CLINICAL METHOD FOR ORTHODONTIC DIGITAL CONSTRUCTION BITE

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Abstract: Nowadays removable functional appliances are highly widespread in the field of Orthodontic.
The construction bite taking may be challenge trough intraoral scanner. The problem comes from the fact the patient must stay in the exactly same lay, while the operator make right and left digital occlusion. For the patient is easy to make "the same" bite, and the operator make both sides without difficulties. For fabrication of functional appliances the construction bite require to have space between tooth arches, and upper and lower arch to be in determined relations. There is patients, which can stay steel, during the operator make the both sides, but there is always risk to make a little motion, which will compromise the construction bite and fabrication of appliance. Thereby, the operator need "something" which will provide the tooth arches to stay stable during operator take the construct occlusion.
Purpose: To evaluate the clinical method for Orthodontic digital construction bite taking.
Methodology: Intraoral scanner Medit i 700 was used for presentation of this clinical method. Condensation silicone Zetaplus by Zhermark was used for the bite guide. The patient included in the article was after orthodontic treatment with fixed technique. In the same day the brackets was taken off, the construction bite was taken in clinical setting.
Results: The present clinical method was effective to provide stability during construction occlusion for fabrication of Twin Bloc appliance has been taking. The method may be used for any construction bite that is needed – for other functional appliances, for surgical guide and etcetera.
Conclusions: The digital intraoral scanner are reliable tool for provide accurate 3D model of the teeth, and to take normal and construction occlusion. The described methodology is a little step in digital workflow process, which provide stability of occlusion and chance for clinician to be sure in construction bite. The advantages that it give are improved patient experience, increased treatment efficiency, time efficiency. This methodology is a little step in digital workflow process, which provide stability of occlusion and chance for clinician to be sure in construction bite. The advantages that it gives are improved patient experience, increased treatment efficiency, time efficiency.
The new technology continue to evolve and suite better clinicians needs which affect as improvement of patients care.
Keywords: Orthodontic Digital models, Digital construction bite, Orthodontic functional appliance construction bite, 3D Scanning technic

1. INTRODUCTION

Nowadays removable functional appliances are highly widespread in the field of Orthodontic. This clinical devices were used in first phase of Orthodontic treatment – to prevent future complications and development of craniofacial deformation, during the phase of main Orthodontic treatment in combination with fixed technic – to improve the effects of the treatment and to shortened the treatment time and in the final stage – after the active treatment were finish – to safe the achieved results. (P. G. Yordanova, 2023)
Twin Block is removable functional appliance, which can be used before main treatment for correction and improvement of jaw correlations, as treatment appliance in cases with aligned teeth with need for only occlusion correction and in the end of orthodontic treatment, in retention phase for retention of teeth and occlusion. It was described by Dr. William Clark.(Clark, 1988) It is important do have the appropriate construction bite, when the Twin Block appliance will be used. (Noro et al., 1994)(Shah & Sandler, 2009) The Twin Block used in retention phase keep the teeth aligned, the occlusion stable and the patient profile stay harmonious. (Salloum et al., 2018)
The intraoral scanners become part of everyday orthodontic practice.(Kihara et al., 2020) (Mangano et al., 2016) Developments and digitalization have greatly influenced orthodontic daily practice. The digital workflow participates from first visit of the patient in the office. The manipulation with can be incorporate in the workflow, at the first meeting with the patient, are photo documentation making, virtual models taking, X-rays, computed tomography, when necessary, analysis of the malocclusion was done, using a variety of software for reading imaging studies, some of them with artificial intelligence. The artificial intelligence can be incorporated during patient analysis.(Khanagar et al., 2021) The virtual patient may be created.(Marradi et al., 2020) The way of

communication with the patient changes, through all these visualization methods, the possibility to fulfill the treatment objectives (Virtual Treatment Objectives) and the possibility for the patient to see and understand the different options that the orthodontist offers him for treatment and to make an informed choice for conducting treatment. All these documents are collected and stored easily and accessible from any point, thanks to the digitization of orthodontic documentation. Digital planning of the design of orthodontic appliances makes it possible to meet individual needs in each case.

