A close-up photograph of a tooth with a white, composite filling. The filling is smooth and glossy, matching the natural color of the tooth. The background is a solid blue color.

Chapter 1

Introduction

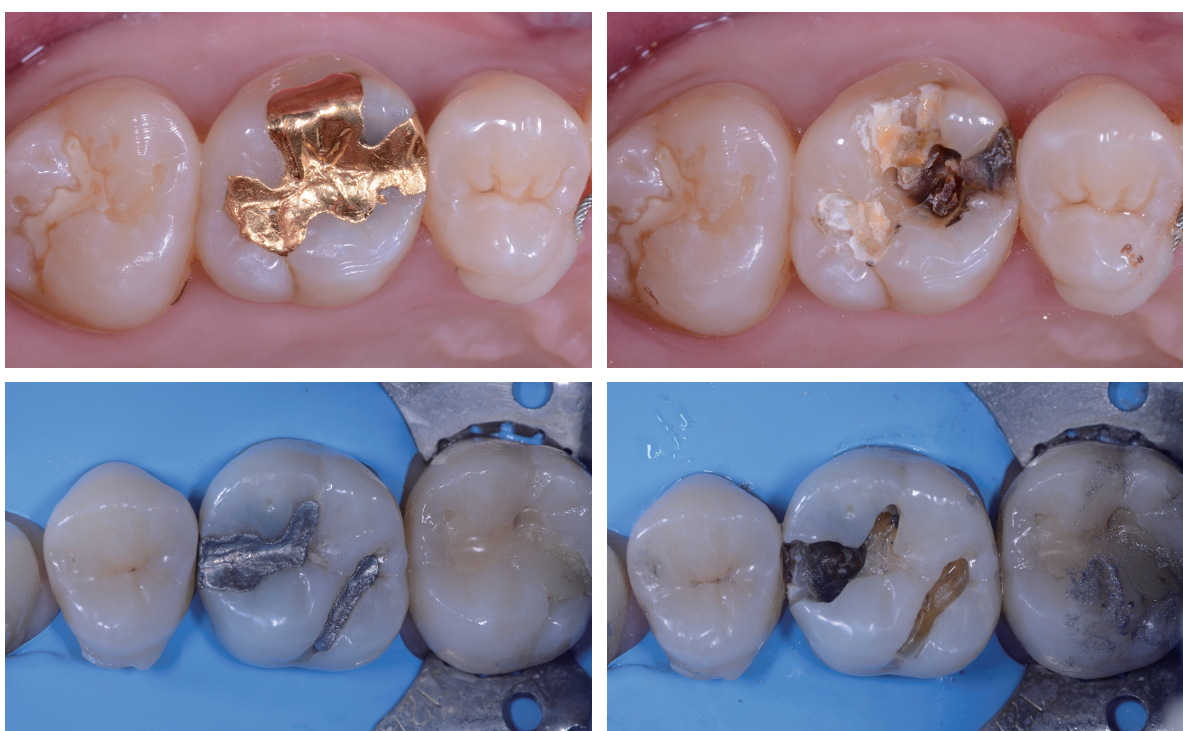
Is composite resin restoration considered as a reliable treatment?

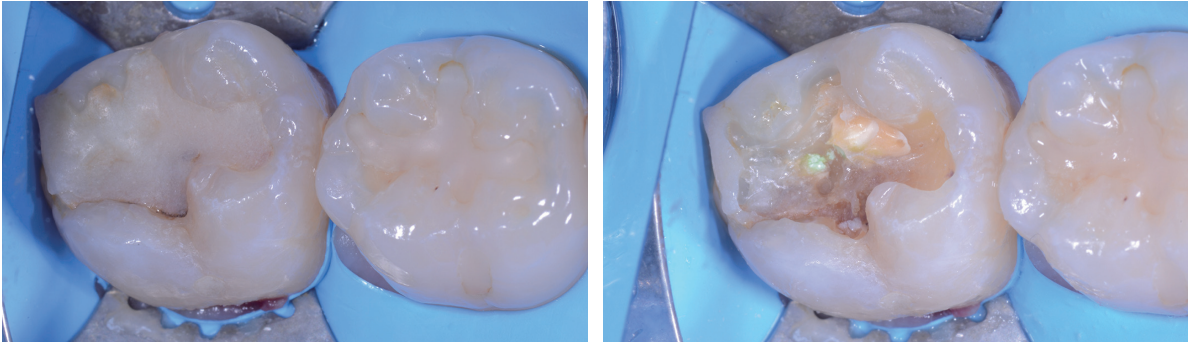
Amalgam has served as a reliable material for many clinicians for decades. Although the physical properties of the material are still reliable, its clinical use is gradually decreasing as the years go by, and patients' demand becomes more complex.



