



CLINICAL ARTICLE

Published at the «Implantologie Revue» journal (France)
May 2010

Guided implantology

Simplifying protocols through the use of
Materialise® Anthogyr Guiding System
(A.G.S)

Dr. Jacques VERMEULEN

Doctor in dental surgery.

Graduated from the Nice Faculty of Medicine.

Advance certificate Implantology University degree.

Graduated in Emergency handlings from the Lyon University.

Advanced certificate with Basal Implantology University degree.

Attestation in Implantology university studies.

Skills in implantology – AFI-DGIO.

Post Graduate of de Tufts University Boston US in Prosthodontic
and periodontology.

Teacher at Marseille's Oral Implantology College.

Teacher at the UD of Oral Implantology in Nice Sophia-Antipolis.

Member of the Implantoral International Club ICI.

Member of the AFI-DGIO.

Regular lecturer and coach for Anthogyr.

Flumet - France

dr.vermeulen@wanadoo.fr

anthogyr

A global solution for dental implantology

Introduction

Finding the right implant position is a problem on which much has been written: articles, publications and reviews. All known and lesser known implantologists have attempted to write on the subject, each using his personal recipe to find the ideal position. This works wonderfully on diagrams and drawings, but it is quite another story in the mouth!

Due to the 3D aspect of the mouth, many disruptive factors cause an alteration in vision: light, shadows and fluids (blood, saliva, irrigation), not to mention **stress**: ours and that of the patient's!

Armed with a contra-angle, things are bound to get complicated because hands are not guided and can deviate.

That is the limitation of infrared guiding systems.

The difficulty lies in the anisotropic structure of the bone: a very dense cortical bone and a trabecular medullary bone. It is going to be necessary to compensate and deviate our trajectory at the risk of not placing the implant in the ideal position, to guarantee the best aesthetic result.

Society and our patients have changed, their legitimate aesthetic demands have increased while our right to make mistakes has decreased.

The obligation to have the right means has undisputedly shown a tendency to go hand-in-hand with the obligation to achieve good results.

In the near future, if not today, experts will certainly ask to see our planning which will be the proof of reflection and evaluation of risk.

This is why, in my opinion, surgical guides have a bright future ahead of them and will become our everyday tools.

Currently, implant placements with guides occupy 3% of the market and this will rapidly rise to 15% (Materialise® short term forecast).

Are stereolithographic surgical guides reliable?

YES, if you strictly follow the protocol from the making of the radiological guide to its fixation in the mouth. The tolerances allowed by Materialise® are:

→ 2 mm in horizontal movement

→ and 5° in angular movement

This may seem to be a lot, but is it possible to be more precise freehandedly? Definitely not!

It is forecast that in the future the more implants you place the more you will use guides. Their use will be more frequent in difficult zones:

→ single anterior teeth where precise positioning affects the aesthetic results.

→ vast multiple reconstructions, to keep the implants in the prosthetic corridor.

→ in anatomically involved zones: tubero-ptyergoid, the zygomatic arch, close to the mandibular nerve.

The popularization of 3D imagery in surgeries, associated with the programming software Simplant™ confirms this tendency.

There are 9 implant systems associated with Simplant™ including: **ANTHOGYR** guiding system (A.G.S).

ANTHOGYR Guiding System (A.G.S.)

The A.G.S. presents beneficial features; it is simple and the surgical kit is very small. "Less is More".

In surgery, simplicity is synonymous with reliability. Stress considerably reduces our capacity to analyse, and when one is faced with a complicated surgical box, mistakes can quickly be made.

In fact, everything is based on the use of a specific contra-angle: the **MONT-BLANC**® A.G.S.

It has an adjustable stop that is pre-indexed to the length of **axiom**® implants. 14 mm - 12 mm - 10 mm - 8 mm - 6.5 mm.

The association of the **MONT-BLANC**® contra-angle with drills with a sliding detachable centring ring is the reason for this reduction in the number of elements in the surgical kit.

The different diameters of **axiom**® implants which can be used are 3.4 mm, 4 mm, and 4.6 mm.



Fig. 1 - The A.G.S. kit: there are fewer instruments and thanks to its support cover, the instruments always face the operators while they work on a bridge-table.



Fig. 2 - The **MONT-BLANC**® A.G.S. contra-angle with its adjustable stop has a torque of 80Nxcmm: it can be completely dismantled for surgical purposes and the push button is easy to use.



