

## **DIRECT AND INDIRECT ADHESIVE COMPOSITE RESTORATIONS OF POSTERIOR REGIONS: RECONSTRUCTIVE AND PERIODONTAL APPROACH**

The present case report describes the multidisciplinary treatment of a 25-year old male patient. A complex conservative rehabilitation of all the posterior regions was performed by means of adhesive composite restorations. All teeth were treated with direct restorations with the exception of one tooth that required the fabrication of an indirect restoration cemented with an adhesive luting agent.

It is worth pointing out that specific stratification techniques (horizontal, 4-increment, oblique) were employed according to the different cavity configurations (little, medium, wide, complex). Sometimes those techniques were combined with periodontal surgery in a one-step approach, using an original surgical technique proposed by the author (EJED 2010).

Moreover, the presented case report allows to discuss clinical procedures described in the literature, just like the preservation of cervical enamel not sufficiently supported and the coronal placement of restorative margins without enamel.

### **INTRODUCTION**

In the last 15 years, the evolution of adhesive esthetic materials dramatically modified the restorative approach in the posterior regions, leading to a more and more limited use of the traditional metal restorative materials. Nowadays, if correctly used, the available composite materials and enamel-dentin adhesive systems allow to guarantee very good long-term esthetic and functional results, making esthetic restorations almost invisible in both anterior and posterior regions.

The best advantages offered by resin based materials in comparison to traditional metal alloys regard the esthetic appearance, the preservation of sound tooth structures and the possibility of reinforcing residual tooth structures. Nonetheless, problems regarding polymerization shrinkage and dentinal adhesion are still controversial.

Nowadays, the increased reliability of adhesive restorations in the posterior regions is mainly due to hybrid resin composites with mini-particles as well as to the last generation adhesive systems. Such materials are characterized by excellent physical-mechanical properties: in fact, they are densely filled, resistant and radiopaque, their elastic modulus is very similar to that of dentin, they are provided with very good surface characteristics and a wear resistance comparable to those of sound enamel and silver amalgam (10-15 micron/year). Consequently, these materials are indicated for all kinds of restorative cavities.

When a proper quantity of sound enamel is present on all cavity margins, direct adhesive restorations represent the first choice therapy in little and medium I and II class cavities. Different clinical procedures were proposed to compensate for shrinkage stress; the most reliable technique is the segmental stratification using pluri-stratified approaches. The incremental techniques vary according to the cavity type; the most validated are the horizontal, the oblique and the 4-increment technique. Conversely, the traditional three-sites procedure described by Lutz (1986) using transparent matrixes and reflective wedges is no longer used.

In the last decade, several studies showed very satisfactory results using direct adhesive techniques in wide cavities requiring cusp coverage as well.

Nonetheless, in the presence of wide and different cavities without two or more walls, with multiple cusp coverage and with absent or reduced cervical enamel, indirect adhesive restorations (inlays, onlays, overlays) cemented with luting agents should be considered as a viable treatment. Such restorations are stratified on a master model and complete polymerization is achieved in the dental laboratory before intraoral cementation. Consequently, indirect restorations allow to better control polymerization shrinkage, bypass the objective procedural difficulties aimed at restoring a correct morphology of the restoration due to the different steps of direct techniques and are provided with better physical-mechanical properties (better dimensional stability, increased toughness and wear resistance) thanks to post-polymerization procedures.

## **CASE REPORT**

A 27-year old male patient with moderate caries propensity was treated. The patient presented with multiple primary and secondary decays on previous incongruous restorations; such decays were evident at both the clinical and radiographic examination by means of bite-wings.

Some of these decays involved the subgingival part of the teeth.

