Orthodontics – science or fashion?

by Dr. Chris Farrell, BDS

The orthodontic specialty is now 100 years old, and the times since Angle have witnessed the rise and fall in popularity of numerous techniques. One of the more memorable of these was the 1950s challenge to the Angle purists by the Tweed extractionists. This represented a fundamental shift in orthodontic diagnosis and treatment planning. The move to fixed, multi-banded appliances (braces) has now become well accepted as the face of orthodontics by the general public. Over the protests of Angle, extractions have become a commonplace adjunct to orthodontics notwithstanding claims that their use is declining.

Despite refinement in the technique, moving a tooth from its stable and naturally induced position to an unstable but theoretically correct position has changed little since Angle first introduced the system. Alongside fixed, multi-banded appliances, removable or "functional" appliances have had an equally long history in Europe – and more recently in the USA – as a means of enhancing "growth modification" and skeletal development. But the braces and wire technicians (orthodontists), generally denounce the acrylic and wire techniques as ineffective. Debates on this subject have ebbed and flowed for decades, indicating that this fundamental issue is far from resolved. At the heart of the debate lies the question of whether the popularity of fixed techniques is built upon responsible science or simply upon convenience and fashion. The article by Dr. Robert Robert Cerny, "Orthodontics: Trapped in a time warp" (Australaisan Dentist No 16 2006) would indicate the controversies far from resolved.

Science or fashion?

If the last 100 years have given us a sound scientific understanding of the causes of malocclusion, then we are confronted with answering whether our treatment techniques are scientifically based on published research, or whether the science of orthodontics has been hijacked by a big-business fashion industry.

A study of the literature reveals a wide range of reports indicating orthodontic treatment to be unsuccessful in most cases[12, 13]. This claim can easily be challenged by anyone who can demonstrate a sequence of correct and stable cases. Little[12] (1988) started this debate a long time ago, and subsequent studies have confirmed his findings[12]. Even surgical cases in conjunction with orthodontic treatment show less stability than expected[14].

Is this the best orthodontics can achieve after a century of research? If it is, should the braces-wearing public be informed that retainers – not orthodontic correction – are for life? And are extractions all in vain anyway, given that we know the teeth will still crowd again?[12, 13] Sadly, the research seems to indicate this, raising significant issues of accountability for our profession.

What is our response to these challenges? Do we accept that all orthodontic techniques are prone to failure unless permanent retention is used? There is increasing concern in the literature that this approach has no scientific or long-term research to show it is not detrimental to the dental structures. Is there a legal requirement for the referring dentist to inform every patient and parent of this probability?

Forces in orthodontics

The force required to move a tooth is quite small. We know this from the light and ultra-elastic wires now available. The ability to move teeth effectively, quickly and with fewer wire-bending skills have been the major advance in orthodontics in the late 20th century. Modern techniques require far less of the traditional skills of the orthodontist. Increasingly, general dentists are attempting fixed orthodontics with the same assumption of a stable outcome as their orthodontic colleagues. Even Invisalign, the no-bracket system, is based on this same incorrect assumption. There has also been a resurgence in maxillary expansion techniques, which have been conclusively demonstrated in the past to be highly unstable[18]. This has rightly led many in the orthodontic profession to condemn the resurrection of this treatment strategy.

The principle of force is crucial to the debate. The force of the lower lip is considerably higher – 100-300 grams – than that of the wires typically used in fixed appliances. (See graph.) This reality is reflected in practice. For example, techniques generally do not seek to change lower incisor position because the force of the lower lip will move the tooth back to the stable position. The lower lip is also responsible for the arch form[22]. Changing any lower anterior tooth position is therefore potentially unstable. The Little research[12] seems to prove this point.

This critical perspective from both practice and research is not new. Graber's observations in the American Journal of Orthodontics about "the 3-Ms": Muscles, Malformation and Malocclusion[5], raised similar concerns about the failure of some Orthodontists to neglect the forces of the soft tissue.

"It is imperative that the orthodontist appraise muscle activity and that he conduct his orthodontic therapy in such a manner that the finished result reflects a balance between the structural changes obtained and the functional forces acting on the teeth and investing tissues at that time."[5]

Unfortunately, too many orthodontists and dentists evaluate the muscle dysfunction associated with the majority of malocclusions. A change in tooth position must be accompanied by a simultaneous change in the soft tissue (dys)function[15].

In addition to the forces exerted by the lower lip, the force of the tongue is certainly more than capable of moving teeth[9, 17]. We know that the treatment of open bites is difficult because of the constant battle with the tongue[5, 8]. This is why surgically treated open bites show similar poor stability[14]*.

Research and practice clearly show us that instability is the norm, rather than the exception, when we undertake the relatively easy task of moving teeth. It is impossible to ignore the reality of the forces at work.

"My observation over the years is that change is the only constant factor and to expect complete, long-term stability is not possible. Muscle factors, tongue position and function all play a major part and can lead to eventual change or recurrence of the original problems"[14]. Otopalik 1998[14]

Soft tissue dysfunction – ignored for 100 years

"The influence of the lips in modifying the form of the dental arches is an interesting study, and almost EVERY case of malocclusion offers some noticeable and varying manifestation of it," Angle observed back in 1907[1].

