



A Comprehensive Approach for Restoring Esthetics and Function in Fixed Prosthodontics

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Modern dental reconstructions do not only aim at restoring the patient's mastication, but rather at improving general well-being and quality of life, especially in terms of esthetics. This is why for many patients today, consulting the dentist does not necessarily mean only treatment of their teeth, but having their outer appearance improved as well. The media, the Internet, advertising, and many other facets of society contribute to an increased cosmetic awareness. Society today does not readily perceive acceptance of factors that may negatively impact a person's quality of life. Therefore, a variety of modern therapies (orthodontia, bleaching, implant dental prostheses), as well as the unlimited possibilities offered by integrated dental prostheses (either peri-

odontal or implant), allow the dentist to satisfy the patient's wishes as superior as they may be.

To provide for biologic acceptance, optimum chewing function, and individual esthetics, a systematic procedure in clinical treatment and a standardized method in dental technology are indicated. Any restoration should be based on scientifically based results, biologic knowledge, and clear-cut technical concepts, including materials and applied methods.

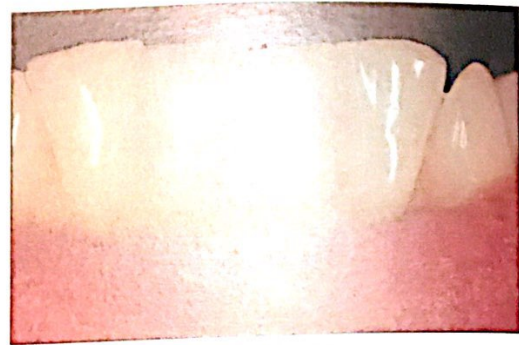
During treatment planning, the following methodology should be observed:

1. Establish treatment objectives and goals.
2. Approach the problems.
3. Visualize final results.
4. Determine sequence of treatment.
5. Determine costs.

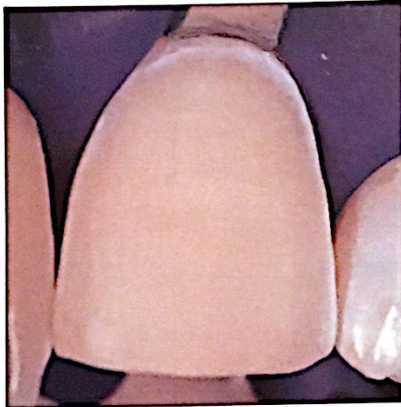
To do this, the patient's wishes are incorporated and the clinicians, dental hygienists, technician, and patient cooperate in an interdisciplinary way to achieve the optimum result. Any step leading to a high-quality result should be discussed and

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Figs 1 and 2 Because of the adhesive technique, it is possible to minimally prepare teeth, conservative to tooth structure. Veneer preparation of mandibular anterior teeth in 1991.



Figs 3 and 4 Micropreparation today on maxillary left central incisor and after bonding.

carried out in accordance with the ideal concept applicable in the respective case, even if in individual cases compromises cannot be prevented.

There are numerous parameters that are responsible for a high-quality result, including:

- Biocompatible materials
- Non-invasive, reversible procedures; conservative preparations (Figs 1 to 4)
- Intimate fit on abutment, passive fit in implantology (Figs 5 to 12)
- Individual function, modern occlusal concepts
- Accessibility for oral hygiene procedures
- Longevity
- Proper phonetics
- Predictability
- Comfort for the patient
- Individualized reconstructions (Figs 13 to 23)

PREOPERATIVE CLINICAL AND TECHNICAL PROCEDURES

Diagnostic Waxup

The first step in fabricating the dental prosthesis in a functional, unobtrusive way should be performed preoperatively after completion of the clinical examination, diagnosis, and treatment planning. This should include the exact description of goals to be achieved by the treating dentist and a diagnostic waxup or setup. To accomplish this, the diagnostic (duplicate) models (Figs 24 to 33), facebow mounted on the articulator, are completed with wax or the plaster teeth. In turn, the occlusal surfaces are equilibrated such that the teeth will be in an ideal contact relation to each other. Also, centric and eccentric paths should allow canine and/or anterior guidance to

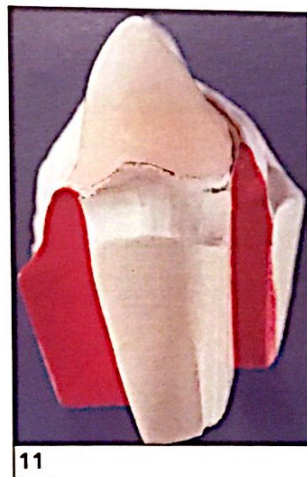
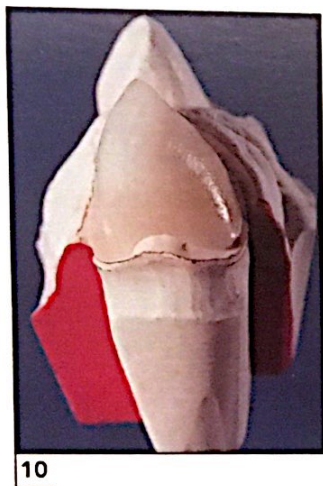


Fig 5 Flawless impression gives exact reproduction of the preparation. The impression should reach beyond the preparation limit for better control of the emergence profile.

Fig 6 Sectioned and solid duplicate models are made for finite corrections and auxiliary use.

Figs 7 to 11 Each chosen reconstruction system should be able to be processed problem-free, so that

high precision in the margin can be achieved. Light transmission as well as the color-shape and light-optic qualities can be controlled and improved thanks to the ceramic margin.

Fig 12 Implant-supported metal-ceramic fixed partial denture during the Sheffield test after passivation through the spark erosion technique. The long-term success of implant-supported restorative dental management also depends on the passive fit/accuracy.



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Fig 13 Modern dental reconstructions often require a combination of techniques.

Fig 14 On the tissue model: refractory dies for veneers, Spinell cores for lateral incisors, metal-ceramic crowns and bridges for the canines and posterior teeth.

Figs 15 to 17 Acceptable color transition between the systems on the model and in situ.

Figs 18 and 19 Preparations and after completion.

Figs 20 to 23 Before and after treatment.

DIAGNOSTICS



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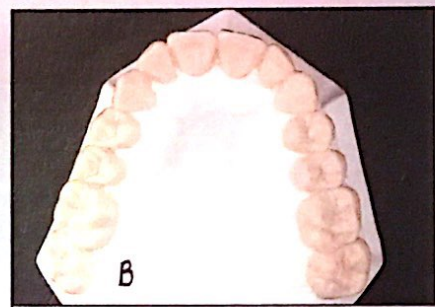
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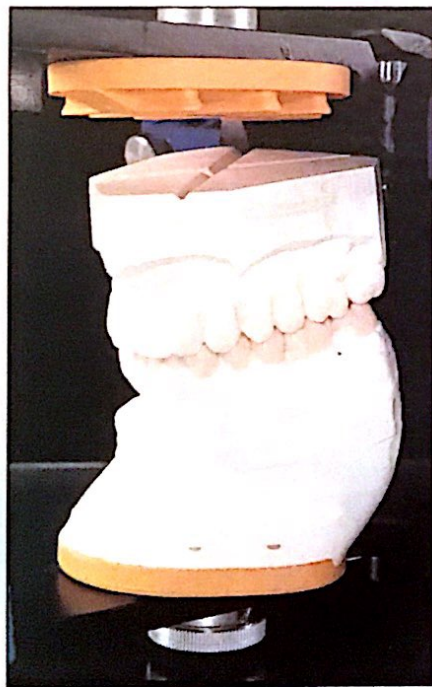
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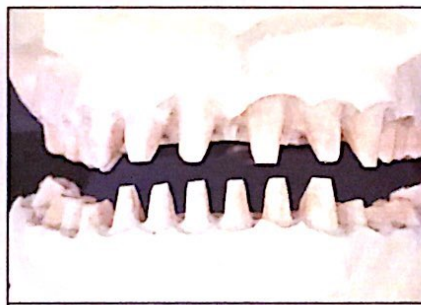
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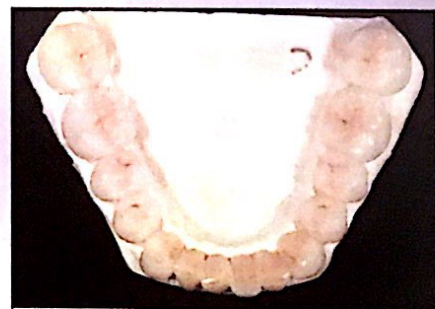
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Figs 24 and 25 Study model A.

