B&B DENTAL
IMPLANT COMPANY

GUIDED SURGERY CLINICAL CASES

2018

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B&B DENTAL GUIDED SURGERY KIT

It is useful to know the surgical accessories that make up the kit. The kit is provided with the drills are to be used successively in order to prepare the implant site to a size suitable for the implant to be placed in position. It is equipped with compactors to enhance the primary stability of implants in case of spongy bone and countersinks to decrease the resistance given by the cortical bone in harder kinds of bone, thus providing a wide range of instruments to adapt to different clinical and anatomical needs.

All instruments are colour coded and laser etched with the sizes features enabling the users to easily find and choose the right tool to use.

The morphology of the instruments inside the B&B DENTAL SURGICAL KIT is specifically designed for the guided insertion of the SLIM, 3P and EV line implants. The neck of the drills allow for a precise insertion inside the guided sleeve determining the depth of the osteotomy with a known full-travel stop at a distance of 9 mm from the crestal edge of the bone.

B&B Dental provides technical support to help during planning and designing procedures, it also has an internal laboratory that can print radiographic and surgical templates.

B&B Dental Implant Lines for guided surgery

The various lines of the B&B Dental implant family (SLIM, 3P, EV and WIDE*) allow you to use the most suitable implant design and size for each surgical site.

The implants are available in diameters of 3.0 - 3.4 - 3.5 – 4.0 - 4.5 - 5.0 and they are characterized by one connection. The uniform implant connection for upper-diameter implants at 3.40 offers different surgical options separated by morphology (3P – narrow thread – EV – large thread) but with a uniform prosthetic platform facilitating the processing and selection of prosthetic abutments.

*** NOTE: the WIDE line can not be used in guided surgery.**

AUTHOR: DR. FRANCESCO GIARDINA

Implantology is the branch of dentistry dedicated to restoring missing teeth, in the way most similar to the natural one: by inserting implants where teeth have been lost, for various reasons. The above tells us that implantology is a surgical discipline aimed at prosthetic rehabilitation which cannot be achieved by excluding the prosthetic project.
Realising all this, correctly and with result predictability, depended greatly on the surgeon's experience, expert eye and manual skill until only a few years ago. The operator's manual skills and experience also affect the choice of implant characteristics in terms of diameter and length.
Information Technology (using dedicated software for implant prostheses design that acquire DICOM files and then returns three-dimensional images of the jaw bones) and robotics (using 3D printers) have recently changed the picture described above, allowing us:

• virtual planning of the surgical and prosthetic phase;
• realisation of a surgical TEMPLATE, with incorporated
rigid guides, that allow insertion of the designed implant
at the position, angle and depth as planned in the virtual project. The above is achieved using dedicated kits with burs that have a working part and a perfectly coaxial guide cylinder for the TEMPLATE's rigid guide (Fig. 2)
• Execution of a pre-constructed prosthesis: By placing the surgical TEMPLATE on plaster models created previously, "plaster surgery" can be carried out and a temporary prosthesis can be created, that is designed virtually and can be placed in the patient's mouth immediately after guided entry of the implants (immediate loading).

Today we are going to talk about Assisted Software Guided Implantology and assisted Software Guided Implantprosthetics.

THE CASE

Woman aged 63 years with upper bilateral terminal edentulism; no contraindications contained in medical his tory. Firmly asks for fixed rehabilitation on implants.
Nine months prior to the insertion of the implants, a bilateral large-scale Maxillary Sinus Floor Augmentation was carried out, using homologous bone grafts. This situation made us decide to perform assisted Software Guided Implantology without immediate loading, by inserting six implants, three each side in the edentulous areas.
After inserting the surgical TEMPLATE into the patient's mouth (it is anchored to the front teeth and making sure it is congruent and stable a necessary condition for carrying out the project) (Fig. 1), circular mucotomies were carried out using the guides, after which mucosa cylinders were removed. The middle surgical sockets on each side are prepared first of all (Fig. 2) where, using the TEMPLATE, the first two implants are inserted (Fig. 3), using specific assembly tools that are firmly anchored to the implants themselves.
This procedure aims to stabilize the TEMPLATE permanently, preventing any accidental displacements.
Once the TEMPLATE is stabilized, the same procedure is carried out using the remaining guides.

Once the implants have been positioned (Fig.4), the assembly tools are removed, unscrewing the connection screws to the implant itself and the TEMPLATE, and viewing the correct implant position (Fig. 5). The operation ends in a classical manner with insertion of the healing screws (Fig. 6).
Control has been done after three months. (Fig. 7).
The technique described below, which is simple and safe to carry out on the condition that all the project phases have been carried out correctly, allows complex surgery to be carried out in relatively short times (60-90 minutes for a full-arch of 6/8 implants) with maximum predictability Also, the possibility of having a pre-constructed fixed prosthesis that can immediately be fitted for the patient


Fig. 1

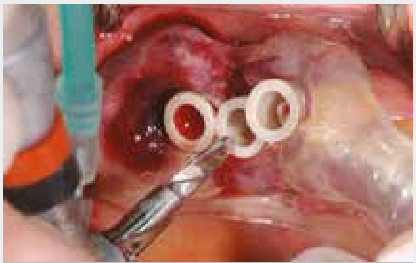
Fig. 2


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7


Fig. 8


Fig. 9

AUTHOR: DR. ALESSANDRO PREDA

Implantology is the branch of dentistry dedicated to restoring missing teeth, in the way most similar to the natural one: by inserting implants where teeth have been lost, for various reasons. The above tells us that implantology is a surgical discipline aimed at prosthetic rehabilitation which cannot be achieved by excluding the prosthetic project.
Realising all this, correctly and with result predictability, depended greatly on the surgeon's **experience, expert eye and manual skill** until only a few years ago. The operator's manual skills and experience also affect the choice of implant characteristics in terms of diameter and length.
Information Technology (using dedicated software for implant prostheses design that acquire DICOM files and then returns three-dimensional images of the jaw bones) and robotics (using 3D printers) have recently changed the picture described above, allowing us:.

- **virtual planning of the surgical and prosthetic phase;**
- **realisation of a surgical TEMPLATE**, with incorporated rigid guides, that allow insertion of the designed implant at the position, angle and depth as planned in the virtual project.

