

The
**ALEXANDER
DISCIPLINE**

Volume 2:
Long-Term Stability

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Dedication

It is mind-boggling to think about how treatment mechanics have changed over the length of my career. The change in efficiency between the start of my career and today is incredible.

I clearly remember Dr Tweed's words of advice, given to us University of Texas orthodontic graduate students in 1963: "If you start and finish one case a week, you will have a successful practice." In other words, he was telling us that we could not control the treatment and produce quality results with a larger practice. He was recommending that each practitioner have around 100 active patients.

At this time, many orthodontists were still "pinching" bands. Preformed bands were just arriving into the market, preformed archwires were nonexistent, and everything was stainless steel. But times were changing!

Two West Texas orthodontists who had a tremendous influence upon my and others' orthodontic careers were Jim Reynolds and Jay Barnett. They were the first to talk about efficiency and delegation in orthodontics. Their contribution to our profession should be better recognized; they considerably changed the way orthodontic treatment is delivered.

When I opened my private practice in 1964, we were controlling torque, angulation, and off-sets by bends into the stainless steel rectangular archwires. During the next decade, Larry Andrews showed how these archwire bends could be transferred to the bracket. This was a huge change, the beginning of straight-wire mechanics.

With the evolution of bonding, bracket design, and new archwire alloys, a single practitioner can now have a quality practice by starting and finishing one patient a day!

To future generations:

When I graduated from orthodontics school, I thought that I had been given a lifetime of discovery on a silver platter. My predecessors spent their lives searching, discovering, and then sharing. What a difference they made in my life and in the lives of so many others. Little did I realize how much additional change would take place in my generation. Although battles continue regarding extractions, stability, and particular techniques in orthodontics, and although much focus has been on quantity rather than quality of treatment, you don't have to make a choice between quality results and financial success. A good orthodontist can achieve financial success while producing high-quality results in his or her patients.

Preface

An old adage says that we all learn from our mistakes. We do something that goes against our education and even though we were taught otherwise, we simply must find out for ourselves. As children we were told not to touch the stove, yet we had to test it and burn our fingers to find out for ourselves.

Having written two book chapters on stability, having seen many former patients return with relatively stable results, and having lectured extensively on the subject, I began to believe that I had solved the problem of long-term stability until a former patient returned 14 years posttreatment showing relapse. Together let us analyze this patient—her diagnosis, treatment plan, and results—and evaluate our treatment and her stability.

Overview

An eleven-year-old girl presented with a convex profile (Fig 1a), lips open when relaxed, and dark buccal corridors when smiling. She exhibited a Class II end-on occlusion with an 11-mm overjet and a 5-mm overbite. The maxillary arch was a typical Class II V-shaped arch form with spacing in the anterior teeth (Fig 1b). The maxillary intermolar width was a narrow 28 mm. Although the patient was still in the mixed dentition with the primary premolars and molars present, the primary canines were missing. The result was a “collapse” of the anterior section of the mandibular arch (Fig 1c). Was this collapse a result of the mandibular lateral incisors’ eruption causing the exfoliation of the canines? Or were these teeth extracted to gain temporary space, allowing the lateral incisors to erupt? This is a question we could not answer.

Although there are exceptions to every rule, my clinical advice is to not extract mandibular primary canines to make space for the incisors. Keep them as long as possible because they maintain the intercanine width and the alveolar bone in this region.

Examination and diagnosis

In observing the panoramic radiograph, it was noted that the mandibular left second premolar was congenitally missing. The root development from the other unerupted permanent teeth was slow, which meant treatment time would perhaps take longer because these teeth require more time to develop.

Cephalometrically, the patient had a significant skeletal Class II (ANB of 5 degrees) pattern with a sagittal SNMP angle of 36 degrees. This, along with her nicely shaped symphysis, tells us that we can predict good skeletal correction with a cooperative patient. The maxillary incisors were flared labially and the mandibular incisors were excessively upright due to the lack of support from the missing primary canines.

