Giuseppe Romeo

Technical, Diagnostic and Esthetic Approach

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A CIP record for this book is available from the British Library.
ISBN: 978-1-78698-157-8

QUINTESSENCE PUBLISHING
DEUTSCHLAND

Quintessenz Verlags-GmbH
Ifenpfad 2–4, 12107 Berlin,
Germany
www.quintessence-publishing.com

Quintessence Publishing Co Ltd
Grafton Road, New Malden, Surrey KT3 3AB
United Kingdom
www.quintessence-publishing.com

Editing, layout, production, and reproduction:
Quintessenza Edizioni srl, Milano, Italy

ISBN: 978-1-78698-157-8

Printed and bound in Croatia

I dedicate this book to my two sons Christian and Gabriele being so precious in my life and the light of my days.

To my mother Rosalba and my father Silvio, that passed away so early, for teaching me how don't give up in my life because life is a miracle and we have to be positively active all the time.

Giuseppe Romeo

Introduction

Great improvements have been made in the field of aesthetics restoration in the last few years.

This evolution derives not only from aesthetics requirements of the patient, but also from a good relationship between the dentist and the dental technician.

The clinician should know technical steps to make the process easier the imagination of the technician and the laboratory should know the clinical operative steps with the possible difficulties in the mouth, so that the technician can develops more techniques to help the dentist in his work.

In this way it is possible to plan the case that will also give to the patient the possibility to perceive and understand clearly the treatment proposed.

Technically the numerous possibilities for anatomical tooth reproduction will be examinated.

A new system that will be enables dental professionals to go beyond the usual creative standards in esthetical rehabilitation: the principal tooth forms and their characteristics will be analysed and the discussion will lay groundwork for the introduction of a new tooth-form classification called Dental Anatomical Combination.

Comparing to the face of the patient several factors will be evaluated when designing an individual customized dental restoration.

Other new digital systems will be evaluated in order to create an individual tooth shape for the patient and the subsequently customized smile.

The application of this new system and subsequently ceramic layering procedures will be demonstrated via a clinical case report.

All the rehabilitations simple or complex are created with precision using the stereomicroscope to achieve the planned result and increasing the longevity of the restoration.

The objective of this topic is to provide valuable information to support the prosthodontic team in the treatment of the various clinical cases.

Detailed analysis of the most significant clinical and technical procedures will be described, beginning with the clinical diagnosis and subsequent diagnostic wax up, then progressing to the correct use of the provisional restorations, which are fundamental in the conditioning and correct development of the soft tissues, as well as in the achievement of the functional and esthetical objectives.

Acknowledgements

The author is thankful for their intense and efficient clinical cooperation with high level of performance being involved to realize all the technical cases to:

Prof. Nitzan Bichacho, Tel Aviv, Israel.
Dr Domenici Massironi, Melegnano, Italy.
Dr Galip Gurel, Istanbul, Turkey.
Prof. Irena Sailer and MDT Vincent Fehmer, Geneva, Switzerland.
Dr Georgi Iliev, Sofia, Bulgaria.
Dr Mirela Feraru, Tel Aviv, Israel.
Dr Monica Imelio, Tortona, Italy.
Dr Roberto Perasso, Tortona, Italy.
Dr Eric Jan Muts, Apeldoorn, The Nederlands.
Dr Sillas Duarte, Jin-HO Park, University of Southern California, Los Angeles, USA.
Dr Pascal Magne, Los Angeles, USA.
Dr Alessandro Conti, Casale Monferrato, Italy.

Forewords

The art and science of dental technology are evolving at an unprecedented pace, and at the heart of this transformation are individuals who bring both technical mastery and artistic sensitivity to their work. Giuseppe Romeo is one such visionary—a dental technician whose dedication to excellence and innovation has set new benchmarks in restorative dentistry.

Having had the privilege of working closely with Giuseppe for several years, I have witnessed firsthand his deep understanding of form, function, and aesthetics. His approach is not merely technical but deeply rooted in a philosophy that combines precision with a profound respect for natural dentition. Through our collaborations, we have refined advanced restorative techniques that seamlessly integrate biology, mechanics, and artistry, always with the ultimate goal of enhancing patient care.

This book is a testament to Giuseppe's expertise and commitment to education. In these pages, he shares his knowledge, experience, and unique methodologies, providing invaluable insights to clinicians and technicians alike. His ability to translate complex concepts into practical workflows makes this work an essential resource for those striving for excellence in esthetic and functional restorations.

I am confident that this book will serve as both an inspiration and a guide, elevating the standards of our profession and reinforcing the crucial synergy between dentistry and dental technology. It is with great respect and admiration that I introduce this work, knowing it will leave a lasting impact on those who seek to push the boundaries of what is possible in modern prosthodontics.

Prof. Nitzan Bichacho

I consider Giuseppe Romeo one of the best, if not the best, dental technician I have ever met in my professional career. We have been working together for over 25 years, and I owe a great part of the excellence of my work to him, as well as much of my success in the fields of aesthetics and rehabilitation. Extremely knowledgeable about materials and the stages of aesthetic work, he has the ability to harness the best characteristics of each material, always achieving extraordinarily natural and flawless prosthetic restorations. It is a great honor for me to dedicate this book—one that will undoubtedly become a bestseller and a reference guide for us professionals and enthusiasts in the field—to him.

Dr Domenico Massironi

In this digital era together with the social media, the patience's aesthetic expectations are increasing towards its maximum. Just like the dentist as an artist as he can be, the dental ceramist should also have the same perception, understanding, artistic eye, and gifted hands to deliver that kind of results.

In this balance, the most important thing remains as the communication between the patient, dentist and the ceramist.

In this amazing book Guiseppe beautifully displays all these communication tips as well as what he can add on to those cases as a ceramist. In his work its not only about teeth, but rather a smile which integrates with the personal features of the patients such as their facial perceptance and personality.

In my opinion, the book is a great source for both dentists and technicians who want to bring their aesthetic work into a different level.

Dr Galip Gürel

In his book "Technical Diagnostic and Esthetic Approach," master dental technician Giuseppe Romeo summarises decades of pronounced expertise into an essential volume. Renowned throughout the profession for his visionary techniques and artistic precision, Giuseppe Romeo has influenced generations of technicians and practitioners through his publications and clinical excellence. His expertise has been recognised by both, the European Academy of Esthetic Dentistry (EAED) and the American Academy of Esthetic Dentistry (AAED), elevating him to Active member status in both organisations. This book, a landmark work, synthesizes his comprehensive philosophy—seamlessly integrating technical mastery with diagnostic rigor and esthetic brilliance. More than a manual, this book represents the culmination of Giuseppe Romeo's distinguished career and offers dental professionals a pathway to transcend technical competence and achieve true artistry in restorative dentistry. We congratulate the author, our dear Giuseppe, for this very impressive masterpiece and wish him greatest success with it!

Prof. Irena Sailer and MDT Vincent Fehmer

Curriculum

Giuseppe Romeo, CMDT

Born in Port Chester, New York, USA.
Owner of the Oral Design Center in Turin, Italy.
Trained in dental technology in Turin, Italy, he then studied two years at the University of Geneva.
He completed his education in Italy and abroad, working in the United States and in Switzerland.
He has published extensively in both Italian and international journals. He has also contributed to the textbooks "Esthetics and Precision. Clinical and Technical Procedures" with Dr. Domenico Massironi and Mr. Romeo Pascetta (translated in eight languages), and "Aesthetic & Restorative Dentistry" written together with Dr. Douglas Terry and Mr. Willi Geller.
Both books are published by Quintessence Publishing.

He is involved as Associate Editors in Dental Technology of the International Journal of Esthetic Dentistry (IJED).
He belongs to several prestigious organizations, such as the Oral Design International Foundation (Willi Geller's group), the American Academy of Esthetic Dentistry (Fellow Member), the European Academy of Esthetic Dentistry (Active Member), the Italian Academy of Esthetic Dentistry (Active Member), the European Society of Cosmetic Dentistry (Active Member), the European Academy of Digital Dentistry (Executive Council Member) and the American Microscope Enhanced Dentistry (Fellow Member).
He was Clinical Assistant Professor in the Division of Restorative Science at the University of Southern California, Los Angeles, USA.

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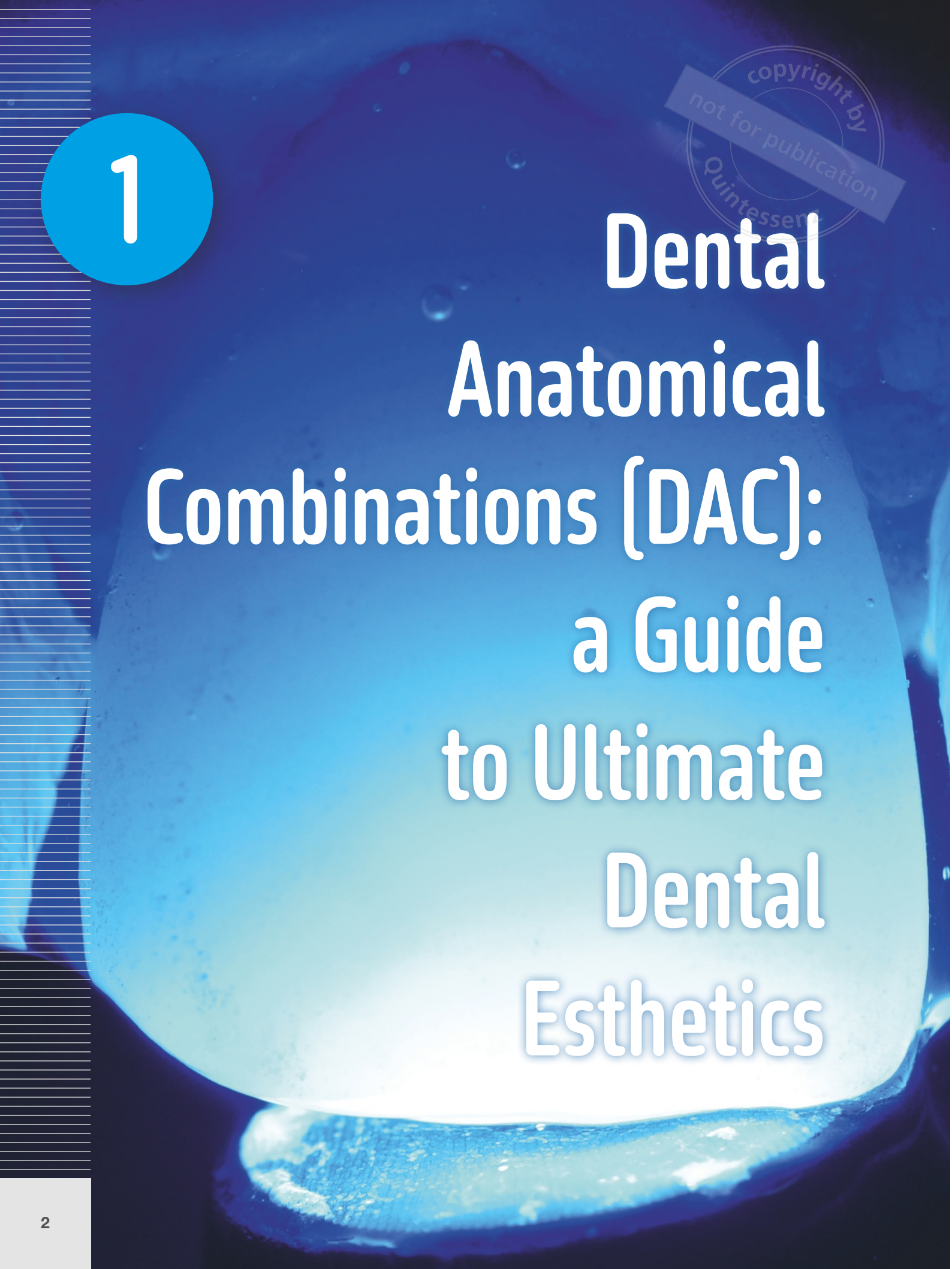
University of Sothern California, Los Angeles. USA



