

# Point of Care

The Point of Care section answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. This month's responses were provided by speakers at the International Society for Dentistry, Sport and Trauma (ISDST) Fourth World Symposium on Sport Dentistry and Dental Trauma ([www.sportsdentistry.org](http://www.sportsdentistry.org)), which will be held August 26 and 27 in Montreal, in conjunction with the FDI World Dental Congress.



**Question 1** As a team dentist, what issues in doping control and banned substances do I need to be concerned about?

## Background

The use of performance-enhancing substances has become widespread among both elite athletes and young adult members of our society. Testing of Olympic athletes for banned substances began in 1968, and is now common in many sports, both during and outside of competition. Various studies have documented the use of anabolic steroids among high school students,<sup>1</sup> people using public gymnasia<sup>2</sup> and schoolchildren.<sup>3</sup>

For a team dentist, there are 2 particular concerns:

- What drugs might my patient be taking that could cause an adverse effect during dental treatment?
- What drugs might I inadvertently give to my patient that would result in a positive result on a doping test?

The most commonly abused drugs<sup>3</sup> are listed in **Box 1**. In addition, counterfeit drugs produced on the black market may contain anabolic steroids of indeterminate dosage prepared in a nonsterile manner or may contain drugs different than what appears on the product label. Contamination of the nutritional supplements often used by athletes is a recent concern.

## Dental Management of Athletes

The adverse effects of performance-enhancing drugs are poorly reported. Therefore, epidemiologic data on specific risks are often unavailable and controversial. Although it may be difficult to assess significant side effects from these drugs or techniques, some potential complications might manifest themselves in the dental office. Cardiovascular risks include hypertension, myocardial infarction, cerebrovascular accidents (stroke) and cardiomyopathy, and caution is necessary when administering epinephrine-containing local anesthetics. Hepatic risks include cholestatic jaundice, liver tumours and increases in liver enzymes, as well as a possible increase in the risk of bleeding during dental extractions and other surgical procedures. Hematologic effects include altered coagulation and polycythemia (from use of androgens or blood “boosters”

### Box 1 Most commonly abused drugs

- Androgenic and anabolic steroids
- Glucocorticosteroids (e.g., prednisone)
- “Protective” drugs, including tamoxifen to reduce gynecostasia, and clomiphene and human chorionic gonadotropin to combat testicular shrinkage and stimulate recovery
- Polypeptide hormones (e.g., insulin and human growth hormone)
- Agents with antiestrogenic activity
- Stimulants (e.g., amphetamines, cocaine, ephedrine, pseudoephedrine, caffeine)
- Diuretics (e.g., furosemide and ethacrynic acid), used to help patient meet a specific weight, promote muscle definition or dilute urine (i.e., as a masking agent)
- Dehydrating agents (e.g., glycerol), used to enhance muscle definition
- Opioid analgesics
- Cannabinoids and/or ethanol
- Blood “boosters” (e.g., erythropoietin or recombinant hemoglobin, as well as blood doping techniques), used to increase oxygen-carrying capacity, especially for long-distance events)
- Growth hormone stimulators (e.g., L-dopa, gamma-aminobutyric acid and gamma hydroxybutyrate)
- Masking agents (e.g., probenecid or epitestosterone)
- b-blockers (e.g., propranolol), used to help reduce tremors in sports such as shooting and biathlon
- b<sub>2</sub>-agonists (e.g., salbutamol and terbutaline), which can be used legally in certain cases but may require an application for therapeutic exemption

or with blood doping techniques), which carry an increased risk of hypertension, myocardial infarction and stroke. Anabolic steroids may alter humoral immunity by lowering levels of IgG, IgM and IgA, leading to a possible increase in the risk of infection.<sup>3</sup> Injecting drug users who share needles are at risk of HIV and hepatitis B and C infection.

