Direct Restorations

Marius Bud

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Clinical Steps for Working Protocols

Springer

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I dedicate this book to my mother, Anastasia, who constantly encouraged me and unconditionally supported in developing a clinical and academic dental career.

Preface

Restorative dentistry is a dental specialty studied from the early years of the faculty, direct restorations being the most frequent treatments performed by dentists. Students are being trained in restorative dentistry since college. Moreover, many postgraduate courses are available for dentists, organized by universities or companies, with the aim of continuing their dental education and training, since the evolution of materials, instruments, equipment, and their scientific validation is constantly changing our way of working and our perspective. A dentist's practice is driven by the influences of lectures, opinion leaders, and personal beliefs based on one's own clinical findings. Thus, we can see that there are no universal protocols for carrying out a treatment, and paradoxically, different protocols are not mutually exclusive, each being able to lead to clinically valid outcomes.

This book is addressed to dentists, students in their final years of study and partly to dental assistants who perform and assist in restorative treatments. The book approaches these treatments from the clinician's point of view, who's interested in achieving good, predictable, and long-term prognostic results in an efficient manner with respect to clinical principles proven and validated by academic studies. Most of the techniques presented are established techniques, some well-known, others lesser known. In addition, some of our own techniques that have been developed throughout our 20 years of uninterrupted clinical experience are also presented: *the "symmetric cusp" occlusal modeling technique, the Teflon roller technique, the matrix-connected palatal key technique*.

In the whole chain called "restorative treatment," the treatment itself represents only one component link of a chain. In this book, we have tried to identify and

present to the reader the whole chain, including the technical support, ergonomics, working technique, and workflow of the treatment steps. All while giving scientific arguments and personal opinions on different theoretical knowledge or working techniques. We have tried to keep the language simple, non-sophisticated, so that the work is easy to read and understand. The iconography is represented by diagrams and photographs from personal case studies.

The tremendous support offered by my family, friends, and colleagues made this work possible. I greatly valued and took into consideration our collaborators' pertinent suggestions when on different topics discussed in this book: Dr. Stefan Jitaru (magnification), Assoc. Prof. Sanda Cîmpean, Dr. Radu Bulat and Dr. Sergiu Spătaru, Dr. Razvan Pop (endodontics)—Chaps. 1, 2 and 3, Assoc. Prof. Ada Delean—Chaps. 1, 2, 3, 4, 5 and 6; Dr. Mircea Mureșan (periodontology)—Sect. 3.2; Dr. Pieter-Jan Swerts, Dr. Andrei Voicu, Dr. Ionuț Aiordachioaei (restorative and prosthetic dentistry) Chaps. 5, 6, 7, 8 and 9. Special thanks to our colleague Dr. Tudor Secasan for correcting the English text.

Cluj Napoca, Romania Marius Bud

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Part I

Preparing the Dental Office and the Patient for Restorative Treatments

Equipment, Ergonomics and Magnification Workflow

1

The basic principles of restorative dentistry have not changed significantly in the last 30 years. Aesthetic, biological, and mechanical criteria are now strictly respected by dentists in the spirit of refinement based on scientific arguments, the evolution of materials, and the general worldwide trend toward aesthetics and biomimicry. This trend has been helped by the rapid development of materials and equipment and bringing many elements of technological progress while generating contradictory evidence. The abundance of instruments and materials in recent years has led to a competition for aesthetic, faster, more predictable, and minimally invasive treatments as close as possible to the natural situation and with an increasing success rate. All these requirements, which imply precision and finesse, are challenging for the operator to meet without using magnification accompanied by good lighting. This chapter will be focusing on the dental operating microscope, the dental loupes, minimally invasive instruments for tooth preparation, dental matrices, instruments and materials for finishing and polishing, lamps for light-curing materials, and photo/video documentation of cases.

1.1 Tools and Equipment

1.1.1 Dental Operating Microscope (DOM): Overview and Brief History

Since the early 2000s, the principles of minimally invasive dentistry have been increasingly and widely promoted in dentistry [1]. David Clark, founder of the Academy of Dental Microscopy and one of the pioneers of dental microscopy, stated: "the greatest indicator of long-term tooth retention is the volume of healthy natural tooth tissue that remains after we finish treating a tooth."

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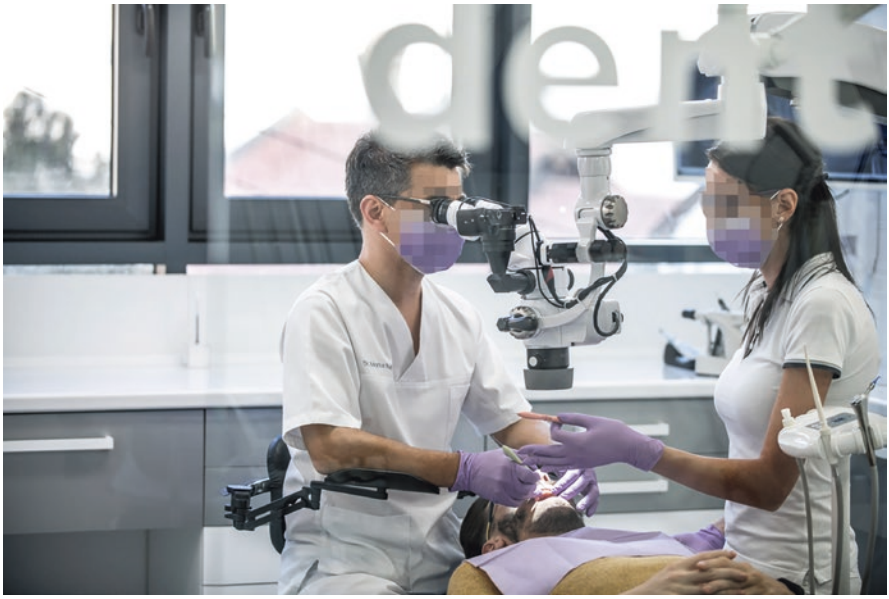

Fig. 1.1 The clinical use of a dental operating microscope

The use of magnification helps to achieve this. In recent years, the dental operating microscope has become increasingly common in dental offices, being used both for endodontic and restorative, prosthetic, or surgical treatments (Fig. 1.1).

The components of a dental operating microscope (DOM) are the stand and arms, the optical body, the light source, and various accessories.

1.1.1.1 Stand and Arms

The dental operating microscope can be placed above the patient by attaching it to a stand using articulating arms. The stand and arms represent the optical body's balance and stabilizing devices. There are several different ways of mounting: on the floor, on the wall, on the ceiling, or on the dental chair.

The floor stand is the most popular mounting method because it is equipped with wheels that allow easy movement and the positioning of the DOM for ergonomic adjustment in the dental office. The floor stand's weight is considerable, in the order of tens of kilograms, and it has a pillar to which the rest of the construction is hinged to. In this way, it can ensure the stability of the DOM. Disadvantages include the taking up space on the floor and the fact that it can propagate vibrations from the floor to the optical head, causing discomfort to the dentist. The floor stand is usually placed on the dentist's nondominant hand side (most often the left side), as far away as possible from the patient's head, in order to free up space for the dental assistant's chair and to facilitate access from other parts in the room.

Attaching the microscope to a side wall frees up floor space but makes it difficult for the dental assistant to reach the working position. As a rule, the wall opposite to

the dominant hand is preferred, as far away as possible from the patient's head, for ergonomic benefits.

Attaching DOM to the ceiling is one of the best solutions in terms of freeing up space in the office, but like wall fixing, it has the drawback of it being permanently fixed and not allowing any changes in position.

Articulating arms keep the optical head in the optimum vertical and horizontal working position. The horizontal position is maintained by several short arms that move in the horizontal plane and whose movements are controlled or blocked by mechanical or electromagnetic brakes. The mechanical brakes are based on the pressure principle exerted by a handle of a softer material, usually brass, over a rigid metal pinion. The pressure is applied by tightening a screw until the arm stays in place when no force is exerted, but it can be pulled easily when the operator desires. It is neither desirable nor practical for the brakes to be fully tightened during work or between patients, as this will lead to wear of the brass handle. However, the breaks can be locked entirely for transport. The electromagnetic brakes can be found on modern, more expensive models, which allow complete joint locking and are operated with a push of a button. This ensures a higher level of stability during work.

