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Essential lines: A concept for the production of functional and beautiful posterior restorations.

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Drawing 'essential lines' can help successfully recreate the natural appearance of teeth in restorative dentistry.

The essential lines concept assumes each posterior tooth has a universal set of characteristics, or common lines. When used in combination with copying techniques, knowledge of these lines can help recreate the appearance of a tooth in restorations – especially in cases where the exact anatomy of the tooth is not available. It can also reduce the time and effort spent on creating natural-looking restorations, without compromising on quality.

This concept works for all molars and premolars in the maxilla and mandible, provided the position-specific essential lines are used.

Restorative dentistry may be described as the art of recreating natural beauty, and this process is often laborious and time-consuming. Even a standard treatment like a direct posterior composite restoration involves certain challenges that need to be overcome every day. One of the most difficult and decisive steps in the procedure is the restoration of the natural anatomy.

Thankfully, there are a few strategies available that allow us to simplify the process without compromising the quality of the outcome. One of these strategies is copying, as the best way to find something is not to lose it …

To copy a well-preserved occlusal anatomy, the tooth morphology is recorded e. g. by use of light-curing resin or silicon. Later, it is stamped onto the composite surface to transfer the recorded information. Not only the tooth to be restored, but also a contralateral tooth or a similar one may be used as the source of information that inspires us during free-hand modeling. Another concept that may be combined with the described stamp technique when the exact anatomy is not available initially due to dental caries, wear or tooth/restoration fracture is the idea of essential lines.

Essential lines

The concept starts from the assumption that the fissures of posterior teeth of each position have some universal characteristics. That means that virtually all lower first molars show similar lines, as do all upper second premolars. By analysing and comparing a number of different teeth of the same position, we were able to confirm this assumption.

Moreover, we isolated and defined the essential lines for each posterior tooth position (Figs. 1 and 2).

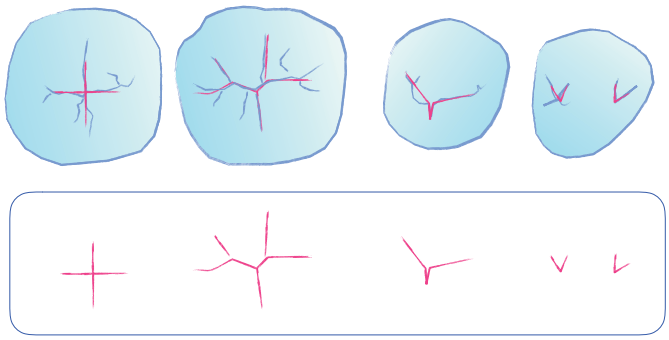

Figure 1: Mandibular molars and premolars and their essential lines.

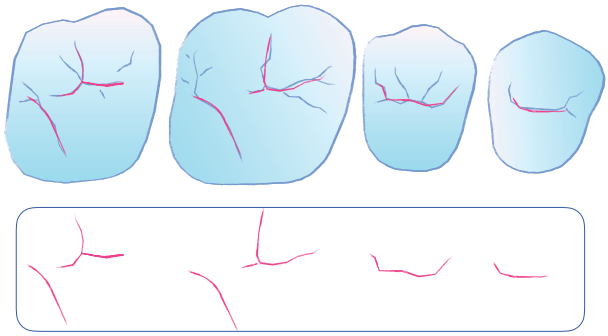

Figure 2: Maxillary molars and premolars and their essential lines.

The reason for us to initiate this work was that we know that lines are a powerful instrument that allows us to fool the eye and manipulate the appearance of an object. We wanted to use this fact in a positive way to let our restorations appear more natural.

The following case is used to demonstrate how it is possible to leverage knowledge about essential lines in direct posterior restoration procedures.

The clinical case

The patient presented for a replacement of an amalgam restoration in a mandibular first molar (Fig. 3).

Figure 3: Initial situation: The amalgam restoration on the mandibular first molar needs to be replaced.

The stamp technique was not applicable in this case, as the occlusal morphology was lacking the details particularly in the amalgam part. However, the shape of the cusps was recorded with a silicon index as a precaution (Fig. 4): If one of the cusps collapses during or after removal of the amalgam, the anatomical information is still available and cusp build-up is facilitated.