The treatment plan aimed at establishing proper oral hygiene and periodontal conditions by means of scaling, root planing, polishing and hygienic motivation. Then, a complete esthetic rehabilitation of all intraoral sites was planned using conservative direct and indirect adhesive restorations. Furthermore, a simultaneous periodontal surgical approach was planned to lengthen the clinical crowns of the teeth interested by subgingival lesions. The maxillary third molars were extracted due to their incongruous position, leading to a difficult achievement of a correct home hygienic maintenance; the extraction of such molars did not impair oral functions. Finally, the impacted right mandibular molar was extracted as well.

The orthodontic examination also evidenced a malocclusion but the patient did not accept to treat it.

## **QUADRANT 1**

At level of the right maxillary premolars (teeth 14 and 15), II class adhesive cavity preparations were performed: a rounded occlusal-distal box was designed, the occlusal margins were regularized, the axial walls were slightly rounded while the margin of the cervical box was cut sharp.

In medium II class cavities, the stratification approach of choice is the 4-increment technique, a modification of the “centripetal build-up” proposed by Bichacho in 1994.

The rubber dam is of paramount importance for the success of the restoration. The sectional matrixes are placed together with the divaricating rings. Such matrixes were specifically developed for adhesive dentistry and allow to achieve effective contact areas.

After applying a three-step etch-and-rinse adhesive system, the marginal crest is built-up with an increment of enamel mass (increment 1); then, the dentin is completely covered with 0.5 mm of a flowable composite resin (increment 2).

The dentin mass is stratified with a unique increment with a maximum thickness of 2 mm (increment 3).

Then, the build-up is completed with the stratification of a unique increment of occlusal enamel (increment 4), modelling the occlusal surface and applying supercolors in the occlusal grooves and pits, if necessary. Finally, finishing and polishing of the restorations are performed.

Particularly interesting is the operative sequence proposed for the esthetic and periodontal restoration of the first maxillary molar (tooth 16), in order to recover both the morphological and functional features.

A previous incongruous composite restoration was present with evident microleakage and residual caries that led to a violation of the biological width as well as to inflammation of the soft tissues.

The treatment was planned with a one-step surgical and restorative approach. Once the rubber dam was placed, the restorative material was removed and the carious lesion evidenced. The careful removal of such infiltrated tissues did not allow the rubber dam to properly isolate the operative area, as noticed under the stereomicroscope; moreover, the radiographic control pointed out the invasion of the biologic width.

Consequently, the rubber dam was removed and a lengthening of the clinical crown was performed, in order to restore a correct distance between the sound cervical margin and the bone crest. A resective periodontal surgery procedure was made by means of osteotomy and osteoplasty.

In the meanwhile, the third molar was extracted, as previously planed. The flaps were placed in crest with vertical mattress sutures, using 6-0 vicryl sutures.

Thanks to the low rate bleeding due to the vasoconstrictor agent as well as to the rapid and correct surgical procedures, it was possible to place the rubber dam immediately. In order to isolate correctly the post-surgical area, a specific cellulose foam was injected before placing the rubber dam.

Then, the sectional matrix was placed using a Compositigth 3D ring together with a Silver ring. A three-step etch-and-rinse adhesive system was used. After etching, 2% digluconate chlorexidine was applied for 30 sec in order to inhibit the metalloproteinases and stabilize the adhesive bond over time.

Afterwards, a complex cusp covering restoration was performed with oblique stratification and multiple increments. The first increment was made with a flowable composite resin, in order to fully covering the dentin and to seal the cervical margin in absence of enamel.

The marginal crest and the axial mesial-buccal wall were built-up with a double vertical increment of enamel mass; then the oblique stratification of the dentin masses with multiple increments was made; finally, the occlusal surface was modelled with enamel masses and post-polymerization supercolors in the grooves and pits.

The final polymerization was made using a glycerin gel so as to inhibit the superficial oxygen. The restoration was finished and polished as previously described.

The quadrant 1 after the operative procedures and at the 3-month follow-up.

