LONG TERM STABILITY OF DISTRACTION OSTEOGENESIS IN THE CONSTRICTED MAXILLA

I thought I would start my lecture by reviewing what I had learnt a number of years ago at a conference that was organized by the American Association of Orthodontists. The course that I attended had listed a number of conclusions about distraction osteogenesis. The first was that there should be a latency period of about 7 days after the initial surgical cut, and then the rate of turning (from a number of evidence-based research reports) should be 1mm a day with a rhythm of 0.25 mm. So, in other words, 4 turns x 0.25 mm. They felt that 20mm of distraction could be achieved and they had suggested a consolidation period of about 7 weeks. A number of researchers who presented at this conference felt that if those criteria were followed, it was certainly possible to move teeth into the new bone; which is great for me as an orthodontist; but also, the bone was of sufficient quality that it was possible to place implants in the newly formed bone. This would be very interesting for our referring general dentists, implantologists, periodontists, etc.

One of the controversies that is often raised, is "when would be the best time to perform distraction osteogenesis for our patients?" and the answer very much depends on what effect it may or may not have on the growing craniofacial skeleton. The second controversy is stability, and long-term studies associated with that. We need to ask ourselves the question whether long-term stability of bone (that has been lengthened by osteo-distraction) is the same quality as bone from a conventional surgical procedure. Then we need to look at the limits of soft tissue stretching during distraction osteogenesis (DO). One of the reasons many surgeons are now looking at DO versus a conventional osteotomy is based on the ability for soft tissue to adapt. Many people feel that it is easier for the soft tissue to adapt during a prolonged DO than during a 4 hour operation for a normal osteotomy procedure. As an orthodontist, I have been looking at the effect of DO on the eruption of teeth; if we are performing DO in a mixed dentition, where tooth buds are still present, and where eventually teeth will have to erupt in the new bone that has been formed by the DO procedure. Also, in situations where we have new bone formed as a result of DO, is that bone of sufficient quality for us to move teeth into via normal orthodontic tooth movement. A number of papers have been presented on the effect of the periodontal ligament and the associated oral soft tissues following DO. Researchers have also reviewed the undesirable tooth movements when using an intra-oral tooth borne, or a hybrid device, versus a bone-bone (direct skeletal fixation) device.

Many of the people I have spoken to, who I have spent time with at Baylor College in Texas, (which is one of the leading centres of distraction in the world) still debate as to whether an appliance should be used which is totally tooth borne or whether a hybrid type appliance should be used, i.e. one that is partly fixed to teeth and partly fixed to bone. Other proponents state we should have a direct bone-bone type distraction appliance.

The main reason I became interested in distraction osteogenesis, is that I felt that one of the main limitations of conventional orthognathic surgery, is the inability of facial muscles to be acutely stretched without the inherent risk of relapse. In orthodontics that involves a combination of orthognathic surgery there is a war between tooth, bone and muscle; and in considering long term stability, muscle will always win the war. So, if we can perform our surgeries with a procedure that would allow facial muscles to re-adapt then maybe we can reduce some of the relapse that we have

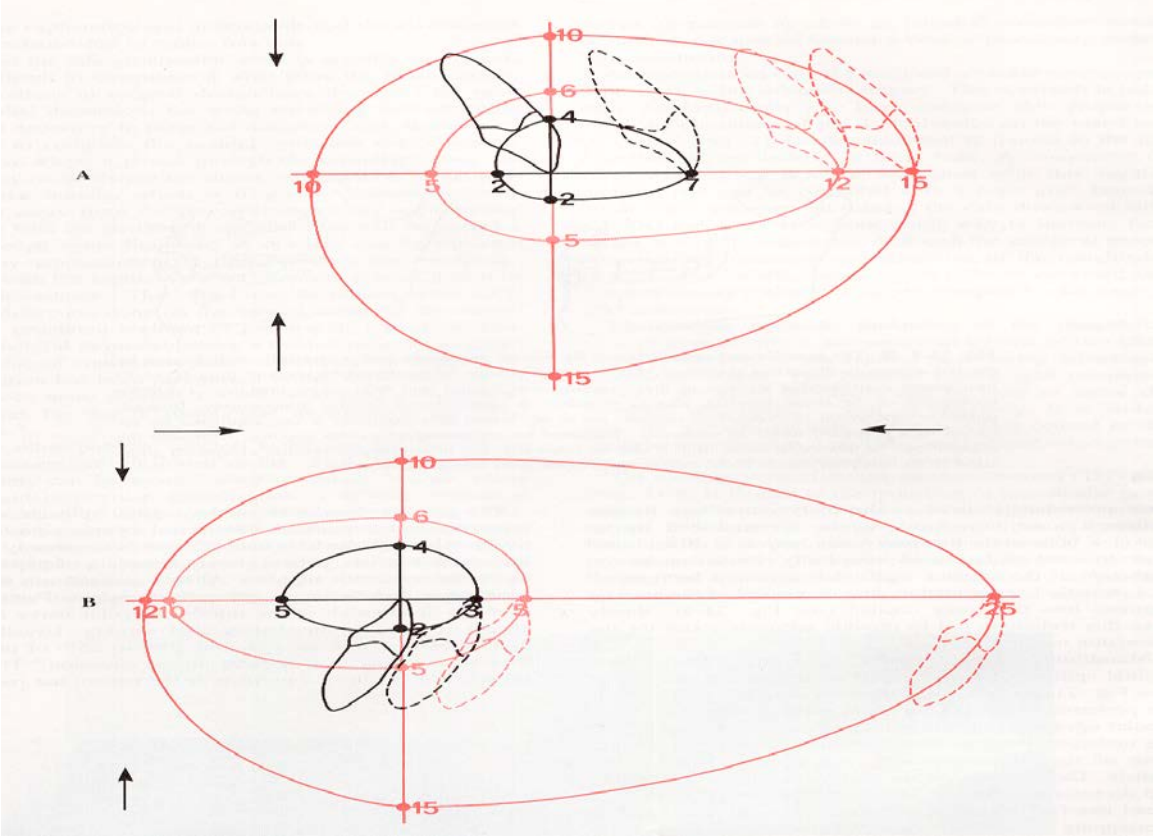
seen in previous osteotomy procedures. The other point to remember is that many of the congenital deformities require large musculoskeletal movements that soft tissues can not accommodate. This could lead to a compromise in function and aesthetics, unless we have additional soft tissue procedures performed at a later stage. One of the questions I raise with my surgeon, at our joint-surgical meetings, deals with patients who have a severe mid-face deficiency, but are only 11 years old. Do we have to wait until that patient is at the recommended age for an osteotomy (18 or 19 for a female, slightly older for a male)? By waiting this long, some patients go through a miserable social existence, as far as facial deformity, especially during the adolescent time frame.

