Today's mouthguards enhance performance, offer more protection and are more marketable

By Eric Yabu, DDS

Time to play a little “Dental Jeopardy!” "Answer: gutta-percha.

Question: What were the first athletic mouthguards made of? (OK, even Alex Trebek would've had a tough time with this one.)

Double Jeopardy! "Answer: Has his own line of custom mouthguards.

Question: Who is Shaquille O'Neal?

Indeed, there is little doubt that today's athletic mouthguards are not like your granddaddy's mouthguards, but more like Shaq Daddy's.

Mouthguard history

Athletic mouthguards, or mouthpieces, have been around for nearly 120 years since a London dentist named Woolf Krause developed them in 1890 to protect boxers from lip lacerations.

Known as "gum shields," they were made from gutta-percha. Krause's son Philip, also a dentist and an amateur boxer, refined the design and began making the shields from vella rubber.

Mouthguards were first introduced in the United States by Chicago dentist Thomas Carlos in 1916. For decades, mouthguards remained largely unchanged.

It was not until the early 1960s that a Canadian pediatric dentist named Arthur Wood, appalled by the number of dental injuries he saw in hockey players, developed a "mug guard" or "teeth guard" for which he became known as the father of the modern mouthguard.

Since then, mouthguard materials, fabrication techniques and subsequent fit have been improved to increase both protection and comfort.

Mouthguards today

Most recently, mouthguard design has been studied in an attempt to enhance athletic performance as well as decrease the incidence of concussions.

The central focus has been on the role of the mouthguard to guide occlusion and, in turn, condylar position within the fossa.

There are three major players in the performance-enhancing mouthpiece arena: Mahercor Laboratories, Pure Power Mouthguards, and Under Armour Performance Mouthwear® by Bite Tech. Each attempts to enhance athletic performance by improving strength, endurance, balance, flexibility and reaction time while decreasing injury risk from concussions and jaw injuries.

Maher guards and splints

Dr. Gerald Maher, a Massachusetts dentist who specializes in TMD and facial pain, was one of the first to explore how an athletic mouthpiece can affect performance and protection. As the team dentist for the New England Patriots, his primary goal was to reduce the number of concussions the players suffered.

He concluded that 64 percent of adults have misaligned mandibles where the condyles do not sit on the cartilage discs; and, if someone suffers a blow to the jaw in this position, the condyles are more likely to be driven into the base of the skull, causing a concussion.

The Maher guards and splints (www.mahercorlabs.com) are designed so that the opposing teeth are seated in a centric relation position so that the condyles are in alignment with the discs. These discs will then act as shock absorbers to cushion the impact of the condyles on the skull.

In addition, because of the thickness of the appliance, the condyles are moved from a position where they are resting directly against the articular disc — or even against the fossa in the case of patients with internal derangements where the disc is displaced, usually anteriorly — to a position farther away from the fossa on the articular eminence.

This would mean that it would take a greater force to drive the condyles into the skull.

Earlier this year, Maher, along with Drs. G. Dave Singh and Ray Padilla, published a preliminary study that suggests a customized mandibular orthotic may decrease the incidence of concussions. The study, however, did not attempt to explain the mechanism of protection.

While Mahercor Laboratories does not market their line of mouthpieces and mouthguards for their performance-enhancing effects and doesn't claim to have specific studies to substantiate these benefits, some of the athletes that have been outfitted with their mouthpieces claim to have noticed a significant increase in strength, balance and speed.

They attribute this effect to the full-body benefits of a properly, CR or neuromuscularly determined bite, but simply the lack of trauma experienced.

The Maher splint design is a Gelb splint or MORA (mandibular orthopedic repositioning appliance). It is not designed to offer soft tissue protection, but Maher's line also includes upper full coverage mouthguards.

The Maher appliances may be fabricated by dentists who are skilled in capturing a CR bite by ordering it through Mahercor Laboratories or, more recently, Space Maintainers Laboratory.

The laboratory fees range from $75 for a custom mouthguard to $175 for their protective splint, with a recommend a retail price range of $175 to $250 for the mouthguard and $300 to $450 for the splint.

Pure Power Mouthguard

The biggest player in the performance-enhancing mouthguard market is currently Pure Power Mouthguard or Makkar PPM™ (www.makkaradvantage.com).

These mouthguards, developed by Nova Scotia dentist Anil Makkar, rely on the principles of neuromuscular dentistry. Simply put, this philosophy and treatment paradigm is based on the premise that the mandible is in its optimal position when the muscles of the head and neck are at rest. This "physiologic rest position" is achieved by using a TENS (transcutaneous electrical nerve stimulator) unit.

Makkar and his company claim to have a soon-to-be-released research study that confirms the performance-enhancing effects of their mouthguard versus traditionally fitted custom mouthguards.

They say that this study will show a significant increase in vertical jump as well as peak and average power, which should be appreciable by their marquee client Shaquille O'Neal. They also claim their mouthguard can improve balance, flexibility, endurance, agility and recovery.

The PPM's come as an upper mouthguard for contact sports or a lower splint-type mouthpiece for other sports such as golf or running. These guards may only be made by a certified PPM dentist who is trained in neuromuscular dentistry and generally retail in the $1,500 to $2,000 range.

Under Armour Performance Mouthwear

The most recent mouthpiece to enter the marketplace is the Under Armour Performance Mouthwear™ by Bite Tech (www.pattersondental.com/underarmour). The design is neither innovative nor proprietary, however, Bite Tech is the only manufacturer of the three that can claim peer-reviewed, placebo-controlled studies to support their claims for performance enhancement.

Their mouthpieces do not rely on a CR or neuromuscularly determined bite, but simply the lack of pressure in the fossa area created

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by a multicomposite reverse wedge bite plate over the molars. This, their research claims, prevents the neuro-receptors in the brain from feeling pressure upon clenching.

That lack of pressure prevents the hypothalamic-pituitary-adrenal (HPA) axis from triggering, effectively interrupting the fight-or-flight response. Their studies showed a trend for lowered cortisol levels and a significant reduction in lactic acid with the wedge appliance.

Like Maher and PPM, Under Armour’s Mouthwear comes in two different designs: an upper mouthguard for contact sports and a lower mouthpiece for non-contact sports. These appliances may be distributed by authorized providers who purchase a Launch Kit from Patterson Dental for $995. The laboratory fee is $120 per guard and the recommended retail price is $499.

Comparing the options

Overall, the three different manufacturers offer mouthguards that are very similar in design. However, Maher recommends a CR-driven occlusal scheme to orthotically correct the TMI; PPM is based on neuromuscular principles and Bite Tech’s research concludes that performance enhancement is not related to a CR or neuromuscular bite.

Maher’s primary focus is on protection, studying its mouthpieces’ ability to reduce incidences of concussions in NFL players and even soldiers in Afghanistan. PPM markets its appliances for their performance-enhancing benefits, boasting a cadre of loyal professional athlete users. Under Armour also concentrates on performance enhancement, referencing its literature and an assortment of patents to back up its claims.

Evolving technology

From gum shields to mouthwear, from gutta-percha to multicomposites, from Woolf Krause to Shaquille O’Neal, mouthguard technology has evolved to produce appliances that are more protective, performance-enhancing and, maybe most of all, more marketable.

About the author

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