### ATHLETIC MOUTHGUARDS



#### >> PRACTICE POTENTIAL:

Picture falling off your bike and breaking a tooth or receiving a blow to the mouth while playing basketball. Now imagine taking in a deep breath of cold air or having a sip of water. Even if you have never personally experienced the pain that comes from an accident like this, just seeing the results of this type of trauma can send chills down your spine.

It is estimated by the National Youth Sports Foundation that more than five million teeth will be knocked out in sporting activities this year. In fact, dental injuries are the most common type of orofacial injury sustained during participation in sports.<sup>2</sup>

Fortunately, many of these injuries can be prevented. The American Dental Association has reported that faceguards and mouthguards annally prevent more than 200,000 orofacial injuries in football alone.<sup>3</sup>

While it clearly makes good sense to wear a mouthguard when playing a sport, the most recent research idicates that not all mouthguards are equal. In 1993 at the First International Symposium on Dental Biomaterial, Dr. J. Park stated that dentists should not recommend the store bought boil and bite mouthguards as they are inadequate and provide the athlete with a false

sense of protection.<sup>4</sup> So, if you are still advising your patients to purchase boil and bite and stock mouthguards, it is time to reevaluate your position.



Every patient in your practice who is involved in any athletic activity where contact can be made or a fall can occur should be using a dentist prescribed, heat/pressure laminated intraoral mouthguard. Wearing this type of custom mouthguard not only protects the teeth and soft tissues, but will also reduce the potentially dangerous forces that may cause head concussions, neck injuries, and jaw fractures.<sup>5</sup>

#### >> DESCRIPTION

The functions of a mouthguard according to Andreasen and Stevens in their 1981 study are as follows. A properly made mouthguard must:<sup>6</sup>

- 1. Hold the soft tissues of the lips and cheeks away from the teeth, so that lacerations and contusions of the soft tissue during impact can be avoided.
- 2. Cushion the anterior teeth and redistribute the forces from a direct frontal blow.

- 3. Fill the space of missing teeth.
- 4.Help prevent neurological injury by separating the condyles from the base of the skull during impact, reducing intracranial pressure and bone deformation
- 5.Help prevent neck injury
- 6.Prevent opposing teeth from coming in violent contact, reducing the risk of tooth fracture and supporting structures.
- 7. Provide support to the mandible by absorbing the forces of impact.
- 8. Provide the athlete with the confidence that they are less likely to sustain injuries, thus giving them the competitive edge for aggressive competition.

There are four basic types of mouthguards:



1.Stock Mouthguards: These are an over the counter product that can usually be purchased at sporting goods stores. These mouthguards require no alterations. Just open the package and place the guard directly in your mouth. This type offers the least amount of protection as there is no retention and can only be held in place by constantly biting into it. At impact it usually becomes dislodged because of its poor fit. Speaking is also difficult because of the lack of retention and added bulk. Again the stock

"mouthguard" should never berecommended by the health professional.

## 2.Boil and Bite Mouthguards:

These are the

most prevalent

mouthguards
used today. This
mouthguard is also
purchased over the
counter at sporting
goods stores. The manufacturers
have designed these mouthguards
to be thermoplastic at a low
temperature so they can be molded
directly in the athlete's mouth.



To do this, the wearer must first place the appliance in boiling water and then allow it to reach a temperature that can be tolerated in the mouth. Then it is molded using the patient's fingers, tongue and biting pressure. Unfortunately, this lower temperature also allows the boil and bite mouthguard to distort at normal body temperatures

According to a study by Park, since the athlete is asked to bite down during the forming procedure, the thickness of the material between the teeth can decrease from 70% to 99%. This makes it inadequate to protect the athlete against an impact to the mandible. The athlete is usually unaware of a continuing decrease in the occlusal thickness as they continue to wear the mouthguard during the competition thus providing the athlete with a false sense of protection. Unless dramatic improvements are made in these products, they should not be promoted to the athletes as they are now.

In July 1995, the Courier Mail, the national newspaper of Brisbane, Australia highlighted a life threatening incident where a 17 year old had his boil and bite

mouthguard lodged in his oropharynx due to poor fit and retention. The athlete collapsed and had to be taken to the hospital.