Fig. 3 - The adjustable stop that is pre-indexed to the length of **axiom**® implants. Note that there is only a semi-circle which enables easy placement of drills. The contra-angle and its stop are not reserved for anthogyr drills but can be used with any other brand.



Fig. 4 - The drill and the sliding detachable centring ring in which bearings perfect the hold and induce a gentle friction which is quite pleasant during drilling. The assistant may prepare the drills and sliders in advance thanks to the guidelines and the large quantity of sliding detachable centring rings provided in the A.G.S. box.



Fig. 5 - The punch drill for gingival eviction during surgeries without flaps. This step is carried out before setting the guide. In fact, the gingival disc must be carefully pulled out and gentle wound care done with the scraper to remove the connective ligaments.

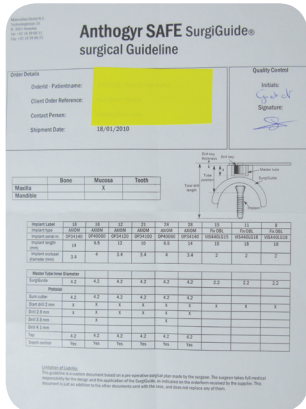


Fig. 6 - The guidelines in which the drill sequences are coded for each implant. The assistant posts it in the operating room so that it is visible to the practitioner and the operating assistant. If several implants of the same diameter and length are scheduled, the sequences may be applied logically for the sake of ergonomics. Tapping is essential regardless of the bone quality. This is due to the exceptional Axiom primary stability. Placement of the implant should follow the tapping sequence without delay to avoid the sponge effect on the bone and to allow insertion with a torque of 30 to 50 Nxcmm. Abundant irrigation of the implant pit before placement of the implant allows the elimination of all the bone shavings which may cause an apical plug that is too compact.



Fig. 7 - The A.G.S. kit can be hand-held and easily fits in the autoclave with the other instruments. Regular wrapping is adequate for packaging, which presents an economy!



Fig. 8 - Self-drilling and self-guiding osteosynthesis screws with automatic break-off heads. They are mounted directly on the contra-angle which is why they are easy to place and avoid loss in the oral cavity.

Description of the A.G.S. kit

- 2 punches of 4 and 5 mm in diameter,
- Initial drills, 2 mm in diameter are to be used with the spoon,
- Drills of 3.4, 4 and 4.6 mm in diameter are used with identical sliding detachable centring rings for the 3.4 and 4 mm diameters which are most often used,
- 2 implant guide-holder mandrels,
- Tap drills,
- 1 guide spoon.

The dental assistant may prepare the drills and their sliding detachable centring rings in advance thanks to a guideline provided by Materialise® to which he/she as well as the practitioner may refer.

All the guided surgery accessories are grouped together in a kit which can be hand-held and which easily fits in the autoclave with the other instruments.

The fixation of the bone supported guides and the mucosa supported guides are done using osteosynthesis screws specially designed for this use. They are sufficiently long to transfix the layers of the guide and the mucosa and to effectively anchor in the bone. A length of 21 mm was created for this purpose.

These screws are mounted directly on the **MONT-BLANC®** contra-angle and they are self-drilling, self-guiding and have automatic break-off heads.

Final tightening is done using a manual screwdriver or a mandrel on the contra-angle in case of difficult access.

I will not repeat the details of the planning with Simplant®, the universality and progressive nature of which makes it a market leader.

I simply wish to call to mind how easy it is to plan, position and select an implant on 3D view or on cross-sections.

In case a patient with a somewhat **small mouth opening** presents difficulties, it is possible to insert the Ø 2 mm drill already fitted in the spoon and in this way 9 mm in height is gained.

All that is required is insertion up to the plateau stop and to do the same with the tap.

Nonetheless, tapping must be stopped before the plateau is touched so that there is no threading of the bone due to an Archimedes screw effect. However, for the sake of simplifying protocols, the implant support is clipped directly onto the implant in its sterile cover. The implant remains sterile and free of any handling until it is inserted into the bone.

Guiding of the implant is done without any slack and its insertion is stopped when the neck arrives at the level of the plateau.

A visual mark of the implant indexation is reproduced on the implant guide holder. This is essential for single implants with prostheses sealed onto a titanium abutment.

When all the implants are fitted, the osteosynthesis screws are taken out and the surgical guide removed.

