

Irrio.

Prosthetic screw-retained implant-borne
rehabilitation of totally edentulous patients
with the Omnitaper-Dentsply implant

Welcome to IRRIO

Who are we?

We are both passionate dental surgeons as well as a couple who wish to share and exchange with members of our profession. Implant-prosthetic rehabilitation is a rich and ever-evolving field. We love our work and exchanges with people within or outside of our profession arouse our curiosity a little more with each passing day. We created the Research Institute for Implant rehabilitations in Odontology in order to shed a new light on training, research and innovation in our area of expertise.

IRRIO in a few words and figures:

- More than 600 implants are placed each year by Doctor Bertrand BAUMANN in his private practice and used for his clinical research within IRRIO.
- More than 60 practitioners trust us and participate in this endeavor.
- More than 50 completely edentulous patients have been rehabilitated with implant-borne prostheses and this data has been used for clinical research by IRRIO in the last three years.
- A multi-disciplinary team including private and academic practitioners, web and digital support, multimedia support, a graphic designer, an experienced translator, a printer, dental laboratories, designers and industrial partners.

Our objectives

- The idea is for the patients who are treated in our private practice to be integrated in the clinical research made by IRRIO to constantly improve our operating procedures.
- Develop implant alternatives when taking care of partially or completely edentulous patients so as to offer solutions that are best suited to each of them.
- Share and publicize the results of our research with the national and international community for stimulating input.
- Shed a new light on training, research and innovation in the field of implantology.

Our institute:

This year, IRRIO is moving into the new institute that was built in the heart of the département of the Haut-Rhin. This research center is equipped with the latest audiovisual tools to set up videoconferences and remote meetings. The new premises will also allow us to host our first events shortly.

IRRIO is the place where we can meet and share with our colleagues and partners.

Our research work is focused on several themes:

- The development of cutting edge surgical prosthetic procedures to improve the placement of implants on partially or completely edentulous patients.
- The retrospective review of all the clinical phases of our treatment in order to improve each step of the implant-prosthetic process.
- The development of surgical equipment to enable autonomous surgery. The first clinical test phases started in 2022.

Dr Bertrand BAUMANN
Dentist Surgeon
President of IRRIO



Dr Aurélie BAUMANN
Dentist Surgeon
General Director of IRRIO



PROSTHETIC SCREW-RETAINED IMPLANT-BORNE REHABILITATION OF TOTALLY EDENTULOUS PATIENTS WITH THE OMNITAPER-DENTSPLY® IMPLANT

**Scientific research realized in the Research Institute for Implant Rehabilitations in
Odontology**

Clinical work realized by

Doctor BAUMANN

Practicing exclusively in implantology and pre-implant surgery

In Soultz-Haut-Rhin, FRANCE

Practicing implantologist at the Albert Schweitzer Hospital, Colmar, France

And

Doctor Aurélie BAUMANN

Private practice, Soultz, Haut-Rhin, France

Prosthetic work realized by Christian Santoro

**Scientific journal written in collaboration with Professor Marc Engels-Deutsch
Hospital of Metz-Thionville, France**

Clinical alternatives to prosthetic rehabilitation of completely edentulous patients are numerous. For this new study, we will focus on screw-retained implant-borne rehabilitation of completely edentulous patients thanks to the new OmniTaper® implant.

Fitting implants and prostheses on completely edentulous patients requires a convergence of skills with fixed prostheses as well as with removable ones. The surgical phase is only the end phase of the thought process before surgery, the position of the implants being dependent on the position of the teeth on the arch.

For the first clinical applications of the OmniTaper implant, we have chosen 3 partially or completely edentulous patients, on the upper or lower jaw or both. Each patient had at least one totally edentulous arch.

34 OmniTaper implants were placed on these 3 patients: 2 females and 1 male. 33 implants benefited from immediate loading 72 hours after the operation.

The first two clinical indications we retained to implement this implant system concerned patients who were completely edentulous on one jaw.

The third female patient was completely edentulous on both upper and lower jaws. We used guided surgery.

These 3 patients were operated under general anesthesia at the Albert Schweitzer Hospital, Colmar, France.

The goal of this scientific research is to highlight the necessary clinical steps to rehabilitate a completely edentulous patient (either upper or lower jaw or both) with a fixed screw-retained implant-borne prosthesis, but also to propose new alternatives and technical solutions made possible by this new implant system.

As far as surgery is concerned, the dimensions of the new OmniTaper implant are very similar to the former Xives implant by Dentsply: the diameters (3,0-3,4-3,8-4,5-5,5 mm) and lengths (8-9,5-11-13-15-18 mm) remain identical. When thinking about surgery the practitioner is thus in familiar territory in this first phase of the treatment.

The prosthetic rehabilitation requires getting used to these new accessories, yet each step follows the same clinical logic.

CLINICAL SITUATION 1:

The first patient of our study is a 60-year-old female under treatment for arterial hypertension.



