Composite Resin Rehabilitation of Eroded Dentition in a Bulimic Patient: a Case Report

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Abstract

Eating disorders such as bulimia nervosa can have a significant impact on the structure of the teeth. Gastric acid not only causes enamel and dentin to dissolve but also causes a progressive deterioration of dental health, which leads to functional esthetic and biological consequences.

According to the classic concepts of restorative dentistry, the rehabilitation of such clinical cases will involve numerous full crowns and root canal treatments, a process which is expensive financially, biologically, and in terms of time.

However, the development of resin composite and adhesive systems has made it possible, today, to reconstruct teeth with minimal dental preparation. This article will look at the dental treatment of a bulimic patient who had numerous serious erosions with a significant loss of dental tissue.

All teeth were reconstructed with a nano-hybrid resin composite and, as very little preparation was necessary, the teeth's vitality was maintained and did not require laboratory collaboration. Furthermore, all biological, functional, and esthetic requisites were successfully met in a very short period of time.

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Introduction

Eating disorders such as anorexia nervosa, bulimia nervosa, and their variants are growing constantly in developed countries.[1,2] Bulimia nervosa, in particular, is a mental disorder characterized by the consumption of exaggerated quantities of food prior to its expulsion from the body, usually through vomiting or sometimes with laxatives. Moreover, it is characterized by a pathological control of body weight which gives rise to the patient having a warped perception of their own body.

From a dental viewpoint, the illness is characterized by a loss of enamel and dentin, without the involvement of bacteria. When the patient vomits, the gastric acids come in contact with the teeth and dissolve the enamel and dentin, resulting in dental erosion. The degree of such erosions is directly linked to the duration of the disorder and the frequency of vomiting.

The loss of dental tiisue brings with it consequences of a biological nature (sensitivity, pulpal exposure) and functional (loss of canine and incisor guidance) as well as esthetic consequences.

There is some discussion as to whether the treatment should only be carried out once the illness has been resolved, or whether it should be undertaken while the condition is ongoing. Some believe that if the disorder persists, the erosions may spread beyond the cervical limits of the restorations. However, if preventive treatment and active treatment are well combined, this can have beneficial effects for the patient, even while the disorder is ongoing.[3]

Subtractive-additive dentistry and additive dentistry

Traditionally, a fixed prosthesis is based on a total crown preparation with consequent sacrifice of sound tissue not directly linked to the pathology which led to the need for treatment. This treatment has been justified essentially by the need to create space to accommodate the prosthesis and to ensure its duration over time. In the days before the existence of adhesive dentistry, this was the approach and the retention of the tooth was guaranteed by macro-retention.

A total crown preparation means sacrificing the sound tissue, and in some circumstances root canal treatment is required, at great biological cost. Furthermore, traditional prosthetic dentistry is also very expensive from a financial point of view.

Ideally, dentistry should be additive and not subtractive. Therefore, only the lost tissues should be replaced with an adhesive material with sound tissues retained.

Since the 1990s, these materials and adhesive techniques have improved enormously,[4] allowing the restoration to be retained without the need to prepare a retentive cavity.

On the basis of this concept, the author will present the oral rehabilitation of a bulimic patient using an additive treatment in composite without dental preparation and which does not require laboratory collaboration, except for diagnostic waxups.

Case report

The patient, a 28-year-old female with a 12-year history of bulimia treated with psychotherapy, had been declared free of the illness 2 years previously. The patient complained of esthetic and functional dental problems (sensitivity to heat and cold, pain when chewing).

She did not complain of muscular or temporomandibular articulation pain. The mandible showed normal mobility, with no restrictions or deviations on opening. The anterior and canine guides were absent.

There was clear evidence of diffused erosions with a notable loss of substance, especially on the maxillary anterior teeth and the mandibular molars. The periodontal condition and hygiene was good.

There were some defective restorations. The space among the anterior teeth was insufficient for future reconstructions (Fig 1).

Fig 1a to d Preoperative view of a 28-year-old patient, who has suffered from bulimia for 12 years and has been free of the disease for 2 years. Erosions, with differing degrees of tissue loss are evident throughout the dentition.

Aims of treatment

The aims of restorative dentistry are to restore health, function, and esthetics with a less invasive treatment. In addition, all objectives should be sustainable for as long as possible and the costs should be contained in order for the treatment to be affordable for as many patients as possible.

There are various ways of achieving these aims. Traditional treatment for this particular case would require numerous full crowns and endodontic treatments, resulting in a lot of tissue being sacrificed. Moreover, the high cost of such treatment would make it unaffordable for many patients, especially patients so young.

There is no published data on the lifetime or inherent complications of this type of treatment in patients of this age, and many authors wonder how often in their lifetimes they will be forced to re-do these types of restorations.[5]

Recently, alternative treatments to these traditional rehabilitations have been published. In cases where there are localized and generalized erosions or abrasions, these alternative treatments exploit the advantages of adhesive dentistry and keep dental preparation to a minimum.[5-10]

Treatment plan

The treatment plan is designed around the reconstruction of teeth that have been affected by the erosive pathology with composite resins. In the present case, this will be applied indirectly (composite shell technique[7]) on the maxillary anterior teeth and on a maxillary first molar (tooth 26, composite onlay). The other teeth were directly reconstructed.

The sequence of treatment was the following:

1) root canal re-treatment of tooth 26 and composite reconstruction with onlay
2) reconstruction of the maxillary anterior teeth at an increased vertical dimension of occlusion
3) reconstruction of the occlusal surfaces of posterior teeth
4) reconstruction of the incisor borders on the mandibular anterior teeth
5) reconstruction of the vestibular surfaces of the teeth affected by erosions.

Reconstruction of the maxillary anterior teeth

Evaluation of a new occlusal and esthetic plan

Subsequent to the loss of dental structure, an increase in the vertical dimensions of occlusion is necessary in order to make space for future reconstructions. This increase is worked out on the basis of the diagnostic waxup.

A 2 mm increase on the articulator pin is sufficient to provide good anatomic form. On the molars, this increase creates a 0.5 to 1 mm space, sufficient for the reconstruction of posterior teeth and not requiring tooth preparation.

A diagnostic waxup is created in order to evaluate the esthetic and phonetic problems and work out the occlusal plan (Figs 2a and b). A silicone matrix is constructed on the waxup and this is loaded with self-curing composite and applied directly in the patient's mouth.

Fig 2a and b Diagnostic waxup of the superior front teeth. The vertical dimensions are lengthened by 2 mm, thus creating space for a functional anatomical form.

After a few minutes the composite is polymerized and the silicone matrix is removed. At this point the esthetic results can be assessed (Figs 3a to e). The central incisors were not dominant and could be lengthened on the waxup. This new form was reproduced in the final restorations (Fig 3f). It is preferable to use a special self-curing composite resin (Protemp™, 3M ESPE, St Paul, MN, USA; Cool Temp®, Coltene Whaledent, Altstätten, Switzerland); due to its elasticity, it can be easily removed and produces very little heat during setting.