The whole concept of DO is that the traction generates tension within the callus and this stimulates new bone formation, which is parallel to the vector of distraction. The team at the University of Southern California has been using a combination of distraction with micro-implants. They use the micro-implants after the distraction (sometimes during) to change the vector (direction) of bone movement. The early work on DO, revealed that although new bone was formed, it was very hard for the oral surgeon and the orthodontist to control the vector of force, and many times we ended up with a distorted facial balance. I particularly remember a case where we tried DO in a short ramal height, long-faced individual; and although the ramal height increased, so did the direction (forward position) of the mandible. Distraction forces applied to bone, also create tension in the surrounding soft tissues. Some people use the term ‘distraction histogenesis’ saying that by using distraction osteogenesis vs. conventional osteotomies, we may have an improvement in the surrounding soft tissues and not just in the bone. Under the influence of these tensional stresses, which are produced by gradual distraction, active histogenesis occurs in different tissues. This includes the skin, fascia, blood vessels, nerves, muscle, ligament, cartilage, and the periosteum. These adaptive changes in the soft tissue may allow larger skeletal movements while minimizing the potential relapse seen in acute skeletal corrections.

“The Long-Term Stability of Distraction Osteogenesis in the Constricted Maxilla”
In the pursuit of optimum function and facial harmony, one of the biggest problems is the failure of general dentists to be educated on what can be achieved with conventional surgery, let alone DO. I still feel that the majority of general dentists talk their patients out of a combined orthodontic/orthognathic treatment plan as they feel that there is an inherently high risk; they find it is unstable; or many times they have heard that the desired results will not be achieved through surgery (perhaps due to their previous knowledge of out-dated surgical techniques). We all need to educate general dentists to recognise which underlying skeletal disproportions can be corrected with orthognathic surgery, rather than orthodontics alone.

The indications that a patient requires a combined approach, is the patient whose orthodontic problems are so severe that neither growth modification nor camouflage offers a viable solution. For example, a patient who has a border-line Skeletal III problem and the orthodontist suggests the removal of upper and lower premolars to compensate and get the dentition into a Class I relationship. Although this may achieve a reasonable dental result, it may (on many occasions) worsen the facial balance. The same could be said for a Class II individual that has a retrognathic position of the mandible. Rather than extracting upper first premolars and retracting the upper incisors, to camouflage the underlying Skeletal II base, it may prove more successful to bring the mandible forward to balance the face. In cases such as the one described above, before you bring the mandible forward, you need to check the width of the maxilla. Many times, a patient who has a

retrognathic mandible will also have a constricted maxilla. Hence, my surgeon and I will normally perform two surgeries, approximately 12 months apart. The first surgery will involve a lateral corticotomy (Surgically Assisted Expansion of the Maxilla); I will then place braces for 12 months to level and align the dentition and to de-compensate the arches in preparation for the second stage surgery which would normally be a one or two jaw procedure with or without a genioplasty.



The diagram above comes from one of the most popular text books in orthodontics and that is by Bill Proffit (*Contemporary Orthodontics*, 1986 first ed.). He calls this the 'envelope of discrepancy'. This is a great way to educate the general dentist. You can see that the 'black zone' is our capabilities only with orthodontics; and in the 'red zone' is our capabilities in conjunction with surgery. In the far 'outer' circle, may be our capabilities with the refinement of distraction osteogenesis.

