



NEWSLETTER

VOL. 22, NO. 2

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The Academy for Sports Dentistry Newsletter is published tri-annually for its members. Comments and suggestions regarding the newsletter should be directed to Dr. Mark Roettger, Editor.

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Better Sports Dentistry Through ASD

Thank you for the opportunity to serve you and follow behind the many wonderful past presidents who have given so much to sports dentistry through the Academy. I especially wish to thank Dr. Brett Dorney for raising the bar in his service to ASD during the 2005-2006 term.

My goals for the organization include bringing together the dentists, physicians, coaches, trainers, scientists, lab technicians, and organizations related to sports dentistry to elevate the level of scientific and clinical knowledge, which would continue to improve the field of sports dentistry.

I also wish to encourage outreach by our members to other colleagues in sports and stimulate their interest, education and research in sports dentistry. Inviting others with overlapping interest in sports dentistry benefits our organization so that members can provide treatment with confidence and success for all of our athletes. ASD provides a forum for all of us with this interest and creates an outstanding resource for the world of sports dentistry.

For those who had the opportunity to attend our 2006 symposium in Santa Monica, we hope you were energized by the wonderful program led by Jeffrey Hoy and Brett Dorney. Our symposiums represent the best opportunities to share information, updates, research, and debates on topics relevant to sports dentistry. For those who wish to provide care as a team/sports dentist, our program, which included presentations on acute oral and facial trauma, concussions, avulsions updates, and mouthguard and suturing workshops, provided great tools for all involved in sports dentistry. Hopefully you are still energized by your interaction with colleagues and friendships shared in the beautiful Santa Monica setting, and you will bring this information back to your dental and sports community. Those who are team dentists and those who treat all the other thousands of athletes have the opportunity to share their experiences, questions, research, and education towards the betterment of care for all athletes.

We want to recognize many of our dental colleagues who are active in sports dentistry by participating in

sports mouth guard programs and treatment of sports oral injuries. As the central organization for the most current information in this area, we want to find ways to evaluate and provide information for all our dental colleagues. There are a large number of athletes in organized sports, and not all have team dentists. So how can we educate and provide resources to those who are providing prevention and treatment of oral/dental sports injuries? Our symposium, which is an opportunity to showcase sports and team dentistry, should be shared with a wider audience. Write a letter to the ADA describing your experience at the symposium, place a paragraph in your local dental society newsletters, spread the information to your team and school athletic trainers, inform the national athletic organizations and certainly encourage this information in dental school education and through dental school chapters.

Let's not forget other community services for which we are uniquely qualified. Specifically I name the Special Olympics Special Smiles program. We have the opportunity as an organization to help provide volunteers for this program. I thank those of you who have been contributing to this program in past years.

As we review the past strategic plan and work on the upcoming plan, we want to encourage scientific research and statistical evaluations of preventive efforts, study injury profiles, evaluations of successful treatment protocols, ask questions, review literature, and act as a resource to other sports-related organizations. We want to hear from you. Contact us and contribute to our strategic plan.

I would be remiss if I did not encourage our current members to participate on our committees and invite new members to share in the goals of this organization. It takes one email or phone call to Shelly Lott our executive director, at our ASD office (1-800-273-1788 or sportsdentistry@consolidated.net) to be active.

With warmest regards to all of you,
Leslie Rye, DDS



Concussions: The Silent Injury

By Brett Dorney, BDS

The problem of mouthguards and whether they play a role in concussion prevention has again surfaced in the media. As with previous articles, unsubstantiated claims are made looking at individual cases where athletes who have suffered concussion have had a miraculous recovery once this new mouthpiece was used.

This particular topic was visited by Dr. Stephen Mills in his President's Message for the Academy for Sports Dentistry newsletter in December 2001. This editorial was in response to claims made by a bimaxillary mouthguard known as WIPSS. The conclusion of Dr. Mill's article is still relevant today. He stated, "Concussion research is an example where the dental and medical professions cannot exist independently... We cannot make claims in advertisements which are not supported by good science."

The original definition of concussion by the American Academy of Neurology, 1997 was, "Any alteration of the mental status following a blow to the head that may or may not involve a loss of consciousness." This definition has been replaced by the definition published in the 2002 Physician and Sports Medicine stating, "Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces." It may be caused by a direct blow to the head, face, neck or elsewhere in the body where there is impulsive force transmitted to the head. Concussion typically results in a rapid onset of short lived impairment of neurological function that results spontaneously. Concussion results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. Concussion is typically associated with grossly normal structural neuroimaging studies.

At present, the Academy of Sports Dentistry's mouthguards statement is being reviewed, looking at scientific evidence as to the effectiveness of mouthguards. The present ASD mouthguard statement is, "The ASD supports properly fitted mouthguards as a proven method to reduce dental sporting injuries." ASD does not support or recommend mouthguards that claim to reduce concussion. At

the present time there is no scientific evidence to support concussion reduction through mouthguards.

