# Achieving success for the Dental Team

Paolo Smaniotto and Giuseppe Pellitteri

**The authors describe the importance of interdisciplinary communication in planning, designing, and fabricating predictable, functional, durable, and esthetic prosthetic devices. Stressing the concept of Team in which in addition to the clinicians (Prosthetist-Dentist: maxillo-facial Surgeon) and dental technician, the patient is a fundamental element of comparison and verification. It is felt that this is the state of the art in individualized treatment plans and in finding a solution that will satisfy both patient and professional.**

## Technical introduction to the materials and methods

This article examines two cases in which metal-free devices were essentially used for esthetic reasons. First and foremost, it is important to understand that these devices need continuous monitoring as it is well known that each situation presents specific technical problems such as exfoliation (chipping) or in the worst cases fracture.

Chipping is a problem that occurs fairly frequently in studies of all ceramics.

In the literature the percentage of chipping of the ceramic coating within two years varies from 8 to 50% while these percentages for metal-ceramic restorations are 4% to 10% after 10 years. The causes of chipping are not known but are presumed to lie in the flexion of the substructure, in a lack of adhesion between substructure and coating, or in erroneous design of the substructure that supports the ceramic or the coating (Factors essential for successful all-ceramic restorations. Donovan TE. J Am Dent Assoc. 2008 Sep; 139 Suppl:14S-18S. Review).

Most fractures in previous studies either originated in the center of the sample near the point where the load is felt or in the region of contact itself. Failures in this region can be explained by tensile stress that develops from flexion of the crown.

Consequently, we have been using a particular method using ZrO2 or Allumina to make the substructure's surface called "A.R.D. – Anatomical Ridges Design - pat. Smaniotto" that decreases the phenomena of delamination when the prosthetic devices are subject to cycles of fatigue.

Essentially a CAD or analog planning procedure not only it's useful in anterior sextants (Figs. 1 to 4) to dissipate the cutting forces as dealt with in case no. 2 in this article, but also and above all, fundamental we feel in the posterior quadrants to dissipate the masticatory forces.

Recent studies carried out by a working group composed of Research coordinators Paolo Baldissara, Roberto Scotti; Principal Investigator: Paolo Smaniotto; Co-investigators: Giovanni Castignani at the L'Alma Mater Studiorum University of Bologna Department of Oral Sciences - Dental Material Course have demonstrated the effectiveness of the A.R.D. design in reducing the occurrence of chipping phenomena. Chipping originates from surface microfracture under the contact area of static and/or dynamic occlusal load followed by both cohesive and mixed adhesive-cohesive failure.

The study showed how A.R.D., developed and patented by dental technician Paolo Smaniotto, created "cells" possessing independent resistance that resist fracture of the ceramic better than the traditional "single cell" design which is more vulnerable under masticatory load. (The A.R.D. technique – Anatomical Ridges Design - pat. Smaniotto is described in "Esthetics and Techniques of New Materials" published by Palmeri Publishing Inc.

## Introduction

Good communication in the team during all phases of treatment is of fundamental importance (Figs. 5 and 6).

There are situations in which the phases of workmanship and communication between clinic and laboratory can be managed by using a standard protocol based on advice and instructions provided by the dentist in the clinical prescription accompanied by appropriate photographic documentation. The dental technician studies the data received and after analyzing it produces the technical plan that forms the starting point of all prosthetic rehabilitations.

Correctly managed, these two phases form the bases of predictable and long lasting results (Figs. 7 to 10).

The clinical prescription and its associated technical prosthesis plan with its various clinical, technical, functional, biological, and esthetic observations along with any specific requests made by the patient form the basis of communication. An analysis of the correctly