Initial clinical situation



Initial panoramic X-ray

The clinical examination and X-ray revealed a chronic periodontal disease with longer probing depths on the maxilla than on the mandible.

On the maxilla we found 8 mm pockets on sectors 13 and 23 associated with a vestibular version of 21 and tooth mobilities. The premolars and molars were mobile and with cavities and carious limits under the gingiva or next to the bones. We assessed that the maxillary teeth couldn't be saved.

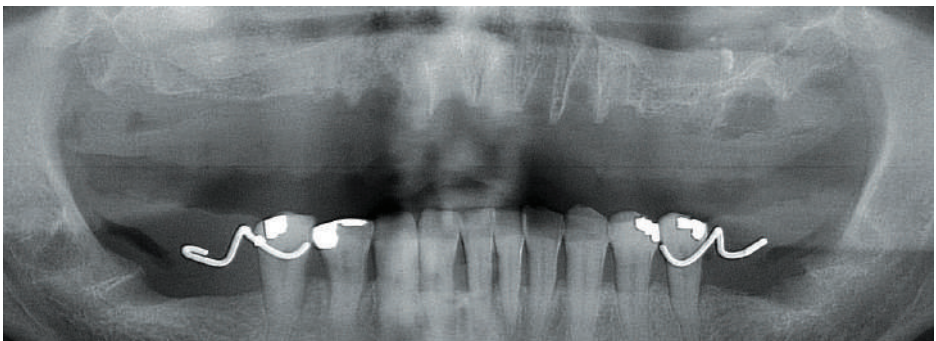
On the mandible, the molars were clearly on the mesial side and mobile, with very irregular occlusal planes. Sectors 35 and 45 were deemed to be in good enough condition to be kept and treated.

The patient was also particularly self-conscious because of her smile. She wanted a global, esthetic, functional and fixed rehabilitation.

It is important to point out that the patient had a lopsided smile. The lips' tonicity was not the same on both sides.

The treatment plan we decided upon was the following:

- Avulsion of all maxillary teeth and mandibular molars.
- A periodontal treatment by scaling and root planning as well as restorative work on the mandibular teeth of sectors 35 to 45.
- The placement of 8 maxillary implants and making of a full screw-retained denture.
- The placement of 4 mandibular implants and fitting of 4 single crowns in the molar sectors.



Immediate post op control X-ray after the avulsions and the right maxillary sinus lift

The posterior maxillary and mandibular avulsions were made under general anesthesia at the request of the stressed patient.

A right maxillary sinus lift by lateral approach was made at the same time as the avulsion. A provisional removable full prosthesis was made on the maxillary arch. A provisional removable partial prosthesis was made on the mandibular arch.



Clinical situation 3 months after surgery with the provisional removable full prosthesis on the maxillary arch

When the patient came for the control visit 3 months after the operation, she expressed satisfaction with her provisional maxillary prosthesis compared with the initial situation.

When we analyzed occlusion and the inter-maxillary contact with the provisional maxillary prosthesis which was stable 3 months after surgery we observed:

- An occlusal curve that was slightly concave in the anterior sector, with insufficient overlapping.
- An underbite on the right sector which set in progressively during the 3-month healing period.

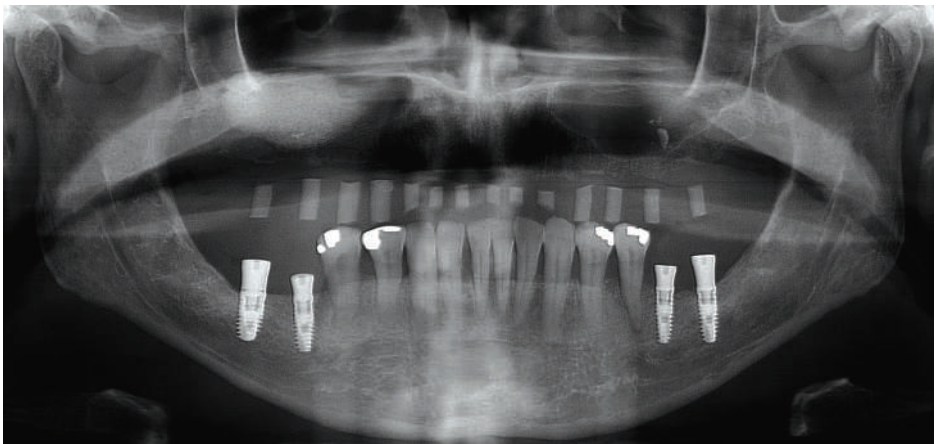
The tooth volumes were also validated by the patient.

The implant rehabilitation occurred in two phases. The first one was the rehabilitation of the mandibular arch. 4 Xives implants were placed in 36-37 and 46-47 (the rehabilitation of the patient had started several months prior to the launching of OmniTaper implants). After 3 months of bone integration, 4 provisional screw-retained crowns were placed on the 4 implants. Once the mandibular arch was restored with more favorable occlusal planes, we planned the rehabilitation of the maxillary arch.

