Level II Master in "COMPUTER ASSISTED IMPLANTOLOGY"

Clinical case of total reconstruction in the upper jaw with guided surgery protocol and immediate loading

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INTRODUCTION

Nowadays modern surgical techniques are more and more moving towards simplified and minimally invasive protocols, aimed at offering patients more effective and highly predictable solutions with shorter treatment times. In addition, this approach makes treatments better tolerated, faster, with more comfortable postoperative courses and reduced costs.
Implant surgery also aligns with this general trend, and one of the brightest and most impressive examples is the Computer Assisted Surgery, more simply and perhaps improperly called Guided Surgery.
It is a protocol by now definitively validated by the international scientific literature, acclaimed as a method able to offer the expert surgeon an extremely effective tool to plan the setting of implants in the maxillary bones, taking into account not only the bone structure but also, very importantly, the final prosthetic project, a project that can be viewed in advance through special software, in relation to the bone structure.
This method can be effectively applied not only to the most complex cases of partial or total edentulism, or in highly reabsorbed patients, in which it becomes possible to insert implants with angles and positions otherwise unlikely if not impossible to achieve by hand, avoiding complex regenerative procedures, but also in the simplest cases of single-edentulism or small edentulism, which however present numerous pitfalls, especially from the aesthetic point of view, if performed without a Computer Assisted Planning. This method, which is also very useful in the diagnostic phase, is very versatile and allows planning reconstruction treatments, both with late and immediate loading, offering the possibility to create, in a simple and precise way, temporary prosthetic devices, thus giving back to the patient both aesthetics and functionality in a single appointment.

All this is perfectly integrated in the context of that process currently in full development in the dental world, which goes under the name of "Digital Revolution".
Thanks to modern DICOM data acquisition techniques, intraoral scanning and CAD-CAM techniques, whose effectiveness is now undisputed, the Computer Assisted Surgery Protocol becomes an integral part of the Digital Flow in our studies.

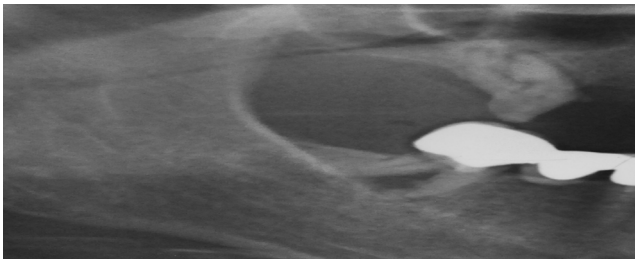
OBJECTIVES:
Object of this thesis and the description of a clinical case, treated with Computer Assisted Surgery Protocol at the upper arch, of a patient who asks for an aesthetic-functional reconstruction at both arches, although only the upper reconstruction will be described here. The antagonist in fact will receive a traditional fixed prosthetic treatment on natural pillars, since for the moment the patient does not want any implants in the rear sectors (short chewing).

MATERIALS AND METHODS:
For this case it was decided to use the C-Tech guided surgery method called "C-Guide" to insert implants of the same company, in particular the C-Tech EL (Esthetic Line).
This is a slightly conical implant with a double spiral capable of obtaining excellent performance in terms of Primary Stability, even in contexts of poor bone quality.
For the virtual planning of the case, 3DIEMME's Real Guide procedure was chosen, which requires the use of a dedicated Software and a CBCT device called "EVO Bite".
A medium value articulator (Artex) was also used to mount the plaster models with the relevant facebow. We also collaborated with a dental laboratory whose role in treatments of this type is fundamental.

PLANNING AND INTERVENTION:
Female patient, 60 years old, ASA 2.
The patient reports that she is not at all satisfied with her smile and chewing function and asks for a fixed prosthetic reconstruction. From the following photos it is possible to see the aesthetic problems and the evident right functional insufficiency as well as the questionable contralateral occlusion and the approximate prosthetic modelling of the device in quadrant II.