Guided surgery indications

- Positioning of the implant requires great precision.
- Facilitates and secures the placement of post-extraction implants.
- Allows drilling at a wide angle in zones with anatomical obstructions.
- Making the prosthesis beforehand.
- For flapless interventions.

The contraindications (limitations)

- Reduced mouth opening, macroglossia and nausea.
- Very thick mucosa in mucosal support.
- Implant angulation associated with a mucosal support guide.
- Accessibility of the head of the contra-angle.
- Difficulty locking the guide with osteosynthesis screws.
- Big flaps when a bone support guide is used. (The question that should be asked is: am I able to?)
- Not being able to complete surgery freehandedly.

I would like to emphasize the problems of mucosal thickness, in particular, which can be an obstruction to the mucosal support guide, especially when the implant is angled. This is the case for tubero-ptyergoids and distal implants of the «All on Four» techniques.

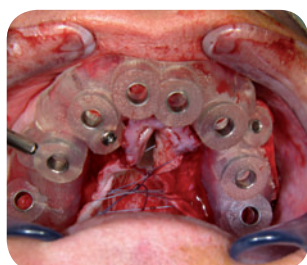


Fig. 9 - With the guide in place, the final check of the osteosynthesis screws is done with a manual screwdriver. The size of the palatine flap which is necessary can be noted on this image. The practitioner should be capable of safely carrying out this action.

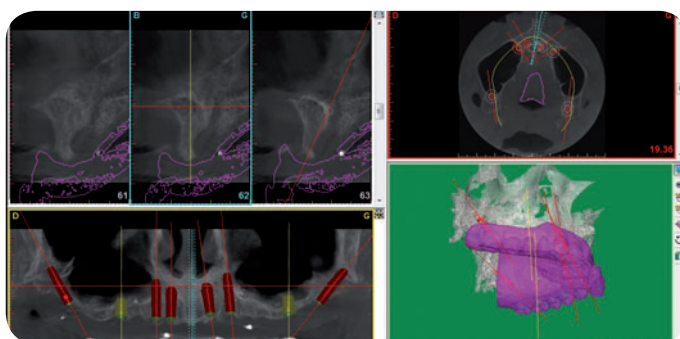


Fig. 10 - Simplant screenshot during planning. This planning requires perfect mastery of the software and the surgical intervention which will result from it. This allows the acquirement of pre-surgical spatialization and training that is identical to a simulator. Anatomical knowledge becomes more like a game thanks to the Simplant-Pro Crystal software.



Fig. 11 - The guide spoon and the 2 mm drill. In case of a lack of height, it is wise to insert them together in the surgical guide.



Fig. 12 - During placement of implants in mucosal support, the drill with the sliding detachable centring ring and the stop in the 12 mm position. Abundant irrigation is essential; we observed no more heating than with an implantation without guide. Nonetheless, it is better to adjust the irrigation output to the maximum and use serum that has been cooled beforehand.



Fig. 13 - On this stereolithography, the practitioner chose the ideal position of the spoon and verified the absence of obstruction in the movement of the head of the contra-angle. These "mock rehearsals" are essential and are a part of the pre-surgical checklist. The guide is then immersed in chlorhexidin and in yellow Betadine for decontamination.



Fig. 14 - The implant guide holder which allows the implant to be grasped directly. At the head of the C.A., the neck, which is the visual mark for vertical insertion of the implant as well as the black point which allows positioning of the three-lobed indexation of the Axiom implant internal connection, can be noted. This is important during use of the angled abutment, for example, for the "All on 4 techniques". We recommend systematizing this index in a vestibular position during each placement; in this way you will have no bad surprises.

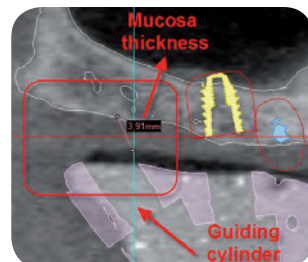


Fig. 15- In this cross-section of the tuberosity region, the significant thickness of the mucosa can be noted. This must be taken into account during gingival evicton: a part of the mucosa should be removed with a cold scalpel.

CLINICAL CASES

Dental supported guides



Fig. 16 and 16 a - Young 18 year-old patient in orthodontic treatment for several years who consulted us for the treatment of many agenesis. In the anterior section, the space was arranged at the same time as the symphysary graft insertion. The use of a mucosa supported guide ensured precise positioning in a reduced space and volume.