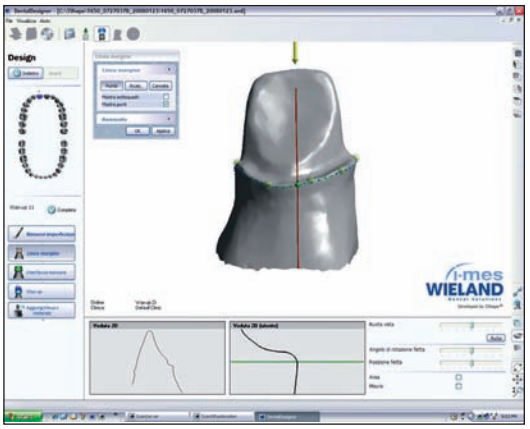


Fig. 1

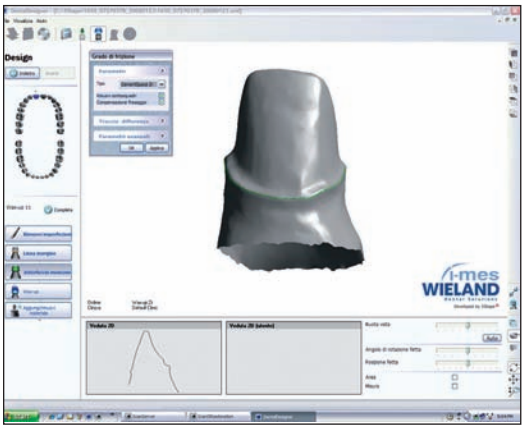


Fig. 2

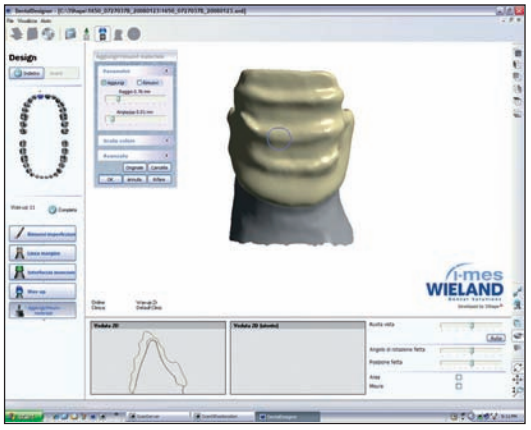


Fig. 3

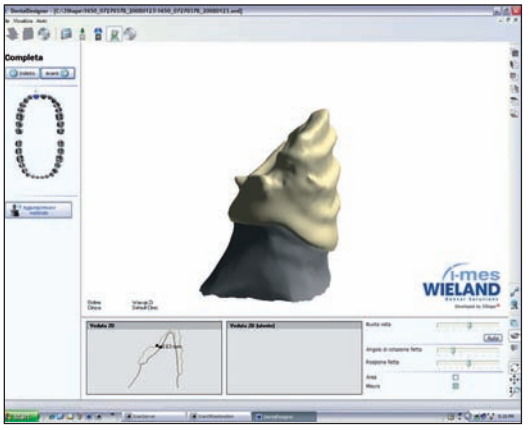


Fig. 4


Fig. 5

Fig. 6


Fig. 7


Fig. 8


Fig. 9


Fig. 10

mounted study models, of the diagnostic wax-up, and any photographic material available can facilitate communication enormously. The clinical prescription must indicate:

- Elements affected
- Type of prosthesis
- Materials to be used
- Functional requirements
- Esthetic requirements of the patient and the dentist
- Requirements stipulated by the patient

The technical planning must be:

- As simple as possible but able to meet the functional and esthetic requirements.
- Able to improve the functional occlusal relationships, reducing negative load to a minimum.
- Able to induce an optimal tissue response and effective maintenance of oral hygiene.

The clinical prescription and technical planning facilitate the maximization of patient satisfaction. This is a result obtained from a harmonious global vision. Consequently, efforts are focussed on obtaining excellent orthodontics and excellent periodontal and implant surgery for although good cervical closure and perfect stratification are required, they do not guarantee the device will work because it needs to integrate with the surrounding structures, which more than ever before is only achieved through planning in a team in which each professional appreciates the advantages of co-operating in a co-ordinated manner, free to act within the limits of their own environment but certain to follow the route leading to integration of the prosthetic device.

## Materials and methods

It is important for all the elements in the team (including the patient) to speak the same language and have the same aims. So let's analyze the steps that need to be followed in an interdisciplinary treatment or a rehabilitation:

- examination ->- anamnesis
- data collection ->- radiographic status
- endoral photo and one of the face
- orthopantomography
- study model
- dental pre-treatment ->- conservative therapy
- endodontic therapy
- periodontal therapy (causal periodontal surgical therapy)
- orthodontics
- orthognathic surgery
- implant/prosthetic rehabilitation

Starting from the initial approach with the patient and together with the dental technician, the clinician makes a close examination of the study models and an initial diagnostic wax-up through which whether or not the rehabilitation can be purely prosthetic and whether or not correct functioning and an enduring result can be achieved are checked. The requirements are:
a) occlusal stability
b) functional guide (anterior/canine/group)
c) esthetic (integration with facial appearance)

Data needs to be collected and the patient informed of the potential result and its advantages and limitations.

