Direct composite restorations from Esthetic view:

Modern resin materials have opened a huge door of opportunity for both dentists and patients by offering an esthetic and minimally invasive alternative for restoring the dentition that can be accomplished in just one office visit. Direct composite restorations make it possible to restore defects, repair tooth structure invisibly (Figures 1 to 3), and change tooth shape and alignment (Figures 4 and 5) without the use of a dental laboratory.

![Figures 1 to 5](images)


**FIGURE 2** A: Hypoplasia (white spots). B: Defect eliminated invisibly by white spot removal and the use of Renamel Micro-hybrid overlay with Renamel Microfill.

**FIGURE 3** A: Wax incisal edges. B: Repaired incisal edges. Note the complete invisibility of the restorations.

**FIGURE 4** A: Old composite veneers. B: Patient after color change with Renamel Nanofill and Renamel Microfill combination.

**FIGURE 5** A: Dentition before realignment. B: Patient after realignment, along with tooth reshaping, gingival recontouring, and color change. Note the translucency achieved with gray tint shifting through the overlaying microfill.
For **esthetic results to be achieved, proper technique and the choice of materials are of paramount importance. Physical and handling properties, opacity, translucency, color stability, and polishability greatly affect the esthetic outcome of the restoration.**

When **proper technique and the proper choice of materials are combined**, the result will leave the dentist and patient more than satisfied, composite procedures are actually less stressful for dentists because tooth preparation is kept to a minimum, no impressions are necessary, no temporization is required, the results are instantaneous, and there is no lag time because the laboratory is eliminated. Dentists can also **use composite to quickly mock up the final results for their patients.** Having patients see what their dentist can do for them.

**Over time, many different bonding agents have been developed with varying adhesive qualities.** This is important because bonding **agents allowed the dentist to have complete control in placing, shaping, and sculpting composite material.** The new adhesive qualities permitted higher bond strengths to enamel and dentin and yielded a better bond to metal, porcelain, and other materials.

**1- Macrofill materials were the first composites used in direct anterior dentistry.** Macrofill composites were highly filled, large-particle-sized materials exhibiting great strength and low esthetic properties. In 1978 the first microfill material was developed and has since been the premier material for simulating the enamel surface.

**2- Microfill composites are the best material for simulating the enamel surface both esthetically and biologically.** Owing to their small-sized, uniform, spherical particles, microfills exhibit the greatest long-term polish and the best wear resistance; they are the most plaque resistant and exhibit a refractive and reflective index closest to that of the enamel surface. Microfills also most closely simulate the enamel surface in color density, polishability, light refraction, and reflection, in both the short and long terms, and give the natural vitality of a finished enamel surface. Microfills have a translucence that most closely resembles enamel, thus allowing tints to shine through. When microfill composites are used, fracture toughness must be addressed. The single contraindication for a microfill is use in high-stress areas because of its lowered fracture toughness.

**3- The Microhybrids composite materials were first developed to compete with microfill materials owing to their higher strength properties.** Although microhybrids are not as polishable or as compatible with the tissues as microfill composites, their strength and opacity are extremely helpful in simulating the strength and support characteristics of the dentin. These composites work well for posterior restorations and, because of their increased opacity, for masking of dark or discolored areas. Their esthetic properties are not as good as those of a microfill or a nanofill composite; however, their physical properties include strength and fracture toughness. The mean particle size range of microhybrids is 0.4 to 0.7 micron. The larger particles are agglomerated up to 35 microns to give the material workability and strength. Because of their larger particle size, microhybrids are not as polishable. The esthetic qualities of microhybrid composites do not compare with those of a microfill in any way.

