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<tr>
<td><strong>Citation</strong></td>
<td>15th Annual Scientific Meeting of the International Association for Dental Research (Southeast Asian Division), Taiwan, 2-4 October 2000, v. 80 n. 4, p. 1375</td>
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<tr>
<td><strong>Issued Date</strong></td>
<td>2001</td>
</tr>
<tr>
<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10722/53684">http://hdl.handle.net/10722/53684</a></td>
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The Role of Basic Science in Clinical Dental Research. G. EMBERY (Univ. of Wales Dental School, Cardiff, UK)

A number of Dental Schools worldwide have invested in oral biology/basic dental science as a specialist discipline to support teaching and research within the clinical training programmes. The research elements range from biomaterials science, odontostem, craniofacial development to physiology, microbiology and anatomy. Such Units allow the development of career structures for especially, not exclusively, non-clinical staff with the ability to devote more time to laboratory-based research carried out with clinical colleagues. Successful Units have interactive programmes with clinical groups allowing a greater understanding of each other's problems and the ability to acquire joint funding from both State, Research Council and industrial sources. Although sharing and exchange of specialist material with Medical Schools is more common, the acquisition of a stand-alone basic science base is vital to everyday functioning and ability to fulfill postgraduate research obligations. The support of the Dental School is vital to maintain its morale and future vision of basic dental science which has done much to raise the profile of clinical dentistry as an academic discipline. Western societies have active programs in this area - Eastern Europe and other developing regions less so. Other parts of the world offer a mixture of scenarios, e.g. non-clinical colleagues attached to clinical units. Even amongst Western countries not all have Oral Biology Departments. Clearly there are many structures for involving oral biology and an overview of the successes and difficulties apparent will be presented.

Designing and Implementing Clinical Research in Dentistry. J. W. Stamm
(University of North Carolina, Chapel Hill, NC, USA 27514)

Clinical research plays a more critical role than ever, providing the vital end-stage of the contemporary basic-translation-clinical research process that provides for the advancement of the oral health sciences. In addition, clinical research is central to the formulation of dental public health policy and practice, and it is on foundation on which modern evidence-based dental practice is being built. High quality clinical research requires the investigator (1) to know what clinical research is, what its components are, and (2) to know how to use clinical research methods, or simply to know how to do it. Hulley and Cummings (1988) speak of the anatomy and the physiology of applied clinical research. Clinical research will often involve the application of several theory-laden disciplines (e.g. behavioral science, epidemiology, clinical decision theory, biostatistics), but at its most basic, clinical research links methods of clinical observation or intervention with methods of analysis and interpretation that lead to valid conclusions. This presentation will offer an outline of key components involved in conceptualizing, designing and conducting clinical research in dentistry.

Educational Research in Dentistry.
MA Boynt* (Faculty of Dentistry, University of British Columbia, Vancouver, BC, CANADA)

Over the years, educational research in dental schools has not received significant attention, recognition, respect or reward. Yet such research can be critical to the efficient and effective academic enterprise of teaching and for the establishment and maintenance of continuing competence of future dental practitioners. Interest and acknowledgement in the last decade or so has brought educational research into a more “respectable” community of research initiatives. Visions for publication of investigations and outcomes has increased. New methodological approaches have spawned renewed efforts of investigation, difficult though they may be. Still new investigators need to be encouraged to undertake the study of important issues related to dental education and its delivery. This paper will explore those issues as well as what should or might be investigated, their potential contribution and how a focus for educational research can be fostered for the good of students, the faculty and the profession.

Structure-Function-Property Relationships in the Dentinocemental Complex. C.P. Lin* (School of Dentistry, College of Medicine, National Taiwan University, Taipei, Taiwan, R.O.C.)

The human masticatory apparatus plays a largely biomechanical role in the preparation of food for the final absorption by the alimentary tract. Mastication itself is a complex process which involves the movement of teeth by which the foodstuffs are broken down and passed through the alimentary tract. Studies on the structure and function of the masticatory apparatus, the transition between the dentinocemental complex and the cementoenamel complex and the mechanical properties are important for the development of dental materials and the understanding of the mechanical behavior of the human dentinocemental complex.

Resin Coating: Does it Improve the Internal Adaptation of Composite Resin Inlays? P.R. JAYAGODA*Y, F. PEREIRA, T. NIKAO, J. TAGAMI (Conservatory and Operative Dentistry, Tokyo Medical and Dental University, Japan/University of North Carolina)

The aim of this study was to evaluate the improvement in "resin coating" to improve the internal adaptation of composite resin inlays (CRI). Ten Class II MOD cavities with gingival margins located above and below the cemento-enamel junction were prepared in extracted premolars. A "resin coating" consisting of a bonding system (Clearfil SE Bond, Kuraray Co., Japan) and a low viscosity resin composite (Protect Liver F, Kuraray Co.) was applied on half of the prepared teeth according to the manufacturer's instructions while the remaining teeth served as the control. No visible differences were observed in the SEM examinations of the control group and those with resin coating except for a thin layer of the low viscosity resin composite. An additional 24 hours were necessary in order to achieve a complete polymerization of the resin composite. The most important clinical result was that the resin coating did not interfere with the marginal adaptation of the resin composite. These results support the use of the resin coating in clinical practice.