This represents a very important moment in the evaluation of the case. At this point the clinician is in a position to decide whether or not to tackle the case alone or if it requires help from the dentist. In the latter case, a set-up of the models is prepared through which a good idea of what the final result will be is obtained, including all the variations in the initial condition.

## Presentation of cases – Case 1

A 19-year-old female patient presented herself to improve her dental esthetics and correct what she called her "masculine" profile (Figs. 11a to 13).

## Diagnosis – Reference lines

- commissural and bipupillar lines: disparallel
- Vertical line: end of nose and chin deviate to the right.
- Facial proportions: not harmonic, prominent chin
  Dentolabial analysis
- Incisal contour: flat
- Smile line disharmonic
- Smile width: partially visible
- Labial corridor: narrow
- Interincisal lines vs. median line: not coincident
- Occlusal plane: disharmonic/not parallel
- anterior/posterior incisal profile: reverse bite
- Prognathism
- Class III malocclusion
- Brachyfacial
- Anterolateral reverse bite
- Protrusion of the upper incisors and retrusion of the lower incisors (= dental compensation)
- Amelogenesis imperfecta
- Generalized abrasions on the enamel
- Hypoplasia of the dentition with general interdental spaces

**a) Therapy**

- Causal therapy
- 4 sessions of professional hygiene

**b) Orthodontic therapy**

Due to the hypodevelopment of the teeth, it is not possible to sufficiently decompensate the dentition orthodontically without opening the space bilaterally for a third lower premolar (Figs.14 to 16a).

The upper spaces were reduced using a fixed device in order to correct the protrusion of the upper incisors and to allow the prosthetist to provide an anatomical form for the future ceramic crowns. Opening spaces for a third lower premolar made it possible to obtain the correct inclination of the lower incisors presurgically so that the orthognathic surgeon could then reposition the maxillaries perfectly.


