

3D Printed Implant Splint: A Novel Way of Splinting Implants for Impressions or Implant Verification for an Implant Supported Fixed Full-Arch Prosthesis



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Introduction:

Implant impression accuracy is crucial in the edentulous arch to produce a passively fitting implant supported prosthesis. Any distortion during the splinting process for impression making can result in a prosthesis misfit. This presentation demonstrates a novel and dimensionally stable method of splinting implants to ensure this required accuracy.

Designing the 3D Printed Implant Splint Components (**Patent Pending. USPTO Application#: 63/591,899**):

Using Blender, Meshmixer, and exocad CAD software, three different mechanical components were designed to aid in splinting the multi-unit open-tray impression copings.

Component 1 swivels to change the distance between the impression copings.

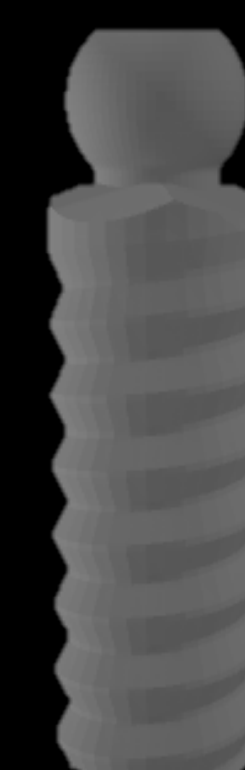
Component 2 slides along a vertical plane to adjust to the varying height between copings.

Component 3 attaches to Component Two with a ball-and-socket type joint to allow freedom of movement.

Component 1



Component 2



Component 3



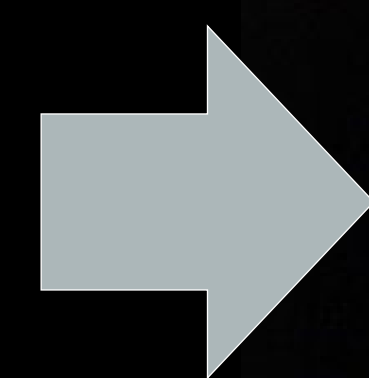
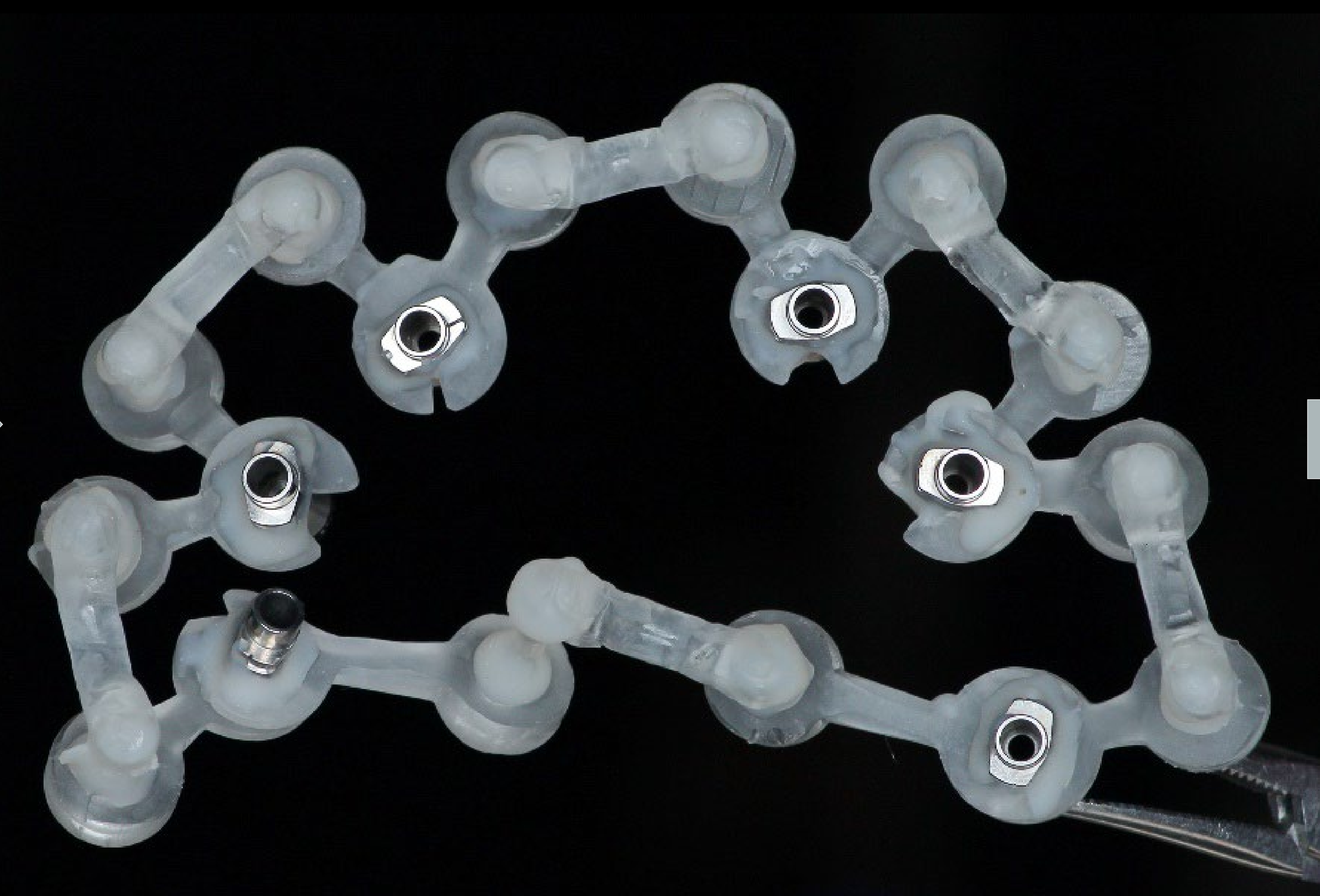
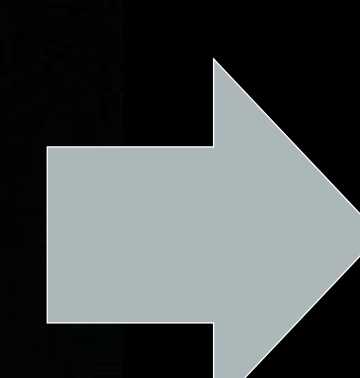
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Use of 3D Printed Implant Splint – Verification Jig Technique:

On a multi-unit analog master cast, impression copings were connected with the three components before being secured with flowable composite.
The verification jig was used to assess the 3-D position of the patient's implants.

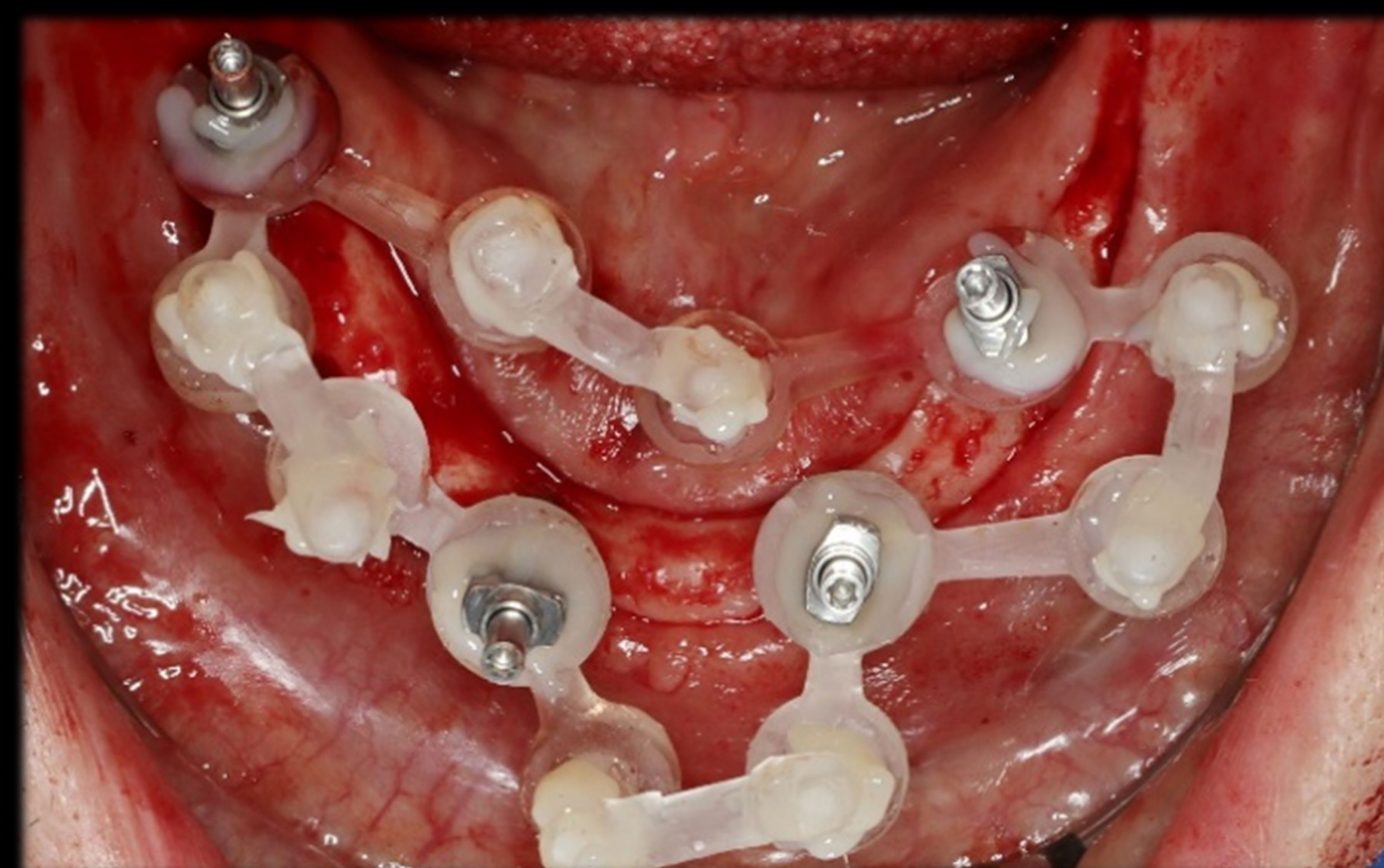
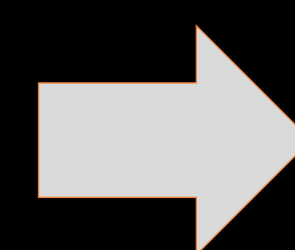