**4- The Nanofills composite materials are considered today’s universal material, exhibiting qualities of immediate polishability and great surface smoothness.** In addition, nanofill materials are strong, demonstrate low shrinkage, and offer good opaquing qualities. They are recommended for use on their own or underneath a microfill, except in areas where extreme color changes are needed. Their translucent quality allows the vitality of the tooth to be apparent when the light reflects through them. When used as a universal anterior material, nanofills exhibit excellent surface smoothness and ease of handling and good color. However, when compared with microfills, they will not maintain their polish long term and do not have the same translucent qualities of enamel. Although not yet proven clinically, nanofill composites are unlikely to be as biologically compatible with the gingival tissues over time as their microfill counterparts.

**To summarize:**

1- microhybrids exhibit great strength and opacity; therefore they are great for dentin replacement.
2- Nanohybrids exhibit good strength and better esthetics then microhybrids and thus are more suited for a universal material.
3- Microfill composites are the most esthetic of the three composite types and are the only materials that closely simulate the enamel surface. (Microhybrids and nanofills simulate dentin in strength and opacity, whereas microfill simulates enamel.)
4- When there is enamel involvement, especially in anterior sites, microfill is still the most appropriate choice.
5- If the dentin’s physical properties are an issue, either nanofill or microhybrids are more appropriate.
Opaquers help dentists achieve complete invisibility of the restoration with composite by blocking unwanted color and raising the value of the final restoration. Opaquers are primarily used to block out the unwanted shine-through from a dark under-color, to block metal, to cover a tetracycline stain, or to eliminate unesthetic translucent shine-through. The best example for the value of a reliable opaquing system is when repairing a fractured incisor. Often clinicians try to replicate the dentin color and then overlay this layer with a compensating shade of enamel to achieve the right surface color.

For example, if a fractured tooth is A1, then an A1 hybrid or nanofill can be added to recreate the incisal dentin portion of the tooth to help achieve opacity and strength. To eliminate translucent shine-through, an A1 opaquer can be placed over the top of the nanofill or microhybrid (Figure 6) to block and blend. Once the shine-through has been eliminated, there should be no difference between the tooth surface and the restoration. The addition of A1 microfill will create a perfect match of material to tooth structure and completely simulate the entire enamel surface once finished and polished. In this type of system, the colors of the opaquers, microhybrids, nanofills, and microfills should match one another and the corresponding shade guide exactly; only their values are different.

Tints are yet another underutilized material that if used properly can greatly enhance the esthetics of anterior composite restorations. Tints are used to enhance incisal translucency as well as gingival hue and chroma. A good tint must be transparent to allow the light to shine through and carry the color into the overlying composite layer. Because of its translucency, microfill is the only composite material that truly allows this phenomenon of color shine-through to take place, creating the color realism from within (Figure 7). This is yet another reason for using microfill as the prime enamel layer.
Clinical consideration

Composite Indications:

1- Composite materials are indicated for almost all types of anterior restorations, from surface and incisal defects to routine restorations such as class III (Figure 8), class IV (Figure 9), and class V (Figure 10).

2- They are ideally suited for other situations such as diastema closures, anterior veneering for color change, tooth reshaping, and tooth realignment to obtain a desired smile design (Figure 11).

3- Composites can be used for any type of treatment; such as full-bonded crowns (Figure 12), short-span anterior bridges, and porcelain repairs (Figure 13) which can all be constructed with direct composite resin.

4- The indications for the use of anterior composite materials depend on how skilled the operator is, how comfortable the procedure feels, and how well the operator can develop the desired restoration. (Figure 14)
Consider these important advantages of composites:

1. These types of restorations require minimal or no preparation.
2. Patient comfort is increased (often no anesthesia is required).
3. No temporization is necessary.
4. Dentists have complete control over the final result because a laboratory technician is not involved.
5. If something does break, it is easily repairable.
For restorative procedures it is important to properly estimate the value of the procedure and reflect that value in how much is charged, technique can be used to save a person’s tooth and restore it beautifully.

**Contraindications:**

Anterior direct composite restorations **should not be done by a dentist who does not feel sufficiently skilled.** Patients who have areas of extremely high stress, such as severe bruxers or clenchers who refuse to wear nighttime appliances, in overly aggressive eaters (e.g., those who chew hard candy), and **in fingernail biters. In cases with long-span spaces to be restored,** these restorations are generally not successful.