Fig. 11a


Fig. 11b


Fig. 11c


Fig. 11d

Figs. 11a to 11h: Initial situation


Fig. 11e


Fig. 11f


Fig. 11g


Fig. 11h


Fig. 12


Fig. 13

Fig. 12: Frontal view of open mouth

Fig. 13: Frontal view of closed mouth


Fig. 14

Fig. 14: OPT at initial orthodontic phase

Fig. 15: Latero-lateral radiography of initial orthodontic phase


Fig. 16a

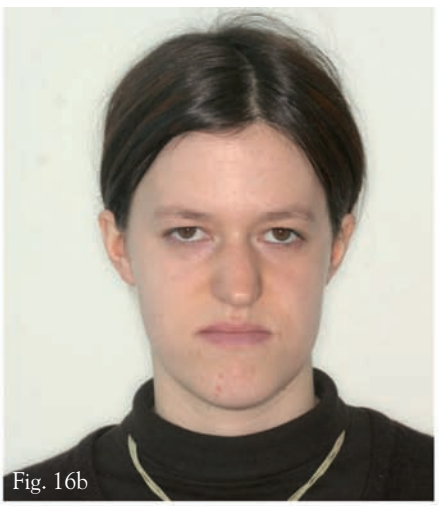


Fig. 16b


Fig. 16c


Fig. 16d

Figs 16a to 16h: Pre-surgical orthodontic therapy


Fig. 16e


Fig. 16f


Fig. 16g

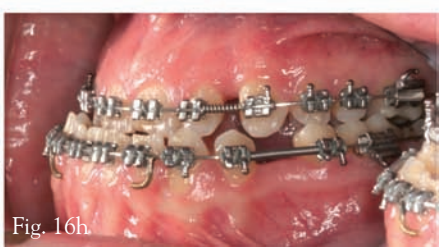


Fig. 16h

Fig. 17

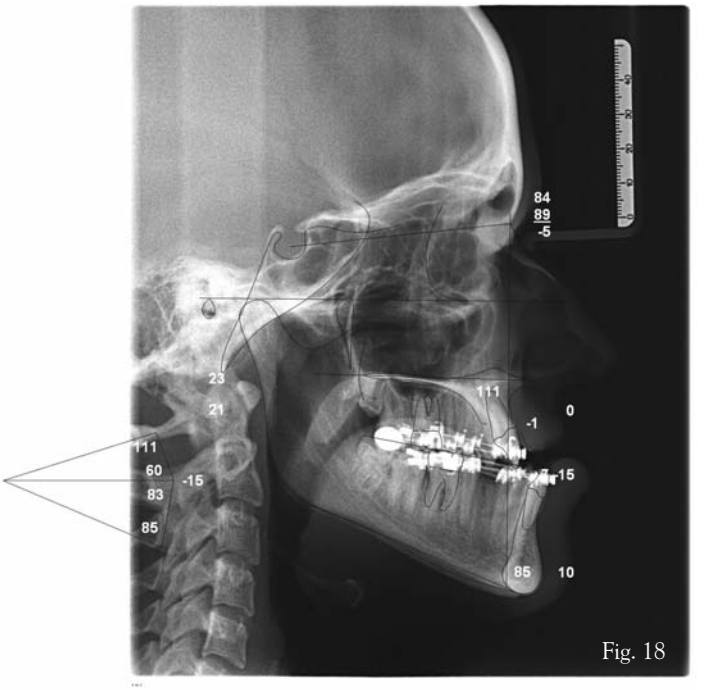



Fig. 18

Fig. 17: OPT at initial orthodontic phase
Fig. 18: Latero-lateral post orthodontic and surgical therapy

Fig. 19a

Fig. 19b

Fig. 19c

Fig. 19d

Figs 19a to 19h Result of post-surgical orthodontic therapy. Inflammation of the soft tissues due to the removal of the upper orthodontic braces is still evident

Fig. 19e

Fig. 19f

Fig. 19g

Fig. 19h

**c) Orthognathic-surgical therapy**

Bimaxillary surgery (Le Fort I to advance the upper maxillary and bisagital ramus osteotomy to retract the mandible) by Dr. U. Baciliero of the Maxillofacial Surgery Department of Vicenza USL1 (Figs. 17 and 18). Eighteen months after the therapy was started, transparent retainers were applied to both arches for the restraint of the orthodontic result (Figs. 19a to 19h).

**d) Prosthetic implant rehabilitation**

Insertion of two 3.7 diameter implants in position 35/45 and fabrication of two metal-ceramic elements (Figs. 20 to 24). Correction of the functional and esthetic defects of the upper/lower anterior sextants with mininvasive shaping of elements 12/11/21/22-43/42/41/31/32/33 (Figs. 25 to 27) to fabricate the facets using leucyte based glass-ceramic obtained by the pressing method, followed by stratification (Figs. 28 to 32).

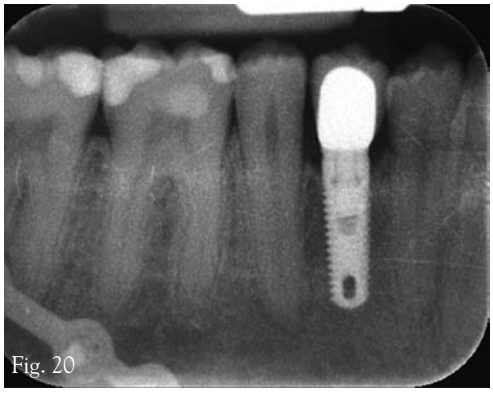



Fig. 20: Endoral x-ray of the implant inserted in position 44

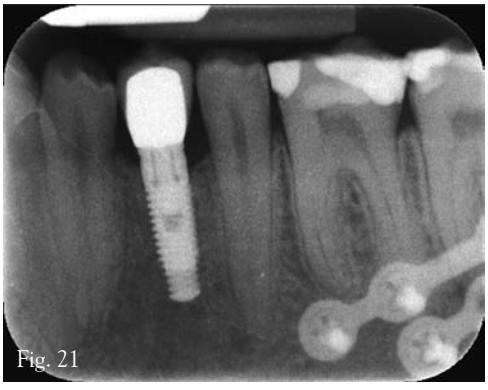



Fig. 21: Endoral x-ray of the implant inserted in position 35




Fig. 22: Occlusal view of the third quadrant

Fig. 23: Occlusal view of the fourth quadrant: prosthetic device mounted on the implant