Treatment timing

Under normal circumstances, it would be acceptable to delay treatment until the unerupted teeth had longer roots. However, because of the protrusive maxillary incisors, it was deemed necessary to begin maxillary anterior retraction to hopefully prevent any possible trauma to these teeth.

The most difficult decision to make in this case was the resolution of the missing mandibular second premolar. There were three options available:

1. Nonextraction: Leave space and later place a dental implant. Although dental implants are much more common today, my general philosophy regarding missing permanent teeth is to close space orthodontically when possible. The final occlusion is acceptable and long-term stability is excellent.
2. Extraction: Extract opposite mandibular second premolar and maxillary first premolars. Extracting three other premolars is an interesting option and very well could have allowed the case to be more stable. The only disadvantage would be the resulting concave soft tissue profile, and this is a major disadvantage.
3. Nonextraction: Close space unilaterally. Unilateral space closure would need special mechanics to prevent the mandibular midline from shifting toward the missing left second premolar space.

Treatment plan

Orthopedically increase the transverse dimension through the use of a maxillary rapid palatal expander (turn once a day for 30 days) and mandibular lip bumper (wear 24 hours/day for 6 months). Sagittally, the patient will wear a cervical facebow (8–10 hours/day).

Use special mechanics to close space unilaterally: After maxillary expansion, brackets and archwires were placed

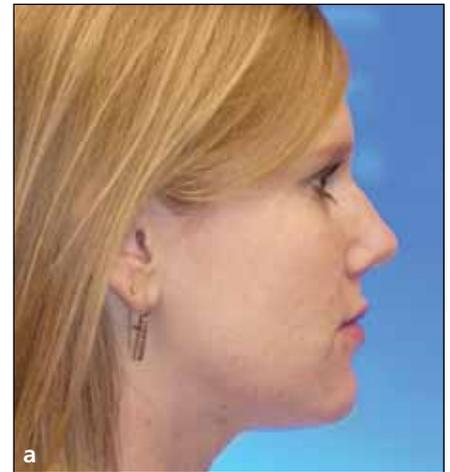


Fig 1 (a) Pretreatment profile. (b and c) Pre-treatment occlusal views.

Fig 2 (a) Final profile. (b and c) Final occlusal views.

Fig 3 (a) Profile 14 years posttreatment. (b and c) Occlusal views 14 years posttreatment.

on the maxillary four anterior teeth to improve arch form. During this time, the lip bumper improved the anterior mandibular arch dramatically. Between pretreatment and posttreatment, the anterior teeth have moved labially into normal positions and the intercanine width has expanded significantly. However, these positions are only temporary.

Another issue to address is the fact that the lip bumper will upright the mandibular molars distally, so why use it when the plan is to move the left first molar mesially?

The answer is based on the mechanics for individual tooth movement. Before attempting to move one molar mesially, the proper anchorage must be in place:

1. The maxillary arch should have a 17 × 25 stainless steel (SS) tied-back archwire for elastic anchorage.
2. The mandibular arch should have a 16 × 22 SS archwire with a unilateral closing loop distal to the left first premolar.

3. After activating the closing loop by “cinching” back, a single ¼-inch, 6-oz, Class II elastic (left side only) is worn for 72 hours. The patient is then seen in 4 to 5 weeks.
4. This sequence is repeated monthly until the space is closed. The molar will tip mesially even though it has a –6-degree bracket and reverse curve in the archwire.
5. After the space is closed, a 17 × 25 SS archwire with reverse curve will level the arch.

Discussion

The treatment time was relatively long (32 months), mostly due to the delayed eruption of the premolars. The final results demonstrated some excellent changes in overbite, overjet, arch forms, and especially a balanced soft tissue and skeletal correction. Her final profile (Fig 2a), frontal view, and smile fit all the criteria of a superior result.

