

Stereophotogrammetry Imaging: An Approach for Screw Retained Implant Prosthesis Fabrication in Oral Rehabilitation

Mazen Aly, BDS; Leonardo Marquez, BDS

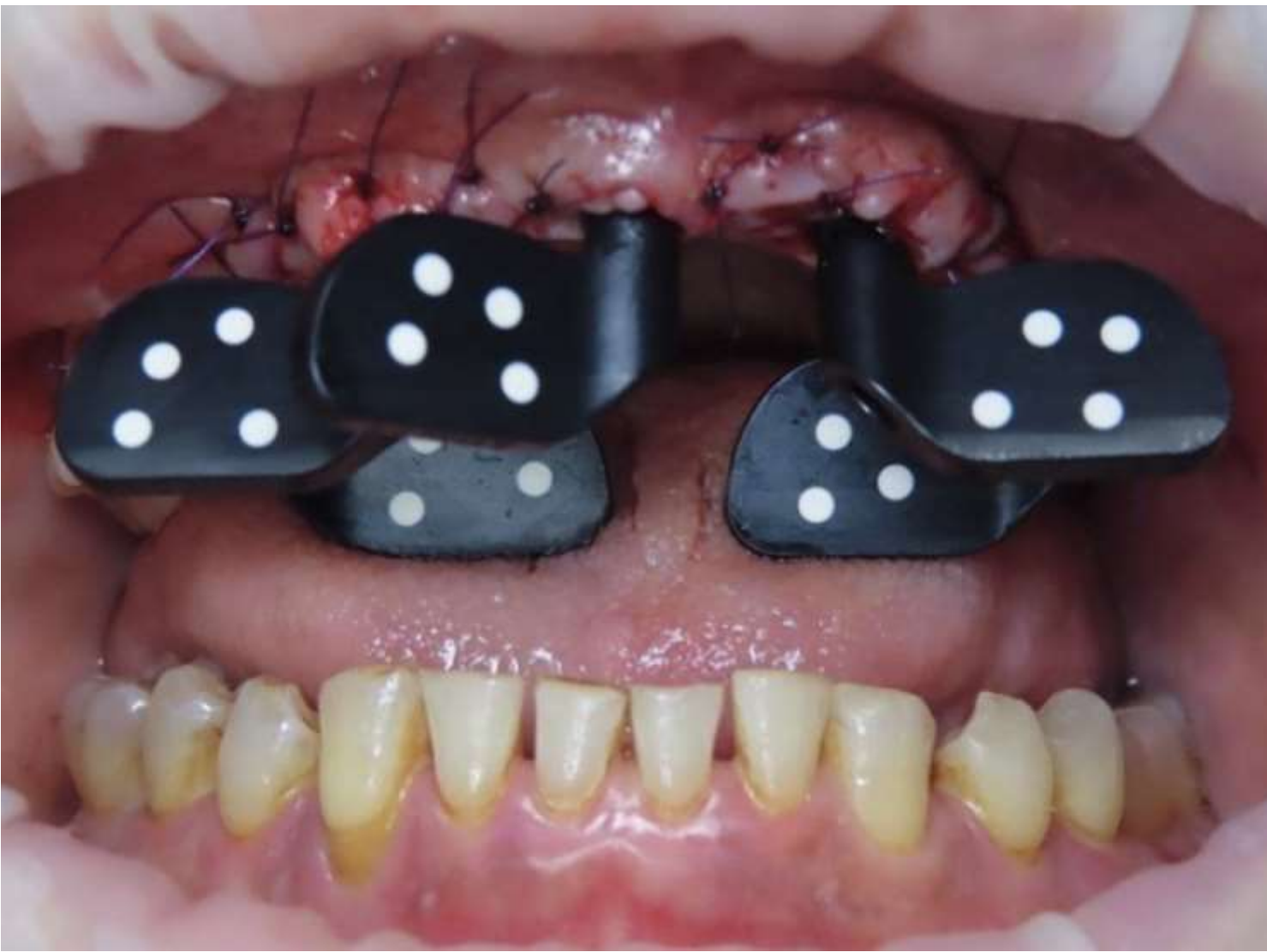


BACKGROUND

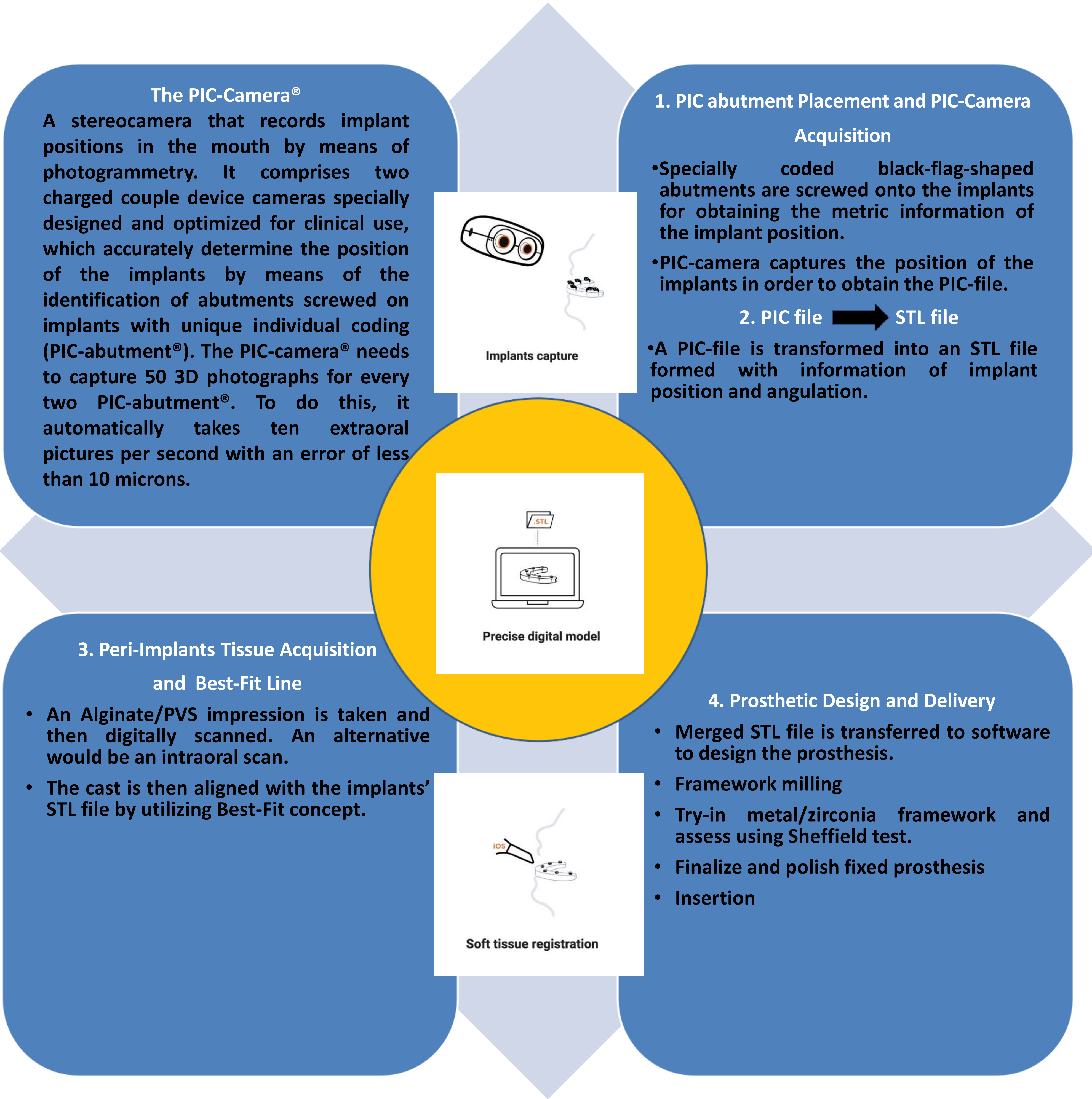
Dental Implants are commonly used for the rehabilitation of partially and completely edentulous patients. It is scientifically proven that achieving proper passive fit of implant-supported prosthesis improves longevity of implants as well as the supported prosthesis. The classical approach for fabricating a fixed multiple-implant-supported prosthesis starts with taking a physical impression followed by framework wax up then casting. Recently, digital intraoral scanners are being used for impression taking and their reliability has been demonstrated in cases involving multiple implants for rehabilitating edentulous areas. However, there is a limitation to the edentulous span to be restored. Clinicians can now reconstruct virtual models of anatomic structures and use dedicated 3D implant-planning software to create accurate surgical guides and plan flapless implant surgeries, even in challenging situations. Photogrammetry is a cutting-edge intraoral option for direct and reliable recording of the spatial implants' positions. It registers the geometrical properties of three-dimensional objects and their relationships with precision and without contacting the objects.

INTRODUCTION

Passive fit of a multiple-implant-restoration remains one of the most challenging aspects of partial or full mouth rehabilitation. Passive fit has been defined as "the optimum fit of superstructures to abutments that determines the absence of bone tension without the occlusal loading" and is considered a crucial factor for the long-term success of dental implant restorations. Commonly, it is accepted that passive fit relates to the gap between the abutments and the framework. However, there is no agreement in the literature regarding an acceptable gap width, which might range between 10 and 150 μm (1 micrometer=0.001 mm). Thus, passive fit can be considered as the minimum gap that permits a framework connection without causing strain on the implants. The absence of a precise fit yields biomechanical failures such as framework distortion or ceramic detachment due to inadequate stress dissipation. A lack of fit between the framework and implants can be attributed to distortions occurring during the impression taking or cast fabrication. Therefore, in order to reduce distortions of traditional impression techniques, the use of photogrammetry has been proposed, in addition to the pre-existing 3D scanning technology.