The above is achieved using dedicated kits with drills that have a working part and a perfectly coaxial guide cylinder for the TEMPLATE's rigid guide

- **Execution of a pre-constructed prosthesis:** By placing the surgical TEMPLATE on plaster models created previously, **"plaster surgery"** can be carried out and a temporary prosthesis can be created, that is designed virtually and can be placed in the patient's mouth immediately after guided entry of the implants (immediate loading).

Today we are going to talk about ***assisted Software Guided Implantology*** and ***assisted Software Guided Implant-prosthetics***.

THE CASE

Man aged 67 with lower bilateral anterior edentulism (Fig. 1); no contraindications contained in medical history. Firmly asks for immediate fixed rehabilitation on implants. This request made us decide to perform ***assisted Software Guided Implantology*** with immediate loading, by inserting six implants, three each side in the edentulous areas.
After proceeding with the panoramic X-Ray (Fig.2) and planning the case with Software Guided Implantology (Fig. 3), by reconstructing mandibular patient bone, a surgical template (Fig. 4) and a customized temporary fixed prothesis (Fig. 5) are constructed in the laboratory.
After inserting the surgical template into the patient's mouth (it is anchored to the teeth and making sure it is congruent and stable a necessary condition for carrying out the project) (Fig. 6), circular mucotomies were carried out using the guides, (Fig.7) after which mucosa cylinders were removed. The middle surgical sockets on each side are prepared first of all (Fig. 8) where, using the template, the first two implants are inserted (Fig. 9), using specific assembly tools that are firmly anchored to the implants themselves. This procedure aims to stabilize the template permanently, preventing any accidental displacements.
Once the template is stabilized, the same procedure is carried out using the remaining guides.
Once the implants have been positioned, the assembly tools are removed, unscrewing the connection screws to the implant itself and the template, and viewing the correct implant position. By using peek temporary abutments (Fig.10), the pre-constructed fixed prosthesis, previously made by the technician in the laboratory (Fig. 5), were rebased with cold cured acrylic resin (Fig.11).
The operation ends in a classical manner by fixing the prosthesis with prosthetic connection screws to the implants (Fig.12) and the final X-Ray gives us a complete overview of the patient mouth with implants perfectly inserted.
The technique described, which is simple and safe to carry out on the condition that all the project phases have been carried out correctly, allows complex surgery to be carried out in

relatively short times (60-90 minutes for a full-arch of 6/8 implants) with maximum predictability The possibility of having a pre-constructed fixed prosthesis that can immediately be fitted for the patient (where the right anatomic-functional conditions allow it) considerably improves not only the aesthetics but also healing of the bone-implant interface that takes place under functional loading.

Fig. 1

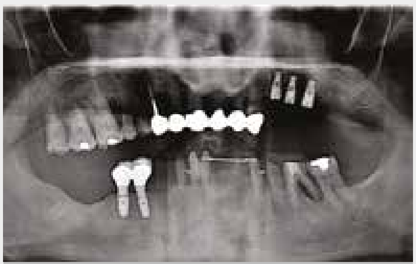

Fig. 2

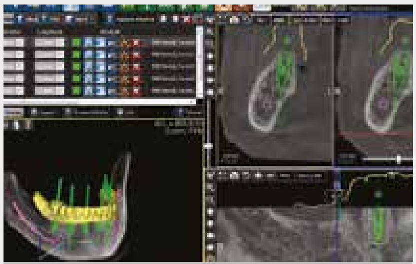

Fig. 3

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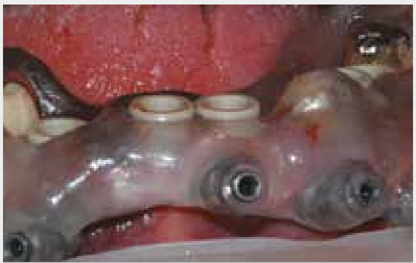

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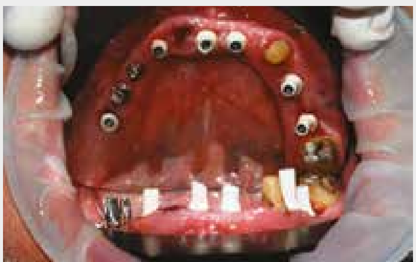


Fig. 10

Fig. 11

Fig. 12

GUIDED MAXILLARY OSTEOCONDENSATION WITH IMMEDIATE INSTALLATION OF TEMPORARY PROSTHESIS REINFORCED WITH PEEK

AUTHOR: DR. ALFREDO NATALI

We have always tried to transpose as best as possible the conceptual phase of Diagnosis into the operational phase of Therapy. This passage, from programming to the application of the therapeutic decisions, can make use of the most varied methods and practical aids in all disciplines.
Every surgical act is developed to respond to a need and must be accurately planned for best results. In dentistry, the ideal objectives have always been the most complete and functional rehabilitation possible of the stomatognathic system, with minimum invasiveness, time, cost, and inconvenience.
In the last ten years, thanks to technological progress and the evolution of Digital Workflow, it has been possible to conceive and realize an uninterrupted work flow from Diagnosis to Rehabilitative Therapy that increasingly expands its indications and possibilities.
In implantology, we recognise this evolution with the generic name of Computer Guided Implantology. The new proposal from B&B DENTAL offers, besides the simplification of the treatment from a digital point of view, the possibility of accompanying the clinician step by step in the inevitable learning curve for complete training.
This procedure includes various phases, conceptually belonging to different environments, but bound together in a consolidated sequence. During Planning, the continuous exchange between the various areas makes it possible to correctly manage and programme the executive phases, with the objective of increasing operational speed, correctness, and safety.
Planning can be divided into three macro areas:

1. Diagnostic Area
2. Surgical Area
3. Prosthetic Area

We will present a clinical case to illustrate the salient phases:

1. Diagnostic Area
We recognise a first Diagnostic Area in which the patient's preliminary and objective information is gathered, including x-rays and the Cone Beam CT (Image 1).
To perform a flapless technique, a necessary condition regards the availability of bone in the areas where implants can be inserted and a sufficient representation in terms of thickness and size of gum tissue. It is also indispensable to have a good patient's mouth opening to allow easy access for drills and the implant.
Before doing the Cone Beam CT, it is suitable to perform a preliminary study, to create a mask with radiopaque markers to be worn by the patient during the radiological exam (Image 2).
The acquisition of the mask using an optical scanner, or in case a anatomical references for digital alignment (Image 3).
With these anatomical references it is possible to anticipate the dental anatomy desired for the patient, and have a consistent volume of information to define the number, position, inclination, and type of each fixture and possible abutment. (Image 4).
These parameters are fundamental and necessary for Planning, but not sufficient.
In fact, it is also necessary to consider Surgical and Prosthetic factors and the reciprocal implications.