1

Dental Anatomical Combinations (DAC): a Guide to Ultimate Dental Esthetics

Introduction

Creating an esthetic dental rehabilitation is undoubtedly a complex operation. Numerous factors have to be studied and evaluated when modeling a restoration, including tooth alignment, dimensions of the clinical crown and occlusion. A correct understanding of all these anatomical parameters is essential to create an esthetic restoration that is as harmonious as possible.[1-5]

For the construction of a tooth, though numerous requirements may make the composition somewhat difficult, at the same time, we feel that some complexity is necessary to enrich the beauty of the result. This topic is aimed at codifying these steps to simplify and clarify the procedures, using a new and simple system that will enable the dental professional to go beyond the usual uninteresting creative standards in esthetic rehabilitation.

In the first part, the principal tooth forms, their characteristics, and the relationship between surfaces will be analyzed. This will create the base for the introduction of a new tooth form classification guide, called Dental Anatomical Combinations (DAC). By sectioning the three principal forms of teeth and recombining their individual characteristics, new tooth forms can be created. Then, numerous possibilities for anatomical tooth reproduction to achieve the most suitable form for each case are highlighted. Application of the new system will be demonstrated in a clinical case.

The Three Basic Forms of Tooth Anatomy

Different facial and dental forms exist in nature, and previously, some scholars have proposed these types as the starting-point on which to base the rehabilitation of patients requiring a fixed or removable restoration.[6-8]

Various concepts have been introduced describing correlations between dental form and other factors, such as gender,[9] face,[10,11] shape of the maxillary arch,[11] constitutional type,[12] or personality.[9,13] Even though these concepts have not been proved,[10,14-16] today, some professionals still

consider these theories applicable to anterior restorations. Whether the application of this mathematical rule can provide a predictable outcome as it annuls the creative approach and penalizes the result of the final rehabilitation is still a point of uncertainty.[17,18] The literature reveals that there are three basic tooth forms in nature: the square form (type A), the ovoid form (type B) and the triangular form (type C).[10,19,20]

Square: The mesial and distal proximal surfaces are parallel and perpendicular to the incisal edge and present a cervical area that is a wide U-shape. The vestibulo-distal transitional ridge may be slightly curved, and the incisal edge is straight or slightly curved. The incisal edge is longer in the mesio-distal direction than in the oval form and almost the same length as that of the triangular form **(Fig 1-1)**.

Ovoid: The incisal edge has a central protuberance; its length in the mesio-distal sense is the shortest of the basic anatomic forms. The mesial and distal transition line angles are rounded and converge at the incisal and cervical. The U-shaped cervical line is more oval than in the square type **(Fig 1-2)**.

Triangular: The distal ridge is not parallel to the mesial ridge but markedly inclined, defining a very narrow V-shaped cervical zone with a convexity at the center of the crown. The incisal edge is wide in the mesio-distal sense and may have a slight curve at the center or a mere convexity. The incisal angles are slightly acute **(Fig 1-3)**.

Outline and form

During the design stage, all tooth forms must be evaluated from an incisal, a cervical, and frontal view with a right-lateral and left-lateral projection, grasping the overall organization of the tooth and the relationship between the anatomic parts **(Figs 1-5 and 1-6)**.[21,22]

The three principal types of tooth include numerous variations not only involving the shape but also the form of the teeth.[23] In this context, the word "form" indicates all the macro-characteristics such as the outline of the tooth, development of the ridge, depth of grooves, difference between mesial and distal incisal angles **(Fig 1-4)**.[24,25] Another element that is closely linked to the anatomical qualities of the tooth is the surface texture or micro-characteristics **(Fig 1-4)**.

The physical form of an object is determined by its outline, comprising the incisal border, proximal ridges and cervical line. These lines dictate the path of the ridges and the shape of the lobes; these interconnected characteristics determine the volume and at the same time—the form we are interested in creating. Thus, the tooth should not immediately be studied in three dimensions; rather the outline should be considered first.

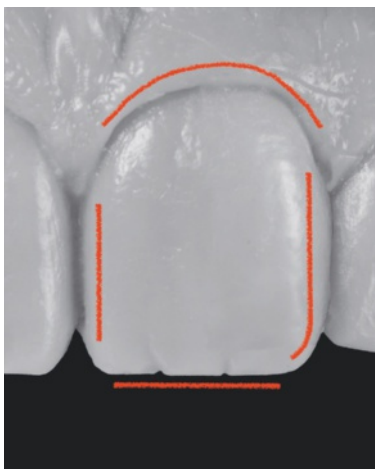


Fig 1-1 Square tooth form.

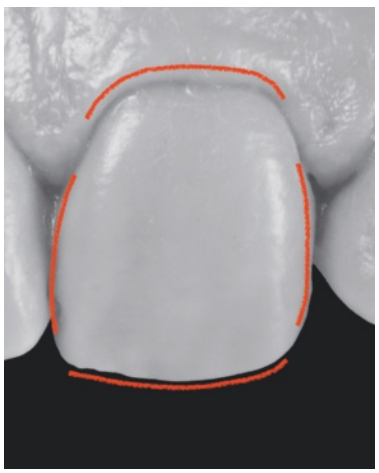


Fig 1-2 Ovoid tooth form.

Fig 1-3 Triangular tooth form.

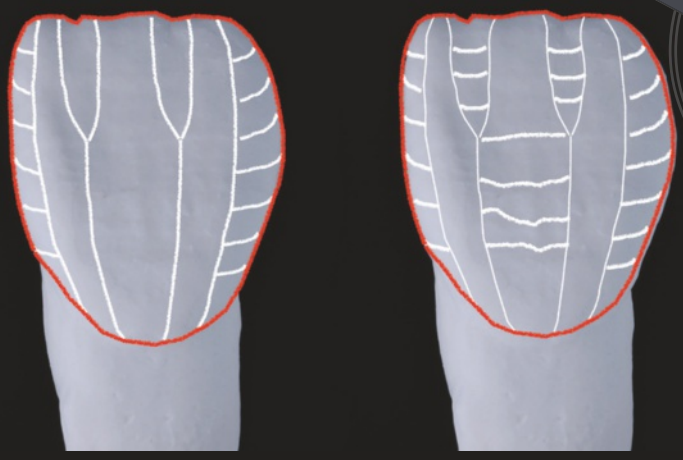


Fig 1-4 Outline of the tooth structure showing the position of the (left) vertical and (right) horizontal grooves and ridges.

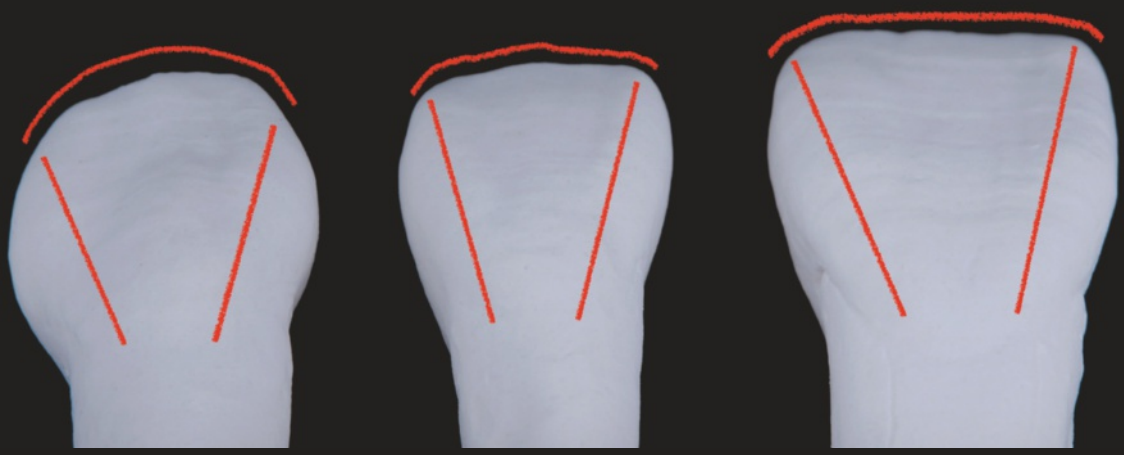


Fig 1-5 Cervical views of the tooth form.

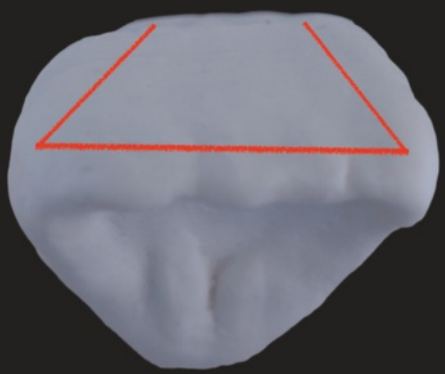


Fig 1-6 Tooth form viewed from the incisal area toward the cervical area.

Transition areas and lines

Characteristics of form are not separate entities but rather combine to form a single feature: this means that the tooth is crossed by grooves, connected logically, that determine three-dimensional anatomical areas.

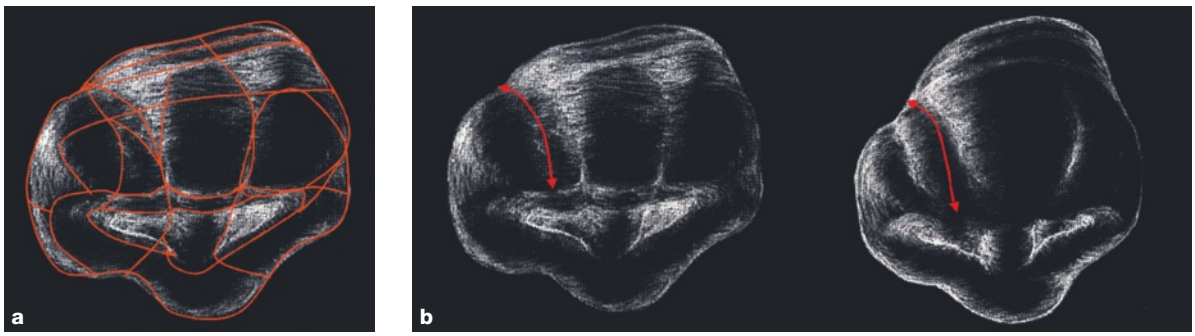
Natural teeth are not the result of a random cut; during their formation, they produce components such as ridges and cusps—the grooves and fossae are the result of this formation. The frontal view does not provide sufficient information to reproduce the area present around a transition line. A transition line must be formed considering the three-dimensional correlations, and to achieve this, we must begin to work on each transition line starting from the lingual surface. In all natural teeth, the ridges and grooves, starting from the lingual surface, are connected to the proximal and vestibular surfaces **(Fig 1-7)**.

