

Preliminary Design Evaluation

a. Design Matrix

i. Design Criteria

Safety

This category is weighted the highest, as the device is going to be placed in the patients' mouth, so it must be made of materials that are non-toxic and non-hazardous to the patients and the dentist handling it. The device should not have any sharp features that could harm the patient upon insertion. The double band design received full marks for safety because it can easily be fabricated from the standard stainless steel sheets which are guaranteed to be non-toxic to the patients. Additionally, the design does not have any harsh features which may harm the patient when inserted or removed.

Ergonomics

This category was heavily weighted as the device should not be excessively complicated for experienced dentists to use, and the device should not be cumbersome. The device should not require any additional training to use. The "Potato Wedge" and "(Doug) DoubleHug" ranked the highest for ergonomics because they are both slightly modified variations of existing products on the market. Both designs were deemed relatively straightforward to operate due to their resemblance in structure and function to widely used band matrix and wedge devices.

Effectiveness

The device should make the procedure shorter in some way. Dentists should be able to perform two adjacent class II fillings simultaneously. The Doug was rated highest in this area due to it wrapping around both teeth in a manner that would allow you to work on both teeth at the same time, near the same rate as the current device. The Butterfly and Potato Wedge were tied for second highest ranking as they work the same way, except a little mechanically different and more obtuse than the current method, and could extend the time required to use the device.

Cost

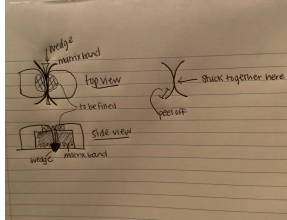
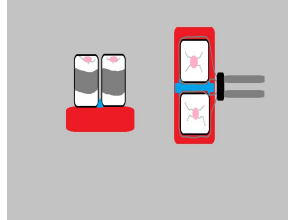
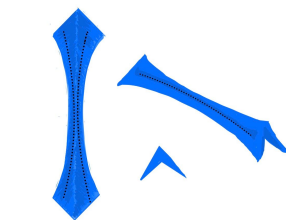
Fabrication of the design should not cost more than the current models. However, if the band is more efficient than a slight increase in cost would be fine. The Doug had the highest rating for cost because it is the same thing as our current model with the addition of the cost of a second band. The Butterfly had the second highest ranking due to it requiring the cost of additional adhesives or manufacturing to the bands and handle that would make it cost more than the standard initial cost. Finally, the potato wedge had the lowest cost score of the 3 designs, because it required the fabrication of a completely new piece of material, a rubber wedge to be inserted between the teeth.

Adjustability

Since all patients have a different teeth and mouth shape, the device must be adjustable. This was given a 15% weight as it is not as important as the three above it, but it still needs to have some sort of adjustability in order to be used in multiple patients. The “butterfly” was given 4 as the adhesive allows for small adjustments to be made. The “Doug” was given a 5 since it has the same adjustability as current designs have. The lowest score of a 2 was given to the “Potato Wedge” since it allows for little adjustability with the stationary connection point.

Patient-comfort

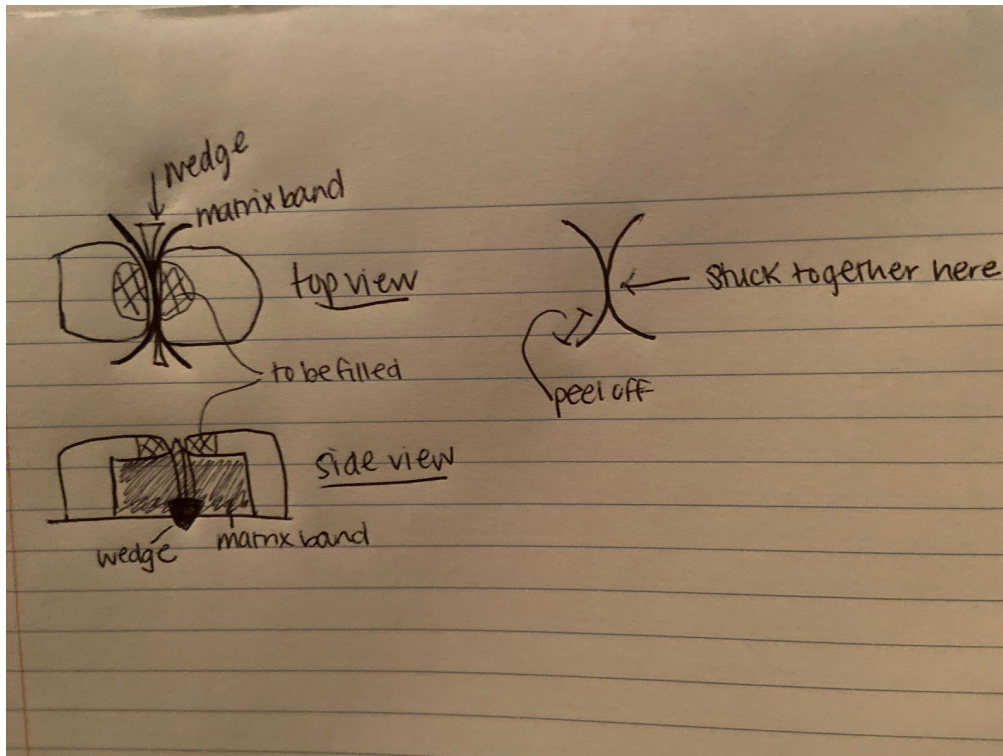
Since a filling isn’t a very comfortable procedure in general, patient-comfort is rated the lowest. The device should fit comfortably in a patient’s mouth without sharp edges. It should be easily taken out without much discomfort. These were all rated fairly high as the designs are all modifications of the current one in use, but the (Doug) DoubleHug design lost one point as its slightly larger to accommodate for two bands, therefore congesting the patient’s mouth slightly more.