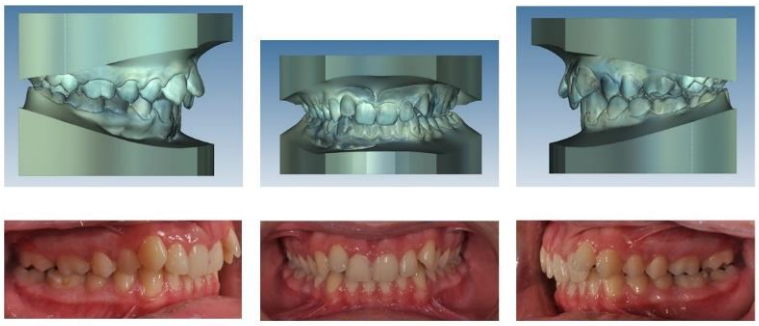
Digital Models can be used for Functional appliance fabrication. In the literature there is a lot of evidence that digital models are accurate compared with real models.(Chiu et al., 2020) (Kihara et al., 2020) The construction bite taking may be challenge trough intraoral scanner. The problem comes from the fact the patient must stay in the exactly same lay, while the operator makes right and left digital occlusion. When the normal occlusion is scanned the patient teeth are bite, they still stable. For the patient is easy to make "the same" bite, and the operator make both sides without difficulties. For fabrication of functional appliances, the construction bite requires to have space between tooth arches, and upper and lower arch to be in determined relations. There are patients, which can stay steel, during the operator make the both sides, but there is always risk to make a little motion, which will compromise the construction bite and fabrication of appliance. Thereby, the operator needs "something" which will provide the tooth arches to stay stable during operator take the construct occlusion. In literature some authors invite methods for achieve stability during scanning of construction occlusion. Charkhandeh et al.(Charkhandeh et al., 2017) supposed to use two point system to achieve stability. The PVS bite registration is separated into three pieces – for both sides and for frontal area. When the dentist scan one side – the other two pieces stabilize the system.

This article will share clinical method for stabilize the occlusion during Orthodontic digital construction bite taking.

2. MATERIALS AND METHODS

Intraoral scanner Medit i 700 was used for demonstration of this clinical method. Condensation silicone Zetaplus by Zhermark was used for the bite guide. It gives the Orthodontist a few minutes working time to precise the construction bite and make correction if patient have difficulties to make it in appropriate way. This is a reason we prefer to work with this material instead of fast setting silicone. The patient included in the article was after orthodontic treatment with fixed technique. The patient was with class II occlusion, before the start of the treatment. (Fig.1)

Fig.1. 3D models and intraoral pictures of the patient before treatment.



During treatment trough class II elastics, the correction of occlusion was made. Twin block removable functional appliance is selected for retention phase, because it can provide teeth and occlusion stability and retention.

The class I occlusion was achieved, but at the start of the treatment the patient was with overjet. (Fig 2)

Fig.2 First row: intraoral scan image with normal occlusion – lateral and central view; second row: intraoral pictures after treatment.

In the day the brackets were taken off, the construction bite was taken in clinical setting.
Firstly, the patient bites a few times in the construction bite need for appliance fabrication. He needs to understand what is his role in the process and what the orthodontist expects. The requirements are first class occlusion, upper and lower middle lines match, incisal edge occlusion in frontal area.
The patient repeated the same bite and the orthodontist think he is trained and ready, the silicone has been adapted in lower jaw. The silicone material covered the occlusal surfaces of lower teeth in distal area. The patient bite in the construction bite with the help of orthodontist and stay steel for few minutes. (Fig. 3)

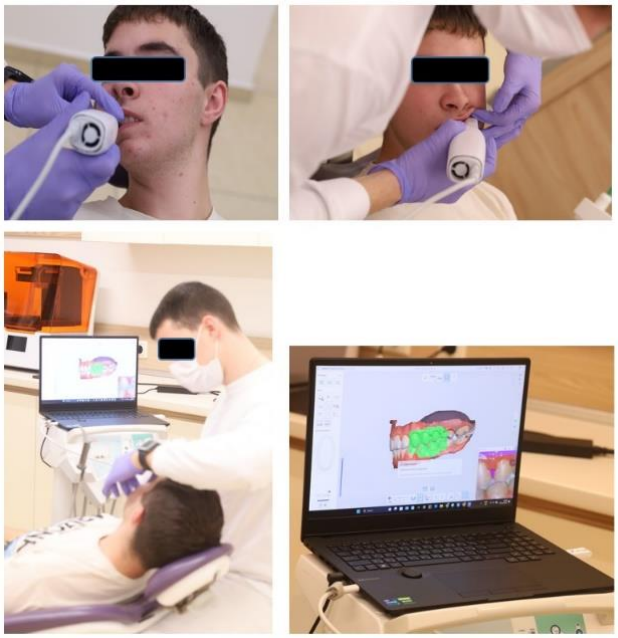
Fig. 3. Taking silicone guide for construction occlusion.