Torsion

Another principle that relates to natural teeth is surface torsion. Viewing the teeth from the incisal viewpoint, the distal protrusion becomes evident at the level of the cervix. Failure to understand this torsion may result in artificial incisors that appear flat or distally protruded.[21] The line of rotation starts from the vestibular face and continues in the lingual direction creating movement that can clearly be seen in the incisal view **(Fig 1-8)**.

In the incisors, torsion is gentler, while in the canines, it is more pronounced; however, the technician may define the extent of torsion depending on the form that is to be imparted to the esthetic rehabilitation. In more facially positioned teeth, this characteristic is more evident; however, torsion is common to all teeth to a greater or lesser extent, although the extent of rotation varies from one tooth to another.

Fig 1-7 Joining the transition lines through the tooth lobes. These lines define all characteristics of the tooth that will make it appear as a single body.



Figs 1-8a,b Surface torsion allows for individualization of the vestibulo-distal lobes.

Dental Anatomical Combinations (DAC)

Based on the anatomical knowledge and three basic tooth forms, a new tooth form classification system can be introduced, called Dental Anatomical Combinations (DAC). This new and simple concept aims to help in the codification of a system that will enable the dental professional to produce different tooth anatomies that go beyond the standard tooth shapes. The basic principle of this system is based on segmentation and recombination of two or even three principal tooth forms.[26] First, the perimeter of each tooth form is sectioned into smaller segments—for example, by sectioning the tooth into three different segments, a mesial, distal, and incisal segment can be obtained **(Fig 1-9)**. If necessary, these segments can be further divided in half, resulting in six half segments: mesial cervical, mesial body, mesial incisal, distal cervical, distal body, and distal incisal **(Fig 1-9)**. To create the final form, these full or half segments can be recombined, forming the so-called Complementary Classes **(Table 1-1)**.

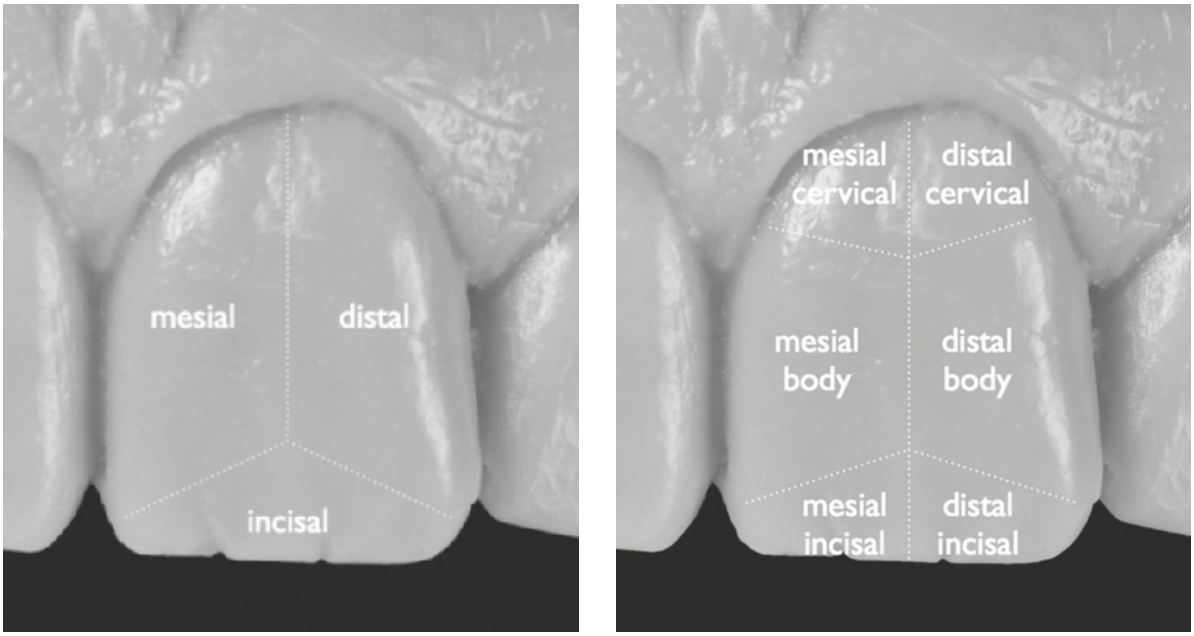


Fig 1-9 Segmentation of the tooth.

Table 1-1 Table indication of one segment or half segment used on three or two natural shapes in order to obtain the variety of dental anatomical combinations (DAC) shapes.

Shape Characteristics	Traditional Shape	Final Shape
1	3	1
1	2	1
1/2	3	1
1/2	2	1

The class numbering (1:3, 1:2, ½:3, or ½:2) indicates which segment was used (number before the colon: either full (1) or half (1/2) segment) and with how many basic tooth forms it was used for recombination (number after the colon: either two or three basic tooth shapes).

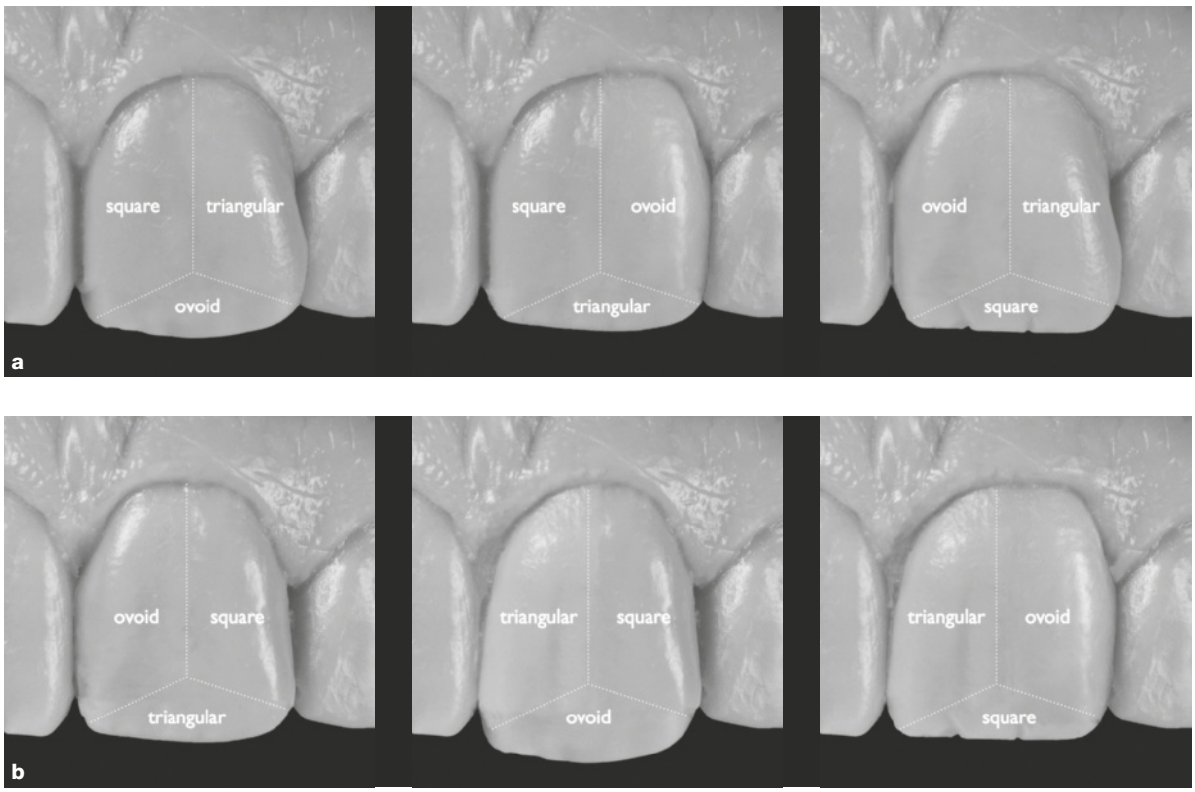
The first complementary class 1:3 uses one full segment of each of the three principal tooth forms, resulting in six different tooth shape combinations **(Fig 1-10)**.

The second complementary class 1:2 uses one full segment, combining it with only two different principal tooth forms, which results in 18 different tooth shapes **(Figs 1-11 to 1-13)**.

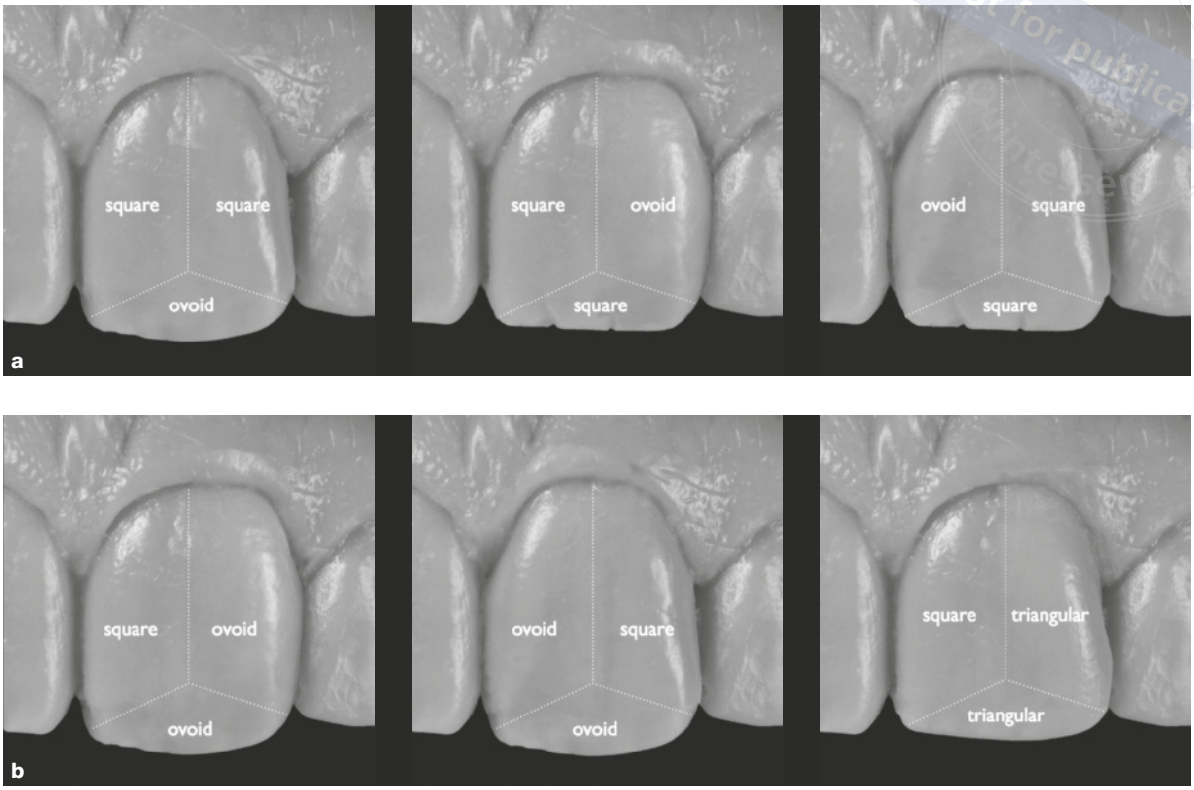
The third **(Fig 1-14)** and fourth **(Figs 1-15 to 1-17)** complementary classes ½:3 and ½:2 involve only half segments, which were combined with three or two different principal tooth shapes. By dividing the tooth vertically or obliquely into two parts of the three teeth, the segments are always in contrast to the final shape, giving it a more dynamic appearance. Although for both classes many more combinations are possible mathematically, only a selection of them is shown.

