Complete Entrapment of the Maxilla
Two Different Case Therapies
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ABSTRACT: Treatment and management of complete entrapment of the maxilla by the mandible can be one of the most difficult orthodontic cases. This affects normal growth and development of the patient. Two entirely different treatment modalities will be demonstrated for correction.

The proper growth and development of the face requires a certain sequence and harmony. There has always been a debate as to which structure comes first, the brain or the cranial base. Most educators agree that the brain gives rise to the proper positioning and development of the cranial base in space. The naso-maxillary complex grows in a downward-forward direction off of this cranial base and establishes the mid-face of the individual. The poor development of this structure can result in restricted rotation and positioning of the mandible which can affect both the function and development of the airway and TMJ complex. In the normal sequence, the maxilla achieves 80-90% of its potential by the age of 7. It must reach proper genetic potential both in a lateral and anterior direction to allow the downward rotation of the mandible. A restriction of this pattern will cause the mandibular condyle to be forced into a superior and distal position. This position can cause many detrimental changes to the individual.

The development of the inner ear and auditory canal can be affected, the proper development of the airway is affected due to the retro-positioning of the body of the mandible, restriction of blood flow in both the carotid and jugular complexes and we all know that this condylar position can cause severe structural changes in the TMJ complex. The most important change being the displacement of the articular disk in an anterior direction which can lead to a myriad of problems. This is very typical of Class II development.

However, when the maxilla is totally entrapped by the mandible, we see different structural changes. We see loss of vertical development of the mid-face, restriction of the growth potential of the naso-maxillary, temporal and sphenoid processes, sinus development and resultant facial and airway changes. The typical Class II changes discussed above is also seen but is a result instead of the distal restriction of the entire naso-maxillary process.

I have seen this pattern of growth in
both the small child and the patient with mixed dentition. This is not a developmental pattern that should be watched. It is not going to correct on its own. Intervention should be considered and attempted as soon as compliance and cooperation levels are compatible to our own comfort levels. I have intervened as early as three with a fixed incline plane cemented to the mandibular incisors.

Both of these patients were referred to me at—the age of seven. As described above, the maxilla achieves 80-90% of its potential by—age seven; therefore structural restrictions had already occurred.

This type of malocclusion can be terrifying at first. I have been taught to correct the anterior crossbite first then proceed to the lateral crossbite correction. If you think about this it makes perfect sense. If the restriction to normal downward-forward growth is causing the facial abnormality, release of this restriction will naturally allow the case to improve. This provides the space for a more normal growth pattern, once the maxilla is released. A certain amount of catch up development is achieved but is directly related to the genetic potential of the patient. As always, if you provide the correct space necessary, the body will take over and bone and soft tissues will heal, develop and grow.

During my exam, I have the child open their teeth and try to guide them as they close with gentle posterior pressure to determine the severity of the case. I am not performing the centric occlusal positioning taught to us by the removable and fixed departments in dental school. This position is artificial and dislocates the patient off of the disc. This is not how I want the patient to function. I simply want to see if the anterior crossbite is a result of incisal interference. I am evaluating the range of motion.

Neither of these cases was that simple. Both demonstrated severity in the distal position of the premaxilla and depth of the vertical dimension. Both exhibited severe posterior open bites when placed in the “as if” position. If you are not familiar with this term it is usu-
ally an observed evaluation of a patient. The mandible is manipulated into what you think will be the corrected position. I usually do this to evaluate the resultant soft tissue profile for Class II correction. I usually use the incisors to determine my vertical dimension and anterior position. Now this is usually very easy to do with a Class II correction. A Class III will normally not allow you to retract the mandible far enough for the same purpose. We obviously do not want to hurt the child or dislocate the condyle or the disc. That is why only gentle pressure is used.

The removable case is a relatively healthy female, age 7, Jennifer K. (Figure 1). A dramatic deep anterior crossbite is demonstrated. The posterior segment is not completely entrapped however it is restricted in lateral development due to the growth restriction of the anterior crossbite.

