International Journal of Dental Sciences and Research, 2020, Vol. 8, No. 3, 68-71
Available online at http://pubs.sciepub.com/ijdsr/8/3/2
Published by Science and Education Publishing
DOI:10.12691/ijdsr-8-3-2

An Effective Approach for Prosthodontic Rehabilitation for a Trismus Patient Seeking Removable Partial Denture

Abdulrahman H. Alzahrani[1], Fahad K Alwthinani[1], Mohammed K. Fahmi[2], Mohamed Y. Abdelfattah[3,4,*]

[1]Assistant Professor of Fixed prosthodontics, Faculty of Dentistry, Taif University, Taif, KSA
[2]Associate professor of Restorative Dental Sciences, Faculty of Dentistry, Taif University, Taif, KSA
[3]Assistant professor of prosthodontics, Faculty of Dentistry, Tanta University, Tanta, Egypt
[4]Assistant professor of Removable Prosthodontics, Faculty of Dentistry, Taif University, Taif, KSA
*Corresponding author: m.yousef@tudent.org

Received February 14, 2020; Revised March 20, 2020; Accepted March 31, 2020

Abstract ***Background:***, Prosthodontic Rehabilitation for trismuspatients with extremelyrestricted mouth openings by using traditional methods represent a big challenge for prosthodontists. Intra oral scanning and digitalized three dimensional CAD,CAM technology have affordeddifferenttechniquesused in the construction of highly accurate virtual dentition casts. ***Aim:*** to improve the accuracy of aRPD framework by incorporating the digitalization technology, computer-aided design (CAD), and 3D printing. ***Materials and Methods***: Multiple intraoral scans were used to reconstruct the virtual cast on which the authors planned the virtual RPD framework. Thenusing a 3D printing process, the titanium alloy framework was constructed, and the final RPD was fitted on the patient mouth. ***Conclusions***: Digitalization technology, computer-aided design (CAD), and 3D printing andIntraoral scanning provided an accurate and effective method in the construction of a removable prosthesis for a trismus patient with severly restricted mouth opening.

Keywords: *removable partial denture, limited mouth opening,trismus, digitalized dentistry*

Cite This Article: Abdulrahman H. Alzahrani, Fahad K Alwthinani, Mohammed K. Fahmi, and Mohamed Y. Abdelfattah, "An Effective Approach for Prosthodontic Rehabilitation for a Trismus Patient Seeking Removable Partial Denture." *International Journal of Dental Sciences and Research*, vol. 8, no. 3 (2020): 68-71. doi: 10.12691/ijdsr-8-3-2.

1. Introduction

An extremely restricted opening of the oral cavity is not uncommon condition in patients with trismus. This can be as a result of head and neck injuries, and represents big challenges for the dentists specially the Prosthodontists. Limited mouth opening commonly leads to compromised impressions and prostheses [1,2]. Sufficient mouth opening is essential to allow appropriate tray alignment andinsertion and obtain perfect impressions.Different modifications are necessary during impression registrationforsmall oral cavities to achieve a successful prosthesis. The custom made separated impression tray for impression taking may represent a solution for this case. [3] but, it is still not suitable for allextremelyrestricted cases besides, the drawbacks ofdifficulty of reassembling and casting of the sectional impression. Intra oral scanning and digitalized three dimensional printing technologieshad beensuccess fully used in the construction of good andperfectdigital dentalmodels in a short time [4,5].

Digitalized three dimensionalprinting technologies has been used infabricating removable partial denture frameworks, only, inlay restorations, orthodontics, andmaxillofacial surgery [7,8,9,10,11,12]

2. Clinical CASE Description

A 55 years old male patient asked for artificial replacement of his extracted teethat the Prosthodontics specialty clinics at the university dental hospital of Taif University (Figure 1).

Figure 1. Intraoral view of patient's remaining teeth occluding on centric occluding position.

Clinical examination results revealed that the patient had an extremely restricted mouth opening with multiple missing anterior and posterior maxillary teeth (Figure 2).

Figure 2. Maximum opening position

Following detailed history taking, intraoral and extraoral examination the treatment plan had been discussed with the patient and consent form was signed by the patient. It was not possible to use the traditional or custom-made separated impression trays as a direct reason of trismus.

After intraoral examination the teeth # 15 and 26 wereexamined for the possibility for occlusal rest preparation as a part of the RPD design. Then the vertical dimensions were recorded. intraoral scanning was performed using an intraoral CEREC video scanning system[1]. The data collected from the digital scan was then united by using software[2] andthe virtual maxillary dentition castswas fabricated (Figure 3) in the standard triangulation language file format. These information are enough to construct the final digital maxillary cast (Figure 4).

The 3 Shape Dental System software,[3] for the computer assisted designingwas used framework designing as it allows electronic surveying and has the ability to design several, complicated frameworks. The cast was survey edelectronically to determine the path of insertion, remove the undesired undercuts. Then the digital framework was designed and fabricated on the digitalized final cast (Figure 5).