The Academy of Sports Dentistry does support the concussion safety testing program involving computerized neurophysiological testing. This program is called ImPact (Immediate Post concussion assessment and cognitive testing). This program was introduced to the Academy of Sports Dentistry at our 2002 Annual Symposium in San Antonio, Texas. We were very fortunate to have one of the designers of this program, Dr. Micky Collins, outline the benefits of this program and their research. This scientific evaluation is absolutely critical if any claims are to be made about the use of mouthguards in concussion prevention.

Contact and collision sports occur in many countries around the world. The main cause of injury is player to player contact, in most cases involving head-to-head, helmet-to-helmet, or a player's head striking the playing surface. In Australia, rugby is no different from other sports where in any survey of injuries sustained while playing this contact sport, concussion is the number one injury recorded. In rugby, concussion is called "the silent epidemic." The severe impact of concussion is realized when athletes make a decision on whether they should continue playing that sport. It is rare that anyone would think of giving up a contact or collision sport for any other injury.

The problem of mouthguards and concussion prevention requires dentistry to take a leading role. I quote from Dr. Stenger's article in the *Journal of the American Dental Association* (Vol 67, 1964): "It is dentists' responsibility to participate in the development of the best mouthguard possible. Achieving this goal will involve, among other things, consideration of all the traumatic forces which can be transmitted through the teeth or through the condyle. Achieving this goal will mean for those engaged in active contact sports protection of both the teeth and the head and neck structure in which the teeth are housed."

Dr. Stenger has provided us with the direction: it is up to us to accept the responsibility and build on his early research.

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ASD 2007 Annual Symposium

June 2007
Charleston, South Carolina

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becomes available
www.sportsdentistry-asd.org



Mark your calendars!
This is a meeting that you won't want to miss!

Photo courtesy of the Charleston Area Convention & Visitors Bureau (CACVB), www.charlestoncvb.com

- ABSTRACT -

A pilot study of shortening the distal end of a mouthguard

Takuto Yamanaka^{1)*}, Ryosuke Mastui¹⁾, Toshiaki Iida²⁾, Hisashi Taniguchi³⁾, Toshiaki Ueno¹⁾

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Purpose: Recently, Matsui et al. applied modal analysis to the living human maxillary dentition with and without a mouthguard and showed the feasibility of assessing the preventive effects of mouthguards. The purpose of this study was to analyze the vibratory characteristics of living human maxillary dentition with a different distal end of a mouthguard, by using a laser Doppler vibrometer as a sensor, from the standpoint of decay rate (DR).

Methods: Mouthguards used in this study were: 1. a mouthguard covering up to the second molar (7MG), 2. the first molar (6MG), and 3. the second premolar (5MG).

The right central incisor was struck with an impact hammer, and the responses from the teeth between the maxillary second premolars on both sides of the

subject were received using a laser Doppler vibrometer. The transfer functions were then obtained from each measurement point using a fast Fourier transform analyzer. Finally, a computer analysis and simulation were performed based on the measured transfer functions to obtain DR. A mean DR statistically compared among different sets of experimental conditions, including that of no mouthguard (NMG), using One-way ANOVA and Scheffe's F Post-Hoc Test ($P < .01$).

Results and Conclusions: The decay rates with 7MG and 6MG were significantly greater than that with NMG. These results might imply that a mouthguard should distally cover up to the first molar at least to ensure efficient absorption and/or dispersion of a traumatic force from the frontal direction.

- A B S T R A C T S -

Influence of Post-Core System on Impact Stress.

Takeda T ¹⁾*, **Ishigami K ¹⁾, **Nakajima K ¹⁾**, **Shibusawa ^{M1)}**, **Akiba ^{T1)}**, **Miyajima ^{S1)}**, **Kawamura S ¹⁾* **Kurokawa K¹⁾**, **Shomura M ^{1,2)}******

1) Tokyo Dental College (Chiba, Japan)

2) Matsumoto Dental University School of Dentistry (Nagano, Japan)

Purpose: Most endodontically treated teeth are restored with prostheses after conventional metal post-core systems (hereafter MPC). Such teeth are susceptible to root fractures. Therefore, prevention of such injuries is a high priority.

However, not enough investigation has been done on the relationship between dynamic load and traumatic injury on such teeth. The purpose of this study was to clarify the influence post-core system on shock resistance.

Methods: Bovine lower front teeth were modified with the CELAY system into human upper incisors' root. Two post-core systems MPC and a composite resin and fiber post (FRPC) were used. Four strain gauges were affixed on the core and root. These specimens were fixed with a super-hard plaster. A pendulum-type device was used to provide impact and measure maximum distortion. High-speed video

camera (Hyper vivion-1, SHIMAZU, Japan) was used to observe a destruction modality with 16000 scenes/second.

Results: As pictures with the high-speed camera; a root fracture in MPC and a core destruction was observed in FRPC respectively. As a distortion; at the core, FRPC showed significantly (t-test; $p > .05$) larger distortions than MPC. However, at the root, FRPC showed significantly smaller distortions than MPC.