Fig. 24: Detail of the ceramic element on the implant in position 35. Note the good integration of the prosthetic device in the surrounding soft tissues


Fig. 25


Fig. 26

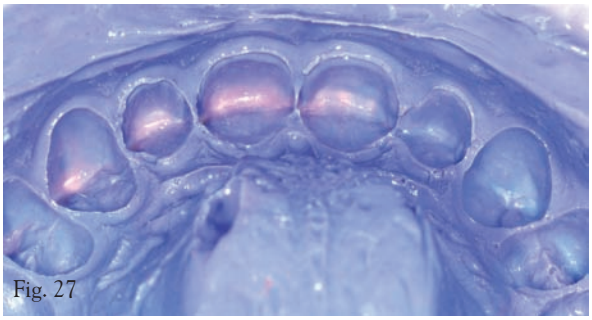


Fig. 27


Fig. 28


Fig. 29


Fig. 30


Fig. 31


Fig. 32

Fig. 25: Preparation of the upper facets

Fig. 26: Preparation of the lower facets

Fig. 27: Detail of the impression

Fig. 28: The completed prosthetic device. The core was fabricated using ceramic pressed in lithium disilicate at 400 Mpa. This makes it possible to manufacture very functional structures with the esthetics being achieved thanks to subsequent stratification using ceramic enriched with leucyte.

Fig. 29: Final open mouth situation

Fig. 30: Final closed mouth situation

Fig. 31: Lateral profile of the completed case

Fig. 32: Lateral profile of the completed case

## Cementation

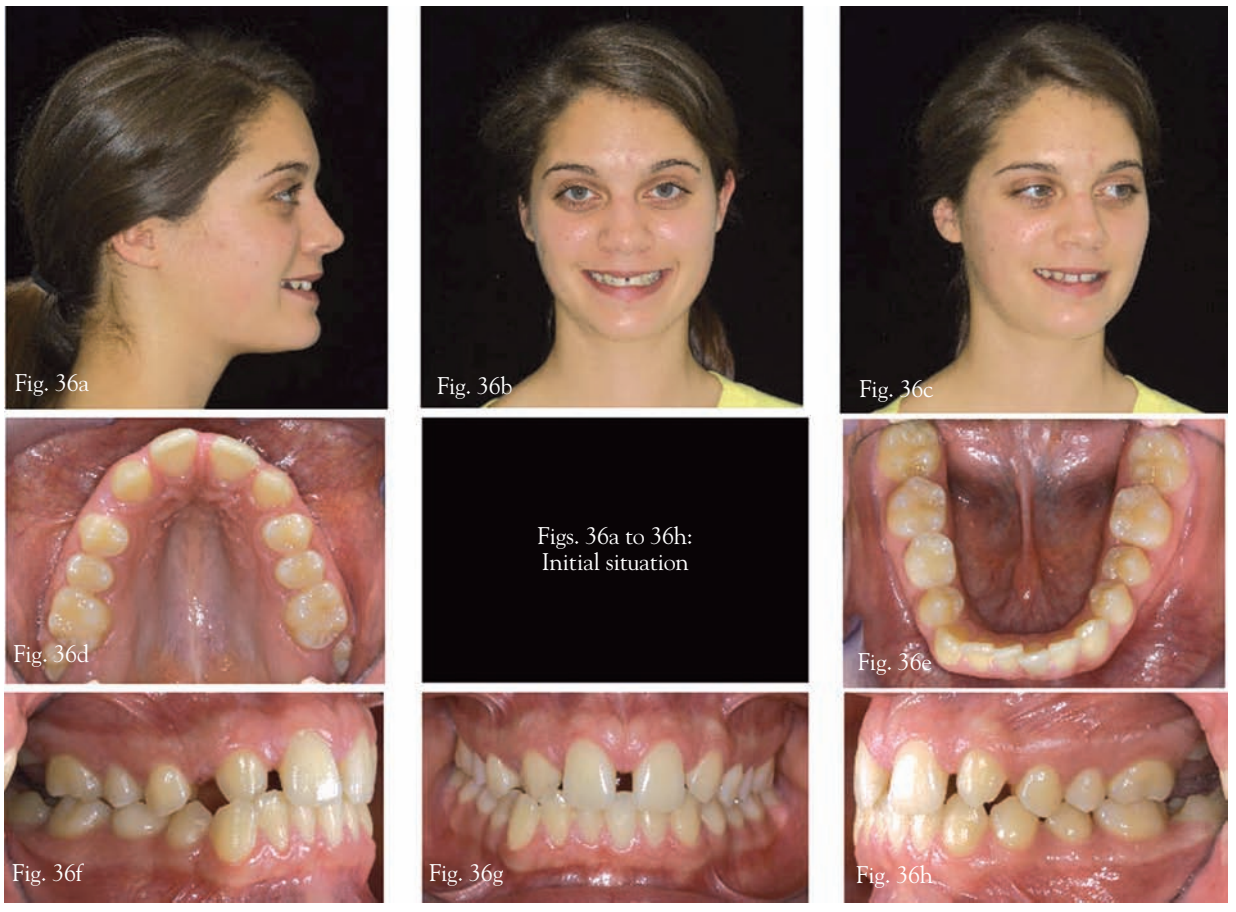
As in the previous phase of the therapy, great attention was also paid to the cementation of the definitive prosthetic devices.