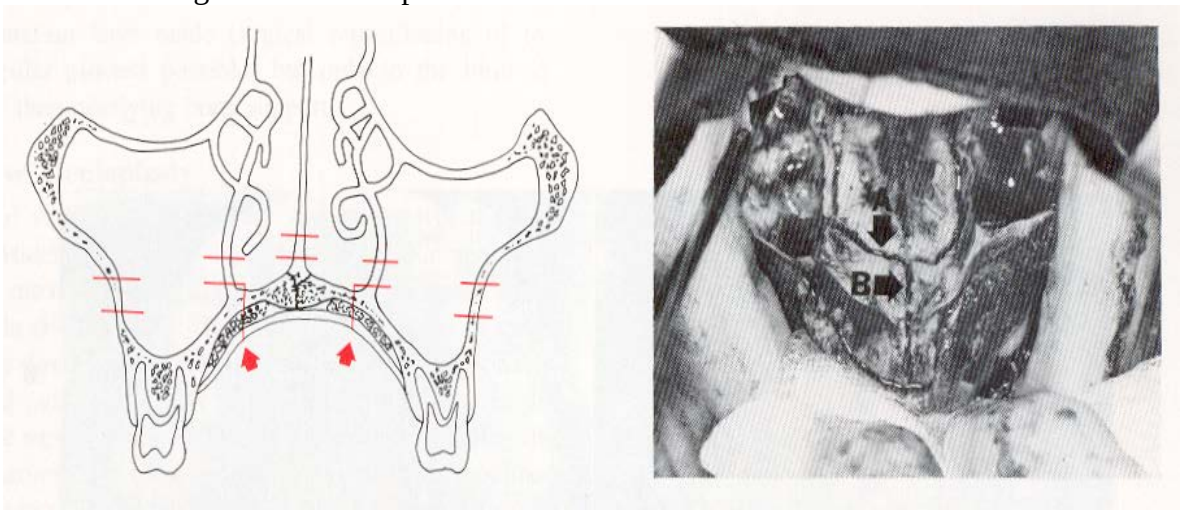
Distraction osteogenesis relies on prolonged, progressive and gradual distraction which does not disrupt the vascular supply. Some of the initial work done on this surgery was with the 'Islasarov technique', i.e. the ability not to perform a through and through cut of the bone, making a big difference in the callus formation. It is my understanding that there are two main cellular processes at action. The first is the formation of the callus, and subsequent to this, the generation of new bone via distraction. The latter is histologically similar to that seen in orthodontic tooth movement. Traditional orthodontics (often involving extractions) may achieve a satisfactory functional occlusion at the expense of facial aesthetics. This is now considered by most clinicians to be an unacceptable compromise and treatment should not be undertaken unless the patient is fully informed of the advantages and disadvantages of the surgical and non-surgical options. This discussion is limited to the non-growing individual. If you have a young child with a mid-face

deficiency I would still develop the arch, and maybe use a reverse-pull facemask. If there is a young child with a retrognathic mandibular position, I would still try a functional appliance. However, in the non-growing individual, the above procedures are prone to relapse due to lack of facial growth. This is where the concept of the 'osteotomy' procedure is relevant.

Most clinicians realise that in a severe skeletal discrepancy, dental camouflage is an unacceptable compromise. I offer my patients three possibilities; the first is not to do anything; the second is to dentally camouflage; and the third is to prepare the arches for surgery. I would personally prefer not to do anything rather than compromise the patient's facial aesthetics for the sake of merely aligning teeth. Many times if a patient does not want to undertake orthognathic surgery I will accept the skeletal discrepancy and align the front anterior teeth (the 'social six') without worsening the profile.

If we evaluate the advantages and disadvantages of surgery, with the patient, and he/she understand the limitations of surgery and what the possibilities are, the majority of people are quite happy to proceed. It also helps if the general dentist has already informed the patient that their problem is more severe than orthodontics alone can treat. That way, if the patient is aware of the possibility of joint orthodontics/orthognathics, they are not as reluctant to proceed. A patient who is dissatisfied with their facial proportions, patients with severe occlusal attrition (aggravated by skeletal discrepancies) and those with marked skeletal malocclusions experiencing severe TMD symptoms are suitable candidates for surgery. The same could be said for patients with sleep apnoea. My surgeon and I have had a number of successful cases where we have performed DO expansion in the upper and lower jaw as the first stage surgery, followed by a maxillary and mandibular advancement to improve the airway. The changes are quite astounding when reviewing the before and after sleep studies.

We must then question, what is possible when it comes to changes in the width of the maxilla. We can certainly widen the maxilla and make it narrow, but narrowing is more difficult because bone must be removed. The amount of expansion that can be achieved is limited, with the major constraint being the soft tissue pull.



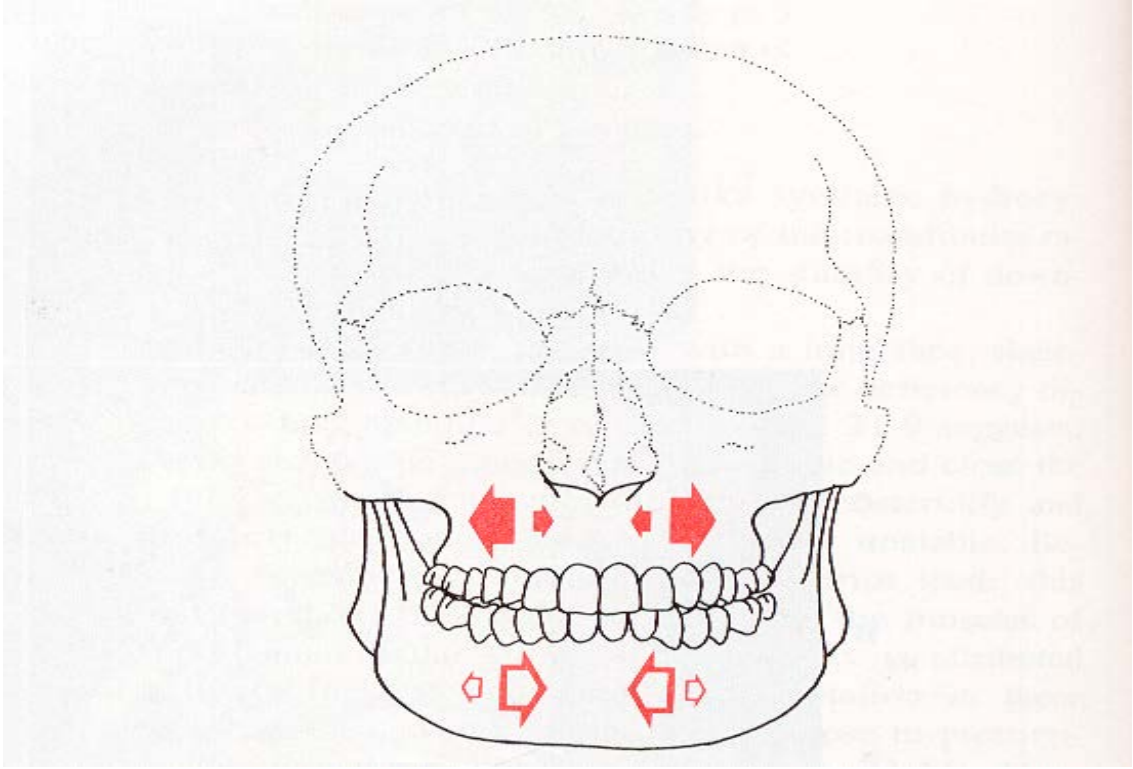
This diagram above also comes from the textbook by Bill Proffit. Surgeons that I have worked with favour a 'cut' in the midline, as well as a cut above the apices of the teeth in the buccal

