Essential Aspects of Sports Dentistry

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What is important to this audience?

- Informing and educating the public
- Advocating for Optimal Health
- Partner with others when making policies for specific groups
Is this a public health concern?

• Does this affect a significant population?
• Is there a Problem? Is there evidence of orofacial injuries in sports?
• Are there practical and meaningful strategies and for public education and prevention?
States with Programs for Mouthguard/Injury Prevention 2008

Source: The Association of State and Territorial Dental Directors and CDC Division of Oral Health's Synopses of State Dental Programs.
States with Programs for Mouthguard/Injury Prevention 2009

Source: The Association of State and Territorial Dental Directors and CDC Division of Oral Health’s Synopses of State Dental Programs.
Participation Numbers

- National Sporting Goods Association
  www.nsga.org

- National Collegiate Athletic Association
  www.ncaa.org

- National Federation of State high School Associations
  www.nfhs.org
## Ten-Year History of Sports Participation

*Participated more than once (in millions)*

*Seven (7) years of age and older*

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NATIONAL SPORTING GOODS ASSOCIATION (www.nsga.org)
# 2011-12 SUMMARY OF ATHLETICS PARTICIPATION TOTALS BY STATE

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Sports Injury Numbers

- Most common age for dental injuries is 8yrs old but for SPORTS DENTAL INJURIES is 13-18 yrs of age.
- Retrospective studies show 10-61% have experienced at least one orofacial injury during sports activities

Knapik JJ, et al. Mouthguards in Sports Activities
*Sports Med, 37(2):117-144, 2007*
Continued...


1.3%-71.5% Sports Orofacial Injury Rates

• “Retrospective surveys...10-61%...at least one orofacial injury during their participation in sports.”

Cause of Dental Related Sports Injuries

- Impact with another player
- Impact with the ground or floor
- Impact with the playing instrument or equipment (balls, pucks, sticks)

Kaplan, et al. 2000
Risk of Orofacial Sports Injuries by Category

- Age
- Gender
- Dental Anatomy
- Individual Sports
Gender

- Males tend to outnumber females in injuries
- 2012 Marked the 40th Anniversary of Title IX and the difference between men and women in orofacial sports injuries has changed
Dental Anatomy as a Risk Factor
Typical Results

Normal overjet/Adequate lip coverage

7.1% dental trauma

Overjet >3 mm/ Adequate lip coverage

11.3% dental trauma

Overjet >3mm/ Inadequate lip coverage

13.5% dental trauma

Bauss, et al, Dent Traum, 2004
Sport Classification

- Non Contact
  - Low Velocity
  - High Velocity
- Contact
- Collision
Non Contact Low Velocity

- Golf
- Swimming
- Billiards
- Nordic Skiing
- Curling
- Weightlifting
Non Contact High Velocity

- Alpine skiing
- Cycling (Mountain and Street)
- Extreme sports
- Skateboarding
- Stunt biking
- Horse racing
- Rodeo
Contact Sports

- Basketball
- Soccer
- Wrestling
- Lacrosse
- Volleyball
- Field Hockey
- Baseball
Collision Sports

- American Football
- Australian Rules Football
- Rugby
- Ice Hockey
- Boxing
Kumamoto and Maeda

- Basketball (2.3-55.1%)
- Baseball/Softball (1.6-40%)
- Soccer (2.6-32.3%)
- Bicycle (5.6-30%)
- Rugby (6.7-71.9%)
- Ice hockey, Field Hockey, Lacrosse (1.3%-29.72%)
So, the numbers are there.

“...it is possible to argue that the best strategic measure for preventing dental and oral injuries is education on both how to avoid them and what to do if an injury occurs.”