2. Surgical Area

To perform immediate rehabilitation it is necessary for the implants to have elevated primary stability (insertion torque ≥ 35 Ncm). In the upper maxillary, due to the typical characteristics of this area, it can be more difficult to have a bone that guarantees the necessary primary stability, notwithstanding the preparation of the site and the shape of the implant. To overcome this critical issue, B&B DENTAL's Duravit system provides a series of osteocondensers for use in both Guided Surgical and traditional systems. The work of progressive expansion increases the local bone density and improves primary stability.
The advantages of this technique were also integrated into the Guided Surgical procedure proposed by B&B 3D (Image 5). To transfer the position of the EV implants from theory to practice, a guide mask is necessary (Image 6). THIS is the most well-known step of Guided Surgery, but you must consider the specific construction needs that influence the design. For example, the special guide bushing conceived by B&B Dental in its special high-precision hexagon shape has a given volume, and if implants are close to each other there can be interferences. In addition, it is necessary to consider that guides have a non-reducible vertical development that limits the possibility of sinking the implant vertically beyond a certain limit. The software was created by 3diemme: it makes the necessary controls and indicates any interference.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

3. Prosthetic Area

Thanks to 3diemme's Planning software, the first to be CE-certified, it is possible to prepare the temporary device even before the surgical operation, eliminating the wait for the prosthesis construction, since the position of the implants is already known.

Obviously, there must be a certain tolerance in positioning the implant due to material elasticity and resilience of the mucous.

Another advantage of this method is represented by the hexagon shape of the guide bushing, representing the programmed position of the implant connection (Image 6). If the hexagon of the key is positioned in line with that of the guide, it is possible to foresee the position of non-rotational abutment prosthetics, like, for example, angled Multi Use Abutment (MUA) (Image 7). It is also possible to programme the occlusal reduction of the temporary titanium cannulas and help reposition them with a specifically designed resin tool (Image 7).

The integration of the 3diemme Planning software and the CAD/CAM rapid prototyping environment of the B&B 3D prosthodontic lab offers almost infinite possibilities of choice as far as the production of the temporary device is concerned. IT is therefore necessary to adapt the design to the real production possibilities and the characteristics of the materials available for each single clinical case. For the clinical case in question a PEEK framework in clad acrylic resin was produced (Image 8). At this point the Planning can be considered complete and we can proceed with the Operational phase.

Surgical Operational Phase

After local infiltration of anaesthetic with vasoconstrictor (Articaina 1:100,000), remove the gum tissue of the opercula before attaching the mask on the front side

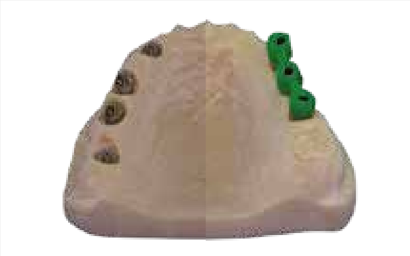
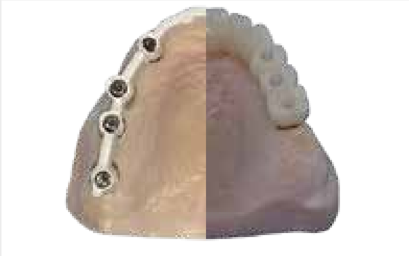


Fig. 7



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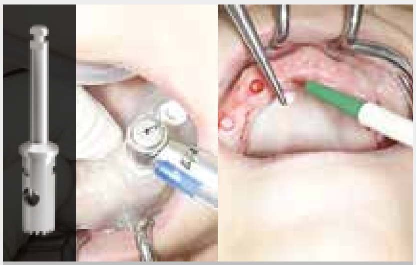

Fig. 9

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Fig. 12

with the provided pins. This makes it easier to remove the fibrous labrum and the assessment of the mucous thickness. (Image 9). B&B DENTAL supplies a special surgical kit designed to facilitate the work of the clinician. The attachment of the mask produced in the B&B 3D lab is a critical operation and must be performed with maximum attention (Image 10). We then proceed to create the first osteotomy with the lance drill in all sites (Image 11). During this phase it is worthwhile to test the bone consistency to suitably adapt the surgical protocol aimed at achieving primary stability.
To improve the stability of the mask, we decide to proceed first with the application of the most distal implant, bilaterally. The supporting area is subprepared and bone is not removed with drills, but compacted thanks to osteocondensers (Image 12). The more the bone is found to be of poor consistency, the more necessary is this procedure. The distal maxillary area typically presents these characteristics.
The Duravit EV implant produced by B&B DENTAL is positioned with a mounting device and contributes significantly to general stability (Image 13). IT is particularly useful to look indirectly to verify that the hexagon of the bushing and that of the mounting device are perfectly aligned (Image 14).
The procedure of osteocondensation and subpreparation was used for all the programmed areas, achieving satisfactory stability.
In particular, we use the tool directly in the place of the mounting device for greater practicality (Image 15). At the end of the surgery we remove the mask (Image 16).
Prosthetic Operational Phase
It was decided not to place the implant in position 13 due to the barely sufficient stability and the small diameter of the fixture. On this implant we position a transmucous healing cap in PEEK, already sterile and included in the packaging


Fig. 13

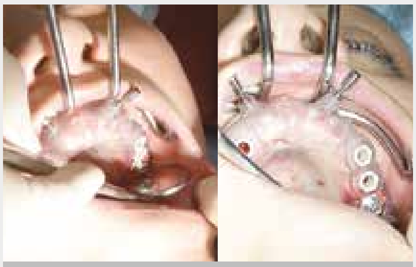
Fig. 14


Fig. 15


Fig. 16


Fig. 17


Fig. 18

of all implants produced by B&B Dental. On the other implants we install the MUA stump. To be properly positioned on the implant, the angled MUA may require the use of the Bone Mill (Image 17).
When the MUA has been fully screwed in, we proceed with a positioning imprint to facilitate the adaptation of the bridge (Image 18).
This phase could have easily been performed intraorally, but we preferred to allow the patient to rest a few hours.
Returning from the break, we apply the two most mesial cylinders, and the prosthesis is lowered directly into the oral cavity, locking its position (Image 19). Afterwards the remaining cylinders are applied, the prosthesis screwed into position, and acrylic resin is injected to complete the locking (Image 20).
The prosthesis is cleaned and polished in the lab (Image 21).
We finally proceed with the clinical application of the prosthesis, the occlusal adjustment, and aesthetic finishing (Image 22).
The patient had moderate pain for about 24 hours, presented a light oedema, no bleeding, and high satisfaction for the treatment. The temporary prosthesis was checked after 7 and 14 days for occlusal adjustment, and after 1-2 and 3 months (Image 23). No complications arose. The prosthesis is maintained in function as a long-term temporary device, awaiting the definitive prosthesis.