Conclusions: These results indicate that teeth treated with FRPC will beak easily at the artificial resin core, and teeth treated with MPC at the root. In other words, while FRPC can preserve remaining roots, MPC ruins such important remaining root structures. Therefore, from the viewpoint of preserving remaining teeth from impact, FRPC post-core systems offer an advantage over MPC systems for non-vital teeth.

Study on Clenching as Defense Posture against Anticipated Impact.

Wakano S ^{*1)}, **Katayama K ²⁾**, **Takeda T ¹⁾**, **Nakajima K ¹⁾**, **Handa J ¹⁾**, **Nara K ¹⁾**, **Suda O ¹⁾**, **Naito K ¹⁾**, **Ishigami K ¹⁾** (**¹⁾Tokyo Dental College, Chiba, Japan;** **²⁾Japan Self Defence Force Central Hospital, Tokyo, Japan**)

Purpose: Strong clenching increases not only masticatory muscle but also head and neck muscle activity, strengthening fixation of the head. Therefore, clenching is believed to be effective in preventing acceleration damage to the head and neck, including concussion. However, the strength and timing of clenching necessary for defense has yet to be investigated.

Methods: When and how clenching occurred in response to an anticipated impact was investigated in 6 volunteers. Each subject was made to wear a head guard. The axis length of the pendulum was about 100 cm, and the apparatus was adjusted to hit the same point on the subject's head guard. As an impact object, a glove with a built-in 1kg weight was used. Impact

was applied from an angle of 90°. Impact was applied under two conditions: one with only a head guard and the other with both a head guard and a mouthguard.

Results: The results showed that in most of the subjects, obvious masseter muscle activity commenced just before impact and continued throughout impact. This was more pronounced with the mouthguard than without.

Conclusions: This suggests that unconscious clenching is part of the defense posture against an anticipated impact. Moreover, the mouthguard increased masseter muscle activity, indicating the effectiveness of a mouthguard in preventing acceleration injury of the head and neck region.

Photocured Thiol-Ene-Acrylate Systems as a New Mouthguard Material Platform.

Gould TE*, Piland SG, Hoyle CE, Nazarenko SI, Wei H, Senyurt AF, Phillips BE, Cole MC, Fos PJ
(The University of Southern Mississippi, Hattiesburg, MS)

Research supported by Perstorp, Bruno Bock, Sartomer, and Cytek coporations.

Purpose: The use of photopolymerized materials is common practice in dentistry. Recently, thick-section, 3 component thiol-ene-acrylate systems possessing unique nanostructured architecture and rheology have been developed for potential athletic mouthguard applications. Therefore, our twofold purpose was to: 1.) compare the performance of the thiol-ene-acrylate and other common material systems to established performance characteristics (i.e., Academy for Sports Dentistry, American Society for Testing and Materials, and Standards Australia International) and 2.) investigate the performance of the thiol-ene-acrylate and other common systems at end-use temperature (~37°C).

Methods: We combined a multifunctional thiol with an ene monomer and acrylate group to develop a photocured material. Processing protocols were developed using low intensity lamps. Properties of the cured, thiol-ene-acrylate and common materials were evaluated through mechanical and impact

analyses according to ASTM test standards.

Results: The new thiol-ene-acrylate material platform met all current established performance characteristics and exceeded contemporary materials' ability to dissipate impact energy (~55% [best current material] versus ~85% [thiol-ene-acrylate]). When we examined performance at end use temperature, we found that current common materials form a permanent set which affects their ability to dissipate energy (now below 45%). The thiol-ene-acrylate system was unaffected because the glass transition was relatively narrow and shifted closer to the end-use temperature.

Conclusions: Our results suggest that this novel thiol-ene-acrylate based material is highly crosslinked and does not lose its shape when exposed to impact stresses at end-use temperature. This material exceeds current standards and has tremendous potential as an athletic mouthguard.

Progress Report on the Finite Element-based Mouth Protection Project.

Kenny DJ*, Casas MJ, Barrett EJ (The Hospital for Sick Children, Toronto, ON)

Purpose: To illustrate enhancements to the finite element model first described at the 2003 (Puerto Rico) Symposium.

Methods: This cadaver-based crash test project that began in 2002 has led to development of a finite element model to test blunt projectile trauma to the maxilla and incisors. Convergence testing of the model determined that a refined mesh that incorporated 24,616 nodes and 15,753 elements was necessary to obtain sufficient accuracy for the maxilla and 11,677 nodes and 15,889 elements for a central incisor. The simulated load case involved a transient, dynamic impact to the medial maxilla. Results were validated by direct comparison with the displacements and principal strains gathered from published experimental and epidemiological data. Subsequently we have

begun to populate the maxilla model with individual teeth (dentin, enamel, periodontal ligament and investing bone).

Results: Destructive testing and bone collection are complete. Calibrated finite element models of both the maxilla and individual teeth are complete.

Conclusions: A revised high definition model that incorporates non-linear and directional bone properties and is populated with individual teeth is currently being developed. Subsequently we will begin simulating fractures and deformations produced by impact from high-speed projectiles and testing innovative mouth protection. We now have sufficient data analysis and model development to expand exploration of industrial partnerships.