

# Direct Posterior resin restorations: everyday dentistry to accreditation standard

## Accreditation Case Type 4

(A posterior quadrant showing two or more direct or indirect restorations)

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### Introduction

This 30-year old female patient had neglected her dental health, but despite bad experiences as a child, she had decided it was time to return to dentistry.

In such a case the dentist is in a delicate position as any further negative experiences may well result in the patient failing to attend again, thereby missing out on important treatment.

### Main complaint

The treatment described here was part of a comprehensive treatment plan involving hygiene therapy, general restorative work and culminating in tooth bleaching and a renewed resolve to maintain the teeth for the future. In the lower left quadrant, old amalgam restorations with significant recurrent caries were replaced with composite resin.

### Diagnosis and treatment plan

It was necessary to replace the inadequate amalgam restorations but also, due to the significant caries present, the patient was warned of the possible need for endodontic therapy, either during this course of treatment, or in the future. Possible alternative treatments discussed included direct composite restorations, indirect composite inlays and indirect porcelain inlays, and possibly full crowns if endodontic

treatment was found to be necessary.

The patient chose direct composite restorations as the preferred restorative approach if possible. The paperwork; outlining the reasons for our choices, ensuring informed consent and outlining the financial commitment involved was then completed and an appointment scheduled for the following week.

### Medical and social history

This included the patient describing her lifestyle as 'hectic' but that she was otherwise fit and well. Radiographs revealed that generalised restorative work was required, specifically in teeth 34, 35 and 36 which had gross caries beneath old amalgam restorations.

### Clinical procedure

At the start of the appointment, the treatment plan was outlined once again to ensure the patient understood the work to be provided and the associated reasons were confirmed. Following local anaesthesia the old restorations and gross caries were removed with high speed and low speed handpieces, both utilising water cooling. Specific care was taken to clear the caries from the cavity walls; specifically the amelo-dentinal junction, where lesions will often advance along the line of weakness.

The caries present in the floors of the cavities close to the pulp horns

was left to be thoroughly excavated with hand instruments to reduce risk to pulps, and to confirm that no soft, infected dentine remained. Hand instrumentation was further utilised to remove any unsupported enamel prisms at the cavity margins and to increase the surface area of the enamel for bonding in this area.<sup>1</sup> However, it is not advisable to create a small bevel on the occlusal cavo-surface margin as this increases the width of the cavity preparation and may infringe upon centric holding stops thereby increasing the wear rate of the restoration.<sup>2</sup> Loupes are particularly useful at this stage.

Rubber dam (Hygienic non latex, Coltene Whaledent) was placed, and the cavities were sandblasted using a Prepstart air abrasion machine. The pressure was set at 40psi, the aluminium oxide granules were 27 micron diameter and the nozzle size was 0.1 mm diameter. The aim of this process was not to prepare the cavity further, but to remove any loose debris and to cleanse the cavity thoroughly to allow the best possible seal between the restorative material and the prepared tooth.

### Dentine sealing and cavity lining

Self etching resin cement (Relyx Unicem, 3M) was painted into the cavity with the aim of completely covering, and thereby sealing, any freshly prepared dentine. Care was taken to keep the enamel margins free from contamination with the

Figure 1: a-c Recommended matrix formers, brushes and composite instruments; d matrix band type **not recommended**



lining resin due to the poor bond to enamel shown by the resin cement which was used. The next stage involved acid etching of the enamel to counteract this problem. The resin was allowed to remain for 20 seconds to allow the self etching properties to do their work and then all was light cured. If the cement is cured immediately, the etching process cannot take place. The gingival cavity margins in the floor of the proximal boxes had no enamel remaining due to the extent of the caries, which can often causes difficulty when trying to seal the restoration at this junction. The dentine bonding properties of the self etching resin cement were

utilised to deal with possible marginal leakage by spreading it right over any margin which did not have the required rim of enamel for conventional bonding. The resin cement in effect becomes part of the marginal wall of the restoration, thereby utilising its excellent bonding to dentine to seal the margins and its excellent bonding to composite resin later in the process. Something like an old fashioned ‘sandwich’ restoration as used unsuccessfully with glass ionomer cement in the past.

**Matrix formers**

Sectional matrix formers (Palodent, Dentsply) were placed at the

interstitial contact areas where the natural contact points had been lost. Palodent matrices retained with bitine spring rings (3M) were chosen, due to their preformed shape, which aids in correct contact point formation. Contoured wooden wedges (Clinicians Choice) were also used to ensure complete adaptation of the matrix retainers at gingival level.