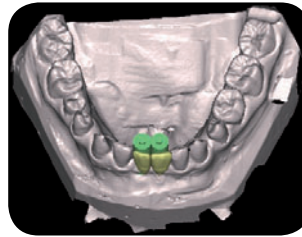


Fig. 17 - Planning the best positioning of the implants as well as providing the space required for 5 mm diameter guiding cylinders and ensuring that they are fixed in the guide resin is delicate. Planning remains an essential advantage because it makes it possible to start over as many times as necessary, which would not be the case during freehanded surgery!



Fig. 18 - The guide is placed in the mouth and it clips onto the teeth and is very stable. Nonetheless, it must be locked by applying pressure with the fingers during the drilling phases.



Fig. 19- The implant is inserted through the guide. This is the most important phase. In fact, at this stage, if the insertion is done without guiding, the operator runs the risk of introducing significant angle errors of more than 10°.

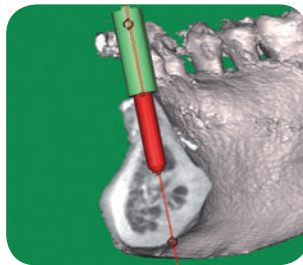


Fig. 20 and 20 a - Comparison between the plan and a postoperative tomography: there is hardly any difference.



Fig. 21 - Implants covered by healing abutments are placed. The sutures enable prefiguring of the papillary profiles.

Bone supported guides



Fig. 22 - This patient made a consultation for a periodontal disease. Global management including: prophylaxis, mucogingival surgery, dental care, implantology with extraction/implantation and IL (immediate loading), were proposed for this patient. A radiopaque prosthesis was made and allowed us to do a dual scan.

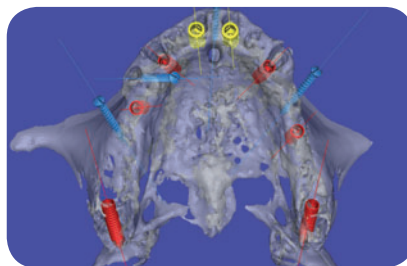


Fig. 23 - The implants are planned: 2 tubero-ptyergoid and 6 axials in the anterior maxillary as well as 4 osteosynthesis screws.

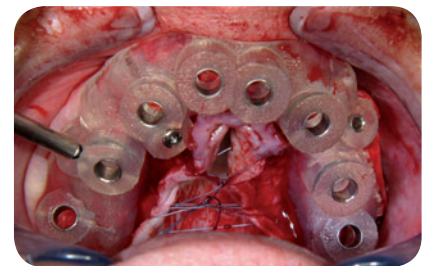


Fig. 24 - The extractions are done by Piezo-surgery which allows the preservation of the fine vestibular bone tables. A vestibular flap is lifted up to the tuberosities. The pearly fibres of the pterygoid muscle insertion ligaments must be identified. The palate flap must be carefully dissected so that the wide palate pedicle is not damaged. The left and right sections are joined by a suture which will be removed at the end of surgery. When the guide is inserted, careful attention must be paid to ensure that there are no mucosal obstructions.



Fig. 25 - The standard prosthesis was placed within 48 h. The mandible was rehabilitated in 45 days.



Fig. 26 - This 36 year-old patient was able to smile again and have a normal social life.

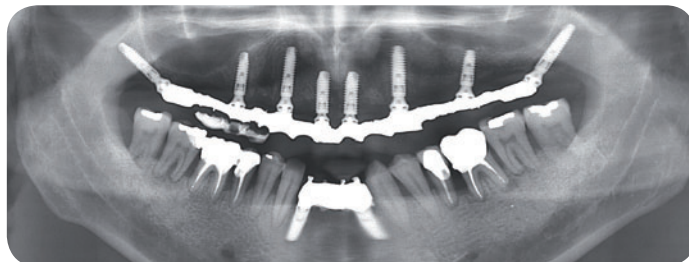


Fig. 27 - The panoramic x-ray at the end of treatment: The patient is monitored in 1 month, 3 months, 6 months, and then every year.

Mucosa supported guides



Fig. 28 - This 45 year-old phobic, nauseous patient made a consultation for global care. The extraction of all the teeth and the placement of temporary removable prostheses are done first. Next, the treatment plan schedules the rehabilitation of the mandible followed by the maxillary. Temporary prostheses make it possible to meet the patient's wishes as closely as possible phonetically and aesthetically. A duplicate is made to develop radiological guides.