PLANNING AND INTERVENTION

After a scrupulous case history study, an accurate objective examination and a careful radiographic evaluation of a first level examination (OPT), see the photo below, we arrive to the diagnosis of "Chewing and Aesthetic Insufficiency" due to the inadequacy of the residual dental elements, as almost all of them are affected by periodontal, endodontic and decay problems. By virtue of this diagnosis the extraction of all the elements present in the upper arch is proposed as a treatment plan since they are considered not maintainable for the above reasons or also in consideration of the strategically unfavourable position, in view of a global aesthetic-functional reconstruction (see in this regard elements 11 and 21). In addition, it is planned to build a definitive screw-retained, fixed prosthesis, supporting only the implant, without the orthopaedic component, as the modest loss of vertical dimension allows the creation of a Natural Fixed Bridge. This prosthetic orientation makes the setting of all the implants in suitable locations particularly important, so as not to have to face aesthetic problems that are difficult to resolve during the prosthetic phase. The implants will be inserted with a Computer Assisted Surgery protocol with immediate temporary loading, then passing through a temporary prosthesis, immediately inserted after surgery, in order to bypass the osseointegration period of the implants, in the most comfortable way possible for the patient.



Smile

Overbite

A Facial Arch recording is performed and the impressions of both dental arches are taken to make study models to be mounted in the articulator at average values.

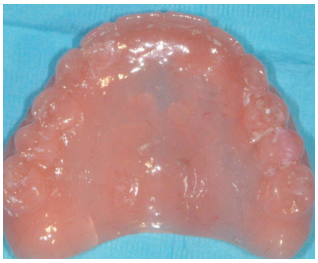
On these models, a diagnostic wax-up is performed to create a temporary total prosthesis, to be inserted immediately after the extraction of all teeth, as we choose to wait for the soft tissue to heal after the extractions, before inserting the implants. This step will allow us to test some aesthetic, functional and phonetic parameters, to correct occlusal planes and to evaluate the patient's satisfaction during the 40 days of waiting after extractions. If necessary, corrections will be made, so that they can be transferred first to the provisional immediate loading implant and then to the definitive implant.

Before the extractions

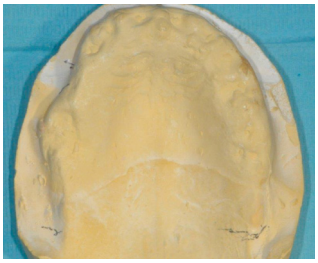
Immediately after the extractions

After healing, the patient's prosthesis considered to be adequate in terms of aesthetics and function is duplicated and a Scan Prosthesis made of radio-translucent resin is made, with which - together with a specially designed device within the 3DIEMME's Real Guide procedure, which will act as a Fiducial Marker (EVO Bite) - the upper jaw CBCT is performed. The Fiducial Marker will allow at a later stage the faithful coupling between the patient's radiological data (DICOM data) and the data obtained from an optical scan performed in the laboratory, both of the Prosthesis Scan and of the plaster model of the patient's edentulous arch (STL data); these data will be imported into a special software. Through this software (3DIEMME), all these data will be processed and matched to virtually reproduce the real spatial relationships (matching), thus allowing an ideal planning of prosthodontist treatment, optimising the position of future implants in relation to bone structure, soft tissue and prosthesis protrusion.