The unilateral closing mechanics, as described earlier, kept the dental and facial midline intact. The final occlusion (Figs 2b and 2c) demonstrated excellent results on the patient’s right side. The Class III occlusion on the left side was acceptable in this compromised occlusion. Treatment brought about dramatic positive changes in the arch forms.

Cephalometrically, the orthopedic and dental corrections were excellent. The final panoramic radiograph demonstrated good root positioning, except in the mandibular incisor region.

Evaluation

The patient returned to our office 14 years posttreatment (11 years postretention) concerned about her crowded mandibular anterior teeth. A new set of diagnostic records was taken to evaluate her condition and compare with her previous records. She was 26 years 8 months old.

The good news was that (1) the patient’s soft tissue profile (Fig 3a), frontal view, and smile had excellent long-term results; (2) the overbite, overjet, and buccal occlusion were very stable; and (3) the maxillary arch form had slightly changed toward a more V-shaped arch (Fig 3b). However, the bad news was that the mandibular anterior teeth had collapsed (Fig 3c), resulting from tipping and crowding of the incisors and constriction of the intercanine width.

But why did this happen? What did I do wrong? Is it true, as some orthodontists believe, that there is no such thing as long-term stability? Or did I make some mistakes to cause this relapse? In retrospect, it is evident that I made several mistakes:

1. Her original mandibular arch form was constricted anteriorly and posteriorly. The posterior expansion with lip

bumper and archwires was stable. The collapse was anteriorly. Part of this constriction resulted from the early extraction of the primary canines. Even though the lip bumper allowed the anterior teeth to assume normal positions, it is possible that there was not enough labial alveolar bone to hold them in their new positions.

2. Poor mandibular arch form: The unilateral space closure created a “shift” of the mandibular anterior teeth toward the extraction site. The midline of the final arch should have been between the central incisors, but instead it was in the center of the right mandibular incisor, causing an asymmetric mandibular arch.
3. Poor bracket placement on the mandibular left central incisor caused an uprighting of the root, thus preventing the “spreading” of the incisors.
4. In observing the position of the mandibular anterior teeth posttreatment, it was noted that slight rotations had occurred after they had been properly aligned. This is a result of poor transition from brackets to the bonded 3 × 3. Today a different wire is used for 3 × 3s and each tooth is bonded to the 0.0215 multistranded wire.
5. The mandibular intercanine width was expanded approximately 5 mm.
6. No interproximal enamel reduction was performed on the mandibular anterior teeth.

Final analysis

As stated earlier, we can always learn from our mistakes. This patient displayed some very challenging problems and positive changes were achieved during her treatment. But relapse occurred in certain areas.

Overall, the positive factors of this case include the patient’s compliance and favorable growth response, the soft tissue profile, the smile, the final occlusion, the maxillary intermolar width change, the maxillary arch form, and the leveled mandibular arch. The negative factors include the poor mandibular anterior root positioning, the expanded 3 × 3, the lack of interproximal enamel reduction, and the poor mandibular arch form.

Summary

With some exceptions, the goal for orthodontic treatment should be to (1) keep the mandibular anterior teeth as close as possible to their original positions, and then (2) build the rest of the occlusion around the mandibular anterior teeth. This book will expand on this very simple concept and demonstrate by research and examples that there is such a thing as long-term stability!

Enjoy the trip!

Acknowledgments

Writing a book has many challenges. Probably the most important factor is the subject material. Spending my professional career studying and practicing orthodontics has been the dream of a lifetime. Having two sons, Chuck and Moody, to continue the “tradition” has been a father’s dream. Knowing classmates and close friends, we have always wanted to share with each other our knowledge and new concepts.

Behind the scenes is my understanding wife, Janna, who has given me the wings to fly around the world.

This book would have been only a dream without the support and efforts of Dr Elisa Espinas-San Juan, my associate

for orthodontic research, lectures, and publications, who was responsible for case images and organization, and Becky Davis, my administrative assistant, who coordinated the manuscript. My appreciation to our clinical staff: Ellie Oginski, Angie R. Knight, and Nancy McInnis. Additional professional support from Quintessence provided the means to an end.