Fig 26 Study model mounted on articulator.

Fig 27 Duplicated model B also mounted on articulator, with teeth prepared and complemented ideally in wax.

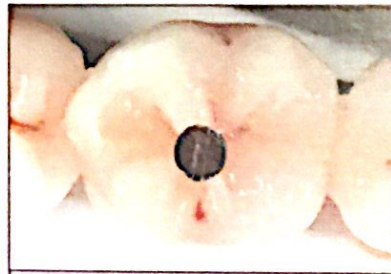
Fig 28 Diagnostic waxup.

Figs 29 to 33 From duplicated model B (waxup), model C is obtained, which is also mounted on articulator. The new situation can be better assessed in stone. A silicone index of model C is made, in which acrylic resin is pressed on the prepared model. With the sandwich technique, provisionals can be individually characterized. After polishing, the crowns are thinned as much as possible from the internal.

DIAGNOSTICS



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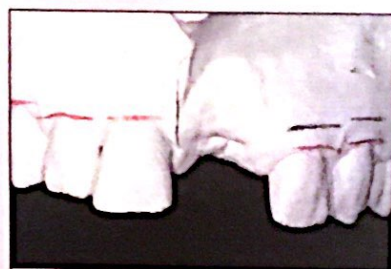


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Figs 34 and 35 Diagnostic planning is especially important for implant-supported restorations, as this is how hygiene access, axes, and implant space, among other factors, can be determined.



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Figs 36 to 43 An apparent easy task: Replacement of the maxillary left central incisor. Patient and dentist suggestions, which are realistic and predictable, lead to the best possible esthetic result. With the analysis of the model, the following points become apparent:

- Problems in function
- Different level of incisal edge
- Unpleasant transition of marginal gingiva
- Different sizes of gaps compared to the contralateral tooth (right central)
- Defect in alveolar ridge
- With the diagnostic waxup, several options come across vividly:
 - Implant-supported single crown
 - Implant-supported single crown; veneer on the left lateral
 - Implant-supported single crown; crown or veneer on left central
 - Crown on the right central with extension element on the left central (possibly including the left lateral)



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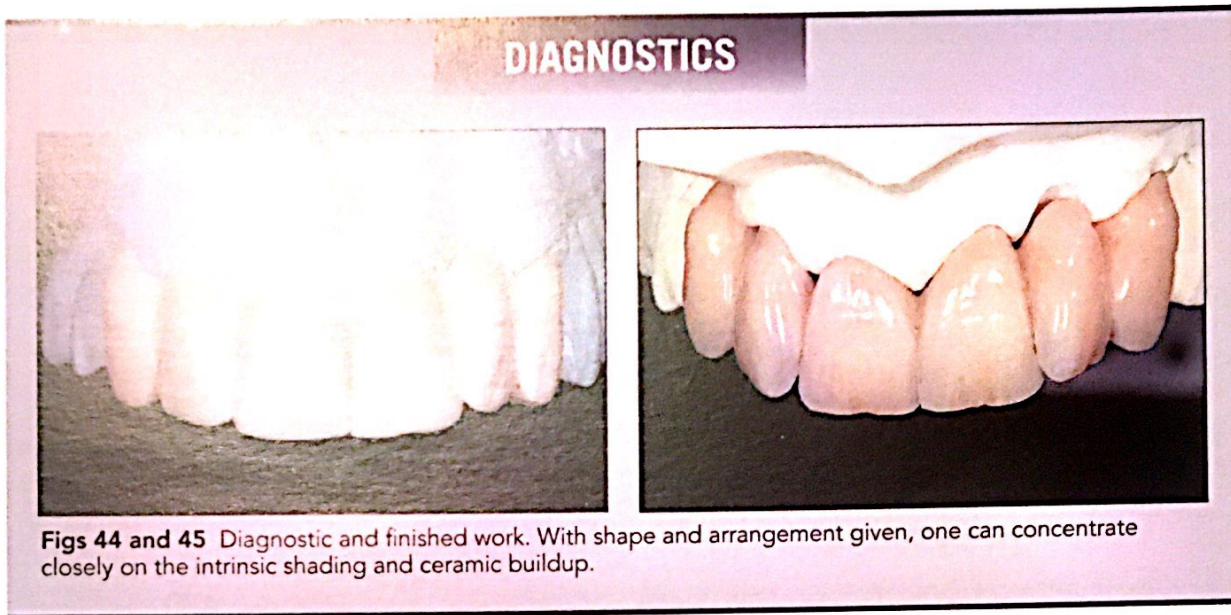
From this analysis, the best possible esthetic result can be determined and the necessity of ridge augmentation, crown elongation, and laminate veneers can be considered.



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Figs 44 and 45 Diagnostic and finished work. With shape and arrangement given, one can concentrate closely on the intrinsic shading and ceramic buildup.

be produced. In applying this method, functional problems will be recognized in an early stage and a formal treatment plan can be discussed. At the same time it is possible to correct a disharmonic gingival line or ridge defects and to show this method in a descriptive way. If the dentist plans to carry out an implant prosthetic reconstruction, the diagnostic waxup constitutes the subsequent technically ideal implant position and orientation of the implant long axis (Figs 34 to 45).

As the patient will likely not be available, the dental technician should be provided with the diagnostic models and standardized photo documentation. This is especially required in cases of anterior tooth reconstruction. However, if the technician is in the position to meet the patient personally, he has the advantage of getting to know the patient's personality, facial physiognomy, as well as dental and periodontal situation. To a certain extent, the missing patient contact may be replaced by modern means of digital photography, digital video, and transmission via Internet.

The diagnostic waxup allows this information to be transferred in provisional restorations that already contain the initial corrections (such as occlusal plane, anterior tooth position, etc). In this way, a basis of discussion is established for both the dentist and the patient.

Computer Imaging

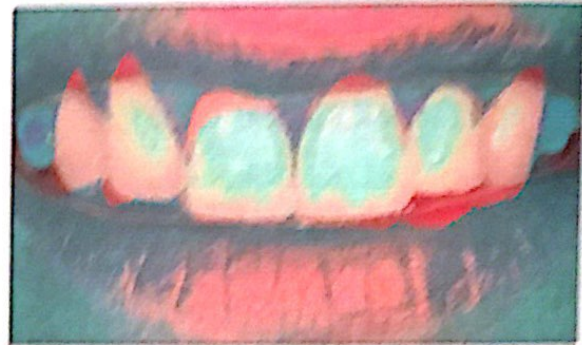
Imaging can prove a valuable addition to diagnostics in patient management. The great advantage is that the patient can be made aware of esthetic shortcomings in a graphic and accessible manner during initial consultations. Virtual idealization of the conditions in the patient's mouth allows both the patient and the dentist to display, assess, and, where necessary, modify the desired changes directly on screen. The disadvantage is the expectations this method occasionally creates in the patient. An unfavorable abutment position or the patient's general dental condition may impose technical limitations and thereby prevent the realistic goal from being achieved (Figs 46 to 50).



Fig 46 Preoperative situation.



Fig 47 Cephalometric radiographs as well as the missing maxillary right lateral incisor can be corrected by systematic analysis using altered codes to clearly illustrate the situation.



Figs 48a and 48b Computer-manipulated "ideal."



