagnosis

A Class III open bite case, with orthognathic profile, but lower lip protrusion and upper incisor proclination and an acute nasolabial angle.

Treatment Plan

- Damon system only: the alignment of the mild crowding would further procline the upper incisor labially.
- Buccal shelf bone screw retraction: the use of buccal shelf bone screw to retract the upper incisors was deemed not as effective as the upper infrazygomatic crest (IZC) screw to retract the upper dentition.

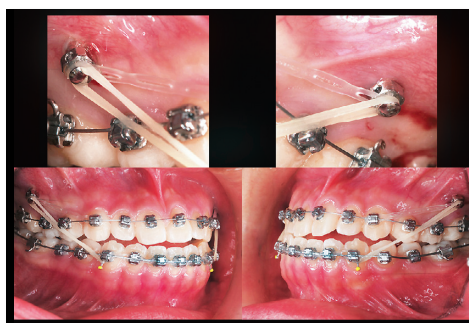
- c) The final decision was to use IZC bone screws, not only to retract the upper anteriors but also to retract the whole lower dentition.

Treatment Result

The use of the IZC screw, has successfully retracted the upper incisors and made them more upright. Also the lower dentition has been retracted by using Class III elastics from the IZC bone screw. The acute nasolabial angle has been reduced a little, the protruded lower anterior dentition has been retracted, and the open bite corrected to about a 2mm overbite.



Standard upper incisor brackets were placed upside down creating a super low torque to upright the incisors.

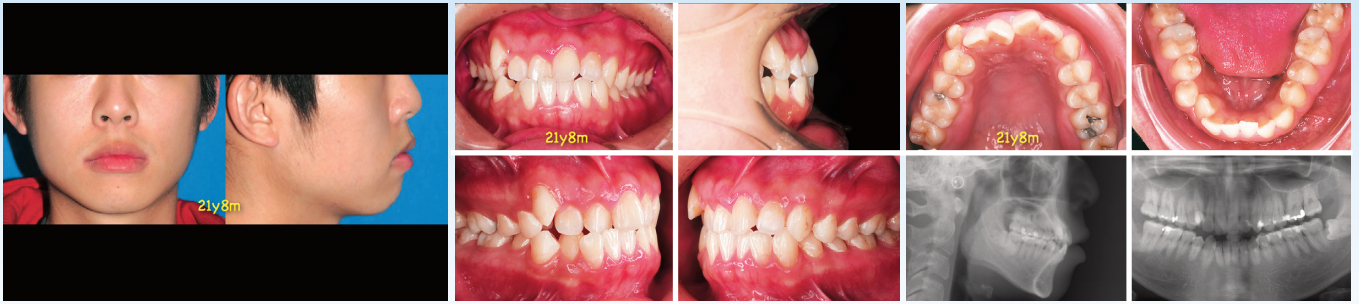


After the two lower 3rd molars were removed, all the braces were bonded and IZC screws placed, not only retracting the upper anteriors but also correcting the Class III malocclusion using Class III elastics.



After 6 months of treatment, the anterior crossbite and open bite had already been corrected, and with enough overbite overjet, Class I molar and canine were also achieved. The protruded lower lip retracted to a much better position. The IZC bone screw retraction of both upper and lower dentition and correction of the upper dental midline would both continue.

■ Case 4



A Pseudo Class III male, with severe upper and lower crowding. The original nasolabial angle was acute, the treatment avoided flaring of upper incisors and the same acceptable profile was maintained after treatment.

Diagnosis

According to the 3-ring diagnosis, this was a Pseudo Class III male, with crowding in both arches and Class I canine and molar occlusion.

Treatment Plan

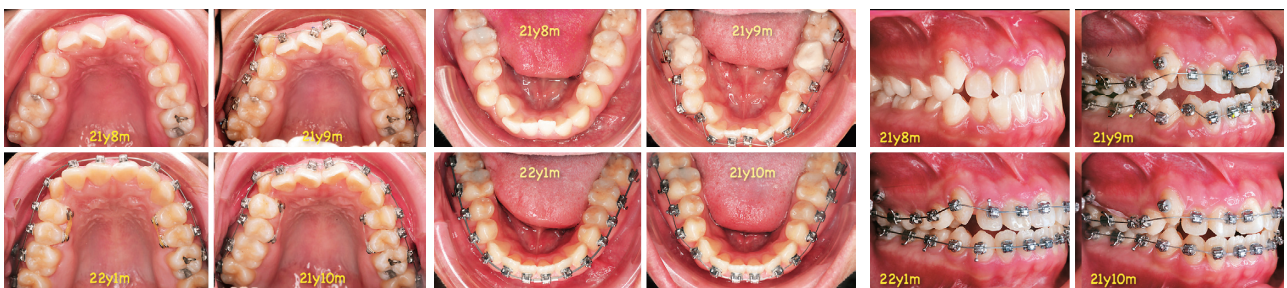
To prevent his original full lip profile becoming a bimaxillary protrusion after relief of the crowding, the upper modified IZC screws were placed to retract the upper and lower dentitions during alignment. Also the IZC Class III elastics were used to relieve the lower crowding and treat the anterior crossbite.