A final “thank you” to all the orthodontists around the world who have heard the “message” and have become loyal supporters. And I might say some of the best orthodontists in the world.

And now... on to the future.

Author’s Note

The reality is that not every patient treated orthodontically can have long-term stability without retention. Some clever person once said that “rules are made to be broken.” In this book, a great effort has been made to identify certain facts that affect the stability of orthodontic treatment. We must realize that in dealing with individual human beings, specific circumstances may prevent us from reaching our goals.

For example, it may be that for stability’s sake teeth should be extracted, but extraction might create an unattractive soft tissue profile. Generally speaking, if I have to choose between esthetics and stability, I choose esthetics. Luckily, this situation seldom occurs.

In a particular case, because the anterior occlusion is a Division 2, the mandibular incisors are excessively lingually uprighted. After improving the torque in the maxillary anterior teeth, the mandibular anterior teeth can and should be advanced beyond the “3-degree rule.” A more normal interincisal angle can be created that is definitely more functional. However, is it stable? My answer is a restricted yes. If the mandibular arch is properly leveled, little overbite relapse should occur. Controlling intercanine width, spreading the incisor roots, and interproximal reduction all play a large part in stability success.

Many years ago at a Texas Tweed meeting, my brother Moody was grading a case that was treated with the extraction of four first premolars. In discussing this with the clinician, Moody observed the concave profile that had resulted. The clinician agreed with the analysis, but very defiantly said, “But I satisfied the triangle,” meaning the Tweed Triangle diagnosis.

Today, in diagnosing borderline extraction cases, the decision depends on appearance rather than stability. Borderline cases will be treated with nonextraction by the vast majority of orthodontists, although the teeth will be moved into unstable positions. So, this brings forth a significant question: Should the patient and parent be told that the teeth are being moved into unstable positions?

At the annual 2011 AAO meeting in Chicago, I had the privilege of being on the program. With a theme of “Finishing, Retention and Stability,” I chose to entitle my presentation “It’s Time to Stand Up for Stability.” The material I presented is found within the pages of this book. In this small way, I am standing up for stability! May my thoughts and suggestions help you treat your future patients with long-term stability as a treatment goal.

Sagittal Skeletal Alteration and Vertical Skeletal Control

“The quality of our expectations determines the quality of our actions.”

— André Godin

Aligning the teeth into normal positions within the arches is the simple part of orthodontics. The major challenge faced by orthodontists is the correction of skeletal problems. One of the most interesting subjects in orthodontics is growth and development. During my 45 years in orthodontics, the knowledge and understanding of this subject has changed dramatically.

Under certain circumstances, particular forces can create excellent changes in the maxillofacial complex. In orthodontic treatment, the affected areas include the maxilla, mandible, and dentoalveolar complex.

I first discovered this knowledge when studying the effects the Milwaukee brace had on tooth position and maxillofacial growth during scoliosis treatment. The conclusions of my research¹ stated that the forces the Milwaukee brace applied to the mandible demonstrated a directional change of growth in the lower face of a growing child. The occlusal forces created by the brace extruded the incisors and depressed the molars. These forces also depressed the total anterior face height. This new knowledge changed the way the profession thought, shifting focus from dental tooth movement to dentofacial orthopedics.

However, although this study showed that maxillofacial growth can be permanently altered (Fig 5-1), it is clinically impossible to create the same force levels delivered almost 24 hours a day as those achieved by the Milwaukee brace.

Growth

Before orthopedic forces have an opportunity to control or change growth, the patient must have growth potential. Because girls generally grow sooner than boys, early treatment in the mixed dentition is usually more successful with girls. If possible, delaying treatment in boys is preferred. Several methods have been used to determine growth potential. Hand, wrist, and cervical vertebrae radiographs are useful but tend to be unreliable in the borderline stages in which it is unknown whether the patient has any growth left. The old-fashioned way of observing the size of the parents and siblings and talking with the parents about the growth potential is usually as good an indicator as other approaches.