An X-ray guide was made based on the prosthetic project validated in the mouth. We were then able to plan our surgery and define the positioning of the 8 maxillary implants².

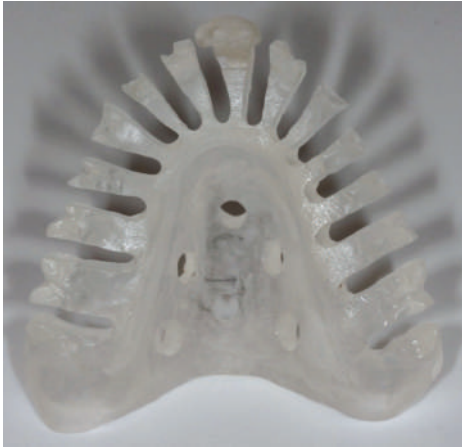


Fitting the maxillary X-ray guide



Panoramic X-ray with radiographic guide in the mouth

A left maxillary sinus lift by lateral approach was made when we placed the 8 maxillary implants. The 8 OmniTaper implants were fitted with a mucosa-supported removable surgical guide. Thanks to this guide, we were then able to accurately position our pilot drill. Managing the implant axes is the surgeon's responsibility in order to orient each implant at best to allow a better fit with the future teeth. It is also imperative that the surgeon correlate the ideal axis of the prosthesis with the bone volume on each site².

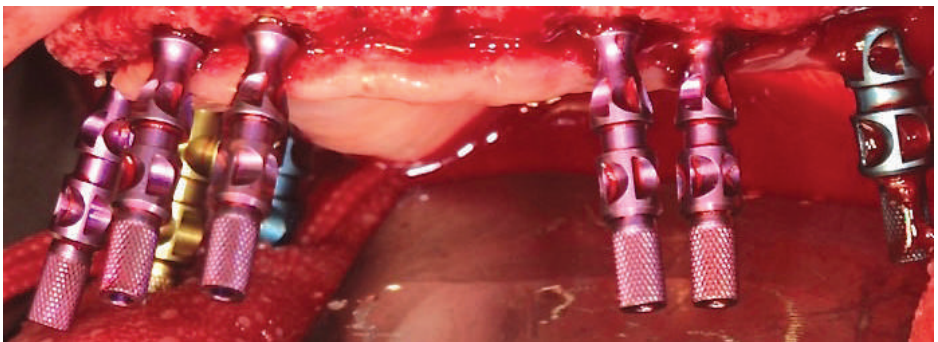


Mucosa-supported surgical guide



Intraoperative clinical situation after placing the 8 OmniTaper implants®

Once the implants were positioned, the open tray impression copings were connected and screwed on. The stitching was made in a second step to make sure the copings fitted perfectly on the implants.



Intraoperative clinical situation after the screwing of 8 open tray impression copings

The open tray impression copings on the maxilla were realized with an individual open tray impression made prior to the operation. It is sometimes necessary to adjust the impression tray during surgery; the choice of drilling sites on the ridge or implant axes may cause a divergence of implants on the arch.

Impregum is the material we use for all our full impressions on implants.

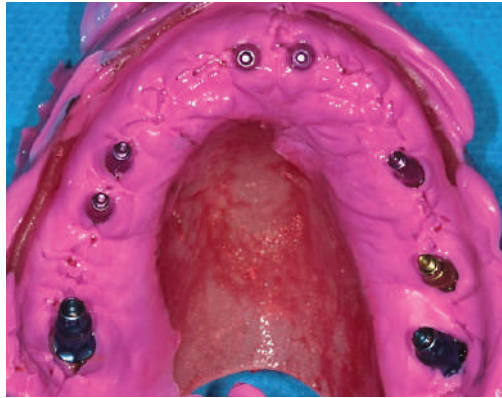
In the case of full impressions on implants that are not bone-integrated, we place the individual open tray in the mouth and then adjust it so it has no contact with the impression copings.

After this clinical validation, a wax sheet was positioned on the occlusal part of the individual open tray at this stage (this step was made outside the mouth). Two holes were drilled for the incisors to allow for the injection of the impression material; two small holes were made distally to the molars to make sure the impression material permeated the impression tray.



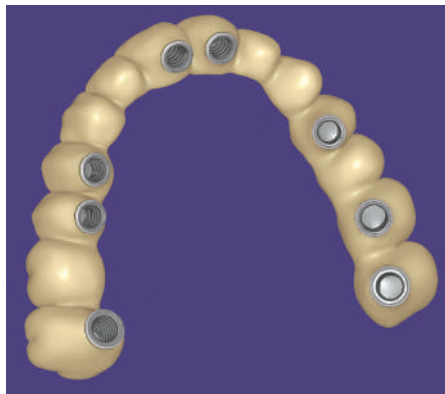
The impression tray inside its wax cover

The individual open tray was then placed in the mouth, the impression copings impacted the inferior surface of the wax cover, then the liquid Impregum® material was injected into the impression tray. Thanks to this technique we can control the position of the impression tray on the arch as well as the open tray impression copings prior to injecting the impression material.



