# The CT Scanning Guide –

## and important step from planning to success

Joachim Mosch, CDT, Christina Ketzinger, DT, Andreas Hoffmann , MDT

Computer-supported or 3D implant planning is gaining ever-increasing significance in implantology, not least because dental technician, dentist and patient work together from the beginning of treatment in order to plan the aesthetics and function of the final prosthetic restoration.

The outcome is more or less pre-programmed and endorsed with the approval of all those directly involved, i.e. the patient, dentist, technician, and those indirectly involved, i.e. the family and friends. This is both advisable and practical, because in this way the patient knows what to expect before the surgery, and the treatment team also does not have to seek justification if an outcome, that has not been defined beforehand, does not meet the requirements, wishes and expectations of the patient afterwards.

The whole procedure only functions properly if the temporary restoration, which was fabricated with the cooperation of all those involved, can also be converted 1:1 to the final implant restoration. This article will demonstrate a practical procedure for achieving this aim, i.e. a happy patient and satisfied team, using the example of a Nobel Guide case, though it applies equally for all other 3D planning systems.

When all the wishes of the patient (within the scope of what is technically feasible) have been met with the temporary or interim restoration set-up (Fig.1), datasets must be created as the basis for computer-supported planning of the implant positions. The patient is scanned in a CT scanner with the CT scanning guide in situ, which is fabricated as a copy of the temporary restoration. In practical terms this CT scanning guide should be as exact a copy of the temporary as possible, because the interim restoration has been established as the ideal outcome with regard to the intermaxillary relationship, vertical dimension, centric, aesthetics, etc. Old dentures, in particular cast partial dentures that have been extended until their final stages, should not be converted into CT scanning guides. This is because CT templates must always be metal free, as metal produces radial artefacts during CT scanning, which render the dataset unusable.

We use primosplint (primotec) for fabricating the CT scanning guide. This light-curing, MMA-free and peroxide-free composite supplied in rod shape (Fig.2) was originally developed for function therapy bite splints. It is also ideal for the fabrication of CT templates as it has virtually no shrinkage or distortion clinically and practically, even when it is applied in large layers.

To obtain as exact a copy of the interim denture as possible, the set-up is captured and conserved using two silicone indexes, one of the buccal and the other of the palatal (Fig.3). The buccal index is retained in the mucobuccal fold of the model. Together with the palatal index this forms the defined cavity of the temporary denture in which the primosplint CT template will be fabricated at a later stage (Fig.4).

Fig. 1: Set-up in wax. This is how the permanent restoration should look and function

Fig. 2: Virtually shrinkage-free and distortion-free – the light-curing primosplint material

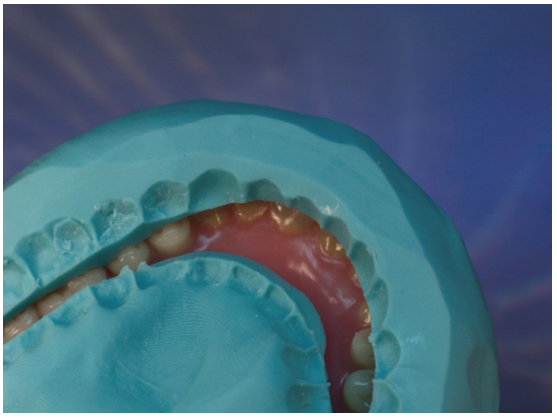

Fig. 3: The first silicone index is placed buccally and the second index is placed palatally to completely capture the set-up.

Fig. 4: This cavity is completely filled with primosplint to obtain an exact copy of the interim denture.

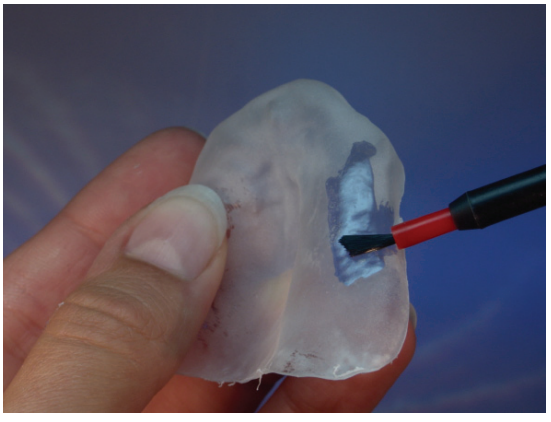

Fig. 5: The surface of the foil is mechanically conditioned by sandblasting it with aluminium oxide and chemically conditioned by applying primostick bonder.