It is worth noticing that the one-step surgical and restorative approach allows to complete the treatment in a single appointment with the following advantages: optimization of the procedural times, elimination of the problems related to the temporary restorations, sealing of the cavity by means of a finished and polished final restoration with correct emergence profiles, rapid and easy healing of the soft tissues.

## **QUADRANT 2**

At level of teeth 24, 25 and 26 II class restorations were made (OD cavities on the premolars and a complex cavity on the first molar). Such restorations were similar to those made on the first quadrant.

It is worth noticing the cavity design on tooth 26, where the non supported cusp was cut by means of an internal bevel, in order to preserve the maximum amount of sound tissue and hold properly the divaricating ring at cervical level. All the three restorations were built up contemporaneously, so as to optimize the operative time. The matrixes were placed forcing adequately the wedges and using the most divaricating rings.

Obviously, the most challenging target was to obtain effective interproximal contact areas together with a correct anatomy on the molar. The segmentation of the stratification was made using the 4-increment technique on the premolars and the oblique stratification technique with multiple increments on the molar with cuspal coverage.

Then, the finishing and polishing procedures were performed, achieving satisfactory morphological and functional results as well as optimal esthetics. Moreover, a good integration of the mesial-buccal cusp of tooth 46 restored with a direct technique was obtained.

At level of tooth 27, an extremely wide occlusal cavity was evident and a microcrack going through the occlusal surface was noticed.

Consequently, two operative choices were available:

- a) complete cuspal coverage by means of an adhesively luted overlay;
- b) direct restoration preserving the cusps, although interested by the microcrack.

Accordingly to the patient, the latter more conservative option was chosen, even if it was less predictable. The small mesial-occlusal II class was filled with the 3-increment horizontal stratification technique. On the contrary, the wide occlusal cavity affected by the microcrack was restored using the oblique stratification technique with multiple increments (flow, 4 increments of dentin, 2 increments of enamel), in order to compensate for the polymerization shrinkage as much as possible.

The final restoration after finishing and polishing and the completed quadrant at the 3-month follow-up, showing proper morphological and functional results as well as good esthetics.

## **QUADRANT 4**

Tooth 47 showed significative loss of tissues on the distal cusps and the decay interested the subgingival area, interfering with the biological width. An incongruous temporary filling was evidenced.

The following treatment plan was chosen: clinical crown lengthening, adhesively luted restoration, extraction of the impacted third molar.

In this case, the author performed a two-appointment combined surgical-restorative procedure, according to the protocol published on the EJED (nr. 1, 2010). A full thickness lingual flap and a double mixed buccal flap were elevated, a limited osteotomy was made and the impacted third molar was extracted.

Then, osteotomy and osteoplasty were performed on tooth 47, lengthening the clinical crown and recovering a proper biological width on the distal surface. The rubber dam was carefully placed, in order to obtain a perfectly isolated area to perform the adhesive procedures.

The adhesive build-up and the cavity preparation were made. The rubber dam was removed and the post-operative impression was immediately taken; although the surgical procedures had been just done, the surgically exposed margins were easily recordable with a correct impression.

After one week (the time necessary to the dental laboratory to build-up the indirect composite restoration), during the second appointment, the sutures were removed and the inlay was intraorally tried-in.

Then, the rubber dam was set in place and both the cavity and the inner surface of the inlay were conditioned, in order to perform the adhesive cementation correctly.

The restoration after cementation, finishing and polishing and a follow-up after 22 days from the surgery.

The restoration showed optimal marginal adaptation, proper morphological and functional results and good esthetics. Moreover, the healing of the soft tissues was very satisfactory. This is one of the most important advantages of the proposed technique: the two-appointment combined surgical-restorative approach allows to finalize the case in short time, avoiding possible problems deriving from temporary restorations and sealing the cavity with a final restoration properly finished and polished, so as to facilitate the healing of soft tissues.

Finally, at level of tooth 46, a small interproximal lesion was evident. The limited dimensions require maximum care in designing the cavity and in the stratification, due to the difficult access to the cavity.