Just like the stock mouthguard, the boil and bite mouthguard should not be recommended by the health professional.

3. Vacuum Custom Built Mouthguard: This mouthguard has in the past, been promoted by the literature and accepted by the health profession as the best available mouthguard. Using a single polyvinylacetatesheet of polyethylene copolymer material and the same type of vacuum forming machine that is used to make bleaching trays, a mouthguard can be formed to fit either the upper or the lower arch. This procedure is done under low heat and one atmosphere of vacuum.



Unfortunately, vacuum processing can pull the mouthguard material away form the incisal edges of the upper front teeth, which is just the area where athletes are most often injured. In the same 1993 study by Park, he noted that vacuum custom made mouthguards also decreased in thickness during forming as much as 25% occlusally (much less than the 70-99% noted with the boil and bite) and 50% buccally and lingually. Because of this thinning, there appears to be no way to insure a proper occlusal, palatal, or labial thickness.

It has also been shown that although these mouthguards fit well at their initial insertion, after several weeks of use in an athlete's mouth, they can become loose. This is believed to occur because the material used to make these low heat vacuum machined mouthguards retains some memory of its original shape.

Therefore, before diagnosing and promoting this type of mouthguard the health professional must be aware of its inherent decrease in thickness and the fact that in time, the mouthguard may not maintain

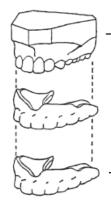
a proper fit. Any vacuum mouthguard, provided by the dentist, must be closely monitored for fit, occlusal thickness, and retention as they may not provide proper protection for prolonged periods of time.

## 4.Heat/Pressure Laminated Thermoformed Mouthguards:



This type of mouth guard is constructed from upper and lower casts of the patient's teeth. The material used is an ethylvinyl acetate that has a Shore Hardness of 80 with minimal shrinkage or water absorption after its fabrication. These mouthguards are laminated with a special machine, under high heat and high pressure. Some of the benefits of making a mouthguard with this type of technique are:

- The mouthguards will have excellent tooth and tissue adaption
- There will be negligible deformation of the guard even after it has been worn for prolonged periods of time.

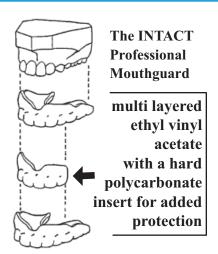


The Youth and Adult Mouthguards are both multilaminated with a difference in their thickness.

- An area can be thickened as needed because of the laminating ability of the high heat/high pressure machine.
- The ability to customize the mouthguard for each sport, age, and level of competition, orthodontics, mixed dentition, clefts, missing teeth, and anatomical and occlusal variations.
- The ability to insert a hard polycarbonate layer between soft ethyl vinyl acetate materials for additional protection for high velocity impact sports such as hockey, football, or racquet sports.
- Achieving a constant occlusal separation while maintaining the proper occlusal balance necessary for concussion prevention
- There is no interference with breathing or speech
- The ability to individually design the guards to meet the specifications of the treating dentist.

Recent published studies and papers are showing that the multi-laminate mouthguards are now considered the mouthguard of choice for the ultimate in orofacial athletic protection.

By acknowledging that there are substantial differences in mouth guard types and designs, we, as health care professionals, can seriously look at providing a much higher level of protection and standard of care for athletes.



#### **>> APPLIANCE DESIGNS:**

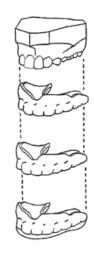
The key to successful mouth guard therapy is to make one that will be worn! Therefore, it must fit the athletes mouth and teeth accurately, stay in place comfortably and allow the wearer to breath and talk normally.

Tear strength, tensile strength, modulus of elasticity and drop ball impact are just some of the material tests that researchers have been doing to find the ideal mouthguard material. Based on these tests, the ideal material should:

- 1.Be subject to high compressive strength
- 2.Be thick enough to absorb the energy of an impact
- 3.Be able to dissipate the energy of a blow throughout the material rather than allowing it to transfer to the underlying teeth.
- 4.Be durable enough to eliminate any physical changes that might occur under normal use

The actual performance of the mouthguard in vivo not only depends on the material properties, but also on design parameters such as the number and type of layers and its final thickness after fabrication. Selecting the proper design for your patient will depend on:

- The type of sport being played
- The type of sporting equipment used.



