# THE COURSE OF TIME IN DENTAL MORPHOLOGY

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Many factors contribute to the success of individual aesthetic restorations, whether ceramic or composite. This is especially true when the indirect technique is used: technical awareness in the lab, together with expert knowledge of dental morphology, plays a fundamental role in the reproduction of a shape where attention to detail must be precise. The perfect knowledge of dental morphology is a legacy to be safeguarded and used beyond the usual time limits of techniques and materials.

The growing demand for aesthetic restorations has been strong motivation for the commercial development of aesthetic materials such as ceramic or composite.

A correct aesthetic reproduction should not be influenced by materials. On the contrary, the choice of the materials must follow an analysis of their real potential for a proper and easy reproduction of the tooth surface, its polishing quality and long lasting stability. As we all know the reproduction of the tooth natural colour is strictly linked to dental morphology: the proper chromaticity is the result of the correct stratification of the different elements within the space available for the requested restoration.

The overall harmony of the aesthetic result must be balance of colour and correct reproduction of dental morphology. *(Figure 0: Pressure die cast ceramic. The restoration must be perfectly integrated both morphologically and chromatically. The perfect reproduction of the lip surface is a determining factor).*

The knowledge of basic morphology and the ability to harmonize all the parts of the tooth, ie. lobes (cones) and surface (texture), are valid criteria to carry out a restoration which matches the other teeth, periodontal tissues and face perfectly.

It is fundamental to check the position of the cones, which are considered as anatomic subdivisions of the tooth, and are usually separated by vertical primary grooves. This check is useful to obtain an exact conjunction between the different elements (margin crests, labial crests, transition areas, incisal edges, horizontal grooves), and consequently achieve the best tooth composition.

Surface texture plays an important role in the aesthetic result of the restoration and the expertise and ability to reproduce it,

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***Figure 1: The tooth bio-architecture together with a control on the primary elements is an additional system both for ceramic and composite materials.***

***Figure 2: The development of each cone determines the relationship with the following one and its direction, thickness and junction point between lobes. Dental morphology is the result of the aspect of the different lobes and their interaction.***

as well as facilitate the imitation of processes such as the natural ageing of a tooth.

As nature is actually the only model for our work, careful observation of natural teeth, together with good practice, are the key for the development of the necessary skills to achieve an "invisible" dental restoration either in ceramic or in composite.

Under an embryological point of view, the natural tooth is a harmonious whole of protrusions whose junction determines the formation of crests and grooves. When modeling a restoration it is vital to concentrate on the position and shape of the crests rather than on the grooves and hollows which are actually a result of the junction between the crests.

It is thus important to achieve aesthetic goals in which the shape and colour are consistent with the patient's age.

In the oral environment, many external factors such as the changes in the periodontal support structure and the appearance of a wear and tear facet, interact to modify the appearance of the teeth. Such processes are linked to age and strongly influence the teeth aesthetics.

During adolescence, for instance, surface features such as edge and secondary crests, horizontal grooves and lines, are clearly visible and all help to determine a rather rough surface.

With age, the surface texture of the teeth tends to change due to continuous labial friction and the mechanical action of the toothbrush. Consequently, the typical roughness of a young tooth's surface accommodates sheen and smoothness, influencing the overall chromaticity of the teeth.

This is mainly due to a increase in the dentine colour reflection through the labial surfaces. Year after year, higher calcification increases the labial enamel translucence thus helping the dentine colour to come through gradually. This was previously inhibited by the low translucence of the dim enamel of the young tooth.

Tooth colour is also determined by the changes dentine undergoes caused by age. The older dentine, the more water it absorbs and the more translucent it becomes. As a consequence the natural colour of a tooth changes from light to darker and translucent nuances.

The intense white shade of an adolescent's teeth tends to acquire a slightly yellowish and finally a brownish tone.

To achieve a correct aesthetic restoration, morphological and chromatic changes due to ageing must be properly and realistically reproduced. Attempting to recreate the effect of biological ageing through surface colouring only, without considering the internal modification of the dentine, can affect the final aesthetic result.