Using modern digital video and capture techniques, we are now able to analyze the soft tissue component Angle observed in a much more objective way. It is still difficult to measure, but seeing the movement of the soft tissue and knowing their influence on the arch form and the dentition, we have a better understanding of why the teeth occupy the position they do. There are also much fewer crowding cases than previously perceived. Soft tissue dysfunction syndrome (STDS) is the cause, not big teeth. Logic and science tells us orthodontic treatment will be futile unless the tissue dysfunction and the tooth position are simultaneously corrected.[15] The research confirms the reality of this understanding.

Observation is a vital first step in understanding. A sound understanding must precede any treatment. Consider the case in the adjacent photographs. At eight years of age, this patient shows evidence of tongue thrust and reverse swallow causing open bite and anterior crowding.

We can observe the (STDS) creating the loss of space, the open bite, the Angle's Class II, upper anterior spacing and narrow maxilla. The lower anterior arch form is flat causing "crowding." The soft tissue dysfunction is causing the teeth to be in this position, and is also driving facial growth more vertically due to

the mouth breathing and tongue thrusting.

In such a case, what treatment should be proposed? Any treatment directed solely at re-aligning the teeth either now or later will be unsuccessful unless the STDS is corrected. Correct facial growth will be also compromised unless the STDS is corrected.

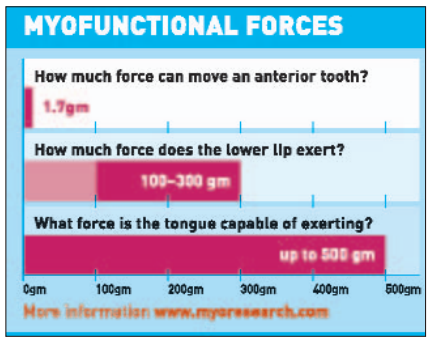
Myofunctional Orthodondics

To be effective, orthodontic treatment must address the underlying myofunctional problems causing the orthodontic disorder. The science supporting our profession compels us to improve our focus on the muscular, soft-tissue and myofunctional aspects and not simply on temporary relocation of teeth which remain subject to those underlying forces. This article has presented just one solution to a comprehensive combined soft tissue and orthodontic correction technique. It is important for us to realise this combined approach is mandatory for the Orthodontic profession to achieve long-term stability.

This child in early mixed dentition shows no such soft tissue dysfunction. He breathes through his nose and his tongue position and function is correct. His upper arch is massively wide because of the correct function. This correct arch form and function means the child will have no crowding, a good Class I occlusion and correct facial growth. This is normal.

So many children have developing malocclusion driven by STDS, and yet they rarely ever receive appropriate early treatment. Instead, treatment focuses on attempting to reposition teeth in spite of the muscular forces at play. The result for these children is poor facial growth and malocclusion for life, except perhaps during the period when orthodontic appliances are worn. This scenario may be open to debate, but the current scientific evidence would appear to support it, and our observation and knowledge of underlying myofunctional forces compels us to realize the limitations of orthodontic procedures that ignore these myofunctional forces. Patients and parents need to be informed of the facts.

Given these facts, can we realistically raise the expectations of our patients beyond probable "recurrence of their original problems,"[14] or "permanent retention for life"[12]. One hundred years of experience, observation, research and practice compels us to consider again the role of "functional" appliances.



The world's most effective, most convenient functional appliance

Most functional appliances had their basic beginnings more than 100 years ago. The Balters Bionator, the Activator and the Frankel are all old designs, developed from Eastern Europe. But none are as old as the most powerful functional appliance of all – one that is still working today in developed and primitive races alike, with no professional assistance required.

While it is popular – or perhaps just fashionable – to respond that "functional" appliances do not work as well as fixed appliances[23], it is informative to contemplate the thumb. As an appliance, it is readily available, requires no lab fees, it is convenient, does not break, and enjoys excellent compliance. In terms of effectiveness, the skeletal changes brought about by the thumb functional appliance are well documented[10, 20, 21]. If a child sucks their thumb for any reasonable amount of time, dental and skeletal changes routinely occur. And as we have all observed, these changes are usually permanent. Correction of the damage done by thumb-sucking can be a difficult orthodontic exercise even long after a child has quit the habit. So the skeletal and dental change is usually permanent. But why? The thumb creates a narrow maxilla and an open bite. But it also trains the tongue to thrust while swallowing and produces a mouth-open posture. This perpetuates the malocclusion long after the habit has gone. Some will self-correct, but rarely after the early mixed dentition stage.

So we can conclude that for better or worse, any appliance placed in the mouth at an early age that can influence the tongue position and function can have an effect on the child's development[7, 19]. Dentists also inform parents of the dangers of long-term use of a dummy. It is hard to argue the potential effectiveness of functional appliances in light of the effectiveness of the thumb.