Gold is another important and reliable dental material that has been used widely in operative dentistry along with amalgam. It has been used by many clinicians for a very long time, and the laboratory technique has been improved during the same period. There is no doubt that it is the gold standard treatment in the caries management of the posterior teeth.

However, the demand for more natural and aesthetic materials is growing. Despite of the many physical advantages of gold, its use has met with much reluctance. Ceramic, composite resin, and glass ionomers are materials that meet these requirements. Glass ionomers have insufficient physical properties for long-term use in permanent teeth, and have limitations in reproducing the shape and shade of teeth. Ceramic is bondable to teeth and is a satisfactory material in terms of strength and aesthetics. However unnecessary cavity enlargement is often unavoidable for the indirect method, which may limit its indications compared to composite resin.





As with all materials used in dentistry, it is true that there are more problems associated with the misapplication by the clinician than the limitations of the material itself.



To fully obtain the advantages of the materials in clinical practice, a clear justification of indications and a proper restorative technique are required. Composite resin had insufficient dentine-bonding strength and wear resistance to be widely used in clinical setting in the past. However, through the significant improvement over the last 20 to 30 years, composite resin has become one of the most popularly used materials worldwide.

The improvement of bonding strength to dentin as well as enamel, the reduction of post-operative sensitivity, improvement of the handling and physical properties of the composite resin made it the first choice of material in the direct restoration.



How long will the composite resin last?

This is the biggest question for many clinicians. The long-term stability of the composite resin should be dependent on two different perspectives.

First, the success is influenced by the composite resin material itself

Second, success rate according to the clinicians

Even with functionally and aesthetically satisfactory treatment, if the result does not last due to the lack of stability of the material itself, and re-treatment is needed within a few years, it can be concluded that the material stability of composite resin is not good enough. So far, the long-term survival rate of gold restorations is the highest among existing dental materials. However, considering the development of latest materials, the success rate of composite resins will become higher and higher.



3 years later

There was a small exposure of pulp horn during caries treatment. After MTA pulp capping and direct composite resin restoration, the three-year follow-up clinical photo shows that the treatment result is stable.

The long-term stability of composite resin restorations is decided by

1. How long will the bonding last?
2. What is the resistance to fracture and how long will it be maintained?
3. What is the resistance to abrasion?

Bonding strength tend to decrease gradually as it tolerates the masticatory force within the oral cavity. The bonding strength weakens over time. One of the example is the destruction of collagen fibers by the actions of collagenase.

The resistance to fracture will be influenced not only by the intrinsic problem of the restored tooth or the composite resin material, but also by the occlusal anatomy, occlusal relationship with the opposing teeth, and the patient's masticatory force and chewing habits.

The wear resistance of the restoration material is also an important factor for long-term stability. If the restoration is dislodged or fractured due to bonding failure, the need for re-treatment becomes very obvious. However, the occlusal wear and change in occlusal anatomy tend to occur slowly, which are often accompanied by super-eruption of the opposing cusp. These oral conditions often make the re-treatment difficult. Choosing restoration materials with low wear pattern is also one of the important criteria when selecting the ideal material, so that the overall oral environment, especially changes in occlusion, do not occur excessively in a short period of time. With the development of bonding, matrix, and filler contents, adhesive and mechanical strength, fracture and abrasion resistance are all improved. Therefore, the current composite resin is strong enough to keep a stable occlusal state for a long time in the oral cavity. Compared to type I gold alloy, the amount of wear is much lower, which is also helpful to maintain stable occlusion.