A pantograph arm handles vertical movement with a mechanical or gas spring. The weight of the optical head varies depending on the accessories mounted on it. The gas spring obtains tension with a spring to maintain its variable weight. It must be adjusted so that the optical head remains balanced in the desired position to easily allow movement to another position.

1.1.1.2 Optical Head

The optical head is the most important part of the whole microscope from the dentist's point of view. The optical head is a mechanical-optical construction that allows observation of an area of the operating field at the desired magnification. The optical head consists of all the elements attached to the DOM arm: eyepieces, objective lens, and magnification changer (Fig. 1.2).

The eyepieces consist of two tubular structures whose position can be adjusted to match the interpupillary distance. Each eyepiece is equipped with a pair of lenses with a standard parameter, coded with the letter ×: 10×, 12.5×, and 16×. The eyepiece lenses allow dioptric adjustment and adjust the light projection according to the length of the viewer's eye. Eyepieces usually have detachable or telescopic rubber extensions called cups. The cups intend to standardize the position of the eye relative to the eyepiece lens to a comfortable distance.

The letter × stands for the eyepiece magnification power, which is different from the magnification power of the microscope, and choosing it has practical importance: the higher it is, the greater the depth of the image, but the smaller the size of the field of view. The 12.5× magnification factor is considered an average parameter that provides sufficient depth and a wide field of view. Some professionals prefer 10×.

Hinged are the two eyepieces to the optical head body, and they are either fixed or have the possibility to change the angle. If fixed in their position, it is usually at

Fig. 1.2 Optical head of a dental operating microscope

an angle of 45°. Variable position eyepieces can usually be set from 0° to 180°, having the advantage of increased ergonomics.

The lens allows the light to enter the microscope and it is coded with the factor "f." This represents the distance to the object to be examined, which can be fixed or variable.

The fixed lens can be f 170, f 250, f 320, and more, which means we can place the object to be examined at the distances measured in millimeters to get a sharp and focused image. The lens will be chosen according to the practitioner's need for space, the specific practice (endodontics, restorative dentistry, periodontology, and others), and the dentist's height. These lenses allow for fine adjustments, similar to the micro vision of laboratory microscopes, by operating a rotary knob.

Variable magnification lenses usually bear registered trade names, e.g., *VarioFocus*, *VarioDist*, etc., and can cover a broader range of distances, such as 200 to 400 mm. Variable objective lenses, although expensive, provide clear ergonomic benefits and ease of operation.

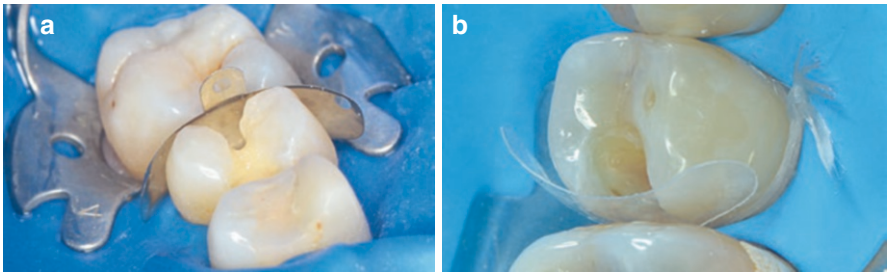

Fig. 1.18 Sectional matrix made of metal (**a**) or clear celluloid (**b**)

Fig. 1.19 Palodent V3 Triodent sectional matrix system

1.1.4.3 Sectional Metal Matrices

A professional matrix system offers the clinician several size options for matrices, rings, and wedges, as well as the accessories needed to handle them: matrix ring forceps and unique autolocking matrix pin tweezers (Fig. 1.19) (*V3 Triodent—Dentsply Sirona; Composi Tight 3D Fusion Garrison—Henry Schein*) (Fig. 1.20).

The Palodent V3 Triodent matrix system (Dentsply Sirona, Germany) consists of the following:

1. Matrix ring forceps (Fig. 1.21) for ring handling. The forceps has ring-holding tweezers so that the ring does not rock in the tensioned forceps. After clamping on the ring, the forceps can be locked by sliding a rod. This allows the ring to be handed to the operator, with the tweezers spread apart, under tension so it can be applied to the buccal and oral embrasures. The inner side of the forceps handles has a notch that is necessary to activate the ring by squeezing it when it is likely to expand after multiple uses and steam sterilization.
2. Self-locking pin tweezers (Fig. 1.22) for handling matrices, dental wedges, and WedgeGuards. The pin tweezer has a pin that fits into the perforations of the matrix or the dental wedges, or WedgeGuards, allowing firm fixation without

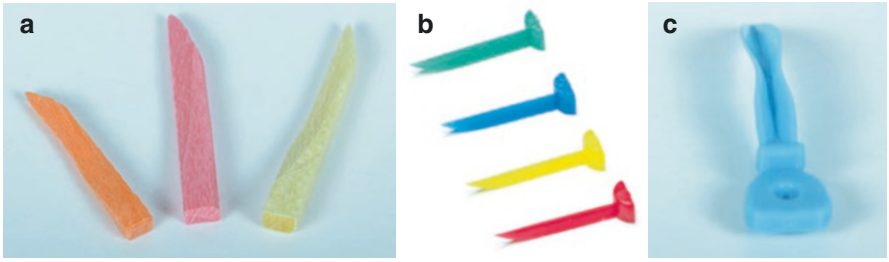

Fig. 1.30 Wooden wedges (**a**), plastic wedges (**b**), V-shaped plastic wedges (**c**)

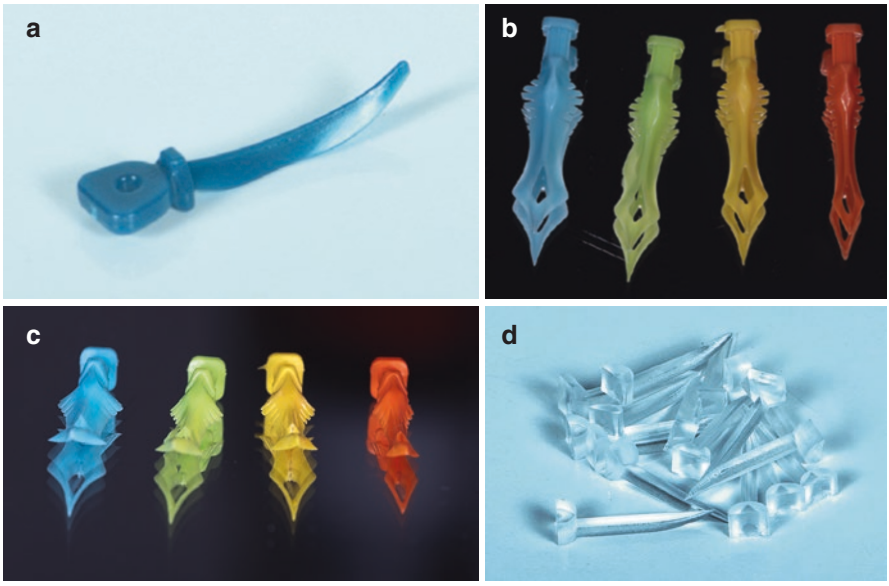

Fig. 1.31 Wedges of different shapes and sizes

The wedges designed in different shapes were in order to be used more straightforwardly and to achieve better results:

- Dental wedges that have the shape of a yataghan with the tip of the wedge slightly raised so that there is no risk of the tip protruding on the opposite side under the rubber dam sheet or piercing the dental papilla during the insertion (Fig. 1.31a).
- Anatomical-shaped dental wedges to allow the matrix to be tightly fixed on the tooth (Fig. 1.31b, c).
- Transparent plastic dental wedges such that when they are used together with transparent celluloid matrices, they can allow a better composite material light-curing by the passage of light during the process (Fig. 1.31d).
- Light-reflecting interdental wedges to improve the composite's polymerization in the gingival edge area.

