PALESTRAS INTERNACIONAIS

- **PALESTRANTES:**

  - Nick Silikas
    *University of Manchester, United Kingdom*
    Effect of filler size and shape on mechanical, surface and and handling properties of resin-composites.

  - Ulrich Lohbauer
    *University of Erlangen, Germany*
    Lifetime of restorative materials in the focus of mechanical fatigue

  - J. Robert Kelly
    *University of Connecticut Health Sciences Center*
    Engineering for maximum durability and esthetics with all-ceramic systems. What do we know and how do we know it?

  - Susanne Scherrer
    *University of Geneva, Switzerland*
    What can failed clinical restorations tell us using fractography

  - Jason A. Griggs
    *University of Mississippi Medical Center*
    Accelerated Lifetime Testing of Dental Restorations

  - Yu Zhang
    *New York University College of Dentistry*
    Engineering Dental Ceramics for Damage Resistance

  - Tomaz Kosmac
    *Jozef Stefan Institute, Slovenia*
    Effects of dental grinding and sandblasting on ageing and fatigue behavior of dental zirconia (3Y-TZP) ceramics
**Presentation Description:**

Resin-composites have attracted the interest of research for several decades now, as they are viable alternatives to amalgam, for posterior tooth restorations. Despite their use for quite some time, inherent material features as well as the fairly “hostile” oral environment have hindered the manufacture of totally satisfactory resin-composites. Filler size reduction and size variation allow for closer filler packing and consequently increased filler volume-fraction. Recently, several resin-composites have been introduced as nano-composites or nano-hybrids that utilize nanofillers. The incorporation of more filler particles is claimed to enhance mechanical properties such as stiffness and strength. Simultaneously, resin-composites with smaller sized filler particles can be more effectively polished and provide smoother surfaces. Improved surface roughness results in higher gloss which is important for the optical appearance of a restoration. However, the significant reduction of filler size can cause increase of the material viscosity and filler agglomerations. The optimum property balance should be sought. This study will attempt to explore the effect of filler size and shape on mechanical, surface and handling properties. A series of model resin-composites has been prepared with varying filler size or shape, while the resin matrix and filler volume remain constant.

**Short Bio:**

Dr Nick Silikas is currently a Senior Lecturer in Dental Biomaterials Science in the School of Dentistry at The University of Manchester. He was born in Greece but has completed all his Higher Education studies in Manchester where he obtained a BSc (Hons) in Chemistry, an MPhil in Pharmacy, and a PhD in Dental Biomaterials. He is an Editorial Advisor of Dental Materials-Journal for Oral and Craniofacial Biomaterials Sciences [Elsevier Science]. He is a Fellow of the Academy of Dental Materials (FADM) and a member of the International Association of Dental Research (IADR). His research interests lie in surface Imaging & Analysis. His expertise is in characterizing interfaces using several techniques like Atomic Force Microscopy (AFM), X-ray Photoelectron Spectroscopy (XPS), FEG-SEM, Fourier Transform Infra-Red Spectroscopy (FTIR) etc. He is also involved in studying mechanical properties of materials using nanoindentation, and traditional mechanical testing (3-point bending, compression, flexure etc.). His real interests are basketball, Manchester City and caipirinha.

**Suggested reference:**

Ulrich Lohbauer (lohbauer@dent.uni-erlangen.de)
University of Erlangen, Germany

“Lifetime of restorative materials in the focus of mechanical fatigue”

✓ Presentation Description:

Modern restorative materials such as resin composites and ceramics have been developed with a focus on mechanical strength, excellent aesthetics and biocompatibility. The materials over time have been improved for an application in stress bearing areas. Therefore mechanical properties under masticatory load, fatigue resistance, and wear are important properties determining a clinical lifetime of a restoration. Fatigue fractures after years in clinical use were found to be a common failure reason. Damages of restorations due to bulk, cusp, chipping, or marginal fractures are reported frequently. Intraoral wear degradation is further observed, especially on ceramic surfaces. Fatigue in dental restoratives is influenced by corrosive water attack at ambient temperature and cyclic masticatory forces. Contemporary approaches to related mechanisms consider a fracture process in three phases: crack initiation, slow crack growth and fast fracture. The latter phase is very short in duration and thus the time of crack initiation and of slow crack growth account for the useful fatigue resistance of a material. This talk is on mechanical strength of restorative materials in simulated oral environment, on degradation of materials in vivo and in vitro, and on related mechanisms leading to failure on resin composites and ceramics.