Where can the composite resin restorations be placed?

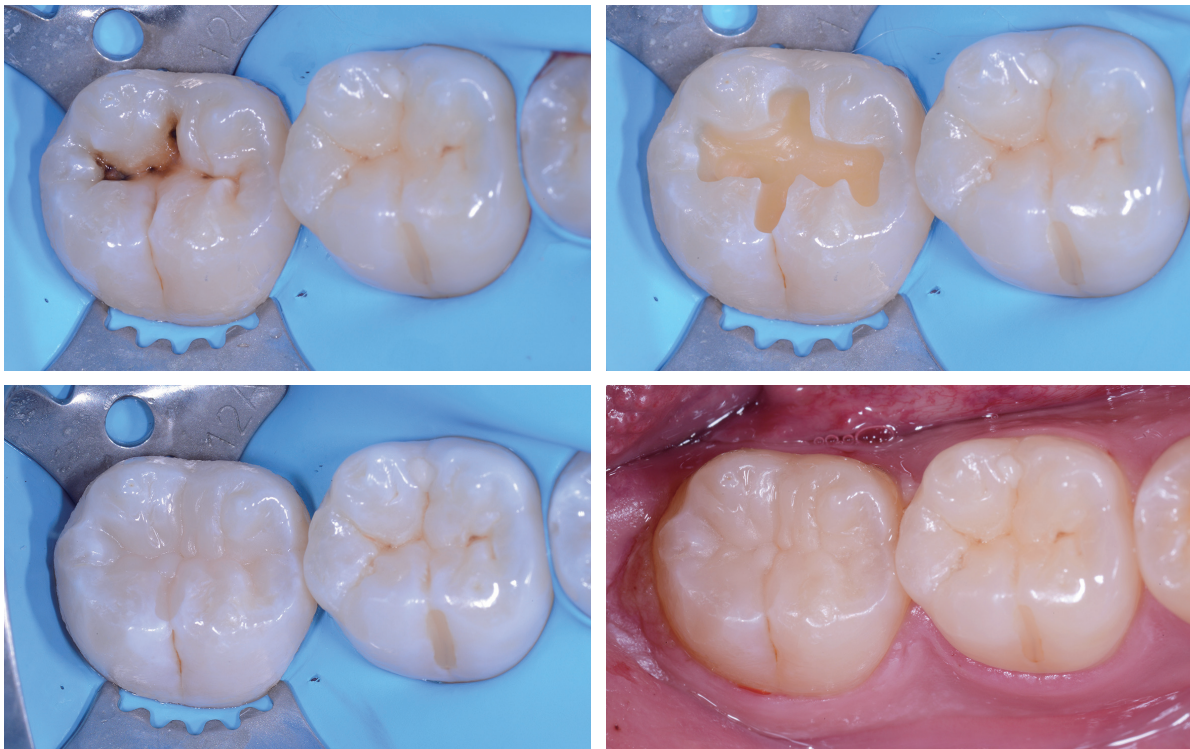


In what cases can composite resins be used as the restorative material of choice? Small cavity? For younger patients? Or for patients who cannot afford the gold inlay?