Fabrication of the anterior restorations

A transparent silicone matrix was realized on the modified diagnostic waxup (Memosil® 2, Heraeus Kulzer, South Bend, IN, USA) (Figs 4a and b). The model, which reproduced the patient's situation, was isolated with a latex-based insulator (Rubber Sep, Kerr Lab, Orange, CA, USA) (Fig 4c).

The composite is applied to the silicone matrix at a thickness of approximately 0.5 mm. A quantity of dentin mass is applied to the palatal surface while enamel mass is applied on the buccal surface. The silicone guide is then repositioned on the model and the composite light cured through the transparent silicone (Figs 5a to e). At this point, the element is removed from the model, light cured again for 40 seconds on each side separately (Figs 6a to c).

The restorations are then adapted to the model. Their length is shortened to the level of the erosions and finally finished and polished (Figs 7a to f).

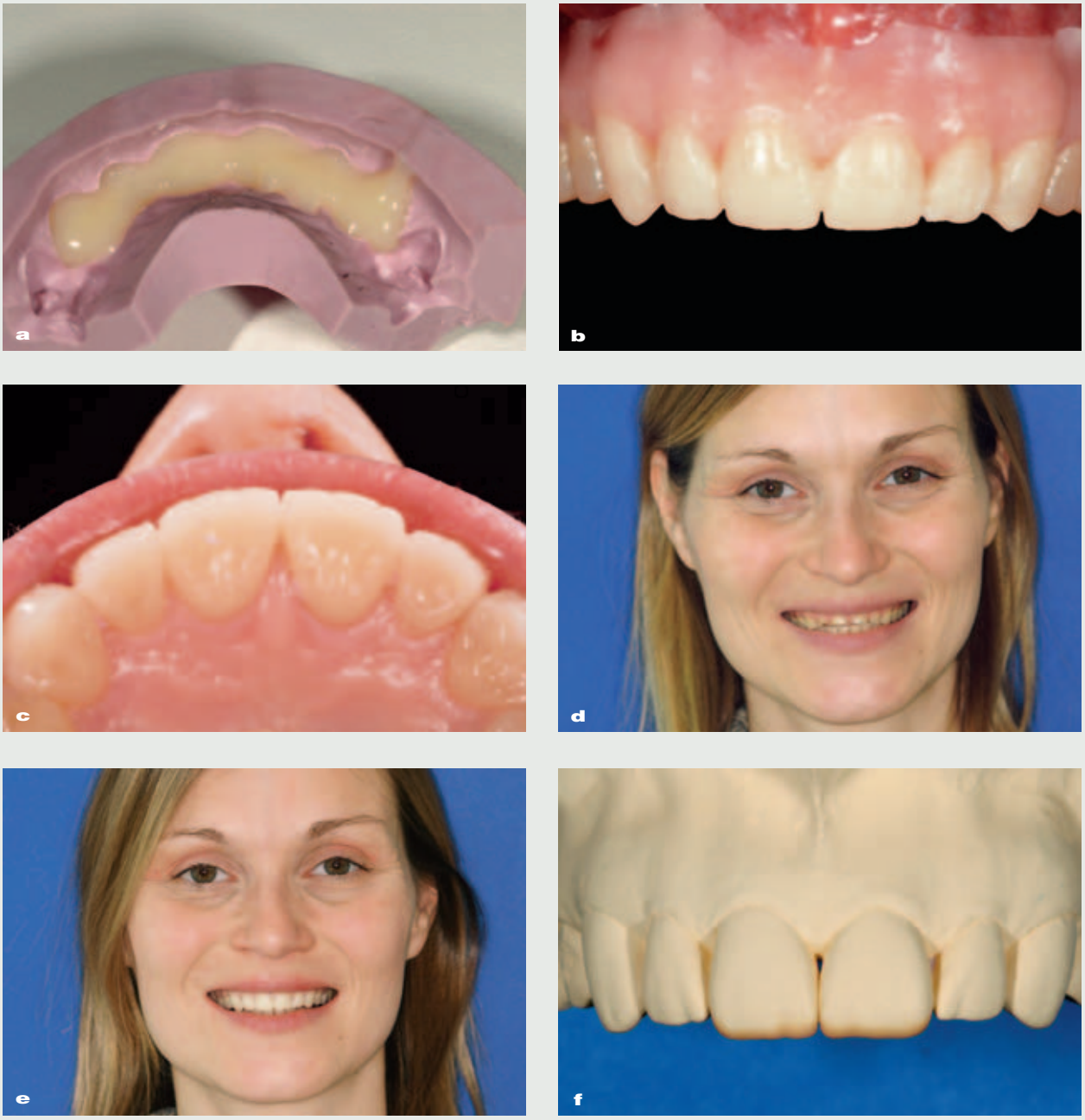


Fig 3 The silicone matrix obtained from the waxup is filled with self-curing resin composite, repositioned in the mouth and left to harden for 3 minutes **(a)**. Once the silicone matrix has been removed, it is possible to evaluate the occlusal plane, the esthetic result, and the phonation **(b and c)**. The reduced thickness and elasticity of this composite makes it easy to remove. The patient before, and 3 minutes after the composite mock up **(d and e)**. In addition to a significant improvement in her smile the face itself appears more relaxed and youthful. However, the central incisors were not dominant and were therefore lengthened by approximately 1 mm **(f)**.

