Digital Models:
A New Diagnostic Tool

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Plaster casts have traditionally served two main purposes in orthodontics: as a permanent, three-dimensional record of the malocclusion, and as a source of information for diagnosis and treatment planning. Plaster casts are also required in some cases for assessment of treatment progress and outcome. Because of their physical nature, however, plaster casts have inherent shortcomings in terms of storage, retrieval, transferability, and diagnosis.

The recently introduced OrthoCad* digital model service overcomes most of these problems. In addition to being the last component of a fully electronic patient chart, this computerized system opens a new realm of orthodontic diagnosis.

Procedure

Alginate impressions and a bite registration are taken as usual. Instead of being sent to the laboratory for pouring, they are packaged in OrthoCad-supplied packing materials and sent by overnight courier to the company. Within a few days, the impressions are scanned and e-mailed to the orthodontist.

OrthoCad's three-dimensional browser allows five simultaneous views of the models, thus allowing them to be examined from five different perspectives instead of having to rotate a particular view (Fig. 1).

The "Jaws Alignment" tool enables the clinician to fine-tune the occlusion in case the wax bite was distorted (Fig. 2). The relationship of the jaws can be adjusted anteroposteriorly,
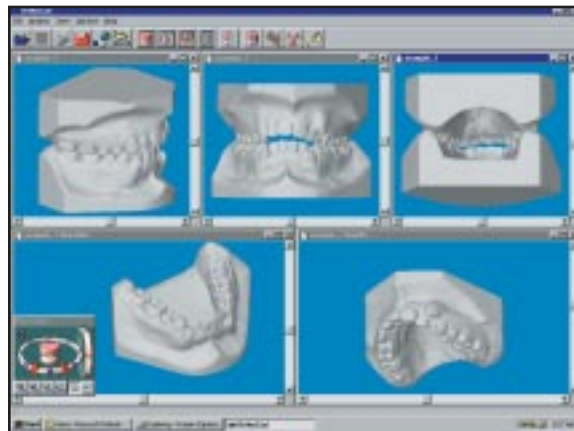
*Trademark of Cadent, Inc., 8 Industrial Ave., Fairview, NJ 07022.

Fig. 1 Browser allows five simultaneous views of digital models.

between the limits of centric occlusion and centric relation, and the software "remembers" this new relationship.

The computer-generated occlusogram has a color scheme that portrays the tightness of contact points between the jaws—essentially simulating the wax-bite width between articulating maxillary and mandibular teeth (Fig. 2). The occlusogram changes if either jaw is moved vertically or laterally. Occlusal information is critical both for initial diagnosis (open vs. deep bite, high vs. low mandibular plane angle, etc.) and for assessment of jaw function. Furthermore, a comparison of pre- and post-treatment occlusograms can help evaluate treatment methodologies and stability of results.

Unlike their plaster predecessors, digital models can be sectioned at any point in the sagittal or transverse plane (Fig. 3). This capability may shed a new light on skeletal and dental asymmetries, and can help pinpoint skeletal and

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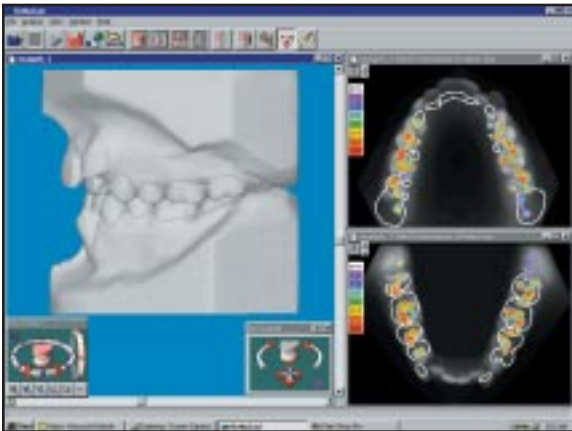
Fig. 2 Anteroposterior jaw relationship can be fine-tuned to avoid problems from wax-bite distortion. Occlusogram is color-coded to represent tightness of contacts between maxillary and mandibular teeth.

Fig. 3 Digital models can be sectioned at any point in sagittal or transverse plane.

Fig. 4 Bolton analysis calculated by program.

dental midlines.

The virtual caliper allows any section of the model to be measured to within 100 microns (.1mm). Widely used analyses such as Bolton[1] can be calculated electronically (Fig. 4).

All contact points and measurements are saved with the file for future reference. The digital models can be incorporated into computerized patient records, eliminating the need for model storage. In addition, they can be transmitted by e-mail with accompanying text to referring dentists or specialists.

REFERENCES

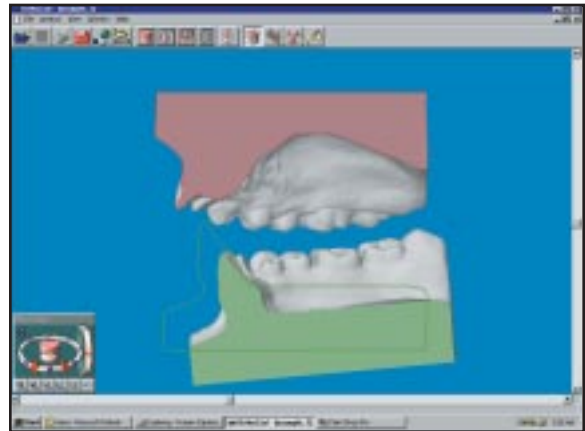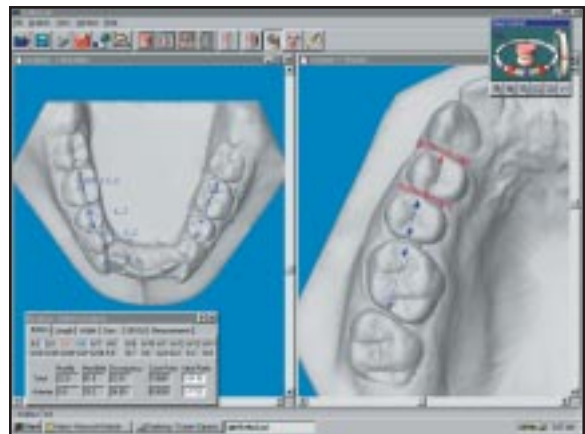1. Bolton, W.A.: Disharmony in tooth size and its relation to the analysis and treatment of malocclusion, Angle Orthod. 28:113-130, 1958.