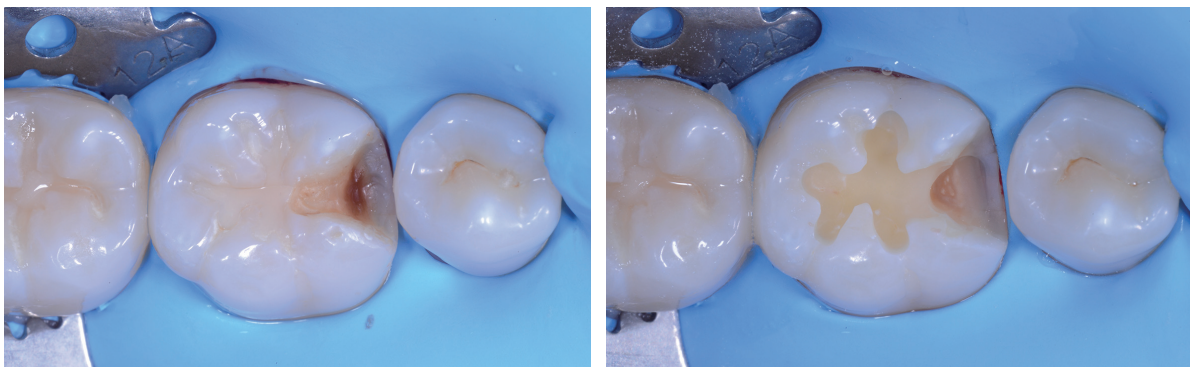
Until now, composite resin restorations have been used as a substitute for other materials with a moderately satisfactory result, but not as the ideal material of choice in the treatment plan. However composite resin has a much wider application than what we thought. It needs to be understood that the application of bonding agents while performing direct restoration in the oral cavity made MID (minimum invasive dentistry) possible, and allowed to establish various treatment plans suitable for different patients' condition compared to the conventional cementation method. Composite resin is a material with an extensive and versatile clinical application than any other materials currently used in dentistry.

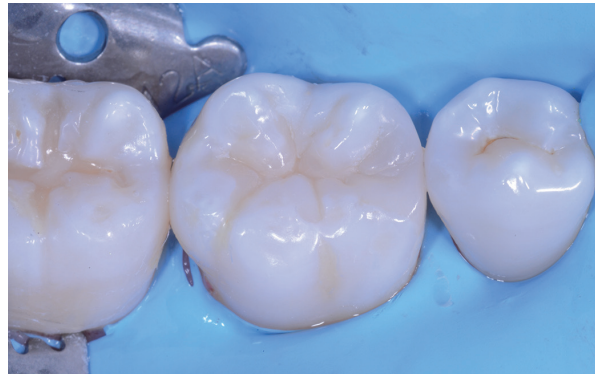
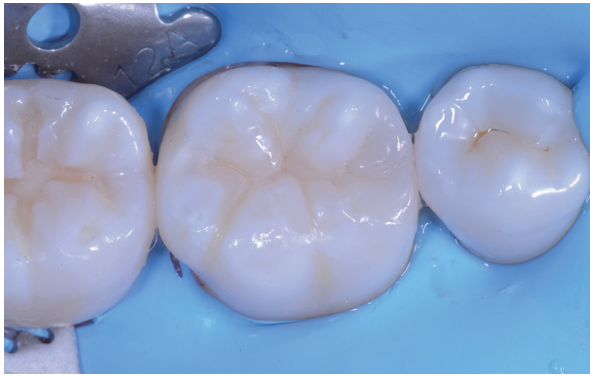
Where can the composite resin restorations be applied?