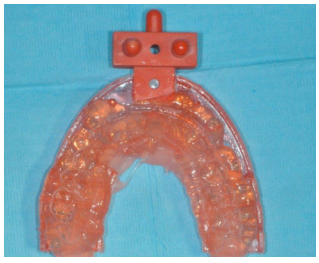
Healing after 40 days



Prosthesis Scan



Plaster model

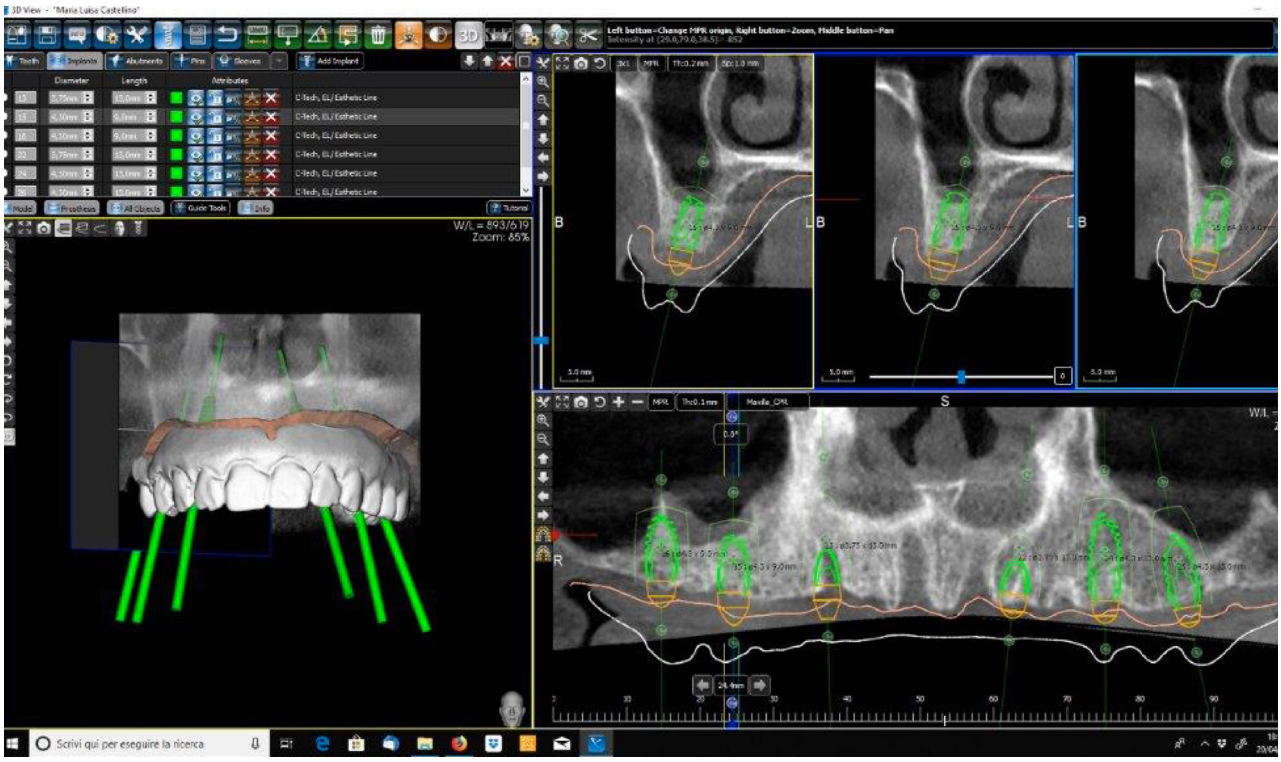


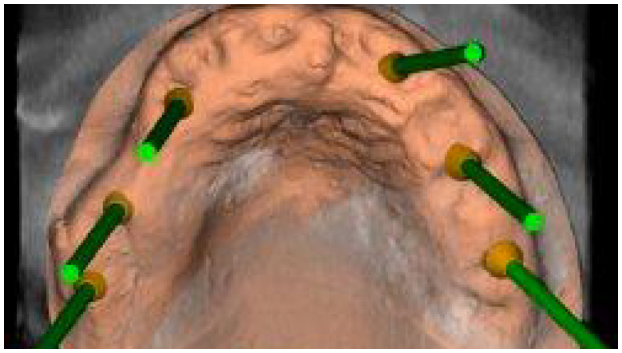
EVO Bite

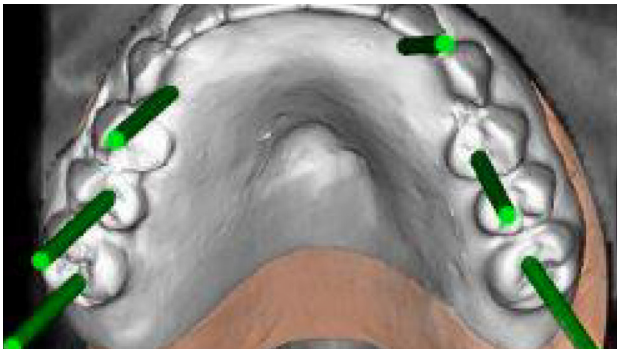
After having imported into the software the three virtual objects represented by DICOM data and the two STL scans of the soft tissues and the prosthesis Scan, we are ready for the actual virtual planning.

We decide to insert six C-Tech EL implants in the following positions and with the following diameters and lengths:
Position 16 4.3/9
Position 15 4.3/9
Position 13 3.8/13
Position 22 3.8/13
Position 24 4.3/13
Position 26 4.3/13

Note from the photos below, that the implant in position 16 was planned to be placed in an Underwood septum because the most mesial position would have been too close
to the implant in position 15 and the more distal one would have inevitably involved surgery at the maxillary sinus level.
The insertion in the context of the septum, on the other hand, allows avoiding a more invasive and expensive surgery and in this perspective the Guided Surgery is particularly suitable because the precision in finding the exact point where the septum is located, would be unthinkable free-hand.

