Graphy versus Thermoformed Clear Aligners

Prof Dr Ali I Al-Bustani

BDS, MSc, MPhil PhD (Orthodontics)

(King's College London, UK)

Thermoformed (Vacuum Formed) Aligners:
(Pioneer: Invisalign 1997)

Directly Printed Aligners:
(Pioneer: Graphy 2021)

Thermoformed (Vacuum Formed) Aligners

- Various thermoplastic materials are used for fabrication due to their excellent characteristics. These include; polyvinyl chloride, polyurethane, polyethylene terephthalate, and polyethylene terephthalate glycol. (The focus is on the visco-elastic properties)

- A shortcoming of the thermoplastic process is the possible significant changes in the material properties in response to the heat generation, e.g. a decrease in the thickness of the aligners compared to the original dimension of the thermoplastic foil (0.5-1.5 mm), increased water absorption and solubility properties, and modified surface hardness.

Workflow of Thermoformed (Vacuum Formed) CA

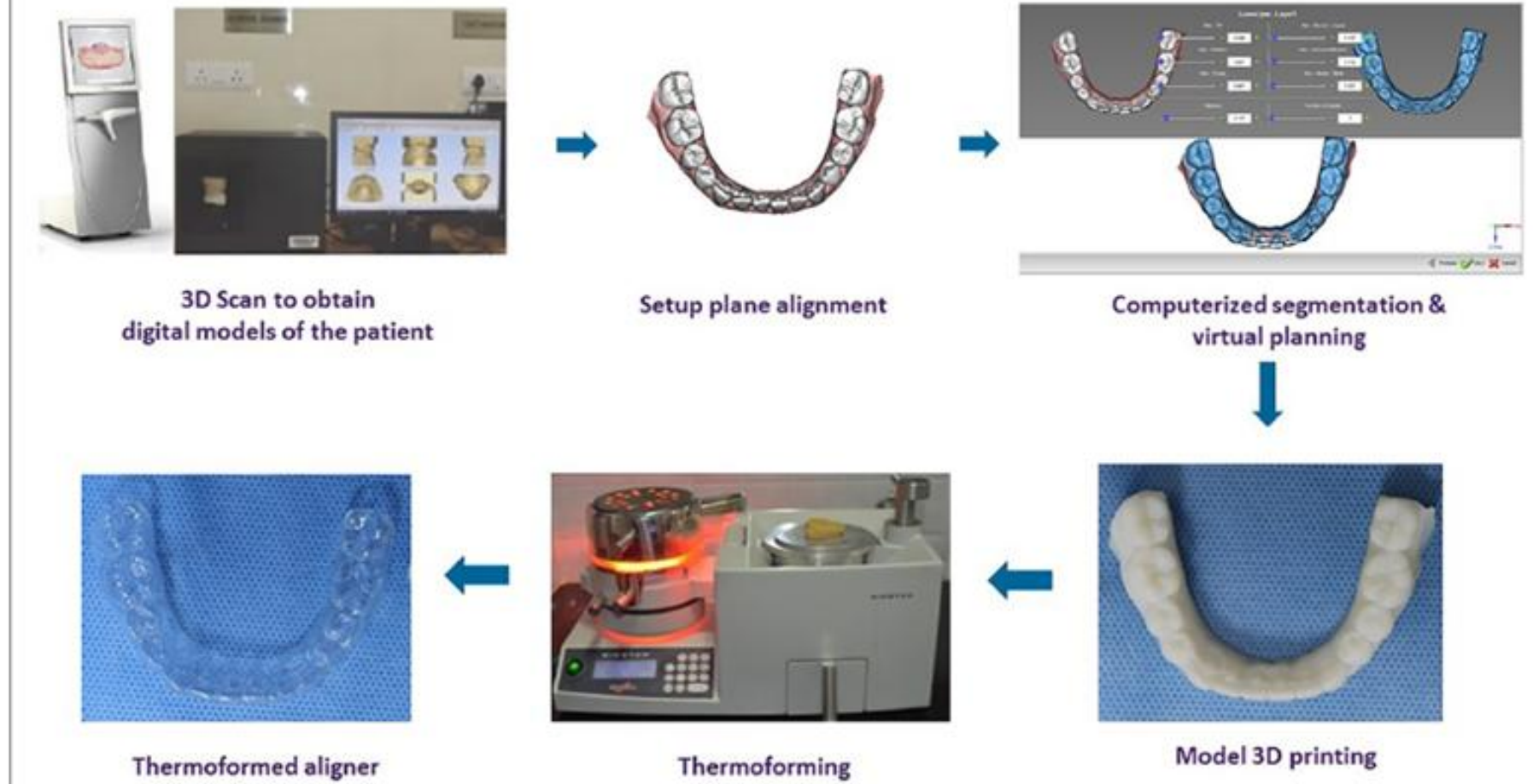


FIGURE 1
The key stages of laboratory procedure in the manufacturing of thermoformed clear aligner.