In total, we have presented 48 anatomical tooth combinations, giving us more possibilities to create teeth than those offered by the usual three shapes. These new combinations enable us to understand how the tooth can have contrasts that give the tooth a more dynamic appearance. The combination of these contrasts, both in form and in composition of the hue, can provide a wider range and greater creativity for an esthetic rehabilitation.

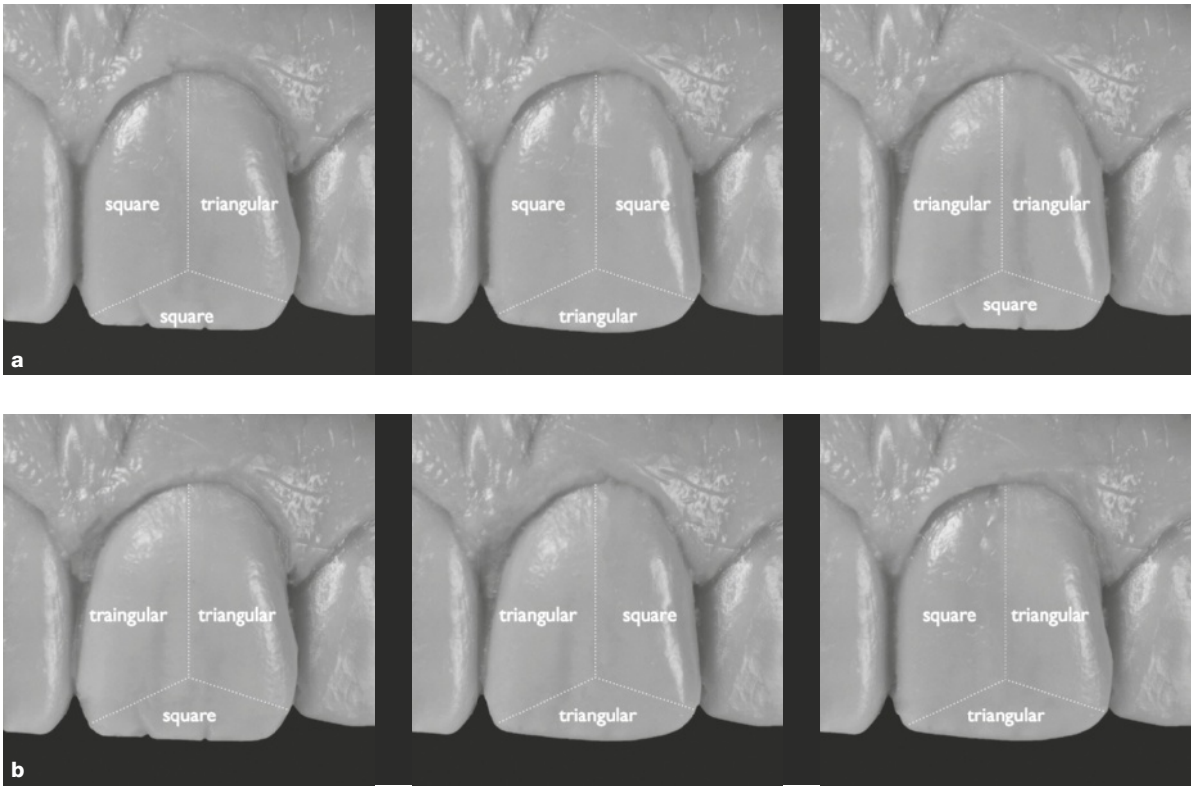
Segmentation is a means of composition that is particularly necessary and evident to facilitate practical orientation. In the laboratory, it is a visual message—a concrete rather than an abstract concept that allows us to understand and produce the tooth shapes that we desire.



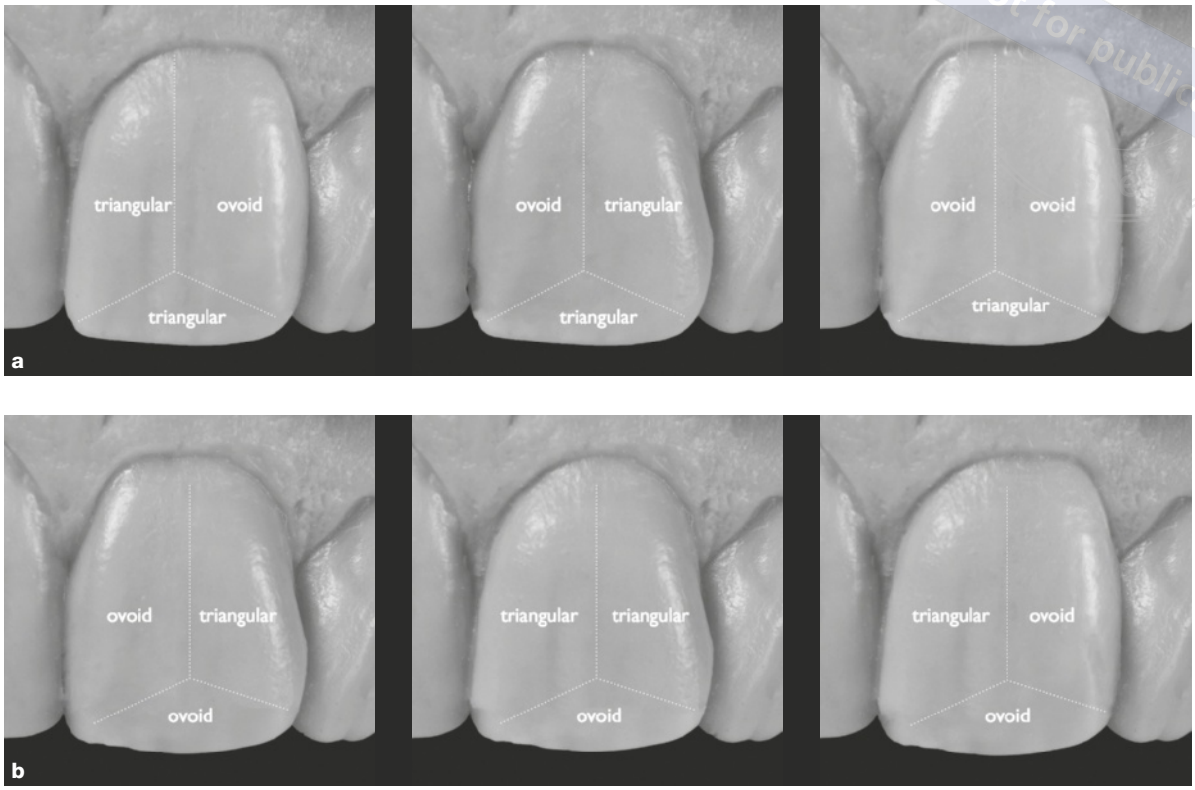
Figs 1-10a,b Complementary class 1:3. Full tooth segments of all three basic tooth forms combined with each other.



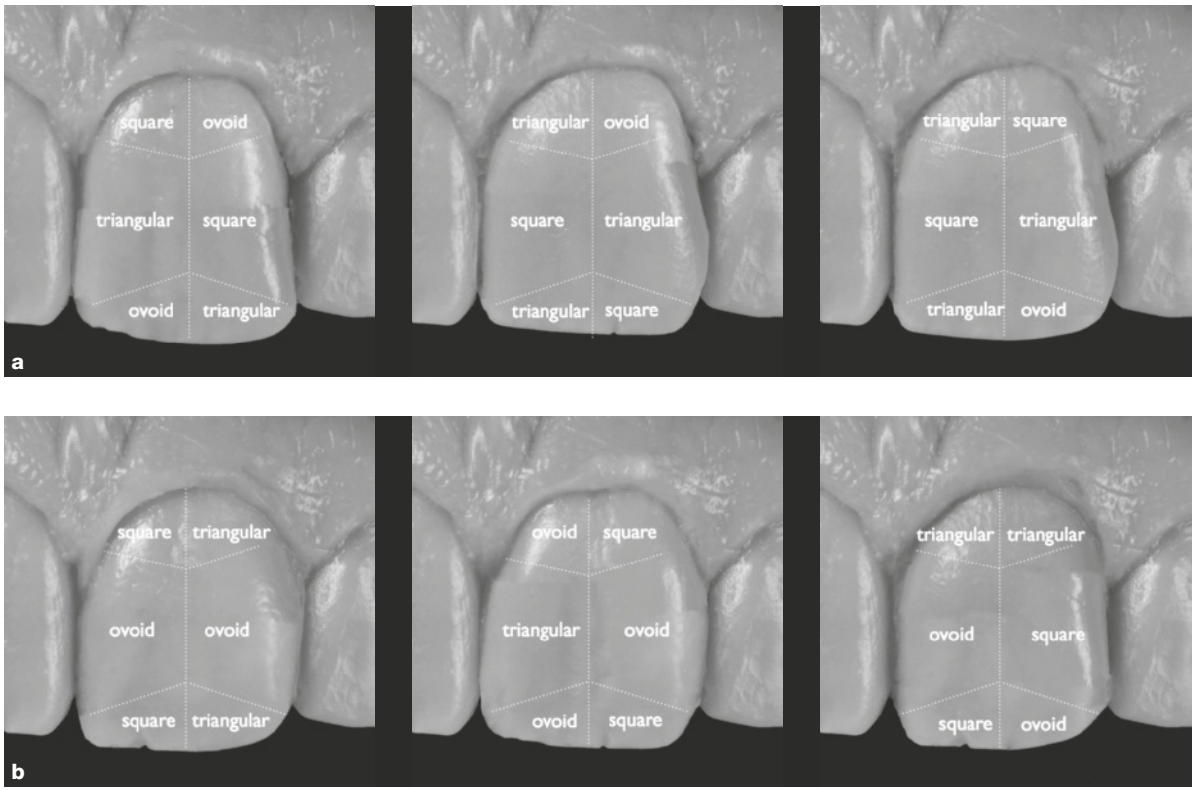
Figs 1-11a,b Complementary class 1:2 ovoid-square combinations.