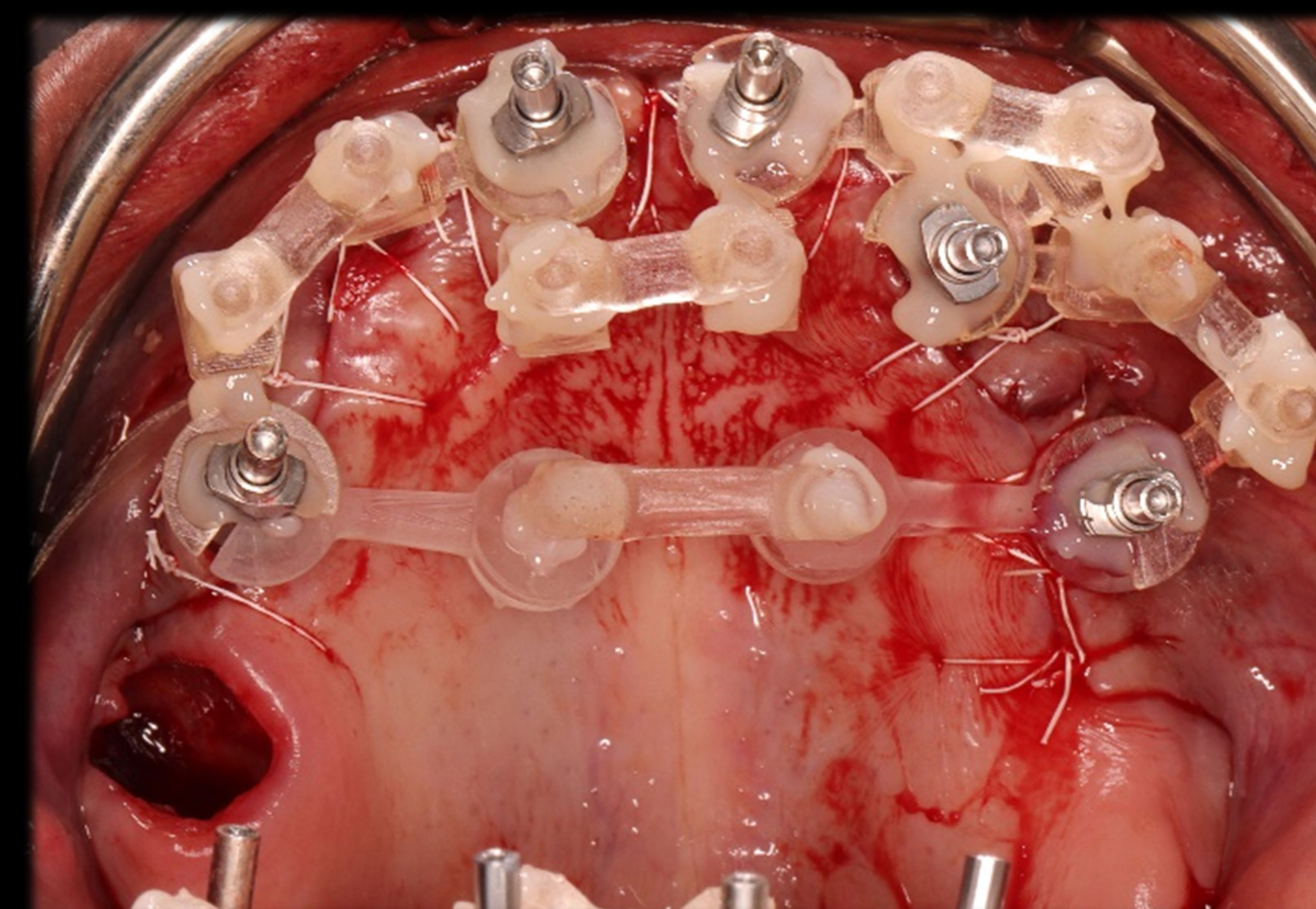
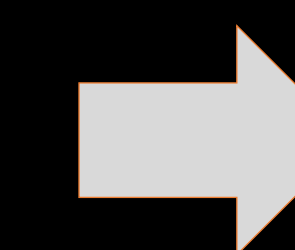
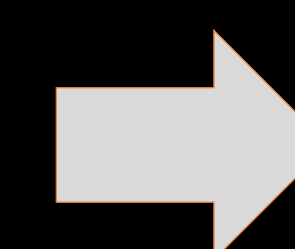
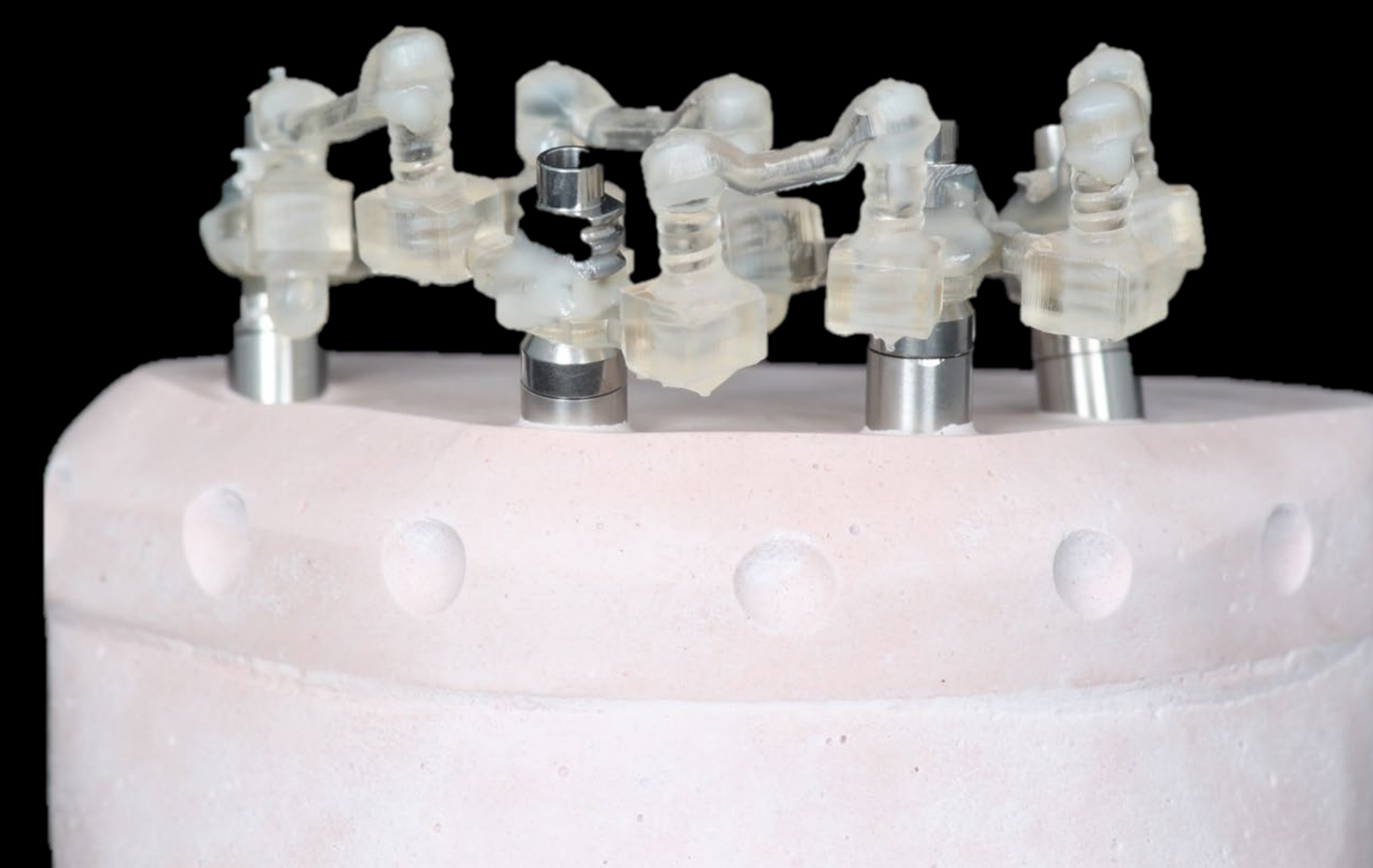