Fig 49 The maxillary right first premolar was remodeled to a canine with a veneer. The right canine became a lateral incisor with a veneer. The right lateral incisor is missing. The right central, left central, and left lateral incisors are metal-ceramic crowns. The left canine is restored with a laminate veneer.



Fig 50 Postoperative photograph shows improvement of the initial situation.

Provisional Restorations

The provisional restorations primarily serve to protect and stabilize the prepared teeth, as well as to control the diagnostically specified functional parameters. Furthermore, they make it possible to try out new vertical dimensions and to condition the soft tissue in the pontic design process.

In general, when producing the provisional shell, dimension, form, and position should be addressed so that the treating dentist can easily assess the length of the crown, center line, incisal edge line, lip support, and phonetics. Additionally, it is possible to make the color of the provisional match the existing dentition. At this treatment stage a beautifully created set of provisional restorations not only contributes to the patient's well-being, it also allows consideration of the final reconstruction and possible modifications needed.

After granting the patient time to acclimate, the provisional restorations should be newly assessed by the treating team together with the patient and, if necessary, be modified. Depending on the scope of modification, this may be carried out by the dentist in the patient's mouth or in the laboratory. At this time, the thickness of the provisional shell should be measured to assess the space available and to carry out a subsequent preparation.

The Metal-Supported Long-Term Provisional Unit

Comprehensive reconstructions requiring extended preparation time will need to include a secondary metal-supported provisional unit in the treatment concept which will be applied after the first treatment using provisional shells. The metal-supported long-term provisional unit fulfills basically the same objectives as provisional restorations. However, it has to withstand a higher load resulting from the periodontal, surgical, endodontic, and/or therapeutic functional measures. At this stage a trouble-free and stable situation is of prime importance.

Also, if unforeseen clinical problems occur or if the patient is undecided, it may become necessary to produce a long-term provisional unit subsequent to the provisional shells in order to find new diagnostic solutions. Prior to this time, the treating orthodontist should have achieved ideal tooth position in accordance with both the dentist's and the patient's wishes.

The metal-supported provisional unit is produced on a plaster model with existing abutment teeth or by way of implant prosthetic reconstruction. In doing so, all findings gathered up to that point are included and transformed into the design of the provisional shell.

If the working documentation does not correspond to the standard of the specified work, or the requirements of dentist and patient cannot be realized using the existing technical methods, the technician may consider terminating the treatment at this point.

The Full Waxup

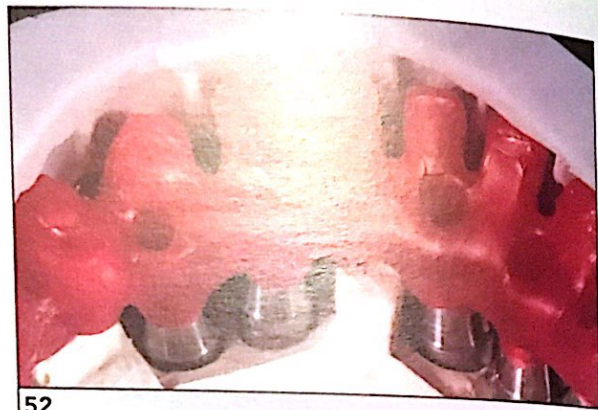
After the pretreatment procedures have been completed and a stable condition has been achieved, the definitive modeling takes place. To be able to use the information gained so far, the provisional unit needs to be recreated in a working cast as well. The working and pinned models registered and mounted on the articulator as well as the newly gained clinical information can be reproduced by a second set of diagnostic models. This exactly reproduces the situation in the patient's mouth with the provisional units in place. It is also important to produce a model that accurately represents the situation of the gingiva. In this way, the crown contour correction and the intermediate member support can be properly designed.

The close cooperation between patient, dentist, and dental technician results in a kind of esthetic sensitivity, which allows the technician to respond even more consciously to the patient's wishes. In most cases, by now the patient's needs and goals have been defined more clearly. The following clinical situations are conceivable:

FULL WAXUP



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Fig 51 Especially for implant-supported reconstructions, the full waxup can idealize the actual dental esthetic and tissue portion, the initial implant contour, its hygiene accessibility, and expansion.

Fig 52 Silicone matrix molded from the waxup allows design of the framework so that optimal metal support is obtained.

Fig 53 The final reconstruction on the master model with removable tissue.

1. The provisional restorations meet the expectations of all persons involved. In this case, a diagnostic waxup becomes superfluous.
2. The provisional restorations require minor corrections. In this case, a full waxup is reasonable, because it can be verified in the patient's mouth and the patient has the chance to give consent.
3. The provisional restorations require major modifications. Here a full waxup is absolutely indi-

cated. Stark comparison from the laboratory to the patient's mouth is essential.

If necessary, the full waxup is produced on the working model using tooth-colored wax. In rare cases it is transferred into a new provisional unit to serve as guidance in decision making (Figs 51 to 57).

FULL WAXUP

Figs 54 and 55 First provisional restoration with only slight corrections of the initial situation. It is supported palatally to ensure a stable position in the mouth during relining. It is the ideal tool for tissue management and pontic design.



Figs 56 and 57 Preoperative view and the definitive fixed partial denture in the mouth.



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TREATMENT SEQUENCE OPTIONS

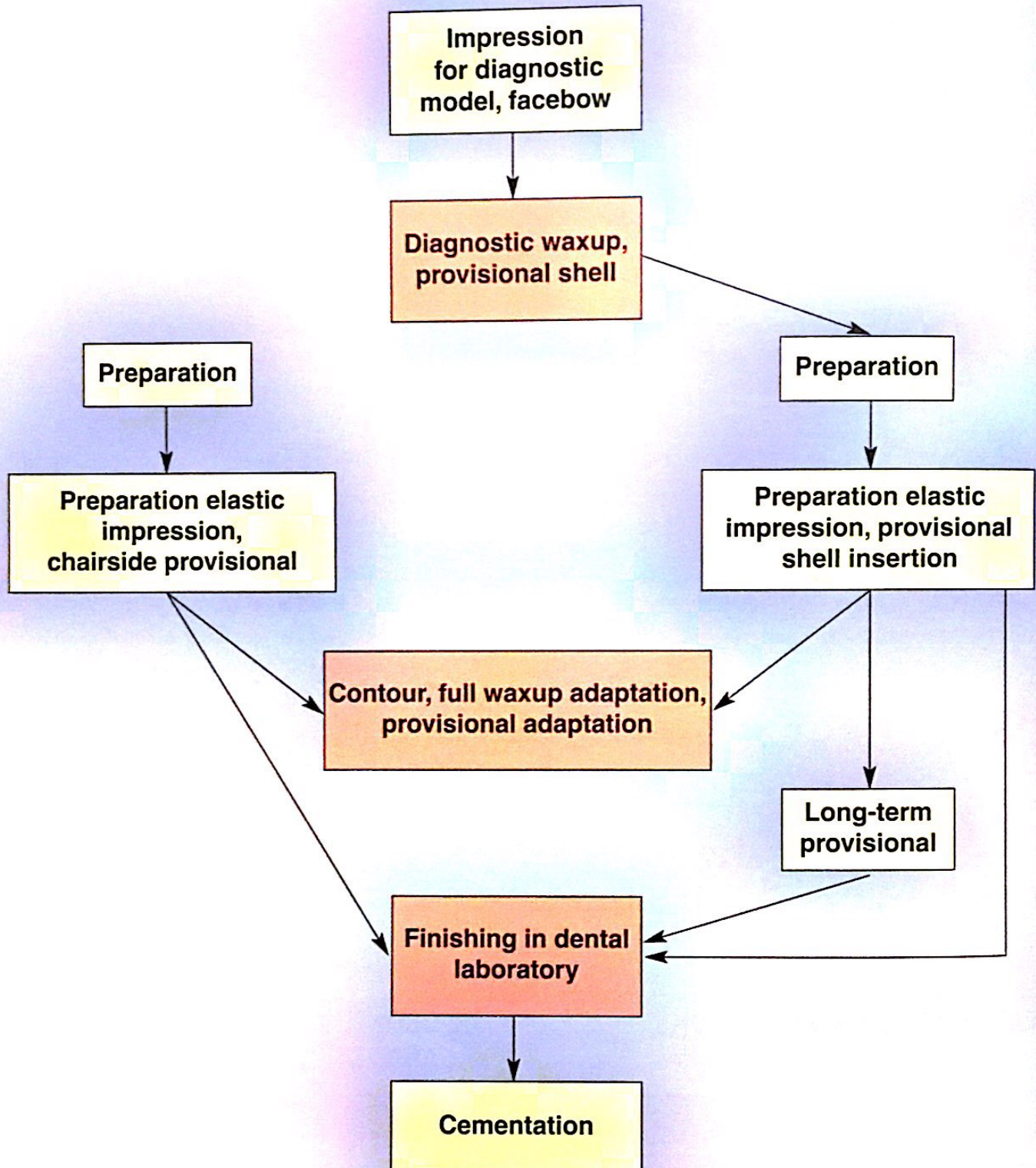
There are different ways to achieve treatment objectives, and it is not necessary in all cases to follow precisely the described steps. The complexity of the reconstruction and the problems encountered will determine the treatment sequence. Sometimes it is necessary to repeat the previously described steps. Figure 58 shows various treatment sequences that may be followed.