a) Facets: Variolink II Ivoclar Vivadent
b) Metal-ceramic: Zinc Phosphate Cement Harvard


Figs. 33a & 33b: Pre and post-therapy lateral view


Figs. 34a & 34b: Pre and post-therapy lateral view

Fig. 35: The patient's face before treatment




## Case 2

A sixteen-year-old female patient presented for her esthetic problems to be solved, wanting "to close the upper spaces" (Figs. 35 to 38).

## Diagnosis – Reference lines

- Commissural and bipupillar lines: parallel
- Vertical line: slight deviation to the right
- Facial proportions: harmonic

## Dentolabial analysis

- Incisal contour: convex
- Smile line: harmonic
- Width of smile: wide
- Labial corridor: normal
- Interincisal line vs. median line not coincident
- Occlusal plane: disharmonic/not parallel
- Incisal profile: flat
- Class I
- Brachyfacial
- Slight dentofacial asymmetry with slight mandibular deviation to the right
- Agenesis 12, 22
- Deviation of the upper median line to the left
- Reverse bite 13
- Upper interdental spaces – wide median diastema
- Lower crowding

Fig. 37

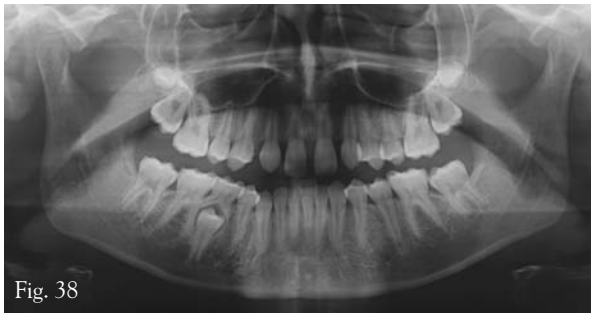


Fig. 38

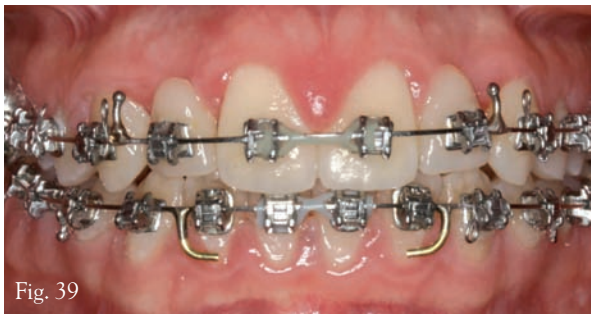


Fig. 39

Fig. 40

Fig. 41

Fig. 42

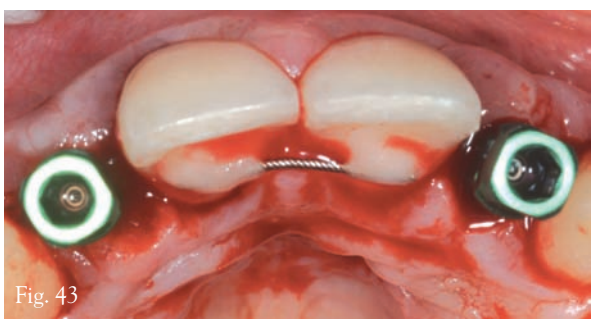


Fig. 43

Fig. 37: Endoral frontal view of the patient

Fig. 38: Initial OPT showing the agenesis of elements 12 and 22

Fig. 39: Start of the orthodontic therapy

Fig. 40: Occlusal view of the upper arch in the final phase of the orthodontic therapy

Fig. 41: The spaces for the purpose of orthodontic therapy ready for the insertion of the implants and the temporary restorations

Fig. 42: OPT for the purpose of orthodontic therapy

Fig. 43: Surgical phase: insertion of the implants in positions 12 and 22 which are prosthetisized immediately

## Therapy

The patient presented posterior normal occlusion and regular profile of the soft tissues, with orthodontic therapy being necessary followed by prosthetic-implant therapy of elements 12 and 22.

