

PROCEDURES MANUAL

T4A™ THE TRAINER FOR ALIGNMENT

developed by Dr. Chris Farrell (BDS Sydney University)

For the alignment of anterior teeth in the permanent dentition

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Introduction

The T4A™ TRAINER for Alignment is a single-sized, prefabricated positioner, incorporating anterior dental alignment and myofunctional training characteristics. The design of the T4A™ is similar to the other members of the TRAINER™ family: T4K™ (mixed dentition); T4B™ (with fixed orthodontic appliances) and is specifically designed for use in the permanent dentition.

The T4A™ has a **tongue tag** for the active retraining of correct tongue position. The tip of the tongue automatically “seeks out” the raised section of the tag and adopts a resting position in the palate. The **tongue guard** stops tongue thrusting while in place which eliminates detrimental forces on the dentition that can slow down treatment progress. **Lip bumpers** are present to stretch the mentalis muscle area. This breaks the reverse swallow habit that is responsible for lower anterior crowding and mandibular underdevelopment.⁸

The two phase T4A™ program utilises the same appliance in two levels of hardness. The Phase I T4A™ is a softer, flexible material for maximum compliance and to adapt to a wide range of varying tooth positions. The Phase II T4A™ is a harder material which is more suitable for closely aligned teeth or as a retainer to restrict tooth movement after orthodontic treatment. Generally the T4A™ Phase I is used as a starting appliance for a period of 6-8 months. It is used alone or with the lingual appliances mentioned (see page 6 Arch development appliances).

Orthodontic movement of teeth is achieved by imparting light forces on the teeth over a constant period. This is conventionally done using fixed or removable appliances. However, the dental alignment is greatly influenced by the soft tissue

forces that surround them. Frankel used the principles of changing these forces with his appliances and found this effect alone was capable of moving teeth and developing the arches.



Mode of action of The T4A™ TRAINER for Alignment

The semi rigid nature of the T4A™ when in place, both reduces the influence of the oral musculature on the dentition and imparts light forces to align the anterior teeth (same as orthodontic archwire) through use of super elastic material and the incorporated labial bows. In addition, unique to the TRAINER™ system, simultaneous tongue position retraining occurs through the tongue tag. Limitation of hyperactivity of the lower lip is addressed by the action of the lip bumpers.

This dual mechanical and functional approach gives improvement in anterior dental alignment, arch form and mandibular relationship through 10-14 hours of regular daily use. In addition, stability of the treated result is superior because of the reduction in aberrant muscular forces during treatment and correction of the myofunctional habits responsible for the malocclusion. Changes begin to take place within 1 month of commencing the T4A™ program. Typically, the complete program of 10-14 hours (combined day/night use) daily, continues for 12-18 months or less when combined with other fixed or removable appliances.

The T4A™ has a tongue tag for the active retraining of correct tongue position

The tongue guard stops tongue thrusting while in place

The two phase T4A™ program utilises the same appliance in two levels of hardness

Simultaneous tongue position retraining occurs through the tongue tag

Changes begin to take place within 1 month of commencing the T4A™ program

ARCH DEVELOPMENT

The T4A™ has a limited ability to increase arch width by itself in the permanent dentition but can be used simultaneously with simple arch development appliances. Arch length gain is acquired by “rounding” out the anterior arch form, as well as increasing inter-molar width. This additional expansion can be obtained using Quad-Helix, LAD, BWS, ALF or Crozat type appliances. The addition of myofunctional retraining extends the possibilities for arch development, as correction of tongue position and mode of breathing has a substantial effect on stability of the corrections.

MYOFUNCTIONAL ORTHODONTICS

The concept of simultaneous myofunctional training and fixed orthodontic treatment will be familiar to users of the T4K™ Pre-Orthodontic TRAINER and the T4B™ TRAINER for Braces when combined with the BWS (Farrell Bent Wire System). In particular, TRAINER™ System users will have an appreciation of the stability of arch expansion in the maxilla and lower anterior arch lengthening as enhanced by the correction of tongue position and function, plus the correction of mouth open posture.