**Acid etching marginal enamel**

The dentine was previously sealed by the resin cement, and the next stage was to bond to the enamel at the cavity margins. The enamel margins were therefore etched with 35% phosphoric acid (Ultra etch,

Figure 2: a-b – Before (left) and after (right) images of the case



Ultradent), and as the dentine was already sealed there was no risk of over-etching the dentine.<sup>3</sup> The etch gel was rinsed with copious amounts of water and dried with 3-in-1 air syringe; again, there was no concern with regard to dentine dehydration, which would weaken conventional dentine bonding, as it was already sealed.<sup>4</sup>

### Enamel bonding

The correctly carried out process of etching enamel followed by bonding with unfilled resin currently provides the best adhesive bond in dentistry. The freshly cut enamel was therefore etched and dried, and then painted

with an unfilled light cured resin, thinned with compressed air and light cured using an LED curing lamp.

A thin layer of flowable composite resin (Filtek Flow, 3M) was applied with a bendabrush to all internal surfaces of each cavity with particular emphasis given to internal cavity angles and gingival margins, and then fully cured using the narrow 2mm curing tip to reach the deep parts of the cavity and proximal boxes. The aim is to reduce possible voids at the margins when placing the more viscous hybrid composite later.

Hybrid composite resin (XRV Herculite, Kerr) was chosen for the bulk of the restorations for its strength and durability, and a semi-translucent micro-hybrid composite resin (Heliomolar, Ivoclar) was applied for the final surface layer due to its polishability. The patient declined any pit and fissure staining.

The problems with composite resin are well documented with polymerisation shrinkage in particular being perhaps the most significant, particularly in single surface restorations. An incremental packing technique was used to reduce the effects of shrinking, as



Figure 3: a-b – Lower occlusal: Before (left) and after (right) images of the case

Figure 4: a-b – Radiographs: *Pro-operation (left) and Post-operation (right) images of the case*



each incremental layer was placed and cured in turn.<sup>5,6</sup> No layer was more than 2.0mm thick and using selective bonding, at no time were the two walls joined together with the composite resin during placement; thus always leaving free surfaces within the cavity to reduce the C-factor of shrinkage and reduce marginal leakage.<sup>7</sup>

Particular care was needed to create adequate contact points between the first premolar distal surface, and the second premolar mesial surface, and the sectional matrices were of great use, and the use of a 'Contact-Pro' instrument (C.E.J.) was also useful.

The final restoration anatomy was created with non-stick instruments (Composite Placement Instruments, Cosmedent), and a #3 sable brush (Cosmedent) with particular emphasis given to marginal ridge creation interstitially. Care taken at this stage can significantly reduce the amount of filling material reduction and carving required at the end of the treatment. Final cure was through a layer of KY jelly (Johnson and Johnson) to deal with any oxygen inhibited layer still uncured.

### Occlusion checked

The rubber dam was removed and excess composite removed interstitially with a scalpel (Swann Morton no 12). The scalpel is useful in carving cured composite generally and was used to refine the marginal ridges later along with Soflex ET discs (3M Espe).<sup>8</sup> The occlusion was then checked following Dawson's principles.<sup>9</sup>

It was accepted that the patient's habitual closure position would not be changed by this treatment plan, so the patient was asked to close together without any mandible manipulation (bimanual manipulation) into centric relation (CR). Centric holding stops were marked using black articulator foil (Accufilm, Parkell) and adjusted with rotary carbide instruments (Brasseler Komet).

Immediate posterior disclusion in both lateral and protrusive excursions was required, and so this was also checked with red articulator foil (Accufilm, Parkell), and the red stripes produced on any inclines removed. Black dots should not be removed as they indicate the centric

holding stops during this procedure in order to maintain occlusal stability and avoid over eruption and tilting in the future. This was confirmed using Shimstock foil when the patient returned for review and final polishing the next day.

### Finishing and polishing

Once acceptable occlusal form had been achieved the surfaces of the restorations were sparingly (to avoid loss of surface detail and excess loss of surface bulk) refined and polished using aluminium impregnated rubber cones and cups (Flexicup & Flexipoint, Blue and Pink, Cosmedent), and then a silicon brush (Occlubrush, Kerr Hawe) and finally 5 micron diamond paste (Luminescence, Premier) was used followed by fine aluminium oxide polish (Enamelise, Cosmedent) applied with a Flexibuff cone (Cosmedent) to create the final gloss. Contact points were polished with ultrafine Diamond strips (Visonflex, Brasseler Komet) and Epitex strips (GC Industries) and checked with dental floss for smoothness.

This was confirmed at review the following day, and the restorations

were etched and sealed one last time with Biscover unfilled resin (Bisco) to reduce wear of the composite surface.<sup>10</sup>

The completed treatment included direct composite resin restorations in teeth 34 (DO), 35 (MO) and 36 (O).

## Conclusion

Compared to placing traditional amalgam restorations, the placement of composite resin restorations requires a new skill set to be mastered. Issues with bonding, contraction of the restorative material and mastery of new matrix retainer systems to create interstitial contact points are amongst the issues that can present a real restorative challenge.

## Editor's note

Lateral 1:2 discluded photographs are now a required part of the protocol.

## References

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## Further reading

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