The INTACT Martial Arts Mouthguard

three laminated layers

- The experience and level of play of the participant.
- The age of the athlete
- The athletes dental health (i.e. tooth mobility, caries, orthodontic treatment)
- The patients dental anatomy (i.e. skeletal relationship, stage of dentition)

Space Maintainers Intact All Sports Mouthguards have four different designs which are based on the parameters specified above.

1.The Intact Youth Mouthguard Recommended for athletes who are in primary and mixed dentition. Given all the pertinent information (i.e. sequence of exfoliation, type of orthodontic movement being accomplished) the mouthguard can be modified to allow for these changes.

Because children's arches continue to change, it is necessary to have a guard that will provide an adequate amount of retention and protection yet be inexpensive enough to be replaced throughout growth. This guard is usually 3-4 mm in thickness.

2.The Intact Adult Mouthguard Recommended for the majority of athletes with an adult dentition involved in recreational sports. This mouthguard is made to last. It is composed of 2-3 laminated sheets making it thicker (approx. 5mm.) and stronger than the Youth.

- 3. The Intact Professional Mouth-guard: This guard is recommended for professional athletes, and for anyone involved in a sport where hard impacts to the face and jaw are to be expected. Some examples are hockey, football, rugby and most racquet sports. These guards are multi-layered with a thin polycarbonate insert on the labial and buccal surfaces of the teeth. This extra protection is also needed for anyone who has a history of trauma
- 4. The Intact Martial Arts Mouthguard: This guard is recommended for anyone involved in any of the martial arts or boxing. Because these athletes often receive strong impacts to the face and jaw, a mouthguard must protect not only their teeth but also their temporomandibular joint. With that purpose in mind, the Martial Arts guard is composed of three laminated layers to give these athletes the added protection they need.
- 5. The Professional Boxer's Mouthguard: This guard is ideal for any athlete where intentional contact to the head or face is involved. It is also recommended for any athlete with a prior history of multiple concussions, mandibular trauma and temporomandibular dysfunction. It is fabricated using two separate mouthguards laminated together at the mandibular relation provided by your properly taken construction bite

All Intact mouthguards are finished on articulated models to a balanced occlusion creating the best protection for the joint and dentition.

#### >> INDICATIONS:

A 1984 study by Davis and Knott in Australia, showed that over 80% of all dental injuries from sports occurred to the front four maxillary teeth. It has been estimated that the total rehabilitation costs for a single knocked out tooth are more than twenty times the preventative cost for a custom laminated professional grade mouthguard.

The National Youth Sports Foundation for Safety reported that dental injuries are the most common type of orofacial injury sustained during participation sports. In 1995, Flanders and Mohandas stated, in the Journal of the American Dental Association that the orofacial injury rate was only .07% in football where faceguards and mouthguards are worn. However, in basketball, where mouthguards are not normally worn there was an orofacial injury rate of 34%.

A report in Pediatric Dentistry magazine clearly indicated the importance of wearing mouth guards. Interviews involving 2,470 junior and senior high school athletes receiving injury during sports revealed the following: Nine percent of all players suffered from some form of oral injury while another three percent reported loss of consciousness. Seventy-five percent of the injuries occurred while not wearing mouthguards, and of this total forty percent occurred during baseball and basketball. Fifty-six percent of all concussions were suffered while not wearing mouthguards.

Mouthguards may help prevent concussions, cerebral hemorrhage, and possibly death, by separating the jaws, thus preventing the condyles from being displaced upward and backward against the wall of the glenoid fossa. Due to the diversity of sports that can produce oral trauma, it is recommended that mouthguards be worn by all participants. Some examples are baseball, basketball, boxing, rugby, hockey, squash, soccer, racquetball, tennis, lacrosse, karate, judo, volleyball, touch and contact football, bicycling, and skating.

#### >> TREATMENT PROCEDURES:

- 1. Ask your patient if he or she is involved in any sports.
- 2.Discuss the need for using a mouthguard.