The contributing factors to the malocclusion (which other orthodontic techniques overlook) **are treated** by these appliances. Research shows there is more than a 50% certainty of relapse using current fixed techniques alone. **By using the T4A™, you fill the need for a more aesthetic and stabler non-extraction technique, at a cost that is lower than any comparable system.** Case selection is important, as patient cooperation is required.

FITTING AND ADJUSTMENTS

The T4A™ is designed with correct arch form and average arch width. The flexible material allows for adaption to all arch sizes, with no moulding or fitting required. The polyurethane material can be trimmed with scissors and/or an acrylic stone or bur. The labial flanges can irritate the soft tissue and can be trimmed and smoothed with a polishing stone (see page 10 Fitting, Adjusting and Patient Instructions).

The following pages of this manual will give you information on specific applications of the T4A™. As the specific applications of the T4A™ are divergent, be certain to see the appropriate section on use of the T4A™.

OBSERVATIONS

It will take 1-2 months to see dental changes with the T4A™ when used as the sole appliance. Used with the Bent Wire System the dental changes are usually evident within 2-3 weeks. In most cases you will see changes in the soft tissue within 2-3 months as well. This is demonstrated mainly in the relaxation of the mentalis area and improved lip competence. These are the myofunctional goals to be achieved at the end of any treatment.

CONTRA-INDICATIONS

Non compliant patient: Do not use the T4A™ on a patient who tends to be uncooperative and does not use the appliances as directed.

Severe malocclusion: Do not use the T4A™ on severely crowded cases or with severe jaw to jaw discrepancies. The appliance will prove difficult to use and excess tooth sensitivity will be experienced.

Chronic mouth breathers: Patients in this category who do not have a patent airway may have a lot of difficulty keeping the T4A™ in. Although these patients need this type of appliance probably more than others, it is better to deal with the airway problem and possibly the narrow maxilla before treating with the T4A™.

Generally, however, there are few contra-indications.

Tongue position and mode of breathing has a substantial effect on stability

Research shows there is more than a 50% certainty of relapse using current fixed techniques alone

Cosmetic alignment of anterior teeth without brackets

Cosmetic Dentistry, in particular, tooth whitening and veneering has substantially increased in popularity over recent years. The General Dentist is often confronted with a patient wanting cosmetic improvement to the appearance of the anterior teeth. These same patients often have an additional requirement for improved alignment of the anterior teeth. This can now be provided for minor cases by the general dental practice in conjunction with these cosmetic treatments.

Although comprehensive fixed orthodontics is always the first choice for treatment of misaligned anterior teeth, many adolescents and adults are reluctant to undergo this treatment. There are also many cases of minor crowding or mild Class II that do not warrant fixed orthodontics (from the patient's viewpoint) and therefore remain untreated.

INVISALIGN® has identified this large body of adolescent and adult population in their market surveys. These patients have been given the "all or nothing" orthodontic treatment plan in the past and opted for no treatment. Also, although many teenagers do accept fixed appliances well, there are many who do not. **The T4A™ program is a viable alternative to consider for these cases.**

The T4A™ provides a two phase system for both anterior dental alignment and Class II correction provided they are of a relatively minor nature. This is suitable for both the patient in their early permanent dentition through to the adult patient. The T4A™ is more generally more effective in younger patients, however compliance of the adult patient can be superior, offsetting this biological difference.

The additional myofunctional training aspect of the T4A™ makes effective part time use possible (1-3 hours daily + overnight) provided there is good compliance.



The General Dentist is often confronted with a patient wanting cosmetic improvement to the appearance of the anterior teeth

Although many teenagers do accept fixed appliances well, there are many who do not

The additional myofunctional training aspect of the T4A™ makes effective part time use possible

Although orthodontic correction using the T4A™ can be unpredictable due to this compliance aspect, the T4A™ gives the patient an alternative that is a simple, unobtrusive cosmetic treatment.