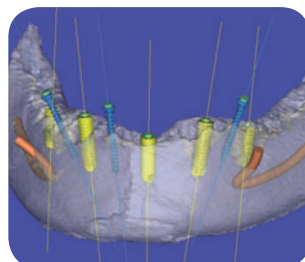


Fig. 29 - The planning provides for 5 axion® implants with mucosal support guides.

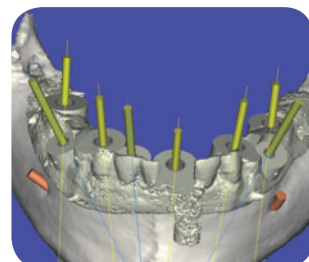


Fig. 30 - Proposal of a mucosal support guide. 2 guides are ordered: one for the laboratory and one for surgery. The Bienfait laboratory in Lyon will make the prosthesis beforehand.



Fig. 31 and 31 a - The laboratory uses a duplicate stereolithographic guide to create the master model. The analogues are screwed onto the connectors which are interlocked on the guide.

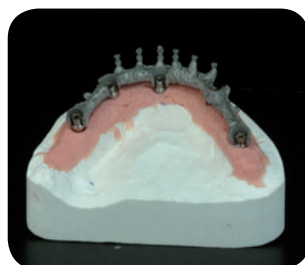


Fig. 32 and 32 a - The armature is ready to receive the resin and the teeth. The completed bridge before insertion in the mouth and bonding of the titanium preforms to the basal surface of the prosthesis. The thickness of the cement is gauged for a tolerance of +/- 2.5/10 mm. The surgical phase can now begin.

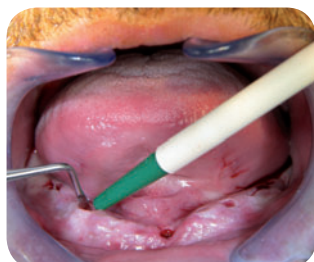


Fig. 33- The guide is tried and the gum marked with punches. Fixation of the guide with the osteosynthesis screws is preceded by careful cleaning with the scraper.



Fig. 34- The guide is fixed. For this to be done, the patient is asked to clench his teeth tightly. The osteosynthesis screws are placed during this time and the stability is monitored.



Fig. 35 - The drilling sequences can be done according to the guidelines.



Fig. 36- The implants are in place. The guide is removed, the cone abutments placed, the titanium preforms screwed onto the cone abutments and isolated by dental dams. The screw access pits are protected by gauged metal sleeves.

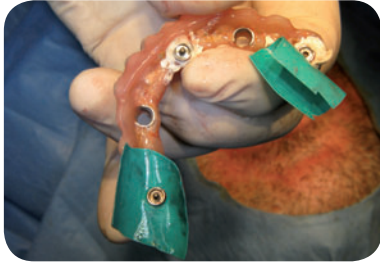


Fig. 37 - An initial bonding is done directly in the mouth on 3 implants in order to create a tripod. The other 2 preforms will be bonded afterwards. The cement used is an attachment cement [3M ESPE Mimetic Cem].



Fig. 38 - The prostheses in place at the end of surgery.



Fig. 39 - Although this post-op loading technique is spectacular, for us it remains anecdotal. We much prefer the traditional technique of making impressions and placements within 48 h. The bonding done in the lab is of better quality and there is less stress!



Fig. 40 - The post-op x-ray allows monitoring of the passivity of the armature, easily obtained thanks to this technique of bonded preform which Gérard Scortecchi taught us.

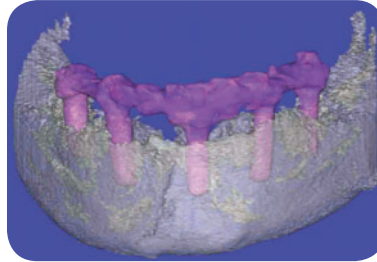


Fig. 41 - A post-op 3D acquisition confirms the perfect balance between the planning and reality. The proportion of the armature which has to be highly rigid can also be noted.



Fig. 42- This view is a blow up of the set of elements of which the bonded preform technique is comprised: the implant + the cone abutment (grey), the bonded preform + the fixation screw (orange). The laboratory will have calculable centring and preform rings to arrange cubicles in which the titanium preforms are bonded in the basal surface of the armature.