DEFINITIVE TREATMENT: ESTHETICS AND FUNCTION

Considering the basics mentioned above and by strictly observing the procedure during the provisional phase, including creating and comparing the fully contoured waxup, we can achieve a predictable and esthetically acceptable result. However, to attain a result that meets the patient's expectations we need to incorporate:

1. Knowledge and experience
2. Information and documentation
3. Ability to observe the patient
4. Communication and understanding

TREATMENT SEQUENCE OPTIONS



Our aim should be to combine these parameters that influence the final result to one single entity. It is now time to address esthetic and functional aspects, integrating one's knowledge of technical aspects, such as correct selection and processing of material, the correct layering technique, quality fitting precision, etc.

1. Knowledge and experience:

- Morphology of the teeth
- Physiology of the entire stomatognathic system
- Occlusal concepts

2. Information and documentation:

- Study models of the existing situation, provisional models, mounted on the articulator
- General information on the patient, age, sex
- Photo documentation, portrait, lips, profile, anterior teeth, occlusal view of upper and lower arches, buccal views, photographs of patient at younger age
- Detailed work description, treatment plan, projected costs

3. Ability to observe the patient:

Personality type

- Introverted/extroverted
- Social environment, social status, profession
- Cosmetics

Static

- Somatotype, height
- Form, asymmetry, center line of the face, classification of upper, middle, lower face
- Color, form, interpupillary distance
- Hair color, hairline
- Eyebrows
- Interpupillary line, line of the occlusal plane
- Nose width, nose basis, sweep of the nose, profile of the nose
- Philtrum
- Lip symmetry, lip color, lip form
- Visible parts of the gingiva
- Tooth form, tooth color, translucency, surface texture, brilliance (value)
- Position of the chin in all dimensions, chin form, chin line

Dynamic

- Phonetics
- Lip dynamics during speaking and laughing
- Visible parts of the gingiva during speaking and laughing

4. Communication and understanding:

- Patient's and dentist's wishes

The highest goal is to reproduce the natural appearance and to improve the patient's expression without changing his/her personality.

The literature offers a number of systems for charting the anatomic form on the basis of mathematical formulas and rules of geometry (Figs 59 and 60). These systems include details such as:

- Segmenting the anatomic form with the help of a grid pattern
- Orientation of the face and teeth with horizontal and vertical reference lines
- Parallelism between the interpupillary line and the gingival line of the canines and central incisors, as well as the incisal edge line of the maxillary anterior teeth, using the eyebrow line and the lip line as reference lines
- Use of the medians as orientation lines to determine the facial physiognomy and any slight disparity of the left and right halves of the face
- Dividing the human face into sections of different sizes, as the golden proportion is described as a proportion which is especially beautiful and often recognized in nature, and which therefore has a great influence on the art as well as on the facial and dental composition of the human being

Other calculations show a balance of proportions, such as the even classification of the three thirds of the face as upper, middle, and lower face. The lower face may be classified once more as nose basis line, mouth opening line, and jaw line. The latter is in a ratio of 1:2.



Fig 59 Observational skills and perception require training. Edwin Borling Old/Young Woman, 1955. Reprinted with permission of Vista Point Verlag, Cologne, Germany.

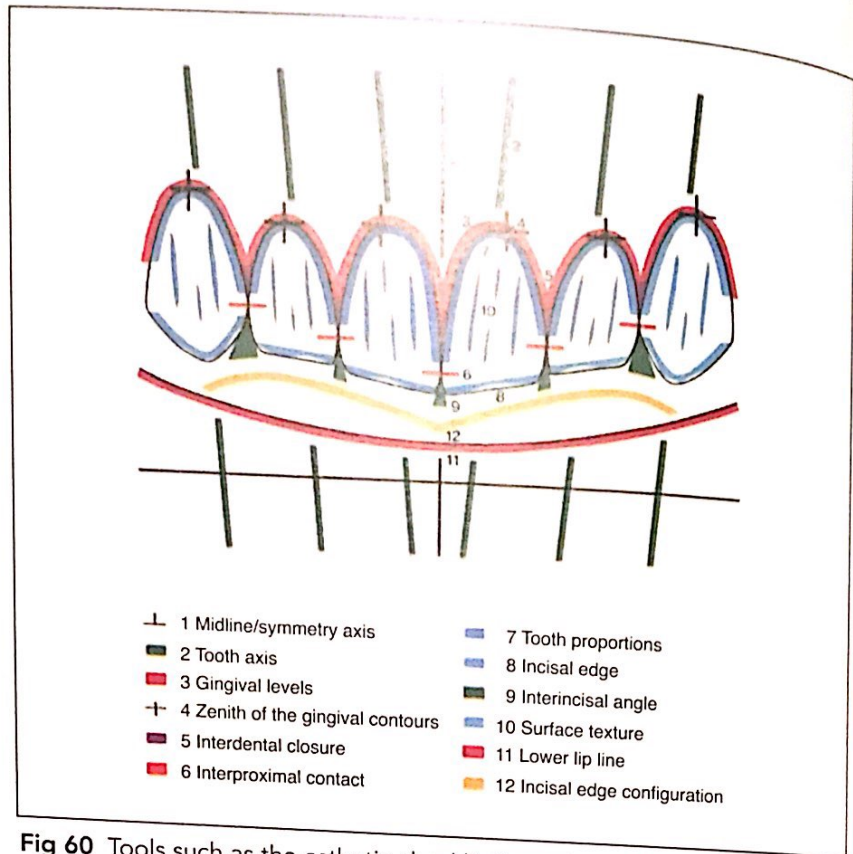


Fig 60 Tools such as the esthetic checklist²⁴ or other grid pattern are needed to systematically evaluate asymmetries.