Per-operative maxillary impression made with Impregum

The provisional screw-retained denture was made in CAD/CAM in a milled PMMA resin block. ³



Model of a maxillary screw-retained provisional full denture directly on the implant

The connection between the provisional abutments was made on a plaster model poured on after the impression. The OmniTaper system provides us with Dentsply[®] provisional abutments (which was not the case with the former Xives[®] system).

We opted for a screw-retained solution directly on the implant for our projects.



Maxillary provisional screw-retained full denture machined directly on the implant on 8 OmniTaper implants®

The emergence of the 8 implants was centered on each tooth. The teeth emerged axially to the implants, so there was no need to make adjustments to compensate for a possible implant offset. Thus, the volumes of the provisional denture were optimized.

If, on the other hand, implants were offset on the palatal side without adjusting the axes we would be faced with palatal emergences with a prosthetic corridor more on the vestibular side. In that case the only way to compensate for the offset is to make a wider prosthesis corridor in the buccal palatal direction. But then the denture is also more voluminous and therefore less comfortable for the patient. The comfort of the patient is improved when the position of the implants fits right into the prosthetic corridor. The preparation work and the thought process going into the conception of the prosthesis prior to surgery takes then all its meaning.

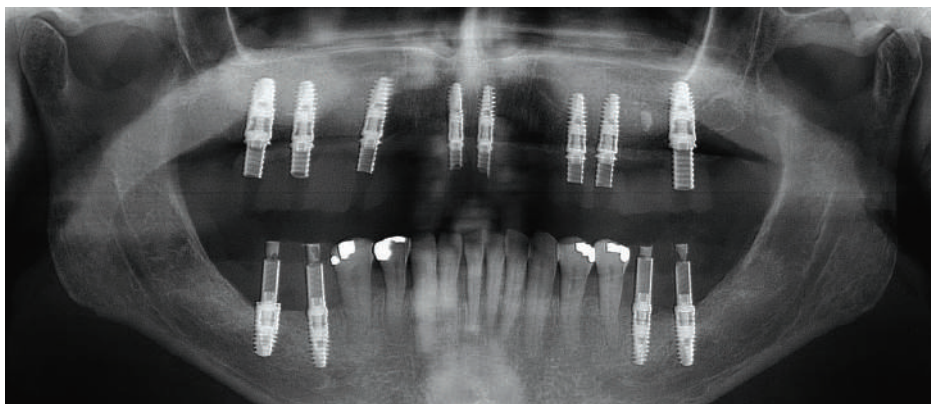
A patient with centripetal bone loss on the maxillary arch at an advanced stage with a more vestibular prosthetic corridor might not be a good candidate for the realization of a screw-retained full denture. The prosthesis would then be very voluminous and uncomfortable for the patient. In that case we favor a removable prosthesis with a retention of implant complement.

The patient had no gummy smile and since the implant system was new, we decided not to add a pink soft-tissue mask on the provisional denture for this first clinical case. We were mainly focused on the new prosthetic system and the discovery of the new accessories for this first realization.

Taking into consideration the clinical height of the teeth in the mouth, it was a foregone conclusion that the manufacturing of the final denture would require pink resin to ensure a more harmonious morphology and more homogeneous tissue volumes.



Endo-buccal clinical situation 72 hours after surgery



Control panoramic X-ray after fitting the provisional maxillary full denture 72 hours after surgery

The patient did not suffer from any pain 72 hours after surgery. The peri-oral tissues were still sore and the mouth corners sensitive because of our intervention. The lips had not recovered their firmness at that point.



Exo-oral clinical situation 3 months after surgery

The occlusal curves were restored. Some plastic surgery on the canine points and premolars could be planned some time after surgery so as to harmonize the smile and to define the final prosthetic project more precisely.

Conclusion

This first clinical application enabled us to get familiar with this new implant system. The surgical phase is the same. The placement of the impression copings in platform switching is straightforward and the manipulation in the mouth ergonomic. The shape of the copings provides perfect stability in the impression material. To allow the insertion of the provisional denture directly on the implant on the model and then in the mouth, it is necessary to cut the engagement hexagons on the implants.

CLINICAL SITUATION 2

The second patient is a 53-year old male with no prior medical conditions.