✓ Short Bio:

2009 - Board Member of the Academy of Dental Materials
2008 - Fellow of the Academy of Dental Materials, FADM
2007 - present University of Erlangen-Nuremberg, Erlangen/Germany Head of Dental Materials Lab, Dental Clinic 1 - Operative Dentistry and Periodontology
2006 - University of Athens, Athens, Greece Visiting Scientist, Department for Basic Sciences and Oral Biology (Prof. George Eliades)
1999 - 2000 University of Erlangen-Nuremberg, Erlangen/Germany Supervisor of the Dental Materials Lab, Dental Clinic 1 - Operative Dentistry and Periodontology
1998 - 2003 University of Erlangen-Nuremberg, Erlangen/Germany Research Assistant, Dental Clinic 1 - Operative Dentistry and Periodontology, Biomaterials Lab
1991 - 1998 University of Erlangen-Nuremberg, Erlangen/Germany Material Science Engineering, Degree: Dipl.-Eng./ MSc. (Prof. Peter Greil)

✓ Suggested reference:

All-ceramic restorations may fail catastrophically, whether these are veneering ceramic chips or through the core failures. The fracture surface analysis (called fractography) of failed ceramic restorations using a stereomicroscope as well as the SEM helps pattern recognition of markings that are indicators of the direction of crack propagation. Mapping these crack features of the failed component provide evidence of where the failure started and what could be done to improve the survival of these restorations.

Short Bio:

1984 : DDS (University of Geneva, School of Dental Medicine, Switzerland).
1984-1989 Part time training in Fixed Prosthodontics at the Univ. of Geneva, (Head: Prof. Urs Belser).
1986: Doctoral Thesis (Univ. of Geneva) (Dr.med.dent).
1989-1991 Visiting Assistant Professor, University of Texas HSC at San Antonio (Department of Restorative, Chair: Dr. Tom Berry).
1984-now: 27 years of private practice activity in Geneva as a general practitioner and Assoc. Prof, Department of Prosthodontics (Univ. Geneva).
General research interest: all-ceramic materials, fracture mechanics and fractographic failure analysis.
2001-02: President of the Dental Materials Group of the International Association for Dental Research
2002-04: President of the Academy of Dental Materials

Suggested reference:

Presentation Description:

Dental restorations frequently fail by mechanical fracture under normal mastication because stress corrosion and cyclic fatigue cause subcritical crack growth, which results in strength degradation over time. Prediction of the time necessary for clinical failure to occur based on in vitro data has historically required a prohibitively large amount of effort. Novel methods for more efficient experimental design and statistical analysis are available to overcome this challenge, but an understanding of the underlying assumptions is essential for interpreting the predictions with confidence. This seminar will demonstrate the application of finite element modeling to help design efficient fatigue tests, the use of step-stress method to extrapolate lifetime at clinical load levels from observations of aggressively loaded specimens, and the use of failure analysis to test the assumptions of statistical models. These techniques will be demonstrated on dental ceramics, metallic implants, and endodontically treated teeth.

Short Bio:

Dr. Griggs conducted his undergraduate and graduate studies at the University of Florida in materials science & engineering under the guidance of Dr. Ken Anusavice and Dr. Jack Mecholsky. He received his PhD from the University of Florida in 1998. He joined the faculty at Baylor College of Dentistry (Texas A&M) that same year as an Assistant Professor. During his appointment at Baylor, Dr. Griggs worked for and collaborated with Dr. Toru Okabe as he progressed to the rank of Professor and served as Graduate Program Director and Vice-Chair of the Department of Biomaterials Science. Dr. Griggs arrived at UMMC in 2007 to serve as Chair of the Department of Biomedical Materials Science because the founding department chair, Dr. Lyle Zardiackas, was retiring. In 2008, Dr. Griggs began simultaneously serving as Associate Dean for Discovery, Innovation & Graduate Studies in the School of Dentistry. He is a Fellow and former President of the Academy of Dental Materials. He is the Principal Investigator of two NIH R01 grants. He has reviewed grant applications as a member of NIH study sections (OBM, ODCS, and SBIR/STTR) and reviewed manuscripts as a member of the editorial boards for Dental Materials and the Journal of Prosthetic Dentistry. He has authored over 100 scientific articles and abstracts, two book chapters, and two patents. His main research interests lie in fatigue fracture of dental restorative materials and implants with emphasis on developing more efficient fatigue test methods.

Suggested reference:

J. Robert Kelly  
University of Connecticut Health Sciences Center  
“Engineering for maximum durability and esthetics with all-ceramic systems. What do we know and how do we know it?”

✓ **Presentation Description:**

From Paris in the late 1700s through the use of 3D data sets for restoration fabrication today, ceramics (and bonding systems) have become increasingly available for dentistry. All-ceramic restorations are no longer experimental or suitable only for specialty practices. There are many techniques and materials in restorative dentistry that are now well-proven and some that remain “dogma”. Clinical evidence will be reviewed for all restorative and prosthodontic applications of ceramics and bonding. What we know today derives from a mix of clinical, in vitro and modeling data: what is it that we really know and what are some emerging problems (and opportunities) to be aware of? The learning objectives are: (1) Review indications for clinical use derived from clinical studies and what is known about optimizing esthetics and durability; (2) Evaluate some perspectives on which dental literature provides useful evidence for restorative practice decisions (and get two great sources); (3) Receive an update on the status of zirconia – is the end of porcelain chipping possibly in sight?