Inform/ Educate the Public

- Immediate Recognition and Handling of Orofacial Injuries
- Prevention/Mouthguard Options
- Examples of Attempts to Mandate mouthguard Usage
What’s Important in Dental Traumatology

- Mechanism of dental injuries
- Classification of dental injuries
- Management of dental injuries
  1. Acute care
  2. Subacute care
  3. Delayed care
Oral Injuries: A Quick Overview
Oral Injuries

Collision with others

Collision with objects
Dental Trauma: Mechanism

Direct

**Direct Trauma**

- The tooth itself is struck
- Injuries usually to anterior teeth; luxations, avulsions and fractures
- Energy of impact: low mass, high velocity; high mass low velocity
Dental Trauma: Mechanism

Indirect

Indirect Trauma

- Lower arch is forcefully closed against the upper
- Crown/root Fx in posterior teeth
- Jaw Fx
- TMJ injury
- Concussion?
Results of Oral Collisions

- Teeth can break (Fracture)
- Teeth can move (Luxation)
Results of Oral Collisions

Teeth can move a long way
Avulsion

Teeth can act as weapons
Lip laceration
Results of Oral Collisions

Bone may fracture

Mandibular fracture
Nature of Dental Trauma

**Complex Injuries:**
- Involving multiple tissues
- Damage to intercellular components; tearing
- Damage to cellular systems; crush, desiccation, contamination
- Tx aimed at resolving all damage
Classification of Dental Injuries
Anatomical

Injuries to dental hard tissues and pulp

• Enamel fracture
• Enamel-dentin fracture (simple)
• Complex crown fracture
• Crown-root fracture
• Root fracture
Classification of Dental Injuries
Anatomical

Injuries to the periodontal tissues
- Concussion
- Subluxation
- Extrusive luxation
- Lateral luxation
- Intrusive luxation
- Avulsion
Classification of Dental Injuries
Anatomical

Injuries to gingival or oral mucosa
• Laceration
• Contusion
• Abrasion

Always look for combination of injuries!!!
Management of Dental Trauma

1. Education of dental providers
2. Education of the general public
Dental Trauma: Healing outcomes

**Regeneration:**  
Pulp → revascularization  
PDL → normal PDL

**Repair:**  
Pulp → pulp canal obliteration  
PDL → replacement resorption (ankylosis)

**Failure:**  
Pulp → pulp necrosis  
PDL → inflammatory resorption

*All wounds heal, it how they heal that determines outcome*
Immediate vs Delayed Treatment

1. **Acute:** minutes to hours
2. **Subacute:** within 24 hrs
3. **Delayed:** >24 hrs
Acute dental care required

- Avulsion
- Alveolar fracture
- Extrusive luxation
- Lateral luxation
- Root fracture
Subacute dental care required

- Intrusion
- Concussion and subluxation
- Crown fractures complex: pain
- Primary teeth
Delayed dental care

- Simple crown fractures
- Non-painful complex crown fractures
Avulsion: A Public Health Opportunity

1. Educate dental providers
2. Educate the general public, parents, trainers and coaches
Avulsion: The Injury

- Tooth completely displaced from socket, clinically socket is empty or filled w coagulum
- PDL and pulp suffer ischemic injury, aggravated by drying, infection and chemical irritation
Avulsion

• Historically the management of these injuries have been fraught with confusion
• The goal of treatment is to regenerate a new PDL and perform endodontic therapy
• Magic solutions and treatments have been proposed
• How do we achieve the stated goals??
• Follow the science...
Research Summary: Effects of dry time on PDL regeneration

- **Less than 5 min.** extra oral dry time, PDL cells maintain vitality and fibrogenic phenotype Result: regeneration of PDL likely
- **Greater than 5 min, but less than 15 min** of extra oral dry time, cells maintain vitality but begin to exhibit osteogenic phenotype Result: Ankylosis likely
- **Greater than 15 min** extra oral dry time cells lose vitality and die; losing the ability to make clones to repopulate the root surface. Result: Ankylosis
Consequences of Ankylosis

Non-growing patient  Growing patient
Considering this Information...

What do we tell the public?
What do we tell dental providers?
First Aid for Avulsed teeth

Dentists should be able to give phone advice to patients

- Make sure it is a permanent tooth
- Keep the patient calm
- Pick up tooth by the crown (whitest part) avoid touching the root
- If tooth is dirty wash it; cold running water 10s and replant the tooth
- If not possible place the tooth in cold milk; if no milk is available transport in the mouth is ok; if the child is young or unconscious get saliva in a cup and transport; no water
- Get emergency dental care immediately
Dental office Procedures:

1. Clean the root with saline and soak in saline
2. Administer local anesthesia
3. Irrigate the socket with saline
4. Replant the tooth slowly
5. Suture gingival lacerations if present
6. Verify normal position: clinically/radiograph
7. Apply flexible splint for 2 weeks
8. Systemic antibiotics
9. Check tetanus status
10. Patient instruction
11. Start endo on mature root 7-10 d; monitor immature tooth for pulp regeneration
What if...the tooth is **NOT** replanted within 5 minutes???