The team dentist can take several precautions to avoid causing an inadvertent positive test in an athlete during the provision of dental treatment. Local anesthetics such as

lidocaine and mepivacaine may be used, but caution should be exercised when using solutions containing a vasoconstrictor just before or during competition. During postoperative dental management, the team dentist should avoid the use of opioid analgesics and should instead rely mainly on nonsteroidal anti-inflammatory drugs such as ibuprofen. Corticosteroids in various dental medicaments for oral ulceration and sedative dressings should be avoided and alternative techniques used. Treatment of generalized tooth pain attributable to acute maxillary sinus congestion or infection, which might include the use of a decongestant or nasal spray, should be delayed until the proposed drugs have been approved.<sup>4</sup>

A team dentist must be aware of possible treatment complications as a result of the illicit use of banned substances or techniques and should also be cognizant of the administration and prescription of drugs and medicaments for dental treatment and postoperative management. Excellent information is available from the World Anti-Doping Agency ([www.wada-ama.org](http://www.wada-ama.org)); the United States Anti-Doping Agency ([www.usantidoping.org](http://www.usantidoping.org)) and the Canadian Centre for Ethics in Sport ([www.cces.ca](http://www.cces.ca)). ♦



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*Dr. Gizzarelli's session at the ISDST symposium, titled "Doping issues for the sport dentist," will be presented on Friday, August 26.*

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## Question 2

What is the role of the team dentist in elite and amateur sports?

The team dentist is an important member of the medical staff for a sports team, especially in contact sports such as ice hockey. The privilege of being a team dentist can be demanding and comes with significant responsibilities, as outlined below.

### Preseason Screenings

The responsibilities of the team dentist begin during training camp, when medical examinations are performed. Every player should undergo a dental assessment, including a brief dental history and clinical examination; bitewing films or a pantographic radiograph should be obtained, if possible.

The dental history should determine prior dental trauma, the presence of any prostheses or orthodontic devices, and the occurrence of any concussions. Athletes should be cautioned to avoid wearing removable appliances or partial dentures during practice or competition to avoid the risk of aspiration. The player should be asked about use of a mouthguard and spit tobacco.

During the clinical examination, the dentist should pay particular attention to oral hygiene, presence of caries or visible infection, status of the wisdom teeth and location of any fixed prostheses that might require additional protection. Fractures, discoloured teeth and lost restorations should be noted in case questions arise later regarding payment or team responsibility for such problems. A

summary of all examinations and recommendations should be given to the head trainer or the team physician to ensure appropriate follow-up.

### Event Coverage

In elite contact sports a venue dentist is often needed during competitions. For example, in the Canadian Hockey League the home team provides both a physician and a dentist to deal with any injuries that might occur. Many leagues have rules that require bleeding to be controlled before an athlete can return to play, so the team dentist must be able to use sutures, dressings or other agents such as cyanoacrylate tissue adhesives to deal with soft-tissue injuries.

Current protocols proposed by The Hospital for Sick Children in Toronto suggest that avulsed teeth must be reimplanted within 5 minutes for the best chance of success. Fractured tooth segments can be successfully reattached using bonding techniques, so these segments must be retained and properly stored. The team dentist must not only be prepared to treat these injuries, but must also train the team therapist in the emergency management of avulsions, luxations and fractures that might occur on the road or during practice.

Other injuries that might require immediate assessment or treatment by the team dentist include dislocations of the



**Figure 1:** Athletes who don't wear proper mouthguards are at greater risk of serious injuries such as jaw fractures.

temporomandibular joint, fractures, pulp exposures and assorted soft-tissue trauma, including single-layer or through-and-through lacerations or degloving injuries.

### Mouth Protection

One of the key roles of the team dentist is to arrange proper mouth protection for the athletes. With pressure lamination, mouthguards can now be customized to provide additional protection according to the risks of the particular sport, areas of previous trauma, a history of concussion, and the presence of any fixed bridges, crowns or implants (Fig. 1). Team dentists should check for any league rules regarding mouthguards (which might specify use of colouring agents, custom preparation or coverage of the molar segments). It may be useful to embed the athlete's name and the date of fabrication within the guard. Players should be reminded that, because of the high incidence of dental injuries during practice sessions, guards should be worn during practices as well as games.

### Regular Dental Care

The team dentist should also be involved with regular dental care of the players and their families. Whenever possible, such treatment should be scheduled to avoid interfering with games and practice sessions. Dentists should be familiar with doping control regulations, if any, for their sport, to avoid an inadvertent positive result on testing of an athlete.

Athletes should be encouraged to have impacted wisdom teeth removed during the off-season — when adequate time is available for bony healing — as the likelihood of jaw fracture is 4 times greater when these are retained.