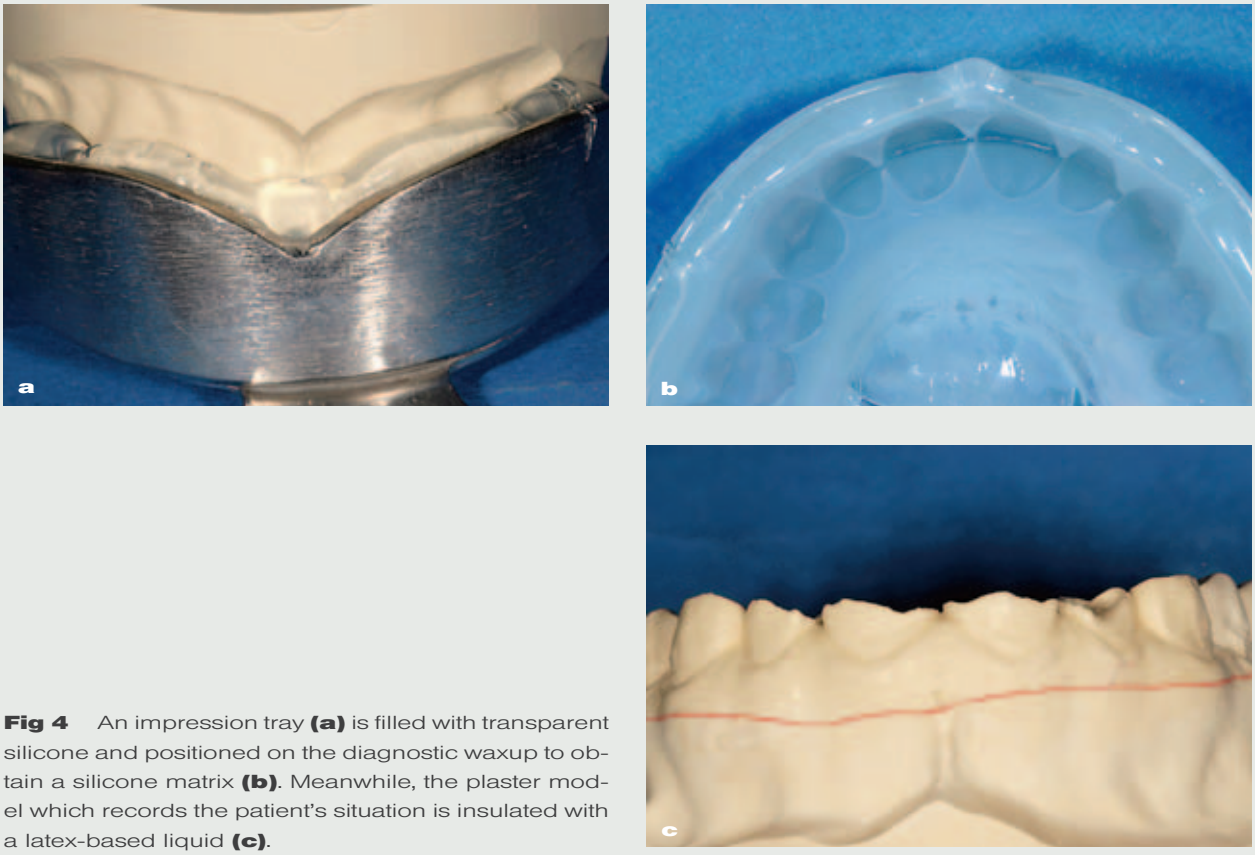


Fig 4 An impression tray **(a)** is filled with transparent silicone and positioned on the diagnostic waxup to obtain a silicone matrix **(b)**. Meanwhile, the plaster model which records the patient's situation is insulated with a latex-based liquid **(c)**.

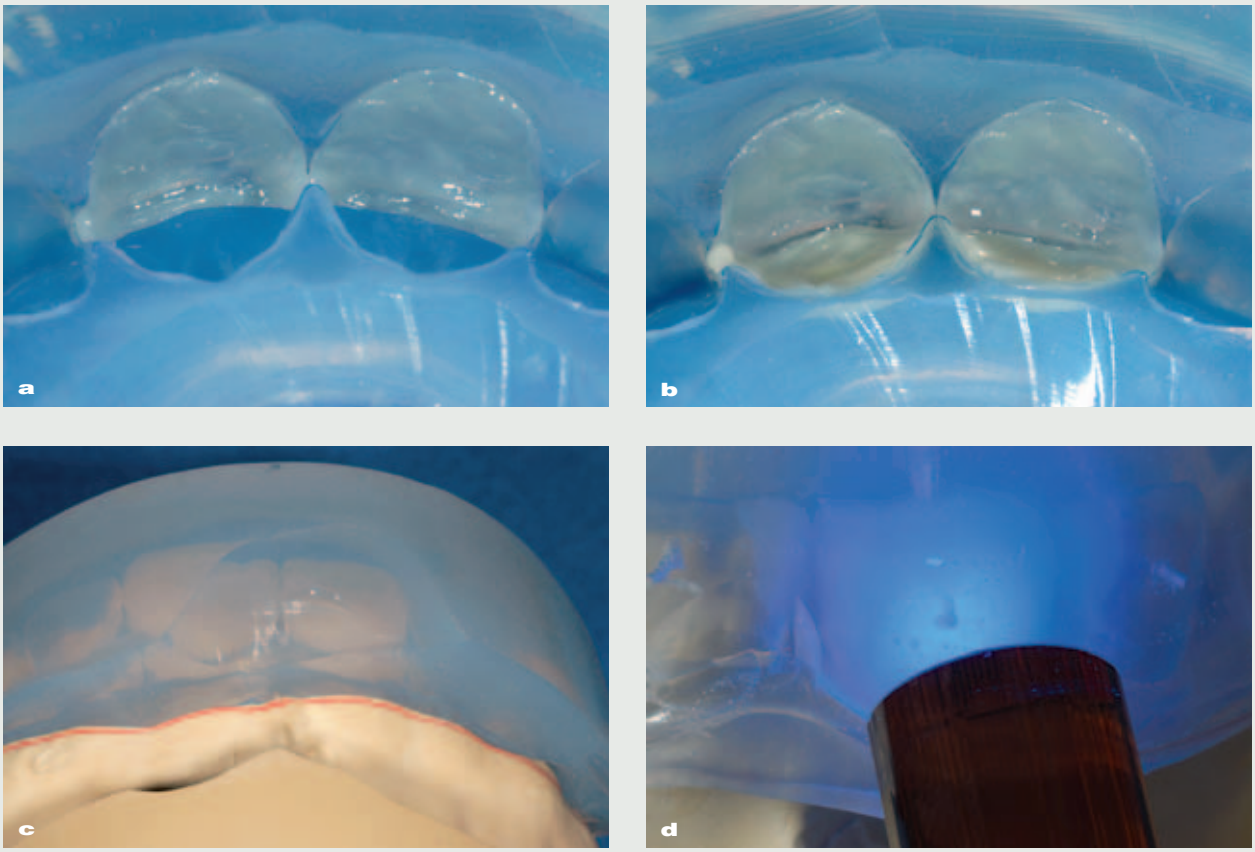


Fig 5 A mass of enamel of about 0.5 mm is positioned on the buccal surface of the matrix **(a)**, a mass of dentin is applied to the palatal surface **(b)**, the matrix is then re-applied to the model **(c)**, and the composite is cured for 40 seconds per surface, through the transparent matrix **(d)**. A diagram is shown of the placement and thicknesses of the masses of enamel and dentin **(e)**.