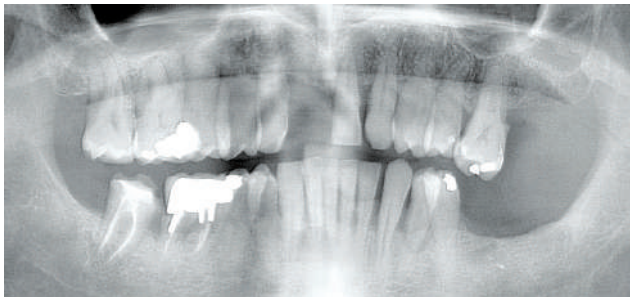
On the maxillary arch, all teeth were mobile with a perturbed occlusal situation. The clinical and X-ray examination revealed a chronic periodontal disease with 8 mm deep probes on the whole maxillary arch. All the teeth were mobile.

On the mandibular arch, tooth 34 was mobile both axially and transversally; tooth 47 was tilted mesially and super-erupted.

The patient pointed out that he did not wish a definitive removable prosthesis.



Initial clinical situation

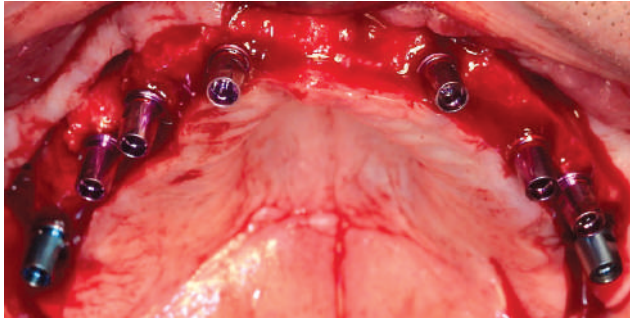


Initial panoramic X-ray

The chosen treatment plan was the following:

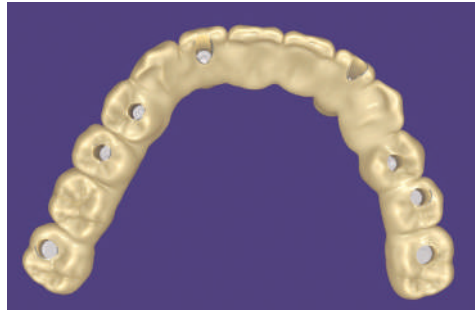
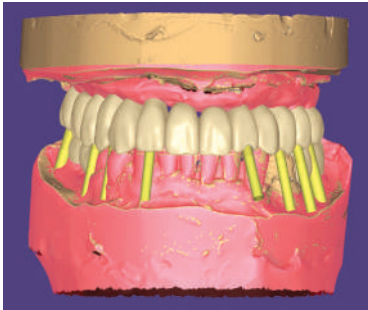
- Avulsion of all maxillary teeth as well as teeth 34 and 47 on the mandible.
- A periodontal treatment by scaling and root planning and restorative dental work on mandibular teeth in sectors 35 to 45.
- A whitening treatment on the mandibular arch.
- The placement of 8 maxillary implants and the realization of a screw-retained full denture.
- The placement of 5 mandibular implants and realization of 4 single crowns in the molar sectors as well as a premolar in position 34.

As in the previous case, the 8 OmniTaper® implants were placed with a removable mucosa-supported surgical guide. The guide was made by the prosthetics laboratory based on a master plan validated beforehand with the patient².

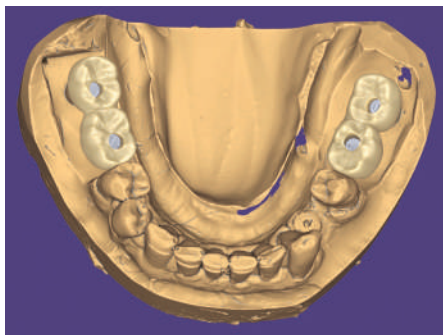


Clinical situation during surgery after fitting 8 OmniTaper implants on the maxilla

For the manufacturing of the provisional screw-retained prostheses on the two arches the laboratory followed the same steps as in the previous clinical case. The implant in position 34 would not be immediately loaded; we would wait its osseointegration to fit the final prosthesis directly on the site.



Modeling of the screw-retained provisional maxillary full denture directly on the implant

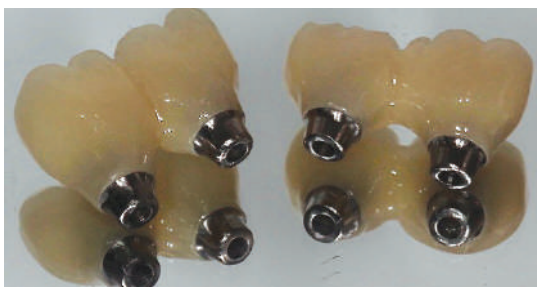


Modeling of the 2 screw-retained molar bridges implanted directly on the mandible

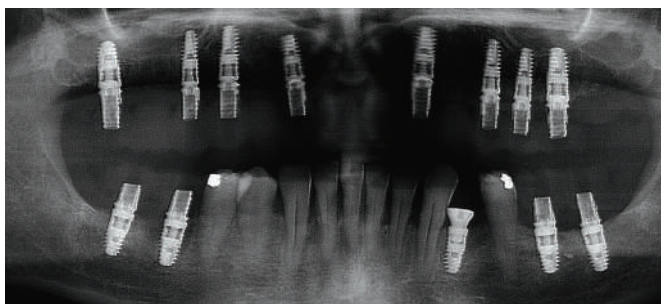
The 13 implants placed under general anesthesia respected the prosthetic corridor initially validated by the master plan. The emergence of the implants was centered on each tooth. These conditions enabled to make a screw-retained provisional prosthesis with the smallest possible volumes.