Fig. 19

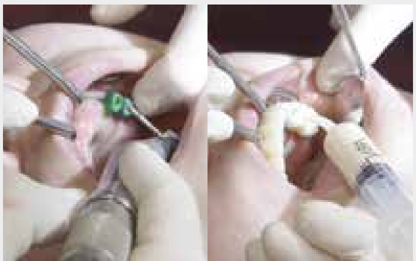
Fig. 20


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Fig. 22


Fig. 23

AUTHOR: DR. ALESSANDRO CECCHERINI

The 72-year-old patient, in good health, arrived at the clinic with an upper fixed prosthesis, which at this point was both aesthetically and functionally compromised, cemented onto 6 residual teeth without any stability (Fig. 1-2-3-4-5). Following an x-ray exam, we found that the teeth supporting the prosthetic structure required removal and informed the patient about the path to follow in order to obtain a fixed prosthesis as requested. The patient also pointed out that she did not want to remove the prosthesis before surgery or live with an intermediate situation that was aesthetically unsatisfactory. Therefore, as to meet her request and permit the insertion of implants in areas that were not post-extraction, we decided to perform preventive extractions so that the sites would have healed before surgery (Fig. 6-7). Alginate impressions were taken and developed in hard plaster (Fig. 8) a few days after the teeth were extracted to allow time for the mucosa to heal.
The radiological template is created from the model. Radiopaque markers are applied, which will allow us to match the DICOM files and STL files (obtained through the scanner) of the model and the template itself once the CBCT has been made (Fig. 9-10-11).
In this case the template we used to do the CT scan is a functionally and aesthetically improved duplicate of the patient’s prosthesis equipped with radiopaque markers. The data obtained from scanning the model and the CT scan are superimposed by means of a dedicated software that identifies the location of the markers on the CT scan and aligns them with the STL file. This way we are able to have both the soft tissue data from the impression as well as the hard tissue data derived from the CT scan. This combined information allows us to digitally plan for surgery (Fig. 12-13-14) and to construct the surgical template (Fig. 15) or a device customized to the patient’s anatomy that guides the drills and implants into the predetermined position of the implant project according to the bone conformation and the anatomical predisposition of the case. The positioning of 5 implants in the frontal area is planned for this patient. Some of them are in post-extraction sites, while others are located where strategic extractions were made months before to achieve the primary stability necessary to perform an immediate load. Planning is facilitated by the clear vision of the overall dimensions and the bone conformations provided by the CT scan, allowing for the positioning of implants with inclinations consistent with the availability of bone matter. The information collected with the impression also provides the choice of the transmucosal height abutments consistent with the prepared implant site. The software also offers the possibility to rotate the abutment in order to place the holes dedicated to the fixing screws accordingly.

Thanks to the digital planning of the case, it is also possible to build the prosthesis in this phase so that it can be fixed in the patient’s mouth immediately after surgery. On the day of surgery, the remaining teeth are removed (Fig. 16) and the surgical template is positioned thanks to the support of a silicon bite (Fig. 17-18). The side pins are inserted into the hole with the dedicated drill (Fig. 19). To increase stability, a crestal pin is inserted into one of the frontal sleeves (Fig. 20-21-22). After having secured the stability of the template, the ostomies are prepared using the drills of the measurements consistent with the implants to be inserted in each site (Fig. 23-24-25-26). According to the B&B Dental protocol, the ostomy is prepared in length

and then in diameter. Inside the B&B Dental guided surgery kit are all the different drills colour-coded for easy selection. In this case the template only contains 4.2 mm diameter sleeves to avoid using the converter necessary in the 5.5 mm sleeves for small diameter drills. Depending on the bone density of each site, EV implants (in areas with spongy bone) and 3P (for areas where the bone is denser) were placed (Fig. 28-29-30-32). The two implant lines require different preparations; in fact, spongy bone requires sub-drilling the site and using a compactor (Fig. 30): a tool supplied in the kit with the function of compacting and condensing the surrounding bone, thereby improving primary stability. In the case of denser bone, the protocol expects the decrease of resistance with the use of a fluted drill that removes part of the cortical bone. Implants are taken from the sterile ampoule using a hexagonal mounter (Fig. 27). The hexagon has the same orientation as the internal hexagon of the implant, so by tightening the implant on its site will be enough to match the mounter's hexagon with that of the sleeve to make sure that the implant is in position to correctly host the abutment as planned (Fig. 33). Once the implants have been inserted, it will be possible to remove the crestal pin and proceed with the preparation and positioning of the implant in the sleeve. The mounters themselves will provide stability to the surgical template. Once all the implants have been inserted, simply unscrew the internal screws of the mounters and remove them from the sleeves (Fig. 33-34). By releasing the lateral pins, the surgical template will be free (Fig.35) and the abutments can be mounted and locked in the prosthetic structure (Fig. 37-38) previously prepared on the model in the laboratory thanks to the project's expectations (Fig. 36). The prosthesis proves to be an aesthetically improved replica of the patient's smile and is attached to the abutments in the mouth (Fig. 39-40-41-42). The temporary screws are removed and screwed in with a peek profile to allow for the finishing touches (Fig. 43). The peek profile facilitates the closure of the points in the extraction areas (Fig.44). For the insertion of the finished prosthesis (Fig. 45-46-47) the temporary screws are removed (Fig. 48) and the prosthetic fixation screws are inserted into the abutments (Fig. 49-50). The bite is functionalized (Fig. 51-52) before concluding the session by closing the composite holes (Fig. 53-54).
The kit is provided with a complete line of tools for guided surgery including the range of drills necessary to finalize the insertion surgical phase of the B&B Dental implants.

