

**SCIENTIFIC
SECTION**

Commentaries on scientific papers published in this edition

A comparison of plaster, digital and reconstructed study model accuracy

Andrew P. Keating, Richard Bibb, Alexei I. Zhurov, Jeremy Knox

Many clinicians are wondering when the day will come that it is no longer de rigueur to have plaster orthodontic study models for orthodontic assessment, planning and record purposes. Perhaps they may eventually no longer even be needed for appliance manufacture. This paper is a very timely and useful addition to the literature on this important subject. The authors set out to evaluate the accuracy and reproducibility of a three-dimensional (3D) optical laser-scanning device to record the surface detail of plaster study models and to determine the accuracy of physical model replicas constructed from the 3D digital files. The study was carefully performed and included a sample size calculation as well as assessment of intra-examiner agreement.

Each model was captured three-dimensionally, using a commercially available 3D surface laser scanner, a rotary stage and integrating scanning software. Linear measurements were recorded between various landmarks on two separate occasions by a single examiner. Measurements were taken directly – on each of the plaster models (using digital callipers) – and indirectly – on the 3D digital surface models. Physical replicas of two digital models were also reconstructed from their scanned data files using a rapid prototyping (RP) manufacturing process, and directly evaluated for dimensional accuracy. Unfortunately, cost constraints prevented further RP models from being manufactured.

The results are interesting and suggest that the errors are on the whole quite small. The potential problem seems to lie only in one plane, the *z*-plane. However, this may actually only be a real problem if digital models were to be used for appliance construction and would thus benefit from specific testing. For other purposes, the models could be perfectly adequate.

The study is also helpful in highlighting some of the complex issues that affect model measurement and provides a number of ways which may help improve the accuracy of such model production even further in the future. Perhaps we are a step nearer to ‘going digital’!

Friedy Luther
Leeds, UK

The efficacy of a plasma arc light in orthodontic bonding: a randomized controlled clinical trial

J. S. Russell, S. J. Littlewood, A. Blance, L. Mitchell

The object of this research was to evaluate the clinical performance of a plasma arc light against a conventional tungsten–quartz halogen curing light for direct bonding. The study design was a prospective randomized controlled clinical trial using a split mouth technique on 43 patients, and quadrants were randomly assigned to either the plasma light or the conventional halogen curing light. The main outcome measure was bracket failure and the secondary outcome measures were time taken to bond-up, patient sensitivity or discomfort during curing and time to replace failed brackets.

The results showed that there was no statistically significant difference in bracket failure rates between the plasma arc light (6.7%) and the halogen curing light (9.5%). Bond-up times were reduced by 204 seconds per patient with the plasma arc light and there were no differences in patient reported sensitivity or discomfort, or in rebond times.

This well constructed study is unusual in that the results are to completion of treatment and therefore directly applicable to clinical practice. Although a limitation of the split mouth technique is the lack of truly independent specimens, i.e. bonded brackets, this is thoroughly discussed within the paper along with adjustment to the statistical analyses. Once again brackets are rarely truly independent in clinical practice and so the inferences are valid.

The main advantage of the plasma light would appear to be the time saving at initial bond-up, which is good for both the operator and patient. However, for the orthodontist this saving also has to be weighed up against the higher purchase price in comparison to the halogen light.

Tony Ireland
Bristol, UK