Restoration of Class I cavity

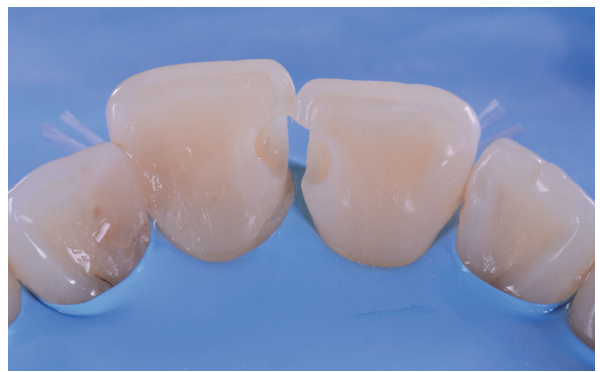


Restoration of Class II cavity

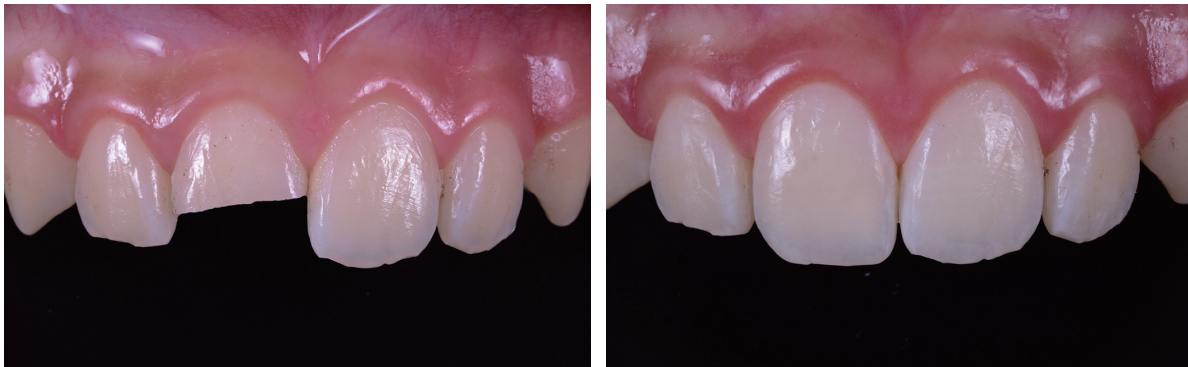




Restoration of Class III cavity



Restoration of Class IV cavity



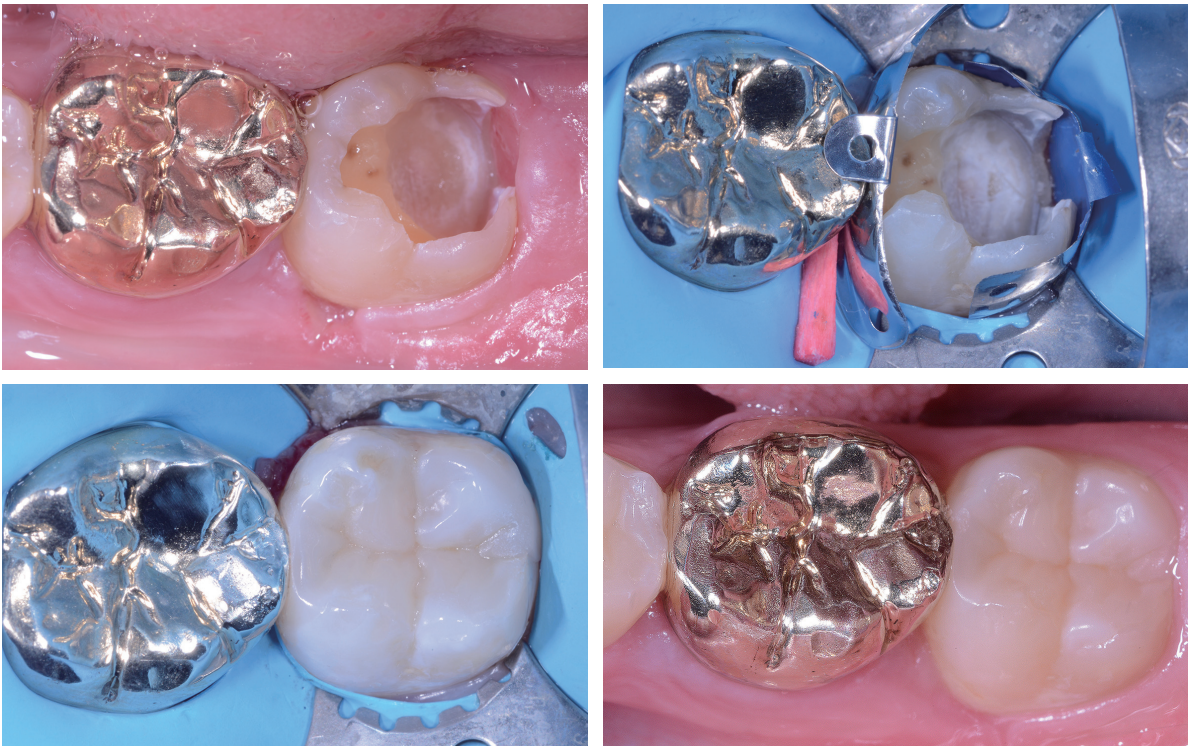
Restoration of Class V cavity



Restoration of Class VI cavity



When an under erupted posterior tooth requires a crown treatment due to extensive tooth structural loss, but has a retention issue