Fig 6-1 Mandibular arch with 3×3 measured and maxillary arch with 6×6 measured.

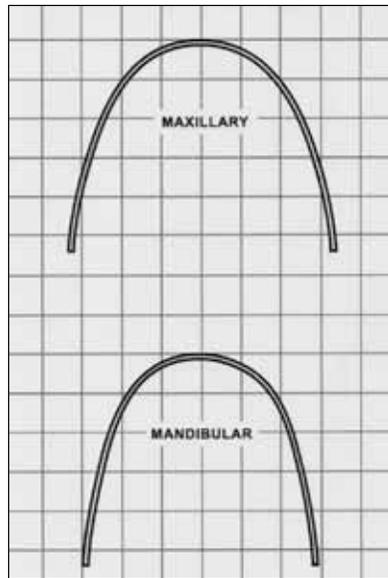


Fig 6-2 Template with maxillary and mandibular arch forms.

Table 6-1	Intercanine width after extraction (mm)		
	T1	T2	T3
J. M. Alexander	25.7	26.8	25.8

Evidence

Four long-term studies from the Room of Truth have substantiated this knowledge.¹⁻⁴ Table 6-1 shows the long-term 3×3 measurements of J. M. Alexander's study.³

Additionally, many other studies have been published with similar results. I would challenge any person who questions these conclusions to show significant long-term stability in patients with mandibular intercanine width expansion and no retention.

Mechanics

With some patients, controlling intercanine width can be just as difficult as controlling torque in mandibular incisors. Mandibular intercanine width can easily be expanded with a 0.016 nitinol (NiTi) archwire as crowded mandibular anterior teeth are unraveled. When a lip bumper is used, the intercanine width is also increased just by removing the pressure of the orbicularis oris muscles. However, this expansion will be temporary (Fig 6-3).

Final arch form is accomplished with the 17×25 stainless steel (SS) archwire. The original mandibular study model is used for a guide to shape the arch form of the six anterior teeth. The archwire should then be placed on top of the brackets in the patient's mouth to check total arch form.

Exceptions

If the mandibular canines erupted lingually in relation to the arch form, the intercanine width can be expanded to conform to the normal arch form (Fig 6-4) and be stable.

Maxillary Intermolar Width

Another goal of transverse dimension is to keep the maxillary intermolar width between 34 and 38 mm when measured from points created by the lingual marginal ridge of the maxillary first molars at the cervical line (Fig 6-5).

Evidence

The Ferris et al study published in 2005 evaluated long-term stability of RPE and lip bumper therapy followed by the use of fixed appliances⁴ (Fig 6-6). Of the 20 patients participating in the study (9 men and 11 women who had undergone initial treatment between the ages of 11 years 2 months and 13½ years), mean posttreatment time was 24 years, and mean time out of retention was 8 years.

Fig 6-3 Mandibular arch before (a) and after (b) lip bumper therapy.



Fig 6-4 (a) Occlusal view of mandibular original study model with 3 × 3 measurements. (b) Occlusal view of patient while checking 3 × 3 width.



Fig 6-5 Caliper measuring maxillary 6 × 6.