### Other Issues

The team dentist should be aware of the potentially harmful effects of sport beverages on the dentition and should work with team officials to minimize use of these products. Drinking water along with sport beverages can reduce these harmful effects, as can both diluting and chilling the drinks.

Acting as a team dentist can provide a great opportunity for community involvement and practice building. However, the dentist must keep abreast of all current protocols and recommendations regarding trauma management, injury prevention and the other issues listed above. Groups such as the Academy for Sports Dentistry ([www.sportsdentistry-iasd.org/](http://www.sportsdentistry-iasd.org/)) and the International Society for Dentistry, Sport and Trauma ([ISDSMontreal2005@aol.com](mailto:ISDSMontreal2005@aol.com)) can provide additional assistance and training. ♦



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*Dr. Dion is co-chair of the ISDST symposium and will present a session titled "Sport specific management and prevention of dental injuries" on Saturday, August 27. He will also be a co-presenter for the pre-congress course "Sport dentistry and custom mouthguard fabrication," to be offered Monday, August 22.*

*Dr. Fasel is honorary chair of the ISDST symposium. His session at the symposium, titled "Dentistry and the Olympic Games — 'Citius, Altius, Fortius...and carious'" will be presented on Friday, August 26.*

## Question 3

Most young athletes do not like wearing athletic mouthguards because some devices make talking and breathing difficult. Can you suggest a type of mouthguard they can wear comfortably?

### Background

The prevention and treatment of orofacial trauma is now an important part of general dental practice.<sup>1,2</sup> Children and adults are participating more in athletic activities that carry a risk of trauma,<sup>3</sup> which increases the possibility that patients will present needing treatment for orofacial trauma and requesting dentists' opinion on how to

prevent such problems.<sup>4</sup> The dentist has several roles in the prevention of trauma, including patient education, diagnosis of injuries and advising on the use of mouthguards. A mouthguard is the best way to prevent orofacial injury, but a mouthguard that does not fit properly will not afford good protection. Conversely, the better the fit, the better the protection, comfort, acceptance and compliance.

### Types of Mouthguards

Three basic types of athletic mouthguards are currently available, all significantly different in fit, comfort and acceptance. The first type is the stock mouthguard available at sporting goods stores (Fig. 1). These are the least desirable and least acceptable because there is no attempt to fit the device; the user simply removes the mouthguard from the package and places it in the mouth. The second type is the common boil-and-bite mouthguard (Fig. 2). These are usually purchased ready-made, boiled and then moulded to the teeth. Despite this attempt at fitting, the instability and uneven distribution of material in the mouthguard prevent proper comfort, fit and protection. In one study, “custom-made mouthguards all performed better than the boil-and-bite type, which afforded only slightly more protection than no mouthguard at all.”<sup>5</sup> Other authors have reported many injuries among users wearing over-the-counter types of mouthguards.<sup>6,7</sup> In literature reviews by the present author, no data published after 1980 were found to support stock or boil-and-bite mouthguards. The literature thus makes it very clear that only custom-made mouthguards should be offered to our patients.

The third type of mouthguards is the custom-made mouthguard (Fig. 3). Two types are currently available: those made with vacuum machines and those made with pressure machines. The differences in internal adaptation between conventional vacuum machines and newer vacuum and pressure machines are significant. The better

the internal adaptation, the superior the fit. Therefore, internal adaptation should be the prime focus of attention in a decision to purchase one of these machines.

In the design of custom-made mouthguards, minimal thicknesses and extensions are critical. The suggested minimal thicknesses are 3 mm labially, 2 mm palatally and 3 mm occlusally.<sup>8</sup> Mouthguards should be designed according to the sport played, the age of the athlete and the patient’s history of trauma. The material of choice is ethylene vinyl acetate with a shore hardness of 80.

There are 4 steps in the fabrication of custom-made mouthguards: impression, fabrication by pressure lamination, trimming and polishing, and placement and occlusal equilibration. Each dentist must decide whether he or she will fabricate mouthguards in the office or have a qualified laboratory do the work.

