

**SCIENTIFIC  
SECTION**

## Commentaries on scientific papers published in this section

### **Assessment of the accuracy of a three-dimensional imaging system for archiving dental study models** **A Bell, A F Ayoub, P Siebert**

This study offers a potential solution to the study model storage problem that is common to orthodontic practices and departments alike. A photostereometric technique, using two video cameras, was used to capture a three-dimensional image of plaster study models allowing digital storage of the data and virtual presentation.

The study evaluated the validity of the technique by comparing actual and recorded measurements of the study models. The results demonstrated a clinically acceptable accuracy.

Does this mean that we can order a skip to collect our study model collection? Perhaps we should wait until the legal acceptability of digital records is established.

Jeremy Knox  
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### **An *ex vivo* assessment of a bonding technique using a self-etching primer** **C J Larmour, D R Stirrups**

The paper by Larmour and Stirrups represents a typical, *in vitro* bond strength assessment of orthodontic adhesives. This study examined the bond strength of a self-etching primer in the wet and dry conditions relative to a standard light-cured adhesive. The study is well-designed and with a sound analysis of findings. However, there is a concern related to the actual clinical relevance of the results.

*Ex vivo* bond strength protocols fail to simulate the multi-factorial intra-oral ageing of resin composites, which include pH fluctuation, complex cyclic loading, microbial attack, and enzymatic degradation. In fact, water by itself can cause hydrolytic breakdown of polymers through elemental leaching from fillers. Filler-resin matrix interfaces may also sustain degradation due to hydration- or acid-induced filler surface breakdown, which leads to detachment of the coupling agent from the filler surface, causing matrix-filler separation. The

deleterious effect of water is not new: evidence of hydrogen-mediated, humidity-induced degradation of glasses, resulting in lower fracture toughness has been known for half a century.

In the case of self-etching primers, the fact that there is no rinsing and drying following their application, results in acidic residues retained on the enamel. When mixed with the adhesive paste, these acidic, watery deposits may induce plasticizing of the resin matrix, or attack the fillers causing structural defects. This hypothesized effect may not be reflected on the short-term bond strength performance of the adhesive because bond strength as a variable is not a reliable estimate of the polymerization efficiency and associated properties such as solubility. Investigation of the degree of cure of these systems, and assessment of their *in vivo* performance through clinical trials is required before a definitive consensus is reached on their efficiency. Perhaps, our research efforts should depart from the commonly used route of *in vitro* bond strength assessment or, at least, not be limited to this testing protocol.

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### **A clinical investigation of force delivery systems for orthodontic space closure** **C Nightingale, S P Jones**

This small study addresses an important clinical question that is relevant to our clinical practice. In this investigation, the authors have evaluated the force decay and rate of space closure of elastomeric chain and nickel titanium springs, following a period of clinical use.

This study revealed several interesting findings. First, the force exerted by power chain did not decay, as was expected, and the rate of space closure was not different from nickel titanium springs. Furthermore, the coil springs delivered variable force and, in some instances, the high initial force exceeded the super elastic plateau.

The study does, however, suffer from some limitations. For example, the split mouth design does not take into account the effect of the two methods of space closure in

the same arch. In addition, it could be suggested that the study lacks power. The authors have addressed these points in the discussion.

Nevertheless, this study should be considered to be a useful addition to the literature as it illustrates, once again, that clinical studies do not necessarily support the findings of *in vitro* investigations or the claims of the manufacturers of the equipment that we utilize.

Kevin O'Brien  
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### **Orthodontic treatment outcome: the relationship between anterior dental relations and anterior inter-arch tooth size discrepancy** **S Redahan, L Lagerström**

It is difficult to get very excited about a study with negative findings. However, such findings can be just as important as a new discovery. In this study, Redahan and Lagerström dispel the assumption that the detailed configuration of the post-treatment anterior occlusion can be predicted from the pre-treatment Bolton ratio of tooth size discrepancy.

Although Bolton ratios have been used for 45 years, most clinical orthodontists assess malocclusions by the millimetre. Take the example of what many of us would consider to be well proportioned anterior teeth: on the basis of 9 mm upper centrals, 7 mm laterals, and 8 mm canines, the upper anterior tooth dimensions total 48 mm; the lower equivalents of 5.5, 6, and 7 mm total 37 mm. The Bolton anterior ratio in this case is 0.771, which corresponds almost perfectly with Bolton's own mean 0.772.

Let us now suppose that the anterior Bolton ratio of a case is not 0.771, but 0.822. This figure is difficult to interpret because it doesn't quantify the discrepancy in millimetre terms that orthodontists can relate to easily. Once informed that the 0.822 ratio in this example corresponds to just one small (4 mm) upper lateral incisor, the orthodontist feels at home and can plan accordingly for the 3-mm inter-arch discrepancy.

Or can he/she? This is the relevance of this study of 137 subjects treated in Sweden. Although relationships were demonstrated between the anterior Bolton ratio and post-treatment overjet and maxillary inter-canine width, the authors concluded they were unable to demonstrate the ratio as being useful in predicting dental relations post-treatment.

So, where does this leave the clinician? Proffit<sup>1</sup> states that 'a tooth size discrepancy of less than 1.5 mm is rarely significant'. The 3 mm hypothetical discrepancy described above would have been in the top 10% and Proffit's borderline 1.5 mm case would have been close to the upper 25% mark in the Swedish sample. Perhaps future studies should investigate samples specifically drawn from the upper and lower quartiles, as it would seem that the middle 50% of cases do not present with inter-arch tooth size discrepancies in need of outcome prediction.

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### **Reference**

1. Proffit WR, and Fields Jr., HW. *Contemporary Orthodontics*, 3rd edn. St. Louis: Mosby Inc, 2000.