***Perfection:** Completely free from faults or defects, or as close to such a condition as possible.*

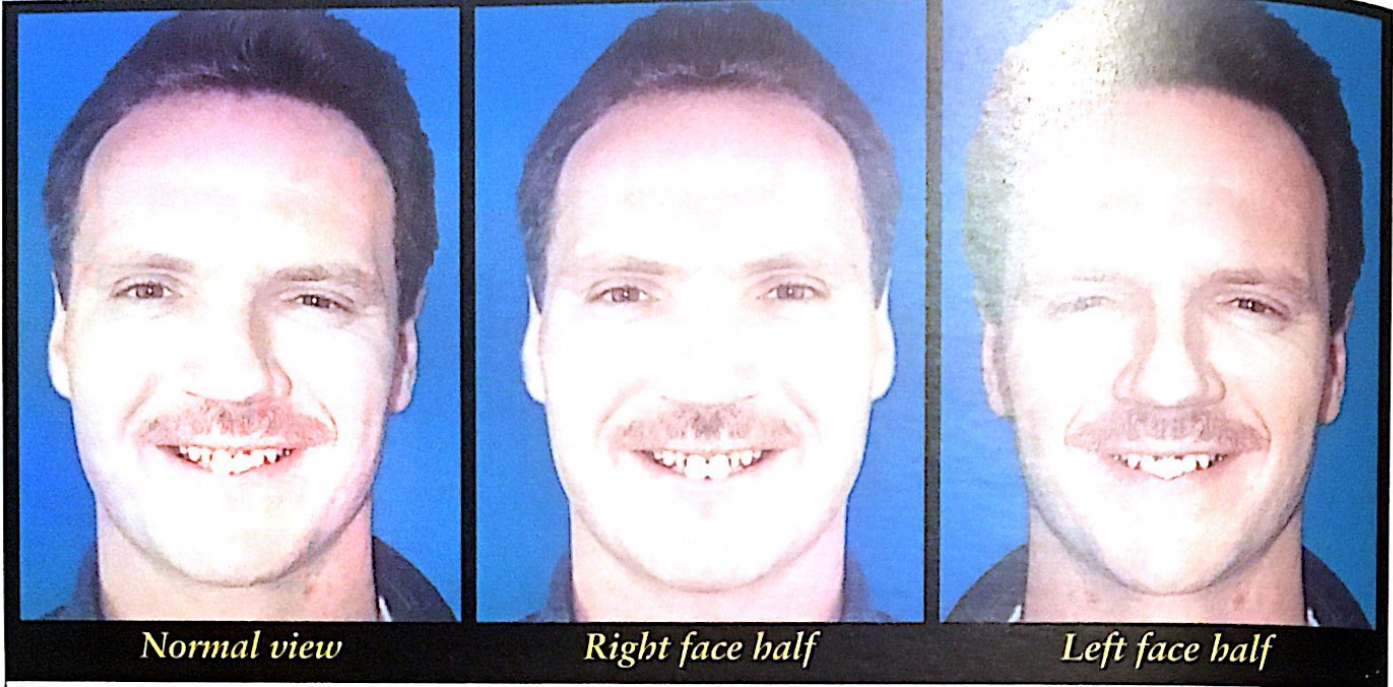
In analyzing a face, a checklist is established based on all parameters mentioned and picturing an esthetic balance (Fig 61). Although we aim at achieving such perfection, it will rarely be found in most faces (Figs 62 to 64). Renner²² summarizes as follows: "...The fact that heritable information is mixed creates a large variety of different facial characteristics. Regarding the human face, nature will never create a bilateral symmetry but emphasize one part or the other in individual compositions. In facial composition, tooth composition, etc, the right half of the face differs from the left half in all dimensions."

Nevertheless, the guidelines help us to better analyze a face's individuality. The focus is put on identical and differing parts of the face and the findings used to come up to esthetic requirements. These deviations render us characteristic and coin a person's attractiveness. One might call them "perfect imperfections." To maintain or reconstruct these results appreciated as beauty is the aim of the clinical and technical treatment (Figs 65 to 95).

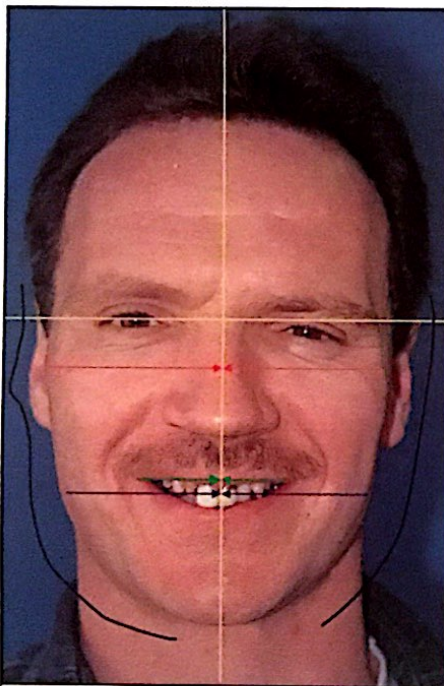
***Individuality:** The quality or character of a particular person or thing that distinguishes them from others of the same kind.*



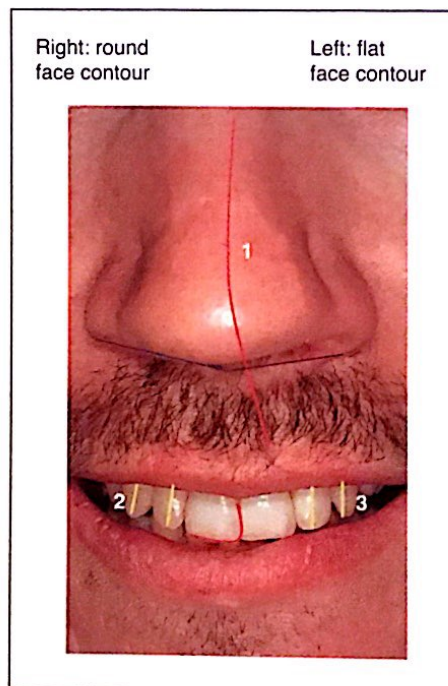
Figs 61 to 64 Because there is seldom a correspondence in proportions, we need to learn to recognize discrepancies and let this skill be part of our daily work. Even a harmonious-looking face has a pronounced imbalance of the right and left halves (mirror images of the right and left facial halves used to make composite of face).



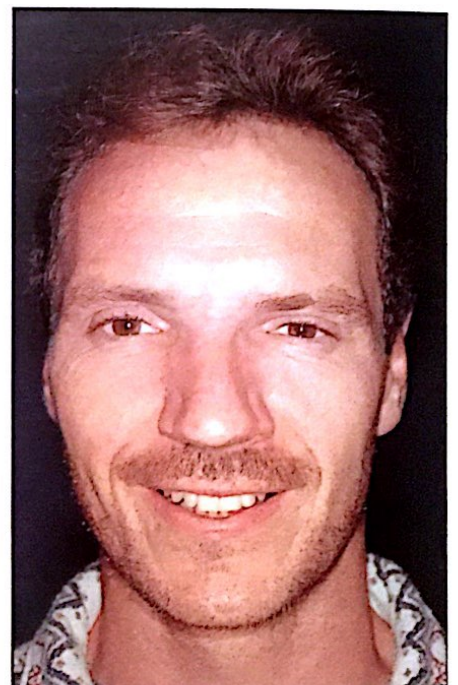
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Fig 65 There is a significant difference between the two sides of this patient's face.

Fig 66 The patient's right facial contour, mouth, and nose are wider and rounder; there is a pronounced shift of the interpupillary line; the left ear is lower; the nose is shifted to the left; and the lower lip is hanging on the right side.

Fig 67 Positioning the teeth in a certain way can accentuate or diminish the discrepancies and imbalance of the face. In this case the overlapping of the central incisors is intended to follow the curve of the nose (1). The axis of the maxillary right lateral incisor and canine were cervically-incisally inclined toward the distal, which is the wider and broader side of the face (2). The contralateral teeth have a straight axis, according to the flat left half of the face (3).

Fig 68 Harmonious, natural-looking solution. The facial features were incorporated but not accentuated. The patient's expression was improved without changing the characteristics.