Screw-retained maxillary full denture manufactured directly on the implants on 8 OmniTaper implants



Screw-retained bridges for two missing teeth on mandibular molars



Post-op X-ray 72 hours after surgery. Immediate loading on 12 implants



Endo-oral situation 6 weeks after surgery



Exo-oral situation 6 weeks after surgery

6 weeks into the healing process, the patient was very happy with his new clinical situation.

Conclusion

In the case of this second patient, the height of clinical crowns did not warrant the use of a soft-tissue mask in pink resin.

As in the case of the previous patient, the surgical plan elaborated prior to surgery was based on a master plan validated in the mouth. The study of prosthetic volumes on each arch allowed to better envision the surgical phase so as to optimize the positioning of the implants. What this boils down to is that it is possible to conceive a prosthesis tailored down to the crown volumes to bring more comfort to our patient.

The morphology of the nearby spaces has to make way for interdental brushes. The framework of the bridges must be convex-shaped to avoid plaque deposit or food remains and make cleaning easier for the patient.

One month after surgery, the patient was very happy with the result. The vertical occlusal dimension was functional again.

CLINICAL SITUATION 3

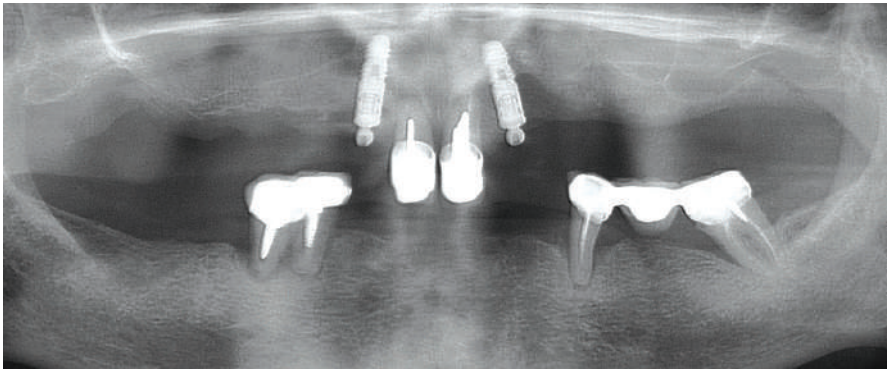
The third patient for our study is a 64-year old female with no prior medical condition.

The endo-oral and X-ray examination revealed a very damaged clinical situation. The prostheses and implants present in the mouth could not be preserved.

The patient made it clear at that stage that she did not want a definitive removable denture.



Initial clinical situation



Initial panoramic X-ray

The two maxillary implants axes were decidedly tipped on the vestibular side. The perio-dental peri-implant environment was unfavorable with bad quality mucosal tissues associated with a terminal peri-implantitis on implant 22.

The treatment plan we opted for was the following:

- Extraction of all teeth on both arches with explantation of 2 implants on positions 12 and 22.
- Bone reconstruction of the anterior maxilla and sinus grafts on both maxillary sinuses.
- Rehabilitation of the two arches with a screw-retained full denture on 7 maxillary implants and 6 mandibular implants.



Clinical situation 3 months after surgery with removable provisional full dentures

The clinical situation with the provisional prostheses was satisfactory and the patient was glad of her new smile.

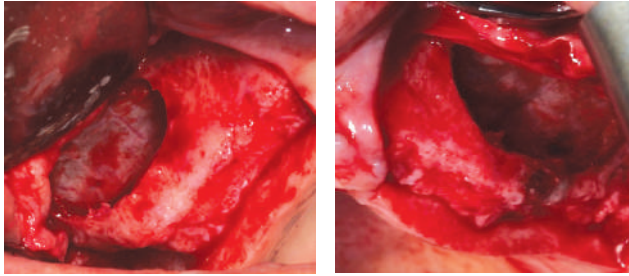
Clinically, the vertical occlusal dimension had been improved but remained insufficient. The occlusal curves were not restored yet with a Spee curve that was slightly inverted on the left side. Successive occlusal equilibrations were necessary in the 3 months of healing. The adjustments mostly concerned the mandibular molars so as to keep good contact between the upper and lower teeth.