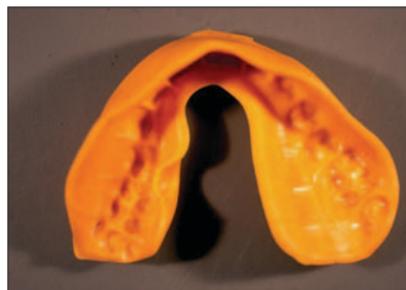
The first step, the impression, is critical to the end result. Similar to any restorative procedure requiring an impression, the better the impression, the better the appliance.

The pressure lamination process involves positive pressure, *not* application of a vacuum. Three pressure machines are currently available for this process, each of which must be connected to a compressor: the Druformat by Dreve (Unna, Germany) (Fig. 4), the Erkopress by Erkodent (Pfalzgrafenweiler, Germany) (Fig. 5) and the Biostar by Scheu Dental (Iserlohn, Germany) (Fig. 6).

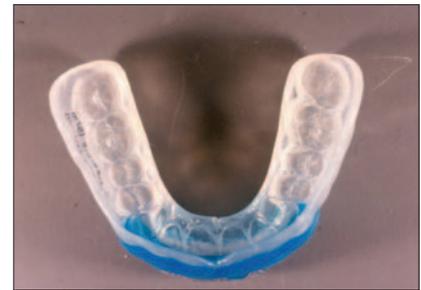
These pressure-laminated mouthguards can be made to any desired specifications, depending on the type of



**Figure 1:** Stock over-the-counter mouthguard.



**Figure 2:** Boil-and-bite mouthguard.



**Figure 3:** Pressure-laminated mouthguard.



**Figure 4:** Druformat pressure machine, manufactured by Dreve (Unna, Germany).



**Figure 5:** Erkopress pressure machine, manufactured by Erkodent, (Pfalzgrafenweiler, Germany).



**Figure 6:** Biostar pressure machine, manufactured by Scheu Dental (Iserlohn, Germany).

mouthguard that is used and its design. The pressure-laminated mouthguards have a much better internal adaptation than the over-the-counter mouthguards.

## Conclusion

The pressure-laminated mouthguard continues to be the mouthguard of choice and acceptance for athletes at all levels. The precise fit leads to better compliance and fewer injuries. Athletes who have previously been unable to wear over-the-counter mouthguards because of their poor fit, bulkiness and lack of retention are more inclined to wear a mouthguard that is comfortable, nonbulky and tight-fitting. ♦

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*The author has no declared financial interests in any company manufacturing the types of products mentioned in this article.*

*Dr. Padilla's session at the ISDST symposium, titled "Trauma prevention through modern athletic mouthguards," will be presented on Friday, August 26. Dr. Padilla will also be a co-presenter for the FDI pre-congress course "Sport dentistry and custom mouthguard fabrication," to be offered Monday, August 22.*

## Question 4

What role do mouthguards play in preventing concussions?

### Background to the Problem

Concussion, also known as minor traumatic brain injury, is an unfortunate reality in contact sports, especially football, rugby and ice hockey. These injuries can cause both significant loss of time from competition as well as premature retirement from the sport. As a result, teams and leagues have begun to look at methods to reduce the number of concussions, including both rule changes and equipment modifications.

Many commercial mouthguard manufacturers claim that their mouthguards drastically reduce the risk of concussions to promote and market their over-the-counter products. However, they offer no scientific validation of these extravagant claims.

Three mechanisms have been proposed for mouthguards in reducing the incidence or severity of concussion.

### Proposed Mechanisms of Protection

#### Opening of the Condylar Space

The condylar head rests in close approximation to the base of the glenoid fossa. Should the jaw receive an upward blow, especially at the chin point, the condylar head might be driven into this fossa, which could result in a potentially traumatic force being delivered to the temporal area of the skull (Fig. 1).

A mouthguard with appropriate occlusal dimensions might serve to open up this "condylar space" by distracting the condyle from the fossa, thus providing additional room for the condylar head to translate upward before making contact with the base of the glenoid fossa and the skull (Fig. 2).

#### Dissipation of Forces

The results of a blow to the jaw can include deformation of the bones of the skull and substantial jarring of the brain. By placing a material with appropriate shock-absorbing qualities between the upper and lower teeth, the upward force might be dissipated across a greater area and be rendered potentially less traumatic to the brain and skull (Fig. 3).

