



Microscopic inspection at occlusal pits and fissures sealants to enamel interfaces

Rita Fidalgo-Pereira¹, Diana Abrantes², Nélio Veiga¹, Bruno Henriques^{3,4,5}, Mutlu Özcan^{4,5}, Júlio C.M.Souza^{1,3,4}

¹Center for Interdisciplinary Research in Health (CIIS), Faculty of Dental Medicine (FMD), Universidade Católica Portuguesa (UCP); ²Universidade Católica Portuguesa, Faculdade de Medicina Dentária, Portugal, 3504-505, Viseu, Portugal; ³Center for MicroElectroMechanical Systems (CMEMS-UMinho), University of Minho, 4800-058, Guimarães, Portugal; ⁴LABELLS Associate laboratory, University of Minho, Guimarães, 4710-057 Braga, Portugal; ⁵Department of Mechanical Engineering (EMC), Ceramic and Composite Materials Research Group (CERMAT), Federal University of Santa Catarina, Florianópolis, Santa Catarina 88040-900, Brazil; ⁶Division of Dental Biomaterials, Center of Dental Medicine, Clinic of Reconstructive Dentistry, University of Zurich, 8032 Zurich, Switzerland

BACKGROUND

The clinical approach of sealing the occlusal pits and fissures of molars and premolars is an effective and fundamental procedure to preventing tooth decay. However, adhesive techniques and the damage on enamel after sealing occlusal pits and fissures continue to raise doubts in dental practice.

OBJECTIVE

The main of this study was to evaluate the interface of pits and fissures sealants to enamel using different microscopic techniques.

METHODS

Two flowable resin-matrix composites and a pit fissure sealant were selected according to the content of inorganic fillers and flowability, as follow: (1) light flow or (2) heavy flow resin-matrix composites. Materials were applied on retrieved third molars regarding the previous conditioning or not with universal adhesive systems.

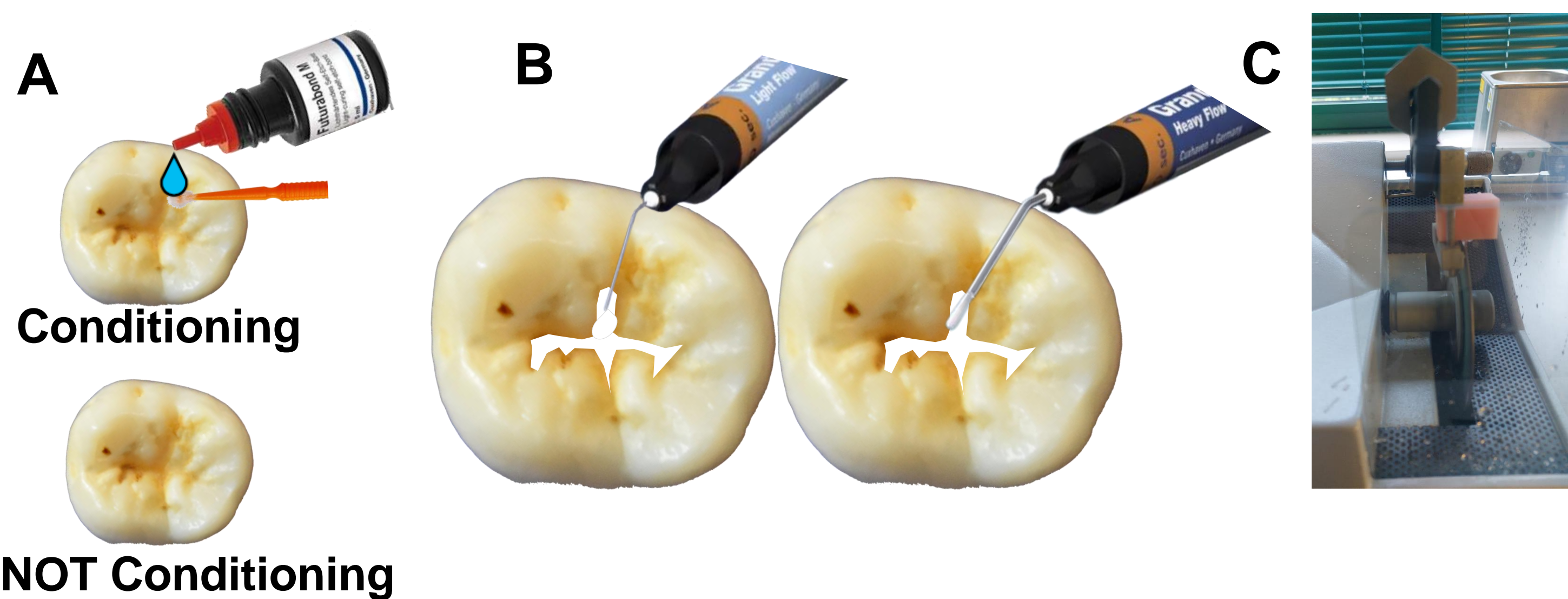


Figure 1. Method schematics. (A) Previous conditioning or not with universal adhesive system. (B) Flowable resin-matrix composite application. (C) Tooth cross section with a diamond disc.

The sealants to tooth assemblies were cross-sectioned using a diamond disc coupled to a precise cutting apparatus under automatic lubrication. After 10 minutes of ultrasonic cleaning in propanol and distilled water, surfaces were dried and inspected by optical microscopy with augmentation from x 50 up to x1000. Surfaces were also inspected by scanning electron microscopy (SEM) on secondary and backscattered electron modes coupled to energy dispersive spectroscopy (EDS).