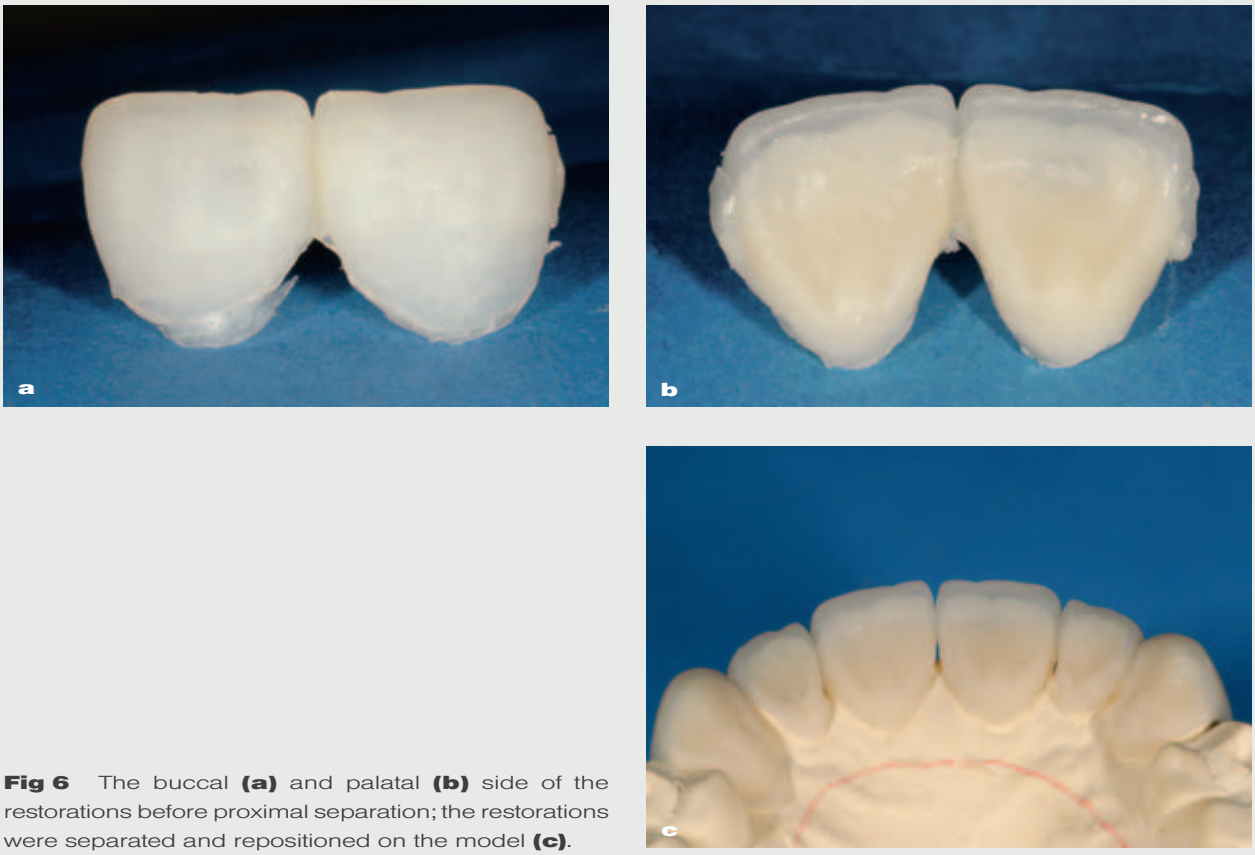


Fig 6 The buccal **(a)** and palatal **(b)** side of the restorations before proximal separation; the restorations were separated and repositioned on the model **(c)**.

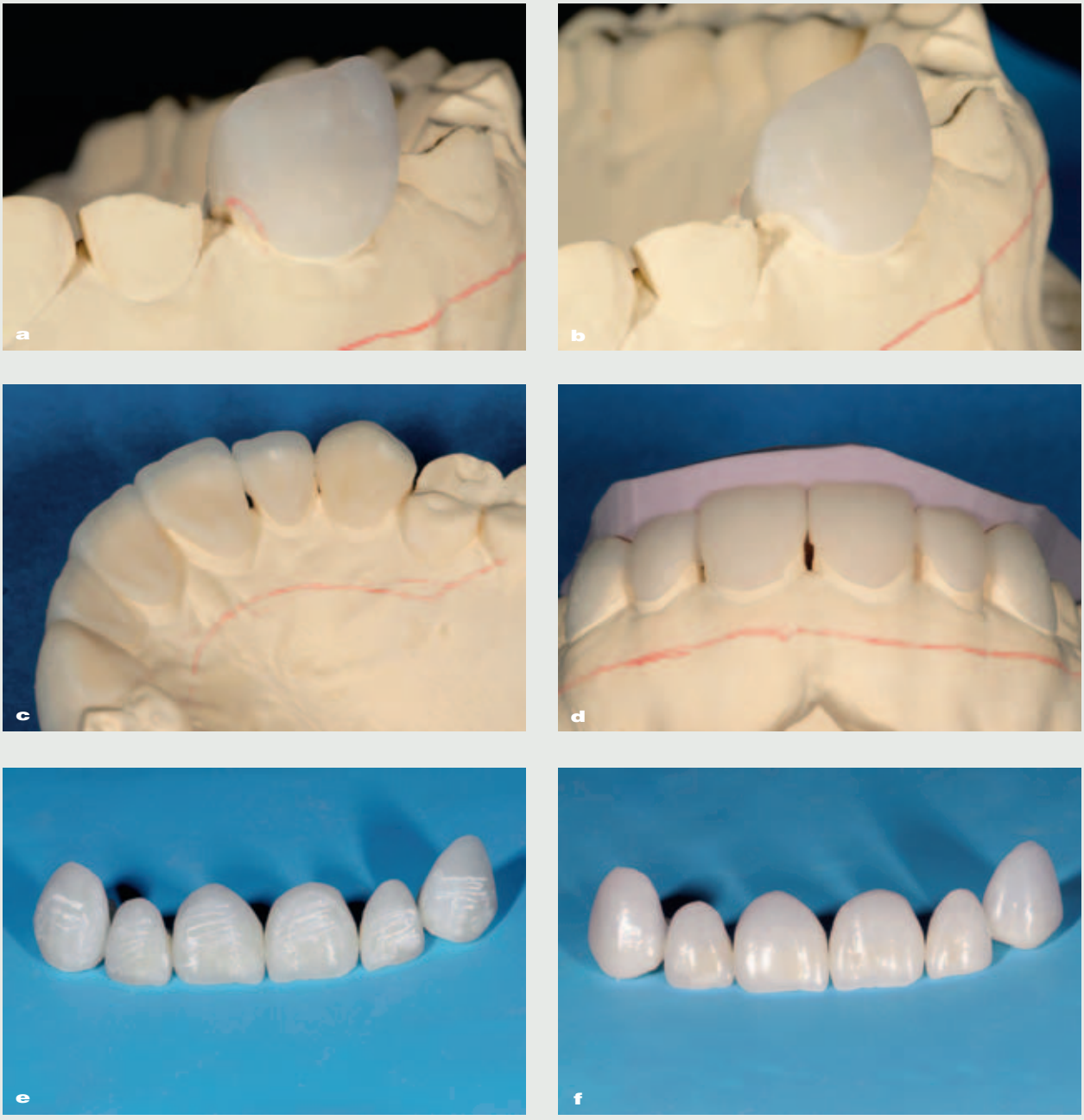


Fig 7 The composite shells are shaped with disks and burs and shortened as far as the level of erosions **(a to c)**. Using a silicone matrix obtained from the waxup, the position of the restorations and their correspondence to the waxup is evaluated **(d)**. The restorations are finished and polished **(e and f)** .

