Evaluation of the relationship between stereolitographic models and in vivo implants' position in Nobel Guide technique: an in vivo prospective study.

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Purpose: At the present time fixed complete prosthesis are the best solution for edentoulus patients and immediate function is a good clinical option. Nobel Guide technique obtain a good result. Preliminary 3D study on patient bone allows to determine implants position and prosthesis design. Thanks to surgical template is possible to transfer virtual situations in clinical and surgical fields (1,2,3). This study compares implants position in virtual models in Nobel Guide technique with clinical implants position. Intraoperatory target points were taken to evaluate the relationships between two series of casts coming from 8 patients, for a total of 8 full arches.

Materials and methods Eight patients have been selected in the two private offices. Selection criteria are the Nobel Guide prescription protocol: negative medical history, edentoulism, panoramic and CT scan preliminary study, presurgery removable denture. These rebuilt arches are 6 in the mandible and 2 in the maxilla (table 1). **For simply we distinguish three work phases: clinical, technical and measurement.**

CLINICAL PHASE

For every patient the implants were inserted using a prefabricated template on a virtual model obtained with 3D CT Scan and flapless surgery. Clinical implants position was taken with the template and related fixture-mount positioned on patient arch (fig.1)

To realize this, a modified transfer (MT) was created with a cylinder, as used for provisional reconstruction; on the opposite of the hexagonal joint a retention system was soldered using laser to have no distortion of the cylinder (fig. 2,3)

This MT has allowed better and controlled positioning using the surgical template. The two distal fixture-mount were removed and two MF were inserted and fixed in the template with a corresponding pin and composite, the same thing for the mesial ones (fig. 4,5,6), obtaining a positional stent.

The prosthesis built with Nobel Guide System were positioned and controlled with panoramic radiograph (fig.7).

tab. 1 Case	Dental Arch	Implants (number)	Implants (type)	Implants (dimension)	Prosthesis
1	mandibular	4	MK III Groovy	3,75 x 18 (2 imp.) 3,75 x 15 (2 imp.)	PIB
2	maxilla	4	MK III Groovy	4 x 15 (3 imp.) 4 x 13 (1 imp.)	Reinforced Provisional
3	mandibular	4	MK III Groovy	4 x 15 (4 imp.)	PIB
4	mandibular	4	MK III Groovy	3,75 x 15 (4 imp.)	PIB
5	mandibular	4	MK III Groovy	4 x 13 (4 imp.)	PIB
6	mandibular	4	MK III Groovy	4 x 13 (4 imp.)	PIB
7	mandibular	4	MK III Groovy	3,75 x 13 (4 imp.)	PIB
8	maxilla	4	MK III Groovy	4 x 18 (3 imp.) 4 x 15 (1 imp.)	Reinforced Provisional

TECHNICAL PHASE

We have two series of laboratory casts: the first (A series) comes from surgical templates shaped with 3D virtual technique (Nobel Guide). (fig.8,9,10,11,12,13)

The second series (B series) was built after MT positioning in patient mouth. (fig.14,15,16,17,18)

All casts were made with the same materials:
- Gypsum Perio Zero Balanced Pinning Stone (Periodent),
- Artificial gingiva Gum Quick Plus (Dreve),
- Implant Replica 29108 BMK Syst Rp.

To built the modified transfers:
- Temp Abutment Engaging BMK System MOD B 29030

MEASUREMENTS

Dimensional analysis
Measurements' modality

Measures were taken with a mechanical centesimal callipers starting from predetermined points in controlled conditions.
Cylindric pins, protruding 0,4 mm from each replica, were inserted to obtain a support for the callipers.
For every couple of casts (A/B) five measurements(q_1,q_2,q_3,q_4,q_5) were taken: q_1,q_2 and q_3 keep the meaning of casts precision each other (see fig.19). Q4 and q5 measures are important for implants relationship in A and B casts:
➤ q4 is distal implants distance interarch
➤ q5 is mesial implants distance interarch

Every distance (q1,2,3,4,5) was taken five times, to nullify measurement errors (example in table 2,3).

Discussion

The difference calculated on every couple of mathematical media shows an extreme precision of the system (always under the unity) (table 3). Standard deviation of media values is always under the unity showing the reliability of measure system. For every couple of samples all the differences between the same measures results under the error value of measurements (estimated of 0,300 mm). The most significative precision is estimated for q4. It means that all the system is very precise: the geometrical shape of dental arch involves that a little mesial discrepancy shows a more evident imprecision distally.

Conclusion

This prospective study indicates that three dimensional oral implant planning is an accurate system for prosthetic rehabilitation with immediate loading. Our intent is to evaluate all the samples in all three spatial planes, considering also implant inclination.

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