The precise positioning of implants in cases of rehabilitation of a complete arcade enables planning of the placement of a prosthesis that has been made beforehand. This is what we did in this clinical situation.

The prosthesis that is placed in the mouth is said to be "standard". It is designed to remain in the mouth for several years or even longer. I do not like the term "permanent" because nothing is actually permanent.

The prosthetic concept that we have been applying for several years now is the one taught to us by Gérard Scortecchi: flat connections and bonded titanium preforms that "passivate" the armature.

We have been working with flat or cone connections for over 12 years now.

The result is clear: over 200 patients treated for complete bridge and always with the same simplicity and reliability. The number of detached titanium preforms in 12 years is less than 3/1,000! The cement used is: 3M ESPE Mimetic Cem. A conical abutment is fitted on every **axiom**® implant. The titanium preforms which will be bonded to the basal surfaces of the armature are positioned on these abutments. Everything is screw-retained.

Do I intend to systematize the bridge placement in the same session?

NO. It is so easy to make an impression, create a master model and make a standard prosthesis in 48 h that the patient will keep for 10 years.

I do not see the purpose of placing a temporary prosthesis and then after the bone integration, redoing an impression in order to make a standard prosthesis.

The total time spent in the dental chair and in the laboratory is much longer and more appointments are required.

Alexandre Bienfait and myself have chosen prostheses on Vitalium armature (Chrome-Cobalt-Molybdenum), Ivoclar acrylic resin and Vita and Ivoclar teeth. For us, they guarantee:

- reliability,
- simplicity,
- the possibility of simple rebasing in case of soft tissue changes,
- a non-traumatising occlusion that is easy to fix,
- simple repairs,
- low weight.

Moreover, the cost for our patients is attractive. If our patients wish to, they may opt to change to a ceramic bridge a few years later, but few of them do!

Conclusion

A few essential reminders:

- The most reliable guides in terms of positioning are the bone supported guides fixed with osteosynthesis screws. (source : Materialise®)
- The longer the implants are and the smaller they are in diameter, the more important it is that their placement is precise.
- The more one passes from a D1 to a D4 bone, the more guiding becomes essential, and even more so with short implants.
- The use of the guide solely for preparation of implant pits does not guarantee perfect positioning of the implant.

It is the guiding of the implant that is most important for placement that coincides as closely as possible with the plan.

Acknowledgements

anthogyr - Laboratoire Bienfait - Materialise - Victory

Bibliography

- 1. **Shiota M, Kihara H, Fujii M, Kasugai S.** Implant placement on restricted mesiodistal space with simulation software and guiding system: a case report. Department of Masticatory Function Rehabilitation, Division of Oral Health Science, Oral Implantology and Regenerative Dental Medicine, Graduate School, Tokyo Medical and Dental University.
- 2. **Katsoulis J, Pazera P, Mericske-Stern R.** Prosthetically driven, computer-guided implant planning for the edentulous maxilla: a model study. Department of Prosthodontics, School of Dental Medicine, University of Bern, Bern 3010, Switzerland.
- 3. **Tardieu PB, Vrielinck L, Escolano E, Henne M, Tardieu AL.** Computer-assisted implant placement: scan template, simplant, surgiguide, and SAFE system.
- 4. **Valente F, Schirotti G, Sbrenna A.** Accuracy of computer-aided oral implant surgery: a clinical and radiographic study.
- 5. **David P Sarment, DDS, MS1/Predrag Sukovic, PhD2/Neal Clinthorne, MS3** Accuracy of Implant Placement with a stereolithographic Surgical Guide
- 6. **L. Vrielinck, C. Politis, S. Schepers, M. Pauwels, I. Naert,** Image-based planning and clinical validation of zygoma and pterygoid implant placement in patients with severe bone atrophy using customized drill guides. Preliminary results from a prospective clinical follow-up study. Int. J. Oral Maxillofac. Surg 2003; 32: 7-14.
- 7. **Sers L., Philippe B.** Implantologie assistée par ordinateur et guides stéréolithographiques à l'aide du système Simplant Navigator®.

PUBLISHED AT THE «IMPLANTOLOGIE REVUE» JOURNAL - FRANCE - MAY 2010

© Anthogyr - AC3A-0710

anthogyr

A global solution for dental implantology

2 237 avenue André-Lasquin
74700 Sallanches - France
Phone +33 (0)4 50 58 02 37
Fax +33 (0)4 50 93 78 60

www.anthogyr.com