



Implant modelling

Part II

In part I of the article I demonstrated the importance and the steps of a CT radiographic guide production, now in part II the most important aspects of 3D virtual planning and the production phases of a surgical drill guide will be described.

The DICOM files of the CT picture taken by the guide are imported into the IMPLA3D navigation program where we can now choose the most ideal site for the implants.

It is very important to emphasize that this is an open system which means we are able to produce a surgical guide for almost every implant system used in Hungary today.

Planning is greatly facilitated if the implant system which we want to work with is included in the software.

If the software does not include our implant system, either we can choose the next fitting one in size by taking some risk of inaccuracy or we can upload our own system even designing the individual stereoscopic form of the implants (optional in the program). The uploading process may take several hours but well worth the effort later.

Other alternative is to learn the implant system by Schütz Dental which alone can ensure that each task from use of pilot drills over countersink bits to insertion of implants is achieved through a single surgical drill guide.

I would like to remark that Schütz Dental has played an active role in development and manufacturing of implants since 1959 and the reason why we hardly know anything of it is their appear-

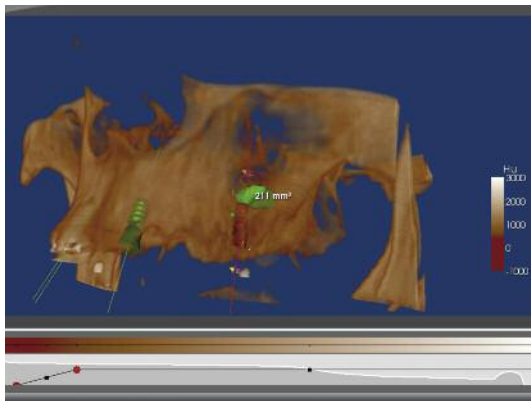


Fig. 1.

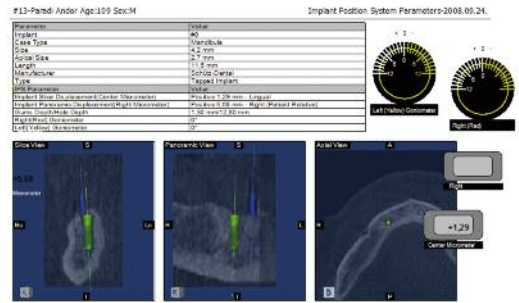


Fig. 2.

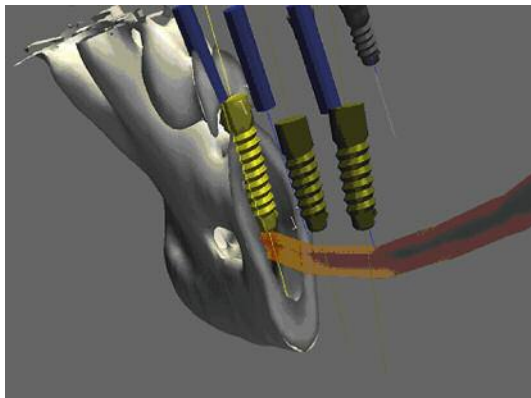


Fig. 3.

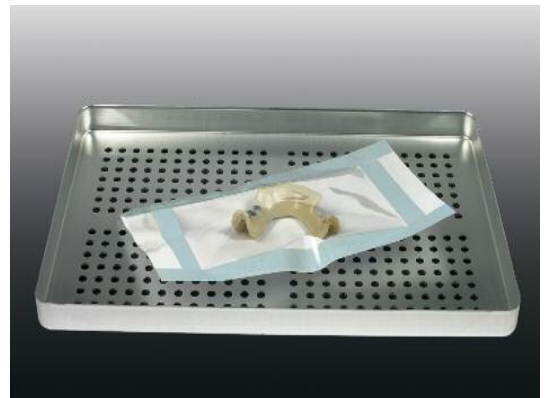


Fig. 4.

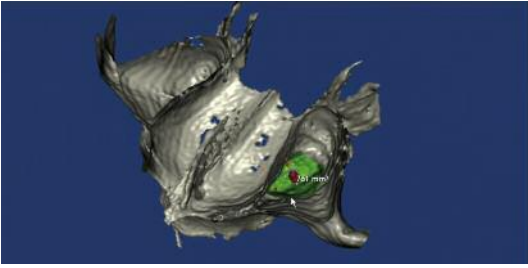


Fig. 5.

rance in the domestic market only a year ago. It is very important to know that software and implant system had been developed simultaneously therefore a few special kinds of drills were produced that are not included in other systems and that is why depthcontrol only works within this closed system.

The IMPLA3D software provides the user with almost unlimited freedom of the 3D orientation and planning.

To explain in details how the software works would certainly exceed the size of this article so I will just summarize the most important steps.