However, the majority of these acrylic and wire appliances encroach on tongue space, lowering tongue position, (with the exception of the Frankel) which can make soft tissue dysfunction worse. So most are as bad as the thumb when it comes to correction of poor myofunctional habits, and once removed, the badly trained tongue forces the teeth into another position of malocclusion. Like the thumb, these appliances fail to correct soft tissue dysfunction, and often make myofunctional habits worse. This concurs with the unpredictable results that occur with these functional appliances.

Tongue position is vital for correct growth and a good occlusion. Compare the arch form of a mouth breather to that of a nose breather.

"The mouth breathers' maxillas and mandibles were more retrognathic. Palatal height was higher, overjet was greater in mouth breathers. Overall, mouth breathers had longer faces, with narrower maxillae and retrognathic jaws."[2]

An appliance that retrains the tongue to the correct position in the palate and that stops mouth breathing and tongue thrusting should be of great assistance in correcting the soft tissue component of a malocclusion (STDS) before or during regular orthodontic treatment. Such an appliance should complement arch development, but must also not interfere with the natural tongue position. Unfortunately, virtually all arch development appliances lower tongue position because of acrylic in the palate and, as Harvold[6] found in his experiments on primates, actually *cause* malocclusion. This is another reason why arch development with Hyrax or acrylic expansion appliances produce an unstable result. The tongue has not been re-trained to occupy the widened maxilla.

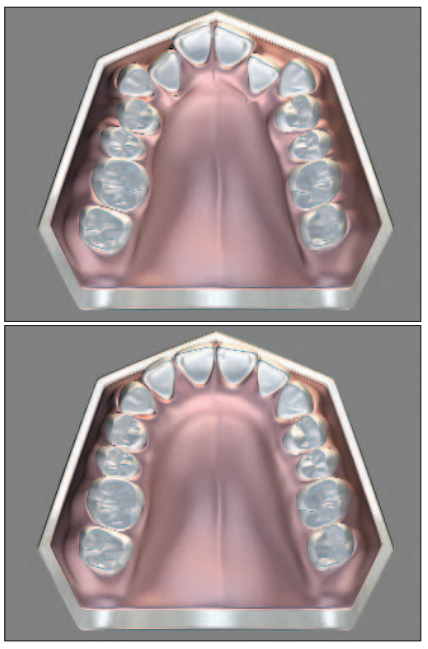
Because of the inadequacies of these appliances, the conclusion reached was that arch expansion to correct crowding always relapsed, and so it was assumed that extractions were the only answer to stability. However, time has proven these extraction cases to be no more stable[13] and if the Little[12] studies are taken to be scientific and published research, then no orthodontist should be treating patients this way either.

The broader perspective

Of course, extractions do sometimes prove effective in the long term for some patients. Likewise, some fixed appliances are able to provide stable longer-term outcomes, as do some functional appliances. We know that moving teeth is easy but that long-term stability is uncertain. We know that many functional appliances have limitations, but we also know that the principle behind them (think of the thumb) demands our consideration. The dilemma practitioners face is how best to advise and treat patients – particularly when those patients may expect a certain type of treatment based on popular awareness. Do we adhere to fashion or consider the science?

What is not uncertain is that our first responsibility is to acknowledge and address the underlying myofunctional problems (STDS) causing the orthodontic disorder. The majority of our growing children have this problem now. The science underpinning our profession compels us to consider the soft-tissue and myofunctional aspects in treatment planning, and not simply relying on temporary relocation of teeth, which remain subject to those underlying detrimental forces. In that light, it is prudent for us to consider all possible treatment options. We are well-advised to re-examine the potential of properly designed myofunctional appliances as an effective adjunct to better and more stable orthodontic treatment. Because of their capacity for addressing the underlying causes of malocclusion earlier than fixed appliances, myofunctional appliances can potentially be an essential part of every orthodontist's range of treatments.

A broader concept in diagnosis



Crowding is not related to tooth or jaw size. Compare these normal and crowded upper arches. Tooth size is the same. Only arch form is different, which is directly related to tongue position and function. Orthodontic diagnosis must shift toward a better treatment of the cause of malocclusion rather than treating the result. This requires a change in classification beyond the definitions of Angle.

Part 2 explores a broader approach to diagnosis based on the soft tissue dysfunction rather than measuring millimeters of tooth and jaw size discrepancies. OT

OT About the Author

Dr. Chris Farrell, BDS is a practicing dental surgeon who has specialized in myofunctional research and treatment of malocclusion for two decades. He is the founder and president of the Myofunctional Research Company, which designs, manufactures and distributes innovative dental appliances now used in more than 60 countries. Facing the problems of malocclusion in daily clinical practice and seeing the results of many different orthodontic approaches led him to explore the literature on both sides of the debate. As a result, in presentations to a number of university orthodontic schools, he has argued that popular orthodontics is based on fashion and not on research.

OT Contact

Chris Farrell, BDS
P.O. Box 14, Helensvale
QLD 4212 Australia
Phone: +61 7 5573 5999
Fax: +61 7 5573 6333
E-mail: chrisf@myoresearch.com
www.myoresearch.com

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