Fig. 1.51 Minimal set of photographs and the dentist's positioning

Fig. 2.6 Basic instruments and materials set up for direct restoration

7. Pulp protection or limitation of preparation and expectation: direct capping and indirect capping (Sect. 3.7)

In order to perform a cavity preparation and the direct restoration (in the case of a cavity that does not require any duplication technique, nor does it require contact with the subgingival limits), the necessary instruments and materials are made ready (Fig. 2.6), starting with anesthesia.

(C) **Direct composite restoration:**

1. Matrix Selection and Application (Chap. 4)
2. Transformation into class I cavity using different wall restoration techniques (Sects. 4.1, 4.2, and 4.3)
3. Filling the cavity with composite layering or bulk and then achieving occlusal morphology (Chap. 5)
4. Finishing, occlusal adjustments, and polishing (Chap. 6)
5. Postoperative indications for the patient, follow-up scheduling, and failure of management (Chap. 10)

Briefly, the preparation of a medium or deep cavity is followed by disinfection, liner application, etch conditioning (Fig. 2.7), adhesive application, application of fluid or bulk composite, filling the cavity with composite, achieving occlusal

Fig. 3.8 Tracing the cavity margins on silicone with an explorer (**a, b**) and the extraoral composite application on the key for palatal wall restoration (**c**)

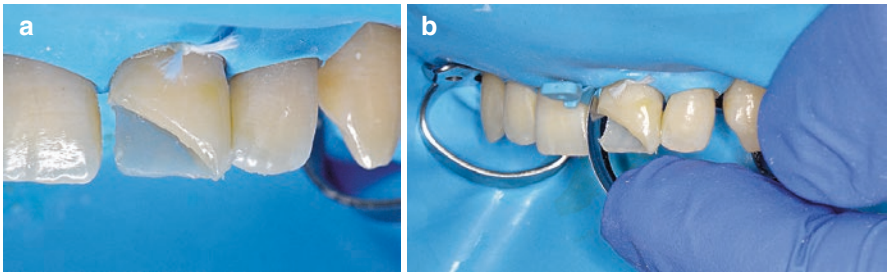

Fig. 3.9 Palatal wall after light-curing the composite and removing silicone key (**a**); mounting a metal sectional matrix in a vertical position for proximal wall restoration (**b**)

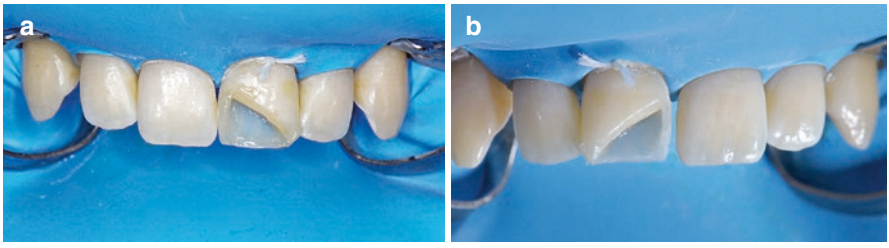

Fig. 3.10 Restored proximal wall with (**a**) or without interdental contact (**b**) with the adjacent tooth

7. Add the dentin composite shades according to the biomimetic layering technique (e.g., described by Vanini [1]) or any other simplified technique (see Sect. 5.3).
8. Application of the buccal enamel layer.
9. Checking the excess proximal material, making macro- and microtexture elements, and finishing and polishing the restoration (Fig. 3.11).

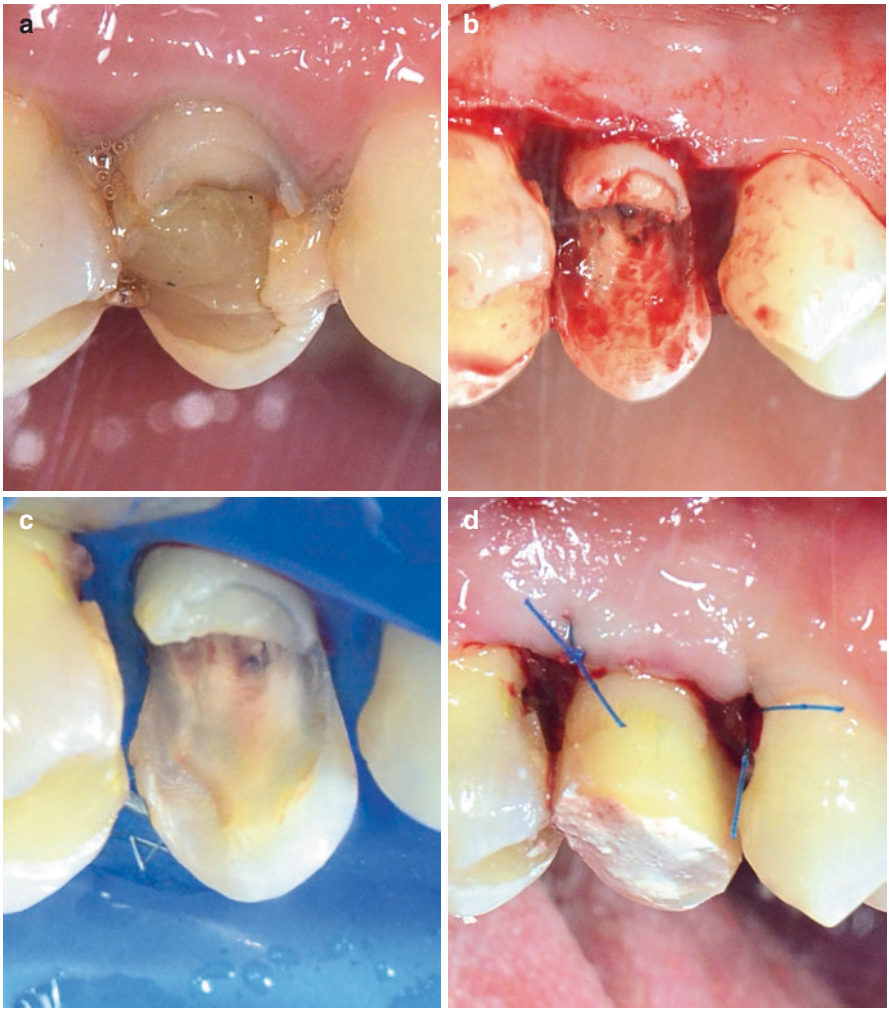

Fig. 3.19 Initial image of an improper direct restoration, extensive mesial and distal subgingival infiltration (**a**); incision, bone resection, and suture (**b**); rubber dam isolation (**c**); final result after crown lengthening (**d**)

Difficulties that may occur	Potential solutions
Emergence of black triangles	Periodontal surgery. Sealing the triangles with composite resins
Occurrence of dentinal hypersensitivity through the exposure of the radicular surface	Periodontal surgery and the use of desensitizing substances
Occurrence of radicular resorption	Avoiding the traumatic touch with the burr during bone resection
Temporary tooth mobility	Immobilization

Fig. 3.43 Liquid rubber dam syringe

Fig. 3.44 Cord made by rubber dam sheet

Additional Clamps

The mesial fixation of the rubber dam sheet can also be achieved by applying additional clamps (Fig. 3.45a). Moreover, the apical positioning of the rubber dam sheet can be achieved by applying type B gingival tissue retractors (Fig. 3.45b).

Additional Customizations

The rubber dam isolation is not indicated for patients with permanent or temporary respiratory problems. If, however, the mouth-breathing patient agrees to the use of the dam, a perforation should be made in the upper part of the sheet (Fig. 3.46a).

The upper part of the rubber dam sheet should not cover the nostrils, limiting the patient breathing (Fig. 3.46b), but it should be stretched, folded, or cut to free the nostrils (Fig. 3.46c).

A disposable textile or paper protector can be placed under the dam sheet to protect the cheeks, absorb perspiration, or avoid direct contact between the skin and the rubber dam sheet material in case patients are allergic to these materials (Fig. 3.47a–c).

