

# Recreating morphology for improved Class IV restorations

A restorative treatment that uses tooth morphology to achieve successful results.

## Background

The fractured incisor is a common occurrence in general dental practice. Achieving a positive aesthetic outcome and maximising bond strength is central to patient satisfaction and ensuring restoration longevity. Correct shade selection and the reproduction of natural anatomy in composite resin can be challenging in the anterior labial segments where the human eye's ability to detect asymmetry plays an important role.<sup>1</sup> An understanding of tooth morphology and how to replicate it will aid in this procedure. This article aims to describe a step-by-step approach towards successful morphological replication in Class IV composite resin restorations. Composite shade selection, placement techniques and polishing methods will be covered.

**Table 1: Relevant terms (see Figure 1).**

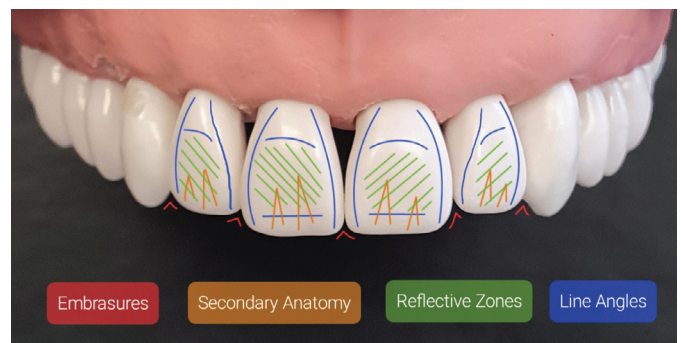
| Term              | Explanation  |
|-------------------|--|
| Primary anatomy   | This refers to the overall external outline shape of the tooth   |
| Secondary anatomy | This refers to the lobes and depressions of the tooth  |
| Tertiary anatomy  | Commonly known as perikymata, this refers to the surface roughness of the tooth and it can be pronounced (younger) or absent (older) |
| Line angles       | The lines of intersection between the different surfaces of the tooth  |
| Embrasures        | These are the triangles of space between proximal surfaces of teeth  |
| Facial planes     | This refers to the gentle slopes of the tooth from the cervical region to the incisal tip (commonly three planes exist)              |
| Reflective zone   | The central flat labial surface of the tooth that reflects the most light  |

## Considerations for correct shade selection

- Permanent teeth dehydrate in approximately three minutes,<sup>2</sup> so shade selection should be done as soon as possible while the teeth are still hydrated and the clinician's eyes are not fatigued;
- where possible, natural light should be used from an open window;

- placing a 'button' of different shades of (cured) composite can be helpful in making a final decision; and,
- if the clinician is still unsure, taking a black and white photograph of the composite buttons on the tooth surface can aid a final decision as the human eye is better at detecting greyscale (value) discrepancies.

**TIP:** When a layering composite resin system is being used, the enamel shade button should be placed incisally as there is little to no dentine in this area. The dentine shade button should be placed cervically as the enamel is thinnest in this area, thus allowing for the underlying dentine shade to show through. In single shade restorations the button should be placed centrally on the tooth as this zone corresponds to the most even blend of enamel and dentine.



**FIGURE 1:** Important anatomy of the anterior dentition.

## Steps for improved restoration placement

### Preparation

- Prior to restoring the Class IV cavity, assess the adjacent tooth. Look out for over-contoured or rough interproximal restorative surfaces. These may need polishing or reduction to improve interproximal contours for the new required restoration.
- Restoration placement under rubber dam has a positive impact on bond strength.<sup>3</sup> Remember to allow approximately 3mm between each hole



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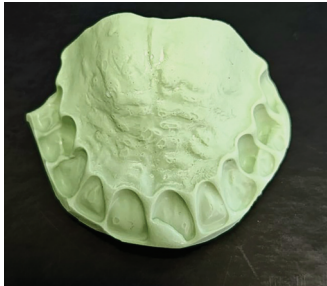


FIGURE 2: Putty matrix prior to adjustment.

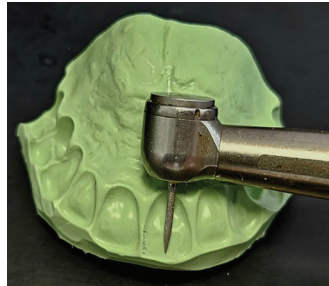


FIGURE 3: Putty matrix adjusted using needle bur.