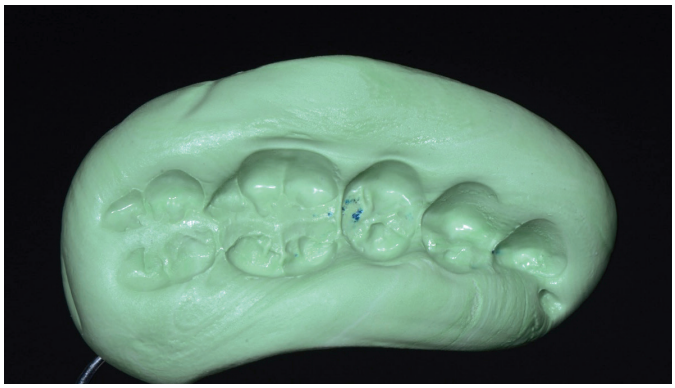

Figure 4: Safety measure: Silicon index used to copy the shape of the tooth.

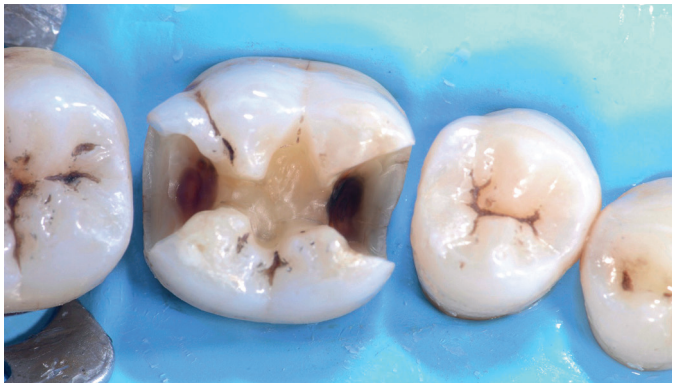

Figure 5: Result of the preparation procedure.

Tooth preparation

Wedges were placed and the existing restoration was removed. Then, the space created was leveraged for restoration of two small proximal lesions in the mesial part of the second molar and the distal part of the second premolar. After finishing and polishing of these restorations, the cavity walls and margins of the first molar were refined. Figure 5 shows the tooth ready for etching and bonding.

Filling procedure

For etching and bonding as well as restoration of the proximal walls, the wedges were repositioned and two sectional dark matrix bands placed. Subsequently, an etching gel containing 35 percent phosphoric acid was applied to the enamel margins and rinsed off after 30 seconds (Fig. 6).

Figure 6: Selective etching of the enamel.

A ring was used to hold one of the matrix bands in place. When the etching procedure was completed, 3M™ Scotchbond™ Universal Adhesive was applied to the prepared tooth surface (Fig. 7), rubbed in for 20 seconds, air-dried until the adhesive did no longer show any movement and finally light cured for 40 seconds.

Figure 7: Application of the one-bottle universal adhesive.

The use of a universal adhesive is preferred as every component needed for bonding is contained in a single bottle and several steps are eliminated. Another benefit lies in the fact that the product produces virtually no post-operative sensitivities and the final layer is very thin.

With two rings securing the sectional matrix bands, the proximal walls of the molar were built up with 3M™ Filtek™ One Bulk Fill Restorative (Fig. 8). The rings and matrix were removed and the cavity was filled with the bulk fill material that may be placed in layers of up to 5 mm thickness – provided that the light-curing protocol recommended by the manufacturer is observed (Fig. 9).

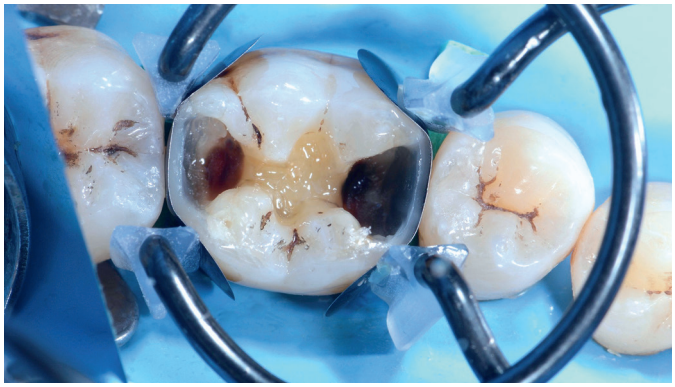

Figure 8: Situation after build-up of the proximal walls. The use of a black matrix helps to choose the proper thickness of the walls.