- 3. Take alginate impressions of the upper and lower arch making sure to record the vestibular and palatal extensions completely.
- 4. Pour the impressions in a hard stone, and check them for accuracy.
- 5. Take an accurate bite registration at the desired horizontal and vertical relationship. The mouthguard will be made to reproduce this relationship allowing you to achieve a constant occlusal separation while maintaining the proper occlusal balance necessary for concussion prevention.
- 6.Carefully wrap up the models and bite relationship separately and send them along with your specific design instructions to the laboratory.
- 7.Based on your instructions, the laboratory can customize the mouthguard for each sport, the age of the athlete, and the level of the competition.
- 8. The laboratory can also modify the mouthguard to take into consideration active orthodontic treatment, a changing mixed dentition, existing clefts, missing teeth, and any anatomical and occlusal variations.
- 9. Mouthguards should be monitored and replaced when necessary. Extra care should be taken during the mixed dentition stage. During this time the mouthguards should be replaced every six months. During orthodontic therapy, close communication should be kept with the orthodontist to establish a time sequence for mouthguard replacement.
- 10.Upon delivery discuss how to wear, clean, and store the appliance.

#### **>> LAB REQUIREMENTS:**

1.A set of accurate working models with full buccal vestibular extensions and palate poured in dental stone along with an accurate bite registration.

2.A prescription (see sample) including the type of mouthguard desired. Indicate color/s, sport to be played, level of competition, age of athlete, and any special instructions. For example, if the patient has a history of concussion; maintain occlusal thickness of 4mm.

#### >> LAB FEE:

The lab fees for the four Intact All Sports Mouthguards are:

- 1. The Intact Youth......\$59.75 2. The Intact Adult.....\$86.65
- 3. The Intact Professional....\$95.75 4. The Intact Martial Arts..\$107.65
- 5. The Intact Pro Boxer....\$167.50

#### >> SUPPLY LIST:

- □ Alginate\*
- ☐ Mixing bowl and spatula\*
- □ Water
- ☐ Dental Stone
- ☐ Impression Trays\*
- □ Per-Fect Bites\*
- ☐ Retainer Brite\*
- ☐ Sonic Appliance Cleaner\*
- ☐ Patient Appliance Care CD\*
- ☐ Patient Calendar Booklets\*
- ☐ Colored Retainer Cases\*
- ☐ Carbide Burs\*
- \*Available from Success Essentials call 800.423.3270

#### **>> ADJUSTMENT TIPS:**

During the seat and adjustment appointment, make sure the occlusion is balanced and all teeth are hitting simultaneously. Check that theproperocclusalthickness is present and the athlete is comfortable with the fit. The mouthguard should be difficult to remove once it is seated properly. Check the patient's speech while the mouthguard in place. If it is

reduce

the palate to allow for

necessary,

better speech.

#### **>> CARE FOR THE APPLIANCE:**

The patient should be instructed in the proper care of the mouthguard. If it is exposed to heat or pressure it may permanently deform. This may occur if the mouthguard is squashed in the bottom of a player's sports bag, left in a hot car, or out in direct sunlight.

The mouthguard should be kept moist allowing it to maintain its flexibility and resilience. After use, the mouthguard should be cleaned with an appliance system using retainer Brite® and a sonic cleaner (both available from Success Essentials – see supply list).

## >> CONTRA-INDICATIONS AND CONCERNS:

- 1. Mouthguards are most commonly made for the maxillary arch. For the athlete with a prognathic mandible, it is recommended that a custom mouthguard be made to cover the mandibular arch.
- 2. Prior to receiving a mouthguard, a complete oral exam should be completed to insure that the patient is in good health.
- 3.All new or recurrent caries should be treated prior to the fabrication of a mouthguard. The decay process could be accelerated if the mouthguard is worn over carious lesions.
- 4.New restorations placed after the mouthguard is delivered could affect the fit of the guard.

5.It may be necessary to block out any undercuts in an area where there is a fixed prosthesis (posterior bridge)

> 6. R e m o v a b l e prosthodontic devices (appliances) should be removed prior to impressions taking for the mouthguard. The patient must be instructed to remove appliances these while wearing the mouthguard.

