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The Clinical Microscope and Direct Composite Veneer

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Clinical Relevance

Magnification is a useful tool for optimizing the quality of dental services.

SUMMARY

This paper presents the advantages and limitations related to the use of a clinical microscope in restorative dentistry, and it demonstrates the aid of magnification during preparation and restoration of a direct composite veneer. Good illumination and visibility is important to adequately viewing the adjacent dental tissues so that the resin composite buildup can mimic natural teeth. The reproduction of details results in a naturally esthetic direct veneer.

INTRODUCTION

Dentistry has become more sophisticated and complex, thus requiring precise motor skills and visual acuity.[1] Among the possible alternatives for improving visual acuity are dental loupes or clinical microscopes, both of which offer better perception of details than unaided vision.

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The German physician Saemmish introduced loupes in 1876 to improve visual acuity in the field of medicine.[2] Clinical microscopes came later and were introduced to dentistry by Baumann.[3] Subsequently, the use of clinical microscopes in dentistry has increased in all areas of interest. Microscopic dentistry allows for the refinement of a dentist's operatory technique as a result of the improvement of visual acuity offered by magnification. Among the listed advantages of microscopes is multiple magnification settings, which allow flexibility for optimized visual acuity for the most diverse clinical situations.[4] Therefore, better perception of details becomes interesting in operative dentistry.

Improved visibility during restorative procedures allows for minimum tooth reduction and good finishing of margins.[5] During the restorative procedure, magnification provides a clear identification of the cavity margins,[4] which is particularly convenient when composite is the restorative material of choice. Additionally, this magnification facilitates a more precise adaptation of matrices and wedges in proximal cavities. In direct veneers or during the restoration of diastema, magnification allows for adaptation of the composite at a 0° angle with the tooth surface prior to curing, consequently simplifying finishing and polishing.

Given the advantages of magnification during restorative procedures, the aim of this study was to demonstrate how the clinical microscope facilitates preparation and restoration of a composite veneer.

TECHNICAL PROCEDURE

A young male patient was not pleased with the appearance of his right maxillary incisor (Figure 1). An earlier trauma event resulted in a coronal fracture, with a resin composite restoration being placed. Slight tooth discoloration was noticed due to dystrophic calcification of the pulp. Although the restoration was clinically acceptable, the patient required modifications to the shape, texture and translucency, since the anatomy of the analogous central incisor possessed far more surface texture and detail. A direct resin composite veneer was proposed as an option and the patient promptly accepted it, although an indirect porcelain veneer was also an option. A clinical microscope (DF Vasconcellos SA, São Paulo SP, Brazil) was used throughout the preparation and restorative procedures.

The buccal surface of the tooth was reduced under visualization with a clinical microscope (8x), preserving as much enamel as possible (Figure 2). The preparation margins were established supragingivally to avoid contamination with gingival fluid and to facilitate access to the margins during the restorative procedures, while also minimizing damage to the periodontal tissues. A retraction cord (Ultrapak #00, Ultradent, South Jordan UT, USA) was inserted into the gingival sulcus for moisture control and retraction of the gingiva (Figure 3), which allowed for inspection of the clear-cut and defined margins.

The restorative procedure was then performed. The adjacent teeth were protected with a polyester strip and acid etching (35% phosphoric acid Ultra-Etch, Ultradent) was performed. A resin adhesive (Adper Single Bond 2, 3M ESPE, St Paul, MN, USA) was applied and light-cured for 20 seconds. A thin layer of fluid opaque resin (C&B Opaque OA1, Heraeus Kulzer GmbH & Co KG, Hanau, Germany) was applied to cover the tooth discoloration (Figure 4). Excess opaque

Figure 1. *Central right incisor with slight tooth discoloration and a resin composite restoration with poor contour and translucency.*