sulcus. Others seem to feel that the buccal sulcus cuts alone, with an anterior fracture is all that is required. We can expect about 10mm of expansion, and the stability could certainly be improved based on the rate of expansion and how long we can hold that expansion with a retainer. Research has shown that 40% relapse can be expected when you expand without rigid fixation; however RIF (rigid internal fixation) may improve the relapse tendency.

In our clinic, prior to surgery, we place a maxillary expander, and we show the patient how to turn that expander. Following the osteotomy cuts, the patient turns the expander on a daily basis and we leave the appliance in for 2-3 months to allow bone stabilization. During that 3 month period I commence my orthodontics, so that by the time I have removed the expander, there is a wire left in the mouth that is rigid enough to maintain the expansion. Using this technique, we have had much better stability of the expansion than in the past.

The relapse after orthodontic expansion is very similar to surgical expansion, therefore I recommend in younger patients the use of maxillary orthopaedics (expansion) which is effective until late teens, followed by a long term retainer. Using this method, I achieve good stability, and I believe that this may be due to the growth of the individual and the fact that the mid-palatal suture is not totally fused. In a non-growing individual, however, we certainly need surgically assisted expansion. The surgically assisted expansion will rely on an osteotomy in the lateral buttress of the maxilla, in conjunction with expansion devices.

In the mandible it is possible to narrow anteriorly, and to widen. However to significantly widen, we need to perform a distraction procedure. My surgeon and I have tried a number of different distraction procedures. One procedure, with a purely tooth borne appliance, involves me moving the mandibular central incisors apart so that he can do the surgical cut; another procedure is where he has done the surgical cut and fitted an expansion appliance directly to the bone.



In this figure from Proffit, we can see the surgical movements that are possible in the transverse dimension. The solid red arrows indicate that the maxilla can be expanded laterally or constricted with reasonable stability. The smaller size of the arrows pointing to the midline represents the fact that the amount of constriction possible is somewhat less than the range of expansion. The only transverse movement easily achieved in the mandible is constriction, although limited expansion is possible.

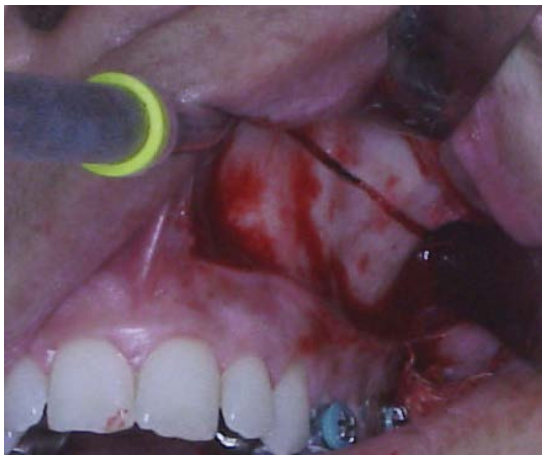
The problem with traditional orthodontic diagnosis is that most orthodontists are very familiar with the lateral cephalometric radiograph, but do not concentrate enough on the frontal PA skull radiograph. In our surgical work-ups we use a lateral cephalometric radiograph, and a frontal PA skull view. New and improved technology has also given us the opportunity to work with long-cone CT Xrays, where in 30 seconds we can have 230 sections of the upper and lower arches. We also use Spiral CT technology to perform a three-dimensional reconstruction. This has helped greatly when planning the treatment options of the transverse and AP discrepancies.

(Surgery for the above patient is performed by Dr. Fued Samir Salmen, Brazil)

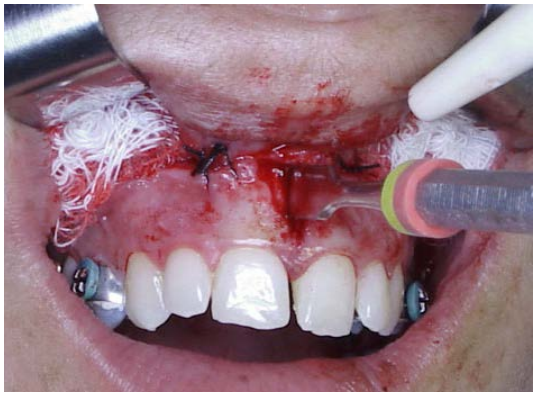
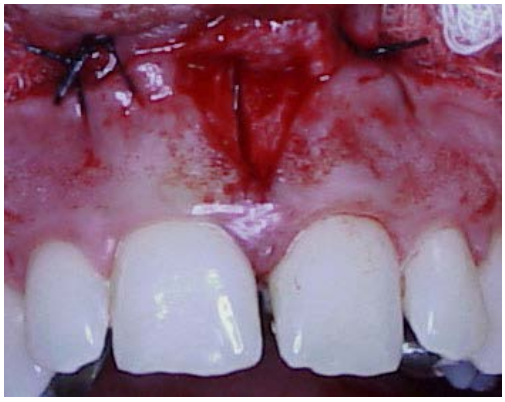
This patient above presents with a mild Class III dental problem, but a reasonable mid-face deficiency. The appliance of choice here is an expander with two bands on the premolars and two bands on the molars. The patient is sent to surgery with a rubber ‘O’ ring around the brackets on the bands so that there is less chance of soft tissue trauma. The reason for these ‘O’ rings, is that after expansion is complete, but before I remove the expander, I want to place an orthodontic archwire and having the tubes and the brackets in situ, within the appliance, makes this easier for