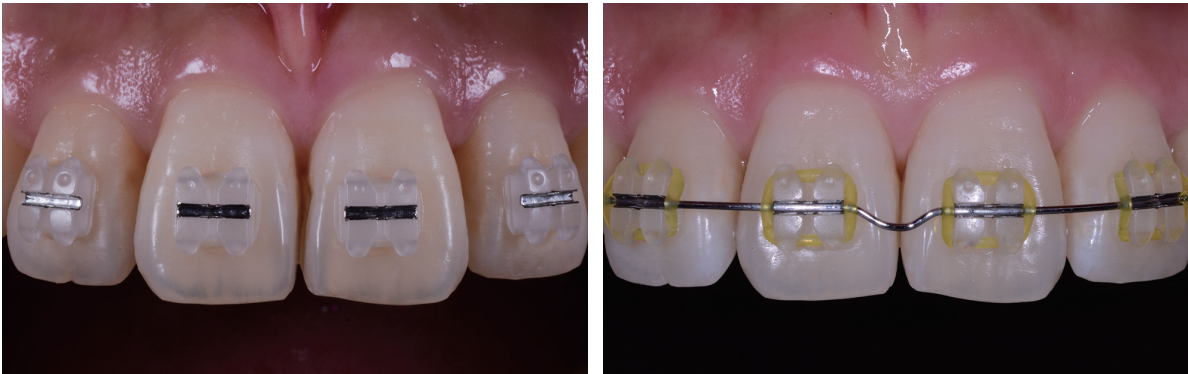


When restoration of the MOD cavity is required

When gold is used in maxillary premolars, molars, and mandibular molars, proper fracture resistance form may not be obtained, and additional tooth structure preparation may be needed for cusp capping. If the cementation method is considered, composite resin restoration using adhesives can be a good alternative that does not expand the restoration scope even when onlays or crowns are needed.

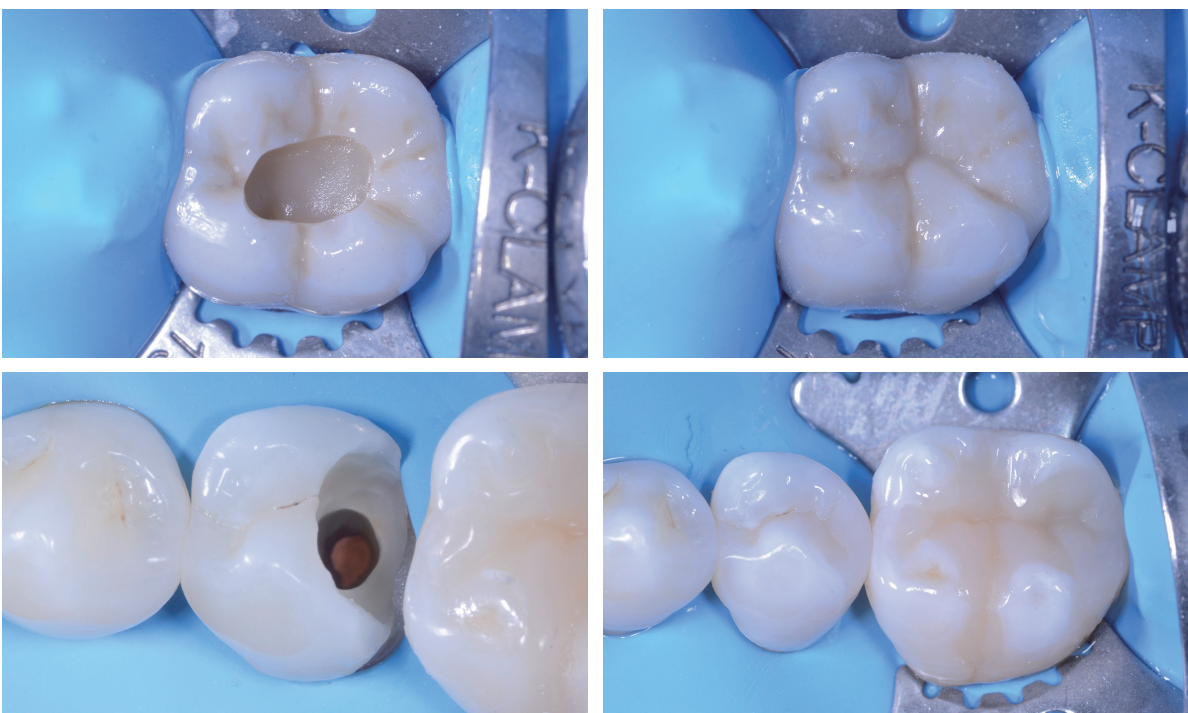
Treatment before, during, and after orthodontic correction