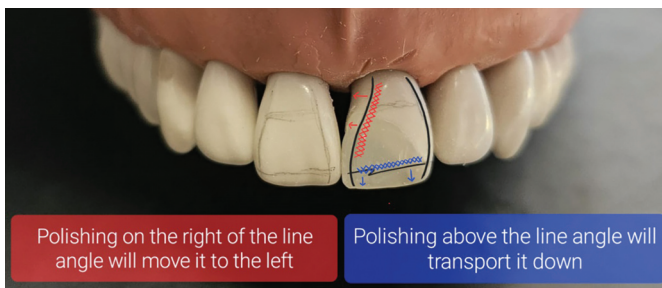


FIGURE 4: How to assess and adjust line angles.

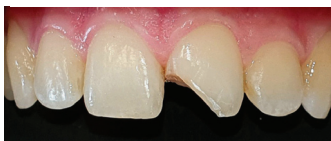


FIGURE 5: Before fractured incisor with bevel in place.



FIGURE 6: After restoration immediately post op.

punched in the rubber dam to allow space for the dental papilla and enough material to invert the dam for optimal isolation. Ensure the size of the holes are not too large to maximise moisture control.

- Place a 2mm wide bevel, starting from the amelo-dentinal junction (ADJ), on the labial surface only. This will allow for a transition zone to blend the composite to the natural tooth, which can be achieved with a red band needle bur. A bevel also increases the enamel bonding area, resulting in improved retention and reduced micro-leakage.<sup>4</sup>

#### Restoration

- Etch and apply the bonding system of your choosing, ensuring that a sufficient area past the margin is incorporated.
- Use a putty matrix to place the palatal shelf increment. In trauma cases the putty can be adjusted using a finishing bur at low speed to create a matching palatal contour (Figures 2 and 3). A second option is to use a mylar strip supported by a flat plastic incisally to recreate the palatal shelf.
- Place the interproximal increment using a sectional matrix band. This is a useful tool to create tight interproximal contours. The curvature of sectional bands aids in avoiding a flattening of the interproximal wall and subsequently the incisal transportation of the contact point.
- Fill the cavity in small increments to ensure depth of cure and minimise shrinkage stresses. When using a layered composite resin system, remember that the enamel shade should only be 0.5mm thick palatally, interproximally

and labially. The remaining bulk of composite should be in the dentine shade.

- Place the entire labial surface as one increment to ensure a smooth and polished final restoration.

#### TIPS:

- Composite should be patted into shape with slow and light touches and not packed in with small quick touches as this will risk the incorporation of air bubbles.
- Use of a brush and a small drop of modelling liquid can aid in the delicate smoothing and shaping of the final composite increment. Alternatively, a clean and polished flat plastic or composite shaping instrument could be used.

#### Morphology

- Using a mechanical pencil while holding the lead at 45°, outline the line angles and facial planes of both the restored tooth and the adjacent tooth to compare and correct discrepancies (Figure 4).
- The aim is to create matching reflective zones. Line angles can be moved closer together to give the illusion of a narrower tooth (smaller reflective zone) or conversely moved further apart to give the illusion of a wider tooth (larger reflective zone).
- Use a coarse grit polishing disk to achieve the correct primary anatomy, moving systematically from (a) incisal edge length to (b) facial planes including labio-palatal thickness and finally (c) line angles.
- Review the shape and definition of the embrasures and, using a medium grit polishing disk, make the necessary adjustments to ensure symmetry.
- When using polishing disks, it is advised to use a gentle stroking motion, keeping the disk constantly moving to achieve the best results. It is critical that you use each grit in the correct sequence to achieve the best lustre (Figures 5 and 6). Skipping a step will only ensure a dull finish.

**TIP:** If you wish to include secondary anatomy, this can be drawn on with your mechanical pencil to guide the yellow needle bur in creating the subtle grooves.

#### References

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3. Falacho RI, Melo EA, Marques JA, Ramos JC, Guerra F, Blatz MB. Clinical in-situ evaluation of the effect of rubber dam isolation on bond strength to enamel. *J Esthet Restor Dent.* 2023;35(1):48-55.
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