✓ **Short Bio:**

J. Robert Kelly teaches prosthodontics and biomaterials and is Director, Dental Clinical Research Center at the University of Connecticut Health Sciences Center. His academic credentials include the D.D.S., an M.S. in dental materials science, the D.Med.Sc. in oral biology and a Certificate in prosthodontics. He has served on the Council on Scientific Affairs of the American Dental Association, is Vice Chairman of the ADA’s Standards Committee on Dental Products, President-elect of the American Academy of Fixed Prosthodontics and is responsible for international dental ceramic standards development. Dr. Kelly has received awards for biomedical research (Harvard), research and post-graduate education (Assoc. Military Surgeons of the U.S.) and as a clinician/scholar (Amer. College of Prosthodontists). He has contributed to dental, engineering, and medical literature, holds five patents, frequently lecturers before national and international dental and engineering organizations.

✓ **Suggested reference:**

Yu Zhang

New York University College of Dentistry

“Engineering Dental Ceramics for Damage Resistance”

✓ Presentation Description:

This presentation will focus on engineering ceramics for future applications in dentistry with consideration of the following factors, a) fracture modes in all-ceramic restorations, b) sliding contact and flexural damage in flat model systems, c) graded structures for fracture resistance, and for enhanced esthetic and cementation properties.

✓ Short Bio:

Dr. Yu Zhang is an associate professor at the Department of Biomaterials and Biomimetics, New York University College of Dentistry. Extensively published, his primary research interests are the development of functionally graded structures for damage resistance, aesthetics and bioactivities; and mechanical reliability, fatigue damage assessment and lifetime prediction for biomechanical structures—all-ceramic dental prosthesis and ceramic hip components. He is a member of numerous professional organizations. He has received a number of awards including the Frechette Award and has served as a PI on NIH and NSF funded projects.

✓ Suggested reference:

Tomaz Kosmac
Jozef Stefan Institute, Slovenia

“Effects of dental grinding and sandblasting on ageing and fatigue behavior of dental zirconia (3Y-TZP) ceramics”

✓ Presentation Description:

This presentation will focus on the effects of dental grinding and sandblasting on the biaxial flexural strength and Weibull modulus of various 3Y-TZP ceramics under static and cyclic loading. The results obtained so far have revealed that dental grinding at a high rotation speed lowers the mean strength and Weibull modulus of these ceramics under static loading as well as the survival rate under cyclic loading. Sandblasting, in contrast, resulted in surface strengthening and a substantially higher survival rate under cyclic loading, but at the expense of reduced reliability. Furthermore, the distorted tetragonal zirconia grains and the pre-existing monoclinic zirconia in the sandblasted surfaces hindered the propagation of the diffusion-controlled transformation during subsequent in-vitro ageing in an autoclave. The presentation will also report on the first results of an in-vivo ageing study of zirconia in the oral cavity and briefly address the adhesion problem.

✓ Short Bio:

Personal Data : Born in Ljubljana, Slovenia; Education: B.Sc.: 1974 in Metallurgy from University of Ljubljana; M.Sc.: 1978 in Metallurgy from University of Ljubljana; Dr. Sc.: 1982 in Chemistry from University of Ljubljana; Experience: Since 1974 - “Jožef Stefan” Institute, Ljubljana, Slovenia, 1979 - 1980 on leave with Max Planck Institute for Metal Research, PML, Stuttgart, FRG, as visiting research fellow; 1990 - 1991 visiting Associate Professor at the University of Virginia, Mat. Sci. Dept., Charlottesville VA; Present position at IJS: head of Engineering ceramics department; part-time full professor at the University of Ljubljana, Metallurgy and Materials Dept., Faculty of natural sciences and engineering; Awards: National (B. Kidrič Fund) award for valuable contribution to better understanding of mechanical properties of oxide ceramics (1983); Rewards for development and implementation of fused silica ceramics (1986) and ceramic cutting tools (1988); National (Ž. Zois Fund) award for valuable technological achievement (2003); National (Puch) award for implementation of zirconia dental posts. Memberships: Slovenian Materials Science Society, Slovenian Chemical Society, Ceramics Division, German Materials Science Society (DGM), European Ceramic Society, American Ceramic Society, IADR. Main Research Topics: Oxide ceramics for structural application with special emphasis on diffusion processes and solid state reactions during sintering of composite materials. Mechanical properties of zirconia- toughened ceramics. Ceramic processing (including mechano-chemical powder synthesis, colloidal- and deformation powder processing, forming and sintering of green bodies) and its influence on the microstructure and mechanical properties of engineering ceramics. Ceramics with bio-medical, in particular dental, applications. Beside basic research activities T. Kosmač is acting as principal investigator in several bi-lateral, international (EC, Eureka, NATO SfP) projects as well in applied research projects leading to industrial production. Bibliography: over 250 documents, including 130 major publications, 28 invited lectures, 7 patents, 2 conference proceedings (ed.).

✓ Suggested reference: