Analysis of computer-aided techniques for virtual planning in nasoalveolar moulding.

Abstract:
We compared two methods of planning virtual alveolar moulding as the first step in nasoalveolar moulding to provide the basis for an automated process to fabricate nasoalveolar moulding appliances by using computer-assisted design and computer-aided manufacturing (CAD/CAM). First, the initial intraoral casts taken from seven newborn babies with complete unilateral cleft lip and palate were digitised. This was repeated for the target models after conventional nasoalveolar moulding had been completed. The initial digital model for each patient was then virtually modified by two different modelling techniques to achieve the corresponding target model: parametric and freeform modelling with the software Geomagic®. The digitally-remodelled casts were quantitatively compared with the actual target model for each patient, and the comparison between the two modified models and the target model showed that freeform modelling of the initial cast was successful (mean (SD) deviation n=7, +0.723 (0.148) to -0.694 (0.157)mm) but needed continuous orientation and was difficult to automate. The results from the parametric modelling (mean (SD) deviation, n=7, +1.168 (0.185) to -1.067 (0.221)mm) were not as good as those from freeform modelling. During parametric modelling, we found some irregularities on the surface, and transverse growth of the maxilla was not accounted for. However, this
method seems to be the right one as far as automation is concerned. In addition, an external algorithm must be implemented because the function of the commercial software is limited.