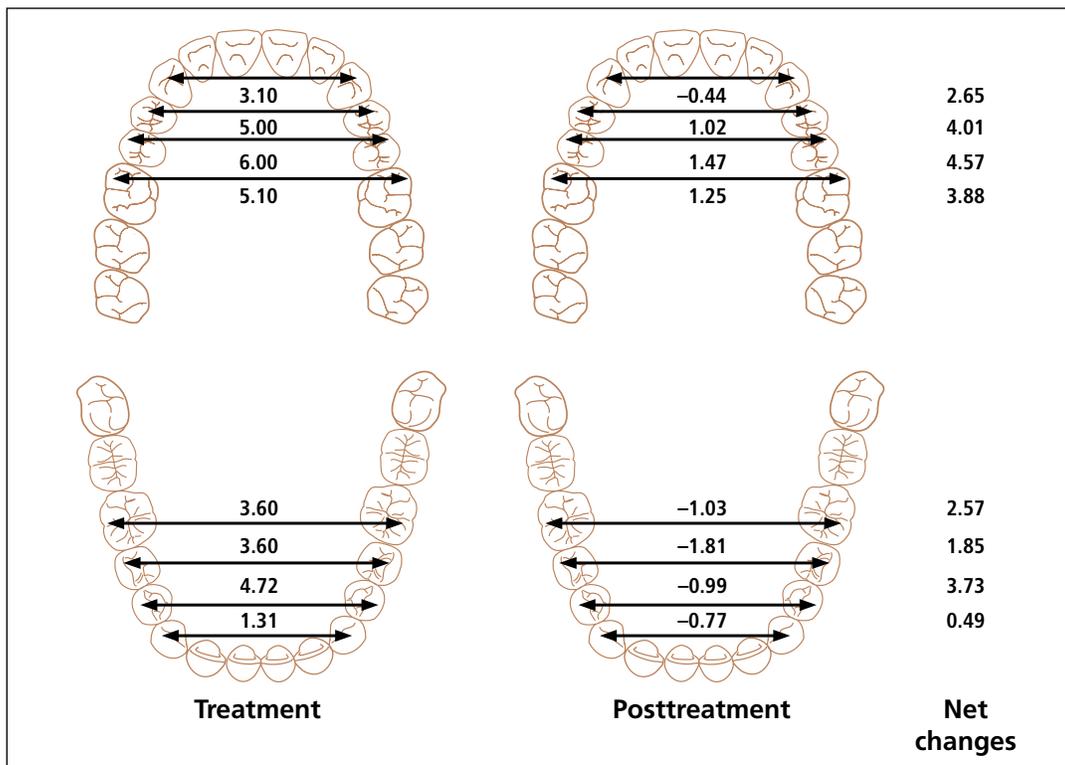
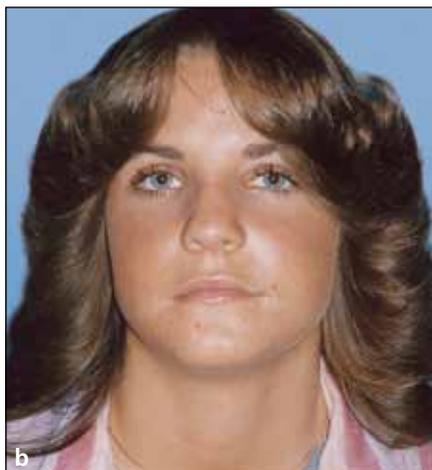
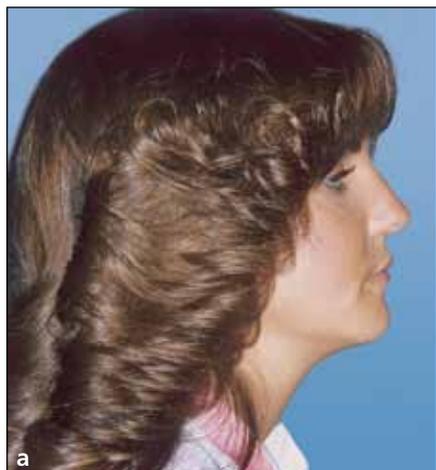


Fig 6-6 Ferris et al study: treatment and posttreatment (eight years postretention) changes in cusp-tip width of the maxillary and mandibular arches. The lateral measurements in this study were taken from cusp-tip widths rather than gingival margins, so the numbers may not coordinate with other studies.