Patient Selection

It is important to select patients who are motivated to comply with a program of use involving **at least 1 hour daily plus overnight while sleeping**. You must reinforce in the patient that failure to comply with regular daily use for a minimum of 12-18 months will give an unsatisfactory result. It is always best to state that if compliance is not good the only way to achieve the result is with fixed brackets.

Class II division 1 or 2, with or without crowding, are ideal cases to commence with. They tend to give the best results as the underlying cause of this malocclusion is myofunctional. The T4A™ program requires a less than a 5mm overjet with what would be regarded as minor crowding of no more than 2-3mm of space requirement.

By examining the models you will also see that cases with a flattened or V'd arch form will respond best as the T4A™ corrects arch form by exerting light forces on the dentition in conjunction with the Frankel effect on the soft tissue.

If the patient is a chronic mouth breather and finds it very difficult to breathe through the nose it is better to avoid the case in the initial stages unless additional orthodontic methods are able to be applied. (see page 6 T4A™ in conjunction with arch development appliances).

This is a guideline to initial case selection. Once experienced at seeing effective cases, it will be easy to move onto Class I crowding cases, again of a minor nature and more severe Class II malocclusion with highly motivated patients.

Treatment Plan

After taking models, radiographs and photos, a formal treatment plan can be proposed. Although the nature of the treatment appears simple it still must be regarded in the same way as any other treatment plan (and billed accordingly).

The patient then commences with Phase I T4A™ treatment. Instruct the patient to put the T4A™ into their mouth and check for any irritation. The labial flanges can encroach on the soft tissue and will need trimming with a stone or bur (see page 10 Fitting and adjusting). The patient is reviewed every 3-4 weeks. Normally very little happens until the second month when the patient should be aware of an improvement and comparison with the records will confirm this. Continue the treatment with the Phase I T4A™ until the case is at least 60% corrected. This will normally be 6-9 months. If patients use the T4A™ for 3-4 hours per day + overnight while sleeping, this stage can be reached much earlier.

Once anterior alignment and Class II correction are completed to 60%, move to the Phase 2 T4A™. This is fabricated in a harder material so there should be more attention to ensuring no irritation occurs from the edges. Initially the Phase 2 T4A™ is applied to day time use only and the Phase I T4A™ is continued for night use. Continue with this combination of Phase I and II for a further 6 months. The T4A™ Phase II can be used at night as well as day time provided it is well tolerated.

Retention

Once the desired correction has been achieved continue night use of the Phase I T4A™ only as a retainer for a further period as required.

If patients use the T4A™ for 3-4 hours per day plus overnight while sleeping, this stage can be reached much earlier

Class II division 1 or 2, with or without crowding, are ideal cases to commence with

The T4A™ corrects arch form by exerting light forces on the dentition in conjunction with the Frankel effect on the soft tissue

T4A™ in conjunction with arch development appliances

Arch development, rather than extraction, is now a preferred method of gaining space. The T4A™ system can be used with simple arch development appliances (particularly the Bent Wire System, to achieve highly stable results. View the BWS™ video for more information on the combined effect of a light wire appliance and retraining the tongue to the correct palatal position. This dual approach not only gives rapid results but, at the end of treatment, the cases are much more stable because of the myofunctional retraining effect.

Over the years, arch expansion had become less frequently used because of the potential for an unstable result. However, research has shown that extraction techniques are no more stable. The missing component in treatment however, is retraining the soft tissues to the changed morphology. The T4A™ can be used for simultaneous retraining of the tongue position, swallowing pattern and mode of breathing to enhance the stability of the arch development. It also assists anterior alignment and Class II correction in the same treatment time frame. This allows for non extraction treatment plans to be considered more often and with better stability than in the past.