me to place the archwire; such that I do not have to remove the expansion appliance to start fixed orthodontic treatment.

Below, we can see the osteotomy cut of the buttress and the mid-line fracture. This shows the older style expansion screw that we are no longer using, and we can see that this patient has a high palatal vault, and constricted maxillary archform. One of the problems with this style of expansion appliance is that it is very hard for the patient to locate the hole for the key. Many times the patient needs to turn the key themselves and this is an almost impossible task with this style of jackscrew. We now use a 'super screw' appliance which is easier to activate because it is a hexagon and the patient uses a small spanner to activate the device.

In the figure below, the last surgical fracture is made.

The following diagrams show the patient 10 days post-operatively. It is very important that you monitor the surgical patients closely in the first week. On many occasions, the patient does not turn their expander properly; some patients turn it the wrong way; some turn it more than the required amount. To avoid these situations, it is imperative to review the patient within the first week of surgery, check their expansion, then follow them on a regular two weekly basis for the initial 8 weeks following the distraction procedure.


I warn the patients, prior to surgery, that they can expect a large diastema between their teeth because many of them are not prepared for this. The main problem that I encounter with patients,

is that they try to convince me that the orthodontic treatment needs to be started straight away in order to close the diastema. When I attempted to try this early, many years ago, I found that I was moving the front teeth into 'thin air'. This increases the chance of the incisors becoming non-vital. We now advise the patient that we will not commence orthodontics for at least 3-4 weeks after they have ceased their last expansion. Once orthodontics is commenced we use ultra-light forces. We employ the principles of the Damon system, which is a passive self-ligating bracket that drastically reduces the amount of force we place on the teeth. I have found that with this method, I am not seeing the same degree of root resorption and non-vitalities that I used to see 10 years ago when we did not use passive self-ligation.

In terms of overexpansion, the first thing you will notice if a patient is expanding too quickly, is tipping teeth. Teeth will tip when you have reached the patients genetic potential for expansion. To avoid this, it is best to stay within the Schwartz Korkhaus measurements. The Schwartz Korkhaus measurements are calculated from the width of the four upper incisors.
Below is a diagram of an adult patient's narrow upper jaw. In the second diagram, you can see that this patient's premolars have tilted outwards. In a good distraction procedure, one thing we should see (other than the midline diastema) is that the molars and the premolars are held upright in bone. The moment you see tipping, you are increasing the chance of orthodontic relapse.

BEFORE

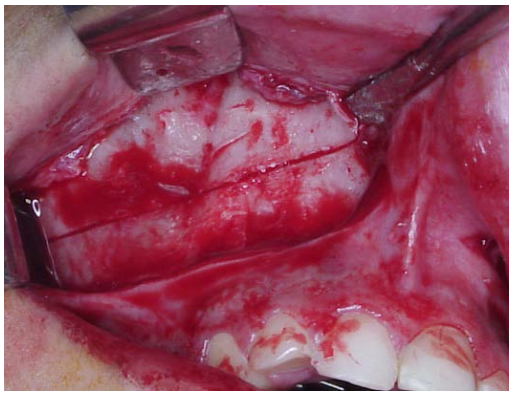
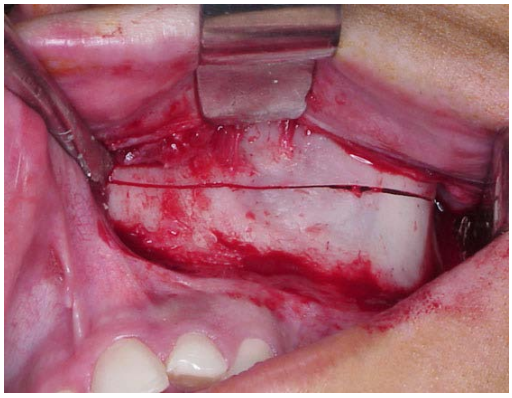
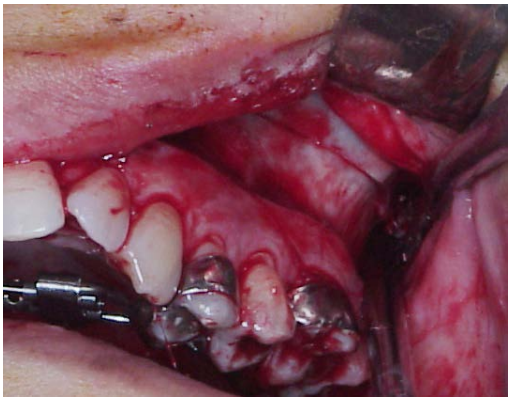
AFTER
(Showing excessive tipping of teeth)

In terms of forward movement of the maxilla, my surgeon and I have not yet offered distraction osteogenesis, but this is something that hopefully we may recommend in the future. I find that a maxilla can be moved forward, up to 10-15 mm, with good stability. The major limitation to the forward movement is the resistance of soft tissue, particularly the upper lip, and the stretch of the

palatine artery. You must also be aware of the effects that the advancement can have on speech and the velopharyngeal closure.