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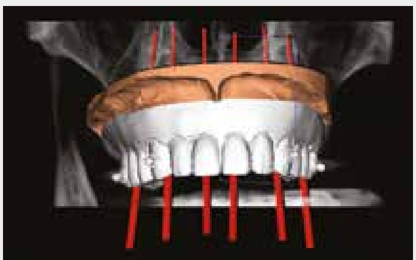

Fig. 13

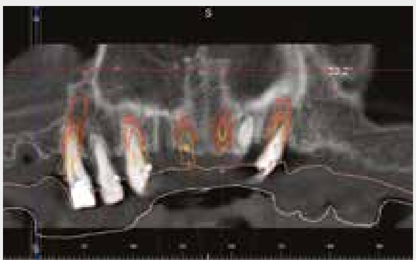

Fig. 14

Fig. 15

FULL ARCH IMMEDIATE LOAD GUIDED SURGERY CASE

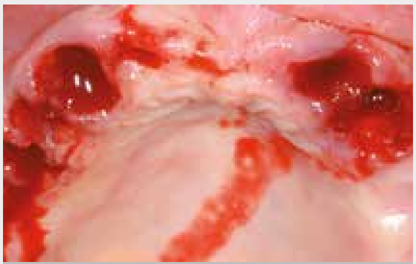
Fig. 16


Fig. 17

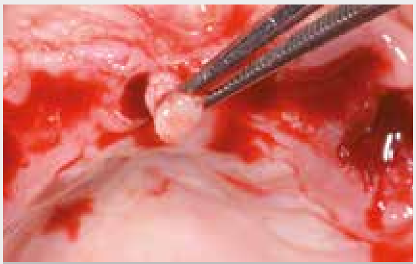
Fig. 18


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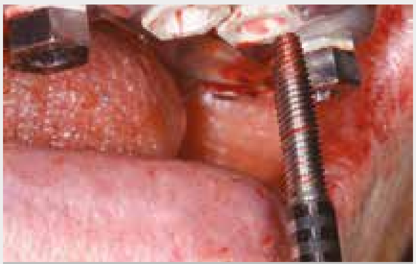
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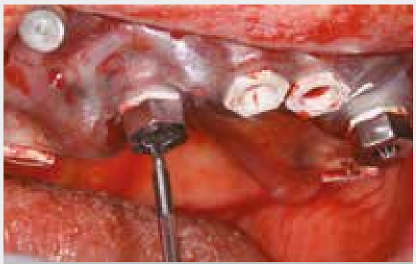
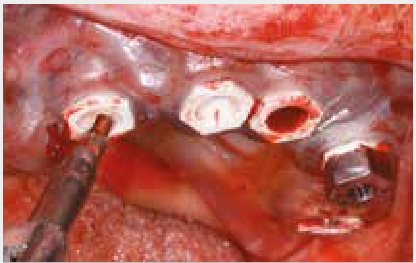


Fig. 33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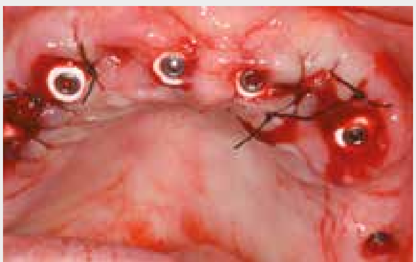
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Fig. 54

1 YEAR FOLLOW UP IN COMPLEX TREATMENT PLAN: CONVENTIONAL VS. GUIDED SURGERY

AUTHOR: DR. IOANA DATCU

Introduction:
In recent decades the rehabilitation of complex clinical cases has undergone an important transformation in the formulation of the treatment plan and the strategic sequence of the various corrective therapies. The increased attention to the needs and wishes of the patient, as well as the need for a minimally invasive surgical approach and the reduction in the number of surgical procedures is the reason for this change. Patients with terminal dentition have common aesthetic-functional and psychological problems. They require a precise and careful gathering of medical, clinical, technical and radiological information for the formulation of the diagnosis and the identification of the overall risk profile of the therapy.
The procedure for immediate loading implants has radically changed the treatment timings and quality of life of patients, avoiding removable temporary prosthetic solutions. The aesthetics, functionality and the correct structural component are the ultimate goals of the implant/prosthetic therapy. Therefore, it is necessary to gather the correct prosthetic information before planning the implant surgery, planned in a traditional manner or via a guided computer.
Case presentation:
Patient R.S, a 68 year-old woman, non-smoker and in general good health, came to our clinic in June 2016 complaining about aesthetic and functional problems. The patient's request was to have a fixed prosthetic solution. An impartial examination revealed a bilateral partial edentulism of both dental arches and periodontal problems affecting the remaining dental elements. She wore two inadequate maxillary and mandibular partial dentures that were completely unsatisfactory both in terms of function and aesthetics (fig. 2).
The complexity of the clinical situation required a deeper diagnostic through x-ray examinations and a careful facial extraoral, dentolabial and intraoral aesthetic analysis (Figure 5) as well as the taking of preliminary impressions and the facial arch, the registration of intermaxillary relationships and the mounting of the models in the articulator. X-rays and periodontal examinations (PSR) revealed a diffused horizontal bone resorption in the two dental arches and the non-recoverability of residual dental elements. It was decided to temporarily preserve some of these dental elements, such as the pillars of a temporary reinforced prosthesis that has all the aesthetic and functional modifications of the future prosthetic rehabilitation, and at the same time allows the patient an adequate social life by avoiding the use of a removable prosthesis in the pre-surgical transition period. The two temporary reinforced prostheses in PMMA with dental support were inserted together with the avulsion of the elements 21, 13, 41, 42, and 32 being strategic extractions for the choice of future implant sites (fig.9).
Approximately 8 weeks after the healing of the soft tissue, new alginate impressions of residual dental abutments were taken. The initial diagnostic wax-up was taken on the relative models mounted in centric relation, from which the duplication of the two resin masks was possible (Figure 10).