The use of the T4A™ program in conjunction with arch expansion appliances also provides another alternative to treatment plans for crowded cases. One of the main advantages is that during the arch development stage, fixed appliances are not required as anterior alignment is being corrected by the T4A™. For those patients who want less visible orthodontics this can be the treatment of choice as anterior bracket time can be reduced by pretreatment with the T4A™/BWS program. Further dental alignment is then achieved with fixed appliances and the T4B™ (TRAINER for Braces) in place of the T4A™. This method also improves the function of the soft tissue, enhancing the overall stability, therefore less retention is required.

The Phase I T4A™ is specifically designed to have the flexibility and the palatal space to simultaneously accommodate a wire arch development appliance. The highly elastic material assists in developing correct arch form which arch development appliances are not particularly efficient in doing.

The patient wears the T4A™ for a minimum of 1 hour daily plus overnight while sleeping. They must be informed that this is an integral part of treatment and failure to maintain daily use will result in longer treatment time and less stable results.



The Farrell Bent Wire System (BWS™) is specifically designed for use with the TRAINER™ system. Although the T4A™ can also be used with appliances like Crozat, ALF or Quad-Helix, these appliances all have disadvantages compared with the BWS™ (see BWS™ Video and manual for more information).

Arch development, rather than extraction, is now a preferred method of gaining space

The cases are much more stable because of the myofunctional retraining effect

The highly elastic material assists in developing correct arch form

Pre-finishing/Retention after fixed appliances

The general application of the T4A™ is similar to a pre-finishing appliance. These appliances have been available for many years and are usually supplied in multiple sizes. The T4A™ has no restrictions to accommodating individual tooth positions and has the additional advantage, that it is considerably less bulky than the older pre-finishing appliances, therefore compliance is much better.

With newer technology it is considered unnecessary to have multiple sizes as the T4A™ has a high degree of frictional retention if the result is reasonably stable. The elimination of multiple sizes makes the T4A™ a low cost and time effective pre-finisher. In addition, another major advantage is the integral myofunctional habit correction (see T4A™ Design Features page 9) which is simultaneously applied during the retention phase. This is particularly helpful in tongue thrust cases. Unlike the conventional pre-finishers, it can be used with a bonded retainer upper or lower for added retention while settling the bite.

The T4A™ Phase 2 can be used with a very compliant patient as a primary retainer for both the dental alignment and Class II correction. To ensure that there is no relapse of the anterior alignment the patient must be cooperative and ensure that the T4A™ is used daily for a minimum of 1-3 hours plus overnight while sleeping. (See Fitting and adjusting, Patient instructions page 10). As with other appliances this allows for the retention of the anterior dentition and settling of the posteriors.

Using the T4A™ as an interim retainer for 2-4 weeks after debanding can be useful both as a convenience retainer prior to removable or fixed retainers or as a myofunctional retainer that can be used in conjunction with fixed lingual retainers. Its low cost makes it ideal to use immediately on debanding prior to, or in place of, a laboratory constructed retainer. Tongue thrusting patients can be difficult to retain adequately due to the constant destabilizing force of the tongue. Once in place the T4A™ not only limits the effect of the tongue but also retrains this habit to assist in its correction. This use can assist in stabilizing many Class II cases.

For those doctors using conventional pre-finishers the T4A™ Phase I & II should be considered as an additional appliance range to eventually replace more than 50% of those used now. This would give a financial bonus to the practice.

When can I have the braces off?

Many patients who have had extended treatment, particularly for Class II malocclusion can be debanded slightly early and commence using the T4A™. The advantage of this is that the bite settling can be done without brackets. This pleases the patient as they do not have the aesthetic disadvantage of brackets while continuing with treatment. In this role, the T4A™ is being used as a single sized pre-finisher. As orthodontic treatment is often prolonged due to tongue habits, the T4A™ and T4B™ are useful in decreasing the treatment time of these patients.

The T4A™ is a single sized pre-finisher

Another major advantage is the integral myofunctional habit correction

Allows for the retention of the anterior dentition and settling of the posteriors

Anterior dental correction for minor relapse cases

Incorrect tongue position and function, tongue thrusting and oral habits are the cause of many malocclusions. More attention has been given to these habits recently as factors in relapse.

