

Anyone can make custom laminated mouthguards

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In the arena of sports dentistry, it is overwhelmingly accepted that modern custom laminated sports mouthguards have the potential to offer the best levels of protection for the broadest range of sports people. Appropriate multi-layered designs have been developed to take into account every sport and level of participation, from the youngest junior player to the senior competitor involved in the most rigorous levels of contest. All are well catered for with today's mouthguard designs.

These improvements in mouthguard design, whilst of great benefit to the sporting public, have for the dental community led to a substantial increase in the complexity, time and cost of producing high quality, high protection mouthguards, even to the point that now the construction of some designs has almost become the exclusive domain of a handful of mouthguard specialists.

The intention of this article is to offer an alternative to the methods that are generally used to manufacture custom laminated mouthguards in this country and describe a simpler and more efficient system which allows anyone, in both the dental practice and laboratory, to easily and quickly construct custom laminated mouthguards of the highest quality.

Why laminate?

The additional protection afforded by custom laminated mouthguards occurs when the second layer of material is formed. The incisal thicknesses will increase by up to 30% when using two 2-mm foils, one after another over, instead of a single 4-mm-sheet.

Thermoforming with a single layer stretches the material downwards over the model causing thinning, particularly at the critical "at risk" incisal edge area of the upper centrals and laterals. However, when a second layer is added, the incisal edges and occlusal areas attract more material than the peripheral areas resulting in a more desirable and protective distribution of material. This second (laminating) layer bonds at the first point

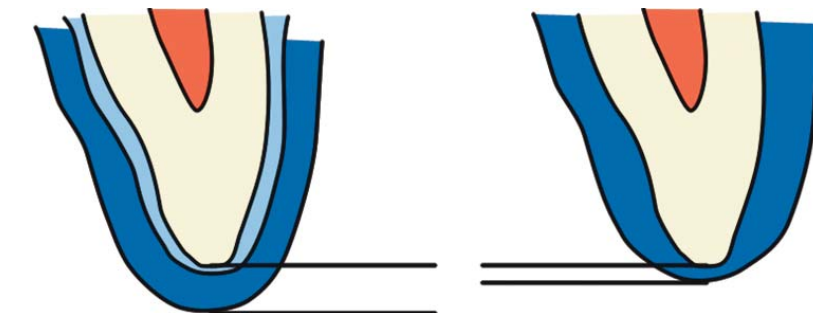


Figure 1. Incisal thinning can be reduced by laminating. The incisal thickness will increase up to 30% when using two 2-mm foils, one after the other, instead of one 4-mm-sheet. Pre-lamination does not help. This effect will reinforce the guard by approximately 20%.

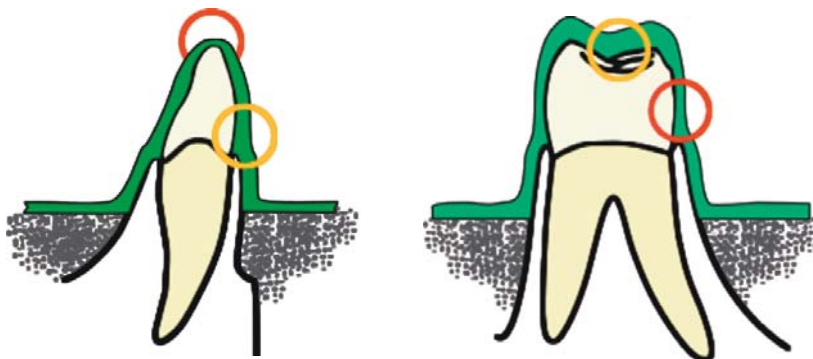


Figure 2. Thermoforming always results in stretching and thinning of the material. What happens? In the occlusal area the material stays thick whereas in the incisal area it thins out.

of contact (highest parts - incisal and occlusal areas) and follows the model contours downward. This effectively gives a reversal of the single foil thermoforming effect and preferentially increases material thickness across the dental arch.

Easy and fast manufacture

Since the early days of custom laminated mouthguard development, clear materials have become the standard as the final layer for custom laminated mouthguards. In Australia during the late 1980's, single layered laboratory fabricated mouthguards were the "gold" standard and with the next logical step toward making a stronger mouthguard appearing to be adding more layers, clear material was the natural choice. Apart from being a more

tangible take off point from the previous technology standard, this also allowed the inclusion of elements such as hard inserts, branding, radiographic strips, identification and graphics to be seen. All of which helped to differentiate this new methodology from existing products.

However, with hindsight and a greater understanding of the laminating and thermoforming process, this method of construction can be identified as one of the fundamental reasons that custom laminated mouthguards can be so technique sensitive and arduous to produce.

The practice of forming a 3mm, 4mm or 5mm thickness material as the basis for a laminated mouthguard requires that extensive thinning and reshaping of the buccal peripheries and lingual areas be carried out



Step 1. Embed model into granules and cover granules with cover template.



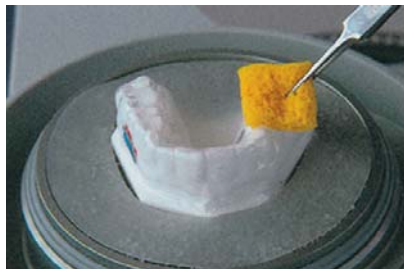
Step 2. Thermoform 2 mm clear EVA material (be sure the material is suitable for laminating). Here a universal separating foil is used under the EVA material to isolate it from the model otherwise use separating solution.



Step 3. Cut with special scissors to a form just slightly larger than the finished mouthguard.



Step 4. Place labels and identification (reversed facing into the guard) taking the position of frenulum and the final form into consideration.



Step 5. For lamination of the next foil - degrease base and model side of the foil and Thermoform! When using multicoloured plates, ensure that the plate is correctly aligned. Allow to cool completely before removing model.



as well as reduction or addition of material to eliminate visible air inclusions. The investment in time and effort to prepare the first layer for the final clear lamination is substantial and extremely technique sensitive. So much so in fact that mouthguards constructed by different people in this manner can show very large differences in specifications even though they have been made of exactly the same materials.

If, however, the situation is reversed and the thinner clear layer (generally 2mm thickness) is formed first, reductions and modifications are not required - the first layer is simply cut out to the final extensions of the mouthguard and the second layer of the colour of choice laminated directly over this. Identification and branding can be included, however, reversed and facing into the fitting surface of the guard.

So with this simple reversal of technique, we can completely eliminate reworking the first layer of the mouthguard. The time savings alone are huge but this also gives us the benefit of less wastage, mess and most importantly, a more consistent product as the variability of individuals' techniques are removed.



Step 6. Finishing. a) Cut with special scissors; b) Grind edges with tungsten carbide bur; c) Now smooth the edges with silicone impregnated discs; d) The glossy effect will be achieved by slightly melting the surface. Stroke the hot air burner slowly but continuously over the surface.

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