Conventional Surgery: upper arch
Surgical and prosthetic operative stage:
Following the elevation of a muco-periosteal flap, we proceeded using a conventional

1 YEAR FOLLOW UP IN COMPLEX TREATMENT PLAN: CONVENTIONAL VS. GUIDED SURGERY

Fig. 1

Fig. 2 abc

Fig. 3 abc

Fig. 4 abc

Fig. 5 ab

surgical technique in the upper jaw with the placement of 6 implants: four axial (#21 was an early post-extraction implant) and two inclined implants (#16 and #25). For the implant positioning, the resin surgical mask was used as a prosthetic guide. This mask could also be used as a transfer area to transfer the implant position from surgery to the plaster model in case it was decided to carry out an immediate load.
Bone quality, assessed according to the Lekholm and Zarb classification was D3-D4: low density in almost all implant sites. Despite having reached the minimum 30N torque of primary stability at the loading of all the implants, it was decided not to proceed with an immediate loading prosthetic and to keep the three remaining dental elements to support the reinforced temporary prosthesis until complete osseointegration was achieved. The traditional approach involved a second surgical phase at 4 months for the uncovering of the implants, the management of the soft tissues and a precision impression for the construction of the second temporary screw-retained loading implant.
Guided Surgery:
Lower arch:
One month later, implant surgery in the inferior arch was performed along with the insertion of 6 straight implants by using a mucosal guided surgery technique.
This choice was dictated by the presence of a sufficient quantity of keratinized gingiva and the need to minimize the invasiveness of the surgical intervention, avoiding the raising of a mucoperiosteal flap.
Virtual and prosthetic design phase:
The B&B Dental guided surgery protocol requires the use of a radiological mask during the Cone-Beam CT scan acquisition. The previously created resin mask was used for the case in question. 5 radiopaque spherical markers were equally distributed on the vestibular and lingual surfaces. (Figure 15). Thanks to these radiological markers, it was possible to match the information precisely between the Dicom files obtained from the Cone Beam CT scan and the STL files obtained from the laboratory scan of the plaster model and the radiological mask itself (Fig. 16, 17). This information, entered into the 3Diagnosis software, allowed for the virtual implant design, taking into account the prosthetic contour, the interface between soft and hard tissues, the correct position dictated by anatomical structures, and the number and distribution of implants according to the biomechanical requests for immediate loading rehabilitation. The implant design allowed for the modelling of the surgical mask with the Plasticad software (fig.19). With the use of a 3D printer, it was possible to print both the surgical mask and the patient's 3D steriolithographic model with the precise position of the implant analogues (fig. 20, 21).
On this model we built a screw retained temporary prosthesis in PMMA on a milled Peek structure.
Once the screw-retained temporary prosthesis was completed, the prosthetic cylinders were attached to the superstructure using a small amount of fluid composite: this way, each cylinder could be easily detached and reattached during the intra-oral releasing procedures of the temporary prostheses, while maintaining the position obtained on the model.
Surgical phase:

1 YEAR FOLLOW UP IN COMPLEX TREATMENT PLAN: CONVENTIONAL VS. GUIDED SURGERY

Fig. 6 ab

Fig. 7 abc

Fig. 8 ab

Fig. 9 ab

Fig. 10

Fig. 11

Fig. 12

Fig. 13

After checking for stability and precision using a fit-checker, the surgical mask was locked intraorally by means of two crestal pins positioned in a balanced manner (fig.23). Each implant site was prepared by using a dedicated sequence of calibrated drills and manual compactors included in the B&B Dental guided surgery kit in accordance with the diameters and lengths of the implants to be positioned (fig. 24-25-26). Virtual planning involved the insertion of 6 straight implants in the lower arch. Initially, the first 4 B&B Dental implants were put into position and then, once the crestal pins had been removed, the remaining two implants were positioned.
A good primary stability was obtained for each implant, verified by screwing with a manual torque wrench to a torque of 40 N/cm. Each implant was positioned paying attention that the hexagon present on the guided surgery mounters matched exactly with the hexagon of the sleeve (fig.26). This matching is of fundamental importance especially in the case of inclined implants as it allows for the exact positioning of the hexagon of the implant connection and consequently the precise positioning of the angled conical abutments as planned virtually. The conical abutments (MUA) were screwed onto the implants with a torque of 25 N/cm with different transmucosal heights according to the height of the soft tissues (fig.28). In the post-extraction alveoli, the gaps around the implants were filled with bone graft material (Bio-Oss-Geistlich) for the stabilization of the coagulum. The matching precision between the prosthetic cylinders, the conical abutments and the fixtures was analyzed using intraoral radiographs (fig.29).
The screw-retained temporary prosthesis in PMMA with a reinforcement bar in Peek, previously created in the virtual project, was lowered into the mouth on the prosthetic cylinders with self-photo-curing resin (Protemp) (fig. 30). It was then finished and polished appropriately to provide for an optimal healing and conditioning of the soft tissues and to permit a consistent home hygiene maintenance procedure. Once the occlusion was checked and all the precontacts were removed, the prosthesis was tightened by tightening the fixing screws to 15N. The temporary prosthesis was left in situ for 5 months.
At about 6 months, the implant osseointegration occurred without any complications (after having verified the absence of signs and symptoms, occlusal problems, loosening of the fixing screws or fracture of the temporary prostheses), the final precision impressions of the following were taken: the two polyether arches (Impregum-3M ESPE, St Paul, Minnesota, USA), the impressions of the temporary prostheses, the facial arch at average values, and the occlusal wax registration in RC at the same vertical dimension as the temporary prosthesis. At the same time, the correction lines of the temporary prosthesis were analyzed and the required aesthetic improvements for the definitive prosthesis were identified. The cross-mounting of the models and their plastering in the articulator were performed in the studio, repositioning the patient’s temporary prostheses on the plaster models (fig.34). Thanks to all the gathered information, the technician was able to create the prosthetic project in a digital format. The definitive digital wax-up (fig. 35) and the zirconia substructure design (fig. 42-43) were made from the shape of the temporary prosthesis using CAD. It was possible to create a PMMA specimen of the definitive work from the definitive wax-up by using the CAM milling procedure, which when tried intraorally permitted the testing of the aesthetics, phonetics of

1 YEAR FOLLOW UP IN COMPLEX TREATMENT PLAN: CONVENTIONAL VS. GUIDED SURGERY


Fig. 14


Fig. 15


Fig. 16

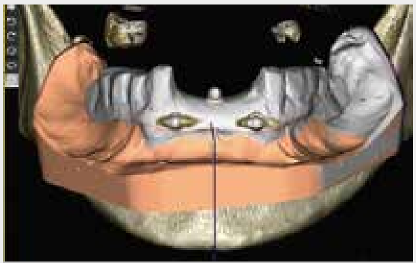
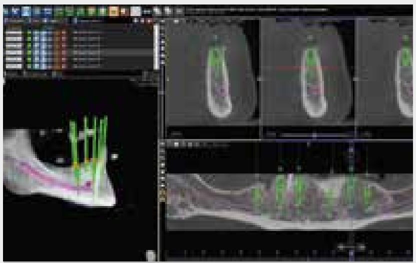