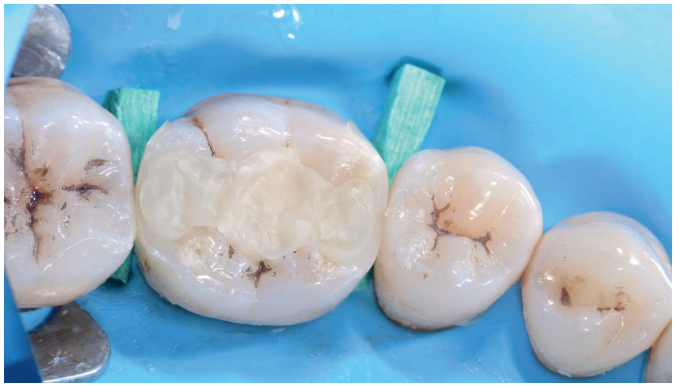

Figure 9: Cavity filled with bulk fill restorative.

For Class II restorations with an increment depth of 5 mm, recommendations are as follows:

Halogen Lights (with output of 550 to 1000 mW/cm²):
20 seconds occlusal
20 seconds buccal
20 seconds lingual

LED Lights (with output of 1000 to 2000 mW/cm²):
10 seconds occlusal
10 seconds buccal
10 seconds lingual

For adaptation of the material and contouring, the Condensa instrument (LM Arte) was utilised. The result of this procedure is shown in Figure 10.

Figure 10: The cavity after the use of the Condensa instrument used to copy the inclination of the remaining cusp tissue.

Fissures

Finally, the essential lines (Fig. 11) were transferred to the patient's mouth with the Fissura instrument (LM Arte). The central point right in the center of the occlusal surface was marked first (Fig. 12), and starting from there, the fissures were drawn with the essential lines in mind and the aid of the remaining landmarks in the marginal areas (Figs. 13 and 14).

In order to optimise the optical effect, a small amount of brown tint was applied into the fissures with a fine brush (Compo-Brush, Smile Line) (Fig. 15).

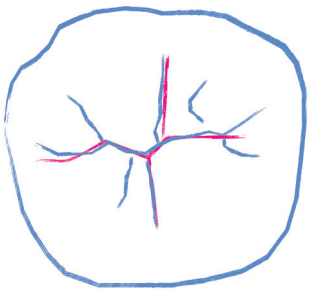

Figure 11: Essential lines of the mandibular first molar.

Figure 12: Central point of the fissures marked on the restoration surface.

Figure 13: Drawing of the essential lines from the center to the remaining fissures in the marginal areas.

Figure 14: Outcome of the procedure.

Figure 15: Effect of fissure staining with a drop of brown tint.

Afterwards, the restoration was polished with the 3M™ Sof-Lex™ Diamond Polishing System (Fig. 16). Figure 17 shows the result after checking of the occlusal contacts and rubber dam removal.

Figure 16: Situation after polishing.

Universal concept

The present case shows that the concept is easily implemented in everyday procedures and does not require any advanced skills. Especially in combination with copying techniques, the knowledge of essential lines helps us to reduce the effort and time involved in the creation of functional and beautiful posterior restorations in the dental office. The concept is universally applicable, as illustrated in Figures 18 and 19 that show other examples of composite restorations in mandibular first molars.

The essential lines are easily identifiable and the desired natural appearance is obtained. The concept works similarly for all molars and premolars in the maxilla and mandible, provided that the position-specific essential lines are used.

Figure 17: Final treatment result.

Figure 18: Additional examples of mandibular first molars…

Figure 19: … restored with composite and provided with essential lines.

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Born in Brescia, Dr Giuseppe Chiodera graduated with a degree in dentistry from University of Brescia in 2004. Winner of a scholarship at Kings College University of London. Currently visiting professor in Siena. Speaker at National and International Conferences Particularly interested in conservative dentistry and aesthetic restorations but also on diagnosis, prevention, bleaching, ozone and diode laser. He is member of StyleItaliano™. He has contributed as author and co-author of articles in National and International journals.

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