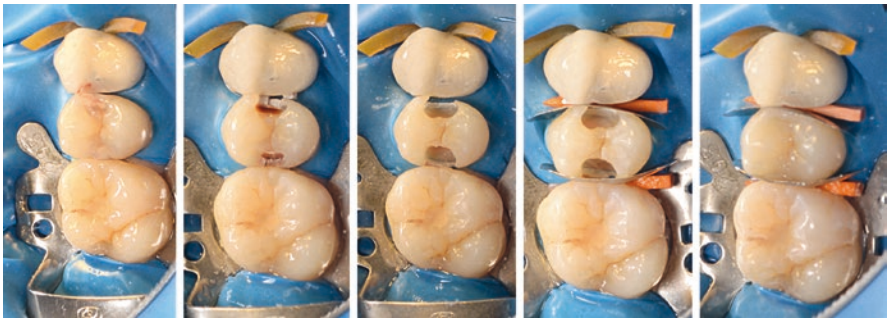

Fig. 3.50 Group isolation with a rubber dam and elastic cord to restore a premolar

better visibility and access [27]. Furthermore, in the case of proximal-distal cavity restorations, it is recommended to place the dam clamp on a tooth as distally as possible, preferably two teeth distally positioned, to provide sufficient space for matrix system placement [28]. When preparations open to neighboring teeth, the neighboring tooth whose cavity will be opened must also be included in the mesial or distal isolation. Group teeth isolation offers several advantages:

- When preparing class II cavities and MOD, the dentist has the opportunity to examine the proximal surfaces of neighboring teeth, which are often affected by caries.
- When filling class II cavities and MOD, the matrices must come into contact with the adjacent tooth in order to achieve the correct contact.
- Continuous monitoring of the adjacent teeth morphology to achieve an aesthetically and functionally integrated direct occlusal restoration.
- Placing the dam clamp next to the tooth being worked on gives more working space and maneuverability in all stages: preparation, matrix fitting, and filling.

Potential Accidents or Adverse Effects of Installing the Rubber Dam Isolation Systems

The clamps fitting must be done carefully because their sudden use can traumatize the marginal periodontium leading to consecutive gingival retraction [29]. Applying clamps on teeth with cervical demineralization may cause enamel loss at this level [30].

At the periodontal level, avulsion can occur accidentally. If clamps are placed on prosthetically restored teeth, the ceramic work may accidentally break off, which is why metal clamps should not be placed over prosthetic work. If necessary, plastic clamps can be used, which are less aggressive.

Difficulties that may occur	Potential solutions
The rubber dam is not entirely cut open when the perforator is pressed, and the cut piece is still trapped inside (Fig. 3.51)	Trying to pull it off easily can lead to pinching and may cause the dam to tear. Tightening the perforator may achieve a better cut, or it may be decided to change the perforator with a new one

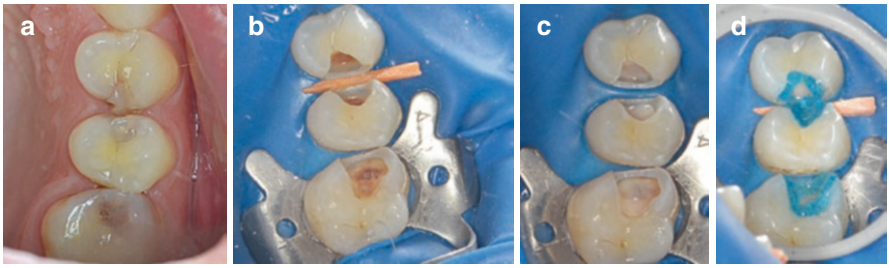

Fig. 4.18 Improper occluso-distal composite restoration on tooth 24; mesial caries on tooth 25 and tooth 26 (**a**); cavities prepared (**b**) and liner applied (**c**); selective etching (**d**)

Fig. 4.19 Sectional matrix fixed with ring and interdental wedge on tooth 26 (**a**); bulk flowable composite (SDR) up to 1.5 mm away from the occlusal surface (**b**); restoration of the marginal ridge on tooth 26 by packable composite and application of matrices on the premolars (**c**)

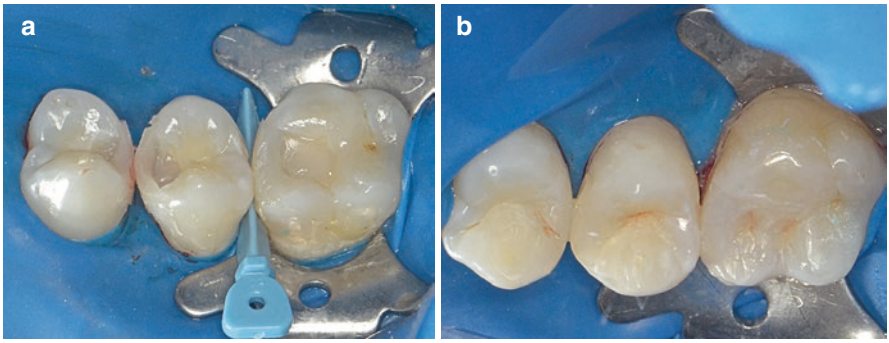

Fig. 4.20 Class II cavities transformed in class I (**a**); final restorations on teeth 24, 25, and 26 (**b**)

Difficulties that may arise	Possible solutions
Arbitrary positioning of the matrices to mirror cavities	Arranging the matrices so that the space is evenly distributed
The impossibility of determining the level of the marginal ridges if initially they were not preserved without a landmark	The level will be set according to the present ridges, and the final adjustment will be made during the occlusal adjustments stage

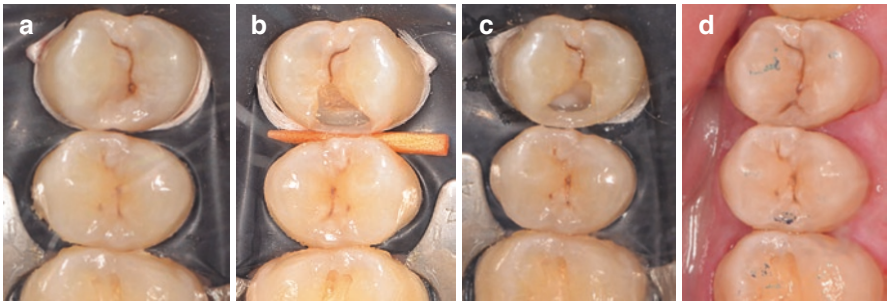

Fig. 4.24 Initial image of a distal carious lesion on tooth 14 (**a**); ocluso-distal cavity prepared (**b**); later transformed into a class I cavity by restoration of the distal wall (**c**); final image of the direct restoration on tooth 14 with application of brown pigment (**d**)

made from a packable composite by one of the techniques described (centripetal, simultaneous, successive, essential lines, etc.).

4.2.7 Injection Technique

Main idea: Filling a prepared cavity can be achieved by injecting a flowable composite with a packable heated composite using a transparent conformer (matrix or a clear stent).

Using the injection technique makes it possible to make direct restorations quickly and minimally invasively, with a predictable aesthetic result. The technique follows a straightforward procedure, with maximum control over each step.

The technique can be performed for class II cavities using transparent matrices (Fig. 4.25), but for more extensive frontal or lateral restorations, it is necessary to create a transparent stent (Fig. 4.26) based on a conventional or digital wax-up. A flowable composite is injected into this mold and light-cured (see Chap. 8).

The injection technique involves several peculiarities of proximal cavity preparation, the most important being the elimination of the concept of cavity preparation in occlusal and proximal slots/cassettes. If occlusal involvement occurs, the authors recommend that this cavity be prepared and filled separately, just like a class I cavity. Afterward, the proximal disk-shaped cavity will be prepared, flattened, and slightly deep so that the composite is applied "on the tooth" rather than "in the tooth." In this way, the C-factor is significantly reduced or even eliminated.

The injection of the composite imposes certain particularities, such as:

- Less geometric preparation of a proximal cavity.
- Use of a transparent anatomically shaped matrix.
- Thin applicator tips for flowable composite (G20).