Luting procedures

Before being cemented, the restorations are tried for size, adaptation, and position (Fig 8a). Any gaps will be filled with the adhesive cement. Before applying the rubber dam and proceeding with the cementing, it is necessary to select the dentin to be used as cement and to decide whether the color and saturations are adequate (Figs 8b and c).

After application of the rubber dam, the teeth are cleaned with a fluoride-free paste. No preparation of the teeth is required.

The adhesive procedure uses a three-step "etch and rinse" system. A layer of bonding is applied to the internal part of the restoration and to the external borders, without curing. The restoration is then generously filled with the chosen dentin and applied to the tooth. The excess composite can be modeled on the tooth and restoration so as to obtain a smooth transition from natural tooth to restoration. Each surface is cured for 40 seconds using a high power irradiation method and the same procedures are then applied to all of the remaining teeth. When all restorations have been luted, the teeth can be polished with abrasive disks, abrasive interproximal strips, and rubber points (Fig 9).

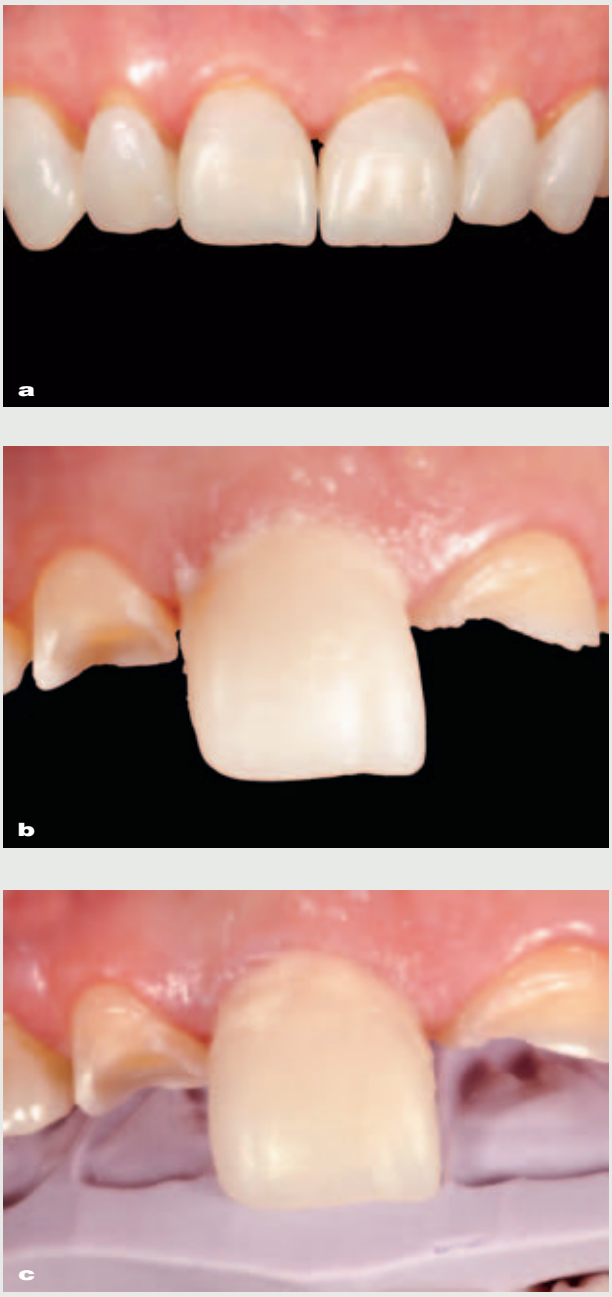


Fig 8 The restorations are tried on. Any gaps will be filled during the adhesive cementation **(a)**. Before the luting procedures, the restoration is filled with a dentin mass and positioned onto the tooth **(b)**. It is now possible to see the final aspect and, if necessary, make changes to the color or saturation of the dentin mass which will be used for cementing. Using the silicone matrix, the correct position of the restoration is checked **(c)**. The composite is then carefully removed from the restoration.