Treatment Result

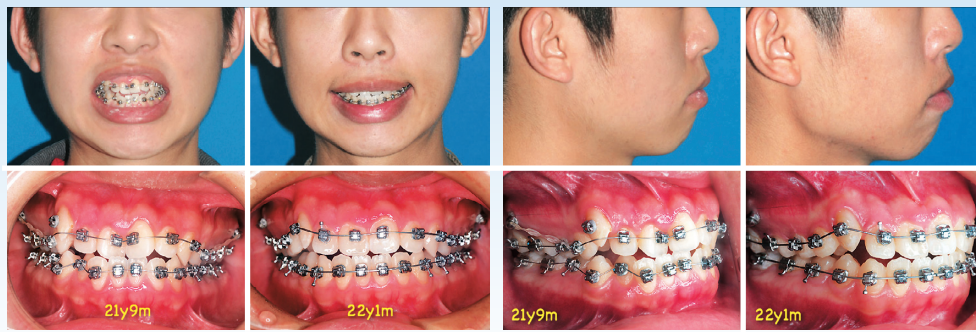
After about 4 months of treatment, both upper and lower arches had been aligned, and there was no further protrusion of the lips.



Two modified IZC screws were placed over the buccal side between distal portion of upper 1st molar and mesial portion of upper 2nd molar.



At the beginning of treatment, the power chain from the IZC screw started to retract the upper dentition, and Class III elastics from the screw retracted the lower dentition.



Since both upper and lower arches had been retracted from the modified IZC screw at the beginning of the treatment, it took only 4 months to align both upper and lower arch crowding, without forward flaring of upper and lower incisors, though the lips seem a little fuller than before treatment. After debonding (*without brackets*), the lips would be about the same as before treatment. And the IZC bone screw can continue to retract both upper and lower arches further, improving the lateral profile even more.

■ Case 5



A severe Class III patient with mild prognathic profile and severely protruded lower lip. The right upper canine was completely impacted. Lower dentition was quite crowded, meaning after alignment, Class III would worsen.

Diagnosis

A patient with severe Class III malocclusion, a moderate prognathic profile and severe lower lip protrusion. He had rejected orthognathic surgery, so a compromised treatment was planned.

Treatment Plan

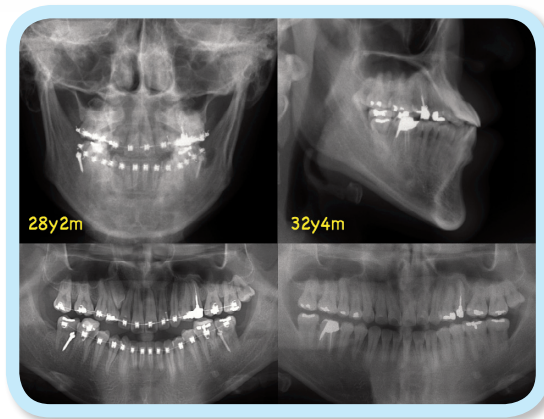
Removal of two lower 3rd molars. Two buccal shelf bone screws to retract the whole lower dentition.

Treatment Result

Just regular Damon D3MX brackets were placed on the upper anteriors. The lower dentition was successfully retracted with the buccal shelf bone screw. The Class III malocclusion was corrected to Class I. However, the upper incisors flared out labially due to opening the space for the impacted right upper canine.

If This Case Were To Be Retreated

The author will place the standard Damon Q brackets upside down to increase the low torque to make the upper incisors more upright. Also from the beginning of treatment the IZC screws will be placed, to retract the upper incisors while opening the space for upper right canine to prevent upper incisor proclination.