Fig. 4.34 Incorrectly restored interdental contacts on premolars

- The matrix may slide or bulge too much when positioning the matrix ring, or it may be inadvertently pushed into the adjacent cavity because it encounters no obstacle.
- Obtaining a too-accentuated proximal contour in cases of extensive destruction, considering that the matrix does not meet resistance to diminish its curvature.

This technique can be used successfully when there is reasonable control of the positioning and a certainty that the space intended for the adjacent restoration will not be invaded. After the restoration of the first tooth, the matrix will be mounted on the second tooth, which will also be restored (Fig. 4.35).

Difficulties that may arise	Possible solutions
Obtaining an over-contoured restoration, extended toward the adjacent tooth	Redoing or reducing size with rotary instruments
Matrix positioning instability	Additional fixation with fingers, liquid dam, and Teflon tape

4.3.4 Two-Matrix Technique for Mirror Cavities

Main idea: This technique involves the simultaneous mounting of the matrices (Fig. 4.36) to distribute the interdental space properly so that each matrix initially has a fixation point on the other matrix. Next comes the restoration of one tooth, removing the matrix from it to restore the second tooth with only one matrix in place (Fig. 4.37).

Overflowing old fillings that create interdental food retention can often lead to cavities on adjacent teeth. In these cases, it is necessary to remove the inadequate filling and to prepare the cavities on the two teeth. These are classic cases of mirror cavities. Mirror cavity preparation is most frequently performed simultaneously for efficiency and ergonomics of work with an interdentally placed wedge for pre-distancing and papilla protection (Fig. 4.38).

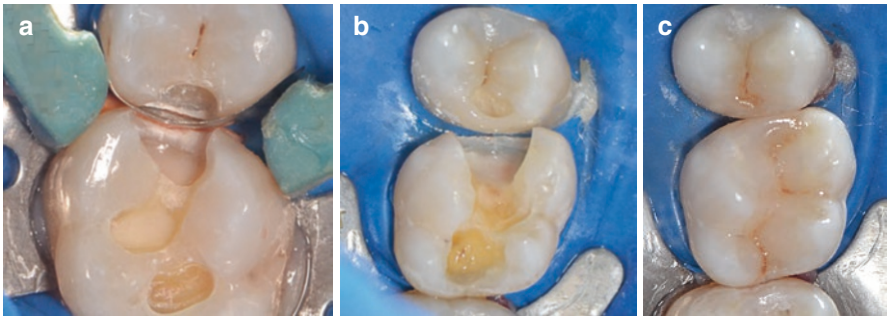

Fig. 4.35 Mounting the matrix on a single tooth (**a**) for the restoration of the proximal wall (**b**) in the case of mirror cavities; the final restorations (**c**)

Fig. 4.36 Simultaneous mounting of matrices to restore a mesial cavity on tooth 16 and mesial and distal cavities on tooth 15

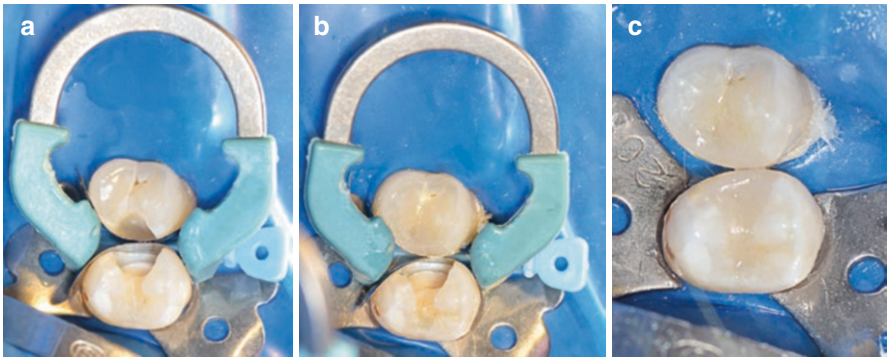

Fig. 4.37 Simultaneous application of sectional matrices in the case of two premolars on which mirror cavities were prepared (**a**); removing one of the matrices after restoration of one tooth (**b**) and restoration of the second premolar with only one matrix in place (**c**)

Fig. 4.45 Mirror proximal caries. Preparation. Restoration (▶ https://doi.org/10.1007/000-bqm)

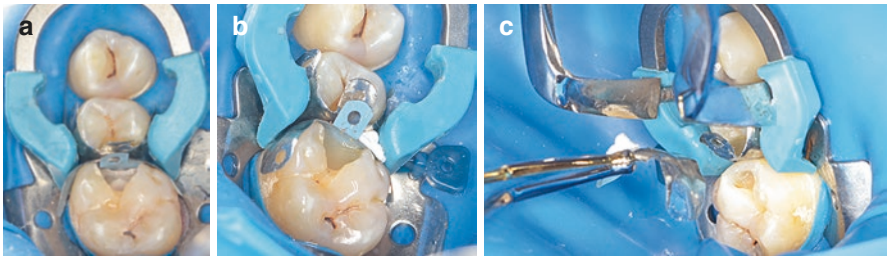

Fig. 4.46 Sectional matrices in place (**a**); flowable bulk composite in the cavity on the molar (**b**); marginal ridge restored on the molar and removal of matrix from this tooth (**c**)

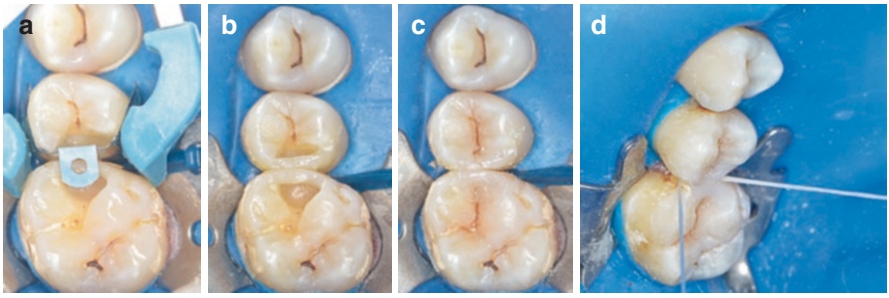

Fig. 4.47 Application of bulk composite and restoration of the marginal ridge on the premolar (**a**); the two class I cavities after the restoration of the proximal walls (**b**); the final restorations after the application of pigments (**c**); checking the interdental contact with the dental floss (**d**)

4.3.5 Matrix-in-Matrix Technique

The main idea: Sectional matrices can be fixed by clamping inside another circular matrix or in the saddle matrix for particular cases of direct restorations.

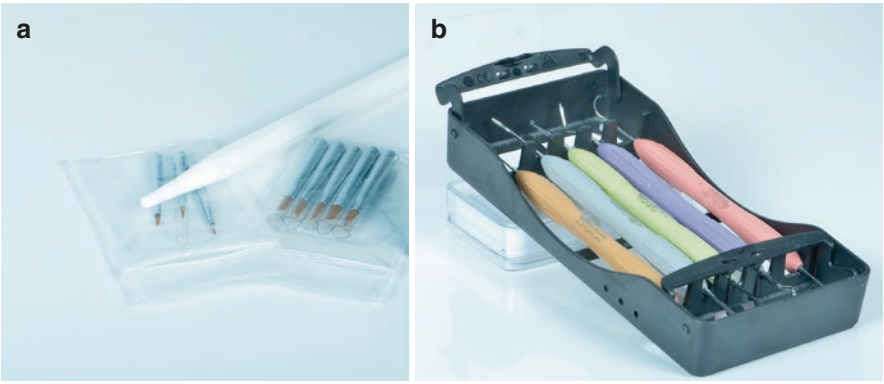

Fig. 5.3 Brushes for modeling composite resin (**a**); LM-Arte Composite Resin Modeling Kit (**b**)