In cases like this, once the cavity is prepared, the horizontal stratification technique is recommended, using 3-4 increments (0.5 mm of flow over the dentin, 1-2 increments of dentin, 1 increment of enamel). The apical-coronal stratification has to be performed and supercolors may be used if necessary.

The matrix has to be kept in place till the end of the stratification.

The final restoration after finishing and polishing and the completed quadrant at the 3-month follow-up.

### **QUADRANT 3**

Teeth 36 and 37 needed treatment in quadrant 3. Clinically, no decays were evident but the radiographic control showed severe carious lesions.

In this quadrant, tooth 46 was particularly interesting: a medium-wide adhesive cavity was prepared and the distal-buccal cusp was covered using a beveled cut. Particular care was taken to the gingival box, where a technique to preserve the cervical enamel not supported by the dentin was adopted.

The level of the dentinal cavity is often more apical than the level of the enamel cavity, since the progression of the decay develops along the path of the dentinal tubules (typically from coronal to apical in this area).

In the cases in which the amount of enamel is sufficient and thick, although not ideally supported, it is possible to choose a minimally invasive approach, preserving such enamel in order not to

perform a crown lengthening. Conversely, this is mandatory in those cases in which the cervical enamel has to be removed, affecting the biological width.

The minimally invasive approach requires particular care during the cavity preparation, using small spherical diamond burs mounted on a low speed device (red ring) to clean the cavity at the enamel border, avoiding the use of multiple blade burs on a blue ring rotary device, since they would undermine the enamel. Furthermore, before placing the wedges and the matrixes, it is necessary to “support” the cervical enamel by means of an increment of a flowable composite adhesively placed behind the enamel itself.

Two different medium shaped mesial-occlusal and occlusal-distal cavities were prepared on tooth 37.

Both the restorations on teeth 46 and 47 were made using a direct technique, building-up contemporaneously the marginal ridges by means of two sectional matrixes. A wedge was forced between the teeth and a strong diverging ring (Golg Compositight) was placed upon the wedge to create a proper contact area.

The wide occlusal-distal box on tooth 46 required a stratification with two vertical increments of enamel to build-up the marginal ridge, in order to have a favourable C-factor.

Then, multiple oblique increments of dentin were stratified and the occlusal surface was completed with an enamel mass and supercolors.

The final restorations after finishing and polishing under rubber dam and the 3-month follow-up.

The final images of both the dental arches show the optimal morphological and functional results as well as the good esthetics achieved using adhesive techniques together with the proper management of the supporting periodontal tissues, where needed.

The good dimensional and chromatic stability of the restorations as well as the sound state of both the soft and bone tissues are evident in the follow-up pictures and in the Bite-Wing radiographic control after 1.5 years.

The case should be completed with an esthetic treatment of the maxillary lateral incisors, to restore their correct morphology, and with an orthodontic therapy, to correct the malocclusion and increase the alignment of the teeth. Nonetheless, the patient has not accepted such treatment plan yet.



## Curriculum Vitae Europass



### Informazioni personali

Nome(i) / Cognome(i)

**Marco Veneziani**

Indirizzo(i)

57 Via Roma, 29020 Vigolzone (PC) Italia

Telefono(i)

**0523/870362**

**Cellulare: 335/1435187**

Fax

**0523/870362**

E-mail

marco.veneziani @nesh.biz

Cittadinanza

italiana

Data di nascita

19 novembre 1964

Sesso

maschile

### Occupazione desiderata/Settore professionale

**Laureato in Odontoiatria e Protesi Dentale Dentaria presso l'Università degli Studi di Milano l' 8 novembre 1988 con votazione 110/110 e lode.**

### Esperienza professionale

Libero professionista in Vigolzone dal 1989 con approccio multidisciplinare all'odontoiatria

Socio Attivo dell'Accademia Italiana di Conservativa dal 1996

Membro commissione accettazione soci dal 2001 al 2006 e dal 2006 al 2011.