- 7. Special care needs to be taken when designing mouthguards for the edentulous patient. Please consult with the lab for further information.
- 8. Third molars the most frequent site of mandibular fracture is in the area of unerupted third molars. Each athlete should have his or her third molars evaluated for possible extraction.
- 9.Erupting teeth the area of tooth eruption should be blocked out on the dental model to allow a guard to be made which will allow for its normal eruption.
- 10.Orthodontics mouthguards should be modified to allow for the anticipated changes over a three month period. Patients in fixed appliances should be wearing either an upper mouthguard and a lower bleaching tray or a bimaxillary mouthguard to prevent the possibility of severe soft tissue trauma.
- 11.At this point it is impossible to properly increase the thickness of the mouthguard through lamination or thermo-forming with a simple "in office" vacuum machine.

#### >> CUSTOMARY FEE RANGE:

The customary fee range for these appliances is \$150 - \$300 per arch depending on the type of mouthguard delivered. These fees can be kept low to encourage mouthguard use and because of the powerful practice building potential of offering this service.

Remember to mention to your patient – it has been estimated that the total rehabilitation costs for a single knocked out tooth are more than twenty times the preventative cost for a custom laminated professional grade mouthguard.

#### >> INCOME POTENTIAL:

Many doctors make mouthguards for their patients at or below cost because of their effectiveness as a marketing tool. Promoting mouth-



guard care is one of the best ways to attract new patients and build your practice. Some effective marketing ideas I have heard while lecturing around the country are:

- 1.Offer this service to local gyms and sports clubs.
- 2.Become a school dentist.
- 3. Give talks to community service clubs i.e. P.T.A., Rotary, etc.
- 4. Make the service available to the neighborhood sports teams i.e. soccer, Little League, Youth Football.
- 5.Contact businesses such as martial arts studios, gymnastic schools, sporting goods stores and bike shops. Cooperative coupons and flyers can be used to promote your mouthguard service and the local business.
- 6. You might want to supply a personalized tooth brush (with practice name and phone number) and a small carrying bag with each mouthguard.
- 7.Become a sports dentist and be added to the Space Maintainers Laboratory referral list for athletic trainers and coaches in your area call us for details.

All Space Maintainers Laboratory Intact Mouthguard clients are placed in our exclusive national network of sports dentists. As inquiries are obtained from our extensive advertising to coaches, athletic trainers, and sports organizations, they are then referred to the Intact Sports Dentist in their area.

Offering mouth protection to your patients will open up many treatment opportunities for you. Every patient who needs a mouthguard should have:

- A comprehensive dental examination
- Their periodontal status evaluated for pericoronitis, periodontitis or gingivitis.
- All caries and restorative work completed.

- A complete orthodontic evaluation which can provide you with the opportunity to do minor treatment i.e. retract protruding upper anteriors.
- Their third molars evaluated for possible extraction, since the most frequent site of mandibular fracture is in the area of the unerupted or impacted third molars.

Just one mouthguard per week at \$150 each equals \$7,800 in additional gross revenue for your practice.

By: Rob Veis D.D.S. Director of Practice Development

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#### INTACT ALL SPORTS MOUTHGUARD MANUAL

The SMILE Foundation, the educational member of the Appliance Therapy Group, has available for purchase an independent learning course on Mouthguards, Winning with Customized Mouthguards. To order, please call 800-423-3270. Also available are reception area pamphlets with rack, prescription slips and shipping supplies.

Steps you need to take to add this service to your practice:

- 1.Make sure you have the supplies you need (see supply list).
- 2. Obtain an Intact Mouthguard Manual Kit (see above).
- 3. Display poster and patient brochures in your reception area.
- 4.Begin routinely asking patients what sports they play.
- 5.Optional join the Academy for Sports Dentistry (details on how to join will come with your manual).

The Practice Building Bulletin is a special service of Space Maintainers Laboratory produced solely for the private use of our clients. It is designed to help expand and enhance your ability to provide comprehensive patient care. Information included is the opinion of the author and may not be reproduced in any form without written consent.

**Appliance Therapy Group Headquarters:** Space Maintainers Laboratory

#### Regional Labs:

SML Contact 800-423-3270

#### ORDERING INTACT MOUTHGUARDS

Please help us by filling each Mouthguard prescription slip out as completely as possible. A few minutes spent here will pay big dividends in better doctor-laboratory communications and save us both time and extra expense. Please be sure to give us the patient's full name. For a team, one prescription for the entire team is all that is necessary provided all the models are shipped together and a list of individual names is attached. Indicate any design change requirements next to that person's name on the list (example – an Intact "Professional" for a goalkeeper).