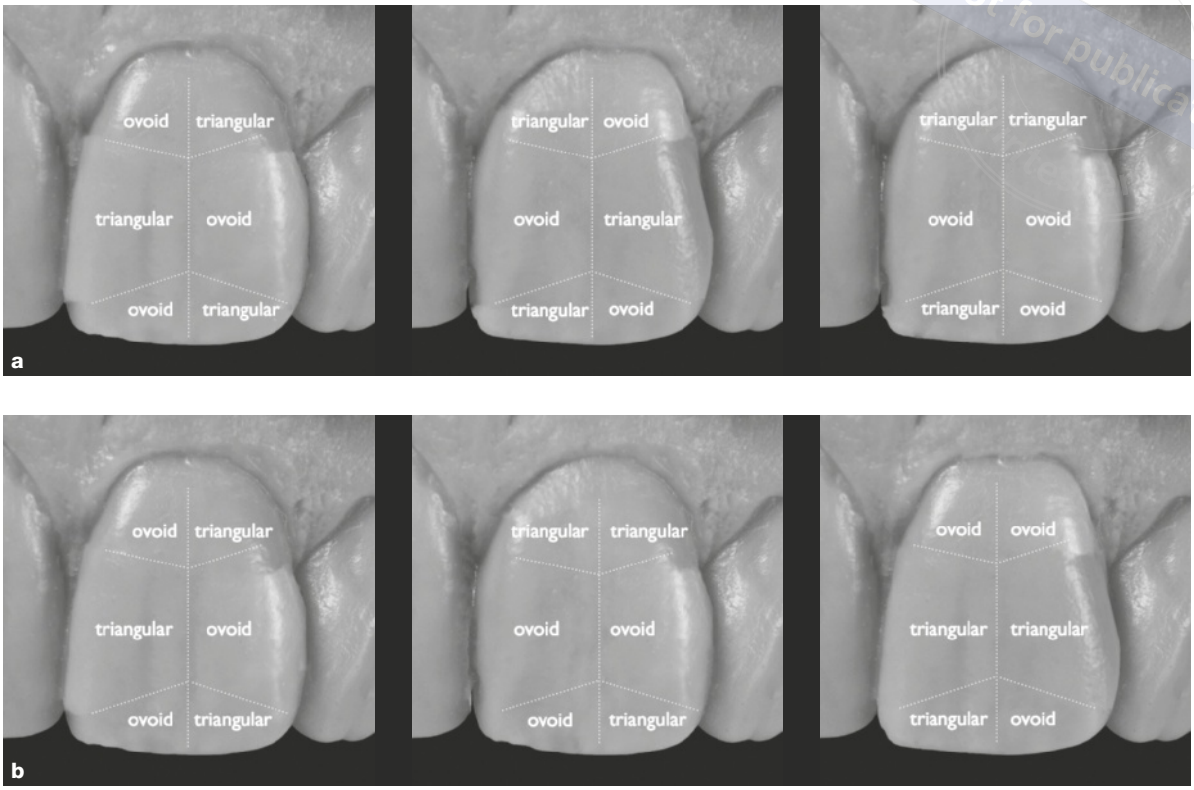
Figs 1-12a,b Complementary class 1:2 square-triangular combinations.



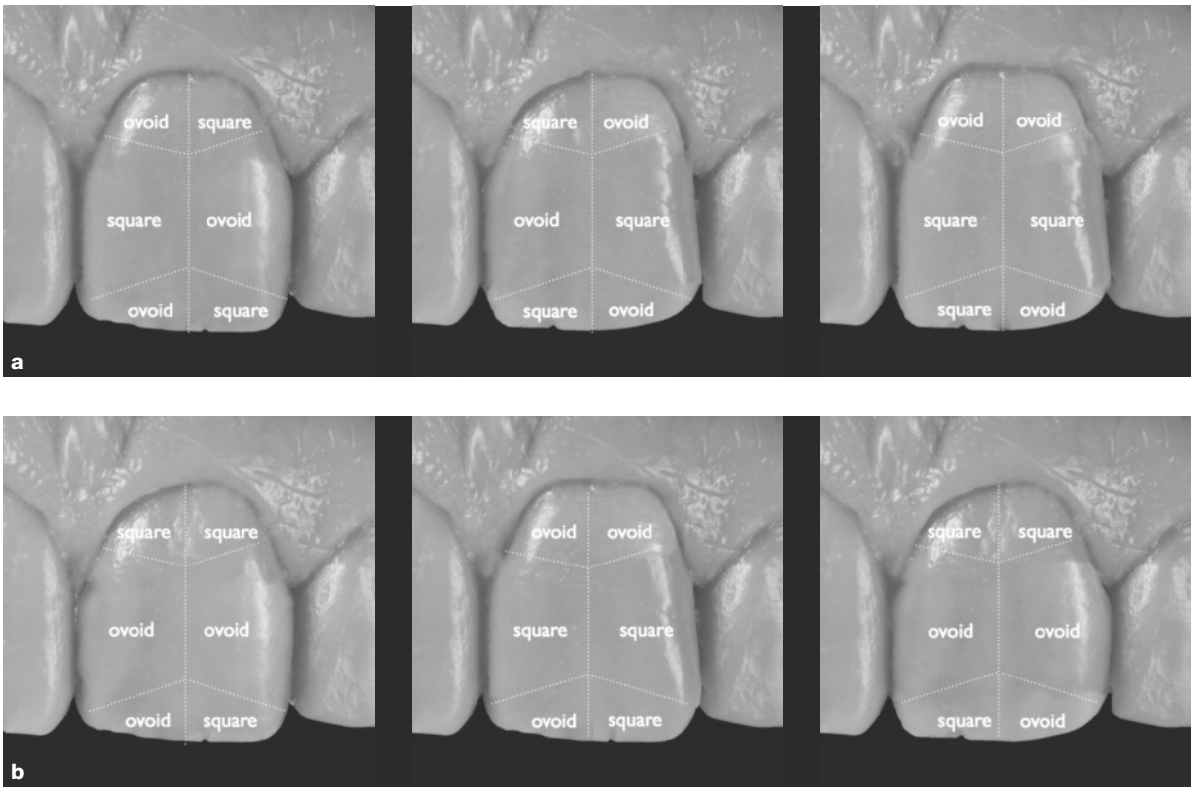
Figs 1-13a,b Complementary class 1:2 ovoid-triangular combinations.



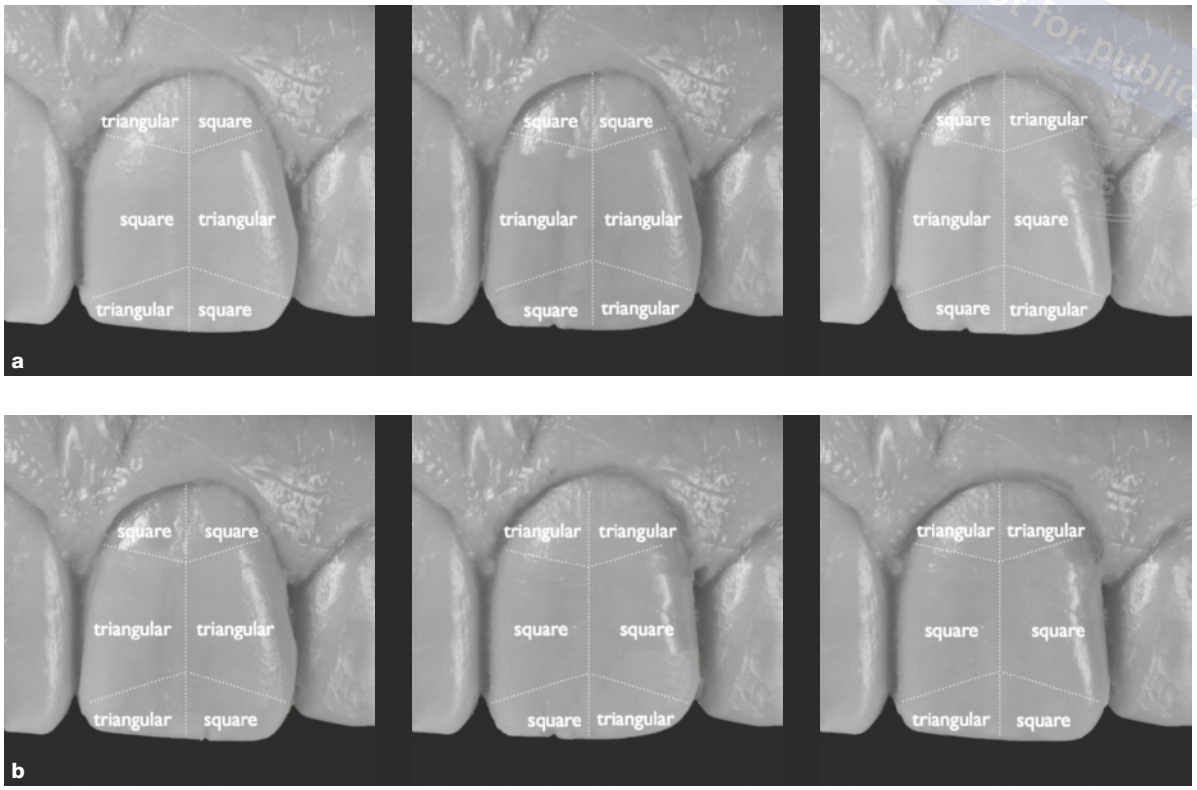
Figs 1-14a,b Complementary class 1/2:3. Half segments of all three basic tooth forms combined with each other. Many more combinations are possible than shown here.



Figs 1-15a,b Complementary class 1/2:2 triangular-ovoid combinations.



Figs 1-16a,b Complementary class 1/2:2 ovoid-square combinations.



Figs 1-17a,b Complementary class 1/2:2 square-triangular combinations.

Case Report

A 46-year-old male patient presented with concerns about the esthetics of his maxillary anterior dentition. His chief complaint was the diastemata between both central incisors and between the right central and canine **(Fig 1-18)**.

Both of his maxillary lateral incisors had been congenitally missing and were substituted by moving his canines and premolars orthodontically at a young age. However, spaces between the anterior teeth had not been closed completely at that time and besides minimal enameloplasty, the transformation of the canines to lateral incisors has remained unfinished since then. The patient did not undergo orthodontic treatment again. He desired an esthetic but minimally invasive treatment preserving as much tooth structure as possible.

