

IN-HOUSE ALIGNERS



Everyone wants to have a beautiful smile, but many of us need help. Braces, which were formed of brackets connected by wires, were previously used to shift teeth. In contrast, modern dentistry has begun to rely on digital technology, and the use of 3D technology in orthodontics has recently increased. A more recent advance is the development of CAD/CAM and 3D printing technology, which are used to design and manufacture "personalized" orthodontic appliances. These systems not only shorten treatment durations but also increase the predictability and efficiency of dental care. It also facilitates communication and decision making by allowing clinicians and patients to preview simulated outcomes prior to beginning of treatment.



VISHNU
DENTAL
COLLEGE

Clear Aligners is one such system. Aligners are a series of custom-made tight-fitting mouthpieces that slip over the teeth to move them to desirable locations. They are an excellent choice for individuals who want to straighten their teeth with exact precision and in less time by offering aesthetic and comfortable alternatives to traditional permanent appliances.

Because the invisible aligners are custom-built for a tight fit, diagnosis and treatment planning becomes an essential step for successful orthodontic treatment. Clear orthodontic aligners are typically used for patients who have mild or moderately crowded teeth, or have minor spacing issues. Capturing the face (if possible in 3D), including the patient's dentition in photographs, radiographs, and dental models, is fundamental requisite. Typically a dental model is used to produce a 3D simulation of a treatment plan called a dental "setup". Through these simulations, potential therapeutic objectives such as the need for tooth extractions or interproximal stripping is evaluated. A setup is thus a valuable diagnostic tool that can be used to confirm, modify or reject a suggested treatment plan and can be particularly valuable in complex cases. An alternative to the traditional setup (using a plaster model) is "**the virtual setup,**" which was made possible with the introduction of 3-dimensional imaging and printing in Orthodontics.

According to production methods, clear aligner systems can be broadly grouped into two categories; aligners made from thermoplastic materials via manual set up and systems using CAD-CAM technologies to design and produce aligners.

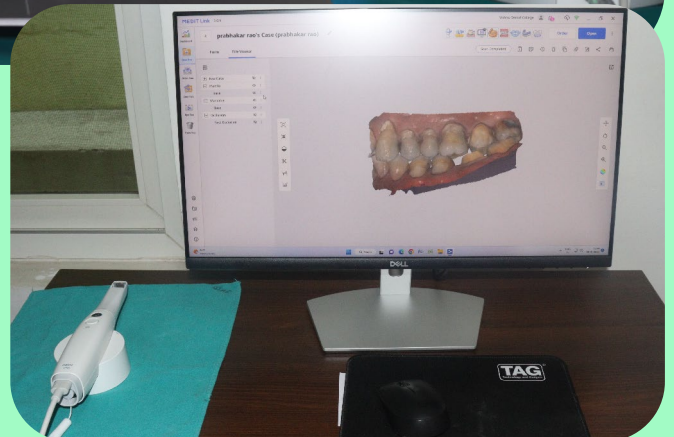
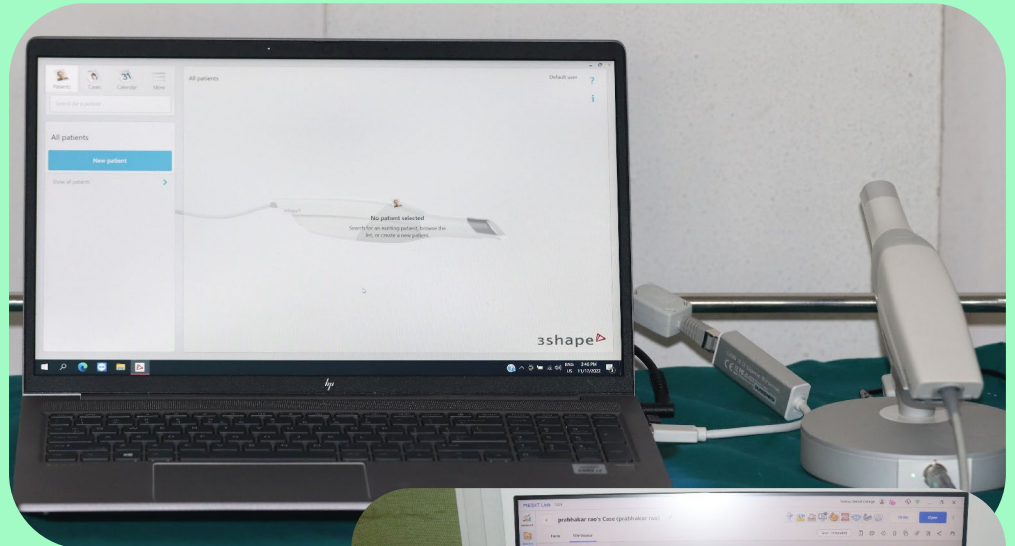
Vishnu Dental College in Bhimavaram has built up, installed, and commenced using this fully integrated In-House Aligner technology.

INTRA ORAL — SCANNING

The first step is to obtain an intraoral scan, which will be a digital 3-D scan of patient's mouth and teeth.