RESULTS

Micrographs at the interfaces were detected after sealing the occlusal pits and fissures using viscous materials such as pit fissure sealants and flowable resin-matrix composites containing a high content of inorganic fillers. Also, macro-scale pores were noticed on the materials' microstructure. On the other hand, flowable resin composites revealed a proper fitting at the occlusal pits and fissures. The conditioning with an adhesive system promoted a mechanical interlocking over rough enamel surfaces prior to the application of the flowable resin-matrix composites.

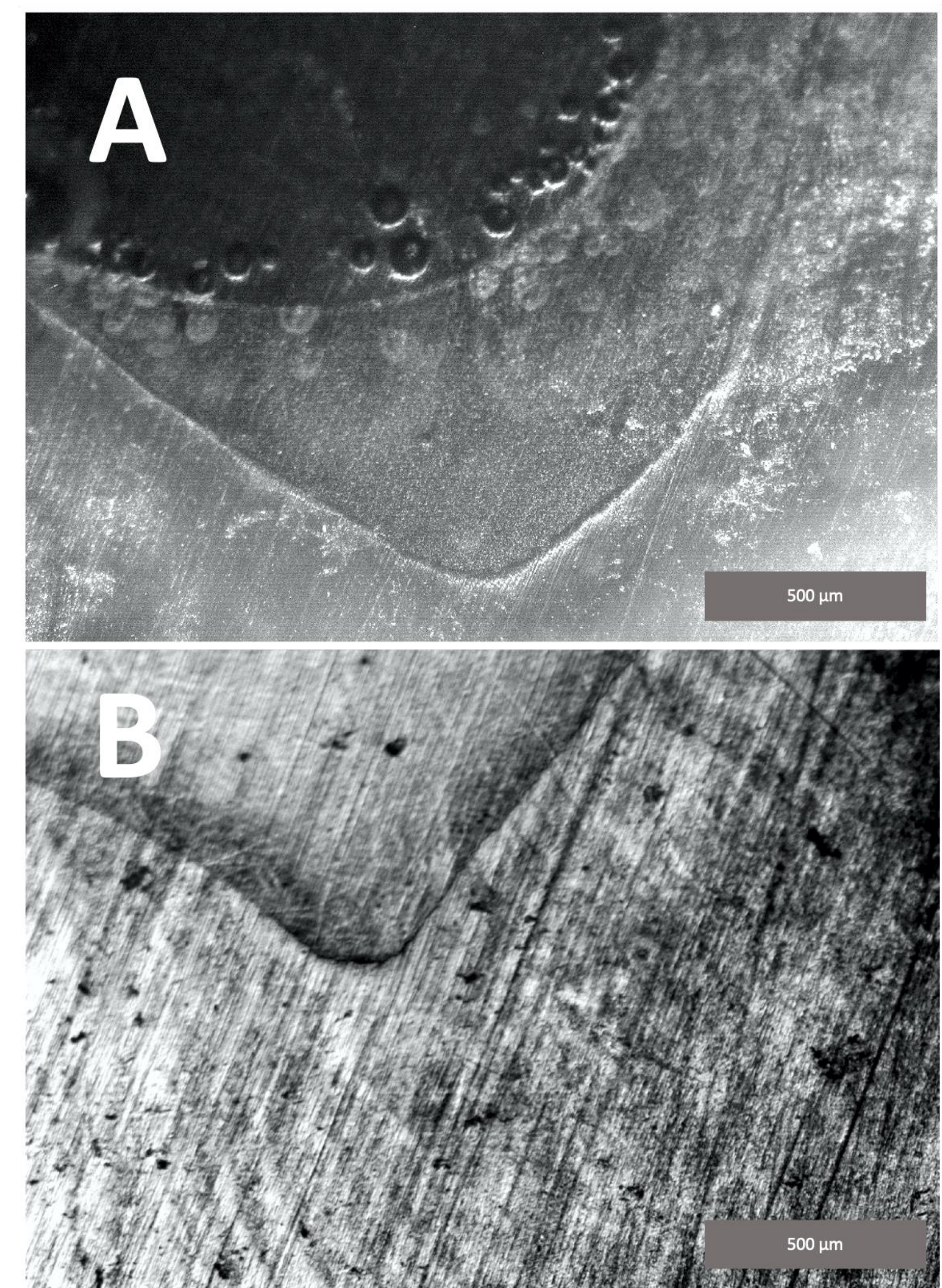


Figure 2. A - Fissurit (F) SEM micrograph at x5000 magnification by backscattered electron mode at 15 kV) and EDS. (B) Optical microscopy Fissurit (F)

CONCLUSIONS

Flowable resin-matrix composites can fill the occlusal pits and fissures depending on the viscosity and previously conditioning with adhesive systems. The accurate application of occlusal pits and fissure sealant and the selection of materials is dependent on several factors that should be properly studied.

REFERENCES

- (1) Faria M, Guedes A, Rompante P, Carvalho O, Silva F, Henriques B, et al. Wear Pathways of Tooth Occlusal Fissure Sealants: An Integrative Review. *Biotribology* 2021;27:100190; <https://doi.org/https://doi.org/10.1016/j.biotri.2021.100190>.
- (2) Asefi S, Eskandarion S, Hamidiaval S. Fissure sealant materials: Wear resistance of flowable composite resins. *J Dent Res Dent Clin Dent Prospects* 2016;10:194-9; <https://doi.org/10.15171/joddd.2016.031>.
- (3) Beun S, Bailly C, Devaux J, Leloup G. Rheological properties of flowable resin composites and pit and fissure sealants. *Dental Materials* 2008;24:548-55. <https://doi.org/https://doi.org/10.1016/j.dental.2007.05.019>