The orthodontic therapy involved self-ligating fixed appliances for 15 months. During the phase of opening the spaces, two resin teeth with brackets were inserted in order to hide the edentulous spaces (Figs. 39 and 40). These temporary restorations were then glued to the fixed upper lingual retainer in order to obtain immediate substitution of the 12 and 22.

To guarantee the routine surgical precision, surgical templates were used as a prosthetic guide (Figs. 41 to 44). Particular attention was paid to choosing both the type of diameter 3.7 implant and the prosthetic components (abutments and crowns). Considering the young age of the patient, the great esthetic expectations, and lifespan desired, components with excellent biomimetic properties

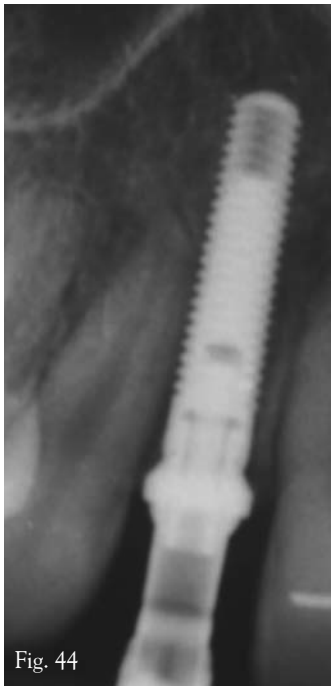


Fig. 44


Fig. 45

Figs. 44 and 45: Endoral x-ray to check the correct mesio-distal positioning of the implant, respecting equidistance from the adjacent teeth

Fig. 46: Plaster model obtained from the impression of the tissutal maturation (6 months)

Fig. 47: Gimmer prepared tooth with tour ceramic abutments

Fig. 48: Prepared tooth compared to the analog

Fig. 49: Ceramization of the emerging profile

Fig. 50: Cervical view of the connection of the prepared tooth with ceramic portion

Fig. 51: Mesial view of the individualized prepared tooth. Detail of the emerging profile.


Fig. 46


Fig. 47


Fig. 48


Fig. 49


Fig. 50


Fig. 51

were used (Fig. 45). It is well known that when combined with a thin scalloped gingival architecture, the esthetic limitations of metal structures can be seen in the facial mimic in the anterior sextants.

The young age of the patient and the great esthetic expectations also favored the choice of metal-free prosthetic-implant components.

Particular attention was paid to the bio/functional integration of the implant part. Consequently, a PASMA surgical template to guide the prosthesis was used in order to respect the indispensable three-dimensionality of the correct positioning of the 3.7 diameter implant fixture, and the abutment was fabricated by modifying the commercial zirconia prepared tooth.