Once selected the most proper section plane and marked maxilla or mandibula we generate a pano-

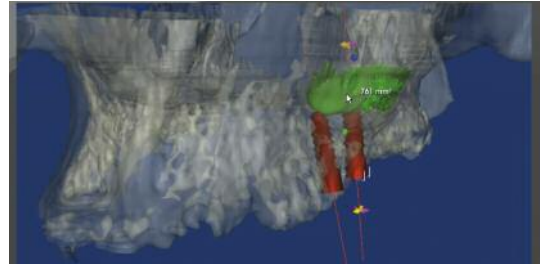


Fig. 6.

ramic radiograph and on its horizontal projection we make the beams of the virtual laser of the program penetrate through the bores of the CT guide - two in the lateral and one in the front region and not randomly of course, but matching the pre-drilled holes - which will be important reference lines for the software.

In the panoramic pictures we can mark the running of canalis mandibulae (Fig. 3); plan the sinus lift - the software calculates with amazing accuracy the volume for the bone replacement material required - and also present them in stereoscopic pictures with various density (Fig. 1, 5, 6).

Next important stage in planning is to place the marks offered by the software onto the CT guide

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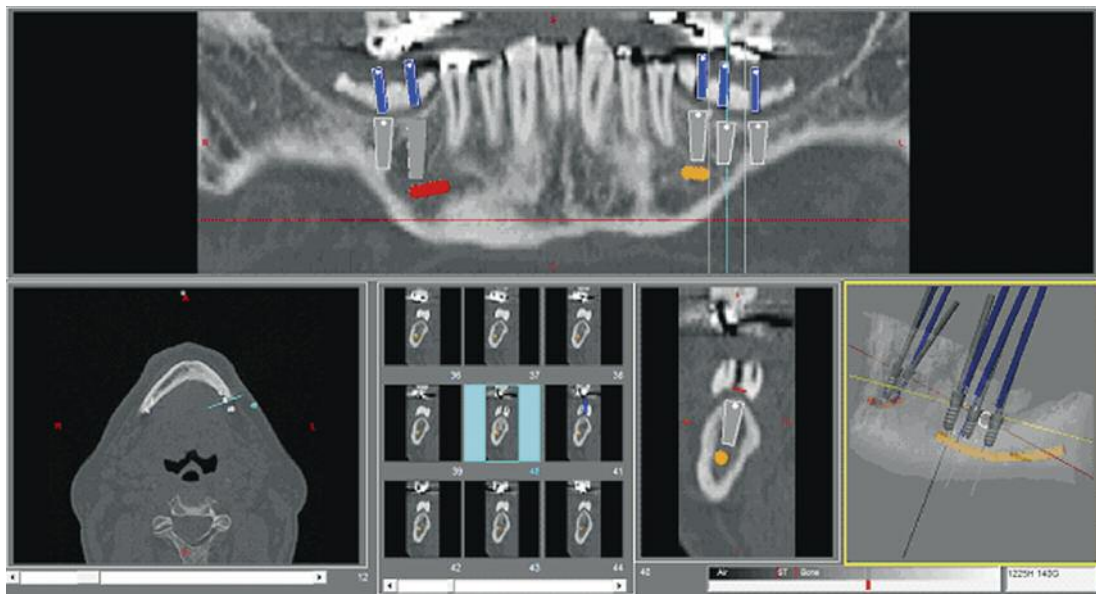


Fig. 7.

bores clearly shown in the 2D (panoramic) picture which actually are X-ray projections regarded as the most ideal sites for the implants. Considering crestal margin, antagonist relationships and axis of teeth – to avoid implanting between two teeth - we drilled the bores in the most ideal sites of the guide and below the reference marks we can study shape, density, quality, trabecular structure and anatomic formulae to avoid (Fig. 7).

We must strive to place the implants as close to the marks as possible which we can optionally select in the software.

Sites and angulation of the implants can be modified freely. We also have to calculate the thickness of the mucosal membrane but this is an easy step in the program.

The implants can be lengthened virtually so their axis and relationship to antagonist teeth can be checked easily (Fig. 7).

After we have placed all implants in the most ideal sites we have them printed by the milling machine for each implant. We have the values for the adjustment also printed which were calculated by the software in all directions in relation to the reference bores (Fig. 2). We can have a guide printed as well that controls the planning process.

Later laboratory work and production of the surgical drill guide follows.

We fix the model in the same position in the milling-machine as the marking bores were made, we reset all parameters at 0 and we set the printed values, angulation and horizontal parameters for

each implant in an arbitrary order but following the same strict protocol.

We make a bore for cementing the technical implant into the plaster model with a drill matching the implant size. We replace the milling engine with a gauge for depth-control and with its help we fix the technical implant considering the gingival height until the adhesive sets. On the suprastructure of the technical implant we can position the guide-ring in the guide with a wrench; we fix it to the model with cement wax.

At this point the technology divides depending on whether we are using a Schütz implant system or something else. In case of other systems the inner size of the positioning rings corresponds with that of the pilot drill (2 mm in general) while having Schütz implants this size is bigger allowing them to keep various factory made guide rings.

To achieve a correct fixing we plan the extension of the base plate for the surgical guide; we create the wax basic plate for the guide that is blocked then with silicone.

Having taken off the block we remove the wax, insulate the model, build up undercuts and after putting back the block we cast it with a special sterilizing “self-bonding acrylate”.

After setting it is removed from the model, worked out, polished and ready for use – of course, after sterilizing in an autoclave which every office has to do on its own (Fig. 4).