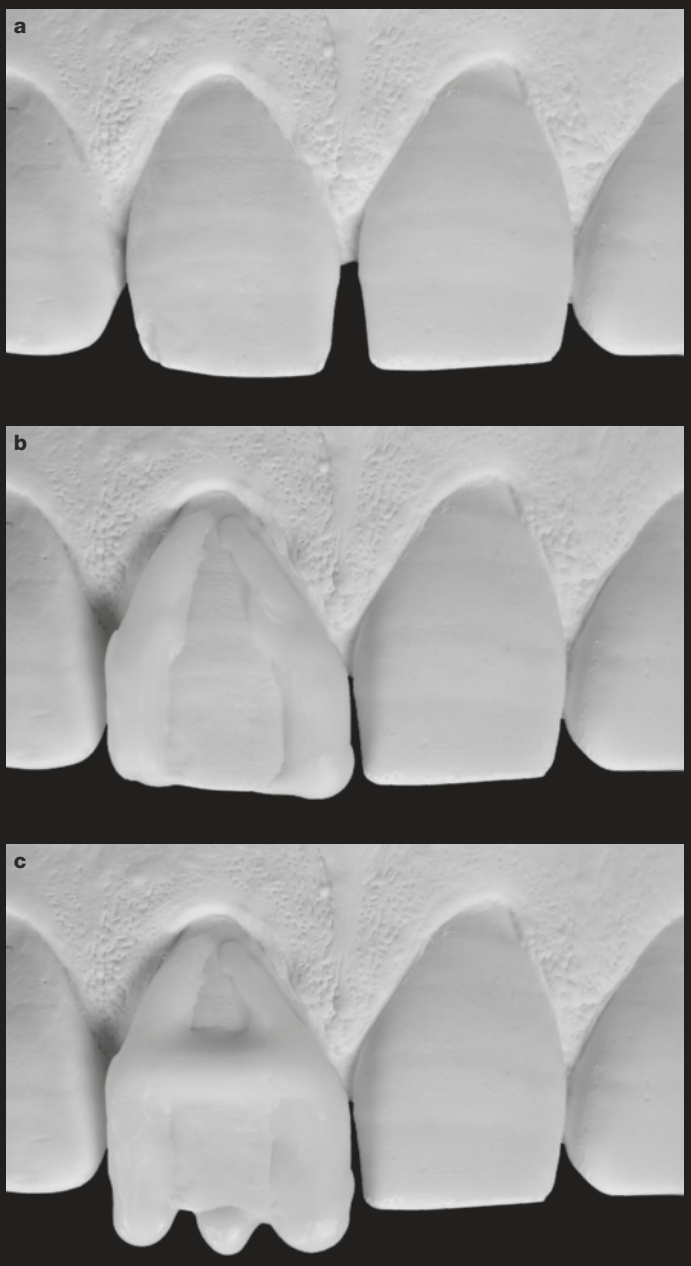
The treatment plan comprised of six veneers covering the maxillary central incisors, the canines, and the first premolars.

Figs 1-18a-f Preoperative situation. Note the diastemata and the incomplete transformation of the canines used to replace the congenitally missing lateral incisors.

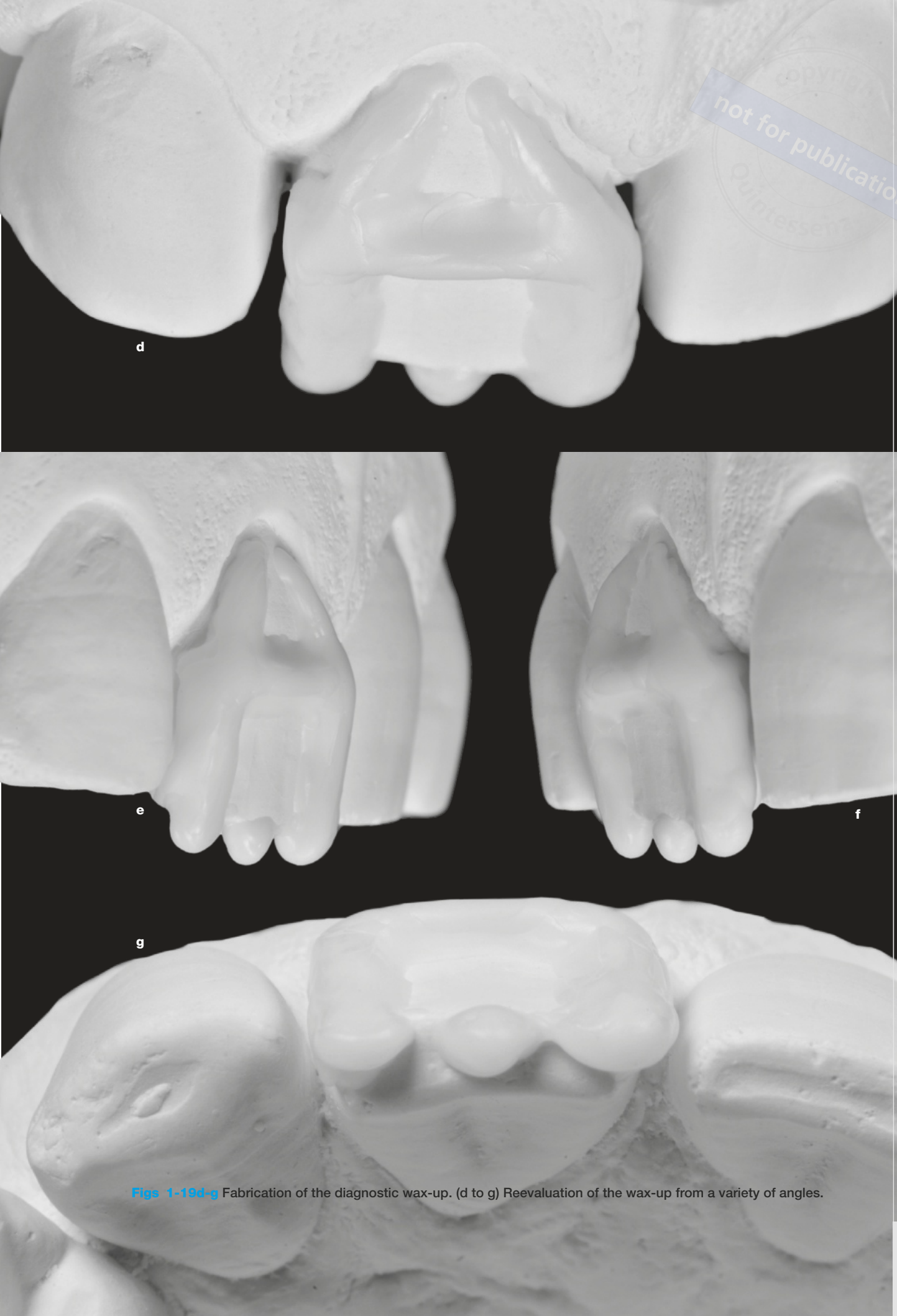
Diagnostic Wax-up

Preceding the treatment-plan decision, impressions were taken to fabricate diagnostic casts and a diagnostic wax-up **(Fig 1-19)**.[27]

The diagnostic cast showed a triangular-ovoid tooth configuration of the maxillary incisors.[26] However, to close the diastema and redistribute the interproximal spaces more effectively, a 1/2:3 complementary class, combining all three principle tooth forms was chosen for the wax-up. Beginning with the marginal ridges, incisal cones and central ridge were then waxed-up in the most suitable position, finishing with the facial surface **(Figs 19a-c)**.[27] During all the stages of the process, the correct proportions of the anatomical features had to be maintained from all dimensions **(Figs 1-19d-g)**.



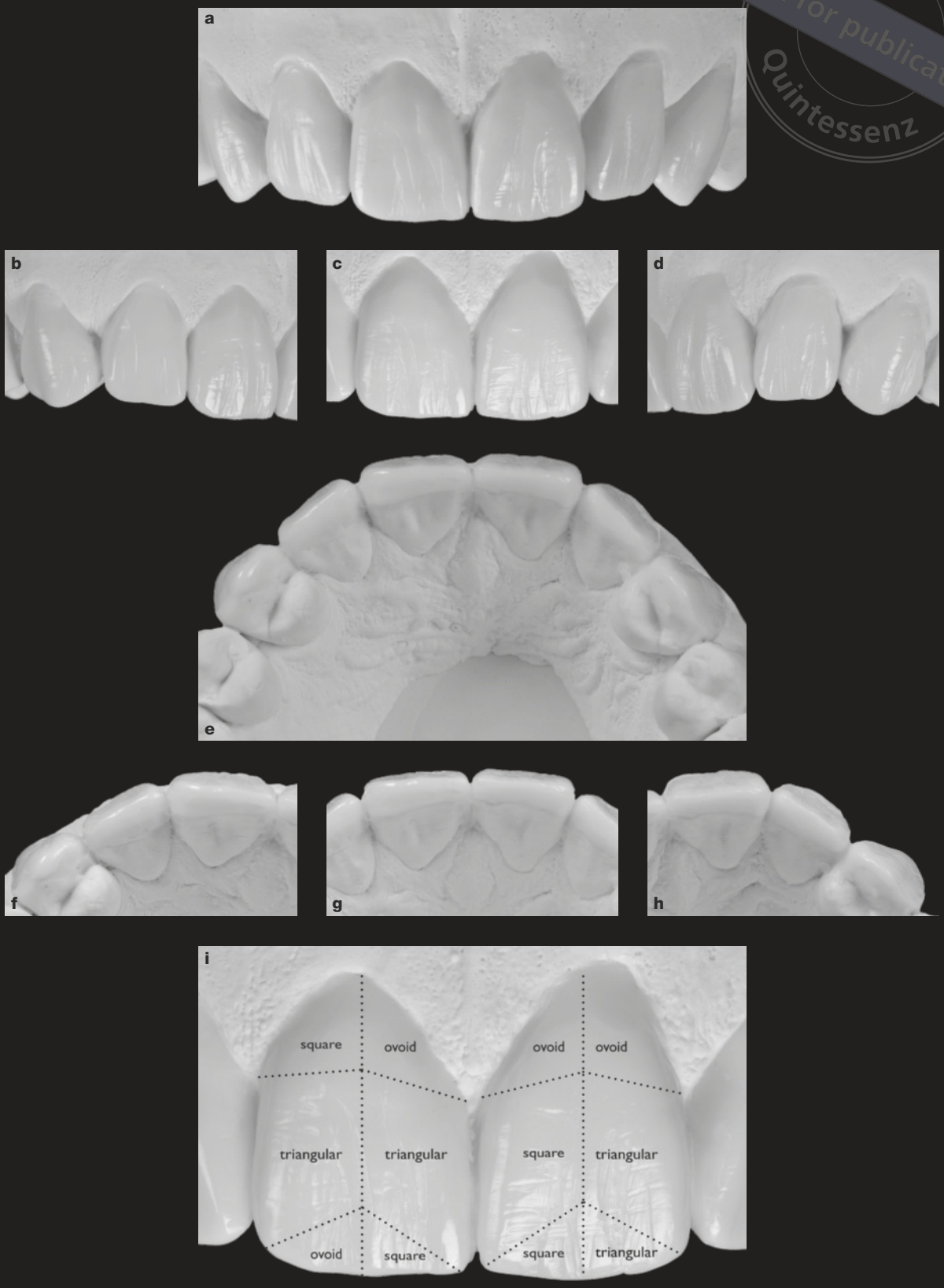
Figs 1-19a-c Fabrication of the diagnostic wax-up. (a) Initial situation. (b) Positioning of the ridges. (c) Waxing of the central ridge and incisal cones.