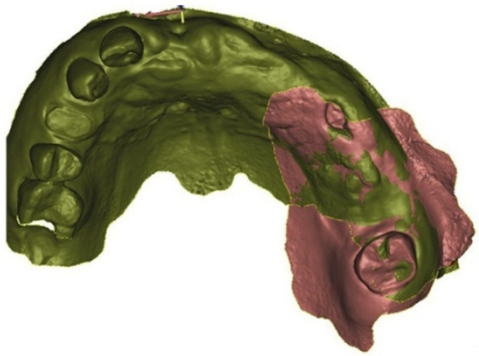

Figure 3. fabrication of the upper model by the overlapping intraoral scanning technique.

[1]CEREC Omnicam, Dentsply Sirona, Sirona Dental Systems GmbH, Germany.

[2]Mimics 17.0, Materialise, Materialise HQ, Technologie, Leuven, Belgium.

[3] 3Shape Dental System: 3Shape, Copenhagen Denmark.

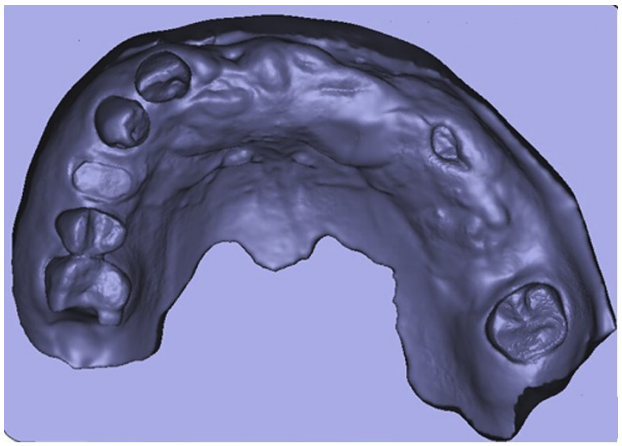

Figure 4. upper digital cast.

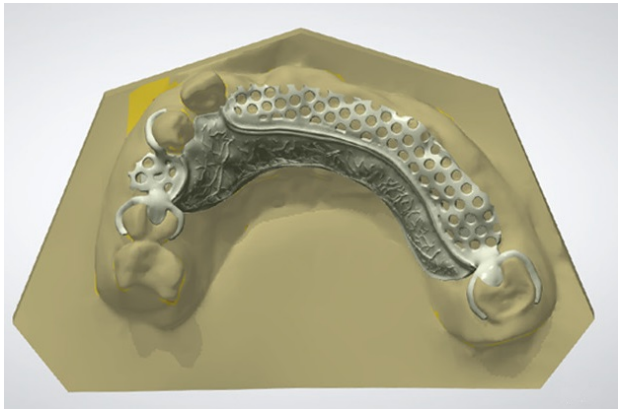

Figure 5. digitalized framework on the final cast.

ASLM machine [4] was used to fabricate the titanium frameworkusing thethree dimensional printing technology.

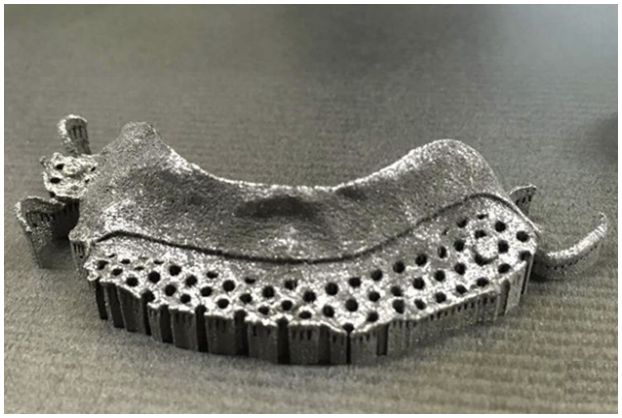

Figure 6. Titanium framework after removing from the SLM machine

The titanium framework was then annealed toincreases the ductility and decreasesthe frameworkhardness and strength, thus, producing a high crack resistant material. Then the supports of the framework was removed, and check its fit on the three dimension printing model (Figure 7).The 3D printing framework was then polished and fitted on the patient mouth (Figure 8) and the RPD was processed (Figure 9 and finally, inserted in the patient's mouth (Figure 10).

[4]SLM®125: SLM SOLUTIONS GROUP AG, Germany.

Figure 7. Titanium Framework checked on the 3D printing polymer cast.

Figure 8. Try-in of the metal framework.

Figure 9. finished prosthesis.

Figure 10. insertion in thepatient'smouth.

3. Discussion

Perfect inserting and aligning of the impression traysis a must during impression taking, this requires a wide mouth opening. Sothis will be difficult to achieve in limited mouth openings patients. Baker et al [3] described a technique using sectional, customized trays for those patients. But this technique has the disadvantages of additional time, materials, and difficulty of reassembling the impression parts and casting them in addition that this method can't be used in cases of extremely restricted mouth openings. Nowadays with the advanced digitalized technologies, Prosthodontistsgain the ability to fabricate precise 3D surfaces of oral structures including the mucosa and teeth and register them in a short time, this allowmakinghighly accurate, time effective impressions.

