

Triple laminated mouthguards

By Peter Herring, Adv Dip Dent Tech, ACCDP



“With the concept of the triple laminated mouthguard accepted... simply adding this third internal layer will add up to 37% to the mouthguard’s ability to distribute forces around the dental arch...”

It was the motivation to produce stronger and more reliable mouthguards that led to the initial development of the dual laminated mouthguard. Yet whilst this new mouthguards architecture was capable of offering a far greater level of protection than its predecessors (boil and bites, preformed shells and custom single layer mouthguards), there still was a need for a mouthguard design which would offer more protection to combat the extreme types of impacts that can occur in some sports.

Impacts such as hockey sticks in full swing, elbows held high and flaying rugby boots produced very hard, sharp, pointed, severe blows. These impacts contain sufficient energy to exceed the limits of the typical custom-laminated mouthguard’s ability to absorb and distribute the injurious forces around the mouthguard and oral structures.

Hence, the concept of the addition of a third internal hard layer was put forward. It made sense at the time that the inclusion of a hard buffer covering the “at risk” anterior segments would give more protection. And it did; anecdotally less injuries seemed to be sustained by players wearing these mouthguards. The first commercial triple laminated designs consisted of a hard PETG co polyester shield which extended from the distal of the 14 to the distal of the 24 and extending over the incisal and occlusal edges of these areas. This shield was formed and shaped and positioned between the two layers of material but without any bonding between the hard third layer and the adjacent materials. Attempts to improve the structural integrity of the triple laminated mouthguard next led to the use of a dual laminate (hard/soft) material as the internal layer. The soft EVA side (Ethyl-Vinyl-Acetate) formed a chemical bond with the first layer of EVA material and greatly improved the mouthguard’s structure and durability. However the



Figure 1. An internal layer of ERKODUR-S, 0.8 mm reinforces the mouthguard. After forming and trimming the first layer of EVA material embed the mouthguard with only the vestibular and occlusal surfaces remain visible. Degrease in preparation for the ERKODUR-S layer.



Figure 2. ERKODUR-S after forming - note that material does not extend over the peripheries of the mouthguard.

disadvantage was the increase in bulk from using a relatively thick (1.8mm) internal layer and lack of a significant bond between the hard SBS (Styrol-Butadien-Styrol) layer and the final EVA material.

Now, with the concept of the triple laminated mouthguard accepted, development has continued



Figure 3. Grind excess away and smooth.

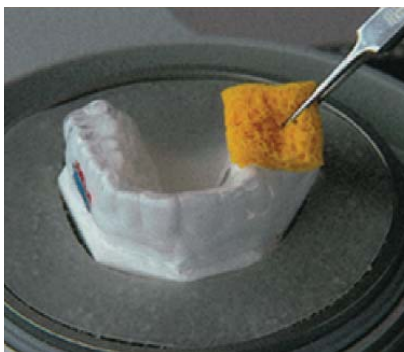


Figure 4. It is important to degrease before forming the final layer to ensure a good bond between all materials.



Figure 5. Final EVA layer formed - allow to cool in the machine and finish as usual.

to the point that today we now have available hard materials (Styrene-Butadien-Co polymer) (Trade name ERKODUR-S at 0.8mm) which will bond directly to the surrounding EVA materials. This allows us to quickly produce extremely protective mouthguards with minimal bulk and total bonding of all layers. Simply adding this third internal layer will add up to 37% to the mouthguard's ability to distribute forces around the dental arch.

The technique for this is described here and should be read in conjunction with the article "Anyone can make custom laminated mouthguards" (*eLABORATE* Jan/Feb 2007) or you can download it at www.erkodent.com.au/downloads.html. Because of the

additional rigidity of these mouthguards, this design is generally only suitable for reasonably stable dentitions. Erupting teeth and changing arch forms can quickly lead to discomfort with this mouthguard type.

About the author

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