The patient below has had a first stage surgery involving a surgically assisted expansion of the maxilla, followed by a second stage procedure of a maxillary advancement. This patient has a Skeletal III malocclusion, with severe mid-face deficiency. Her chief complaint was that on smiling she didn't show enough of her incisors. She was referred by her general dentist due to the excessive wear on the upper and lower incisor teeth- due to the edge to edge traumatic occlusion.


The expansion appliance is fitted on the patient, however it is not cemented so that the surgeon can remove it to make the midline palatal cut. The surgeon will then cement the expander after the midline cut. The lateral wall surgical cuts are then made.


The top left diagrams below, show the patient 14 days after the operation; then 45 days; 120 days; and 14 months. You can see from these images that once I am happy with the amount of expansion that I will start my orthodontics. The orthodontics is utilized to level and align the dentition, and close spaces by bringing the back teeth forward, so that the archform is maintained. This is generally called Type C anchorage ("burning anchorage").

14 Days

45 Days

120 Days

14 Months

The following pictures show the patient pre-treatment and pre-second stage surgery. The patient (particularly one with a Skeletal III malocclusion) is warned that the orthodontics will worsen their dental Class III prior to the surgery. For patients with an edge-edge bite, they are warned that they may end up with a 5-6mm negative overjet prior to the second surgery. Looking at this patient's profile, you can see the Class III malocclusion is more evident on the right side.

Pre-Ortho **Pre-Surgery**

If we look at this patient's step-deformity, we have now created an increased negative overjet in preparation for the surgeon to perform the maxillary advancement procedure.

Pre-Ortho **Pre-Surgery**


The benefit of working as a team is that we can perform plaster model surgery. We take a face-bow transfer, and mount the models on a semi-adjustable articulator, so we can look at the amount of movement that is required and where the surgical cuts need to be placed. We then construct a wafer-thin surgical splint, from these working models, which we use as a guide during surgery and also to maintain stability of the upper and lower jaw post-surgery.

As we review this patient post-surgery and we can see the improvement in the mid-face as the maxilla has been brought forward. In many cases, the surgeon may use a technique known as a "high Le Fort I" where the surgical cuts are made much higher to improve the prominence of the alar base. The input of an Ear, Nose and Throat Surgeon, in cooperation with an Oral-Maxillo Facial Surgeon, is beneficial in cases where a patient requiring an SAE of the Maxilla has poor nasal pathology; such as enlarged turbinates, deviated septum, large adenoids, or large tonsils.

Pre-Ortho **Pre-Surgery** **Post-Surgery**



This patient was extremely happy, post-surgery, because we successfully addressed her chief complaint, i.e. she was concerned with the lack of incisal display. You can see that we have increased the patient's incisal display by approximately 5 mm. In terms of her profile, there is better facial balance; the relationship of the maxilla to the chin and nose has improved, and if we show our intra-oral before and after photos, you can see the initial edge-to-edge occlusion, the decompensation prior to surgery, and then finally, the maxillary advancement procedure. The use of surgical hooks on the final archwire, has proven to be difficult in the past. Previously I crimped the hooks in place, or placed hooks on the orthodontic brackets. I have found that both of these options are not secure. The best option is to solder the hooks on the upper and lower archwire, in between every bracket, so that when the patient has to use maxillary elastics it is easy for them to attach the elastics in different directions, based on the surgeon's instructions.

Above: Surgical Hooks soldered on the archwire.

Why so many patients would benefit from Surgically Assisted Expansion of the Maxilla.
The 'perfect smile' is indicative of what most patients would like to achieve; that is white teeth, and a wide smile. I can achieve straight teeth regardless of whether I choose to extract or not; however the question is whether I can achieve that wide smile without some form of maxillary expansion.

Research published in the American Journal of Orthodontics, 2005, (Moore et al) attempted to determine the influence of the dark buccal corridors when it came to the attractiveness of the smile. The figure below shows the measurements used in the research article.

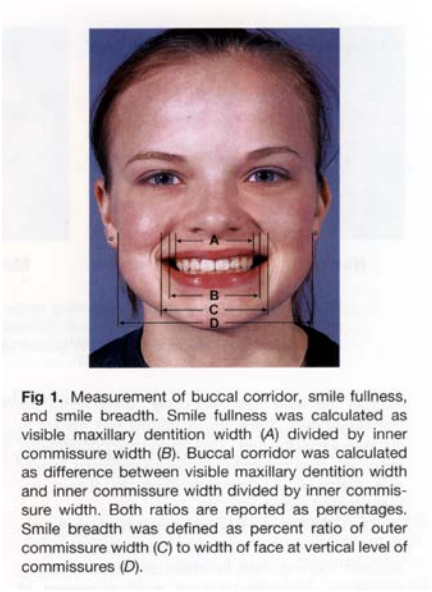


Fig 1. Measurement of buccal corridor, smile fullness, and smile breadth. Smile fullness was calculated as visible maxillary dentition width (*A*) divided by inner commissure width (*B*). Buccal corridor was calculated as difference between visible maxillary dentition width and inner commissure width divided by inner commissure width. Both ratios are reported as percentages. Smile breadth was defined as percent ratio of outer commissure width (*C*) to width of face at vertical level of commissures (*D*).

The researchers used a series of patients and showed lay judges their initial malocclusion (28% buccal corridor), then expanded their dentition (using photo manipulation), thereby reducing the percentage of buccal corridor. Using the opinion of the general public, the researchers gained insight into the most visually appealing smile. The majority of patients chose the broad smile with a minimal 2% buccal corridor.