People are squeamish...and not all injuries look like this
Some look like this!!!!
Avulsion Treatment

When immediate reimplantation is not possible:

- Proper storage medium is required **5 Minutes**
- Proper osmolality (280-300 mOs), cell nutrients
- Hanks balanced salt solution
- Cold milk
- Isotonic saline (contact lens solution)
Avulsion management

To maximize healing potential:

• Replant the tooth within 5 minutes

OR

• Place tooth in a proper storage medium within 5 minutes of the trauma
Resources For Dental Trauma information

- ASD Trauma card
  www.academyforsportsdentistry.org
- IADT Treatment guidelines
  www.iadt-dentaltrauma.org
- The Dental Trauma Guide
  www.dentaltraumaguide.org
Prevention of Injuries
The Athletic Mouthguard
That Reference again...


ASTM

Designation: F 697 – 00 (Reapproved 2006) An American National Standard
Standard Practice for
Care and Use of Athletic Mouth Protectors 1

Classification

3.1 Mouth protectors covered by this practice shall be of the following types and classes:

3.1.1 Type I—Thermoplastic Type:
   3.1.1.1 Class 1—Vacuum-formed.
   3.1.1.2 Class 2—Mouth-formed.

3.1.2 Type II—Thermosetting Type:
   3.1.2.1 Class 1—Mouth-formed.

3.1.3 Type III—Stock type.
Stock Mouthguard
Mouth formed
The (Updated) Functions of a Mouthguard

- Dental Protection
- Soft Tissue Protection
- TMJ protection
- Bone protection
- Concussion Protection
- Systemic Influences

Does it work?
Protect the Teeth From Fracture

Overall injury reductions of 1.6-1.9 times fewer injuries with mouthguards.
Soft tissue protection

No Real Numbers For This
TMJ Protection
TMJ Protection

- No real numbers for this
- The most protected position is fully engaged occluded teeth
- Need a locked occlusion
Bone Fracture Protection
Bone Protection

• Hickey, et al 1967 measured bone deformation
• Takeda, T., et al, *Dent Trauma, 20*:150-156, 2004
Concussion Protection

Sorry guys, no numbers
Mark!!!!
In Fact....
For Release: 11/29/2012

FTC Approves Final Order Settling Charges Against Marketer Brain-Pad, Inc. for Allegedly Deceptive Claims that Its Mouthguards Can Reduce Risk of Concussions

Agency Sends Warning Letters to 18 Other Marketers of Anti-Concussion Products
Systemic influences of intraoral appliance wear

- MORAppliance early 80’s
- New Styles available
- Jury is still out.
Biting Suppresses Stress-induced Expression of Corticotropin-releasing Factor (CRF) in the Rat Hypothalamus


**Methods:**

- Stressed a group of rats
- Part of the group was allowed to bite on sticks during stress and part was not
- Subjects were sacrificed and brains were analyzed
Systemic Influence
Special designed MG

Cortisol  Lactic acid

Bike protocol/Average cortisol values of those who benefitted from the mouthpiece

Average values

Mean of Participants (N = 10)
Results: Airway

Mean values of oropharynx width and diameter with and w/o a specially designed appliance:

Airway is significantly increased
Summing up mouthguard effectiveness....

• “Many do believe that a mouthguard will protect the teeth and even the brain, but without good randomized clinical trial study, the evidence supporting that belief is weak at best.” Sigurdsson, Ped Dent. 2013

• One model study NCAA Div I Basketball study. 70,936 athlete exposures. Significantly lowered dental trauma. 3:1.16 times.

But dental injury protection is enough, no?

So, Let's make it a rule!!! Everyone has to wear one!
What groups can make rules?

- State Athletic Associations, Little League Intl, USA Hockey, AAU Basketball, ASA, NCAA, All professional leagues, Pop Warner Football, USA Rugby, US Youth Soccer, National Federation of State High School Associations, NAIA, Local Community Organizations of various sports, and many more......
What rules are there now?