On the left 28y 2m postero-anterior cephalogram, showing the buccal shelf bone screws were outside the roots of lower 1st molars, making retraction of the whole lower dentition possible. On the right, post treatment, no more anterior crossbite, but upper incisors were flared forward. Note the buccal shelf screws were outside the roots of lower 1st and 2nd molars, making retraction of Class III malocclusion to Class I, possible. Throughout the whole treatment, only one buccal shelf screw on each side was used.



Waiting for the right upper impacted canine to self-erupt after enough space had been created, 5 years later the treatment was completed to Class I occlusion. The upper incisors were flared forward due to space opening for right upper canine. The Class III canine and molar relationship was corrected to Class I canine and molar mostly by the use of only one set of buccal shelf bone screws.

Case 6



A Class III malocclusion patient with severe crowding in both upper and lower arches, and orthognathic profile with acceptable nasolabial angle and lip position (courtesy Dr. Yi-Hung Shih).

Diagnosis

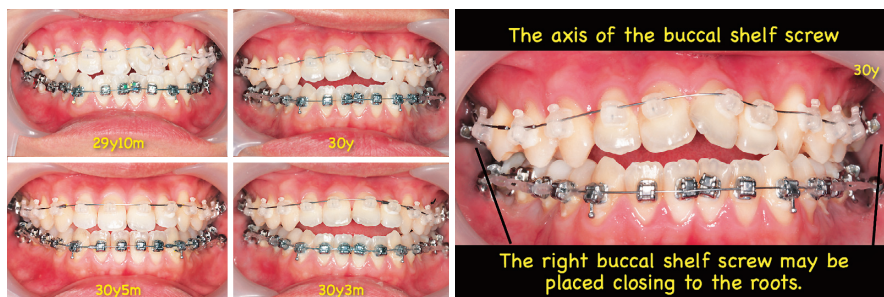
A Class III case with severe crowding in both upper and lower arches. Patient had an orthognathic profile and acceptable lip position.

Treatment Plan

Used the Damon system and buccal shelf bone screws to retract the lower dentition and correct the Class III malocclusion.

Treatment Result

Due to severe crowding on both arches, the early light short Class III elastics only flared the upper incisor more. The original acceptable lip position became protruded. A left side buccal shelf screw successfully retracted the left lower dentition back to Class I, but the right side buccal shelf screw seemed not to work; after 5 months of retraction the lower dentition maintained the same Class III position. From the angulation of the right buccal shelf screw, maybe the buccal shelf screw was placed between the roots and there was contact with the distal root of the lower first molar. Therefore, on the right side there was almost no distal retraction of the lower dentition.

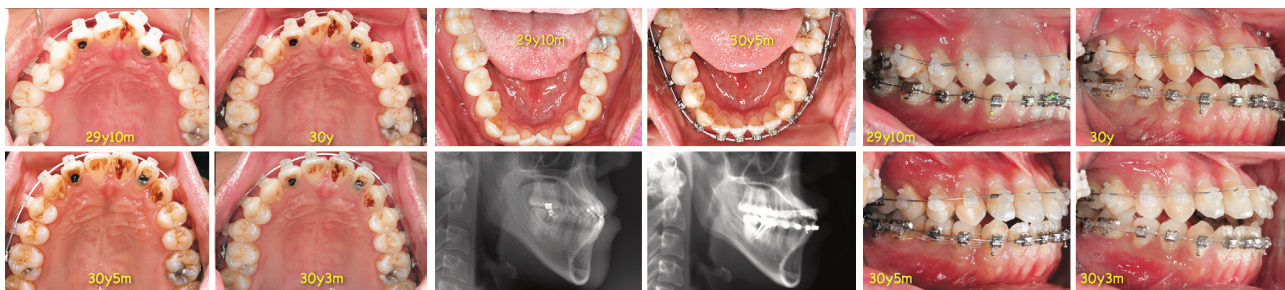


Two buccal shelf screws were placed on the lower arch for retraction of the whole lower dentition. The axis of the right screw seems tilted to the inter-radicular space between right lower first and second molars. The upper arch after alignment, the arch not only expanded transversely but also the upper incisors flared forward.

If This Case Were To Be Retreated

Because of the good nasolabial angle and lip position, the treatment objective would be to try and maintain the original situation. For the severe upper crowding, if an early IZC screw had been used at the beginning of the treatment, the upper incisor could have been aligned without flaring and maintained the original good nasolabial angle.