Digital impression in one scanning process couldn't be achieved in cases of trismus with severely restricted mouth opening. Consequently, 2 sets of scanning data were overlapped and aligned to fabricate the final digital cast.

Even if some areasdid not be completely scanned as a result of restricted mouth opening and the digital impression was not completed, the scanned area of the reformed digitalizedmodelhadenoughdetails forframework designing and construction. With the help of the 3D printing technology and digital impression, the polymerized cast was built.

Designingthe RPD framework was achieved using the CAD software package which has the ability to automatically block the undesired undercuts. Using the CAD software library, Suitable RPD components were selected, dragged and dropped on the dental cast. Suchmethoddecreased the laboratory work and reducedthe design discrepancies.

The smooth titanium framework was treatedto remove a few powder adhesions and then it is tried on the digital final polymercast.

In the conventional RPD, the impression faults, design variation, and casting defects influence the adaptation and fit of such prostheses. Regarding the technique used in this case, the high adaptability and fitcould be accredited to the extremely accurate digital scanning, precise CAD, and the exceptional SLM machine producing frameworks with high mechanical strength and dense void free cross-sections.

4. Conclusions

Regarding the extremely restricted mouth opening case report, digitalized scanning, computer assisted design, and three Dimensional printing technology were successfully used to fabricate a digital impression and construct aRPD alloy framework. Contrasting the conventional method, three dimensional printing technologieshave the ability to construct complicated RPD frameworks.

With advancements within the digital dentistry and application of the batch productionmethod of manufacturing, the inter-operator variability can be reducedin addition to theincreasedaccuracy and time saving.

ACKNOWLEDGEMENT

The researchers would like to acknowledge the Deanship of Scientific Research, Taif University for funding this work.

References

[1] Shankargouda P , Thirumal R , Sachin C S , et al:Prosthetic Rehabilitation of Microstomia Patients: A Systematic Review of Published Case Reports and Case Series. The journal of contemporary dental practice, 2019; 20(4): 508-15.

[2] PhilipM R.: Posterior maxillary segmental osteotomy for prosthodontic rehabilitation of vertically excess maxilla -a review. Journal of Stomatology, Oral and Maxillofacial Surgery, 2019; 120(5): 450-55.

[3] Baker PS, Brandt R L, Boyajian G: Impression procedure for patientswith severely limited mouth opening. J Prosthet Dent. 2000; 4(2): 241-44.

[4] Papaspyridakos P, Galluci GO, Chen CJ, Hanssen S, Naert I, Vandenberghe B. Digital versus conventional implant impressions for edentulous patients: accuracy outcomes. Clin Oral Implants Res. 2016; 27: 465-72.

[5] Hye-N P , Young-Jun L , Won-Jin Y, et al. A comparison of the accuracy of intraoral scanners using an intraoral environment simulator. J Adv Prosthodont 2018; 10: 58-64.

[6] Crafts TD, Ellsperman SE, Wannemuehler TJ, et al. Three-Dimensional Printing and Its Applications in Otorhinolaryngology -Head and Neck Surgery. Otolaryngol Head Neck Surg. 2017; 156(6): 999-1010.

[7] Vandekar M, Fadia D, Vaid NR, Doshi V. Rapid prototyping as anadjunct for autotransplantation of impacted teeth in the esthetic zone.J Clin Orthod. 2015; 49(11): 711-15.

[8] Tunchel S, Blay A, Kolerman R, Mijiritsky E, Shibli JA. 3D printing/additive manufacturing single titanium dental implants: a prospectivemulticenter study with 3 years of follow-up. Int J Dent. 2016: 8590971.

[9] Nawal Alharbi, Saud Alharbi, Vincent M.J.I. Cuijpers, et al. Three-dimensional evaluation of marginal and internal fit of 3D-printed interim restorations fabricated on different finish line designs. Journal of Prosthodontic Research 2018; 62(2): 218-26

[10] Gurpartap Singh, Rupinder Singh, Sarbjit Singh, Partial dentures by centrifugal casting assisted by additive manufacturing , Sādhanā, 2019; 44: 143.

[11] Park SA, Koak JY, Heo SJ, Kim SK, Park JM. RPD framework fabrication using computer-aided design (CAD) and rapid prototyping. J Korean Acad Prosthodont. 2017; 55(1): 94-99.

[12] Wang CH, and Randazzo L. *Evolution of imaging and management systems in orthodontics.* Am J Orthod Dentofacial Orthop. 2016; 149: 798-805.

[13] Yu-Cheng Wang, Toly Chen and Yu-Cheng Lin. A Collaborative and Ubiquitous System for Fabricating Dental Parts Using 3D Printing Technologies. Healthcare 2019, 7, 103.