TEM and STEM/EDX study of an all-in-one adhesive containing pre-reacted glass ionomer fillers. *Tay FR, Sano H, Tagami J, Hashimoto M, McLeod KM, Pashley DH* (Univ. of Hong Kong, Hong Kong, Kinki Univ., Tokyo Medical & Dent., KURSU, Medical College of Georgia) Reactor Bond (Shofu Inc., Kyoto, Japan), is a novel fluoride releasing, tri-cure-adhesive that utilizes Pre-Reacted Glass Ionomer (PRG) technology. It utilizes both unreacted, as well as fully-reacted glass ionomer particles (PRG-PRG) to fill the defects and the interfacial gaps between the glass ionomer and resin composite interfaces that were treated with this single-step adhesive. Dentin discs prepared from human third molars were embedded in resin to a thickness of 600- or 650-gs and different regions of each dentin disc were bonded using Reactor Bond and further lamination into disk-pairs. Two strips were prepared from each disk-pair, one of which was completely demineralized. Both unmineralized (U) and demineralized (D) regions were examined with TEM and examined and unrestained and uranyl acetate sections were further coated with carbon for STEM/EDX analysis. Results: Stained "D" sections revealed the presence of a glass ionomer layer in the 650-gs region and a glass ionomer pellet in the 600-gs region. Unstained sections only partially present in the 65-gs regions. The overlying resin layer exhibited completely different ultrastructural features in unstained "U" and "D" sections. In "U" sections, the conventional glass ionomer layer was seen as an electron-dense layer which was surrounded by a layer of hybrid resin (PRG-PRG). In the PRG filler contained numerous spherical, electron-dense "seeds" within the pre-reacted hydrogen. The predominant elements present were Si, Al, La, F, and Ca. In the PRG-PRG regions the resin filled and the contented levels of Ca, P and F. In "D" sections, numerous artificial, electron-dense diamorphite deposits, rich in Ca, P and La, were evident within the trend matrix for both types of sections. There was a high volume of Ca, P and F. Similar TEM observations were also made on 35,000-gs and 20,000-gs sections. The presence of a fluoride-containing inhibition zone, and the appearance of diamorphite deposits after laboratory demineralization suggest that continuous ion exchange is possible within the polymeric resin matrix of Reactor Bond. This probably accounts for its fluoride releasing and retarding potential.

Effect of different conditioning protocols on a high strength GIC to dentin. FR Tay, SHY Wee J Hug, PG Foo, W K Hing, TH Hong Kong, "The University of Adelaide, Australia, Medical College of Georgia, USA"

This study examined the microstructure bond strength (μTBS) and ultrastructure of ChemFil (Dentsply De Trey, Konstanz, Germany), a high viscous resins glass ionomer cement (GIC) to sound dentin that was conditioned with various techniques. Mineral and dentin smear of extracted human third molars were removed Dentin specimens were then treated with one of the tested methods: 1) air abrasion, 2) 5% hydrochloric acid, 3) 15% phosphoric acid with a 30 second air blast, 4) 37% phosphoric acid, 5) 10% acetic acid, 6) 35% nitric acid, 7) 30% citric acid, 8) 5% sodium hypochlorite, 9) 5% sodium perborate, 10) conditioned by gently scraping the dentin surface. The resulting dentin was followed by GIC building using the recommended liquid-powder ratio. After being stored at standard humidity for 24 h, the tensile bond strength was determined using the "non-grinding" technique. Bond strength to failure was examined with SEM. Additional unstained beams from each group were prepared for TEM examination. Both demineralized and undemineralized specimens were examined. The results indicated a significant difference in the bond strength of ChemFil to sound dentin. There were also significant differences in the bond strength of ChemFil to sound dentin. The GIC specimens were classified for each treatment group for the presence of interactions (IF) in all groups. In [C], the SLS was retained to the smear layer. In the other groups, the SLS was observed to be within the intertubular dentin. Similar μTBS seen in the other groups suggests that such values represent more of the cohesive strength of GIC under tension, rather than true adhesive strength to dentin.

Clinical Evaluation of a Composite in the Reinforcement of Class I and II Caviton in Permanent Posterior Lower Teeth Results C G TOW, NH ABDULLAH \(^{\text{a}}\) (Dept of Conservative Dentistry, Faculty of Dentistry, University of Malaya, MALAYSIA)

The clinical performances of a composite (Dyract AP) in combination with a non-rinsing condition (K-O100) and self-priming adhesive (K-O111) were compared with a hybrid composite resin (Spectrum TPF plus) in combination with a 34% Tetric Ceram and (Dyract TPF) in a randomized controlled double-blind 3-months study. Removal of surface smear film was done by means of 15.3% lactic acid and 25% composite/35% silicate etching for 35 seconds. The teeth were prepared for each conditioning protocol: (1) no polyacrylic acid (PAA) treatment (control); (1) 10% PAA for 30 s, rinse (R); 10% PAA for 30 s, rinse (R) and (3) 15% PAA for 30 s, rinse (R). A 3-mm-thick 25-gauge needle was inserted into the pulp chamber through the cavitory. A 3-mm-thick composite resin was placed through the cavity. The cavities were restored with a conventional composite resin adhesive system using the "non-grinding" technique. Bond strength to failure was examined with SEM. Additional unstained beams from each group were prepared for TEM examination. Both demineralized and undemineralized specimens were examined. The results indicated a significant difference in the bond strength of Dyract AP to sound dentin. There were also significant differences in the bond strength of Dyract AP to sound dentin. The GIC specimens were classified for each treatment group for the presence of interactions (IF) in all groups. In [C], the SLS was retained to the smear layer. In the other groups, the SLS was observed to be within the intertubular dentin. Similar μTBS seen in the other groups suggests that such values represent more of the cohesive strength of GIC under tension, rather than true adhesive strength to dentin.