- Mouthguards are mandated for Lacrosse, Ice Hockey, Football, Field Hockey
- Wrestlers who are wearing orthodontic appliances
- Boxing is the only professional sport which mandates mouthguards
What about basketball, soccer, softball, baseball, volleyball, wrestling, etc?

Well, Go ahead, but it ain’t easy.
For High School and Below

Individual States Have the biggest impact.

- Minnesota
- Massachusetts
- New Hampshire
- Maine
Mouthguards: The Minnesota Experience

Recommendation: < 10% compliance

Mandate: 70-80% compliance
Minnesota New Rule

To require mouthguard use in these sports:

1. Soccer (boys and girls)
2. Volleyball
3. Wrestling
4. Basketball (boys and girls)
5. Baseball
6. Softball
Minnesota Mandate: Chronology

- Medical advisory committee recommendation: 11/1992
- Board considers recommendation 1/24/1993
- Board request coach input 1/24/1993
- Board votes to mandate 6 sports 2/24/1993
- Violent protests erupt
- Board rescinds the mandate 4/1994 and makes a strong recommendation for MG use
Arguments against

**Scientific standards:**

1. Opponents will demand stringent data to support, but will spout idiotic dribble to support their side

2. Scott M Jensen MD letter is a prime example
   - Aspiration
   - Bacterial transmission
Arguments against

Libertarian issues:
1. Seatbelts
2. Motorcycle helmets
3. Threats of physical violence
   – Death threat against a director in the MSHSL
Arguments against

1. Dentists just want to make lots of money by requiring mouthguard wear
2. Decision makers must have stock in MG companies
Parent argument: Letter to the MN Governor: Kathy McIntosh from Minnetonka, suggests that MG make for ugly media photos

Is this so ugly Kathy????

Or...
IS THIS UGLY????????
Attitudes on Mouthguards

- **Coaches**: Extra hassle to deal with
  - I’ve coached for...
  - Simply just not qualified to judge need
- **Athletes**: Mirror coaches views
  - Comfort and breathing issues
- **Trainers**: Most believe in MG use
  - Work most closely with athletes
  - Our greatest ally in this endeavor
  - *Minnesota study injury reports*
- **Parents**: Ugly media photos
The Death of the Minnesota Rule

Minnesota State legislature

1. Uninformed: large ego

2. Vocal minority

3. 3-4 female legislators that had previous conflict with MSHSL regarding tennis camps

4. “force of law”
Massachusetts, 2007 Soccer

- Initially in June 2007 rule was overturned without input from the medical committee.
- After the medical committee, the rule was reinstated for two years.
...Basketball

- Rule changed from a mandate to a strong recommendation
- Arguments against were “difficult to speak and breathe”.
  Hygiene issues of mouthguards falling onto the ground/floor
  “...lack of education of the coaches, athletic directors and principals.”

Dr. Paul Epstein
New Hampshire 2008

- Mandates about 18 years ago for soccer and basketball
- Questioned the mandate for Basketball.
- Maintained the mandate
- Must encourage the input of the New Hampshire Dental Community to enhance access to quality protection
Maine 2009

- Initiated Soccer mandate in 2009
- Since that time, it is attacked yearly
- The strong leadership of the Medical Committee upholds the mandate.
Hockey Rules Committee Plans to Formally Recommend Change to Three-Quarter Visors

Adam Wodon/Managing ED, College Hockey News, May 12, 2012

“There are few issues that you will get every coach in college hockey to agree upon. Eliminating the mandate for full face shields is one of them.”
If you want to initiate a rule change, what would our recommendations be?
Education

**Educate before you mandate!!!**

1. **Dentists:** Dental schools and CE
2. **Parents:** prevention means proactive
3. **Athletes:** Custom MG are comfortable and can be made to improve breathing
4. **Trainers:** Teach dental trauma and prevention
5. **Coaches:** Injuries DO occur; even if you aren’t aware of them!!!
Summing up our most important points

- Millions participate in Sports and they put themselves at risk of injury.
- It is critical to know how to recognize and manage trauma.
- Mouthguards are not all equal but overall they work. But not for everything.
- Rule changes require cooperation and ongoing diligence.