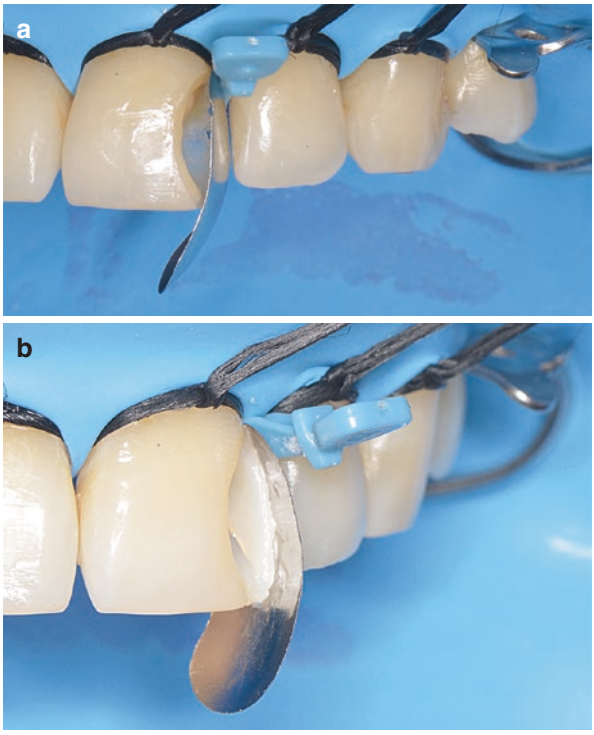

Fig. 5.4 Restoration of the enamel composite proximal wall with a classic Palodent metallic sectional matrix (**a**) keeping its height at the level of the buccal surface (**b**)

Fig. 5.5 The aspect after restoring the palatal and proximal enamel composite wall on tooth 21

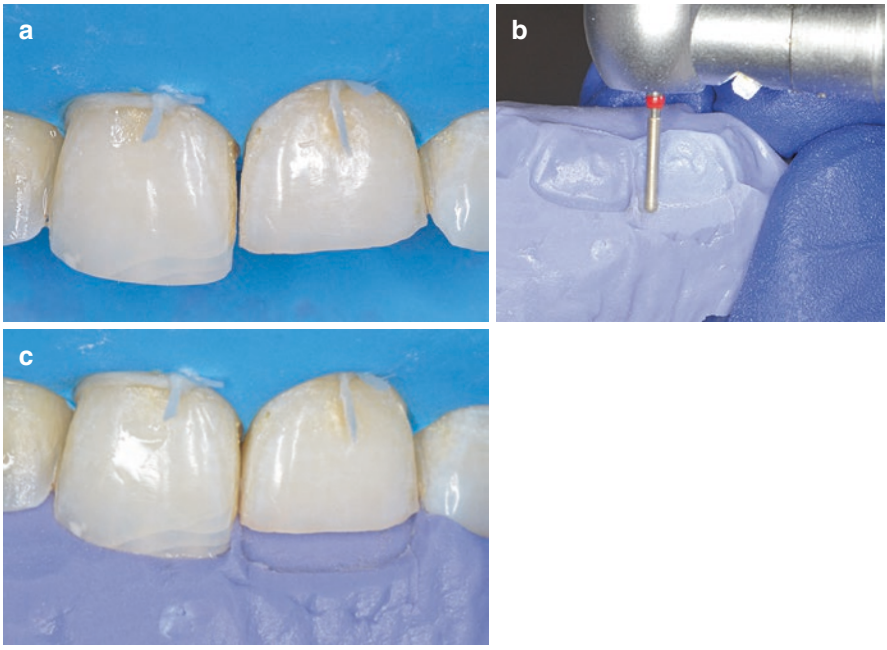

Fig. 5.12 Initial aspect after rubber dam isolation in order to restore tooth 21 where the old direct restoration has dislodged (**a**); palatal impression with putty silicone and individualization by cutting excess silicone with a diamond/multibladed bur (**b**); the aspect of the silicone key after individualization with a bur (**c**)

unnecessary. One shade of dentin and one of enamel is sufficient for most cases (Fig. 5.14b, c).

The mamelons' number, shape, and size will be dictated by the need to achieve symmetry with the adjacent or homologous tooth. The special characterizations (white, transparent, amber, etc.) are achieved by placing the pigments following the map of the adjacent teeth. The instruments that can be used are the spatula for coarse application and modeling, the microbrush for packing the composite, and the modeling brush for improving marginal sealing and fine modeling the composite (Fig. 5.15a–c).

Finishing may be done according to the standard protocol (see Chap. 7).

The incisal anatomy may sometimes be well-defined in the teeth of one arch and absent in the opposite arch (Fig. 5.16). The existence of some orthodontic treatments that have the effect of aligning the incisors may lead to the need for aesthetic restoration of the incisal edges. Careful evaluation on examination may indicate the presence or absence of an internal morphology with lobes and incisal transparencies (Fig. 5.17). The treatment begins with a silicone key, fitting it, and removing any remaining old composite areas from previous restorations (Fig. 5.18a–c). The

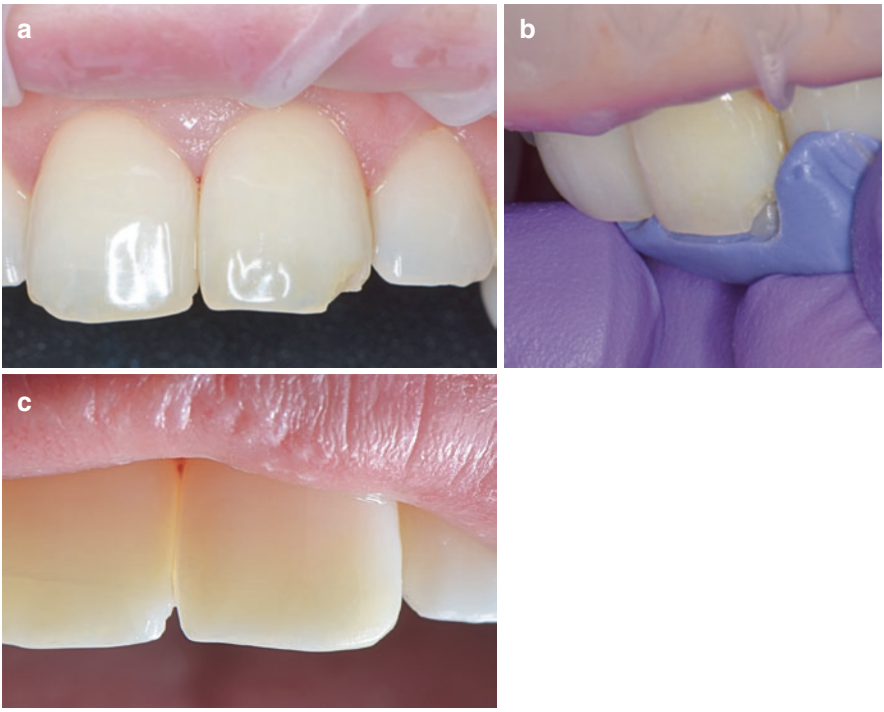

Fig. 5.23 Restoration of the disto-incisal angle on tooth 21 (**a**) using a silicone key individualized (**b**) and final aspect (**c**)

5.4 For Posterior Teeth

One of the main reasons the layering of conventional composites is carried out in the case of posterior teeth is the technical limitation imposed by the manufacturers. They recommend limiting the polymerization thickness to less than 2 mm to decrease the shrinkage coefficient, improve marginal sealing, and decrease cuspid deflection.