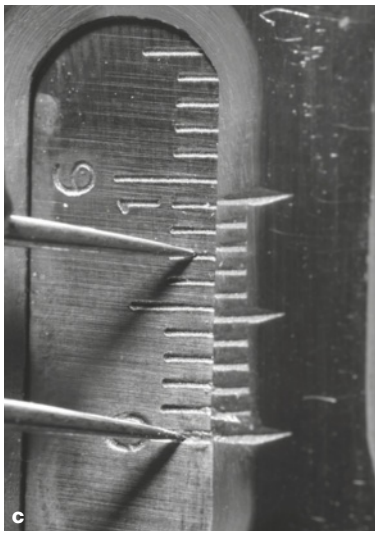
Figs 1-19d-g Fabrication of the diagnostic wax-up. (d to g) Reevaluation of the wax-up from a variety of angles.

Once the facial surface was completed, surface characteristics could be worked on **(Fig 1-20)**. **Figures 1-21a-h** show the finalized wax-up with successful transformation of the canines into laterals and the first premolars into canines. **Figure 1-21 i** shows both central incisors with the complementary class ½:3 applied. The teeth were divided in six half segments and the three principal tooth forms were used to recombine the final outcome. In order to transform the shape of the canines into the shape of lateral incisors, differences in overall shape, size, and anatomical features, such as mesio-distal and orofacial width, need to be considered. Therefore, a measurement of the cervical area of the two canines was taken to evaluate the differences in these parameters between canines and lateral incisors. The canine had in the cervical area a mesio-distal and an orofacial width of 7 mm **(Fig 1-22)**, while for a lateral incisor, the average mesio-distal width in the cervical and orofacial dimensions was around 5 mm.[1,21,28] To create a cervical emergence profile that matches the one of a lateral incisor, the canine needs to be reduced in width to those dimensions **(Fig 1-23)**. On the facial surface, the less convex surface of the lateral incisor compared to a canine must be considered. Insufficient preparation of the canine might result in either inadequate thickness of the ceramic or if minimum thickness of the ceramic is maintained, in an over-contoured final restoration. On the other hand, over-reduction would conflict with the desire of the patient for a minimally invasive treatment and more importantly, would compromise optimal bonding of the veneers by exposing the dentin. Considering these parameters, a preparation was simulated in the laboratory **(Fig 1-24)**. Such a simulation is a useful tool in communication between the technician and the dentist. Based on this preparation simulation and on the wax-up, silicon keys were fabricated **(Fig 1-25)**, which were delivered to the dentist as a guide during the clinical preparation.[27] Furthermore, this preparation simulation allowed the fabrication of a shell provisional.

Figs 1-20a-c Surface characterization.

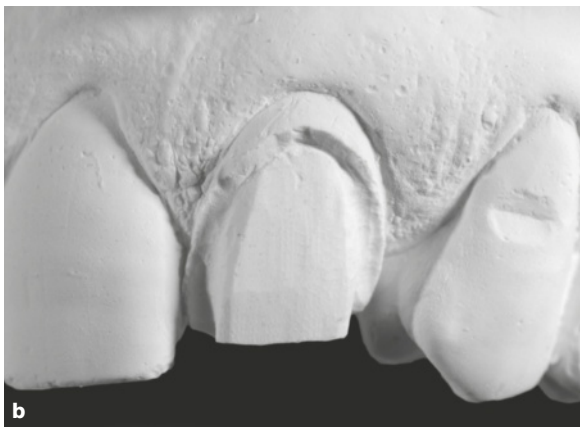


Figs 1-21a-i Completed wax-up with transformation of the canines into lateral incisors. A square-triangular shape was chosen. (i) Complementary class 1/2:3 applied to the wax-up.



Figs 1-22a-c Measurement of the mesiodistal and orofacial width of the canine in the cervical area.

Fig 1-23 For an optimal cervical emergence profile, the canine reduced to the size of a lateral incisor.



Figs 1-24a,b Preoperative preparation simulation.

Figs 1-24c,d Silicone keys based on the diagnostic wax-up.

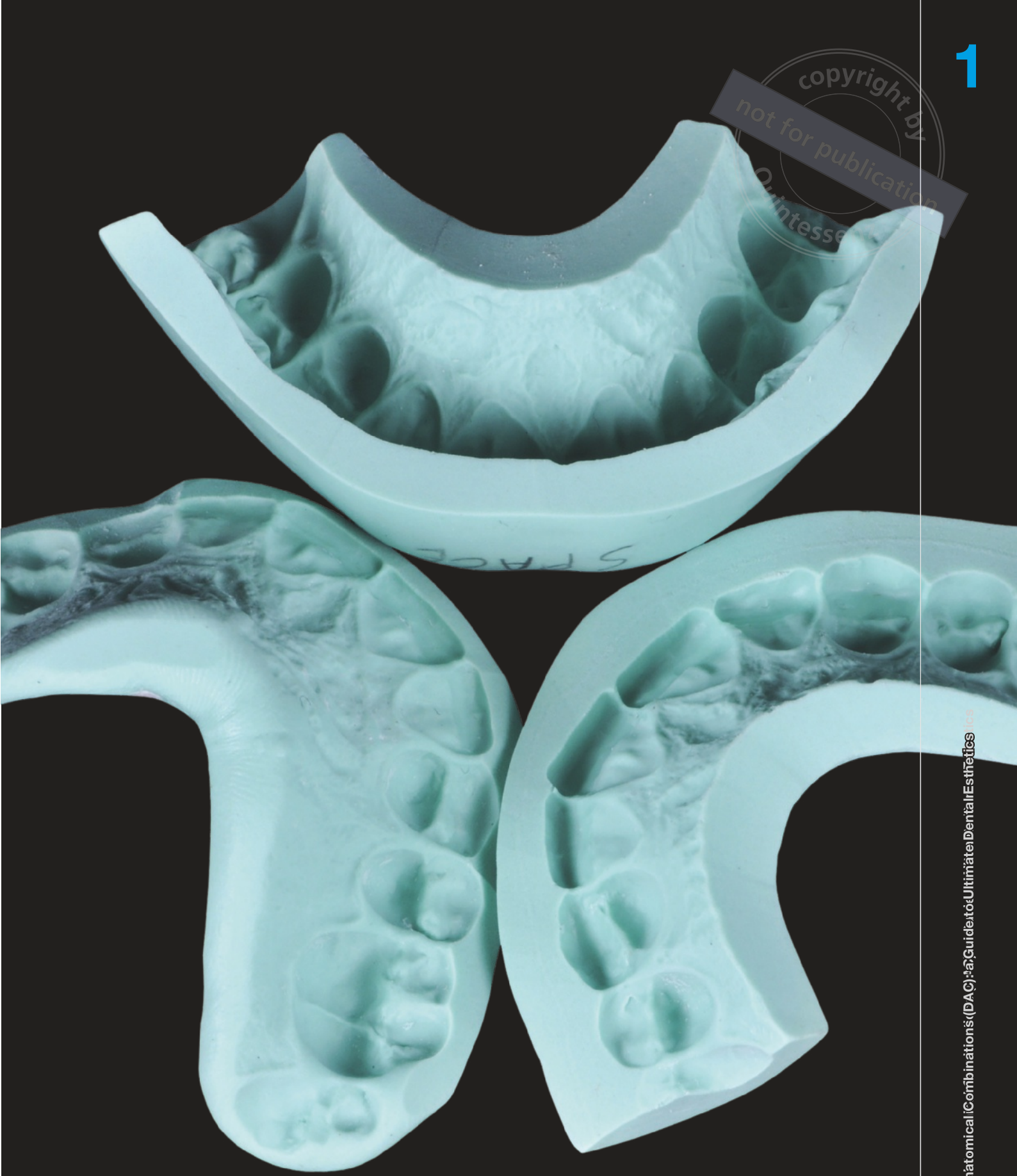


Fig 1-25 Silicone preparation guides.

Tooth Preparation

For clinical preparation, the silicon guides were used to initially verify the original dimensions of the teeth in relation to the projected shape as outlined in the wax-up **(Fig 1-26a)**.

No preparation was necessary on the two central incisors. Preparation on the first premolars remained minimal, including only the facial surface. The occlusal and lingual aspect of the first premolars remained completely untouched. On the canines, the preparation was performed as projected in the preparation simulation. Using diamond burs (Komet; Lemgo, Germany), the incisal edge was reduced by 1 mm, followed by the facial surface with a 1 mm reduction and a light chamfer at the cervical margin. The mesial and distal surfaces were each reduced by 1 mm using diamond burs, and diamond coated discs (Komet) **(Figs 1-26b,c)** were used in the interproximal areas shaping the cervical area to the desired width of 5 mm **(Figs 1-26b-d)**.

A gingival protector (Zekrya, DMG America, Englewood, NJ, USA) was used to retract and protect the soft tissue **(Fig 1-26b)**. Prior to impression, retraction cords without any hemostatic agent were placed **(Fig 1-26e)**. A polyvinylsiloxane impression material (Extrude Extra and Wash, Kerr; Orange, CA, USA) was used in double-mix technique to capture the preparations. The prepared teeth were provisionalized with the premade shell provisional after relining.

Fig 1-26a Intraoral verification of the difference between the wax-up and preoperative situation.

Fig 1-26b Interproximal reduction with a diamond bur.

Fig 1-26c Diamond wheel used for interproximal reduction. A gingival protector (not pictured) was used to protect the soft tissues.

Fig 1-26d Verification of the cervical width.

Fig 1-26e Final tooth preparation.

Fig 1-27a Soft tissue cast from the alveolar cast.

Fig 1-27b Alveolar cast with segmented dies.

Fig 1-27c Refractory dies on the alveolar cast.

Ceramic

To manufacture the ceramic veneers an alveolar model was fabricated, consisting of an intact soft tissue model and interchangeable dies **(Figs 1-27a,b)**.[29] The presence of the soft tissue is fundamental in the creation of final rehabilitation, because it is the key in positioning transition lines, and the tissue allows to have more control over the tooth shape.[17,18]

Feldspathic ceramic (Creation, Jensen Dental; North Haven, CT, USA) was layered to create the veneers. The first step of the layering process was to apply two layers of connector material on the refractory dies in two different firings **(Fig 1-27c-d)**. Later, different enamel and translucent masses were added to build the incisal wall **(Fig 1-27e)**. Modifiers and stains were added to obtain incisal effects; the mesial and distal aspects were built in the same manner followed by the first bake. Then the entire labial shape was layered using 20 different ceramic masses **(Fig 1-27f)**.

After the next bake, the ceramic was ground with diamond burs to create the desired anatomical shape and texture. Following glazing, which harmonized the texture in relation with the patient's adjacent teeth, all veneers were manually polished.