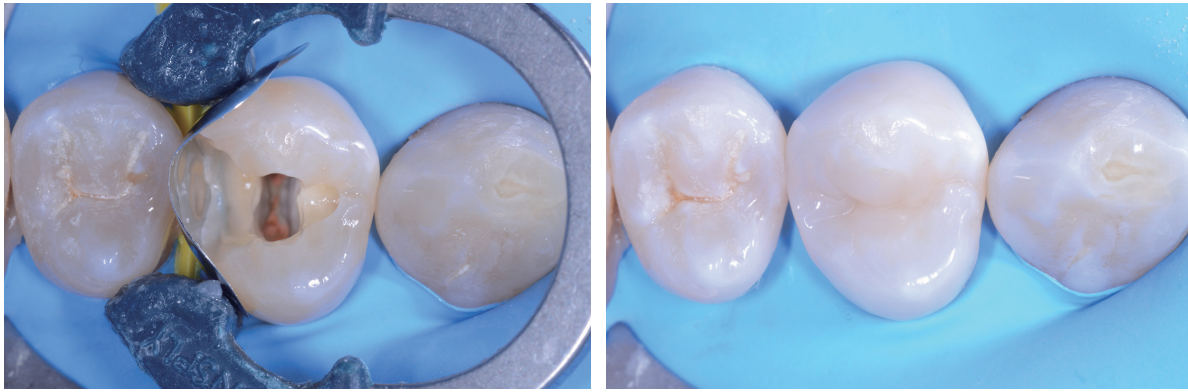
In patients who need to undergo orthodontic treatment, caries treatment may be required before and during the treatment. Further aesthetic or occlusal treatments may be needed for occlusal stability after the orthodontic treatment. Before orthodontic treatment, the caries treatment period can be shortened with composite resin. During orthodontic treatment, composite resin restorations do not affect orthodontic treatment plan.



As a final restoration for endodontic treatment

Until now, there were many cases where the endodontic treatment was completed with composite resin restoration in the anterior teeth, and it was believed that composite resin restorations cannot replace the crown treatment in the posterior teeth. However, there are more and more case where endodontically treated molars are completed with composite resin only. If the tooth is prepared for the crown, in the case of endodontically treated tooth, the possibility of crown fracture increases due to insufficient cervical tooth structure. Employing microscope and ultrasound equipment during endodontic treatment minimizes the access opening, and the necessity for a crown after endodontic treatment is decreasing.