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Use of 3D Printed Implant Splint – Implant Position Transfer Technique:

After implant placement and multi-unit placement, impression copings were connected using the three components. This splinted jig was used to pour a master cast.

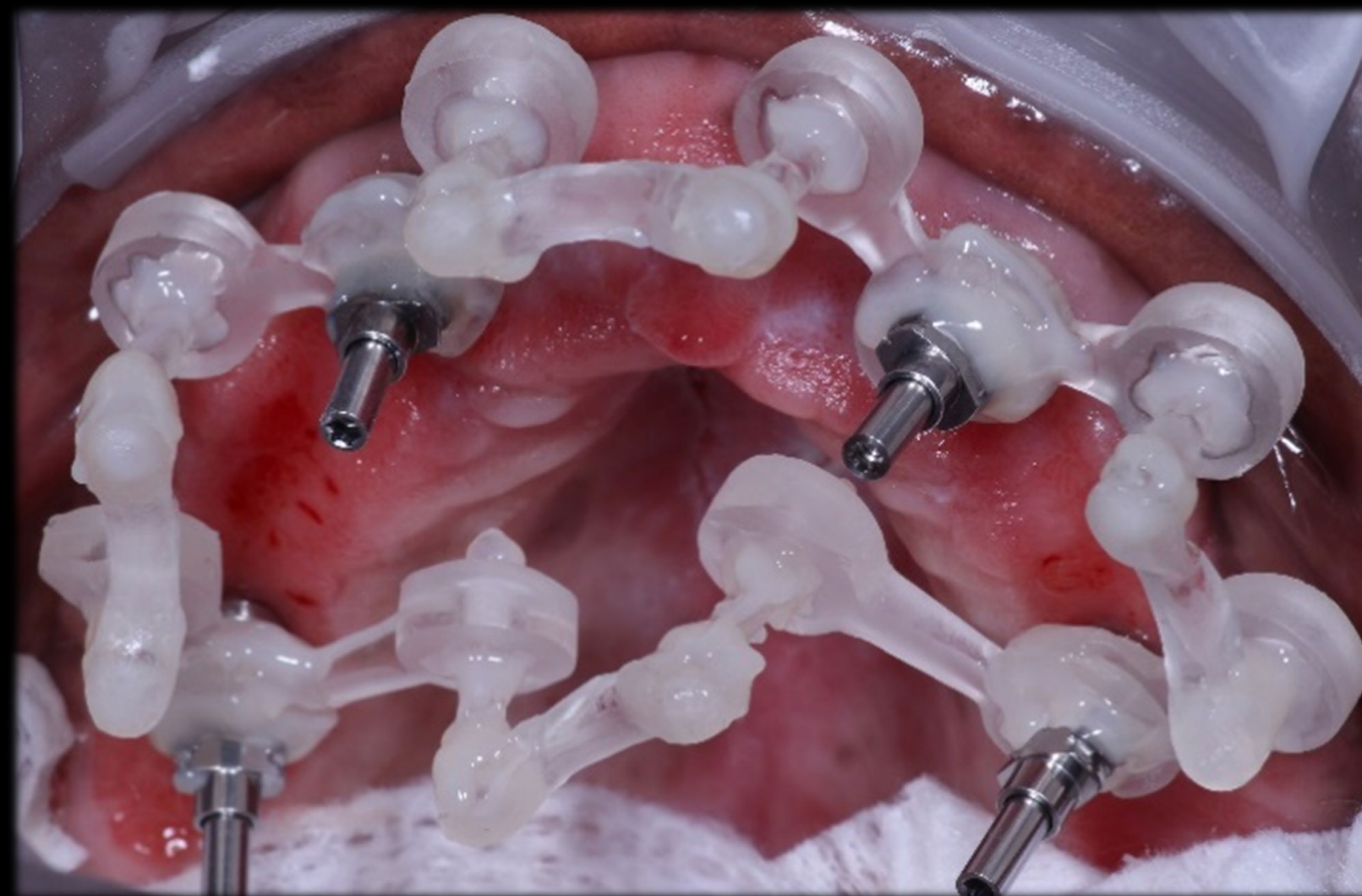
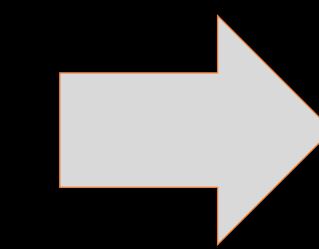