As seen in figures 46 to 49, in order to optimize the emerging profile, its cervical portion was modified by

Fig. 52

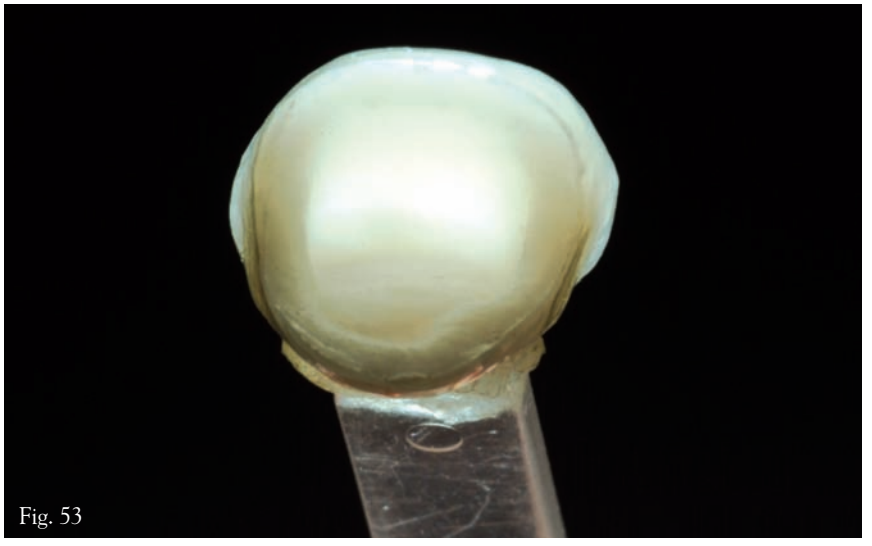


Fig. 53

Fig. 52: Checking of the precise positioning of the aluminum coping fabricated using Smaniotto's Anatomic Ridges Design

Fig. 53: Luminous optical characteristics of the ceramic aluminum crowns fabricated using the A.R.D. technique

using dedicated high fluorescence ceramic to create a particularly "luminous" gingival profile and to connect the cervical closure of the crowns in the juxta-gingival area.

The crowns were manufactured using the A.R.D. (Antomic Ridge Design) technique using an aluminum core covered in ceramic (Fig. 16). Maintaining the health and esthetics of the soft tissues through time is strongly influenced by the cementation technique and the type of cement chosen (Relyx Unicem, 3M ESPE). Consequently, the authors prefer easy access to the cervical closure area of the crowns in order to avoid any residual or excess cement that may cause iatrogenic damage.

Fig. 54

Fig. 54: Correct biological and esthetic integration. The following were obtained: good symmetry of the smile, good interincisal relationships, and good positioning of the incisal margin with the lower lip

Fig. 55: The patient's face at the end of treatment

Fig. 56: The integration obtained

Fig. 57: OPT with the implants prosthetisized and inserted. Esthetic in black and white.

Fig. 55

Figs. 56 and 57

The overall result of the therapy is pleasantly harmonious and the morpho-functional integration was also achieved thanks to the materials used, fulfilling the pre-established aims (Figs. 51 to 53).

## Results

The importance of a correct multidisciplinary approach is seen. There are phases that have to be planned and managed in a team whereas others involve individual professionals working by themselves. Maintaining the results through time is strictly correlated to the correct application of home and professional hygiene procedures. The final result is the optimization of the therapy to the consequent satisfaction of both patient and professional (Figs. 54 to 57).

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- Laboratorio Biotecnologie Dentali, Odt. Paolo Smaniotto
Via IV° Armata, 44, 36061 Bassano del Grappa (VI), Tel. 0424 31414 • Fax 0424 392224, info@labsmaniotto.com
www.labsmaniotto.com
- Studio Dentistico, Dott. Giuseppe Pellitteri, Via Mendola, 21
39100 Bolzano, Tel. 0471 282079 g.pellitteri@studiopellitteri.it
www.studiopellitteri.it

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## About the author

**Paolo Smaniotto, MDT** graduated cum laude as a certified dental technician in 1978 at the Superior Institute for Health Art "E.Bernardi" in Padova. He has been the owner of a dental laboratory since 1981 in Bassano Del Grappa. In 1996, he obtained the specialization in periodontal and implant prosthesis at the School of Porta Mascarella, in Bologna. He is an active member of the AIOP (Italian Academy of Prosthodontics) and a member in the scientific committees of well known specialized international journals. He is a lecturer at the Postgraduate School in Implantology at the University of Modena and Reggio Emilia. He is the author of 53 scientific publications and the book "Aesthetics and Techniques for New Materials."