In these conditions, it was out of the question to plan surgery without realizing a new master plan.



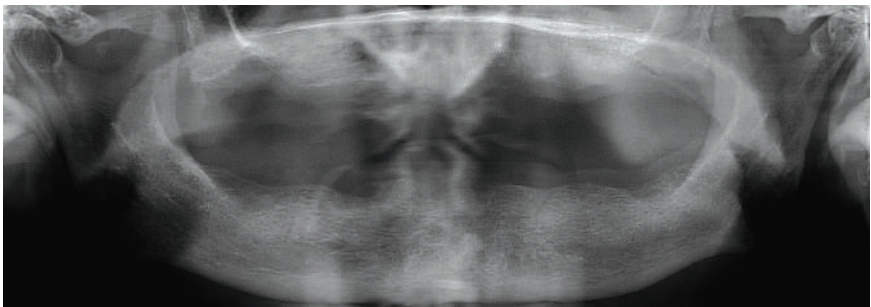
New master plan validated in the mouth

The vertical occlusal dimension was reevaluated at 1,5 mm. The occlusal Spee and Wilson curves were also corrected. The patient agreed to this new plan. Once we restored the prosthetic markers, it was possible to plan the implant surgery.

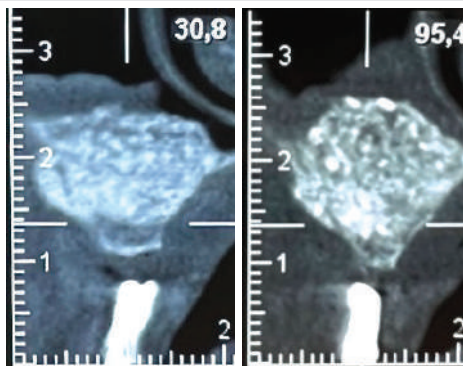


Clinical situation during surgery of left and right maxillary sinus lifts

The reconstruction of the anterior maxilla was realized during avulsions and explantations. The sinus grafts were made 3 months after extraction to benefit from provisional prostheses that were functionally integrated.

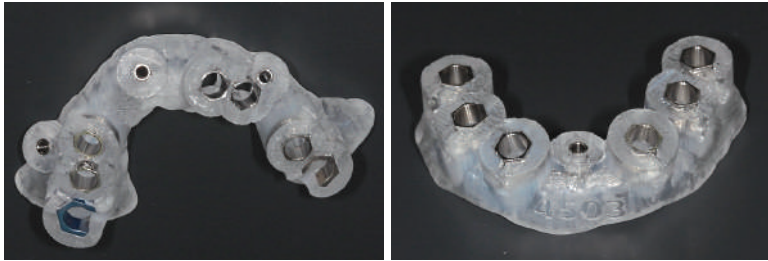


Control panoramic X-ray 6 months after right and left maxillary sinus graft

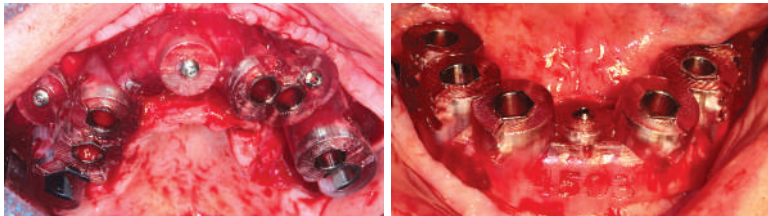


Control scanner 6 months after sinus grafts

The graft on the right and left maxillary sinuses allowed to reconstruct bone volumes that would enable implant placement with 15 mm available height on each side. The surgical plan was realized on Simplant. The bone-supported guides were manufactured to guide us throughout the whole surgical process up to the insertion of the implants. In this way, it was possible to best use the bone volumes ¹⁻²⁻⁵⁻⁶.



Maxillary and mandibular bone-supported Simplant guides



Screw-retained Simplant guides positioned on both arches

All the drilling was made through the guide. The insertion of the 13 OmniTaper implants was made with specific tools to guide each implant into the bone with no risk of deviation.



Clinical situation during surgery after placing the 13 implants



Modeling of the provisional screw-retained prostheses on both arches

It is essential to point out that this patient's bone volume was sufficient but reduced. The use of a Simplant guide allowed to optimize the implant placement but also to make the surgical gesture safer. In our case, hand-held drilling would lack in precision with a risk of diverging from the prosthetic plan.

The modeling of provisional prostheses shows up an impressive inter-arch prosthetic height. In order to improve the esthetic end result, we decided to make both dentures with pink soft tissue masks. It was then possible to digitally reduce the crown volumes at the cervical level, to manufacture the prostheses in Dentsply PMMA blocks and then to add the soft tissue mask in the volumes that had been prepared before³.