#### Reduction of Rotational Forces

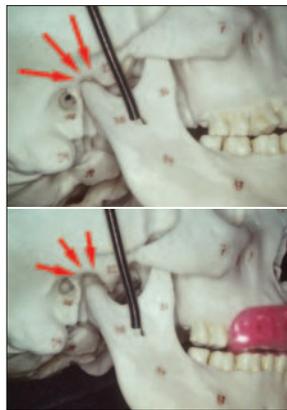
Many clinicians feel that the root cause of cerebral concussions is the rotational torque that the brain suffers when the skull is jarred in any axis. The placement of an appropriately designed mouthguard might allow an athlete to exert greater clenching forces with the head and neck muscles, thus stabilizing the skull and reducing the arc of rotation after a traumatic hit to the head or body (Fig. 4).

#### Evidence for Proposed Benefits

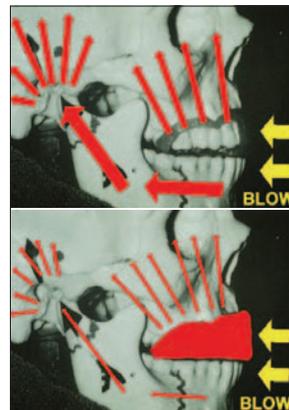
Although a number of authors<sup>1,2</sup> have alluded to the role that mouthguards might play in reducing the number and



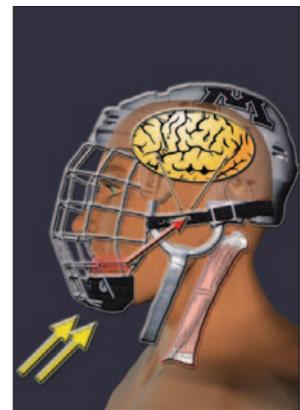
**Figure 1:** Blows to the chin may be transmitted to the temporal regions and other areas of the head. (Figures courtesy of Dr. N. Biasca.)



**Figure 2:** Mouthguards can open up the space between the condylar head and the glenoid fossa to provide reduced impact force.



**Figure 3:** Mouthguards may dissipate and reduce forces to the head.



**Figure 4:** Clenching on a mouthguard may increase neck muscle activity and stabilize the head against rotational forces.

severity of concussions, there are no clear scientific data to prove these claims. McCrory<sup>3</sup> recognized the role of mouthguards in reducing dental and orofacial injuries but noted the absence of research linking concussion prevention with these devices. Marshall<sup>4</sup> showed that although mouthguards reduced orofacial injuries in rugby players, they did not lessen the risk of concussion.

### Management of the Problem

Despite the lack of hard clinical evidence, many clinicians still feel that an important component of any return-to-play protocol after a concussion should be a properly fitted mouthguard. Dentists can certainly confirm the beneficial effects of mouthguards in reducing dental trauma but should be extremely cautious in making any unsubstantiated claims regarding prevention of concussion.

It is possible that ongoing research may eventually prove a link between mouthguards and concussions. As McCrory noted, “Absence of proof is not proof of absence.”<sup>3</sup> Until then, by using proper design components and materials in the fabrication of mouthguards, dentists can minimize the risk of orofacial trauma and possibly provide additional neurological protection. The following are considered important aspects of design and materials for mouthguards:

- Delivering only custom-made mouthguards fabricated from a properly extended model of the maxillary teeth using recognized stable materials such as ethylene vinyl acetate (EVA).
- Using techniques such as pressure lamination to improve both fit and comfort, to ensure that the mouthguard stays in place at the time of a blow to the head.
- Extending the guard onto the molar areas — as far back as the athlete can tolerate — to maximize the potential for force dissipation.
- Maintaining an optimal occlusal thickness — currently thought to be at least 3 to 4 mm for adult males — to

increase energy absorption and gain any potential benefit from opening of the condylar space.

- Balancing the occlusion on the guard to reduce specific areas of stress to the teeth or supporting bone. ♦



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*Dr. Piccininni is co-chair of the ISDST symposium. His session, titled “Sport dentistry and the role of the team dentist” will be presented on Friday, August 26. Dr. Piccininni will also be a co-presenter for the pre-congress course “Sport dentistry and custom mouthguard fabrication,” offered on Monday, August 22.*

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### Further Reading

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