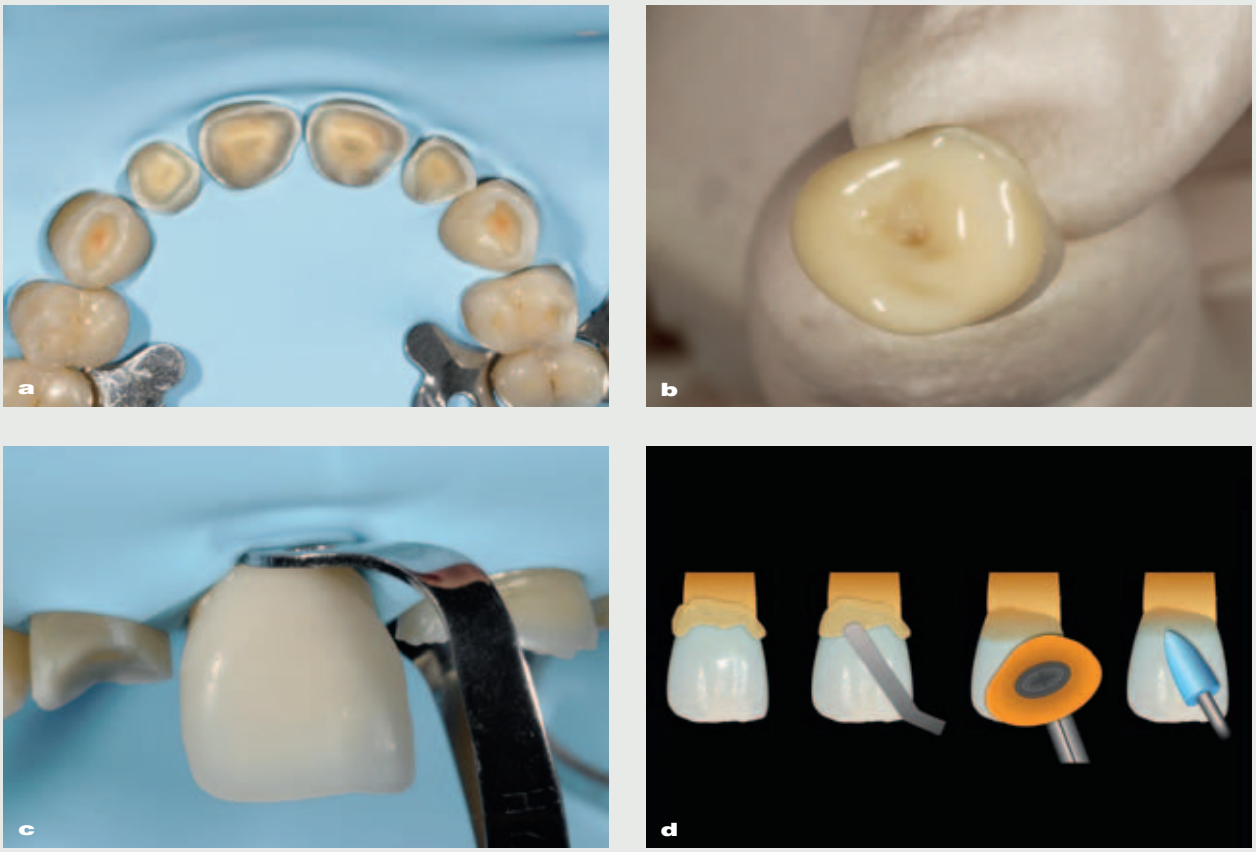


Fig 9 After isolating the operative field with a rubber dam, the teeth are carefully cleaned using cups, brushes, and a non-fluoride prophylaxis paste **(a)**. The adhesion procedure continues using a three-step adhesive system. A layer of bonding is applied with a brush to the inside of the restoration and is not cured but filled with a mass of dentin **(b)**, and positioned on the tooth **(c)**. Any excess of composite is spread over the restoration and tooth with a spatula and brush in order to obtain smooth margins without gaps **(d)**. Once the restoration has been polished, the same procedure is then carried out for the other restorations. The restorations 2 days after cementation **(e)**.

Restoration of posterior and mandibular anterior teeth

Following the increase in the vertical occlusal dimension, the posterior teeth do not make contact (Fig 10). Two days after the maxillary anterior restorations have been cemented, work can begin on the posterior and mandibular anterior teeth. The occlusal surfaces and some of the vestibular surfaces will need to be reconstructed

For occlusal surfaces, this can be carried out by ceramic or composite overlay, either with the indirect method or by applying matrix-guided composite[8,9,11], or by using a traditional direct technique.

Several authors have obtained a high success rate in the medium term using the direct technique to reconstruct teeth that have been subjected to erosions or abrasions.[12,13] Yet another research paper has demonstrated that micro-filled composites applied either directly or indirectly are not suitable for reconstructing posterior abraded or eroded teeth.[14]

In the present case, all reconstructions were carried out with a nano-hybrid composite applied with the direct technique. Naturally, the direct composite reconstruction, having no antagonist reference, does present major difficulties and requires greater clinical experience. However, this technique is much cheaper for the patient.

Dental preparation is also not necessary for the reconstruction of premolars. The composite is applied directly and replaces the lost dental tissue. Each cusp can be recreated with a single layer using a small amount of enamel mass (Figs 11a to f).

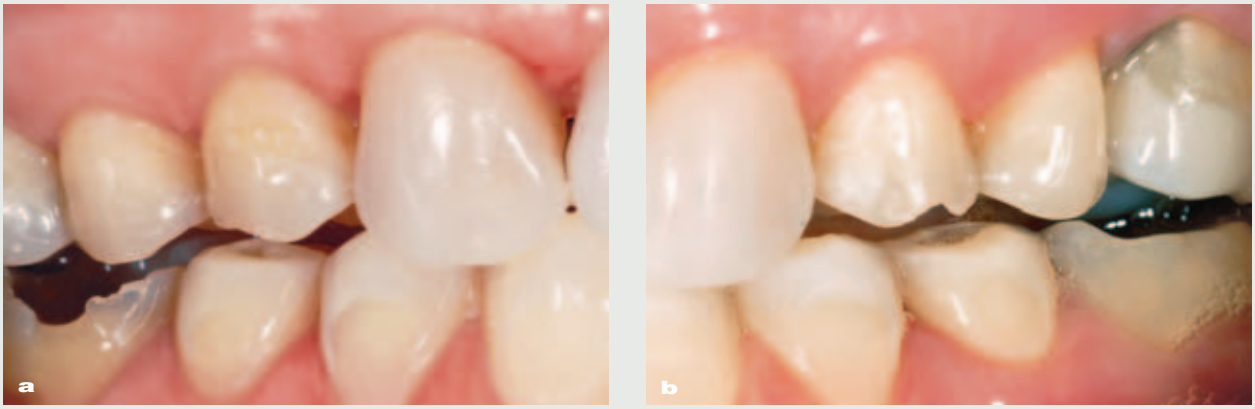


Fig 10a and b Having increased the vertical occlusal dimension, the posterior teeth are no longer in contact.