Mamellons are usually clearly visible in adolescence, but tend to disappear at a relatively young age through flattening. This presents several wear and tear patterns according to the individual mouth closing scheme. Because of their angle, the facets' wear and tear pattern is visible on both the upper and lower front teeth lingual surfaces. As the worn facets on the upper front teeth are not visible from the labial side, the only evident change is the gradual shortening of the incisal edges.

On worn surfaces, especially on the incisal edge, dentine exposure may occur. As dentine is generally softer than enamel, it usually wears easily, thus causing hollows around the incisal edge area. When exposed it is also subject to dischromias that will affect the overall chromaticity of the natural tooth.

***Figure 3: Position and development depends on the primary shape to be reproduced and the junctions will determine an oval, squared or rectangular shape.***

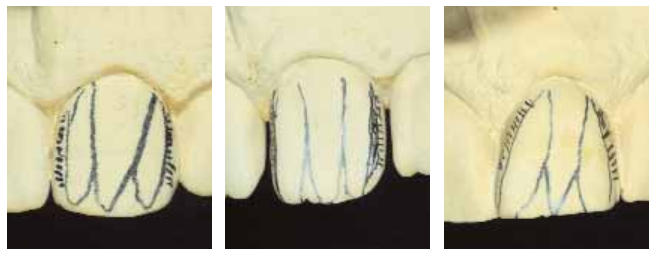


***Figure 4: Natural teeth remain the best example to observe and imitate, taking into account the course of biological time.***

***Figure 5: Composite replica of the effects of ageing and function on the tooth morphology and colour.***

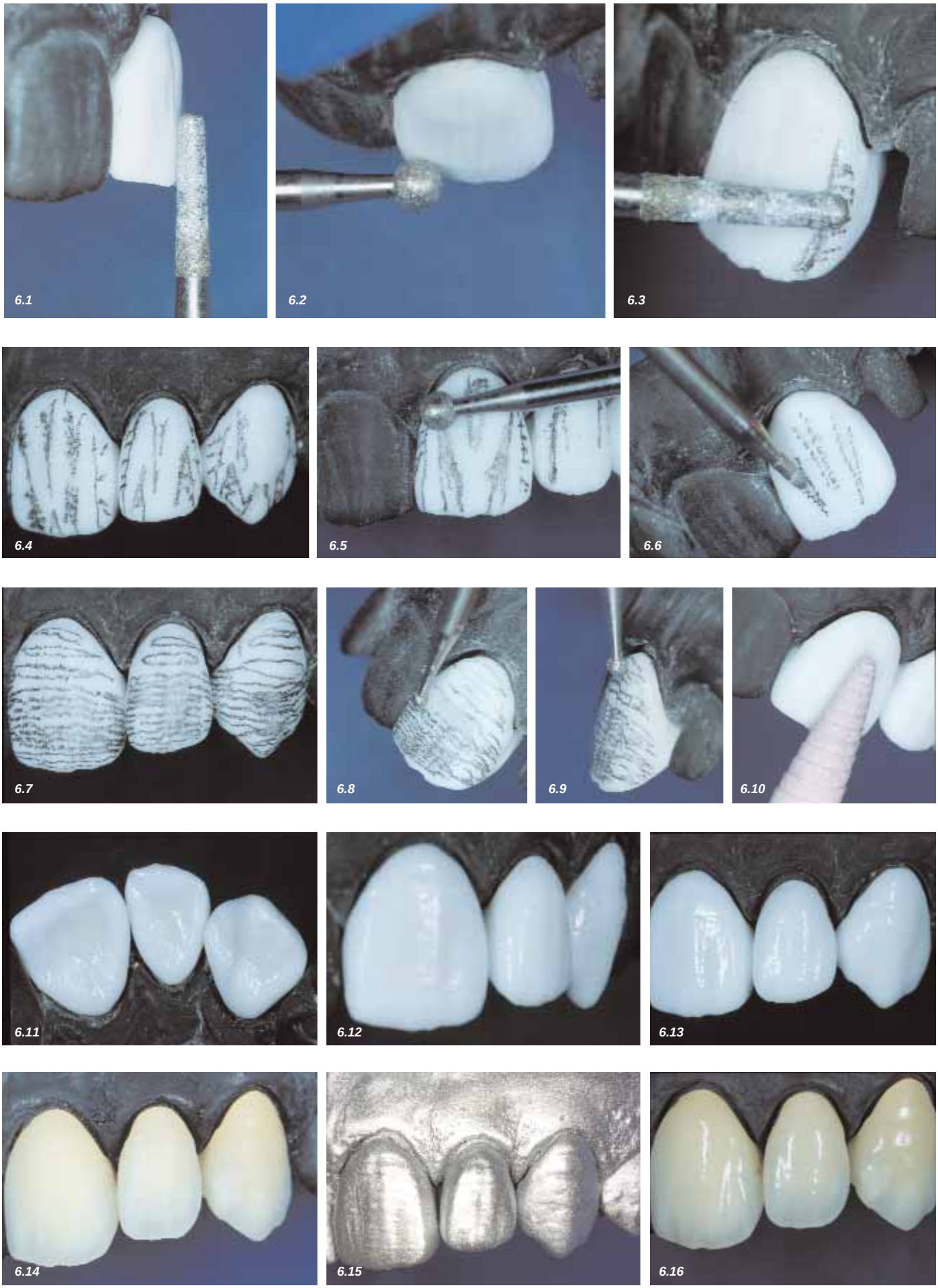
The following interesting exercise with opaque white ceramic is useful to recreate a correct morphological refinishing plan. This material allows a better analysis of the surface texture and a better application of the technique to be used with any covering material.