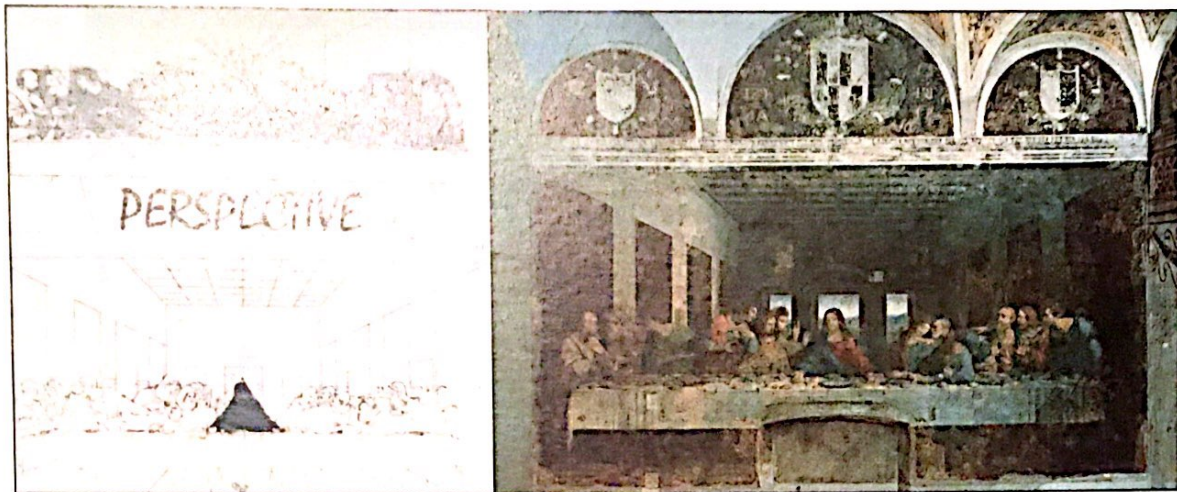
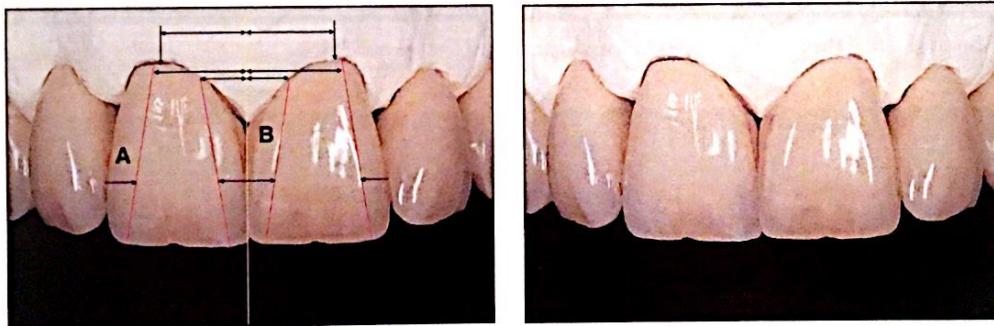


Fig 69 A reconstruction should look three-dimensional and depends on the arrangement in the right perspective view. Adjusting the facial of a crown by correctly positioning the height of contour will allow creation of a different crown width, accentuation of the three-dimensional appearance, closure of interproximal spaces more efficiently to emphasize the shape of a tooth, better control of porcelain layering for easier control of the light reflection. To correctly position the height of contour, the patient's personality must be considered as well as the facial outline, and the line between the frontal eminence, zygomatic arch, and prominence angle of the mandible. The midline and zenith must be considered as well. Reprinted with permission of Vista Point Verlag, Cologne, Germany.



Figs 70 and 71 Without considering the tooth's width, the height of contour lines must be properly positioned in order to have the same distance between: midline and mesial height of contour line, mesial height of contour line and zenith, zenith and distal height of contour line.

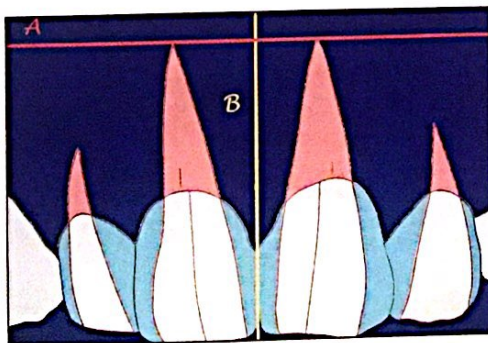


Fig 72 By extending these height of contour lines apically, they should meet at the same level. These lines are not intended to be the course of the root surface, however.

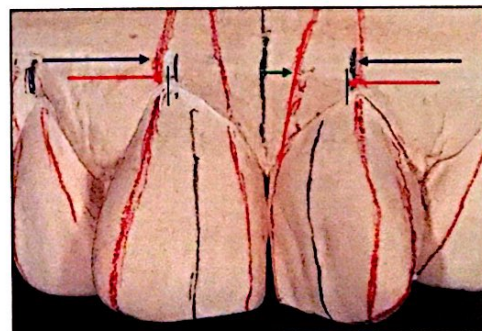
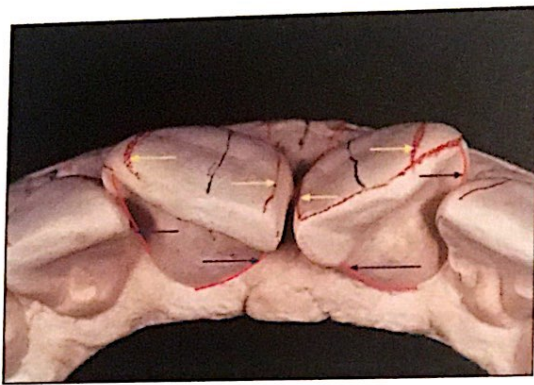
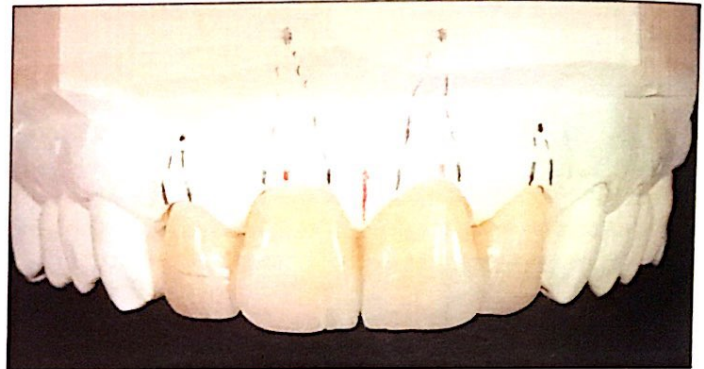
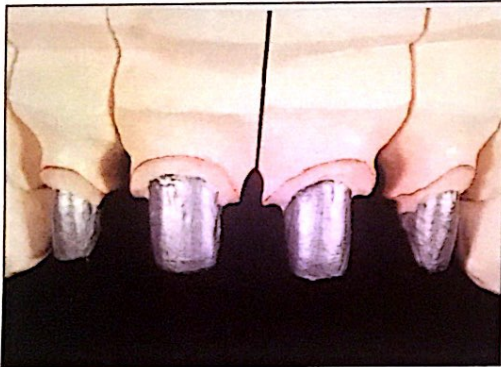


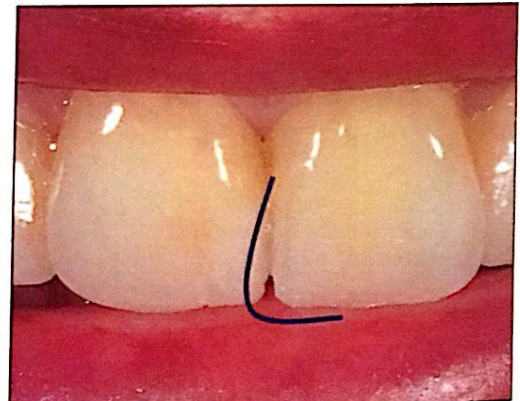
Fig 73 The relationship between midline, zenith, and height of contour lines is influenced by tooth positioning.



Figs 74a and 74b The labial and lingual height of contour lines are not parallel. The labial height of contour line is positioned more to the center, which influences the color-translucency contrast.