METHODS & RESULTS

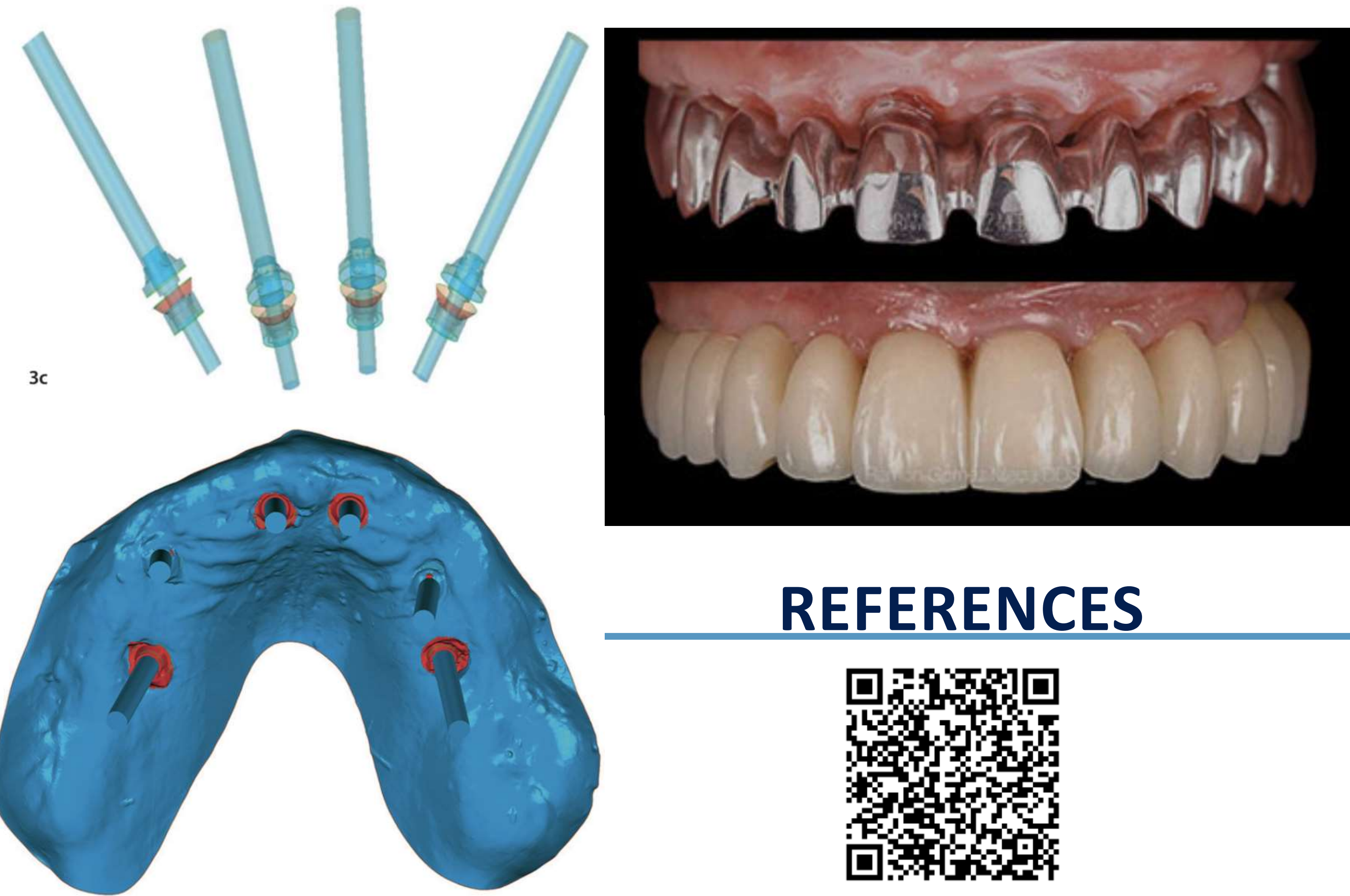


DISCUSSION

There is increasing application of digital techniques at different stages of dental implant therapy. At the stage when impressions are recorded, intraoral-scanners have been used by clinicians. The technique avoids the need for registering implant positions with impression materials and stone model, which avoids the slight dimensional distortions. Photogrammetry is a novel option for reliable, direct intraoral registration of the positions of multiple implants. It is a technique for determining the geometrical properties of objects and their spatial arrangement from photographic images. Its most important feature is the precision with which it can measure objects without direct contact. Photogrammetry is useful in many sciences and fields. This technology has an infrared flash that constantly illuminates the scanned object while eliminating the shadows that occur with ambient light. The registered angles and distances between implants are interrelated and treated as a unit. The software then calculates average angles and distances between implants from these photographs, obtaining an accurate relative position of each implant in vector format.

CONCLUSION

Photogrammetry is a newly introduced technology to the dental field and is scarcely used by clinicians nowadays. Even though the literature and current results of case studies show that it is a promising technique, further studies are needed to assess long term results of utilizing such technology on implants' osteointegration and longevity of prosthesis. Additionally, one of its major drawbacks is the inability to acquire peri-implant tissue in the scan, which requires an extra step of a physical or digital impression followed by merging both STL files.



REFERENCES