	The Butterfly! 🦋 	(Doug) DoubleHug 	The Potato Wedge 🥔 
Safety (30)	24 (4)	30 (5)	18 (3)
Effectiveness (20)	16 (4)	20 (5)	16 (4)
Cost (20)	16 (4)	20 (5)	12 (3)
Adjustability (15)	12 (4)	15 (5)	6 (2)
Patient Comfort (10)	8 (4)	6 (3)	10 (5)
Ergonomics (5)	5 (5)	4 (4)	5 (5)
Total	81	95	67

Preliminary Designs

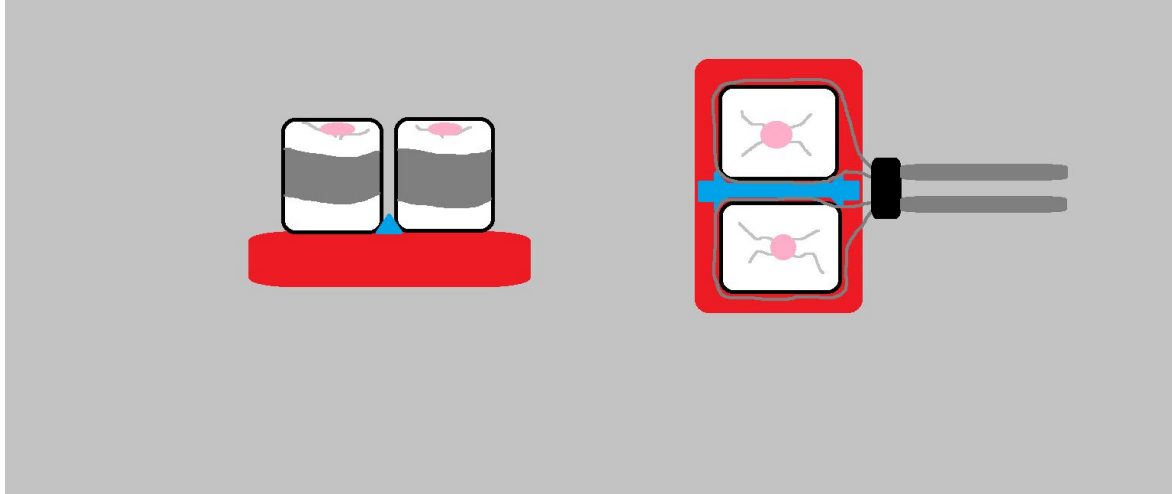
a. Designs Overview

i. Design 1: The Butterfly



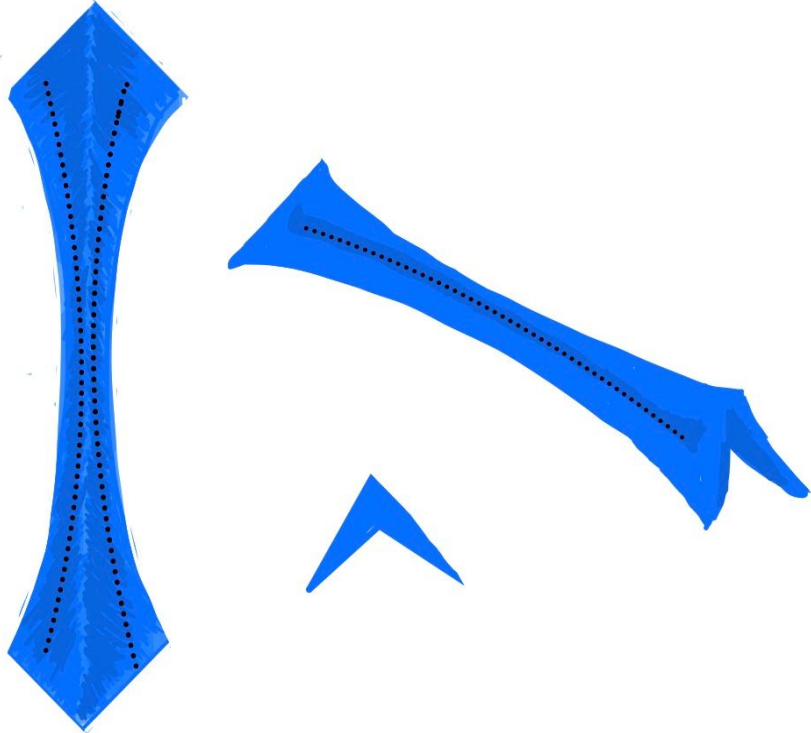
The Butterfly: This consists of one matrix band that has two sections on either side that can peel apart. This allows for adjustability for size and can be wrapped around both teeth. The part in between the teeth would be permanently stuck together to give more stability.

ii. Design 2: The (Doug) DoubleHug Design



(Doug) DoubleHug design: features similar functionality to current model in use, save the use of two independent bands with two separate actuation systems, allowing for the filling of two teeth simultaneously while keeping the fillings separate.

iii. Design 3: The Potato Wedge Design



The Potato Wedge: This design closely resembles the Insert Palodent® plus wedge guard, however, the Potato Wedge incorporates slit inserts on the sides where matrix bands may be inserted and shaped to the respective curvature of the adjacent teeth. The premise of this

design is to incorporate a mechanism which ensures the secure placement of two bands for each tooth while maintaining the natural spacing. Ideally, the wedge may be easily slid into place between the two teeth undergoing restoration (as a typical wedge currently on the market would), and the bands can easily slide into place between the teeth.