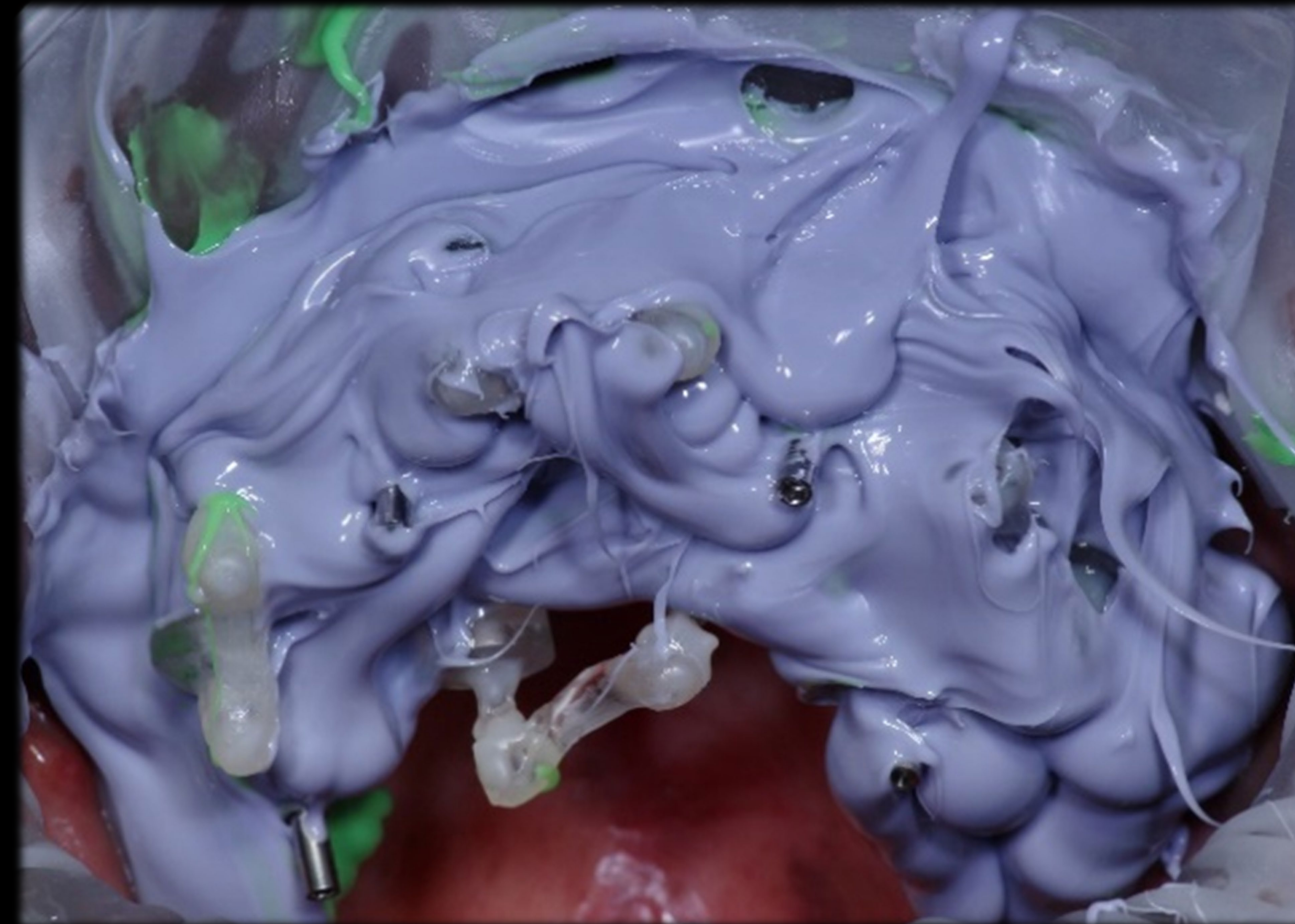
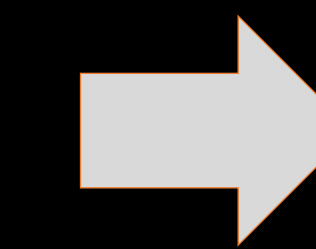
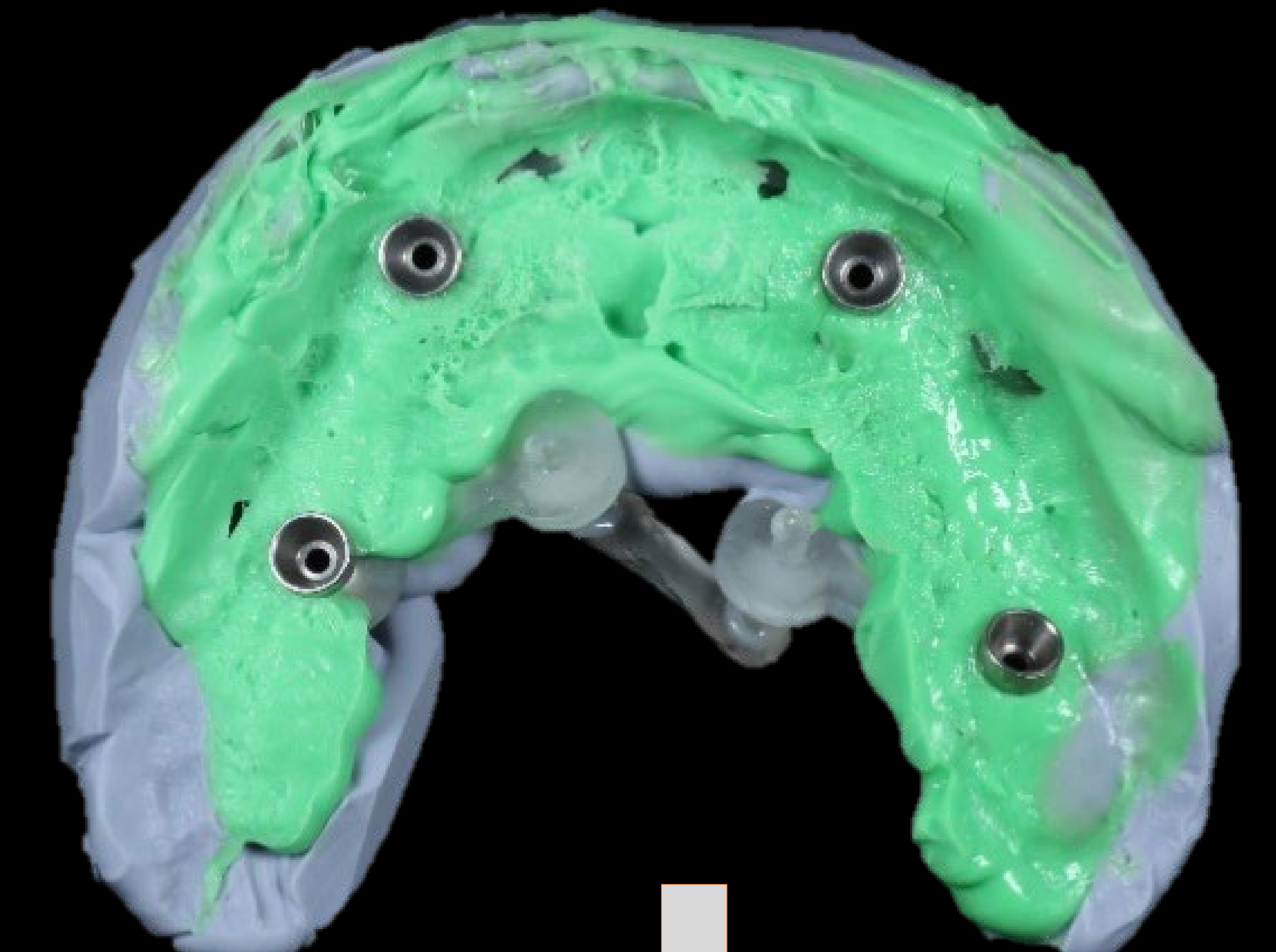
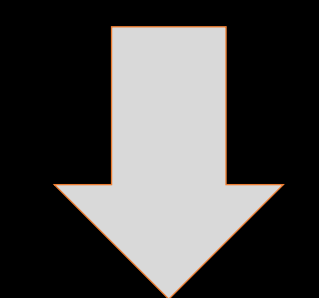