After the whole opaque ceramic mass has been processed and baked and the crowns have been adapted to the master model, they are be aligned with the rest of the teeth. This step will be carried out through reduction by extended diamond or silica drills. By operating both horizontally and vertically the crown perimeter will be checked as well *(Figure 6.1).*

We then move on to the external profile (labial crests) by using a diamond sphere longitudinally on the tooth *(Figure 6.2)*. The cones' bio-construction and correct location of the primary lobes will thus be achieved *(Figures 6.3, 6.4, 6.5).* With a thinly pointed tungsten cutter, the secondary vertical details of the crown labial surface will be replicated *(Figure 6.6).*

The horizontal grooves are marked in pencil, following the proximal transition areas. The grooves within the incisal body are more numerous and follow the patterns and depressions formed by the links to the primary cones. On the contrary, the grooves are less numerous and more evident in the cervical body area *(Figure 6.7).*

***Figure 6***



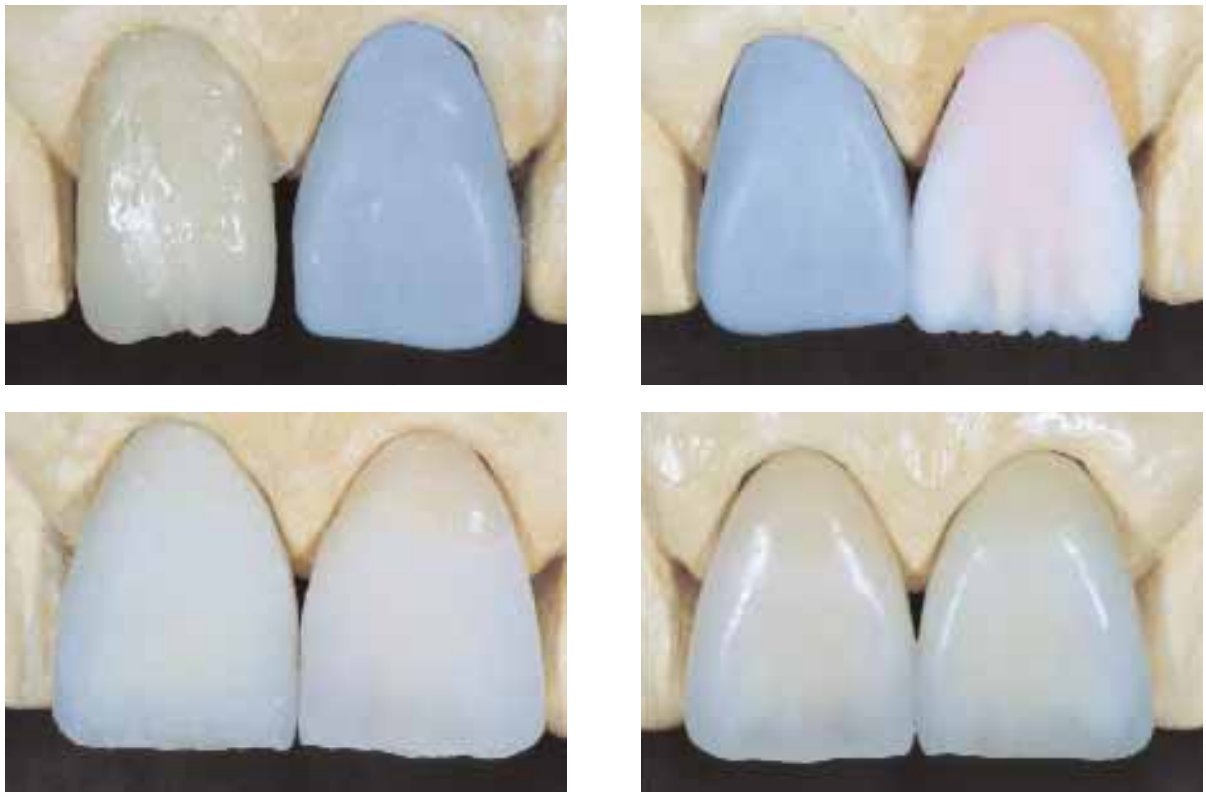


*Figure 7: Conflict between two aesthetic covering materials: ceramic and composite. Please note the different behaviour under light reflection).*