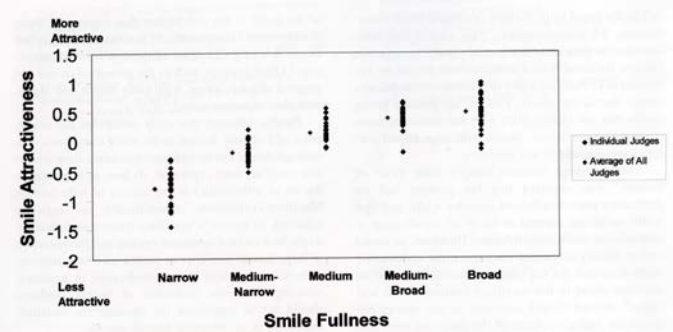


Fig 3. Smile attractiveness related to smile fullness and buccal corridor. Mean scores represent average from 30 judges. Smile fullness ranged from narrow (28% buccal corridor) to broad (2% buccal corridor).

The ‘perfect smile’ can be defined using the following characteristics:

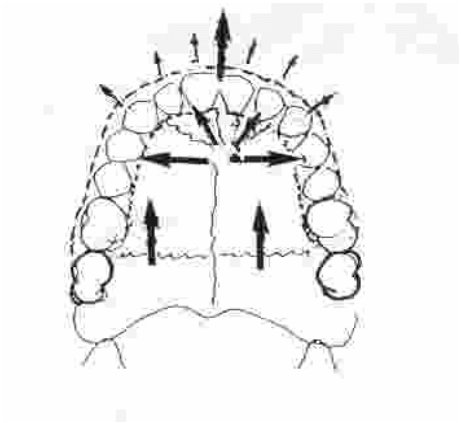
1) The amount of incisal display showing all upper teeth, minimal lower teeth, and showing no gingiva;
2) The upper teeth follow the line of the lower lip (smile arc);
3) The absence of dark buccal corridors.

When it comes to expansion of the maxilla, we need to ask ourselves a number of questions. Firstly, does it work; secondly, is it stable; thirdly, when should we commence expansion; fourthly, once we start the expansion at what rate should we activate our device; lastly, which appliance is best to achieve the expansion.

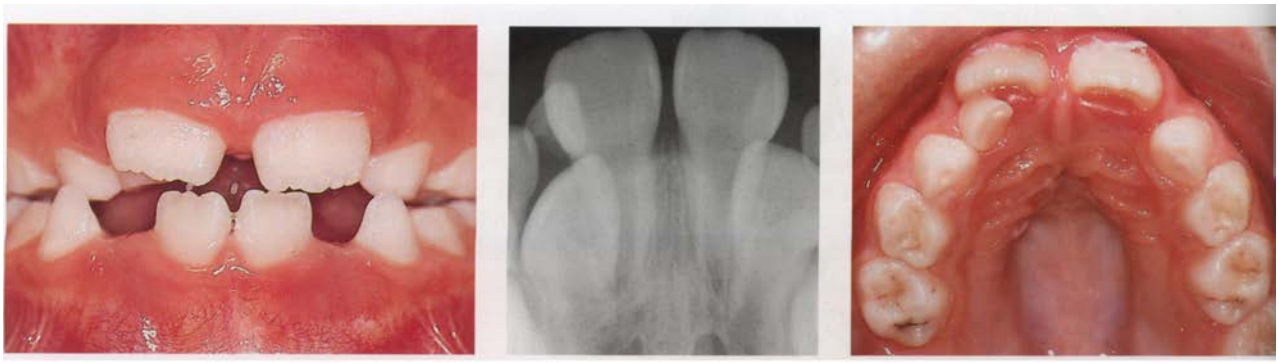
The orthodontic literature, and practical information provided by clinicians at meetings and in courses, regarding maxillary buccal segment expansion is variable and confusing. Therefore I will attempt to answer the above questions myself. In answer to the first question, in a growing individual (for a boy up to 14/15 years old and for a girl up to 12/13 years old) good expansion can be achieved, slowly, without the need for surgery. However, for the non-growing individual, I recommend a surgically assisted expansion to achieve stability, and the distraction approach to achieve stability from the soft tissue pull. In terms of rapid expansion versus slower techniques, in the non-growing individual, the best rate of expansion is about 1mm per week; whereas in a surgical case I would increase that to 2-3mm per week. Can we minimize the number of pre-molar extractions if we expand? Before we answer that question, we need to assess the patient’s smile line. If the patient already has a very broad smile and we remove teeth, but bring the back teeth forward in the same corridor width, you will find that the smile is not affected. Nevertheless, what sometimes happens in traditional orthodontics, teeth are removed and there is no pre-extraction arch development so the crowding is resolved by retraction of the incisors. This may narrow the archform and flatten the smile. So, although I wouldn’t say that all extraction cases end up with a narrow smile, certainly those patients who need arch development (surgically or not) should have that completed before a decision is made on the relief of crowding and the need to remove teeth. Regarding the elimination of buccal corridors, and achieving a fuller smile, a full smile can be achieved (with and without extractions) provided the archform is maintained, and provided that the extraction space is closed by bringing the back teeth forward rather than total retraction of the incisors.