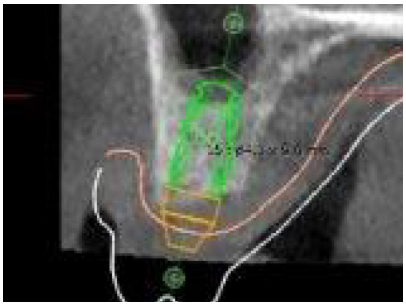






By observing the second picture of the planning, note how the protrusions of the implants are all in the occlusal surface of the future prosthesis and in correspondence of the individual elements and NOT between them.
Even this requirement is not easy to obtain if the implants are inserted free-hand, forcing the prosthetist to "acrobatic" prosthetic configurations.

After having elaborated the virtual planning, we move on to the design and moulding phase of the transfer guide, whose purpose will be to replicate in the patient's mouth what has been planned through software. It is therefore the link between the "Virtual" and the "Real" world.
During the design phase, three fixing PINs are also planned, which will stabilise the guide after inserting it into the patient's mouth, taking care that these PINs do not interfere with the implants, although any interference would be a condition manageable with special measures.

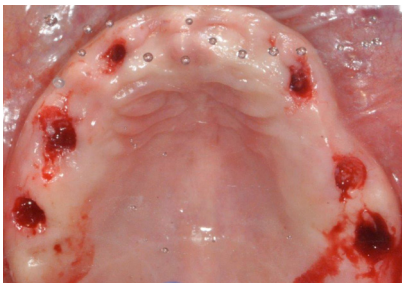


In the picture above you can see the surgical guide with its six guide bushings in which to slide the drills of the Guided Surgery Kit and the three mini-bushings for the fixing PINs.
It is very important to check on the surgery day, or even better a few days before, the perfect fitting of the guide on the soft tissues, an indispensable prerequisite for the precise insertion of the implants according to plan.

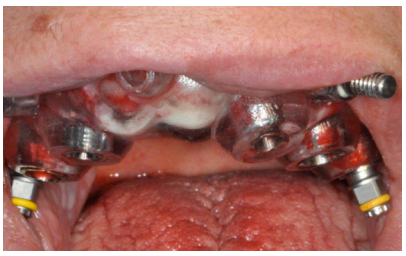
The second photo shows a detail of the implant in position 15 in which you can see in white the prosthetic profile, in orange the soft tissue profile and in grey scale the bone tissue. Thanks to this graphic representation, not only can the implants be inserted correctly, but it is also possible to choose the abutments, if planned, taking into account the transmucosal routes.
Another possible and important thing is to check the implant position by means of the implant vision. This vision allows you to "rotate" the DICOM files around the implant, keeping the implant "fixed" so as to verify its correct insertion at 360° in the bone structure.
On the surgery day, when an anaesthetist was employed to optimise the patient's compliance and make the entire procedure less stressful, local anaesthetic infiltration was performed, taking care not to deform the soft tissues too much, otherwise it would have been difficult to fit the surgical guide well.

Once this had been done, the fibrous tissue overgrowth in the positions suitable to receive the implants was completely removed by means of guided mucotomy, as there was an adequate amount of keratinised mucosa.

Finally, after the stabilisation of the guide with the three suitable PINs, we performed osteotomies, starting with the lance-shaped drill (Locator) to drill the cortical bone and then proceeding with the sequence of drills provided by the C-Guide Kit.

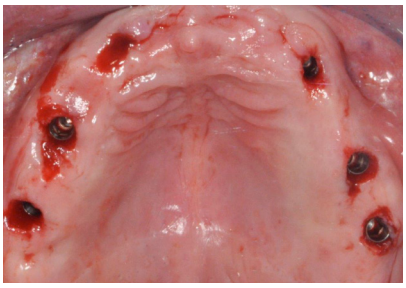


Mucotomies

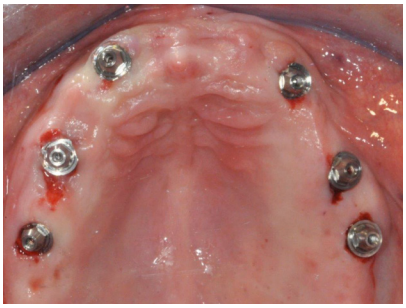


Guide on the spot

In order to avoid drilling errors, especially with regard to the angle or even to avoid the displacement of the guide or even worse, its breakage or the detachment of the bushing from it, it is essential to make sure that, when inserting the drill in the bushing with the motor stopped, its tip comes into contact with the bone surface and that AT THE SAME TIME its guiding part engages the bushing.
ONLY at this moment can you start the motor by gently sinking the drill to the end position on the bushing, with accurate back and forth movements.
In this case it has been chosen to drill at low speed (200 rpm) without irrigation, taking care to drill with back and forth movements in order not to overheat the bone.
After having prepared all the sites, possibly preparing the underneath surface where necessary, proceed to insert the planned implants always in a guided manner.
Only then is it possible to remove the mounters, the PINs and the surgical guide.