Various Names

3-D Printed CA

Directly Printed CA

In-Office CA

In-House CA

Graphy/Shape Memory CA

General Workflow of 3-D Printed CA

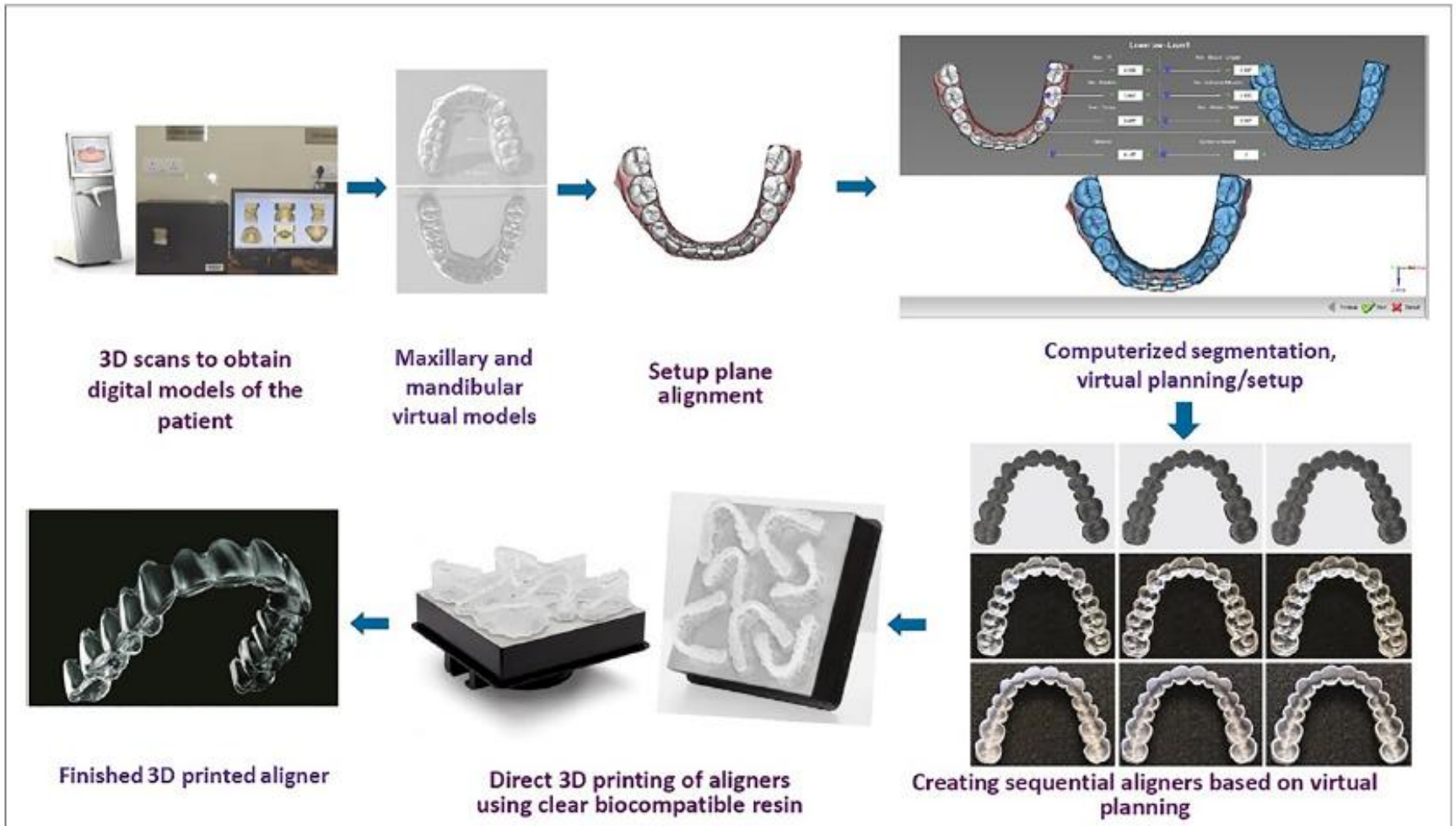
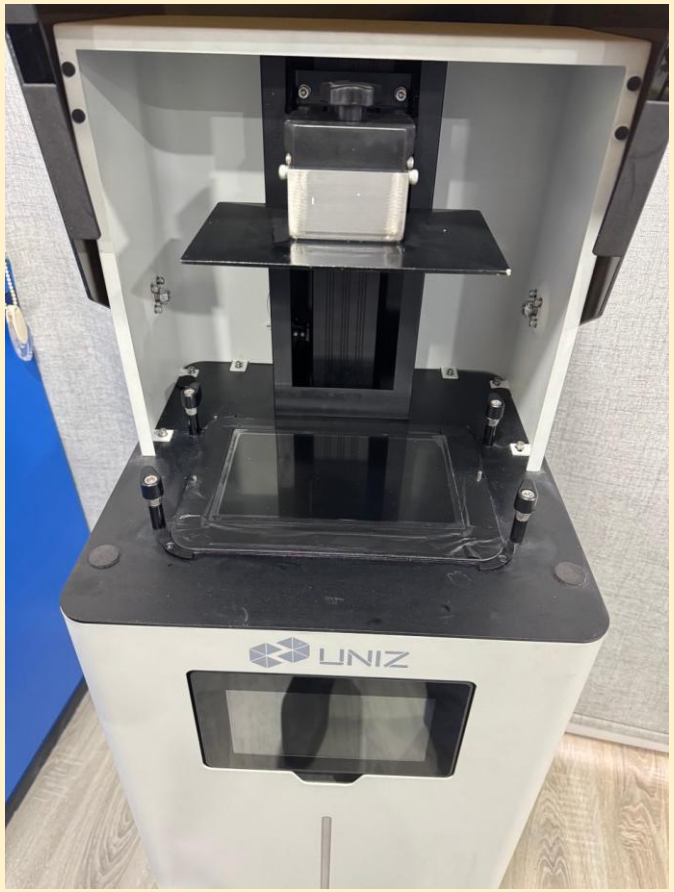