Also Class III elastics could have been used from the IZC screws to correct the anterior crossbite and Class III malocclusion. In an upper crowding situation, care should be taken when using the early light short Class III elastics, because relief of crowding would have already flared the upper incisors, so, Class III elastics would flare the upper incisor even more, especially on the initial alignment stage.



Despite early light short elastics and two buccal shelf screws were used, it's very difficult to get rid of the Class III on right side occlusion, also the upper incisor flared forward with more acute nasolabial angle.

Buccal shelf screws are very useful for retracting the whole lower dentition, but the placement of the screw is very crucial. The screw should be placed extra-radically, otherwise, if (*sometimes due to the steep buccal shelf*) the screw has been placed interradiarily then the contact of the screw on the distal root of the lower first molar will prevent the retraction of the whole lower arch. For an extremely steep buccal shelf situation, flap surgery then placing the screw can be a better choice to prevent placing the buccal shelf screw between the roots.

■ Case 7



A Class III female patient, with orthognathic profile, but acute nasolabial angle, also moderate crowding in both upper and lower arches, and upper incisor flared labially (*courtesy Dr. Sabrina Huang*).

Diagnosis

A Class III patient with moderate crowding in both arches and an orthognathic profile with acute nasolabial angle and relatively full lips.

Treatment Plan

The original plan was to try and treat with the Damon system and non-extraction. After alignment however, the upper and lower dentition flared forward, the nasolabial angle became acute, therefore for a better axial inclination of the incisors and lateral profile, the upper 2nd premolars and lower 1st premolars were removed.

Treatment Result

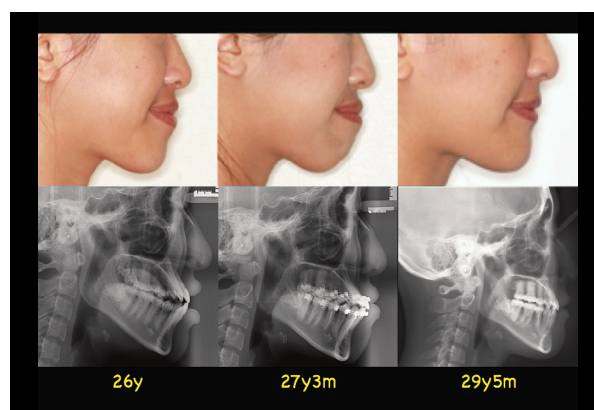
After alignment of both upper and lower arches, the Class III became a Class I bimaxillary protrusion. After four premolar extractions, the results were good.



After alignment of the dentition and correction of the Class III malocclusion, both upper and lower anterior teeth flared forward more. For better axial inclination of both upper and lower incisors and profile, two upper 2nd premolars and two lower 1st premolars were removed.

If This Case Were To Be Retreated

Due to the flaring upper incisor, full lip profile and also moderate crowding on both arches, it would have made the treatment easier to have started at the beginning of the treatment with four premolar extractions.



During the correction of the Class III, the nasolabial angle became very acute, and bimaxillary protrusion appeared. After extracting four premolars, an excellent profile was achieved.

Conclusion

- 1) With the proper use of Damon, IZC screws, and buccal shelf screws most difficult Class III can be treated without extraction and without surgery, as long as the patient has an orthognathic profile or is willing to accept a slightly prognathic profile.
- 2) Upper incisor angulation and nasolabial angle are the key factors for successful Class III treatment. When the upper incisors are already proclined or there is upper arch crowding at the beginning of treatment, placing IZC screws and Damon upper incisor brackets upside down is a very effective way to prevent the upper incisors from flaring and can even make them more upright, making a non-extraction treatment possible.
- 3) Though early light short Class III elastics are very effective for correction of anterior crossbite, before using them, the upper incisor proclination and upper crowding must be evaluated. Either of the above will cause the upper incisor to procline even more and turn the non-extraction treatment into an extraction treatment.
- 4) Whenever using the buccal shelf screws to retract the whole lower arch, be sure to place the screw extra-radicularly, if not, the screw contact with the molar root will prevent further retraction of the whole lower arch.

Acknowledgement

Thanks:

- (1) Paul Head for his great editing.
- (2) Dr. Rungsi for his excellent diagrams making the explanations much clearer.
- (3) Dr. Sabrina Hwang and Dr. Yi-Hung Shih for sharing their cases.
- (4) Dr. You Cheng Liaw for his accurate cephalometric tracings.

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