

# Modern Trends in Indirect Adhesive Restorations in Posterior Teeth

by Simone Vaccari and Felice Giulino

The development of dental materials, in terms of improving physio-chemical and biocompatibility properties, and advancing their operational techniques, has allowed dentistry to surpass its preventive and rehabilitative purposes, allowing the operator to focus attention on the aesthetic aspects inherent in restoration work. Indeed, the introduction of aesthetic materials, especially composite resins, of their marketing of new clinical procedures relating to their use, have made it possible to perform restoration tasks which in relation to morphological and functional rehabilitation, may be defined as aesthetic, since they blend in with the natural appearance of other dental aspects. (1).

Dental composites are products based on inorganic fillers in an organic matrix containing various additives, such as initiators, stabilisers, pigments. An ideal composite must simultaneously satisfy physio-mechanical, clinical, toxicological and aesthetic requirements, attributes which are often mutually exclusive. The failure of composites to achieve these ideal requirements was the main reason behind the low average lifespan of hybrid restoration work in posterior teeth, especially if compared with the average lifespan of restorations using amalgam. There have been various attempts to improve the clinical performance of composites, mainly based on the following parameters:

- Reducing contraction at the margins, due to polymerization shrinkage, in order to prevent the onset of secondary caries;
- Improving mechanical properties, especially wear resistance;
- Improving biocompatibility, reducing the elution of components (2).

The development of various resin based systems and their improved physio-chemical properties, especially with the advent of nano-technology, has led to their reliable use in the posterior region. (3-4). Indeed, in the past, posterior metallic restorations, have not been very aesthetic due to their unattractive colour, but they were widely used, and if applied well achieved good marginal seal. However, for stability in the cavity, they require wide matrix bands, meaning we are often forced to remove healthy tissue and sacrifice a significant portion of the tooth. On the other hand with adhesive dentistry, the restoration is anchored to the dental substrate by means of a treatment which saves us from having to sacrifice this tissue.

Furthermore, metallic intracoronal restorations produce oxides in the tooth-restoration interface, causing discolouration which is difficult to remove. Moreover, these neither protects or reinforces the tooth, resulting in increasingly obvious vertical and horizontal microfractures,

with negative prognosis. Hence, if an adhesive system is used, then at least in the short to medium term prognosis, the tooth structure will be strengthened, almost to that of the original natural tooth. Thus, the advantages of adhesive dentistry are the preservation of dental tissue during the preparation of the cavity, greater patient comfort, improved aesthetic results, and is an alternative to full crowns and endodontic treatment.

The aims of restorative dentistry are not only the restoration of appropriate anatomy, but also restoration of adequate function, protection of the pulp, and performing invisible aesthetically acceptable restorations. In order to satisfy all four points, it is essential to begin by first performing a thorough, objective examination, followed by an instrumental examination, in order to obtain a correct diagnosis and treatment plan. It should be remembered that the main problem associated with composite materials is contraction due to curing and the stress this produces. Nowadays, contraction is around 3.8% compared to 5% with older generations of composites, but it is still a very significant aspect. In the case of the direct technique, the idea is to remedy the problem by layering the material and curing layer upon layer, even though this method does not completely eliminate the problem. It is precisely the aim of reducing curing stress and reproducing dental anatomy that inlays and onlays were introduced, where the only component undergoing contraction within the cavity is the composite used for cementation, since this is present in minimal quantities, stress is significantly reduced.

The latest clinical studies published demonstrate that inlays allow the attainment of improved marginal sealing in the case of large cavities.

Also, in terms of lifespan and survival, one five-year study has demonstrated that inlays have a percentually longer lifespan, with respect to direct restorations (5).

## Clinical Case

The patient presented (fig. 1) with destructive caries of 2.4, caries and infiltrated fillings of 2.5, 2.6 and a small OM caries of 2.7. Work began with the removal of the old restorations and the decayed tissue on 2.4, 2.5, 2.6, so to then perform three adhesive build-ups with composite material, following root canal therapy of 2.4; while a direct restoration has been performed on 2.7 (fig. 2).