After the silicone impression is ready, the dentist shelf it with scalpel. The aim is only lingual part of the impression and half from the occlusal surface to stay. (Fig. 4) After this the occlusal silicone guide is ready.

Fig. 4. Silicone guide for construction occlusion – the vestibular parts were removed.

The dentist scan upper and lower jaw. Afterwards the patient bites the silicon guide and the occlusion is stable for construction bite registration. The orthodontist may take a pause between first and second occlusion if there was a need.

Fig.5. Taking intraoral scanning of construction occlusion with silicone guide.



The method is fast, easy and establish stability. It is relevant for dentist office in everyday practice. (Fig6) When orthodontist use this method for stabilization and scanned teeth, the silicone material has been not seen in the image on the screen. The scanner detects the teeth from upper and lower jaw, which has been scanned previously and fixed them in proper position.

Fig 6. Image of construction bite trough intraoral scanner.

The constructive occlusion can be sent directly to dental technician laboratory and the team can start to create the appliance design.

3. RESULTS

The present clinical method was effective to provide stability during construction occlusion for fabrication of Twin Bloc appliance has been taking. The method may be used for any construction bite that is needed – for other functional appliances, for surgical guide and etcetera.

Fig.6 First row intraoral photography with Twin block appliance, down row intraoral scan with construction occlusion.

The describe methodology include four steps:

1. Teach the patient how to bite in construction occlusion
2. Taking silicone bite
3. Preparing silicone guide
4. Using the silicone guide to stabilize the occlusion during scanning.

The digital intraoral scanner is reliable tool for provide accurate 3D model of the teeth, and to take normal and construction occlusion.

4. DISCUSSIONS

The developing technology impose a new methods and strategies to incorporate our daily life and everyday clinical practice. When a new task appears, the innovative clinical solution has been created. New technology such as intraoral scanners, 3D printers and laser sintering give new horizons and opportunity to create individualized appliances. Some of them may be fabricate in dental office. The orthodontist makes intraoral scanning and create appliance design through special software. The traditional workflow is transformed by digital era to digital workflow, which have four steps(Digital scan, Appliance design, 3D printing, Appliance delivery) instead of seven steps(Alginate impression, Plaster models, Send to Lab, Design and Casting, Manual finish, Receive from Lab, Appliance delivery).(M et al., 2021) The After that the appliance may be printed by 3D printer or through CAM (Computer aided manufacturing) machine and laser sintering technique. (Graf et al., 2022) (G. Yordanova et al., 2023)(Küffer et al., 2022) (Lowe et al., 2020) (Петрунов, 2023)

The described methodology is a little step in digital workflow process, which provide stability of occlusion and chance for clinician to be sure in construction bite. The advantages that it gives are improved patient experience, increased treatment efficiency, time efficiency.

The new technology continue to evolve and suite better clinicians needs, which affect as improvement of patients care.(Francisco et al., 2022)

5. CONCLUSIONS

Digitally planned and printed orthodontic appliances are extremely accurate, which guarantees patient comfort. In the retention phase of orthodontic treatment of class II patients is important to maintain the new position of the teeth and the achieved inter-jaw ratios. The digital analogue of the Twin block appliance guarantees this, but the key point is the correct structural occlusion removed by the orthodontist during the digital scan. With the methodology described by us, which has been tested in everyday life practice, an efficient and accurate position of the lower jaw is achieved when registering the structural one occlusion. The digital intraoral scanner is a reliable tool for providing an accurate 3D model of the teeth, and construction occlusion from which the appliances are printed.

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