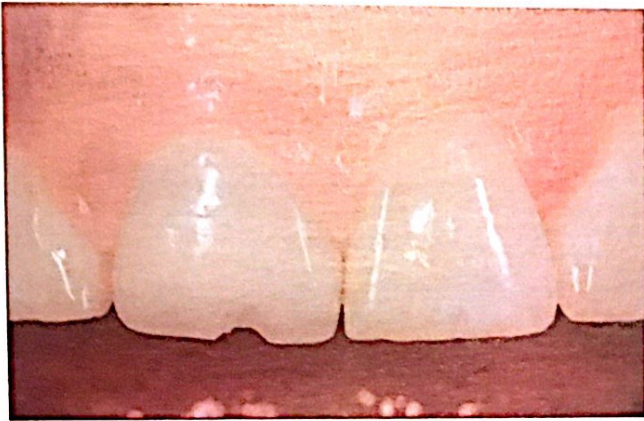
Figs 75a and 75b Preparations and full waxup on the tissue model.



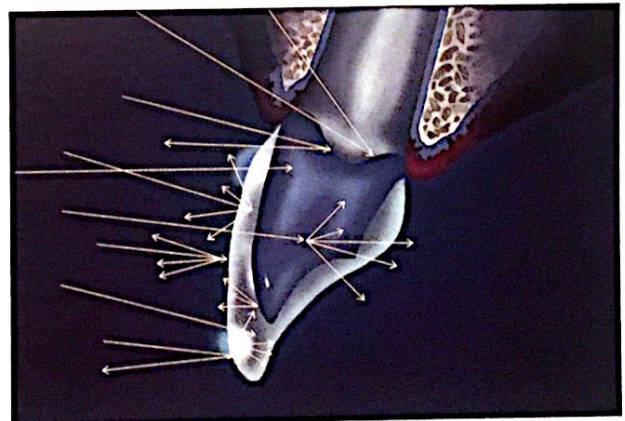
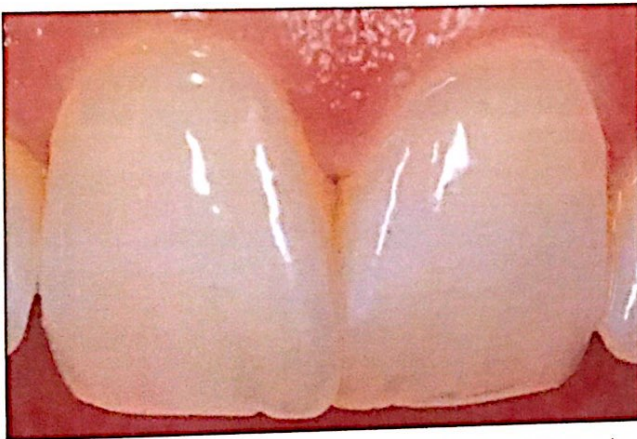
Figs 76a and 76b Necessary corrections can easily be made by means of waxup try-in.



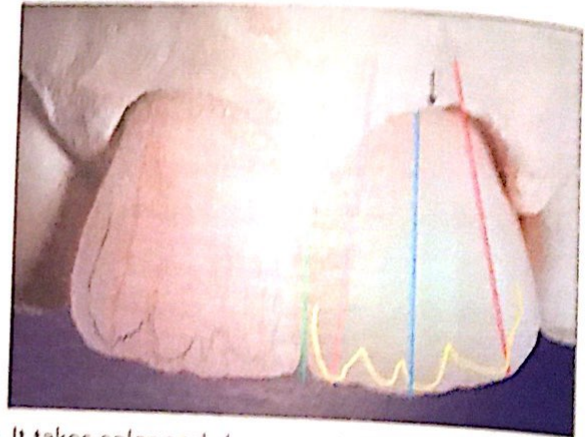
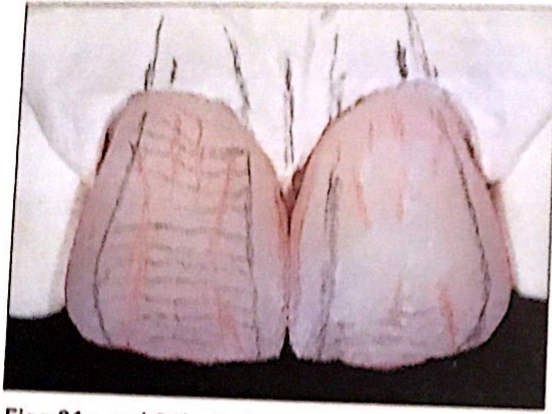
Figs 77a and 77b Metal-ceramic crowns manufactured according to the corrected waxup, during the try-in phase.



Figs 78a and 78b Replacement of the maxillary right central incisor with a metal-ceramic crown. Esthetic compromises had to be made because of abutment position and length as well as proportions of the left central. An acceptable result was achieved by changing the arrangement and height of contour.



Figs 79 and 80 Light transmission and reflection can be influenced through different layering techniques, depending on the core material.



Figs 81a and 81b Architecture alone is not enough. It takes color and shape, and their interaction, to create a natural three-dimensional-like crown.

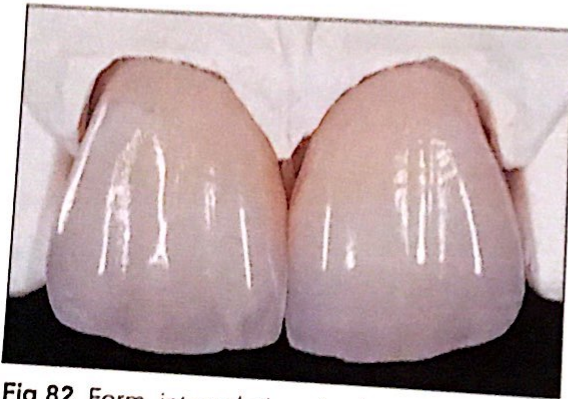


Fig 82 Form, internal play of colors, as well as mamelons and line angles, are necessary for a natural three-dimensional appearance.

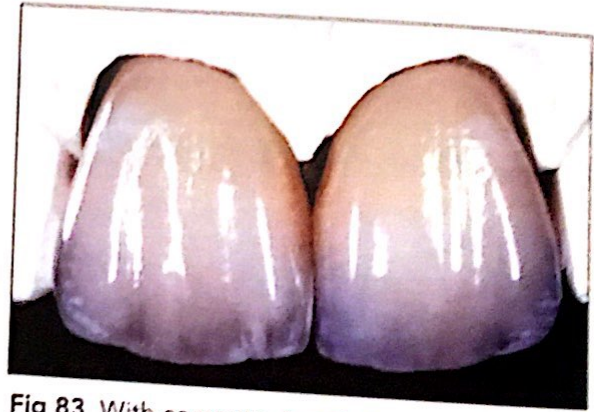


Fig 83 With computer imaging we can change the contrast of the photograph, which helps us to recognize the interplay of the line angles, light reflection toward mamelons, and internal layering.

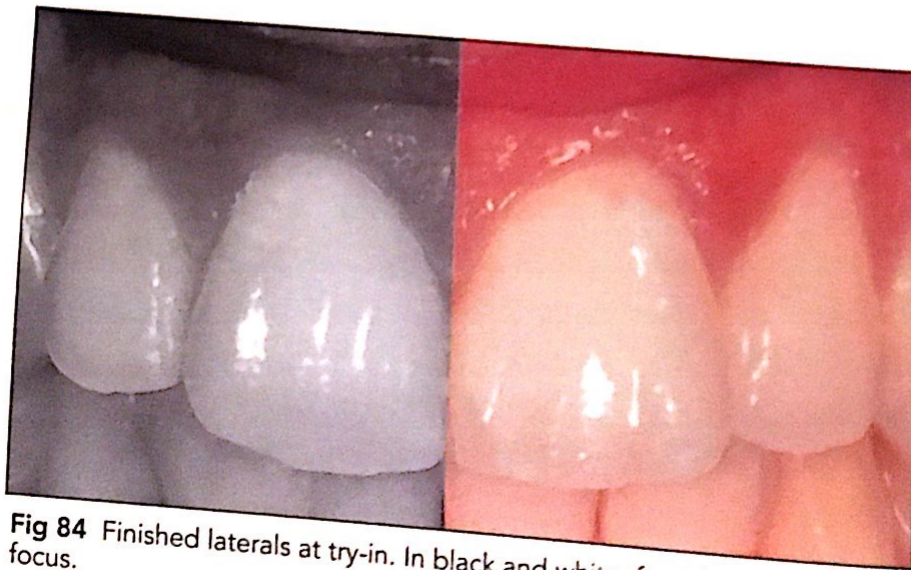


Fig 84 Finished laterals at try-in. In black and white, form becomes the focus.