At this point, the veneers were ready to be removed from the refractory dies by sandblasting with glass beads at low pressure. They were adapted on the master dies under a stereomicroscope at x12 and x20 magnification. For optimal adaption of the intaglio surface of the veneers to the dies, adjustment was initially performed at the finish line and peripheral areas, followed by the central areas **(Fig 1-27g)**. Once the adaptation was finished, the contact points were checked on the solid model and the veneers were ready to be delivered **(Figs 1-27c and 1-28)**.

Fig 1-27d Refractory dies on the alveolar working model.

Fig 1-27e Feldspathic ceramic layered over the incisal area.

Fig 1-27f Ceramic result after the first fire.

Fig 1-27g Contact point on the veneer's intaglio surface for optimal adaptation.

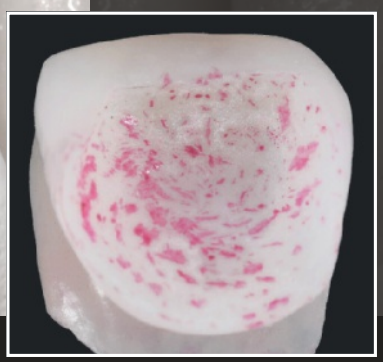
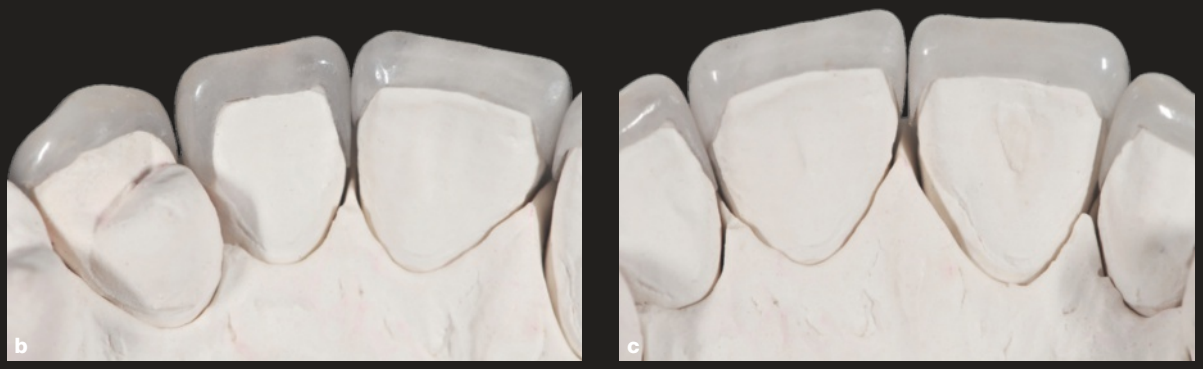


Fig 1-28a Definitive ceramic veneers.



Figs 1-28b-c Optimal marginal fit of the ceramic veneers on the master dies.

Fig 1-28d Veneers in place on the working alveolar model.

Try-in and Cementation

The provisional restorations were removed and the teeth were cleaned using pumice. Definitive cementation of the final restorations was preceded by a try-in to verify the fit, shape, and shade.

The intaglio surfaces of the feldspathic veneers were etched with 4.5% hydrochloric acid (IPS Ceramic Etching Gel, Ivoclar Vivadent AG; Schaan, Liechtenstein) for 1 minute **(Fig 1-29a)** to create micromechanical retention by removing the glass matrix.

This etching process produces crystalline precipitates, which are insoluble in water **(Fig 1-29b)**. The precipitates can be removed either by ultrasonic cleaning for 5 minutes or by etching with 35% phosphoric acid (Ultra Etch, Ultradent; South Jordan, UT, USA) for 1 minute **(Fig 1-29c)**.

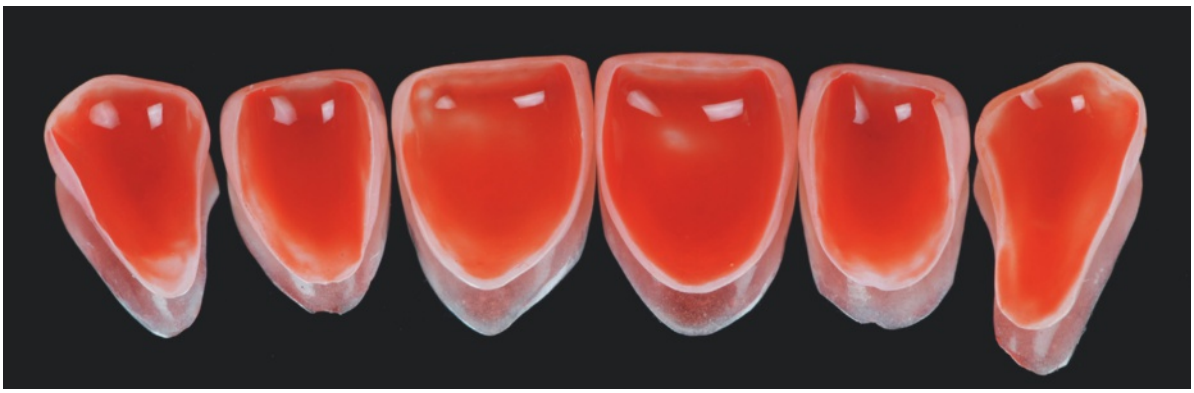


Fig 1-29a Hydrofluoric acid etching of the intaglio surfaces.

Fig 1-29b Formation of precipitates on the intaglio surface after etching.

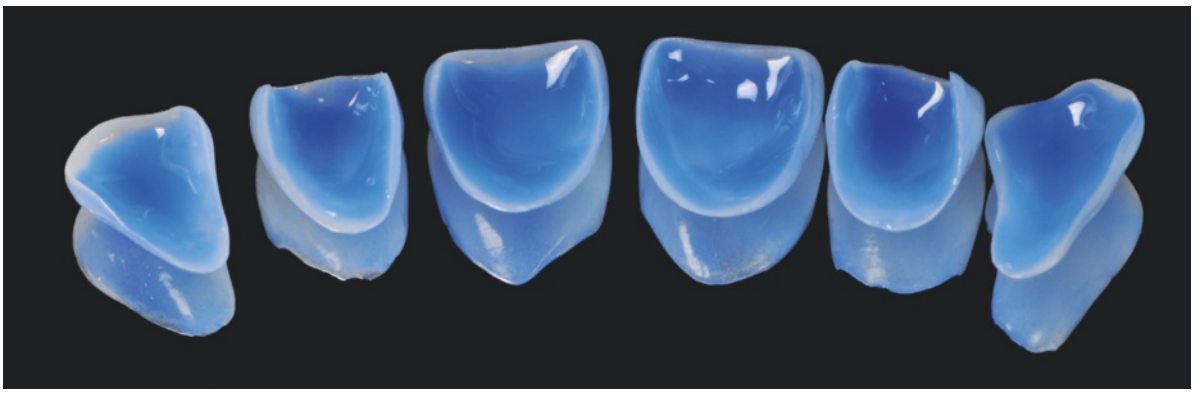


Fig 1-29c Removal of the precipitates by additional etching with phosphoric acid.

Fig 1-30a Thin layer of pre-heated composite resin applied to the intaglio surface of the veneer.

Fig 1-30b Placement of the composite resin–loaded veneers into the heater.

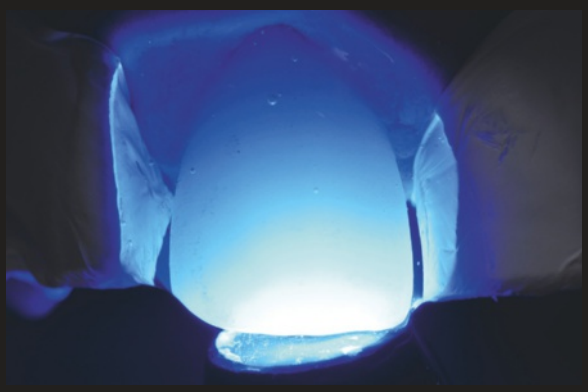


Fig 1-30c Light polymerization through a layer of glycerin gel.

Failure in removing such residues might result in reduced bond strength to the ceramic intaglio surface.[30,31] After rinsing and drying, a silane coupling agent (Porcelain Silane; Premier Dental, Plymouth Meeting, PA, USA) was applied for 2 minutes.

In consideration of an optimal long-term performance, a light cured, nano-filled composite material (3M ESPE Filtek Supreme Ultra, Shade CT; St. Paul, MN, USA) was used for cementation. In the oral cavity, the cement at the margin was subjected to water sorption, subsurface degradation, wear, and discoloration.[32] In comparison to methacrylate- or phosphate-based resin cements, pre-heated composites used as luting agents exhibited reduced deterioration by wear.[32] Cements with smaller filler-particle-size and a higher filler-load also showed less wear.[33,34] Furthermore, unlike self- or dual-curing cements, light-cured cements allow merely unlimited time for the placement of restoration and removal of excess cement.

For better handling during cementation, the highly viscous composite must be pre-heated. Heating the composite reduces viscosity, improves flowability, and decreases film thickness.[32] However, once removed from the heater, the composite cools down quickly during handling and it might even cool down more rapidly if applied to a much colder restoration at room temperature, voiding the advantages of the pre-heating. Thus, the restoration must be pre-heated as well. To avoid such a rapid temperature loss, the veneers were filled with a thin layer of the pre-heated composite **(Fig 1-30a)** and then placed into the composite heater until needed **(Fig 1-30b)**.

The veneers were bonded one after another, beginning with the central incisors, followed by the canines, and lastly the premolars. While the composite-loaded veneers were heated, a total-etch adhesive system (Optibond FL, Kerr; Orange, CA, USA) was applied to each tooth without light curing the adhesive yet. After placement of the restoration on the designated tooth and removal of excess luting agent, the adhesive and composite were light cured for 40 seconds through a layer of glycerin gel to avoid the oxygen-inhibited layer **(Fig 1-30c)**. A scalpel and scaler were used to remove any excess adhesive and luting cement. Interproximal areas were finished with polishing strips (3M ESPE Sof-Lex Finishing Strips; Saint Paul, Minnesota, USA) and occlusion was checked and adjusted. To complete the rehabilitation, the insufficient class V restorations on the second premolars and first molars were replaced with a nano-hybrid composite (ENA HRi, Synca; Le Gardeur, QC, Canada). **Figures 1-31a-d** show successful shape transformation 2 months after the delivery.

Fig 1-31a Final result.

Conclusion

Esthetics can be defined in many ways, but through the DAC of basic configuration of tooth anatomy, different types of teeth can be made that exalt the image in esthetic rehabilitation.

It is necessary to know how to relate the surfaces one to another to achieve an esthetic outline of the crown. Knowledge of the different dental structures and the ability to harmonize the teeth with the patient's face will lead the technician to create esthetically pleasing restorations.

For a successful restoration, detailed planning and intensive communication between the dentist and technician by means of preparation simulation and preparation guides are essential.

Figs 1-31b-d Final result.

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