Fig. 6: Primosplint is pressed into the buccal index using a light pulsating pressure.

An Erkolen foil is first vacuum formed over the model as the base of the CT scanning guide. The foil must be roughened by sandblasting with aluminium oxide to ensure that it bonds to primosplint. After this mechanical conditioning, primostick bonder (primotec) is applied and light cured. The bonder provides the chemical bond between the foil and the primosplint composite (Fig. 5).

Primosplint is supplied in rod form and has a putty-like consistency at room temperature. As the material is thixotropic, i.e. it becomes malleable when it absorbs energy, the rod should be wiggled back and forwards in the hands and lightly kneaded before pressing the material into the silicone index and onto the model with the Erkolen foil (Fig.6).

When the cavities in the silicone index have been filled gap-free with primosplint, the material exactly reproduces the set-up of the temporary denture. The palatal morphology is then added using the second silicone index. The silicone indexes are now carefully removed to light cure the primosplint (Fig.7). This working stage can be facilitated by first removing only the palatal index and fixing the material in position using a cold spray before removing the buccal index. Alternatively, partial polymerisation with only one silicone index may be a practical solution for achieving higher primary stability of the primosplint CT scanning guide before removing the buccal index (Fig. 8). An exact copy of the original set-up is produced following polymerisation thanks to the high dimensional stability of primosplint (Fig.9). A plastic Lego block is then integrated palatally to transfer the bite for the CT template (Fig.10).

The CT scanning guide still requires reference points, which provide exact orientation in the dataset. A sufficient number of reference points are initially marked on the polymerised and finished primosplint CT template and exposed using a round-head bur. The resulting indentations are filled with gutta-percha (Fig.11). Finally, the entire CT template is coated with primoglaze lacquer and briefly light cured again. This fixes the gutta-percha

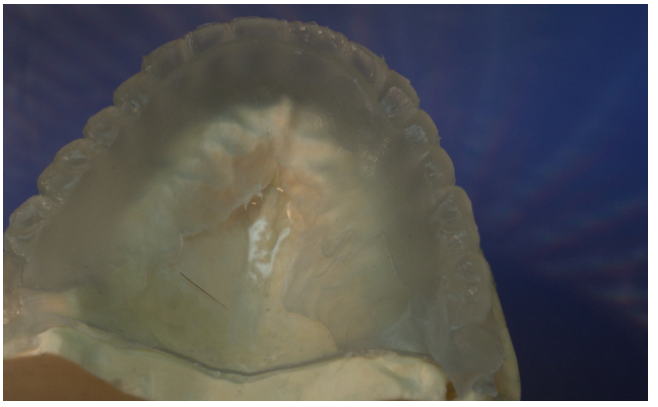

Fig. 7: The silicone indexes are carefully removed before light curing.

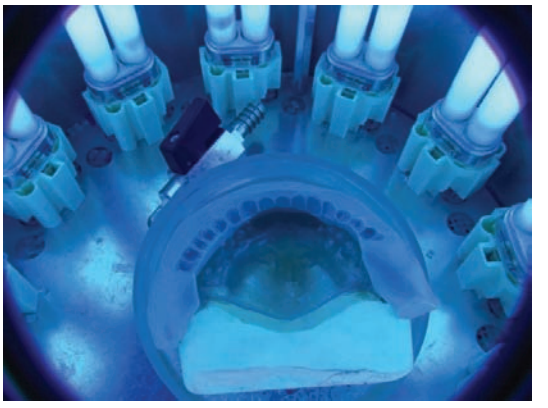

Fig. 8: Partial polymerisation of the palatal aspect. The buccal index initially remains in situ.