**Treatment planning:**

Treatment planning is driven by the characteristics of each individual case. For patients who have no problems with their **centric occlusion, centric relation or vertical dimension,** treatment planning can be done in segments. Anterior restorations can be accomplished without restoring the posterior, always remember to look at tooth size, inclination, rotation, or position and then visualize what needs to be done to create the illusion of perfection. For patients whose teeth are over-closed and those with decreased vertical dimension, it is necessary to treat the posterior occlusion first before addressing the anterior problems. Once the correct vertical dimension and centric occlusion have been established, then the proper anterior length and incisal guidance can be achieved with ease (Figure 15).

**Sequence of Treatment**

When planning a case, dentists must **first look at the patient’s occlusion and all of the excursive and protrusive movements.** If a person has either lateral or protrusive interferences, these must be addressed before tooth lengthening. For example, establishing proper canine rise with the use of composite is an excellent way to allow dentists the space necessary for tooth lengthening and proper disclusion (Figure 16). In wear cases, the patient’s mouth is treated according to the lip line. Often it is **necessary to restore the cusp tips of the bicuspids and at least the first molar to achieve the ideal look and the uniform curve of Spee.**

![Image](image_url)

**FIGURE 16** A. Absence of canine disclussion places disclussion on laterals and centrals, which causes wear and possible fracture of composite veneers. B. Canine disclussion after cusp rise has been added. C. Retracted view before treatment showing discolussion of original composite and canine wear. D. Full view in centric occlusion after the development of canine disclussion and re-veneering on centrals and lateral incisors with nanofill and a microfill overlay.

**Treatment Considerations:**

The **treatment considerations depend on what the patient wants.** It is important to get the patient’s input on the proposed treatment, particularly when creating a complete color change. **During a patient consultation, let the patient do the talking, then offer him or her advice and discuss the options available.** Often the patient does not see exactly what all the problems are. Doing just half the case will never make a patient happy. In treatment considerations, a thorough functional and esthetic diagnosis is essential to get the best result. After treatment, patient input is also welcome. The first treatment choice would be a layered technique, which would simulate both the enamel and the dentin layers. In the procedure, a **material that simulates the dentin—a hybrid or nanofill—is used first,** followed by a material that simulates the enamel—typically a microfill placed on the outermost surface. Knowledge of opaquing and tinting principles helps in achieving invisibility and overall consistency in the final restoration.
Clinical conservation concepts:

The object of minimally invasive dentistry with the use of direct resin bonding is the preservation of tooth structure. In preparation, dentists should consider how conservative the approach can be, what the plan is, and how minimally invasively the results can be achieved. The hard tissues should be preserved whenever possible because excessive destruction of these tissues can cause many long-term problems. The amount of preparation depends on the procedure to be done. For example, if a tooth is in labial version, the preparation may extend into the dentin, whereas if the tooth is in lingual version, no preparation may be necessary. It is desirable in any preparation to maintain as much enamel as possible for the best adhesion of the composite.

Morphology:

It is often difficult for dentists to shape anterior teeth properly. To establish proper morphology:

1-The dentist must recognize the relationship of tooth size and form to the facial structure and understand the relationship of lip line to tooth size.

2-A completed smile should follow the curvature of the lip line.

3-The art form of creating correct morphology is sculpting, in order for the dentist to achieve proper sculpting of the tooth form and to be able to manipulate the material beneath the gingiva, the dentist must have
proper instrumentation, such as Cosmedent’s anterior instruments. These titanium-coated instruments make it easier to apply and refine morphological aspects of tooth formation (Figure 17).