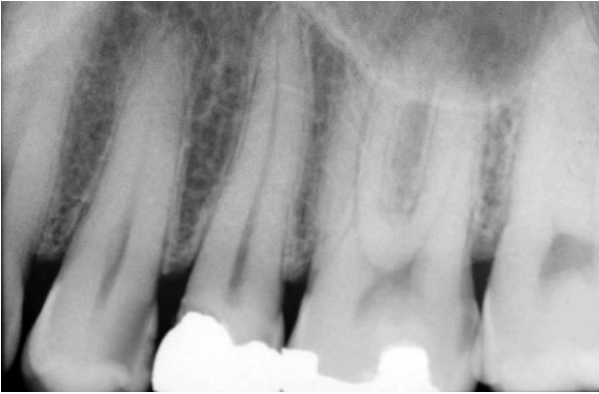


Fig. 1



Fig. 2

As observed from photos 3 and 4 (figs. 3 and 4) the restorative material to healthy tooth ratio favoured the execution of three cuspidal-covering indirect composite inlays.



Fig. 3



Fig. 4



Fig. 5



Fig. 6

After having isolated the operating field with rubber dam (figs. 5 and 6), 2 mm deep guide furrows have been made (fig 7) on both the occlusal surface and cuspidal edges, to achieve correct and uniform removal of both dental tissue and past restorative material (fig. 8).



*Fig. 7*



*Fig. 8*

A preparation with a 90° box is made on the mesial and distal edges (fig. 9, and in detail fig. 10), while a slight chamfer has been made in the enamel in the vestibular and palatine edges (fig. 11, and in detail fig. 12).



*Fig. 9*



*Fig. 10*



*Fig. 11*



*Fig. 12*

After removal of the rubber dam the impression has been taken with an individual tray using silicone material (Extrude extra putty + light body), followed by the pouring of the models, and the manufacture of the inlays (figs. 13 and 14). The patient was called back one week later for cementing of the final structures.



Fig. 13



Fig. 14

Having once more isolated the operating field, the restorations were microblasted to thoroughly cleanse the surfaces (figs. 15 and 16). Mordanting has then been performed using 37% orthophosphoric acid for 30 seconds, while protecting the adjacent elements (fig. 17); after thoroughly washing, the primer and bonding are applied (OptiBond® FL); in the meantime the inlay is blasted and silanised (Silane primer). At this point the inlay is ready to be cemented using the same composite that was used to make the inlay (Premise™ XL1) (fig. 18).



Fig. 15



Fig. 16



Fig. 17



Fig. 18

To help fitting of the inlay into the cavity and to allow any excess cement to escape, the inlay is vibrated using an ultrasonic probe (fig. 19) carefully removing all the excess (fig. 20). Prior to polymerisation, the margins are carefully polished and finished using a small brush soaked in a lightly loaded resin (OptiGuard). This is then followed by curing, which must be conducted for 60 seconds on each surface of the inlay (fig. 21). The restorations have been carefully polished, firstly using silicone rubber points (HiLuster<sup>PLUS</sup>) followed by diamond paste (figs. 22 and 23).



Fig. 19



Fig. 20



Fig. 21



Fig. 22



Fig. 23

Figures 24 and 25 shows the check-up results after two years, where the perfect integration and precision of the marginal seal can be appreciated.



Fig. 24



Fig. 25

#### Conclusions:

The choice of direct or indirect restorations is determined by the size of the cavity, the thickness of the walls and the presence of cervical enamel.

In large cavities without cuspids but with cervical enamel it is possible to use an inlay. If the cavity is medium sized without cervical enamel, then it is possible to use a direct restoration, if the residual walls have a thickness of less than 2 mm, then they are removed and indirect restoration performed. In conclusion, the authors maintain that if the above-mentioned conditions are respected, the execution of an indirect restoration using composite materials is capable of guaranteeing a lifespan comparable to indirect metallic restorations, with the advantage of improved aesthetic results, increased patient compliance and greater respect of residual dental tissues. (Fig. 6)

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