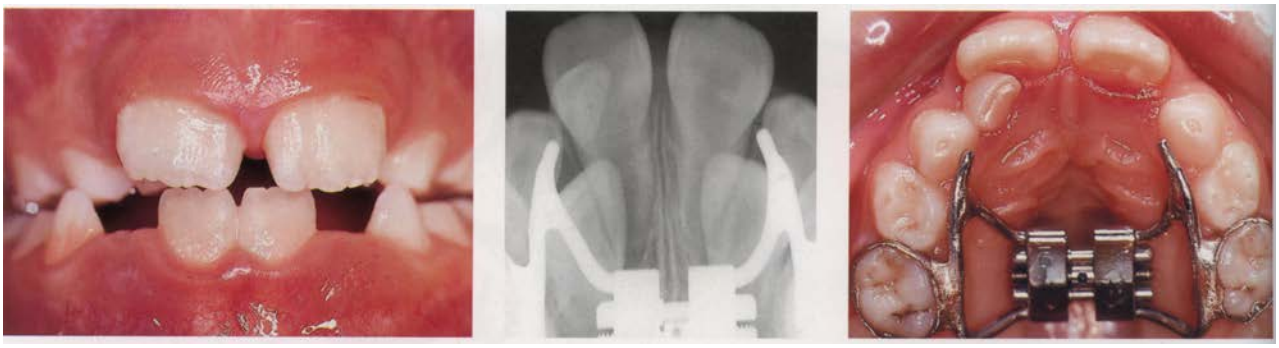
In young children where the maxillary sutures are active, we can influence full growth of the mid-face based on the arch development. It is a far reaching effect from what we see dentally. I find that 'A' point comes forward in a growing individual when you expand, and many times in the borderline Class III patients, with a narrow arch, after the first stage expansion procedure we find that we don't need to do the second stage maxillary advancement because the expansion opens up the palate like a 'V' and as a result the pre-maxilla tends to push forward. For young children the timing of treatment can be determined by the cervical vertebrae. This is based on the research by Franchi, Baccetti, Cameron and McNamara. They feel that between stage 3 and 4 of vertebral maturation is a good time for mandibular movement, i.e. where use of a functional appliance would be appropriate. For a maxillary expansion, however, compared to the control, the skeletal growth philosophy or period to commence expansion would be even earlier, i.e. between the stage of C2 and C3.

From the diagram below you can see what we are trying to achieve via the pre-maxillary suture, the palatine suture, and cruciate suture, so that we are obtaining development of the archform. Growth of the maxilla, with normal airway and tongue position, results in good downward and forward movement. However, in a non-growing individual I cannot achieve these same results unless the sutures are opened for me by the surgeon. Of course, we cannot expect the natural forward movement of the maxilla in these individuals. That is normally the role of the Le Fort I advancement procedure. In a mixed dentition, we can achieve many of these skeletal changes non-surgically.



The patient below is an example of an individual with blocked out lateral incisors. By fitting an expansion appliance (without surgery) the clinician is able to create room for the eruption of the lateral incisors over a six month period, such that there is less need to extract premolar teeth at a later stage. Research has shown that the canine follows the root of the lateral, so that if you have an instanding lateral there is more chance of an impacted cuspid. If you have a peg lateral (or missing lateral) the same is true, but if you can align the four upper incisors at age 9 or 10, and have a well developed arch it really improves facial balance and minimizes the need for unnecessary premolar extractions.



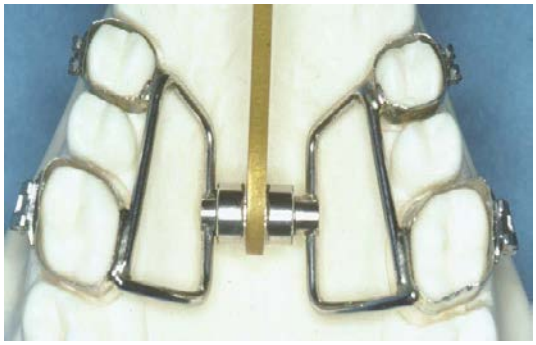


(Pictures reproduced from Textbook on 'Interceptive Orthodontics' by Dr. Damaso Caprioglio, et al.)

WHICH APPLIANCE IS USED AND WHEN?

Initially we used an expansion screw or jack screw that needed a key for the parent or patient to place in the hole in order to activate the device. This was a difficult procedure for parents, and many experienced problems with it. Also, we never put bands on the 1st bicuspids in the premolar region, instead we would use a heavy-bodied wire which resulted in tipping of the teeth. Now we always use bands on the 1st bicuspids and the first molars. For accuracy I fit the bands myself and I take an alginate over the bands. This way, when I send the case to my laboratory I know that it will fit. In the past, an alginate was taken and sent to the laboratory. They poured up the model and cut the teeth to fit the bands; this of course, would ensure that the bands fitted on the model, however it did not necessarily fit chair side.

Dr. Lewis Klapper, Orthodontist, developed a 'super screw' expander design. The benefits of this design is that it is a rigid expander so there is less tipping of the teeth; secondly it has a screw that is easy for the parent or patient to turn; lastly it has a gauge built into the appliance, so as the patient is turning it you can measure the amount of expansion.



The "super screw"

The 'super screw' is the style of expander that I am now using in my surgical cases,, where bands are fitted on the fours and sixes. We extend a heavy bodied wire from the cuspids to the second molar so that when the expansion is activated, we have movement of the entire arch. Otherwise, in the past, we would have expansion of the buccal segment but narrowing of the anterior segment.

CONCLUSION

Distraction Osteogenesis is a scientifically proven technique to expand the arches in non-growing individuals. The clinician must pay close attention to what appliance they would use, when they should start turning, how many times the appliance should be turned per week, and how long they should retain the expansion to enhance stability.

A patient should at least be offered the possibility of arch development as opposed to extraction based, dental compensation, before a final treatment plan is made. This is particularly relevant to relieve crowding in a constricted archform, for a non-growing individual.