

Summary of: Advances in orthodontic anchorage with the use of mini-implant techniques

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FULL PAPER DETAILS

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Orthodontic mini-implants (OMIs) represent a new form of anchorage provision and appear to provide a variety of benefits for both anchorage-demanding and complex orthodontic cases. This paper reports the latest perspectives on OMIs in terms of the emerging clinical evidence base coupled with their varied clinical applications.

EDITOR'S SUMMARY

BDJ themed issues are intended to focus on a particular field of dentistry, in this case orthodontics, highlighting advances in the area and putting these into context for the general dentistry community and specialists alike. This particular research paper certainly fulfils that brief. In it the authors highlight and summarise an especially important advance in the field, namely orthodontic mini-implants. As Andrew DiBiase mentions in his commentary on this research review, this discovery and application is a seminal moment in orthodontics.

Research is a funny thing. When we are not involved in it ourselves it can seem niche and far-removed from our everyday lives. But as soon as we become more involved or it is applied to something we can use, the results are wondrous. In this case, if you were being elaborate, you could claim that the research behind the useful application of orthodontic mini-implants started out with Newton in the late seventeenth century and his work on forces. Another stand out piece of research which laid the paving stone for mini-implants was Bothe, Beaton and Davenport's work on titanium implants in

the 1940s. So that very basic research over hundreds of years has provided patients and practitioners alike with a whole new concept to play with in terms of anchorage in orthodontic treatments.

The articles in this special issue of the *Journal* reinforce that so much of orthodontics is linked to psychological and psychosocial aspects of people's lives. Thus, where possible, it is useful if the treatment itself does not compound these problems for patients. For example, if a child patient is required to require headgear, this can single them out even further from their peer group as being different, at a stage in their lives where being different is not always welcome. However, the anchorage provided by mini-implants is much more discrete and so the patient is happier and compliance is improved. As the authors point out in this paper, mini-implants also provides more versatile anchorage and opens up the possibility of controlling tooth movements in three dimensions.

One of the most exciting aspects of research is the fact that it often opens up new avenues for exploration which could lead to further new applications and ideas. Though sometimes we tire of reading 'further research required' at the end

of research papers, this is really a positive thing. Indeed, in the case of orthodontic mini-implants this translates as 'boundless possibilities for the future' of orthodontics!

The full paper can be accessed from the *BDJ* website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 218 issue 3.

Ruth Doherty
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IN BRIEF

- Informs that orthodontic mini-implants (OMIs) provide reliable anchorage in all three dimensions (antero-posterior, transverse and vertical).
- Reports that OMIs are well accepted and tolerated by both adult and adolescent patients, with minimal morbidity.
- Highlights that optimum use of OMIs requires an understanding of orthodontic biomechanics, particularly in terms of the effects of altered traction positions.

COMMENTARY

Over the hundred years or so that is the history of modern orthodontics there have been several seminal moments that have irreversibly changed the way orthodontics is practised: the use of direct bonding to place fixed appliances and the development of the straight wire appliance to mention just a few. It appears we are living through one of those moments now with the introduction of skeletal anchorage, most notably in the form of mini-implants. Unlike implants used in prosthodontics, orthodontic mini-implants are not designed to osseointegrate. Rather they rely on mechanical retention, meaning they can be small allowing placement in numerous locations in the alveolar bone and palate, including interdental. They are easy to place under local anaesthetic, can be loaded immediately and left in place for as long as they are needed and are simple to remove.

In the UK Richard Cousley and Jonathan Sandler have been in the vanguard of this revolution providing not only clinical guidance and expertise but also the research to back this up. In this article they outline the use of mini-implants in contemporary orthodontic practice, giving a brief summary of the literature in this area. While much has been published, until recently there has been a paucity of proper clinical research. One the authors has undertaken one of the first proper clinical trials in this area, the findings of which are discussed. These have shown that the use of mini-implants is safe, predictable, provides excellent anchorage and is very acceptable to patients. In addition, the technique does *not* rely on good patient co-operation which is needed in more conventional forms of anchorage control, such

as headgear.

The article goes on to describe the use of mini-implants in a variety of clinical scenarios:

- Anchorage reinforcement
- Molar distalisation
- Protraction of teeth to close space in hypodontia cases eliminating the need for prosthetic replacement of missing teeth
- Correction of a centreline discrepancy by the unilateral use of a mini-implant
- Correction of an anterior open bite.

Each is illustrated with a clinical example. The final clinical case demonstrates the use of mini-implants placed palatally to intrude the buccal segments to close an anterior open bite, which conventionally would have required surgery to impact the maxilla. This shows the impact mini-implants are having in orthodontics, extending the envelope of what tooth movements are possible and the severity of malocclusion that is orthodontically treatable without recourse to orthognathic surgery. Indeed, we live in exciting times.

Andrew DiBiase

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AUTHOR QUESTIONS AND ANSWERS**1. Why did you undertake this research?**

We were both introduced to orthodontic skeletal anchorage when (osseointegrating) palatal implants became available in the late 1990s. Subsequently, when OMIs were introduced we could see the clear advantages of these smaller, non-integrating skeletal fixtures in terms of their small size, ease of insertion, low morbidity, and wider options in the range of anatomical insertion sites and anchorage/traction applications. This led one of us (RC) to design a mini-implant system to overcome some of the perceived initial practical limitations, and the other (JS) to focus on randomised controlled trials comparing these new forms of anchorage with conventional options such as headgear. This approach in the UK mirrors technical and research efforts in other countries, notably Korea, Japan, Germany, the USA and Brazil. Overall this means that twenty-first century orthodontic patients, presenting with anchorage-demanding and/or complex treatment requirements, now have a much wider range of treatment options available to them, as illustrated here.

2. What would you like to do next in this area to follow on from this work?

We aspire to use both our clinical and research expertise to consolidate mini-implant success rates and refine their clinical applications. For example, while OMIs have a high overall success rate, there are still anatomical sites (eg mandibular sites in adolescents) where the failure rate is relatively high. In terms of clinical applications, the most recent novel OMI application is bone-anchored expansion of the palate where dramatic mid-face expansion has been demonstrated by case reports. Our aspiration is that this work is progressed in terms of both clinical technique refinements and research of the long-term maxillary and dental changes.