Factors affecting polymerization shrinkage include [4]:

- C-factor
- Filler content
- Conversion rate
- Modulus of elasticity
- Water absorption
- Photopolymerization variables
- The influence of the tooth substrate on which the composite material is applied

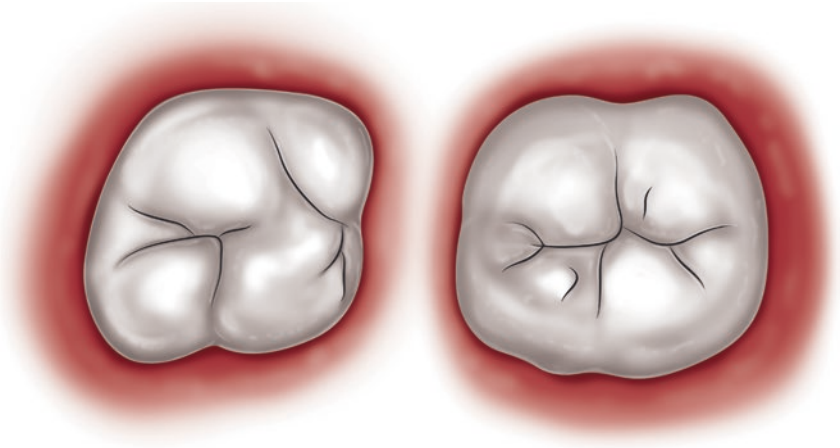

Fig. 5.40 Map of essential lines for mandibular posterior teeth

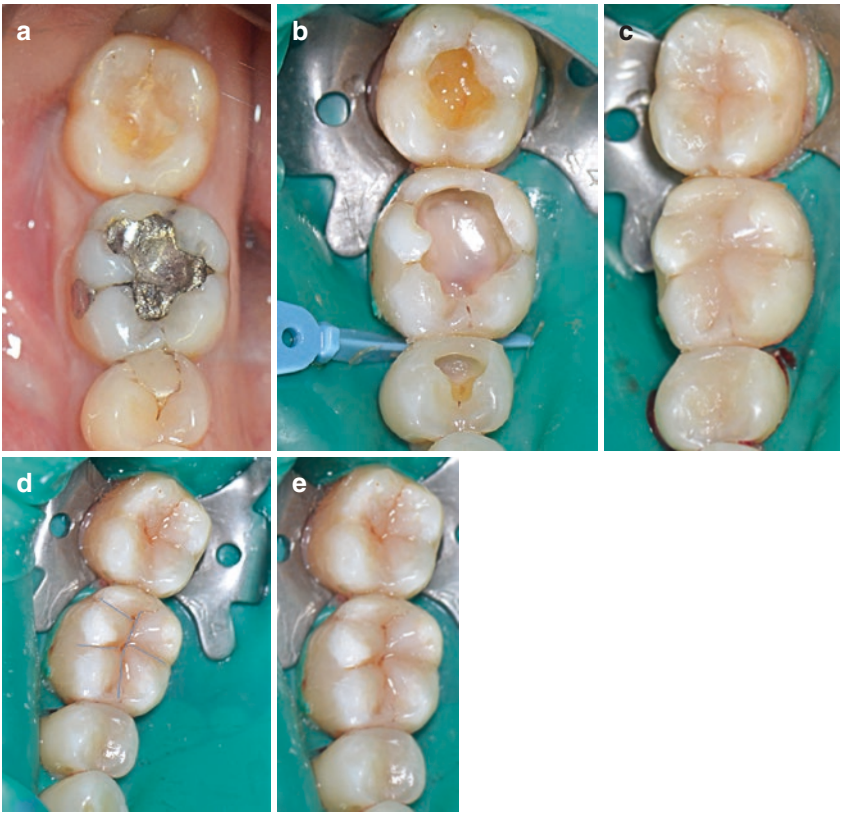

Fig. 5.41 Initial aspect of an old amalgam occlusal restoration inadequate in terms of aesthetics, morphology, and marginal sealing (**a**); aspect after amalgam removal, cavity re-preparation, and liner application (**b**); applying composite resin and drawing essential lines (**c**, **d**); final aspect after applying of pigments (**e**)

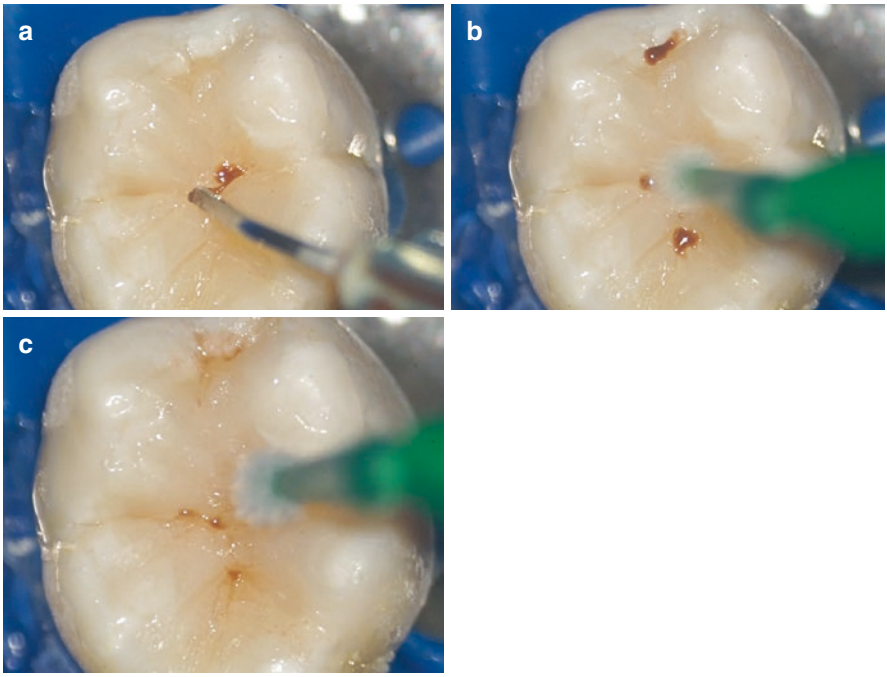

Fig. 5.47 Applying the brown pigment in the pits (**a**) and removing the excess with microbrush (**b**) until the desired result is achieved (**c**)

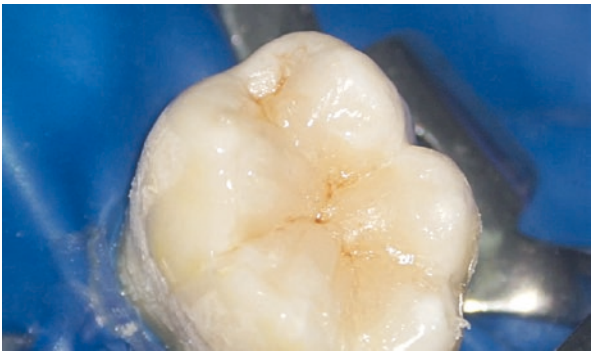

Fig. 5.48 Final aspect of the direct restoration

7. What is the simultaneous cusp technique?
8. What does the occlusal key stamp technique consist of?
9. What is the essential line technique?
10. What is the bilaminar technique for posteriors?

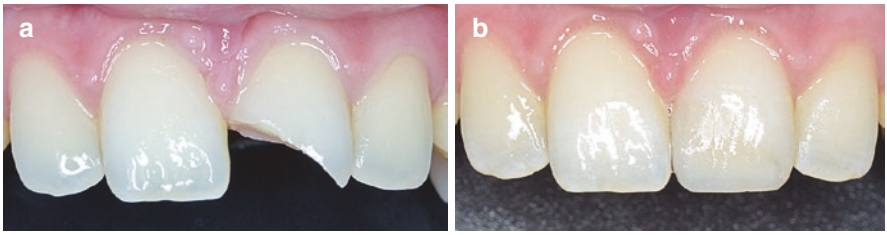

Fig. 7.24 The initial aspect (**a**) compared to the final aspect after restoration, immediately after the removal of the rubber dam sheet (**b**)

(called perikymata). They are extremely thin and close together. They can be made with fine diamond burs with a sharp tip at low speed and used at a 45° angle by continuously moving the bur in the same direction (either from mesial to distal or in the opposite direction). These elements can be polished with soft, fine rubbers or silicone spirals. For a natural glossy appearance, a fine polishing paste based on aluminum oxide or diamond paste with particles below 0.5 microns can be applied with soft brushes at low rotation so as not to scratch the surface (Fig. 7.22c).

The final result evaluated immediately after removing the rubber dam foil can be influenced by the dehydration of the teeth during the treatment (Fig. 7.24).