Relatore ai Continuing Education A.I.C. 1998/1999 – 2001/02  
2004/05 - 2007/08 - 2010/2011.

Professore a contratto presso l'Università di PV dall'anno accademico 2007-2008.

Socio attivo Italian academy of Esthetic dentistry dal 2012

Relatore su temi di Odontoiatria Restaurativa a corsi e congressi Nazionali dal 1993

Autore di pubblicazioni di odontoiatria conservativa e protesica su riviste nazionali ed internazionali.

Autore dei capitoli relativi ai restauri in amalgama e ai restauri in composito con tecnica diretta del Testo "Odontoiatria Restaurativa" Ed. Elsevier 2009 .

Primo "Premio Case Report Dentista Moderno" 2002 per la conservativa Segretario culturale ANDI sez. di PC dal 1998-2009. Attualmente facente parte del Consiglio direttivo.

Referee ECM per il Ministero della Sanità.

Date

Iniziare con le informazioni più recenti ed elencare separatamente ciascun impiego pertinente ricoperto. Facoltativo (v. istruzioni)

Lavoro o posizione ricoperti

Principali attività e responsabilità

Nome e indirizzo del datore di lavoro

Tipo di attività o settore

**Istruzione e formazione**

Laureato in Odontoiatra e Protesi Dentale Dentaria presso l'Università degli Studi di Milano l' 8 novembre 1988 con votazione 110/110 e lode.

Date

Anno 1991/1992 corso di perfezionamento post-universitario annuale in Conservativa del Dr Stefano Patroni  
Anno 1993/1994 corso di perfezionamento post-universitario annuale n Protesi Dr Stefano Patroni  
Anno 1993/1994 corso di perfezionamento post-universitario annuale in Parodontologia del Prof. PierPaolo Cortellini  
Anno 1999 corso di perfezionamento a numero chiuso in *Tecniche di chirurgia implantare*, diretto dal Prof. Weistein presso l'Università di Milano  
Anno 2003 corso di chirurgia avanzata applicata all'Implantologia Dr.Tinti  
Anno 2008/2009 corso di perfezionamento in chirurgia muco-gengivale del Prof .Givanni Zucchelli  
Partecipazione a Congressi nazionali annuali delle piu' importanti società scientifiche

Titolo della qualifica rilasciata

Sopra specificato

Principali tematiche/competenze professionali possedute

Sopra specificato

Nome e tipo d'organizzazione erogatrice dell'istruzione e formazione

Sopra specificata

**Capacità e competenze personali**

Madrelingua(e)

**Italiano**

Altra(e) lingua(e)

**Inglese**

Autovalutazione

Livello europeo (\*)

**Lingua**

Comprensione				Parlato				Scritto	
Ascolto		Lettura		Interazione orale		Produzione orale			
B2	inglese	B2	inglese	B2		B2		B2	

(\*) Quadro comune europeo di riferimento per le lingue

Capacità e competenze organizzative

Descrivere tali competenze e indicare dove sono state acquisite. (facoltativo, v. istruzioni)

Capacità e competenze informatiche

Utilizzo MAC e PC Programmi Key Note ,Photoshop, Word .

Patente

Patente B

**Ulteriori informazioni**

Inserire qui ogni altra informazione utile, ad esempio persone di riferimento, referenze, ecc. (facoltativo, v. istruzioni)

**Allegati**

Il sottoscritto è a conoscenza che, ai sensi dell'art. 26 della legge 15/68, le dichiarazioni mendaci, la falsità negli atti e l'uso di atti falsi sono puniti ai sensi del codice penale e delle leggi speciali. Inoltre, il sottoscritto autorizza al trattamento dei dati personali, secondo quanto previsto dalla Legge 196/03.

Data \_\_\_\_\_

Firma \_\_\_\_\_