



## **Nord Grant Proposal**

### **Project title: Enhancing student learning experience with the fabrication of micro-tensile and shear bond strength specimens: the practical application of adhesive dentistry**

The overarching aim of this proposal is to enhance the student learning experience of clinical procedures in Dentistry. This pilot project will help the faculty of the Department of Comprehensive Care better prepare our students by greatly increasing their exposure to the materials, techniques, and underlying science involved in dental bonding and adhesion.

Bonding is the application of a composite resin to repair or restore a tooth. The innovation and advancement of dental materials in the restorative field has exploded in recent years. This has led to the availability of a wide variety of bonding/adhesive products that can be used by dental practitioners. The increase in available products has created a great variability in the techniques used by dental practitioners, as each product has its own protocol for application. And while manufacturers provide detailed instructions on how to apply the product for maximum benefit, there is often little explanation of the reasoning behind those instructions. When applied incorrectly, the restoration may fail prematurely, causing stress to the patient and costing the dentist valuable time to correct. Therefore, it is critical that we prepare our students – our future dentists – to understand the science behind these products so that they will know how to optimize the steps of a procedure without affecting their final result. This not only benefits the dental practitioner by allowing them to better schedule their time, but also benefits the patients by providing the most durable restoration and successful procedure possible.

The current curriculum in the School of Dental Medicine does include instruction on bonding techniques. However, students only have the opportunity to restore a few test teeth and perform the techniques involved. They are not exposed to the underlying science and they are not able to test their work to see how well their bonding procedures perform. It would be an enormous benefit to the student to learn adhesion concepts by using and testing them in practical ways. For this reason, a pilot curriculum enhancement is proposed to determine if a deeper dive into this area is valuable to our students and faculty.

The pilot project will be part of the current course “Basic Principles of Aesthetic Dentistry” that is offered to second year dental students. The part of the course devoted to bonding procedures would be expanded to allow the students to fabricate specimens and then test bond strength. Bond strength is a sensitive procedure that can easily go wrong with one missed step; this makes the procedure difficult for the students. Allowing them the opportunity to test their work will help them to understand how differences in procedure impact the final outcome.

The bonding tests will be carried out by means of micro-tensile and shear bond strength equipment, for which we are requesting funding. Micro-tensile and shear bond strength are the standard for determining the bond strength between adhesive systems and the natural tooth. Additionally, it can be used to determine the strength of the adhesive interface between resin cements and ceramics. The determination of the bond strength in both situations described is of great importance in the field of Dentistry and it will define the success of the restorations.

The proposed addition to the curriculum has the following objectives for our students:

1. Provide practical experience to evaluate adhesion procedures,
2. Improve critical thinking skills in the restorative and bonding procedures,
3. Prepare students to understand practical differences between bonding materials,
4. Clearly exemplify how small changes in the original application protocol can make a difference on final bonding strength.

To accomplish these objectives, students will:

1. Learn how to prepare the specimens in order to be tested,
2. Understand differences by using a variety of bonding protocols,
3. Learn acceptable variations on the existing bonding procedures,
4. Determine to what extent variations can be done without affecting the final bond strength,
5. Perform the main steps that must be followed in order to achieve excellence in adhesive procedures,
6. Work in teams to prepare the specimens so the students can learn with and from each other.

While this expansion will be a great benefit to our students, it will also provide continuing education and refinement of technique for our faculty. By having the equipment available in-house to perform these tests, our faculty will be able to work with new products and procedures first-hand. This also has the potential of opening up new avenues of inquiry into the testing and perhaps the development of dental materials.

In order to evaluate the curriculum's performance and value, a survey will be distributed to the students at the end of the course with specific questions on their perspective of this pilot project. The data from the survey will be compared to surveys given to students that took the course previously, who did not take part in the expanded curriculum.

If we find that our pilot has been successful, the next objective is to develop a new course on bonding procedures for our second year students. The data and experience gained from this pilot will be an integral part of a planned submission to the National Science Foundation (NSF) Career Award program. This submission is planned for the July 2020 NSF deadline and will be prepared in collaboration with the seminar offered by the Office of Faculty Development within Case Western Reserve University.



SCHOOL OF DENTAL MEDICINE  
CASE WESTERN RESERVE  
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March 29, 2019

University Center for Innovation in Teaching and Education (UCITE)  
Case Western Reserve University  
Allen Hall, Room 101  
Cleveland, OH 44106

Re: Dr. Thiago Porto

It is with pleasure that I write in support of Dr. Porto's application for the innovative pilot project to enhance the students' didactic and clinical experiences relative to esthetic restorative dentistry while performing bonding procedures.

This project is closely aligned with the strategic themes of research and teaching within the Department of Comprehensive Care. I enthusiastically endorse Dr. Porto's innovative teaching efforts and am willing to match up to the Nord Grant funding, with department funds, to complete this project.

Following the pilot, the full project will be submitted to the National Science Foundation (NSF) Career Award.

Dr. Porto is an outstanding and very accomplished Junior Faculty with a strong teaching and research background as evident by his CV.

Needless to say, he has my full support. Thank you in advance for your consideration, and if you have any questions or require further clarification please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Fady F. Faddoul'.

Fady F. Faddoul, DDS, MSD  
Professor and Chair  
Department of Comprehensive Care  
Case Western Reserve University School of Dental Medicine

**Nord Grant proposal budget**  
**Dr. Thiago Porto**

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**Department of Comprehensive Care, School of Dental Medicine**

<b>Expenses</b>	
Microtensile tester starter kit	\$ 2,995.00
Shear bond tester starter kit	\$ 2,995.00
Department will match funds in consumable up to	\$ 5,990.00

**Department contact information**

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**Dr. Thiago S. Porto D.D.S., M.Sc., Ph.D.**  
Assistant Professor, Department of Comprehensive Care

**Education**

**Ph.D.** – March 2013 – October 2016, Sao Paulo State University – Araraquara School of Dentistry, Brazil.

- **Thesis title:** Comparative analysis of different CAD/CAM materials used to indirect restorations

**Master in Science** – March 2005 – November 2006, Sao Paulo State University – Araraquara School of Dentistry, Brazil.

- **Dissertation title:** Procedures to obtain micro-retention on the inner surface of porcelain by surface roughness tests and SEM

**Academic Appointments**

**Jul 2017 – present** - Assistant Professor (tenure track) Case Western Reserve University, School of Dental Medicine, Cleveland, OH, USA

**Jun 2015 – May 2016** - Volunteer Clinical Assistant Instructor Case Western Reserve University, School of Dental Medicine, Cleveland OH, USA

**Aug 2013 – Jul 2016** - Assistant Professor Camilo Castelo Branco University, School of Dentistry, Descalvado – SP, Brazil

**Mar 2013 – Dec 2014** - Clinical Instructor Sao Paulo State University – Araraquara School of Dentistry, Brazil

**Aug 2005 – Jun 2006** - Pre-Clinical Instructor Sao Paulo State University – Araraquara School of Dentistry, Brazil

**Awards**

**2018** Outstanding Sim Clinic Preceptor – awarded by School of Dental Medicine CWRU student council

**Scholarly activities**

27 peer-reviewed articles published

41 abstracts presented in several International and National conferences

Currently Director of Clinical Implant courses in the DMD program of School of Dental Medicine and Co-Director of Basic Principles of Aesthetic Dentistry for pre-clinical students.