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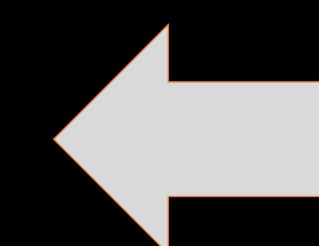
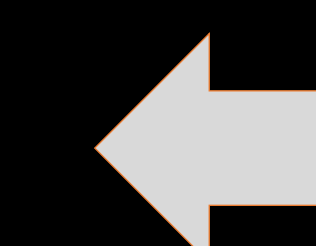
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Use of 3D Printed Implant Splint – Final Impression-Making Technique:

Impression copings were placed in the mouth and connected with the three components. Light and heavy bodied PVS impression material was expressed around the splint and then picked up.



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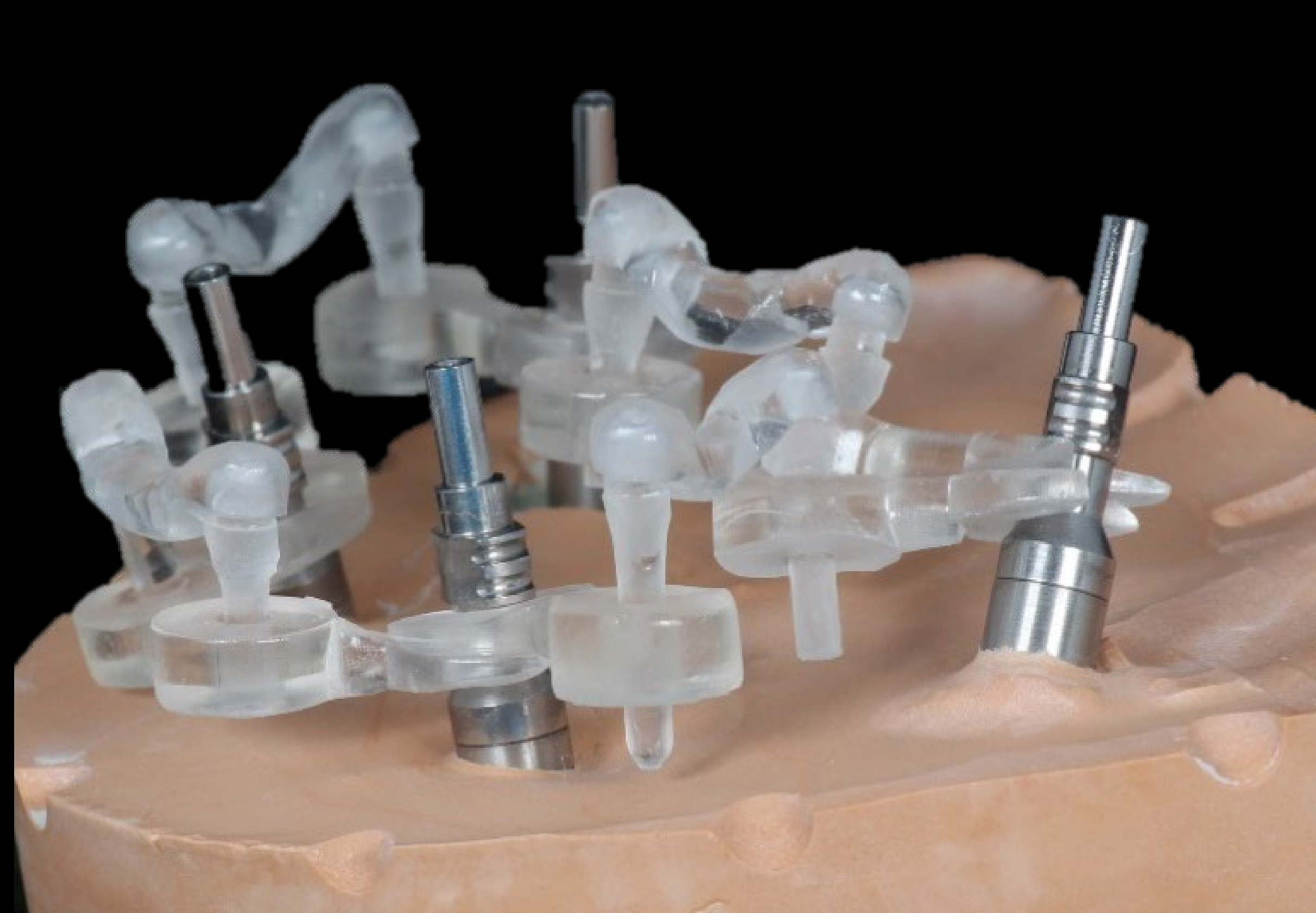
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The 3D Printed Implant Splint has many characteristics that allow the splint to have excellent dimensional stability.

- Components are pre-polymerized biocompatible material that directly contact each other. There is minimal additional material used to connect components resulting in limited distortion during polymerization.
- The design allows implants to be splinted along the arch and between two terminal implants creating a stable verification jig for the most extreme implant positions with differing heights and angles.



Discussion:

Most implant impression splinting techniques utilize a polymerizing material as the scaffold to record the implant positions. This inherently has flaws since common materials for splinting implants are dimensionally unstable with initial polymerization shrinkage and continued dimensional changes over time. There are several studies that compare different splinting techniques *in vitro*, demonstrating significant distortions with the traditional methods. In addition, most studies simply compare splinting two short-span implants, yet splinting multiple implants along the edentulous arch is much more technique sensitive compared to splinting two short-span implants. Polymerization shrinkage is amplified dramatically when splinting multiple implants along an edentulous arch due to the length the splinting material must cover. New materials must be used to limit the distortion during the impression or verification process.

Conclusion:

This novel method of splinting implants for an implant-supported fixed full-arch prosthesis is significantly less time-consuming, more cost effective, and more reliable than other conventional splinting methods.

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