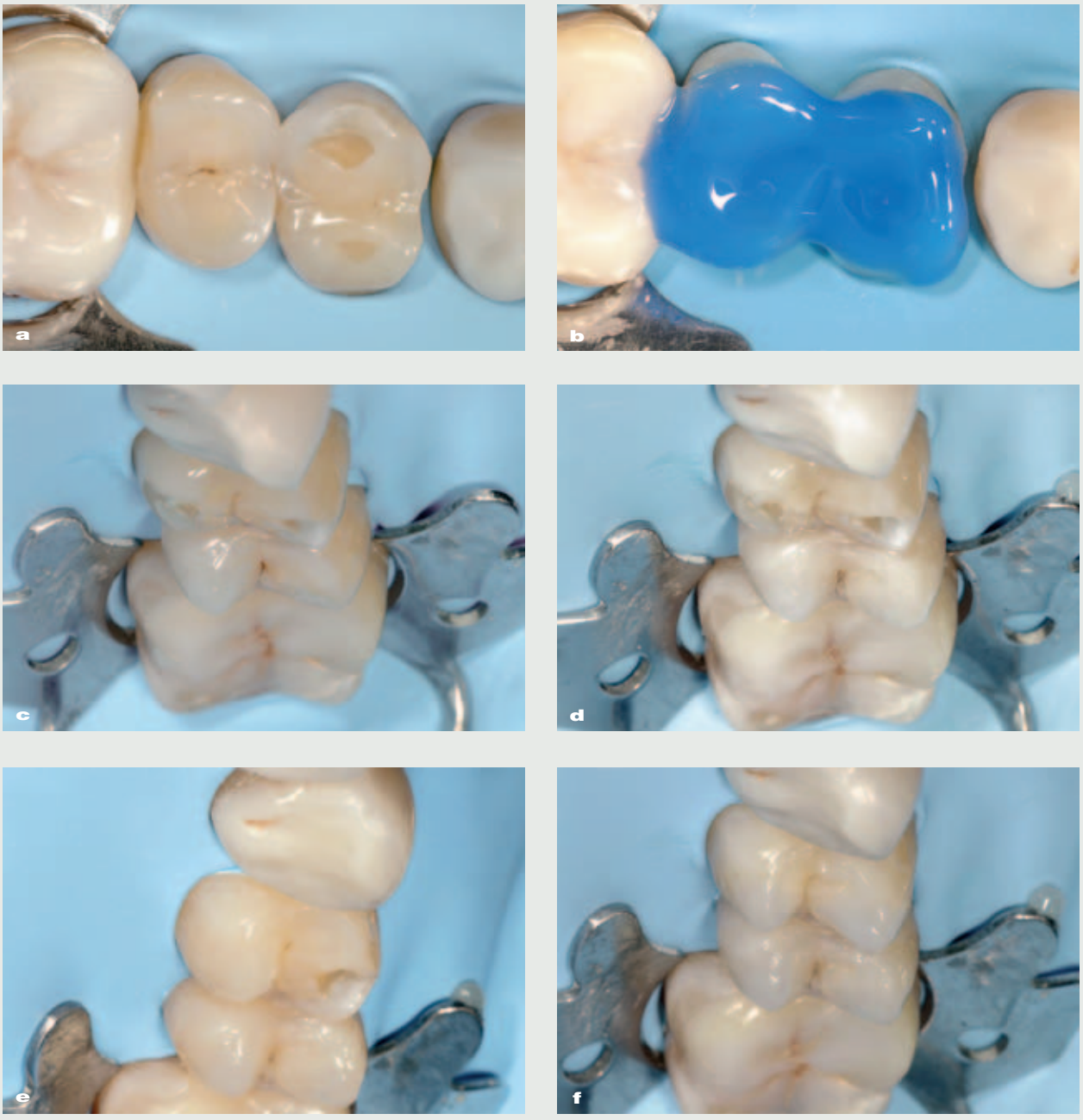


Fig 11 Preoperative view of the maxillary premolars **(a)**. The missing part is replaced with no preparation; the restoration is retained through adhesion **(b)**. The palatal cusp of the second premolar is reconstructed with a single layer of enamel **(c)**. Reconstruction of the buccal cusp **(d)**. The first premolar is then rebuilt, using the same procedure **(e and f)**.

The molars, due to the significant loss of tissue, required a greater number of layers (Fig 12).

The erosions on the buccal surface of the posterior teeth were treated with no preparation of the cavities, but rather by simply applying the resin composite.

The incisal margin of the anterior mandibular teeth was restored with direct composite restorations (Fig 13). The occlusion was then adjusted and the patient dismissed. Occlusal checkups were carried out at 2 weeks, 1 month, and 9 months (Figs 14 and 15).

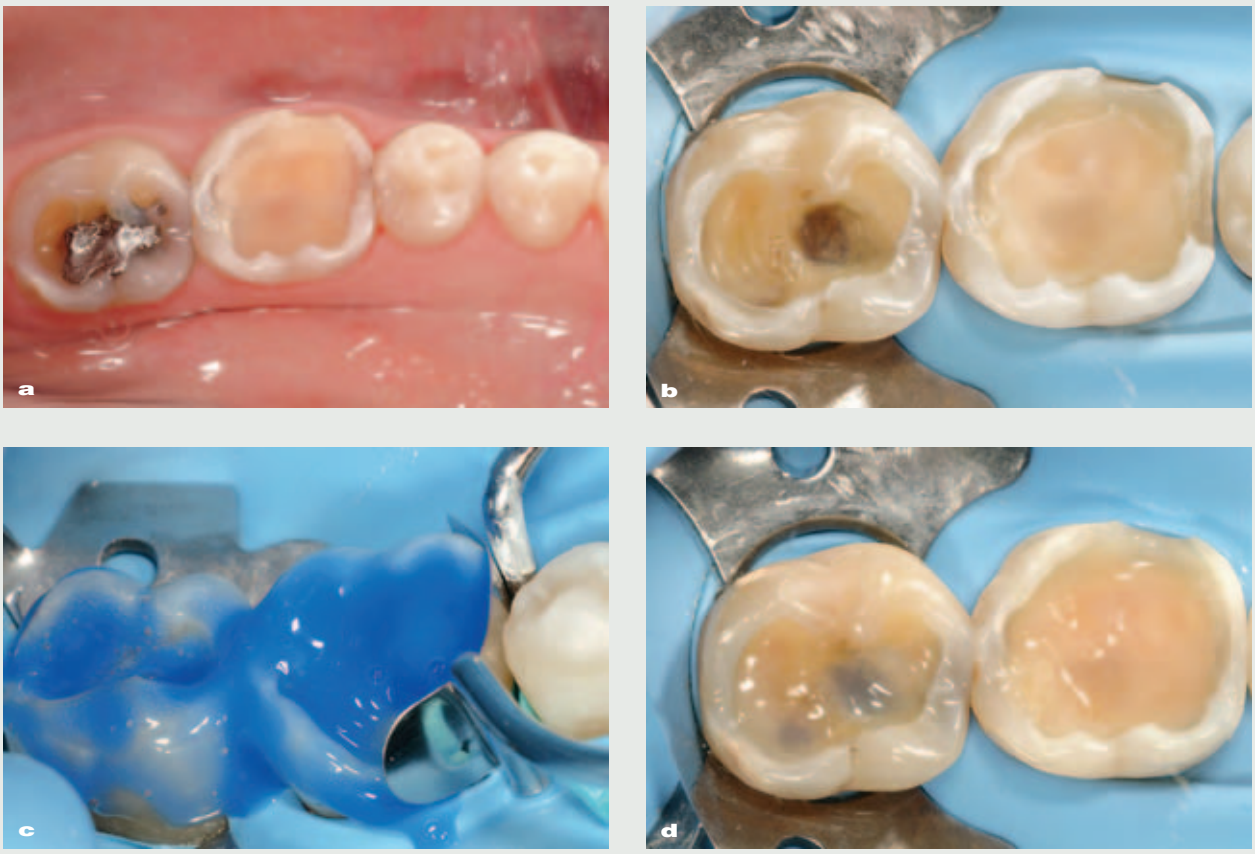
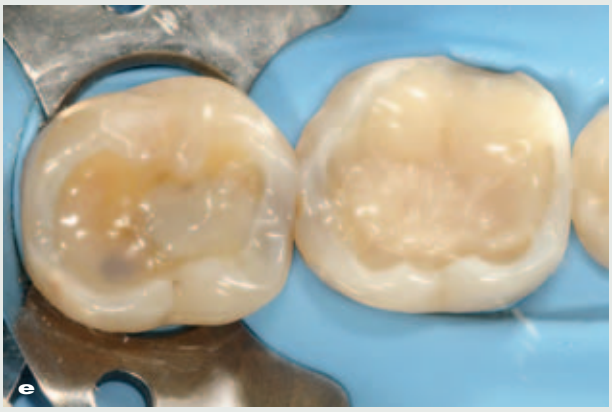
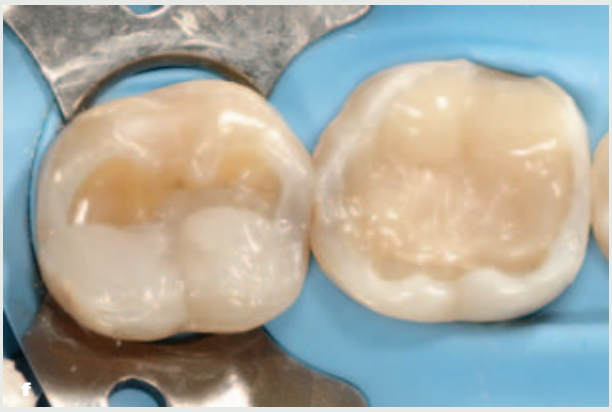


Fig 12 The quadrant before treatment **(a)**. The mesial surface of the first molar is prepared because of a partial fracture of the marginal ridge **(b)**. The dentin of the molars has been previously hybridized and covered with a layer of flowable composite to eliminate sensitivity. Adhesive procedures and sectional matrix *in situ* **(c)**. A thin layer of flowable compoite **(d)**. A layer of dentin **(e)**. Layering is continued with a mass of enamel **(f and g)**. Last enamel layer **(h)**. The restorations are now to be finished, and polished. After removing the rubber dam, any occlusal adjustments are made (these will be very limited) **(i and j)**.