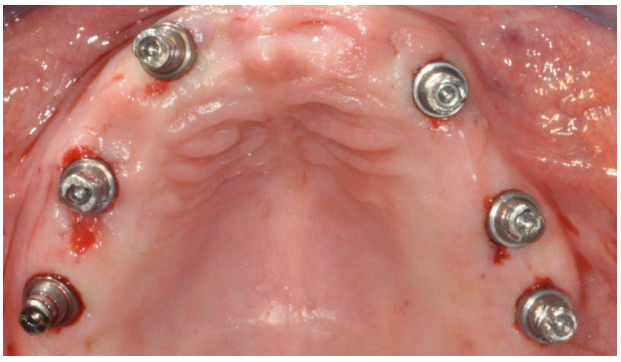
Implants on the spot



MUAs screwed on implants

As you can see from the previous photos, in this specific case it was decided to use Multi Unit Abutments (MUA) in order to bring the prosthetic connection out of the soft tissues so that it shall no longer interfere with the implant's biological amplitude during the following stages.
The temporary cylinders, previously cut and shaped by the dental technician on a prototype model, are then screwed onto the MUAs, where the implant analogues have been placed in the appropriate holes.
All this BEFORE their actual surgical insertion.

On this model, a provisional implant for immediate loading is made of milled stratified PMMA.
Finally, this provisional implant is inserted into the mouth, matching the through-holes with the cylinders, and fixing the latter to the provisional implant using acrylic resin, while the patient is invited to occlude to minimise subsequent occlusal touch-ups.
Once the acrylic resin has hardened, taking care to previously protect the screw access holes with Teflon, all six screws are unscrewed and the provisional implant is removed for final finishing.
This is then screwed back onto the MUAs to perform a final occlusal check before the patient is allowed to go.

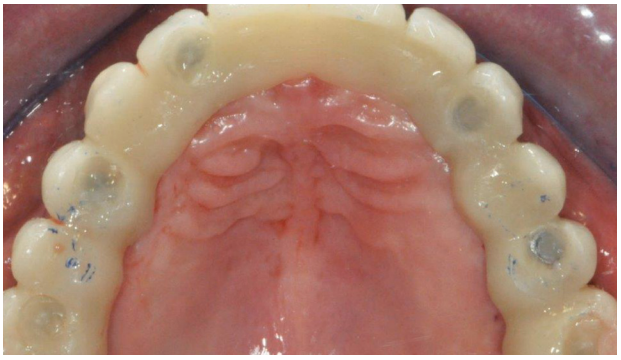


Cylinders on the spot

Provisional implant on the spot

Smile before...