**Smile relation:**

After observation of the occlusion in relationship to the lip line and an exploration of the patient’s needs and wants, the occlusal relationship and the relationship in phonetics must be considered. It is important that the patient be able to pronounce the sounds needed for communication. The relationship of one tooth to another is explored because not all teeth are the same length. The central incisors are more prominent, the laterals are less prominent and perhaps a millimeter shorter, and the canines are longer, about the same length as the central incisors. It is desirable to have a nice smile line and a good curve of Spee, plus well-defined contact areas with good proximal contact, although sometimes some spacing may be desirable. The dental arches should conform to the relationship of the buccal mucosa over the dentition so that no negative space and no narrowing of the arch form are present. The smile line should follow the lip line, giving a good curve of Spee and avoiding a negative smile (Figure 18).
The importance of color:

There are many techniques for color management. Shade taking has always been a problematic area for dentists. Some materials do, in fact, match existing porcelain shades guides exactly (Figure 19). Some manufacturers make shade guides from polymerized and polished materials to work with their system.

There are three different aspects of color in the tooth structure (hue, chroma, and value):

1-Hue is the actual color of the tooth; the color one can see.

2-Chroma is the density of that color. This correlates to the depth of intensity or how much color is present.

3-Value is the relative lightness and darkness of the tooth.

In trying to take a shade, overall hue is seen in the center of the tooth or the center of the shade guide. Looking at the tooth from the front will help determine the density of the gingival color and whether there is a deeper chroma or more color at the gingival margin or the tooth has a straight flat color gingival to incisal. The incisal edge will show the amount and color of translucency. This may be, on the blue side, violet side, or gray side. Taking all Electronic or computerized instruments are now available to help match shade.

Taking a shade should always be done in a moist environment. Drying the area dehydrate the tooth, and it loses its color. Shade reading is best taken under fluorescent light; the whiter the better. Shades can be taken in colored light, but not in sunlight because sunlight contains all shades, which will influence the appearance of the tooth.

Translucency is different for every patient and every tooth. Dentists tend to consider translucency as uniform, but some patients have no translucency in their teeth. The translucency is very important because in a vital tooth there is subtlety of transfer. People like subtle translucency; it is something they can see. Generally people do not like hyper-translucent incisal edges. Teeth that are so thin that they can be seen through are not esthetically pleasing.

Beveling:

In preparing the facial aspect of a class III or IV or the buccal aspect of a class V restoration, beveling is important for making the margin of the restoration disappear into the tooth structure. The preferred method is a feather-edged bevel blended into the enamel surface (Figure 9-20). Neither butt joints nor chamfers are desirable. Once composite material is placed past the bevel, it should be finished and polished into the enamel surface, following its contours past the long bevel. One should never polish to the beveled margin because this will create an area of visible demarcation between the restoration and the tooth surface.
Contouring, finishing, and polishing anterior composites:

A common mistake made by most practitioners is trying to polish without properly contouring the restoration first. Proper contouring can be accomplished only if one sculpts the material to correct morphological shape before polymerization (Figure 21). Precontouring is accomplished through the use of reliable instruments such as fine diamonds, esthetic trimming carbides, or coarse disks (Figure 22). Once the proper contour has been achieved with these instruments, then the finishing and polishing process can be started. It is extremely doubtful that this will ever happen. It takes a series of different systems to obtain the best finish and polish. Composite materials cannot be marginated with the use of silicone or rubber-impregnated material alone. The only way to properly marginate composite material is with the use of a series of different aluminum oxide disks with various grits ranging from coarse to superfine (Figure 23).

A aluminum oxide– or diamond-impregnated instruments will characterize composite restorations very nicely (Figure 24). Diamond-impregnated rubber instruments are also extremely helpful in polishing hybrids and nanofills, but they will not polish a microfill as well as the aluminum oxide cups and points. Given all the finishing and polishing instruments that are available, it is a matter of finding the ones that work best for each material. The final step of polishing should include the use of an aluminum oxide polishing paste on microfill and the use of a fine diamond polishing paste followed by an aluminum oxide polishing paste on a microhybrid or a nanohybrid. Using these pastes under pressure, with a felt wheel, point, or felt disk will highly enhance the final polish (Figure 25).