When a patient presents with relapse after orthodontic treatment, often it is because they have not worn their retainers as instructed. However, many of these patients and their orthodontists are reluctant to enter into a re-treatment program. Also, as the level of the relapse is often minor, re-banding is not desirable. In addition to this, **many of these well treated cases relapse because of untreated muscular/soft tissue (myofunctional) habits.**

The T4A™ is of great assistance in these cases providing correction of anterior alignment and Class II treatment. It is simple and well accepted by patients. Since it is not used full time there is less chance of root resorption which can occur from extended fixed appliance use.

Most importantly, the T4A™ is directed at these causes as many of these relapsed cases are the result of untreated myofunctional habits, not poor orthodontics. No orthodontic treatment or re-treatment can be stable unless these habits are corrected. Tongue thrusting and overactive mentalis are the most damaging habits. Long term retention with fixed retainers can bring about root resorption in the presence of persistent myofunctional habits.

The T4A™ can be used simultaneously with bonded retainers to reduce the possibility of this complication. The patient needs to be made aware of this fact and the T4A™ program is well suited to permanent correction of these unstable cases.

The words of Angle are still appropriate today:

“American Journal of Orthodontics and Dentofacial Orthopedics” June 2002

*“The duty of the orthodontist is not merely to straighten teeth but restore the lost function or to establish the normal function of the denture and all its correlated parts. Moreover, there must be established: normal function of lips; tongue; nose and throat. From these intimately related and highly interdependent tissues and structures come the auxiliary forces which must also be enlisted for the ultimate support of the teeth in their corrected positions. **These forces are the permanent retainers.....***

Furthermore it follows, as the night follows the day, that only in the proportions that the forces of growth, development, and function of the denture and its correlated parts are normalised, will there result true balance, beauty and harmony of the face in accordance with its type.”

When a patient presents with relapse after orthodontic treatment, often it is because they have not worn their retainers as instructed

Many of these well treated cases relapse because of untreated muscular/soft tissue (myofunctional) habits

The T4A™ can be used simultaneously with bonded retainers to reduce the possibility of root resorption

Myofunctional habit correction

Myofunctional habits such as tongue thrusting, reverse swallow and mouth breathing can be major factors in some malocclusions, prolonging treatment time and compromising stability. Correction of these aberrant forces imposed on the dentition can assist dental and skeletal alignment. This is most apparent in the T4K™ when used in the mixed dentition stage. This same unique myofunctional training system has been built into the T4A™. Although facial growth is unlikely to be altered and the habits are more difficult to correct once the permanent dentition is complete, elimination of these habits is essential to achieve a stable orthodontic result.

The design of the T4A™ incorporates a tongue tag for proprioceptive location of the tongue tip. The raised section on the tag trains the patient to place the tongue tip in the correct position with the T4A™ in place. This also acts as a “reminder” to place the tongue tip correctly without the T4A™. Myofunctional therapists use this tongue positioning as the basis of retraining the oral musculature. The tongue guard prevents a tongue thrust swallow when in place, this is a position “training” process for the tongue.

Lip bumpers or mentalis stretchers are incorporated into the design of the T4A™. They stretch and deactivate overactive mentalis contraction associated with a tongue thrust swallow. Lip bumpers have been shown to assist in gaining arch length in mild to moderately crowded cases.

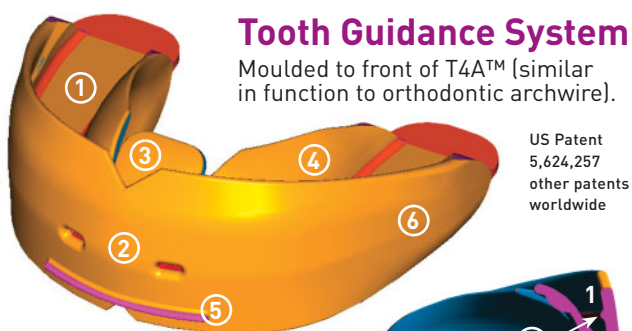
The T4A™ stops mouth breathing when in place. Mouth breathing can cause Class II malocclusion and crowding. The double mouthguard design of the T4A™ TRAINER for Alignment trains the patient to breathe through the nose.