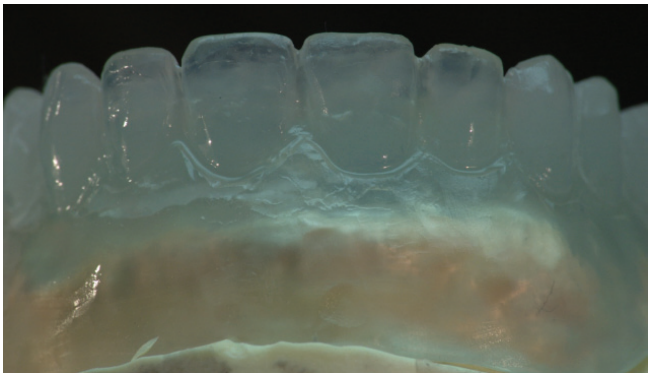

Fig. 9: Following complete light curing, a perfect copy of the wax set-up is produced

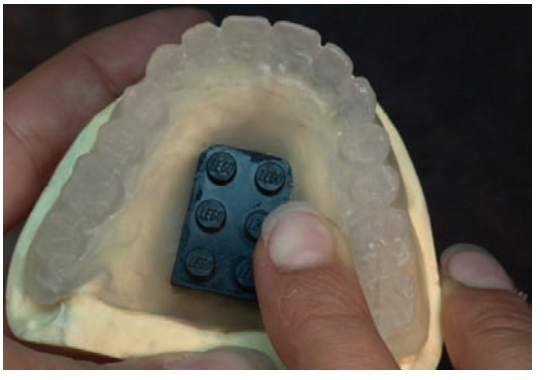

Fig. 10: A Lego block is integrated palatally

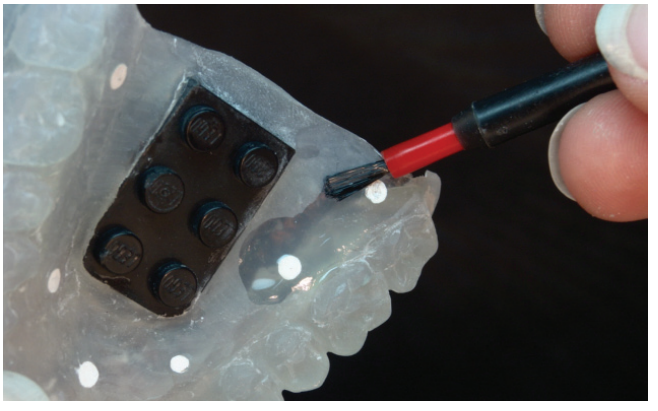

Fig. 11:The reference point indentations are filled with gutta-percha and sealed with primoglaze lacquer.

Fig. 12: The finished polymerised, prepared and ….

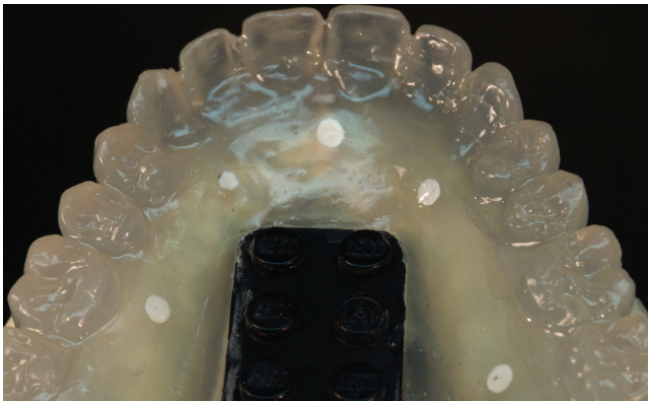

Fig. 11:The reference point indentations are filled with gutta-percha and sealed with primoglaze lacquer.

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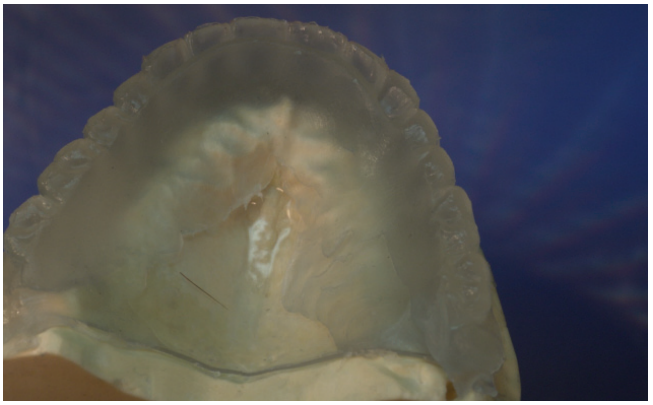