...and after



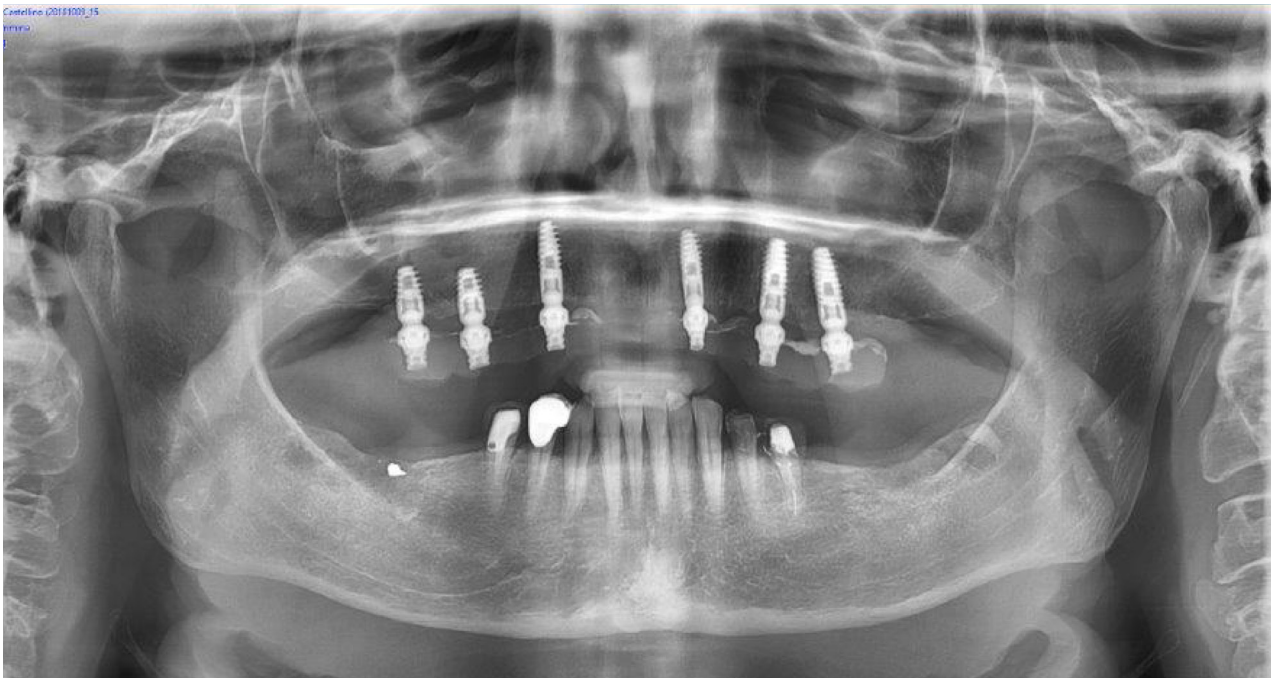
Occlusal view

Smile

Note from the occlusal view of the provisional implant, the correct protrusion of the implants in relation to the provisional implant.
The patient is then allowed to go with the appropriate recommendations regarding antibiotic and anti-inflammatory therapy to be followed, oral hygiene manoeuvres to be adopted, behaviours to be avoided, such as cigarette smoking, what to do in case of "problems", what diet to follow etc..

The patient is seen again ten days after surgery. Nothing to report about the post-surgery period,
the patient reported that implant is extremely comfortable and very well tolerated from an algic point of view.
Upon clinical examination, absence of gum tumefaction, swelling or any other signs or symptoms that might suggest a complication.

OPT examination is performed for an initial post-surgery examination. The implants are well positioned and optimally distributed according to the plan.



RESULTS

Another OPT examination is performed four months after surgery to confirm its success.

The next step will be to replace the temporary resin prosthesis with a permanent metal ceramic bar although for reasons of time it is not possible to document this stage here.

CONCLUSIONS

Computer Assisted Surgery to date does not have the diffusion and success it deserves, especially because of the scepticism that still arouses in many, as it is considered an inaccurate method.

This is despite the fact that the literature has now established that an implant inserted with such a protocol certainly has a significantly higher degree of precision than an implant inserted free-hand.

This applies both to the mesio-distal and vestibulo-lingual/palatal position and to the apico-coronal position and angle (parallax error).

I find the comparison with instrument flight in case of reduced visibility, where pilots are trained to "trust" the on-board computer, having verified that their senses can deceive them.

Even the oral surgeon must learn to trust what is planned with the design software, if all the various steps have been performed scrupulously.

This method has undoubted advantages for both the surgeon and the patient, advantages that we have already mentioned. Moreover, to date, management costs have been greatly reduced to the point of becoming almost insignificant.

It should be stressed, however, that this is still an advanced implantology and as such must be carried out by very experienced surgeons, who are able, where necessary, to deal with possible, although rare, unforeseen events and who are therefore able to switch to a traditional approach during the surgery, for example by sculpting and lifting a flap. The guide used in this case is a mucosa-supported guide, which has made it possible to exploit one of the potentials of this type of approach, namely to perform flapless surgery.

This ensures maximum respect for the soft tissues, optimal healing of the same and a remarkable post-surgery comfort for the patient, almost painless and oedema-free. However, the versatility of the method allows, where there are indications for it, the use of various other types of surgical guides, such as dental or bone-supported guides, in which case the incision and the detachment of a flap become fundamental, or more complex guides, such as modular guides, which allow for example the execution of guided osteotomies.

An encouraging fact that comes from the literature tells us that the use of computer-assisted flapless surgery in total edentulousness, has shown in 5 years results similar to conventional implantological treatments but with deferred load.

It is to be hoped that in the light of these and many other data in the literature, this method can increasingly find the spread it deserves.

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