

One-Step Photopolymerizable Adhesives for Bone Fracture Fixation

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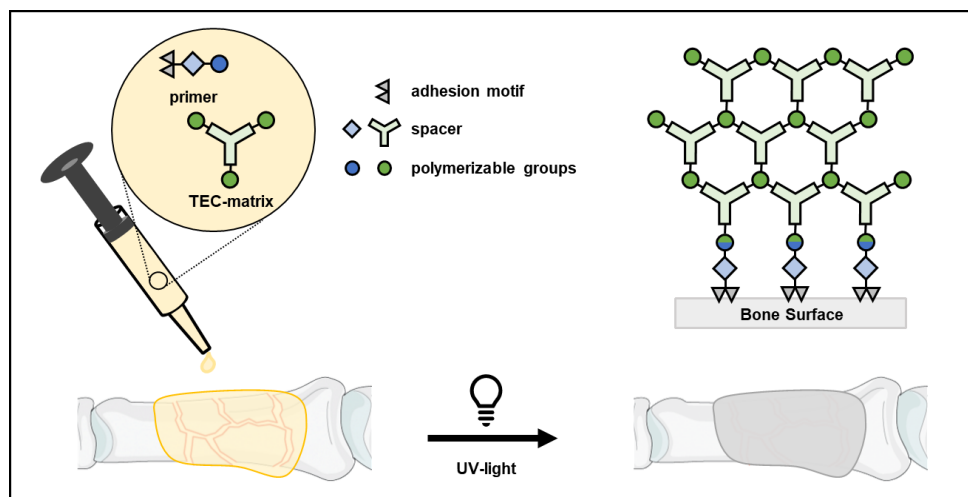
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For the treatment of complicated bone traumata, such as comminuted fractures, conventional means of fracture fixation (*i.e.* plates, screws or casts) cannot be used or result in severe bone loss. In such cases, biocompatible bone adhesives are needed, comprising advantages such as shorter operation times, homogeneous force distribution and no need for revision surgeries [1]. Despite three decades of research, no surgically realizable bone glue has been identified, due to high requirements such as biocompatibility, sufficient bonding strength and ease of usage [2]. In this work, we present the first-known bone adhesive system, based on thiol-ene “click” chemistry (TEC), which is curable by UV-light in a fast one-step process applicable in surgeries. Inspired by self-etching dental adhesives, the one-step formulations are comprised of matrix monomers, thiols and adhesive molecules, so-called primers. These newly synthesized primer molecules contain adhesion motifs with high binding affinity to bone and implants, and polymerizable groups for matrix incorporation [3]. By selecting ene moieties with different reactivity towards the thiol component, improved primer incorporation into the polymer network and a 1-step process were achieved. Results show, that this easily applicable system exhibits exceptional shear bond strength on bone and implant surfaces, which is significantly higher compared to commercial bone glues currently reviewed by the FDA. First *ex-vivo* indentation tests were highly promising and *in-vitro* biocompatibility was confirmed. Hence this adhesive system combines practicability and applicability and paves the way towards future fracture treatment.



Schematic principle of the 1-step bone adhesive system.

Acknowledgments

Funding by the Christian Doppler Research Association, the financial support by the Austrian Federal Ministry for Digital and Economic Affairs and the National foundation for Research, Technology and Development are gratefully acknowledged.

References

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