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Stereolithography in implant placement: A review

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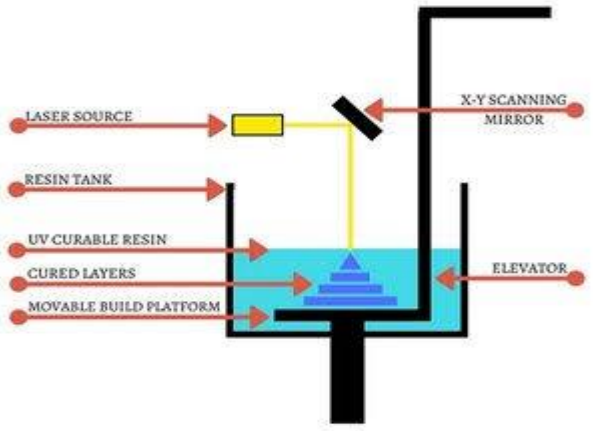
***Abstract*---**Stereolithography (SLA), the first form of additive manufacturing, creates 3D objects by selectively solidifying liquid resin via a photopolymerization reaction. Stereolithography has gained popularity due to its ability to fabricate objects with high accuracy and in a wide range of materials. SLA has undergone four generations of major technological innovation since its invention in the 1980s. As a result of these advancements, a diverse range of stereolithography systems with dramatically improved resolution, throughput, and material selection for creating complex 3D objects and devices is now available.

***Keywords*---**stereolithography, photopolymerization reaction, implant placement, 3D objects.

Introduction

Stereolithography is an additive manufacturing process that works by focusing an ultraviolet (UV) laser on a vat of photopolymer resin in its most common form. Because photopolymers are UV-sensitive, the resin is photochemically solidified and forms a single layer of the desired 3D object. Stereolithography can be used to create prototypes for new products, medical models, and computer hardware, among many other things. While stereolithography is quick and can produce almost any design, it is also costly. Stereolithography (SLA) uses UV lasers as a light source to selectively cure a polymer resin. Digital light processing (DLP) uses

a digital projector as a UV light source to cure a layer of resin. Liquid crystal display (LCD) uses an LCD display module to project specific light patterns.



Techniques of stereolithography
It has three methods:-

- PBF (Powder bed fusion)
- Light Curing
- FDM (Fused deposition modelling)

Uses

In the field of medicine, such as

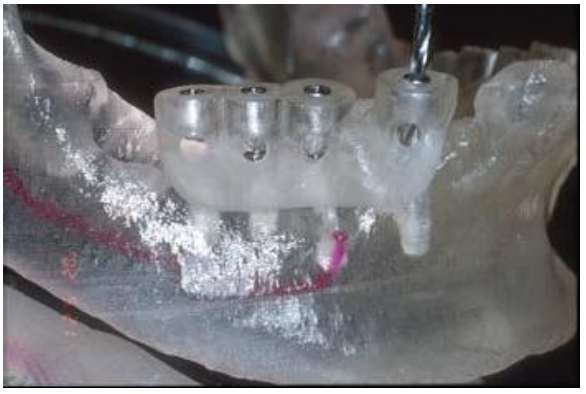
- Traumatology
- Cardiology
- Neurosurgery
- Plastic surgery
- Carniomaxillofacial surgery
- In the field of dentistry, it's application range
  - Prosthodontics
  - Oral and maxillofacial surgery
  - Oral implantology to orthodontics, endodontics and periodontology

Uses in prosthodontics

- Production of auricular and nasal prosthesis
- Obturators
- Duplication of existing maxillary/ mandibular prosthesis
- Manufacturing of surgical stents for patients
- Manufacturing of lead shields

Implantology

The use of computer aided design/computer aided manufacturing (CAD/CAM) technology. The Applications pertain to the three dimensional imaging, 3-D software for treatment planning, fabrication of computer-generated surgical guides using additive RP



Advantages

- It has high accuracy.
- It has smooth, high quality surfaces
- High resolution of small details
- It has short turnaround time

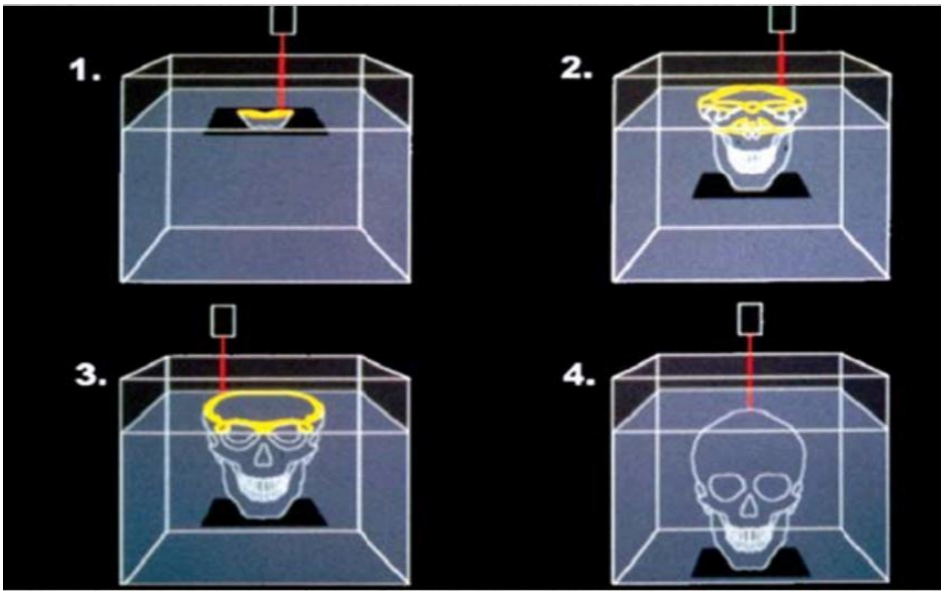
Disadvantages

- It has limited mechanical and thermal strength.
- It requires support structures some designs cannot be printed.

Technique
Diagnostic Wax up

Diagnostic study casts are properly articulated on a demo adjustable articulator. After a comprehensive clinical and roentogenographic examination a sound treatment plan is formulated and diagnositic wax up is made up by using irreversible hydrocolloid and a duplicate cast is made with Type IV dental stone. A radiographic template is fabricated on a duplicate study cast.
For a complete dentures, a duplicate of a previously fabricated complete denture can also be used, if the denture contains correct relationships

Principle of stereolithography



Conclusion

SLA stereolithography enables the production of parts that adhere to a few simple constraints. Projects requiring prototypes with mechanical and visual properties identical to series parts, on the other hand, must be manufactured using other prototyping techniques. Stereolithographic templates can be used to predictably place surgical and prosthodontic implants. Soft tissue, bone, or remaining teeth can be used to support the templates completely. The cost is higher than with traditional templates, but the benefit may justify the extra expense in more complex, fully edentulous cases

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