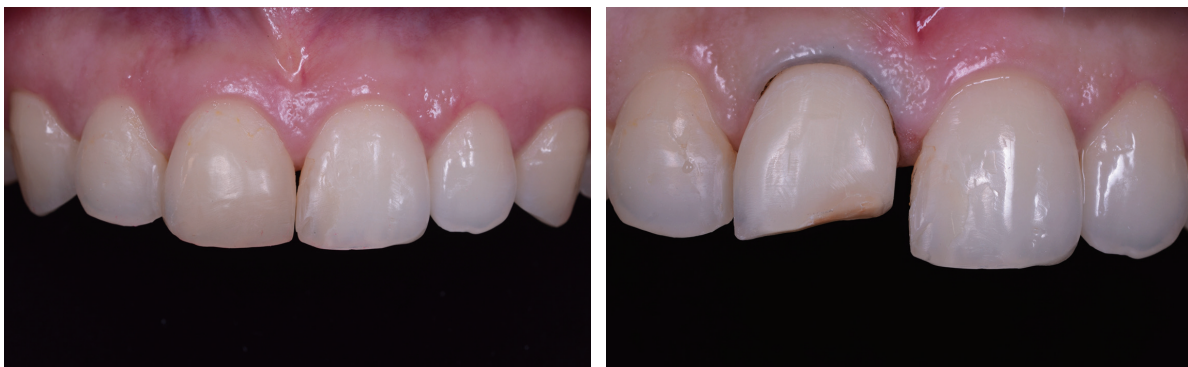


If there is an interdental space

The interdental space such as diastema and black triangle are good indications for composite resin restoration.

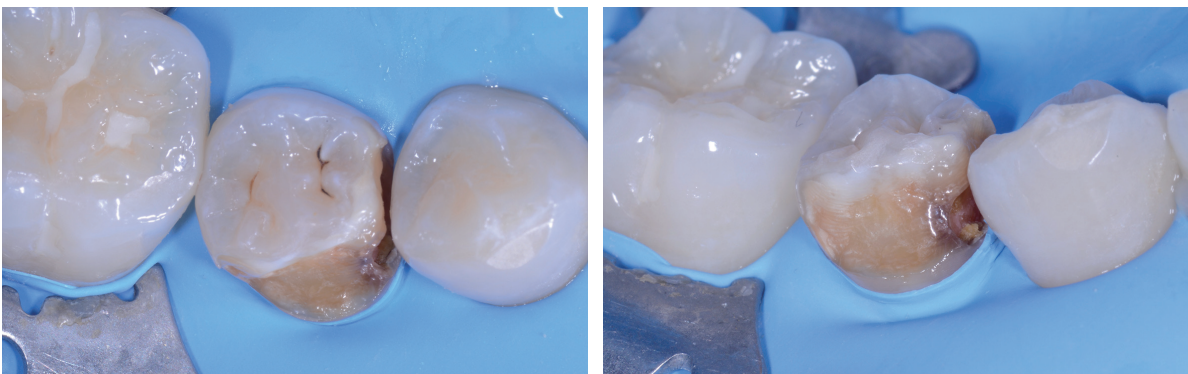


Composite resin laminate or crown





If a porcelain laminate veneer was a common treatment approach to improve the aesthetics of the anterior teeth, treatment with a composite resin laminate veneer has been increasing. Sometimes, when there is a loss of coronal tooth structure, a composite resin crown can be provided with the similar concept of treating the post and the core to restore the patient's aesthetics on same day of the visit, and reducing the chance of removal of tooth structure to increase the longevity of the teeth.



Even resin onlay or crown restoration were indicated, if tooth isolation can be properly achieved, the removal of unnecessary tooth structure can be kept to the minimal.



Besides treating large occlusal cavity with direct composite resin, overlay type restoration with direct restorative material can also be provided to stabilize the occlusion. In addition to this, composite resin has other numerous ways of clinical application. Therefore, composite resin is a material that can be applied in various ways depending on the clinical setting.



In this book, we will cover methods that can enable to achieve functional and aesthetic restorations using composite resins in various clinical situations.

Many materials used in dentistry have their own limitations, so the scope of their application are often not beyond their clinical indications. However, composite resin is a material that can be applied widely depending on the experience and skill of the clinician. The active use of composite resin will enable to produce successful restoration in situations where ideal treatments have been difficult to provide in the past, and clinicians will be able to formulate more diverse treatment plans.