It is always a good idea to give us a due date in the space provided on the prescription slip. On occasion, a case will arrive late due to a delay in the mail. When this happens, you will receive a call from our client service staff immediately advising you of the need to reschedule your patient. You can always check on a mouthguard in progress by calling our Client Services people or leave a message on voice mail. Every prescription is entered into our computer system within minutes of its arrival in the lab. Team and quantity discounts are also available, call for details.

#### SPACE MAINTAINERS INTACT MULTI-LAMINATE MOUTHGUARD PRESCRIPTION FORM

The Intact Mouthguards Prescription slip has been designed to ensure all details for laboratory construction are covered completely and in an organized manner. While we will be happy to work from any prescription you prefer, including the regular Space Maintainers Laboratory appliance form, it will help the technician do a better job if the Intact form is used when possible. With so many options for style, color, and logo/s, in addition to having the athletes name spelled correctly and client details for warranty purposes, use of the Intact Mouthguards Prescription slip will help ensure nothing is forgotten.

PLEASE NOTE: In some sports it is recommended players at high-risk positions wear Intact Professional Mouthguards regardless of age or participation level (example: a soccer or hockey goal keeper). For a small extra charge (\$3.25), your name and office number can also be placed in the mouthguard as another practice-building feature. When your patients/athletes are asked "where did you get the great mouthguard?" Your name and number is right on the tip of their tongue.

Please feel free to photo copy the adjacent prescription form for additional copies or better yet, just call client services for all of the free shipping supplies you need.

Touth award
Outhguard Prescription
Dentist's Name
Practice Address
City State/Province
Postal Code Country Contact Telephone:
Patient Name Age
Sport being played Position
Level of Competition
Experience Level BeginnerYears of Experience
Ry Date Needed
INTACT MOUTHGUARD DETAILS  Athlete's name to be in guard  Patient's first initial and last name as above
☐ Patient's given name or nickname
TYPE OF MOUTHGUARD
☐ YOUTH - primary and mixed dentition
☐ ADULT - recreational adult sports
☐ PROFESSIONAL - contact, racquet, and pro sports
☐ MARTIAL ARTS - intentional contact to face
☐ PRO BOXER - prior history of concussions, mandibular trauma, temporomandibular dysfunction
MOUTHGUARD COLOR ☐ Clear ☐ White ☐ Pink ☐ Red ☐ Orange ☐ Blue ☐ Yellow ☐ Black ☐ Green ☐ Purple ☐ Multi-colored (call for selection)
LOGO REQUEST (Youth and Adult level only)
☐ Football ☐ Soccer ☐ Baseball ☐ Hockey ☐ Tennis
☐ School or team logo enclosed (can't exceed 1/2" in diameter)
☐ Please include dentist's name and practice phone as above or as:
(\$3.25 extra charge for this service)
Dentist's Signature
Referring Sports Professional
☐ Athletic Trainer ☐ Coach ☐ Team Physician  SPACE MAINTAINERS  **

# Gaining the Competitive Advantage with Comprehensive Care



Every patient in your practice engaging in an athletic activity, involving possible contact or a fall, should be using dentist prescribed, pressure laminated, intraoral mouthguards. This independent learning course features discussion on all the functions of a properly made mouthguard, detailed description on the different types of mouthguards that are available to the public, details of the benefits of the dentist prescribed, pressure laminated mouthguard, information on why it is the dentist's job and only the dentist's job to fit his or her patients with custom-made mouthguards, and much, much more!

#### What We Provide:

- A complete full-color Manual of Intact Mouthguards
- Professionally recorded DVD
- Complete set of easy-to-follow course notes
- Chairside and lab-constructed appliance designs
- Insurance narratives and billing codes
- Patient forms and reception room pamphlets
- Self-test for 8 hours of continuing education credit
- Marketing strategies for your practice

Space Maintainers Laboratory is an ADA CERP Recognized Provider Only \$129.50, per course.