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# Sutureless, Minimally Invasive Sealing of Corneal Lacerations with a Novel Bioadhesive Material.

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## Abstract

**Purpose :** Recent advances in bioengineering have provided new materials to treat wounds and injuries, including corneal lacerations. Currently available adhesives (e.g. cyanoacrylate) lack biocompatibility and the ability to integrate into the corneal tissue, while other adhesives (OcuSeal® and ReSure®) have a limited retention on the cornea. The aim of this study is to test the ability of a new gelatin methacryloyl (GelMA)-based bioadhesive for sealing corneal lacerations *ex vivo*.

**Methods :** Full thickness central corneal lacerations with different lengths (2, 4, 6, or 8mm) were made on explanted New Zealand rabbit eyes (n=9 for each laceration length) using a microsurgical knife. Our engineered GelMA-based biomaterial or ReSure® was applied on the lacerations. Subsequently, the bioadhesive was cross-linked using visible light ( $\lambda=450-550\text{nm}$ ) for 4 minutes. The rabbit eyes were connected to a syringe pumping air into the anterior chamber. The syringe was attached to a pressure sensor and a recording unit to document the burst pressure of the sealed wounds.

**Results :** Our results showed that the GelMA-based bioadhesive was transparent and easy to apply. We observed higher burst pressure measurements for the GelMA-based bioadhesive in comparison with ReSure® in lacerations of 2mm (4.8-fold;  $p < 0.001$ ), 4mm

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(5-fold;  $p < 0.0001$ ) and 6mm (8-fold;  $p < 0.0001$ ) in length. In addition, our GelMA-based bioadhesive could successfully seal corneal lacerations of up to 8mm in length, while ReSure® was unable to seal corneal lacerations larger than 6mm.

**Conclusions :** Our results demonstrate that our engineered GelMA-based bioadhesive is able to seal corneal lacerations with lengths up to 8 mm, with several folds higher burst pressure than ReSure®. This GelMA-based bioadhesive is easy and quick to apply, and can be used for sutureless sealing of corneal lacerations.

This is an abstract that was submitted for the 2018 ARVO Annual Meeting, held in Honolulu, Hawaii, April 29 - May 3, 2018.

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