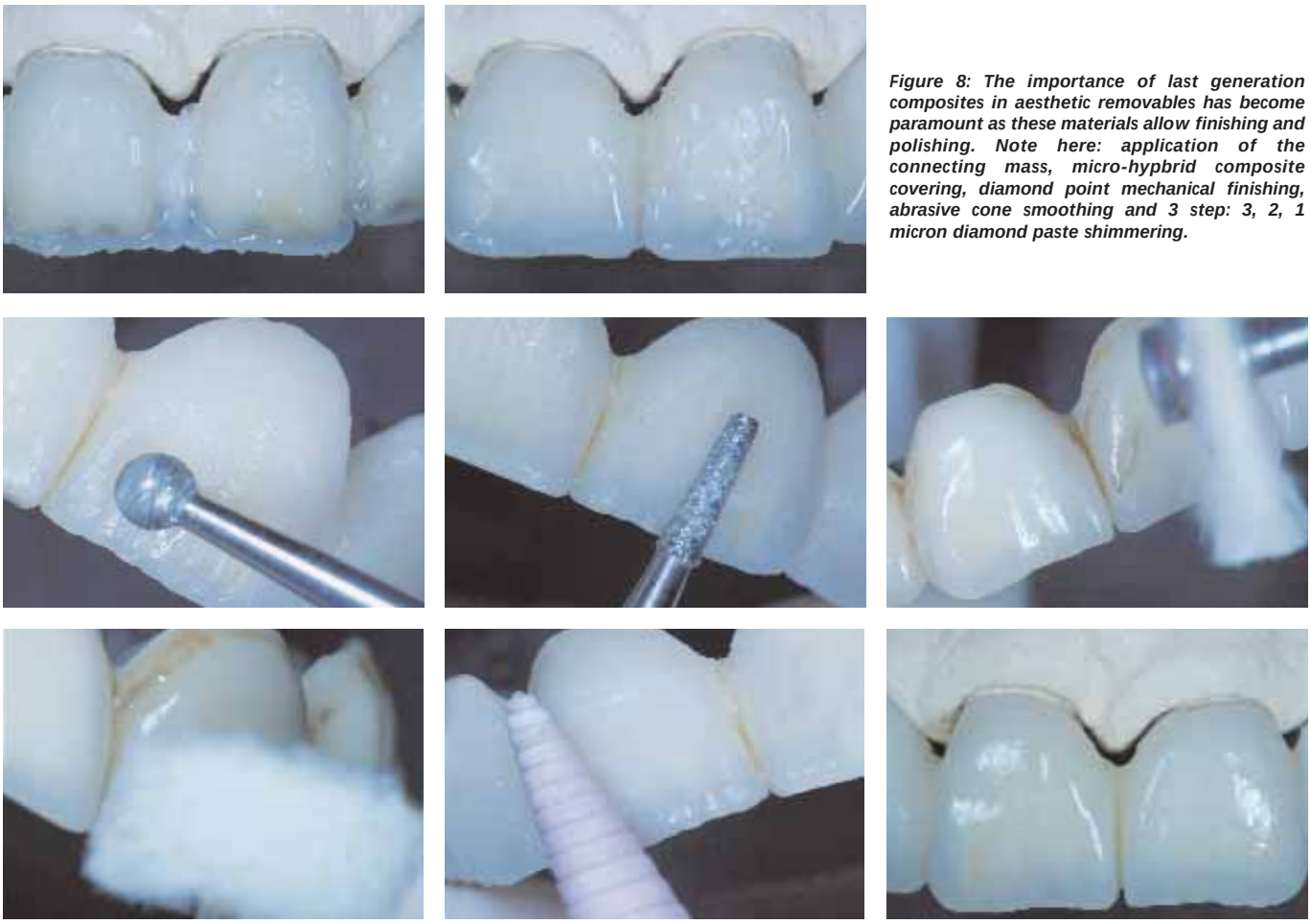


*Figure 8: The importance of last generation composites in aesthetic removables has become paramount as these materials allow finishing and polishing. Note here: application of the connecting mass, micro-hypbrid composite covering, diamond point mechanical finishing, abrasive cone smoothing and 3 step: 3, 2, 1 micron diamond paste shimmering.*

***Figure 9: Composite in direct aesthetic restorations. Four composite facets, two anterior covering inlays.***

A small sphere diamond edge point will be used for finishing, carefully following the design formerly drawn on the labial surface *(Figures 6.8, 6.9).*

To complete the mechanical finishing of the crown, the action of the diamond point will be reduced by polishing the abrasive paper cones *(Figure 6.10).*

The paper cones followed by the oven obtained self-shimmering, will help give the final restoration a natural look that takes into account the effect of natural wear and tear.

The imitation of biological ageing may be intensified by using pumice and diamond pastes which may eventually give a typical "aged tooth" effect *(Figures 6.11, 6.12, 6.13).*

We are now ready to repeat the mechanical finishing procedure with the stratified crowns as well. The effect obtained will be extremely natural due to the rigorous application of building techniques in combination with morphological finishing.

When the job is stratified, "Silver" powder may be useful in eliminating surface reflections in order to improve the morphological evaluation. This non polluting powder is easily washed away before the final polishing *(Figures 6.14, 6.15, 6.16).*

It is vital for the technician to be able to apply the fundamental working procedures, with the same outline and methods for all covering material used.

In aesthetic restorations, the development of composite materials has strongly supported the use of these materials in the lab as well, particularly for their mimetic aesthetic solutions and for their long lasting surface stability.

It was possible to apply the same techniques and tools normally used for the mechanical finishing of ceramic materials. The only difference is the use of simple abrasive diamond paste to obtain the final shimmer without the help of glazing varnishes or even obtained shimmering.The composites we refer to are new generation micro-hybrid. They are used successfully not only in direct techniques, but also in indirect techniques as their surface compactness offers an almost physiological abrasion resistance.

*The development of composites for lab techniques offers a new working horizon for technicians in the aesthetic restoration field, where they can ultimately exploit their know-how and expertise with particular emphasis on dental morphology, a fundamental legacy for the modern professional technician.*