

Left: No root resorption using intermittent forces with fixed or removable appliances.
Right: Root resorption with continuous forces using fixed appliances.

Research continuous force applied by fixed braces causes root resorption.

brackets does not significantly reduce the incidence or severity of root resorption.

How can we reduce the incidence of root damage? Are we bound to admit to our patients and parents that the use of fixed appliances will cause damage to the root surfaces, the root length and possibly reduce the tooth life? Added to this is the uncertainty of fixed retainers continually causing root damage as the patient ages, which can cause tooth loss in the future and is a real medico-legal issue the profession needs to openly face.

Part 11 of the 'Physical properties of root cementum' series examined the possibility that using fixed appliances with intermittent use, rather than continuous force, coupled with modern arch wire techniques may decrease the incidence and severity of root resorption. The results concluded; "Intermittent force produced less root resorption than continuous force."⁹

"The application of intermittent orthodontic forces of 225 cN for 8 weeks (14 days of force application, 3 days of rest, then 4 days of force application repeated for 6 weeks) caused less root resorption than continuous forces of 225 cN for 8 weeks. Although it might not be clinically practical, compared with continuous forces, intermittent forces might be a safer method to prevent significant root resorption. This regimen, however, could

compromise the efficiency of tooth movement."⁹ It may be less convenient but the path to preventing root resorption certainly lies in this ground-breaking research.

Kumasako et al (2009) echoed the same findings that intermittent force is a more efficient way to avoid root resorption, as well as recruit the osteoclasts, when compared to continuous force. "Results show that an 8-hour intermittent force efficiently recruits osteoclasts while causing minimal root resorption."¹⁰

The researchers at Sydney University found even more astounding results. "A radiographic study established that fixed appliances are more detrimental to the roots of maxillary incisors than activators and spring plate removable appliances. Another radiographic study by the same authors involved comparing patients treated with full fixed edgewise appliances with Class II elastics and rectangular wires with patients treated with activators, plates with clasps, and vertical elastics. The patients treated with fixed appliances had notable OIIRR (root resorption), but the other group had none."⁹

We can extrapolate from these findings that the Sydney team found NO root resorption while using intermittent forces of removable appliances. Therefore, it is curious that these research findings are not applied into the clinical practice.

It is clear from the three aforementioned studies that the conclusion is root resorption can be minimised by intermittent orthodontic techniques.

The latest tendency in orthodontics is to use self-ligating brackets and "archwires and corresponding sequencing have been carefully selected to keep the applied force in the "optimal force zone" during each of the four phases of treatment."¹¹ It is curious that this trend appears to directly contradict the recommendations from research quoted earlier in this article. James L Ackerman concluded in March 2015 that "it is fair to say that orthodontics has been more technology driven than biologically or scientifically based."¹²

There is a medico-legal problem upcoming for the industry because the research shows us there are less damaging ways to practice orthodontics and either reduce or completely eliminate root resorption. Patients and parents should be given the safer option, but one wonders about the concerns of the specialist orthodontist having to live up to claims on the Australian Society of Orthodontics website that orthodontic treatment is beneficial because "having well aligned teeth and jaws gives you healthier teeth that will last a lifetime."¹³

For those General Dentists who are not proficient in evaluating orthodontic research and may not be aware of the potential root resorption dangers or the medico-legal aspect of providing orthodontic treatment, it is important to know there are less damaging alternatives.

The Myobrace® system is orthodontic treatment that utilises removable appliances and uses intermittent forces with a 12-hour on, 12-hour off program to treat aberrant myofunctional disorders. Research into Myobrace® appliances also demonstrates that benefits of the system include Class II correction,¹⁴ myofunctional correction¹⁵ and obstructive sleep apnoea correction.¹⁶

Increased awareness of root resorption and intermittent orthodontic techniques that potentially reduce or completely eradicate root damage is an important step forward for the industry from a medico-legal standpoint. As always, the profession needs to apply research recommendations into the clinical setting and implement a more biological approach to orthodontics. The next article in The 6 Rs of Orthodontics series will focus on Retention. ♦

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