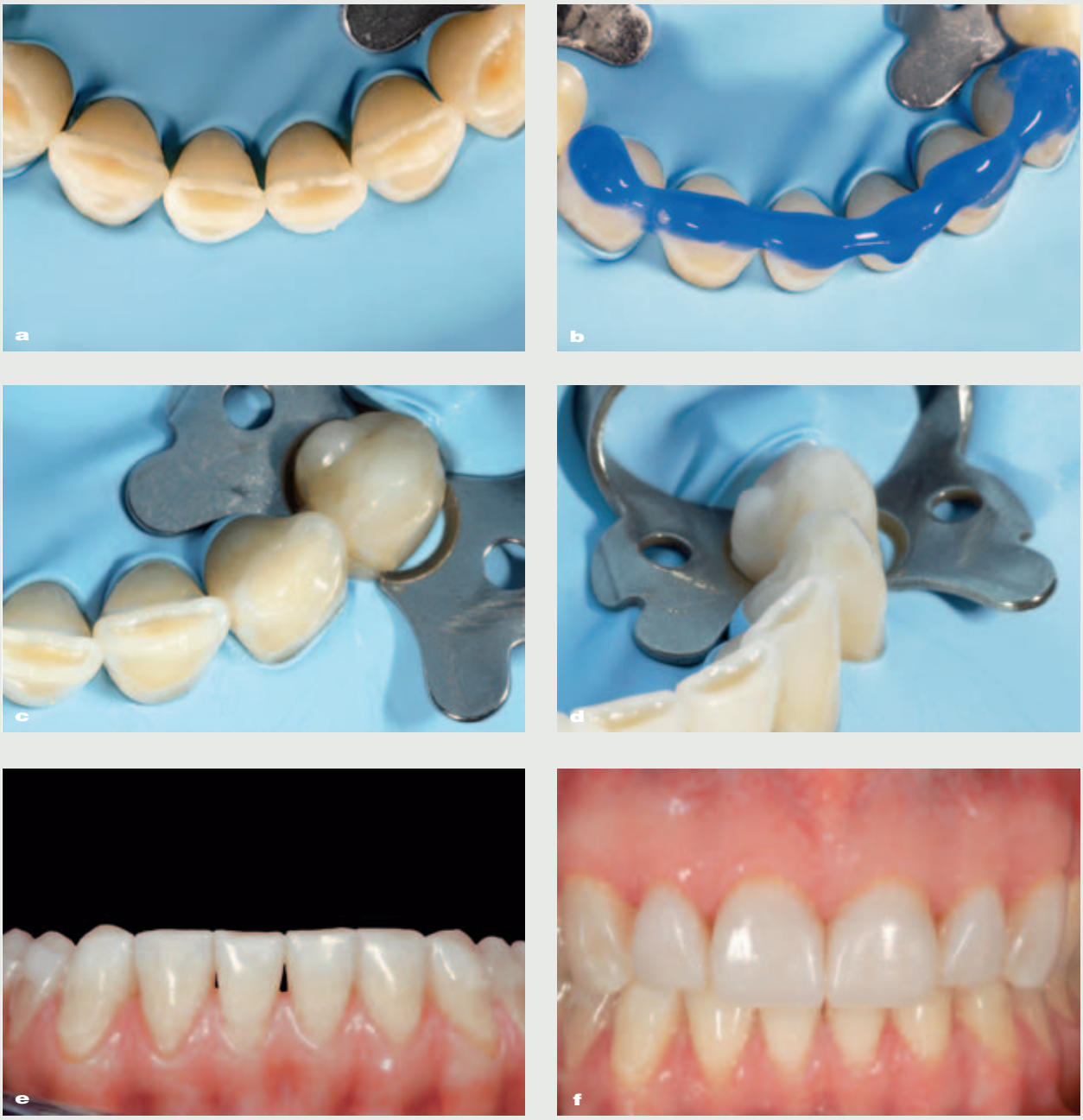


Fig 13 In order to avoid liquid pooling, which could make the erosions worse, the canines and incisors are treated with composite resin **(a)**. After the adhesive procedures, the erosions are filled with a mass of enamel **(b to d)**. The result after the removal of the rubber dam **(e and f)**. Occlusal adjustments are not needed.

Fig 14 One-month checkup **(a and b)**. The restorations are esthetically well-integrated with the patient's face **(c)**.

Conclusions

Non-carious pathologies, particularly erosive lesions, are on the increase in developed countries and tend to primarily strike young patients.

In the classic order of events, treatment of these patients would require the teeth to be rebuilt using crowns, overlays, and root canal treatment. This would involve a great loss of healthy dental tissue as well as a very high economic expense, which young patients can not always afford.

Therefore, there is a need to investigate and develop alternative treatments that can satisfy the biological, functional, and esthetic requirements of these young patients and are both reliable and long lasting. In recent years, new strategies for the prevention and treatment of erosive lesions have been described.[3,15]

Improving adhesive materials and their reliability makes it possible to provide alternative treatments. At present, currently available resin composites are much improved from a mechanical viewpoint and, in addition, offer excellent esthetic qualities. These materials are, in fact, able to replace missing tissue with very little dental preparation as has been clearly shown in the present case history.

The composite shell technique for treating upper anterior teeth, which has been documented here, is not supported by any clinical studies but arises from personal experience.[7] However, the treatment of posterior teeth with resin composite or with porcelain is something that has become routine and has been proven to be reliable for lesions of a carious nature.

Fig 15a to e 9-month checkup.

The treatment applied to the present patient, in a short space of time, met all the requisites of restorative dentistry as well as the wishes of the patient herself, and all in very few appointments. Moreover, apart from the manufacture of a diagnostic waxup, collaboration with another laboratory was not required and the cost, both biological and financial, was far less than it would have been for conventional treatment.

Moreover, all of the described treatment was minimally invasive and allowed the possibility for more invasive conventional treatments in the future, should they be necessary.

Naturally, more time and further studies will be required before the positive short-term performance described here can be confirmed.

Acknowledgements

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