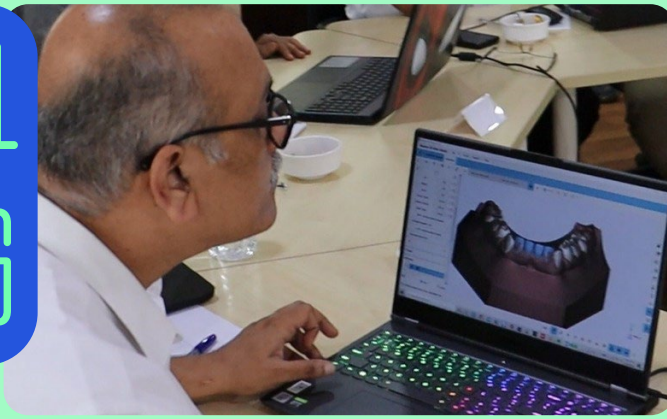
(Trios 3SHAPE, MEDIT i700, PANDA scanners)

Not only impressions of patients, models obtained from traditional techniques can also be used for digital aligners using extra oral scanners. Vishnu Dental College also provides this facility with medit T500 and 3shape extra oral scanners.



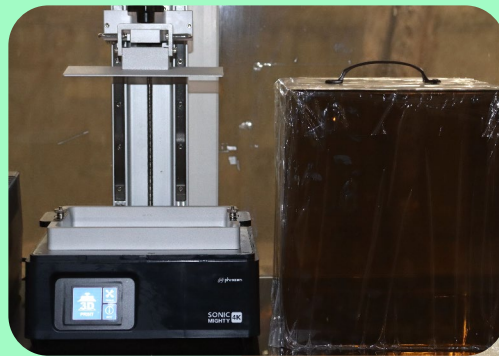
The orthodontist uses advanced computer software to map out the position of teeth and how it will look when the aligners are inserted. Intraoral scanning is the process of creating a virtual model of the inside of the mouth through a series of digital images. It is a non-invasive and pain-free process that uses an intraoral camera. An intraoral scanner is similar to a small digital camera, and it functions by emitting infrared rays and taking pictures of the inside of your cheeks and mouth. The images are sent to a computer, where they are converted into 3D images. The images it produces are extremely accurate, and the scan is fast, comfortable, and mess-free unlike the alginate impressions.

VIRTUAL PLANNING



Dentists specialized in Orthodontics perform virtual treatment planning using advanced software (3Shape, 3D Maestro & DAD) to design aligners customized to patient treatment needs.

— 3D — PRINTING



The 3D models are printed using SLA or DLP 3D Printers (UnizNbee, Phrozen & DIO PROBO Z)

The number of models to print will depend on the magnitude of the desired tooth movements. Small corrections on the position of one or two teeth may be achieved with just a few models, while more complex movements of a large number of teeth may require up to 40 or 50 models.



— ALIGNERS



Routinely, Aligners are made of thermoplastic material (TPU or PETG) using a technique called thermoforming, or more specifically vacuum forming: a sheet of material is heated under an electric heating element until it becomes pliable, and when it reaches the right temperature it is pressed against the 3D model using suction. After cooling down it is cut from the dental model in a specific way without losing its shape; it is manually trimmed and polished with rotary instruments and it's ready for patients use.



On the day of appointment, attachments are bonded on patient's teeth followed by insertion of aligners. They are given instructions on how to insert & remove their aligners so that the treatment proceeds as smoothly as possible.

The conventional thermoforming workflow of model formation, molding, removal, and finishing is a complex manufacturing process requiring considerable time and effort. It also generates a significant amount of non-biodegradable waste such as petroleum-based polymers used in model fabrication.

To overcome these limitations, direct 3D-printing technology for clear aligner manufacturing with a biocompatible material has been recently attempted. It controls the thickness of the aligner and therefore has a better ability to control the force vectors. It also bestows a more environment friendly choice in the employment of digital technology.



The Asia's first Direct Printed Aligners (Graphy) was launched on December 5th, at Vishnu Dental College by Dr. Priyanka Patil, Co-founder and CEO of Orthosystems, (Partner: Braces & Smiles) together with our director, Dr. M A K V Raju, Principal Dr. M. C. Suresh Sajjan and Vishnu Team in Department of Orthodontics & Dentofacial Orthopaedics.

Graphy employs a UnizNBee 3D Printer, which produces the aligners directly with TC85-DAC Resin material. It makes use of the LCD Stereo Lithography technology, which is aided by a unique nitrogen curing machine called "TeraHarz," that removes residual uncured resin. 3D Printer has the distinct attribute of keeping the system temperature below 40°C. In addition it offers several advantages, such as the ability to print 6 complete arches in 5 minutes with an accuracy of 95.05% for 50µm, and 99.60% for 100 µm. The TC85-DAC Resin material applies constant, low forces. It has unique properties such as a shape memory that can make the treatment more effective and convenient for our patients. A material which makes the aligners remember the shape they were printed in and which prevents them from being deformed when removed by the patient. With Graphy, Intra Oral scanning, designing, printing, and delivery of the aligners can all be finished on the same day.

Hence, 3D treatment planning software integrated with scanners and 3D printers has enabled Vishnu Dental College to provide full in-house laboratory manufacture of Aligners to patients with minimal malocclusions. We believe that the expertise and understanding of this technology would enable us to deploy aligners at an affordable cost to the patients.



Contributed by TEAM VDC