FIGURE 2
The key stages of laboratory procedure in the manufacturing of direct 3D-printed clear aligner.

UNIZ 3-D Printer

- Other 3-D printers can be used (e.g. Sprintray or Formlabs), but better to contact Graphy to give them the printer specifications
- UNIZ produces 8-10 aligners within 32 min
- Cost of UNIZ 3-D Printer $ 7500
- Cost of one Resin Bottle $ 650 (Produces 70-100 aligners), expire date: 2 years

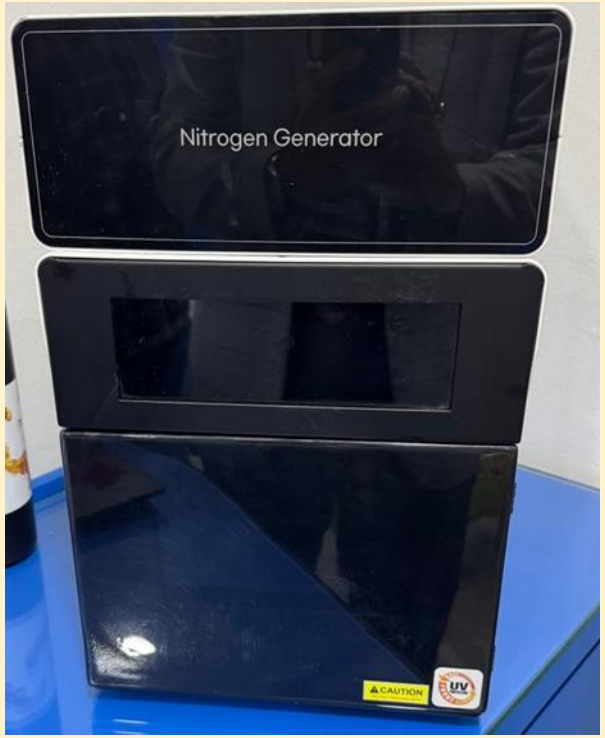



Graphy
Direct
Aligner
UNIZ


Graphy
Tera Harz
Clear
Orthodontic Preformed
Direct Aligner
Clear
1 KG

Centrifuge (Spinner) (4-6 min)

UV Light Curing under Nitrogen (20-25 min)



Disadvantages

- Technique sensitive!! Alterations to the delicate manufacturing process, involving multiple production as well as post-curing steps, may lead to undesired side effects such as allergic reactions which can be as severe as an anaphylactic reaction.

- Costly equipment.

- These aligners are designed to be changed weekly because a study of the ability of 3D-printed TC-85 aligners to maintain their mechanical properties during use tested them for only one week.

- Further research (In vitro & In vivo) is required.


Thank You