The removable appliance of choice is a Sagittal with thick posterior bite blocks to provide the necessary vertical augmentation to jump the anterior crossbite (Figure 2). The patient must be both cooperative and compliant. The appliance must be worn 24/7, turned on a regular schedule and must be worn during mastication. The posterior bite block is necessary for normal mastication due to the presence of a severe posterior open bite and to provide relief of the occlusal interference of the incisors. Without this relief, advancement of the premaxilla would be impossible. The posterior open bite will need to be addressed in the future after anterior crossbite correction. As always inform before you perform. The patient and parents must know why the appliance is designed in this way and made aware of the posterior open bite as well as your future plans for its correction.

Normally the screws are adjusted one turn twice a week (Mon-Thurs, Tues-Fri). This pattern allows for growth and development without loss of retention of the appliance. In this case retention of the appliance is paramount for both function of the appliance and patient
compliance. The anterior flange of the Sagittal will also have the tendency to creep up the lingual surfaces of the maxillary incisors as the expansion continues. You will easily see this when the patient comes in for appointments because the acrylic will be close to the incisal edge. When I notice this I have two options; reline or replace. If I reline, I turn the screws back to the beginning and add acrylic. This has a dual advantage. I have always noticed a reduction of force and resistance of the expansion screws as they progress past about 1/2-2/3 of the screws potential. Turning the screw back gives you back most of that original force and resistance. You don’t get it all back due to fatigue of materials. You usually need to advance the premaxilla 5mm or more to correct the cross-bite. This is obviously case specific. Two of the normal 7mm screws do not usually fit well into the vault of the palate of these patients and most labs must use smaller screws. At least one reline is necessary for these patients.

Now that is a lot of turns and a lot of time. In the second case, I was not as patient; I realized I had to help this kid fast. The fixed case is a relatively healthy male, age 7, Payton T. (Figure 5). He demonstrates a much more severe case. His maxilla is totally entrapped both in the anterior and in a posterior-lateral direction. Sometimes stock appliances just are not appropriate. This was one of these cases. So I had to revert to my old habits and fabricate my own. This kid had no room in his palatal vault for one screw let alone the four I would need.

I chose to incorporate my fixed Sagittal appliance into a posterior bite block and cement it into place (Figure 4). I used molar bands with a buccal bracket (my stock orthodontic bands). This provided retention within the acrylic for the posterior bite block. The lingual tubes were soldered to the lingual surface of the bands. The rest of the appliance is my standard design, fixed Sagittal appliance. This has already been featured in a past publication of this journal. The appliance
incorporates an .036 arched wire, Ni-Ti open coil springs and lingual .040 tubes, molar bands and some solder. I always bond the anterior segment of my .036 arched wire to the lingual surfaces of the maxillary centrals. This helps my retention and prevents the incisal slippage which you usually experience with Sagittal appliances. I used duralon cement for easy removal of the appliance. As it turned out, I had to partially cut the acrylic and stainless steel band to remove this appliance. This is a simple appliance to use and I was lucky to have such a great patient. All of your orthodontic patients should be such great kids.

My anchorage was achieved with the use of the entire posterior bilateral segments. The force on the premaxilla and maxillary central and lateral incisors was controlled by the length of the springs that I used. The bonding of the lingual arch to the lingual surface of the incisors provided stability. The posterior bite block relieved the anterior and posterior occlusal interferences (Figure 5). The premaxilla had no choice but to move. Bonding of the teeth to the appliance also moved the force onto the sutures of the bone and off of the individual teeth. No reduction of root support has occurred. I didn't go crazy with the length of the springs. The appliance can always be removed and more spring added if necessary. Too much length would provide too much force and would affect the stability of the appliance. I usually measure the space from the anterior aspect of the tube to the solder on the arch wire and add 3-5mm depending on the case.

Both cases were different after stage one appliance therapy. I knew I would need more than one appliance and made sure that the parents and patients were aware of this fact. In my office I provide the first appliances and the patients are usually responsible for any others.

