

3rd TCBC Midwinter Meeting

“Fibre-Reinforced Composites: Past, Present and Future.”



Thursday 6th of February 2020

Arje Scheinin Auditorium
Institute of Dentistry, University of Turku, Turku, Finland

Organised by
Department of Biomaterials and Turku Clinical Biomaterials Center, Institute of
Dentistry, University of Turku, Turku, Finland

3rd TCBC Midwinter Meeting

- Aim?** Bring together TCBC (guest) researchers from over the world by creating a forum for academic and social networking
- When?** Friday 9th of February 2018
- Where?** Arje Scheinin Auditorium at the Institute of Dentistry, University of Turku, Finland
- What?** Part 1: Scientific program with lectures
Part 2: Sauna Get Together

Organizing Committee

Lippo Lassilla
Filip Keulemans
Akikazu Shinya

Our sponsor

Stick Tech
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Scientific Program

09h00 - 9h15	Opening ceremony Lippo LASSILA, Filip KEULEMANS and Akikazu SHINYA
Morning session	<i>"Fibre-reinforced composites: past, present and future."</i>
09h15 - 10h00	Mutlu ÖZCAN (University of Zurich, Switzerland) "Current Status of Direct and Indirect Adhesive Bridges versus Other Treatment Options"
10h00 - 10h45	Scott DYER (USA) "Composite Design Principles in Prosthodontic Practice"
10h45 - 11h15	<i>Coffee break</i>
11h15 - 11h45	Bora BAGIS (İzmir Katip Celebi University, Turkey) "Clinical Applications of Fiber Reinforced Composite (FRC): Cases and Experiences"
11h45 - 12h15	Tomohiro KAWAGUCHI (Fukuoka Dental College, Japan) "Effect of cellulose nanofiber content on flexural properties of injection-molded polymethyl methacrylate denture base material"
12h15 - 13h15	<i>Lunch</i>
13h15 - 13h45	Jingwei HE (South China University of Technology, China) "Phenes, new family members of dental monomers for reducing polymerization shrinkage"
Afternoon session	<i>"Contemporary insights in post-and-core design for endodontically treated teeth"</i>
13h45 - 14h30	Emre NAGAS (Hacettepe University, Turkey) "FRC in endodontics"
14h30 - 15h00	Minori HATTA (The Nippon Dental University, Japan) " Fracture strength of fibre reinforced composite post
15h00 - 15h30	Mark FRATER (University of Szegred, Hungary) "Short fibers for reinforcing root canal treated teeth – practice and research"
15h30 - 16h00	Closing remarks with drinks

Sauna Get Together

16h00 – 16h30 Evening	Introduction to sauna get together by Lippo LASSILA Smoke sauna, ice hole swimming and dinner
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Current Status of Direct and Indirect Adhesive Bridges versus Other Treatment Options

Mutlu ÖZCAN

University of Zurich, Dental Materials Unit, Center for Dental and Oral Medicine, Clinic for Fixed and Removable Prosthodontics, Zurich, Switzerland

Abstract

Decision making for the reconstruction type is multi-factorial. Yet, invasiveness of the therapy, biological complications and financial costs as well as long-term durability of the chosen therapy needs to be considered and communicated with the patient. Progress in adhesive dentistry allowed us to approach classical prosthodontic work in a less invasive way. In this lecture, direct adhesive bridge options using fiber-reinforced polymers will be elaborated considering both biological, mechanical aspects and clinical survival data and compared with other therapy options.

Composite Design Principles in Prosthodontic Practice

Scott DYER

Department of Biomaterials Science and Turku Clinical Biomaterials Centre-TCBC, Institute of Dentistry, University of Turku, Turku, Finland

Abstract

Who and what drives the design process for prosthetic structures used in dentistry and medicine? For the oral environment, the dentist and dental team must manage many aspects of patients' treatment including microbiological diagnoses and surgical interventions to prosthetic rehabilitation. This presentation will focus on dentists' and technicians' roles as composite designers and fabricators. Past and current prosthetic design concepts will be discussed. Failure mechanisms and the subsequent modifications of design parameters will be reviewed. A special emphasis will be placed on the reinforcement of polymers with long fiber reinforcement.

Clinical Applications of Fiber-Reinforced Composite (FRC): Cases and Experiences

Bora BAGIS

Department of Prosthodontics, Faculty of Dentistry, Izmir Democracy University, Izmir, Turkey

Abstract

Nowadays, improvements in the adhesive materials and techniques allow dentists to prepare different treatment modalities with less invasive and faster approaches. Glass fibers are known as the most suitable fibers to reinforce the composite resin materials because of their chemical bonding performances. Fiber reinforcing the composite materials increases the physical properties of these materials but also help dentists to use them in different clinical cases. This presentation will be about some clinical cases with personal experiences about the FRC restorations.