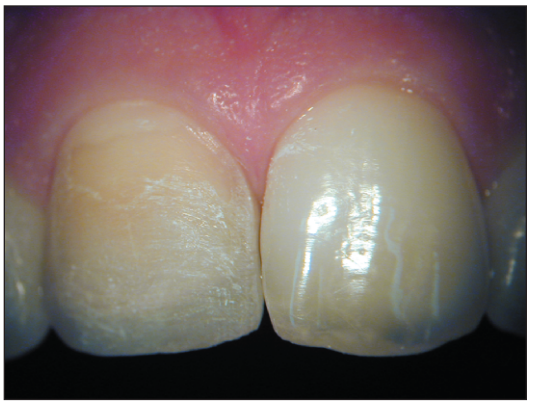

Figure 2. *Reduction of the buccal surface under 8x magnification: greater control and accuracy in margin placement.*

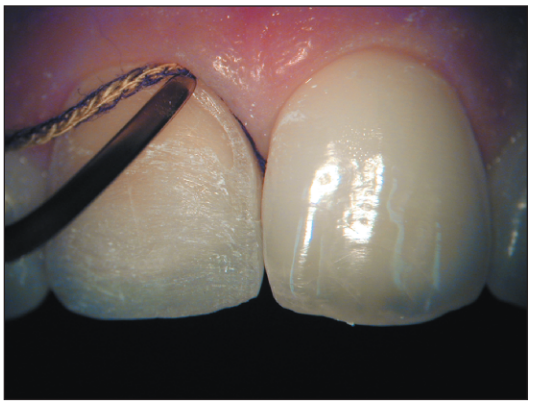

Figure 3. *Insertion of the retraction cord into the gingival sulcus (8x magnification).*

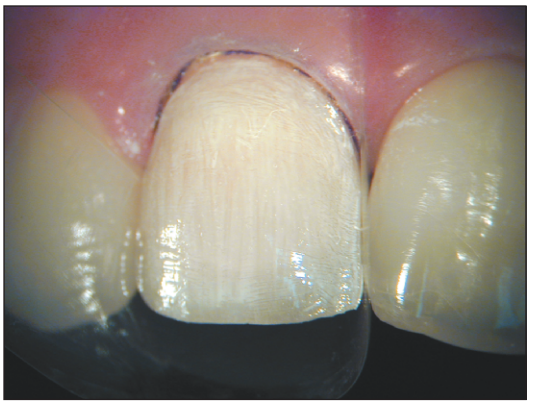

Figure 4. *Protection of the adjacent teeth with a polyester strip prior to application of the adhesive system and opaque resin (8x magnification).*

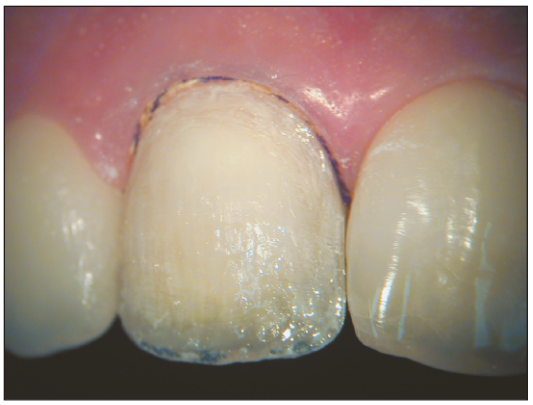

Figure 5. *Modification of the restoration with tints and application of a thin layer of resin composite (8x magnification).*

Figure 6. *Application of the enamel shade and microfill resin composite (8x magnification)*

Figure 7. *Final restoration after finishing and polishing (8x magnification).*

Figure 8. *Natural result of the direct resin composite veneer (3x magnification).*

resin was avoided, as the excess could result in an excessively opaque and unnatural restoration.

Medium incisal resin composite (Herculite XRV, Kerr Corporation, Orange CA, USA) was applied at the incisal third of the tooth to reproduce the characteristics of enamel. Resin color modifiers (Tetric Color, Ivoclar Vivadent, Amherst, NY, USA) were used: yellow was applied in the center, blue was used around the incisal edge and white was applied at the outermost enamel border to imitate the translucency and opacity of the enamel. The white resin modifier was also used to replicate cracks and stains present in natural enamel (Figure 5). A thin layer of resin composite (IR Blue, Ultradent, South Jordan UT, USA) was applied over the resin color modifiers.

Further layers of resin composite (Vitalescence, Ultradent, shades A2 and TM) were applied to replace enamel and define the contour of the direct resin composite veneer. A microfill resin composite (Amelogen Microfill Incisal, Ultradent) covered the surface of the restoration to optimize polishing and improve the gloss of the restoration (Figure 6). Magnification from the operatory microscope was useful in maintaining the integrity of the margins.

Finishing and polishing of the restoration was performed (Figure 7). The visualization of details under the microscope allowed for good reproduction of the contour and surface texture of the analogous tooth, resulting in a very natural looking esthetic restoration (Figure 8).

Appropriate finishing and polishing is important for optimizing the optical and mechanical properties of restorations. The aid of magnification is useful for adjusting the contours and reducing overhangs around cavity margins, thus reducing the possibility of secondary caries along the margins or gingival inflammation. The smooth surfaces of resin composite, particularly those in contact with soft tissues, are directly related to periodontal health and, hence, contribute to the longevity of restorations.[5] Another reason for using magnification is to create texture on the composite surface, characterizing grooves and elevations as to simulate the surface of natural enamel. Therefore, it becomes obvious that the clinical microscope can aid in

the reproduction of details from adjacent teeth, particularly for anterior restorations.

ADVANTAGES AND DISADVANTAGES OF THE CLINICAL MICROSCOPE

The need for optimal visibility is one of the most common challenges shared by all disciplines in dentistry.[4] The use of magnification increases production while improving the quality of services offered.[6-8] Additionally, the use of magnification reduces the risk of musculoskeletal injury to the clinician.[1] Dental loupes are one of the alternatives for magnification in dentistry. In general, dental loupes have a lower cost and provide the operator with a more ergonomic position, because focus is obtained at a greater distance between the operator and the object. However, dental loupes offer a convergent visibility, which causes ocular fatigue when used for extended periods of time. Additionally, loupes offer unique magnification, lower than that provided by the clinical microscope, and they may be related to cervical injury.[2] In high-power loupes, the heavy lenses may cause tremors in the operator's neck, causing instability of the visual field.

When the clinical microscope was introduced, a wider range of magnification possibilities became available, in addition to multiple articulations of the magnifying device to work on multiple positions without prejudice to the operator's ergonomics. Although the use of dental loupes could also have been an option in the current case, the clinical microscope was an interesting tool, because of the several degrees of magnification offered and good illumination of the field, thus allowing for a better perception of details that can otherwise become unnoticed. Additional advantages of the clinical microscope are the possibility of documentation of the clinical procedures, sharing of the magnification field with the auxiliary team and real-time communication with different media.

Despite the recognized advantages of clinical microscopes in dentistry, there are some known limitations as well. Among the limitations are the high cost of this equipment, the specific training required to operate it and the required paradigm shift in dentistry. A light-curing filter is also necessary during the adhesive procedures to allow for uncompromised handling of light-sensitive dental materials without premature curing.[4] The limited field of view at higher magnification may also be considered a drawback to some procedures, because the focus and area of interest are easily lost when the patient moves. However, these limitations are easily overcome with training. The learning curve takes approximately three to nine months to overcome.[4]

Using magnification should be considered by dental professionals, so that the practice of dentistry can become easier, more precise, and the risk of musculoskeletal injury minimized.[1] Dental professionals should be aware that unaided vision (non-use of loupes, microscopes or other optical devices) is inadequate when striving for excellence. A dental practice based in visual acuity will result in enhanced quality, regardless of the area of interest in dentistry

CONCLUSIONS

The use of the clinical microscope allowed for a minimal reduction in dental tissues and the reproduction of details during restoration, resulting in a naturally esthetic direct veneer.

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