After you have corrected the anterior crossbite, the cases are both simplified. The second appliance for the removable Sagittal
patient was a common Hawley appliance. There was no need of posterior correction. I did posterior composite build-ups on the deciduous first and second mandibular molars because these will not passively erupt and the patient had to have some function. This corrects the posterior open bite. Changing the appliance added to the patient comfort, got rid of the thick acrylic posterior bite blocks and screws and provided a smooth thin retention appliance. This also aids the airway with the removal of the thick obstruction and provides a better environment for tongue posture. The overbite was left slightly deeper than normal to prevent any Class III latent tendencies of mandibular advancement.

The fixed case was much more difficult. After anterior crossbite correction, I now had to correct the true bilateral posterior crossbite. I used a fixed Crozat for this correction. (Figure 5) I removed the fixed Sagittal with the posterior bite blocks and immediately placed the activated Crozat. Some time passed and some adjustments were done on the Crozat and finally the posterior crossbite was corrected. You always have a treatment plan in mind but sometimes that needs to be adjusted. Just when I thought about placing the patient into a Hawley for a retainer phase of treatment, the maxillary laterals started to erupt. They were in anterior crossbite as well. I modified my treatment plan and added a posterior bite block to the appliance. This allowed me to jump the occlusal interference and with the use of four brackets on the anterior teeth, I corrected the crossbite and aligned the teeth.

For this purpose, I always start with a .016 NiTi wire. (Figure 6) This allows light flexible force to level and align the teeth. The second wire is usually a .016 X .016 NiTi. This gives me the root torque adjustment I need and stabilizes the alignment. If space correction is necessary, a four unit long elastic chain is usually used. I am not in a hurry to move these teeth because I don’t want to harm the apex of the
roots. If you move them too fast you can burn the root tips or even cause an irreversible pulpitis. (Imagine telling the parents that you need to do one or two root canals or even worse remove the teeth because you have lost root support!) Light force on flexible wires is always better. I do not attempt to place a rigid stainless steel wire that fills up my slot (.022) to do space closure. That just increases the frictional coefficient and puts more stress and tension on the root structures of the teeth. If the wire is flexible and the slot is not filled the teeth move without as much stress. When the space closure is complete you can use stainless steel to stabilize the case. My NiTi wire have a central crimp which prevents lateral slippage; my stainless steel do not. Therefore it is necessary to do a distal cinch. I always polish the cut ends for patient comfort. I always prepare and instruct the patient and parent about the need of wire adjustment as the spaces close. I make sure they have wax but also I make sure that they know it is alright to clip the free distal ends. (I don’t really like emergency calls, do you?)

Once my anterior segment was corrected, I was finally able to place a Hawley. The case has stabilized awaiting further exfoliation and eruption. Last month on one of the normal recall visits, I noticed that it seemed that the maxillary anterior segment was slightly reclined. I have since placed a second fixed Sagittal appliance to augment the pre-maxilla a little bit more. (Figure 7)

I know that I have used a lot of appliances but I make my own fixed appliances and four brackets and some wire isn’t a big deal for me. You have a growing child and you must both monitor and modify your treatment as the case progresses. Is doing nothing a better alternative? Maybe if you are a surgeon, but avoiding orthognathic surgery, I think it is a better choice. You really get to like these kids because of the dramatic facial and developmental changes and of course for their resiliency. They really put up with a lot! You may have noticed that the fixed case was a male so not only do I have a different growth potential, I also have a different growth schedule. This was an extremely difficult case but it was also extremely gratifying.

In both cases, I used completely different techniques to achieve the same goals. The time factor was similar for both. I have experienced full permanent eruption with the removable case but I am still waiting for that with the fixed case. Both children have achieved dramatic growth and development by simply providing them with the chance. All I did was simple crossbite correction. I hope by seeing these two separate cases and different techniques that you will be better prepared if they show up in your office. You get to choose which way you want to treat them. I have planned to finish both cases with full bracket therapy.