Fig. 13:…. sealed primosplint CT scanning guide

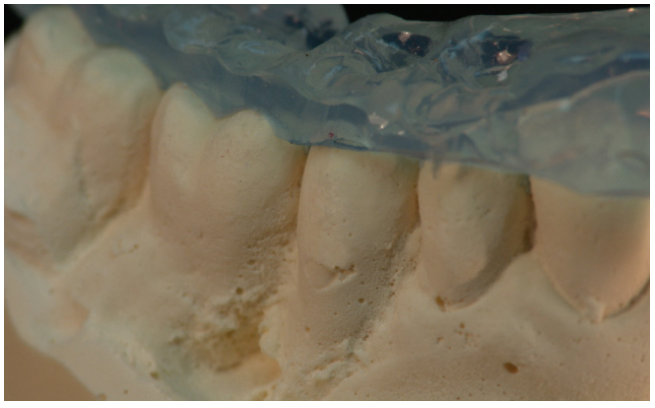

Fig. 14: An occlusal silicone bite index is fabricated in the slightly opened articulator.

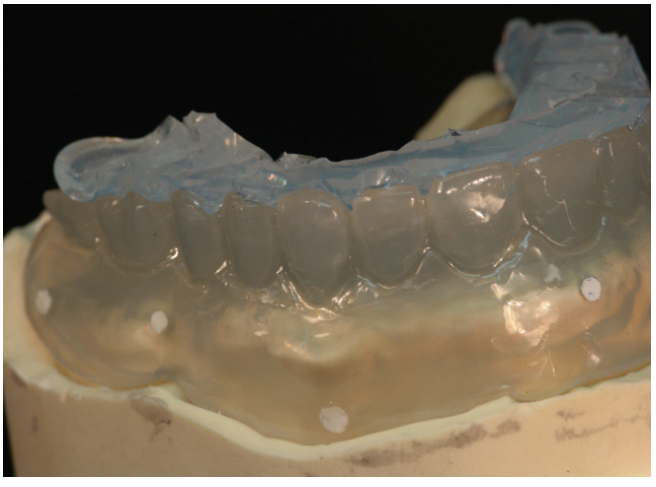

Fig. 15:The occlusal silicone bite index on the primosplint CT scanning template

markers in position. The CT scanning template is completely sealed and shines as if it has been polished to high shine (Fig. 12 and 13).

As the CT scanning guide is eventually also to be used as the base for the surgical guide required at a later stage, it must be encrypted in habitual centric (Fig.14). This ensures that the newly defined centric, intermaxillary relationship etc. of the provisional

Fig. 16: The CT scanning guide on the special stand for individual scanning

restoration is and remains reproducible during computer tomography (Fig.15). In the first CT sequence the patient is measured in the CT scanner with the CT scanning template and silicone bite index in situ. It is important during scanning that the patient bites together firmly and that the soft tissue under the CT template is compressed fully (the gingiva turns white). The same procedure is used at a later stage with the drilling guide. The white discoloration (anaemia) of the gingiva indicates that the position of the surgical guide corresponds to the position of the CT template during measurement. Another positive characteristic of primosplint is an advantage in this situation, i.e. the high translucency of the material. This allows the anaemia under masticatory pressure to be very easily assessed and checked in situ. A further positive material characteristic of primosplint is that it is also completely autoclavable using steam sterilisation.

Once the patient dataset is available, only the CT template is scanned on a special stand in a second sequence (Fig.16) as close as possible to the same spatial position as previously in situ. The data sets collected via CT are transferred to the planning programme in the next step, whereby the programme setting for the conversion of the CT data should be adjusted to allow for the density of the primosplint material. When the data has been converted and imported it is finally used as a realistic basis for the exact planning of the implant positions. SD

## About the author

Joachim Mosch, Dental Technician, Bad Homburg, Germany
Christina Ketzinger Dental Technician
Andreas Hoffmann Master Dental Technician, both Gieboldehausen, Germany. further information www.primogroup.net