Fig. 17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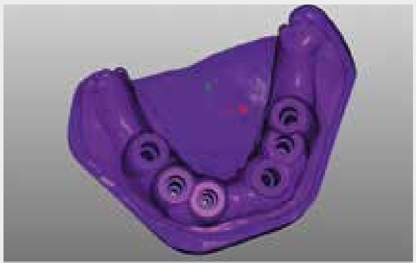


Fig. 19


Fig. 20

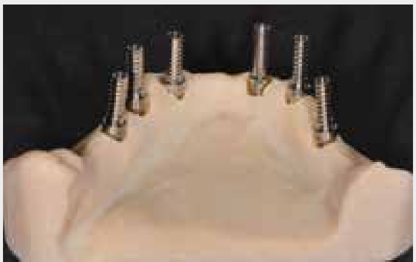


Fig. 21


Fig. 22


Fig. 23


Fig. 24

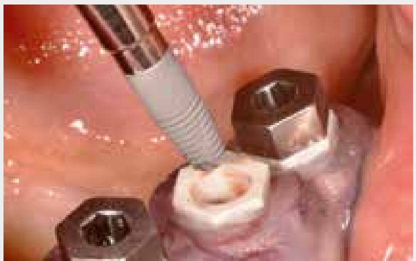


Fig. 25


Fig. 26


Fig. 27


Fig. 28

the occlusion and the verification of the correct positioning of the implants on the model (Fig. 38 a.b). The various modifications were subsequently reacquired by scanning and designing the monolithic zirconia structures.
The case was finalized with a monolithic full zirconia screwed prosthesis cemented on the titanium connection pillars and layered with ceramic on only the vestibular surfaces of the upper and lower frontal sectors (fig. 39 a-d, 40).

CONCLUSIONS

In the modern philosophy of planning and treatment, in addition to the classic clinical goals of surgical and prosthetic success, the most important objectives are the patient related ones: to improve the quality of life not only at the end of the treatment but also during the entire workflow of the treatment itself. Reducing the number of surgical steps, the invasiveness of these steps and the overall timing of treatment are fundamental elements in increasing the satisfaction of our patients.
In this sense, guided surgery compared to conventional surgery offers numerous advantages both for the clinician as well as for the patient: the achievement of a level of precision in the three-dimensional positioning of the fixtures is much higher than that obtained manually; a level of security that can be standardized; the duration of operating procedures lower than the intervention with a conventional approach; the possibility of avoiding major regenerative surgeries and the related surgical sequelae that make rehabilitation treatment much more complex and expensive; the possibility of integrating prosthetic aspects in the radiological diagnosis and the possibility of pre-setting and creating an immediate loading prosthesis, thereby increasing the patient comfort in the immediate postoperative period.
In the opinion of the authors, if everything has been carefully planned and carried out, new technologies and new materials are excellent tools for simplifying workflows and guaranteeing the patient a successful restoration even in complex cases.
The procedures used present a valid clinical manageability, but both the virtual design and the surgical performance can not be separated from a careful study of the case in question, with an integrated approach by the dental and prosthodontic team in full respect of the common biological principles of conventional surgery. The same attention must be paid to both the techniques and management of the peri-implant soft tissues to guarantee an optimal and long-lasting aesthetic result.
The case described was carefully monitored over time to verify both the clinical efficacy of virtual planning, as well as the accuracy and the intra-oral reproducibility of what was designed in the virtual environment. In particular, one year after surgery, a good stability of bone and soft peri-implant tissues was found.

