Dispelling the Myth

Mouthguards, Concussions and the Prevention of Sports Injuries

Dr W Scott LeBuke DDS, HD, AANG
Definitions of Concussion

- A brain injury that results from trauma sustained to the head, directly or indirectly, that may cause temporary or long term alteration of how the brain functions
- The primary mechanism for concussions is excessive rotational acceleration of the brain leading to shear strain within the nerve axons and a disruption of their function
- “Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathologic and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include....”

1. Concussion may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an “impulsive” force transmitted to the head.

2. Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously.

3. Concussion may result in neuropathological changes but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.

4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. However it is important to note that in a small percentage of cases, post-concussive symptoms may be prolonged.

5. No abnormality on standard structural neuroimaging studies is seen in concussion

Signs and Symptoms of Concussions

❖ **Immediate**
- Confusion/ Feeling in a fog
- Headache or feeling pressure in the head
- Nausea or Vomiting
- Blurred Vision
- Loss of short term memory (may not recall Injury)
- Perseverating (repeating the same thing over and over)
- Dizziness or seeing stars
- Ringing in the ears
- Slurred speech
- Fatigue

Signs and Symptoms of Concussions

❖ **Delayed**
- Concentration and memory complaints
- Irritability and other personality changes
- Sensitivity to light and noise
- Sleep disturbances
- Psychological adjustment problems and depression
- Disorders of taste and smell

Signs and Symptoms of Concussions

❖ **Children**
- Listlessness, tiring easily
- Irritability, crankiness
- Change in eating or sleeping patterns
- Lack of interest in favorite toys, Loss of balance
Concussion Management

- Rest
- Rest
- Rest
- Expect gradual resolution in 7-10 days
- Start graded exercise rehabilitation when asymptomatic at rest and post-exercise challenge

Return to Play - Graded Exertion Protocol

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional Exercise</th>
<th>Objective</th>
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<tbody>
<tr>
<td>1. No Activity</td>
<td>Physical and Cognitive Rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>2. Light Aerobic</td>
<td>Walking, stationary bike MHR&lt; 70/min</td>
<td>Increase HR</td>
</tr>
<tr>
<td>3. Sport Spec</td>
<td>Skating.... No contact</td>
<td>Movement</td>
</tr>
<tr>
<td>4. Non Contact Training</td>
<td>Complex Drills</td>
<td>Exercise, Cognition, Coordination</td>
</tr>
<tr>
<td>5. Full Contact Practice</td>
<td>Following Medical Clearance</td>
<td>Restore Confidence, Assess Functioning</td>
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<tr>
<td>6. Return to Play</td>
<td>Normal Game Play</td>
<td></td>
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Mouth Guards and Tooth Injury

Why wear a mouth guard?

- More than 5 million teeth are knocked out every year during sports
- During a single athletic season, athletes have a 1 in 10 chance of suffering a facial or dental injury
- 39.4% of all hockey injuries involve the head or face, with dental injuries accounting for 11.5% of all ice hockey injuries
- In Football, prior to mandatory wear of mouth guards dental injuries averaged 2.26 per 100 players. After mandatory wear of mouth guards, oral injuries were reduced to 1.0 per player.

Why are there more documented concussions?

- Players are bigger, stronger, and faster
- Better diagnosis and documentation
- Better understanding of the condition
- More participants in recreational and organized sports
- The desire to win at all levels
- College scholarships
- Athlete salaries
Mouth Guards Design

1. All should have adequate thickness (3-4mm)
2. As much of the occlusal surface of the teeth should be covered, as can be tolerated
3. All should be balanced for even distribution of force
4. All should have proper retention so that they easily stay in

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The Bottom Line

- After reading the available literature, I do not support the claims made by mouthguard manufacturers and other dentists that there is a definite relationship between wearing mouthguards and the prevention of cerebral concussions... however there is significant evidence that they prevent tooth injury.
References

Research Articles/Papers infering that there is a relationship between the wearing of mouthguards and the prevention of concussions:

- The Effectiveness of Mouth Guards and Face Masks in Reducing Facial and Oral Injury in Ice Hockey players - Sasktel web hosting internet abstract
- Do Mouthguards Prevent Concussions - Russell Gunner C.A.T (Club Physio Plus)
- Dental Device Helps Reduce Concussion Risk for Athletes - Mark Kram, Philadelphia Daily News
- Merits of Custom Mouthguards - Bernadette Mackay RDH, President of Allsports mouth guards
- The 3XS Mouth Guard with Super Impact Absorbing Gel Pads Reduces the Risk of Head Injuries from Lower Jaw Impact - Health News Digest.com interview with Joe Manzo, President of Brain Pad Mouth Guards
- Relationship Between Temporomandibular Joint Dynamics and Mouth Guards: Feasibility of a test method - Waililko et al
- The Relation of Mouth Protectors to Cranial Pressure and Deformation - Hickey, Morris, Carlson
- Protecting teeth with Mouthguards - Prepared by the ADA Division of Communications, JADA Dec 2006; Vol 137: p 1772
- Mouth Guards and Concussion Prevention - Grossutti, Saward, Shaver, 2010, MacMaster University
- Mouth Guards: Protection Against Shock to the Head Neck and Teeth - Streger et al J AM Dent Assoc 1964
- Brain Injury in Sports Related to Trauma to the Lower Jaw - Albert Gusenbauer DDS, Dentistry Today April 2003 (Dr Gusenbauer is a stockholder in WISS Products - manufacturer of Mouthguards)
- Commentary: Role of Properly Fitted Mouthguards in Prevention of Sports Related Injuries - Jackson Winters Sr
Research Articles/Papers stating that there is currently not a scientifically proven relationship between the wearing of mouthguards and the prevention of concussions:


Concussion Prevention: Are Mouth Guards the Answer? - Rob Johnson MD


The Mouth Guard Claim - Review of articles author unknown

Do Intraoral Mouthguards Work - Rayes et al, U of T Faculty of Dentistry, 2007, Literature review

The Role of Intraoral Protective Appliances in the Reduction of Mild Traumatic Brain Injury - P.D. Halstead, Abstract, Director, Sports Biomechanics Research Lab, U of Tennessee

Patterns of Mouth Guard Utilization Among Atom and Peewee Minor Ice Hockey Players - Raaii et al, 2007-2008

Do Athletic Mouth Guards Have a Role in Reducing the Incidence and Severity of Cerebral Concussion in Sport - Review of the Literature

Mouth Guards no Help - Patrick Bishop MD, Chair of the Canadian Standards Association on Equipment and Facilities for Ice Hockey (CSA)

Mouthguards and Sports Related Concussion - Dr Brian Benson, AHFMR Research Clinical Fellow, Calgary Flames Dentist and NHL’s injury Epidemiologist, Calgary Herald article.

Comparison of Mouth Guard Desins and Concussion Prevention in Contact Sports: a Multicenter Randomized Controlled Trial - Barbic et al, Department of Community Health and Epidemiology, Queen’s University, Ontario


Effectiveness of Mouth Guards in Reducing Neurocognitive Defecits following Sports-Related Concussions - JP Mihalik et al, Dental Traumatology 2007;23:14-20