Case 9-2



Figs 9-14a to 9-14c Pretreatment facial views, age 16 years 11 months. (a) Soft tissue profile is straight. (b) Frontal view shows balance. (c) Smile view shows strong chin.



Figs 9-14d to 9-14f Pretreatment intraoral views. (d) Class I molar relationship. (e) Overbite of 2.5 mm and overjet of 2 mm. (f) Class I molar relationship.



Figs 9-14g and 9-14h Pretreatment occlusal models. Initial maxillary intermolar width: 33.5 mm; initial mandibular intercanine width: 24.0 mm. (g) Maxillary arch has a blocked-out maxillary right canine. (h) Mandibular discrepancy of 4 mm.

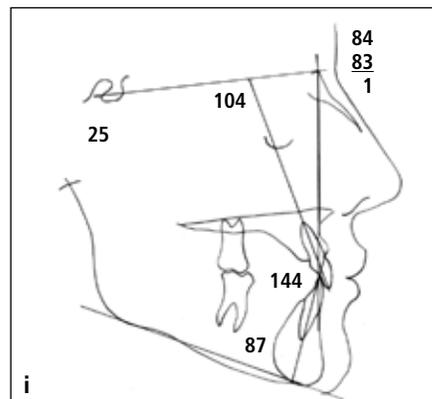
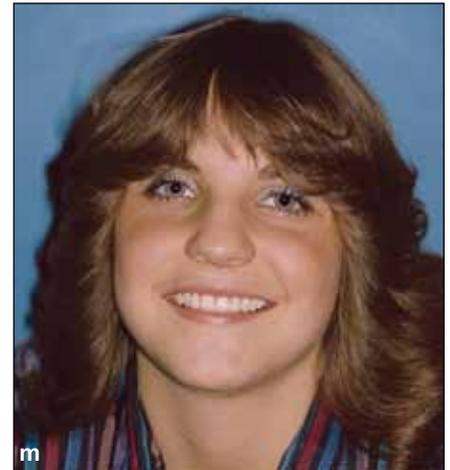


Fig 9-14i Pretreatment cephalometric tracing shows a skeletal Class I low-angle pattern.



Fig 9-14j Pretreatment panoramic radiograph shows missing impacted maxillary right canine.



Figs 9-14k to 9-14m Final facial views, age 18 years 3 months. (k) Soft tissue profile shows nice balance. (l) Frontal view shows nice balance. (m) Smile view shows nice smile line and smile arc with no dark buccal corridors.



Figs 9-14n to 9-14p Final occlusion shows Class I molar relationships, a coincident midline, and good interdigitation.

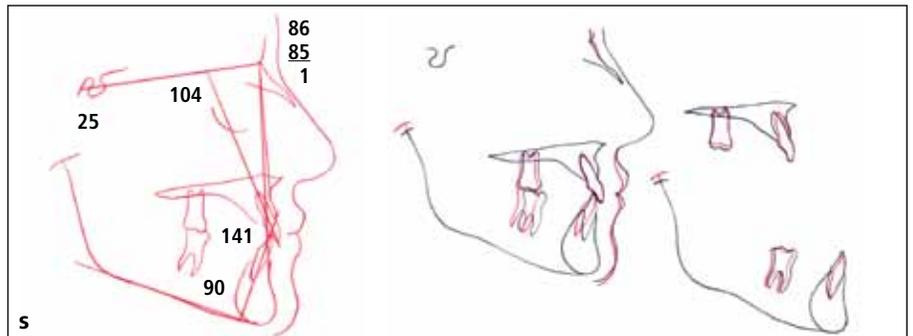


Fig 9-14s Final cephalometric tracing (left) and composite of pretreatment (black) and final (red) cephalometric tracings (right).



Figs 9-14q and 9-14r Final occlusal models. Final maxillary intermolar width: 34.6 mm; final mandibular intercanine width: 25.2 mm.

Fig 9-14t Final panoramic radiograph.