CASE PRESENTATION

(Figs 85 to 95)



Figs 85a to 85c In many cases such as this, necessary changes of the vertical dimension can be tested and corrected in the provisional phase.



Figs 86a and 86b Preparations.



Figs 87a to 87c The full waxup is manufactured according to the new fixed vertical dimension with provisionals. It is easier to determine the length of the teeth and the position of the incisal line in wax.



Figs 88a and 88b Framework try-in, Procera and metal-ceramic restorations.



Figs 89a to 89c After finishing. Note transition between Procera and metal-ceramic restorations.



Fig 90 Opposing teeth direct color and incisal form.



Fig 91 Satisfying corresponding colors; the height of contour lines vanish in sulcus.



Fig 92 Phonetics affect the decisive position and length of the incisal line.



Fig 93 The harmony angle and phonetics are good aids for determining the vertical dimension.



Fig 94 Restored teeth in profile.



Figs 95a and 95b Before (left) and after treatment. Note the improvement of the facial proportions.

In addition to the patient's features, phonetics also may provide valuable information for a harmonious integration. In prosthetic reconstruction, the speech pattern defined in logopedics is used to design the length and position of the anterior teeth.²⁷

CONCLUSION

The final result is the product of technical know-how and understanding, the patient's esthetic sense, as well as the influence of the dental practitioner.

A perfect imperfection is not achievable in every patient treated; perhaps one should be satisfied with a compromise consisting of an imperfect but individually achievable perfection.

ACKNOWLEDGMENTS

The ideas presented on harmonization and esthetic integration of prosthetic reconstructions are based on observations and abandon any scientific research.

Everything we know, built on what we have learned and experiences we have gathered intuitively, flows into our daily work and should be constantly questioned and if necessary improved by the treating team. I have the great fortune to be able to work in just such an environment, motivated and critical in a very positive and constructive way. I would like to express my gratitude to all of my clients and collaborators, especially to: Dr K.H. Meyenberg for his intense and fertile collaboration on which everything mentioned herein is based; Prof Dr C. Marinello and his team for all their help and support; Dr G. Allais for his uncompromising will to perfection. And for their friendship.

This article is dedicated to Mark Anderson and Joop Bakker.

BIBLIOGRAPHY

1. Ahmad I. Geometric considerations in anterior dental aesthetics: Restorative principles. *Pract Periodontics Aesthet Dent* 1998;10:813-822.
2. Allais G, Allais D, Stuck J. Rehabilitation der Gesichtsproportionen bei zahnlosen Patienten. *Teamwork* 1999;2:168-177.
3. Aoshima H. A Collection of Ceramic Works: A Communication Tool for the Dental Office and Laboratory. Chicago: Quintessence, 1992.
4. Bammes G. Die Gestalt des Menschen. Ravensburg, Germany: Ravensburger Buchverlag, 1995.
5. Chiche GJ, Pinault A. *Aesthetics in Anterior Fixed Prosthodontics*. Chicago: Quintessence, 1994.
6. Feher A, Schärer P. Ein klinisches Kompendium Zahnmedizin 2000. Zürich, Switzerland: Verlag KBM, 1999.
7. Fischer J. *Esthetics and Prosthetics: An Interdisciplinary Consideration*. Chicago: Quintessence, 1995.
8. Gebhard W. Modellanalyse und Wax-up beim festsetzenden implantatgetragenen Zahnersatz. *Implantologie* 1993;2:157.
9. Geller W. Wechselwirkung von Licht und Schatten. In: Suckert R (ed). *Funktionelle Frontzahnästhetik*. Munich, Germany: Verlag Neuer Merkur, 1990:83-114.
10. Jordan R, Abrams L. *Kraus Dental Anatomy and Occlusion*. St Louis: Mosby-Year Book, 1992.
11. Kataoka S. *Nature's Morphology*. Chicago: Quintessence, 1993.
12. Kataoka S, Mutoke Y. In Harmonie mit der Natur. *Quintessenz Zahntech* 1999;25:972-981.
13. Lombardi RE. Factors mediating against excellence in dental esthetics. *J Prosthet Dent* 1977;38:243-284.
14. Lombardi RE. A method for the classification of errors in dental esthetics. *J Prosthet Dent* 1974;32:501-513.
15. Magne M, Magne P. Schlüsselement eines umfassenden ästhetischen Behandlungskonzeptes. *Dental Labor* 1999;4:545-555.
16. Magne P, Magne M, Belser U. Natural and restorative oral esthetics. *J Esthet Dent* 1994;6:15-22.
17. Magne P, Magne M, Belser U. The diagnostic template: A key element to the comprehensive esthetic treatment concept. *Int J Periodontics Restorative Dent* 1996;16:561-569.
18. Meyenberg KH, Imoberdorf MJ. The aesthetic challenges of single tooth replacement: A comparison of treatment alternatives. *Pract Periodontics Aesthet Dent* 1997;9:727-735.
19. Nameta Y, Odanaka Y. Anatomie und Morphologie festsitzender Restaurationen. *Quintessenz Zahntech* 2000;26:339-357.
20. Obama T. Klinische Standards für Zahnkronenformen. *Quintessenz Zahntech* 2001;27:400-412.
21. Paul SJ. Smile analysis and face bow transfer: Enhancing aesthetic restorative treatment. *Pract Periodontics Aesthet Dent* 2001;13:217-222.
22. Renner RP. *Anatomie und Ästhetik des mastikatorischen Systems*. Berlin: Quintessenz, 1989.
23. Rufenacht CR. *Principles of Esthetic Integration*. Chicago: Quintessence, 2000.
24. Schärer P, Rinn L, Kopp FR. *Ästhetische Richtlinien für die rekonstruktive Zahnheilkunde*. Berlin: Quintessenz, 1995.
25. Sieber C. Spielarten des Lichts. In: Suckert R (ed). *Funktionelle Frontzahnästhetik*. Munich, Germany: Verlag Neuer Merkur, 1990.
26. Sieber C. Variationen der Lichtleitfähigkeit und Leuchtkraft. *Quintessenz Zahntech* 1992;18:1123-1151.
27. Stuck J. *Die totale Prothese*. Fuchstal, Germany: Concept & Text Verlags GmbH, 1996.
28. Yamamoto M. *Metal-Ceramics*. Chicago: Quintessence, 1986.
29. Yamamoto M, Miyoshi Y, Kataoka S. *Grundlagen der Ästhetik Konturierungstechniken für Metallkeramik-Zahnersatz*. Berlin: Quintessenz, 1991.

Highlights

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Walter Gebhard

CONCEPTUALISM AS AN ART FORM

Walter Gebhard is one of those rare individuals who can be truly classified as an artist. His approach to reproduction of the human dentition is preconceived in a way that makes his achievements as delicate as they are stark. His use of porcelain as a substrate is analogous to a painting on a canvas: he instills a lifelike semblance of natural teeth within the raw, lifeless nature of porcelain. His international collaboration with Konrad Meyenberg and other leaders of esthetic and reconstructive dentistry uniquely illustrates the significance of having a laboratory counterpart in restorative dentistry. The beginning of his career was built on strong European concepts of traditional restorative dentistry and, as an art form, blossomed into the creative nuances and spontaneous methodology which he freely offers in published material. The ever-changing science of dental laboratory technology is constantly challenged with new materials, methods, and approaches. Mr Gebhard has risen to the occasion and experimented dynamically with these contemporary materials and methods to modify traditional concepts in a unique way that distinguishes him as one of the leaders in laboratory technology. It is refreshing to know that after the years of establishing guidelines of traditional restorative techniques, new trends not bound by a specific paradigm are continually emerging with new creativity.