Effect of cellulose nanofiber content on flexural properties of injection-molded polymethyl methacrylate denture base material

Tomohiro KAWAGUCHI

Division of Removable Prosthodontics, Department of Oral Rehabilitation, Fukuoka Dental College, Fukuoka, Japan

Abstract

Cellulose nanofiber (CNF) made from wood-derived fiber is considered as a potential alternative reinforcing material to conventional fibers. The aim of this study was to investigate the effect of CNF on the flexural properties of CNF-reinforced, injection molded, polymethyl methacrylate (PMMA) denture base material. Test specimens were fabricated from thermoplastic denture base resin using the injection molding technique. The resin pellets were mixed with CNF (to obtain different weight percentages 5, 10, 15, and 23 wt.%). PMMA without CNF served as the control (0 wt.%). The flexural strengths and moduli of the specimens were determined using three-point bending tests. Statistical evaluation included one-way analysis of variance and the Student-Newman-Keuls test ($\alpha = 0.05$). The flexural strengths and moduli of the CNF-reinforced PMMA were significantly higher than those of pure PMMA ($p < 0.05$). Hence, incorporation of CNF can significantly improve flexural properties of a thermoplastic PMMA denture base material.

PHENES, new family members of dental monomers for reducing polymerization shrinkage

Jingwei HE^{1,2}

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Institute of Dentistry, University of Turku, Turku, Finland*

*²College of Materials Science and Engineering, South China University of Technology,
Guangzhou, China*

Abstract

In this research, a series of monomers with α -methylstyryl structures named "Phenes" were synthesized and incorporated into dental resin composites with the aim of reducing polymerization shrinkage. The results showed that "Phenes" could reduce shrinkage stress of dental resin composites through reducing polymerization rate and volumetric shrinkage. With a certain amount of concentration, "Phenes" had no negative effect on physiochemical properties of dental resin composites.

FRC in endodontics

Emre NAGAS

Department of Endodontics, Hacettepe University, Ankara, Turkey

Abstract

This topic attempts to provide a better understanding of the clinical applications of fiber-reinforced composites in Endodontics.

Fracture strength of fibre reinforced composite post - Two different post designs and polymerization conditions -

Minori HATTA

Department of Crown and Bridge, School of Life Dentistry at Tokyo, The Nippon Dental University, Tokyo, Japan

Abstract

Fibre reinforced composite (FRC) post and core system is widely applied now, and it becomes alternative to cast and pre-fabricated metal post, which has been used for a long time.

Generally, endodontically treated teeth with a loss of hard tissue were restored with a post and core system. For clinical situation, restored teeth were damaged by caries, repeated endodontic treatment or restoration. Also, for the treated teeth which has thin dentin wall or extremely flared root canals, metal posts have sometimes disadvantages such as increasing the possibility of root fractures, however, they have the high retention and thin cement layer as advantages. It is considered that this problem is related to difference of elastic modulus of metal and root dentin. In addition to the metal post, several post materials have been introduced, including the fibre reinforced composite (FRC) root canal posts, and these posts also satisfy the aesthetic demands before final crown restorations.

In this study, everStick POST 1.5 mm (StickTech, Turku, Finland) was used. This post material is an adaptable, polymer (PMMA) and resin-impregnated (bis-GMA) unpolymerized glass fibre post for individual FRC post fabrication, some posts were bundled to become the same diameter of root canal, so the use of everStick posts enable to make the post to the same shape and diameter, and keep the cement layer to a minimum thickness.

By using this mouldable FRC post, two different post designs: lower volume FRC post (prefabricated) and higher volume FRC post (individually formed) with different post lengths (1/3, 1/2 and 2/3 of root canal length) and polymerization conditions (chairside polymerization of the post versus in situ polymerization in root canal with luting cement) were set up. Then the fracture load of restored teeth with different post designs and conditions was evaluated.

From the results of this study, using short (1/3 length) and thick fibre post system (the same diameter as the root canal) showed higher strength than one fibre post only. In addition, by curing the cement and the fibre material simultaneously, the strength of the restored tooth was increased.

Short fibers for reinforcing root canal treated teeth - practice and research

Mark FRATER

Department of Operative and Esthetic Dentistry, Faculty of Dentistry, University of Szeged, Hungary

Abstract

Reinforcing root canal treated teeth has long been desired by many. Usually unidirectional long fibers in the form of fiber-reinforced composite (FRC) posts are used for this purpose. However, the reinforcing ability of FRC posts is highly debated and the clinical success of such restorations highly depends on several factors (type for tooth, root canal geometry, type of definite coronal restoration, etc.). Multiple drawbacks of conventional FRC posts have been highlighted in the past years, pushing both manufacturers and clinicians to individualized solutions in post usage. The lecture will focus on theoretical and practical solutions to restore and reinforce the both the radicular and coronal part of root canal treated teeth, trying to fit the proposed concepts into a restorative guideline for clinicians.