1 YEAR FOLLOW UP IN COMPLEX TREATMENT PLAN: CONVENTIONAL VS. GUIDED SURGERY

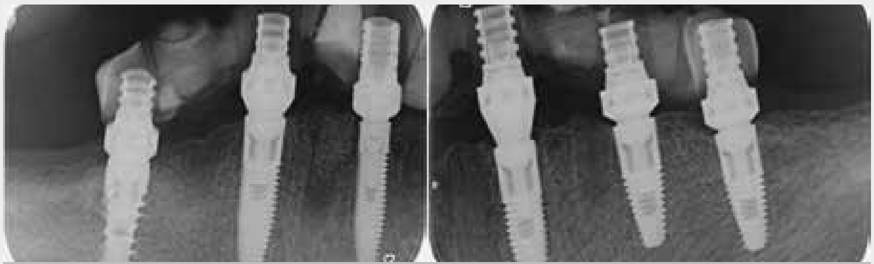


Fig. 29 ab

Fig. 30

Fig. 31

Fig. 32

Fig. 33

Fig. 34

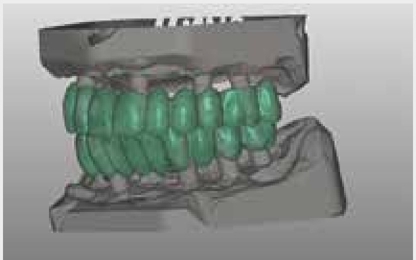


Fig. 35

Fig. 36

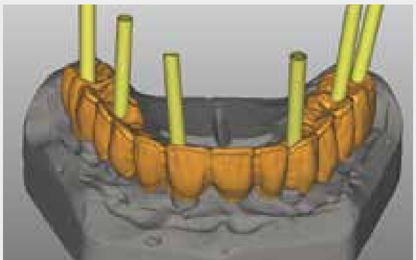


Fig. 37

Fig. 38 ab

Fig. 39 abc

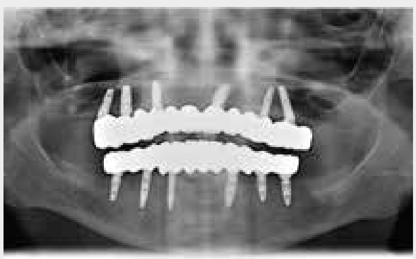


Fig. 40

AUTHOR: DR. FILANNINO

Temporary denture work as a long-term solution is increasingly more common due to a series of combined factors, including the decisive factor of the patient's financial situation.
Though they may be designed and prepared with care, temporary dentures present defects at a technical, functional and aesthetic level (due to the techniques and materials used as well as the limited time available) that negatively affect the underlying supports in the long term, be they natural teeth or implant abutments.
This article presents the case of a 64-year-old patient who wore a temporary denture on natural teeth for a year and a half, in which time he presented various problems such as chipping, splitting and cracking in several places.
Following an x-ray exam, a permanent solution was chosen in accordance with the patient's budget: the insertion of 7 implants with a guided surgery technique following the extraction of the residual dentition.
The guided surgery approach for an expert operator is connected to the possibility of improving surgery performance both in precision and speed, having planned all the phases in advance through digital planning. It allows the operator to choose the most suitable implant and diameter typology and place them in the most suitable area in terms of bone availability, its position relative to nerves and the anatomical structures present. In order to be able to carry out this planning stage, it is essential to perform an analysis with a cone beam CAT scan where the patient wears an anatomical mask dotted with radiopaque markers. It was necessary to take a two-phase silicone impression upon which the technician made the resin trial provided with properly positioned markers.
Since surgical planning software works on triangular plane portions, the markers must be distributed by forming triangles on the prosthesis surface, observing it occlusally. This way the program can automatically recognize them and create an automatic matching between the cone beam CAT scan file and the model scan. Once the above information has been obtained, it can be imported onto the software and used to identify and trace the nerves and all other sensitive structures to be avoided during implant placement. Thanks to the presence of B&B Dental implant library software, not only can you choose the most appropriate implant line and size and positioning them as necessary, but you can also select the prosthetic abutments in relation to the mucous thicknesses and the subsequent prosthetic project. During the planning phase, it was possible to notice beforehand the necessity of performing a bone resection in order to improve the working conditions and create a uniform surface. Thanks to the ductility offered by the system, it was possible to understand how much thickness should be removed and plan for the implant surgery under these new conditions. To carry out the surgery, it was necessary to create three surgical templates:
- the first is a dental support for the positioning of the lateral pins that act as reference points and the repositioning of the templates thereafter;
- the second is for defining the thickness suitable for what was planned to be removed during osteoplasty surgery;
- the third is a mixed support (mucosal and bone support), the surgical template for implant insertion.
The three templates have the position of the lateral pins in common. Following the variation of the bone structure, these pins act as the only reference points for the

FULL ARCH IMMEDIATE LOAD CASE WITH OSTEOPLASTY

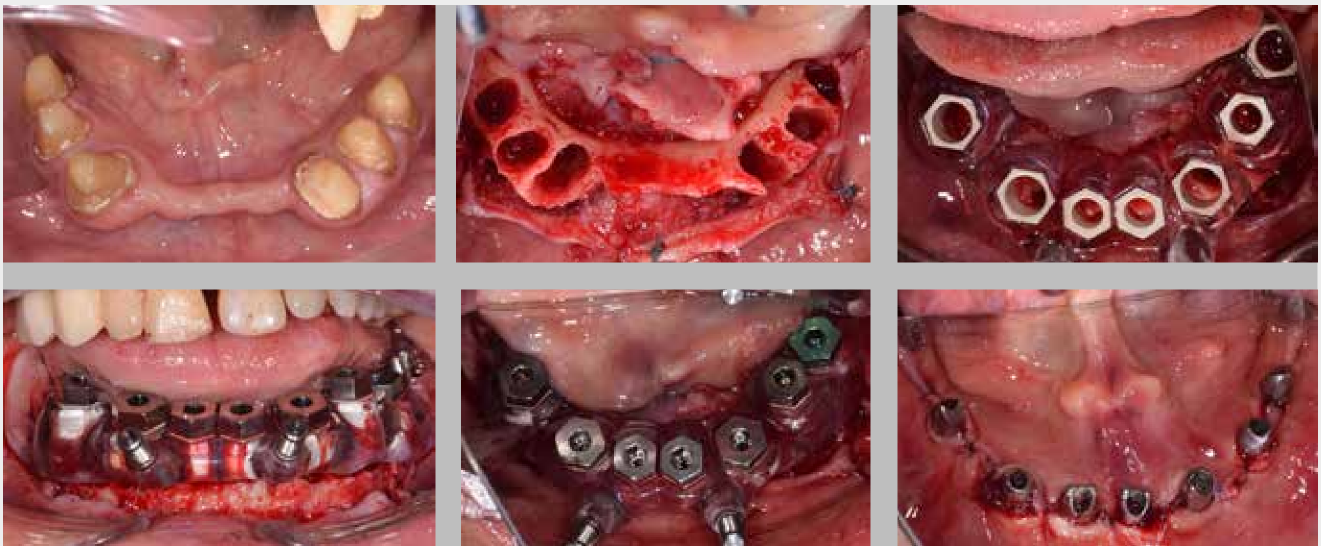
fixing of the templates in the same position as planned. As the planned surgery has predictable results, it is possible to create the immediate loading prosthesis structure (according to the project) to be inserted after surgery in the same session.
In order to obtain a highly aesthetic and functional prosthesis (by correcting the implant divergences and facilitating the insertion phase of the structure), a prosthetic project with customized abutments is prepared.
By simply exporting the STL file of the surgical plan and importing it onto a CAD software, it will be easy to design the structure according to the required criteria as well as including the three unknown brand implants already present in distal positions.
On the day of surgery we will have the following at our disposal: the surgical templates, the prototyped model, the immediate loading prosthetic structure with customized abutments and the B&B Dental guided surgery kit.
Once the temporary denture is removed, the first template (dental support) is positioned to prepare the holes of the lateral pins.
We proceed with the extraction of the remaining teeth and the opening of a flap from area 35 to area 45; the second mask is positioned to evaluate the areas to be remodelled based on the contact points. It was not possible to create an open mask as the bone thickness needed to be removed was very thin, which would have made it less resistant with the consequent risk of rupture or flexion during surgery. When the second mask is stably repositioned without any contact or problems, bringing the lateral pin holes in correspondence to the previously prepared holes, it will be possible to insert the third template and insert the implants according to the project. Once the implants have been inserted, the surgical guide is removed and the customized abutments are positioned; the edges are then sutured, and the PMMA structure is positioned, adapted and functionalized before cementing it.

Initial situation of the patient – x-ray exam

Cone Beam CAT scan with radiopaque markers on the base

Surgical templates: A - template for lateral pins insertion, B - osteoplasty template, C - implant insertion template.

Customized abutments on the model, PMMA prosthetic structure.



Implant insertion surgical phases, mounters in position, the mounter hexagons are in line with those of the implants.

FULL ARCH IMMEDIATE LOAD CASE WITH OSTEOPLASTY



Finished prosthesis in place and final x-ray exam.

B&B DENTAL
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