Tongue thrusting, reverse swallow and mouth breathing can be major factors in some malocclusions, prolonging treatment time and compromising stability

Most children with open mouth posture can nose breathe

Passive arch expansion and mandibular growth can be achieved by changing mode of breathing

Design Features of the T4A™



1. **Tooth Channels**
2. **Labial Bows** (impart a light force on misaligned front teeth)

Myofunctional Training

3. **Tongue Tag** for the correct positioning of the tongue tip as in myofunctional and speech therapies.
4. **Tongue Guard** stops tongue thrusting when in place and encourages the wearer to breathe through the nose.
5. **Lip Bumpers** discourage overactive lip muscle activity.

Jaw Positioning

6. **Correct Jaw Position** is produced when in place by preventing mouth breathing and tongue thrusting.

Most children with open mouth posture can nose breathe. These are habitual mouth breathers that can be retrained to breathe correctly. Particularly when worn overnight, the T4K™ Pre-Orthodontic TRAINER helps to prevent maxillary arch loss and slowed growth so common in mouth breathing children. Woodside and Linder-Aronsen showed “a change from mouth-open to mouth-closed breathing was associated with greater mandibular growth expressed in the chin and greater facial growth expressed in the midface.”

Fitting, adjusting and patient instructions

Because of the flexibility of the polyurethane material in the T4A™, individual sizes are not required. For smaller mouths or where the second molar is missing, shorten the distal end by trimming up to the vertical flanges. Sometimes the vertical flanges, particularly on the labial, can irritate the gingival tissues. These areas can be shortened using scissors and a stone in a similar way as you would trim any acrylic appliance.

Always have the patient place the T4A™ in their mouth by themselves for the first time. Do not fit it yourself as this often causes apprehension in the patient which may lead to poor compliance. Most patients will find the T4A™ comfortable, but with a little sensitivity if they have misaligned teeth.

For an even softer starting appliance in severely misaligned cases where you are starting with arch development, you may wish to use either the T4B™ or the TMJ™ Appliance. Most functions of these two appliances are the same as the Phase I T4A™ except that they are made of much softer material. After a period of familiarisation (4 - 6 weeks) with the TRAINER appliances the patient should be able to commence using the Phase I T4A™.

As the T4A™ has 2 major modes of action it is important to remind the patient to place the tongue tip on the tongue tag area whether the T4A™ is in or out. This myofunctional training combined with the Frankel effect assists both arch development and stability of the finalised case. The second action is similar to the function of orthodontic arch wire in that the polyurethane material has memory and exerts a force to align the dentition into the natural arch form. It is a good idea to tell patients that this is the mode of action of the T4A™ and regularity of use is important.

Daily use

The T4A™ Phase I must be used for a minimum of 1 hour daily plus overnight while sleeping. Optimal day time use is up to 4 hours, although this can be difficult to achieve. If, however, at the start of treatment, there is difficulty keeping the T4A™ in during sleep, longer periods of daytime use must be maintained until the situation passes. The dual action of dental alignment and myofunctional training allows the T4A™ to be effective with intermittent daily use. The improvements in soft tissue function then apply correcting forces 24 hours per day. See quote page 8.

The harder material of the Phase II T4A™ makes it suitable for use only after good dental alignment has been achieved. This means after about 6-8 months of T4A™ Phase I or being used as a retainer after orthodontic treatment to maintain level position. Using the T4A™ as a retainer should be similar i.e. 1 hour minimum daily and overnight while sleeping.

Notes:

Individual sizes are not required in the T4A™

Always have the patient place the T4A™ in their mouth by themselves for the first time

The tongue tip must be on the tongue tag area whether the T4A™ is in or out

Optimal day time use is up to 4 hours