Difficulties that may arise	Possible solutions
Overheating of the tooth during finishing procedures. Although working without water has the advantage of observing the surface better and keeping the polishing paste longer, it leads to sensitivity	Finishing can be done intermittently using a continuous or intermittent water jet to avoid irreversible pulpal damage caused by overheating the tooth. If the procedure were performed under anesthesia, the patient would be unable to signal the sensitivity or pain caused by overheating to the doctor
Unwanted excessive removal of the composite due to the use of high-speed piece (high-speed piece) diamond burs	Redoing of the composite additive procedure

Conclusion

Finishing previous restorations is done in well-defined stages with specific laborious instrumentation and sufficient time allocated by the doctor to achieve optimal results. This step is of equal importance to layering. The finishing step can be done as an individual session later after the restoration is completed.

Did You Get It?

1. What are the advantages of the finishing stage?
2. What risks can be created by not completing the finishing stage of the restorations?
3. How can contour finishing be performed to remove excess extruded material?
4. How can occlusal adjustments be achieved through shape adjustments and reduction of relief size of the restoration?

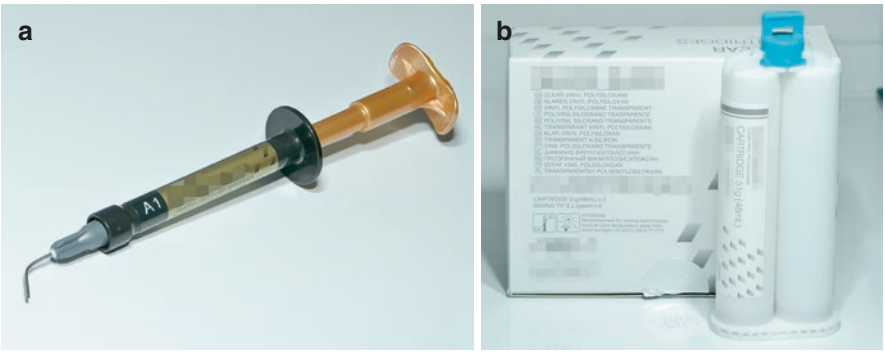

Fig. 8.4 The flowable composite resin for the injection technique G-aenial Injectable (**a**) and transparent silicone for fabricating the stent (**b**)

Fig. 8.5 Transparent stent for injection molding

8.2 Working Technique for Injection

The main idea: The technique requires a wax-up (or digital equivalent), a transparent stent that will serve as a conformer for the injection of composite. The result proposed in the case design will thus be obtained.

8.2.1 Planning

An impression of the initial intraoral situation will be taken conventionally or digitally. The planning is done according to the impression, either conventionally with wax on the model (Fig. 8.6a) or digitally using Digital Smile Design software (Fig. 8.6b). For a digital workflow, the mock-up can be 3D printed or milled. Also, the mock-up can be made conventionally using an impression of the printed model of the proposed final design.

8.2.2 The Fabrication and Preparation of the Stent

In order to make the transparent silicone stent, the model/cast with the wax-up representing the proposed situation is immersed in water for 5 min before the impression (Fig. 8.7a). Lubrication or wetting can help prevent the impression of silicone from sticking to the model/cast.

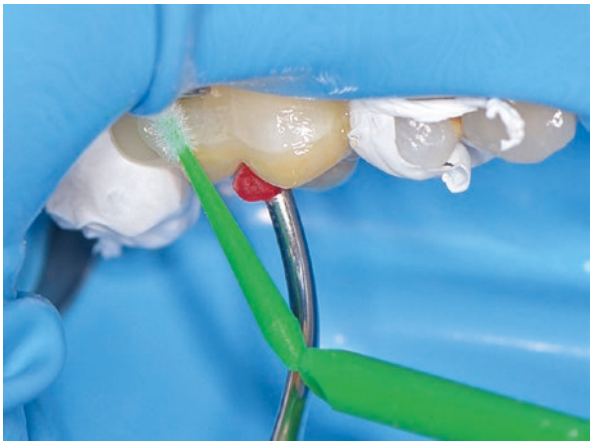

Fig. 9.30 Removing excess cement with a microbrush

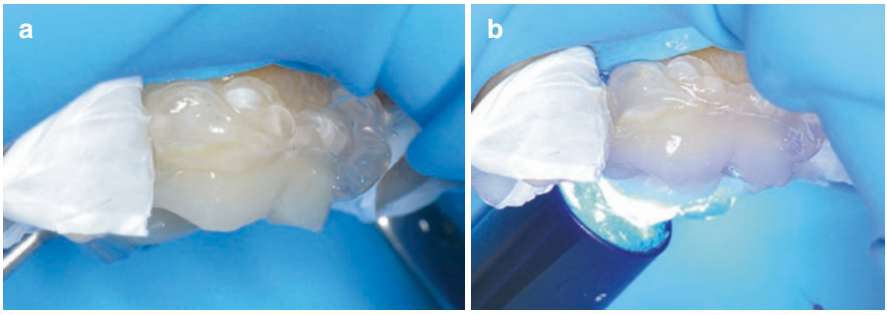

Fig. 9.31 Application of a glycerine layer over the interface area prior to cement polymerization (**a**) and polymerization through the glycerine (**b**)

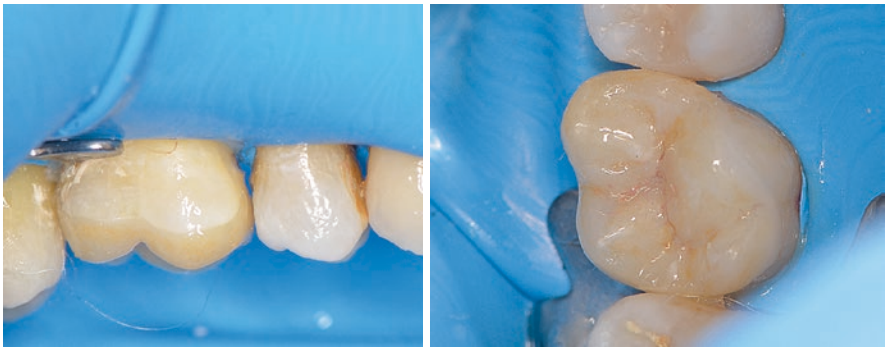

Fig. 9.32 The final aspect after cementation

Fig. 10.4 Juxtagingival fracture of the palatal wall of an upper premolar in which a MOD cavity was previously restored with composite resins and cement base

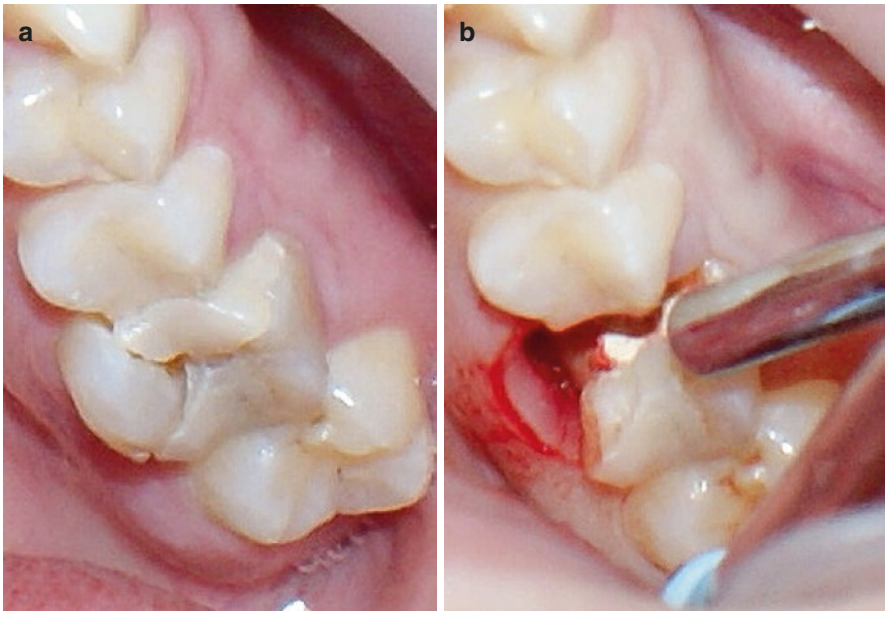

Fig. 10.5 Subgingival fracture of the palatal wall of an upper molar and fracture of the restorative material (**a**) and the clinical aspect after removal of the fractured part (**b**)