



# accurate, fast and patient-friendly

The Ankylos CAD/CAM prosthesis in the everyday practice  
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## INTRODUCTION

Progress and success in medicine and dentistry have always and will continue to come from the development of new methods and the improvement of existing methods in diagnostics, planning and treatment. Technical progress is closely connected to the above. All technical innovations are applied to medicine sooner or later depending on their suitability for the purpose.

Machining workpieces with automatically controlled turning and milling machines for mass industrial production of large numbers of identical articles has been under continuous development in recent decades. Because only unique items are manufactured in dentistry and dental technology, such technology was initially not considered suitable for the fabrication of prostheses. However, the progress in data processing, particularly the number and speed of calculations, the developments in the software sector, and the miniaturization of the required hardware enables unique items to be manufactured with reasonable work outlay and at acceptable cost.

▷ **With all new manufacturing processes the question arises of how useful they are and what are the advantages of the innovation in comparison with the conventional methods and options?** Are innovations in some cases simply a fashion that will be forgotten again in a short time? Even though we try to maintain a critical distance to CAD/CAM-technology, we are convinced that it will become a permanent part of dentistry.

The tertiary structure for implants has until now been manufactured almost exclusively by casting. This technology has some disadvantages, which have long been known but have had to be accepted for good or bad because of the lack of other realistic options. The accuracy and the material properties of tertiary structures (bars, bridge



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frameworks etc.) that have been planned and industrially milled with the CAD/CAM-process are significantly better than their cast predecessors or contemporaries.

What is the reason for the differences?

- ▷ **The classical method consisting of impression – master cast production – wax-up/mock-up – investment – casting – trimming is characterized by the continuing conversion of the positive shape into a negative shape and back again to a positive shape.** Because of changes in volume caused by the materials (shrinkage, expansion), every one of the conversion processes tends to distort the original shape. This particularly affects the casting process. Investment and shrinkage of the alloy during cooling are the primary causes of problems with fitting. **Reducing the number of conversion processes increases accuracy. This is the case with the CAD/CAM-process, because the casting process is completely eliminated.**

It is very difficult to achieve a completely homogenous and porefree workpiece in dental casting. The irregularities in the structure can result in corrosion processes to a greater or lesser degree, depending on the type of alloy. The metallic ions released in these processes may cause material-induced problems, which fortunately occur very rarely. A second, significant advantage of CAD/CAM-technology is the structure of the material, assuming that the milling blanks are not simply cast products. The best quality comes from sintered milling blanks. The material is strongly compressed by special processes, giving it a homogenous and porefree structure.

There are significant advantages in CAD/CAM technology, but some factors must be considered to ensure that the user can take advantage of all options for accurately fitted and tension-free tertiary structure. We present a case report with suggestions for the clinical stages in the manufacture of a CAD/CAM-based tertiary structure.

#### THE CASE REPORT

A 79-year-old female patient presented with a prosthetic restoration in very poor condition and a collapsed vertical dimension. She wanted a fixed denture in the mandible and a restoration in the maxilla. The treatment was started in the mandible,

- ▷ because the problems there were more acute. **The position of the teeth was first simulated with the assistance of a wax-up (backward planning).** The position of the implants was derived from this information combined with the local bone diagnosis. Seven Ankylos C/X implants were placed for anchorage (Fig. 1). Because of the prior history, the work on the final restoration could not be started at this point. A long-term temporary denture anchored on the implants was used as a test to see how the patient coped with the new vertical dimension and the occlusion (Fig. 2).
- ▷ **The impression for the final prosthesis and the master cast production (Fig. 3) was taken using the standard procedures.** The superstructure was fixed at gingival level with the aid of the non-indexed Ankylos Balance C/ base abutments (Fig. 4 and 5).

*1\_ The restoration was started in the mandible with the placement of Ankylos C/X implants*

*2\_ The occlusion and occlusal height were adjusted with the aid of a long-term temporary denture*

*3\_ The master cast*

*4\_ The Ankylos Balance C/ base abutments form the connection with the tertiary structure*



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10\_



11\_



12\_

5\_ The abutments on the master cast

6\_ The transfer key is used to check the congruence between master cast and oral situation

7\_ Bite registration is important for a correctly dimensioned tertiary structure

8-11\_ The tertiary structure fabricated by the CAD/CAM-process

12\_ The tension-free passive fit is vital when test-fitting the framework

▷ **A very important step before continuing work was to check the congruence between the oral situation and the master cast. A transfer key was fabricated on the abutments in the laboratory from a cold-curing acrylic resin.** The shrinkage during the polymerization process, particularly with the arch-shaped curve of a tray of this type, may induce tension inside the block. Therefore, the trays are cut in the center before placing them on the implants. Each of the two segments must fit on the abutments without tension (passive fit) (Fig. 6). This small, but extremely important step is decisive in ensuring that the subsequent framework can be placed without tension. If there is the slightest doubt about the congruence between the oral situation and the master cast, the impression and master cast production must be repeated without tension. After checking the individual quadrants, the two components of the transfer key are fitted together with the cold-curing acrylic resin. The bite registration is conducted in a second step (Fig. 7).

▷ **The wax-up or mock-up that was initially used to check the prosthetic conditions is sent to the DENTSPLY CAD/CAM-Center along with the master cast. The two working templates are scanned in detail at the center.** The bridge framework is created virtually in a reduced tooth shape based on this information. Particular attention is paid to the required layer thickness of at least 1 mm and a maximum of 2.5 mm for the ceramic. There must be no sharp edges. Ensuring that these conditions are met will make a significant contribution to preventing chipping of the veneers and any tension in the framework during firing of the ceramic. The virtually created framework construction is returned to the laboratory for approval. The laboratory can view the framework from all sides and make any required

▷ corrections with a free viewing program. **After approval the DENTSPLY CAD/CAM-Center prepares the customized milling strategy for the industrial milling units.** The milling program uses the individual patient data and also parameters specific to the material and production conditions. The milling phase follows (Fig. 8 to 11). The possible materials are titanium or a cobalt-chromium alloy, which was used in this case.

- ▷ **The fit of the framework was tested in the try-in. If all previous steps were carried with the required accuracy, the framework will fit on the implants without tension (Fig. 12 and 13). The try-in is completed with the coding of the bite (Fig. 14) and the work is then completed in the laboratory. In this case the framework was completely veneered with ceramic (Fig. 15 and 16). The finished work was delivered without any problems (Fig. 17). Corrections of static and dynamic occlusion in this case were only required on the prosthesis in the maxilla, because this was completely replaced in the second phase of treatment.**

### CONCLUSION

The CAD/CAM scaffolds excel by virtue of their accurate fit, provided the individual steps were performed with the necessary precision. This type of dental prosthesis is a very good and easy-to-handle form of restoration with a minimum of prosthetic work. The high precision of the milled tertiary structure means it is also a relief for you as the experienced prosthodontist, as many corrective steps are already eliminated prior to integration. This saves time and costs for the dentist, but also for the patient – in our experience a very persuasive argument, also for best agers. ■

- 13\_The detailed view clearly shows the accurate fit of the milled framework  
 14\_The bite key  
 15\_The ceramic veneered framework  
 16\_The prosthesis is screwed to the implants  
 17\_The finished prosthesis in situ



13\_



14\_



15\_



16\_



17\_