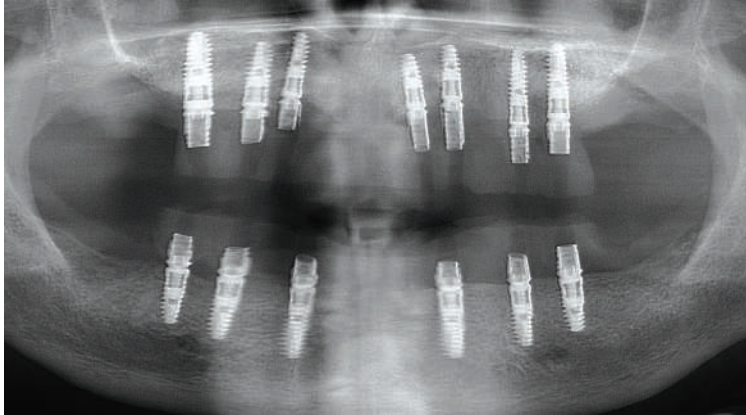
Provisional maxillary screw-retained bridge



Provisional mandibular screw-retained bridge



Patient's smile 72 hours after surgery during immediate loading



Post op X-ray 72 hours after immediate loading



Endo-oral clinical situation 72 hours during immediate loading

Conclusions

This last clinical situation highlights many issues: a collapse of the vertical occlusal dimension and unstable inter arch relationships, terminal peri-implantitis, advanced bone resorption and the wish of the patient to regain the comfort of fixed prostheses.

To take care of our patients the new OmniTaper implant offers new prosthetic solutions (compared to the Xives implant) and broadens even further the scope of therapeutic possibilities at our disposal. We could mention among other things the presence of a new internal EV conical connection, a new OsseoSpeed surface, dedicated provisional abutments as well as the development of new prosthetic hardware for the making of screw-retained prostheses.

In the treatment of totally edentulous patients, our aim is to restore the chewing function while taking into account the esthetic wishes of our patients. In this context, our treatment plan must be guided by a prosthesis-oriented thought process. Our surgical gesture is but the final touch of a prosthetic project validated beforehand in the clinical situation. The elaboration of our treatment plan must allow to break up a complex situation into multiple steps so as to ensure a successful outcome.

It is important to make it clear at this point that a good periodontal maintenance is essential to the success of our implant treatments. The patient's compliance throughout our treatment as well as daily oral hygiene are two major aspects. If these conditions cannot be met, failure is inevitable and it will then be preferable to advise the patient to look at alternative therapeutic solutions.

Irrio.

1° Chen. Peter, Nikoyan. Levon

Guided Implant Surgery : a technique whose time has come

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Andrea, Caloro. Giorgia Apollonia, Troiano. Guisepppe, Muzio. Lorenzo Lo, Mastrangelo. Filiberto.

Guided Dental Implant Surgery : Systematic Review

J Clin Med. 2023 Feb13;12(4):1490.

3° Makarov. Nikolay, Pompa. Giorgio, Papi. Piero

Computer-assisted and full-arch immediate loading with digital prefabricates provisional prostheses without cast : a propective pilot cohort study.

Int J Impalnt Dent. 2012 Sep 6;7(1):80

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Immediate loading with fixed full arch prostheses in the maxilla : review of literature

Med Oral Patol Oral Cir Bucal. 2014 Sep 1; 19(5):e512-7.

5° Rosenfeld. Alan L, Mandelaris. George A, Tardieu. Philippe B.

Prosthetically directed implant placement using computer software to ensure precise placement and predictable prothetic outcomes. Part 1 : diagnostic, imaging and collaborative accountability.

Int J Periodontics Restaurative Dent. 2006 Jun;26(3):215-21

6° Yulei. Pan, Yeying. Tu, Ting. Wang, Junwei. Liang, Haiyan. Lin

Clinical Study of precision analysis and deviation control of a domestic guide plate-assisted edentulous implant surgery

J Stomatol Oral Maxillofac Surg. 2022 Nov 4;S2468-7855(22)00342-1

d'orienter le patient vers d'autres alternatives thérapeutiques sans quoi l'échec sera inévitable.



Research and development within IRRIO

Energy is at the core of our concerns in all areas. The IRRIO team has been working for 2 years on the development of operating equipment to make surgery autonomous.

We all work in medical offices which use up a lot of energy. So we imagined ways to recycle part of that energy to use it again during our surgical interventions.

The environment of the dental surgeon is very bright; that's why we are working on the development of surgical equipment which will allow to recycle the energy of the photons: thus we would be able to operate on our patients with the surrounding light of our offices.

Thanks to the elaboration of ever more efficient photo-voltaic cells, we can now recuperate the energy of natural or artificial photons to store it in batteries and use it again during surgery.

The first clinical applications we have implemented in our studies are very encouraging: dozens of patients have been operated on successively without a single loading phase. More than 35 implants have been placed in a row thanks to the energy supplied by the same battery which powers our engines. The energy of the photon is now serving implant surgery.

