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CLINICAL OBSERVATION OF THE PRACTICAL APPLICATION OF ADDITIVE TECHNOLOGIES IN PATIENTS ORTHODONTIC TREATMENT

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ABOUT ARTICLE

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Abstract: The use of mini-implants is an integral part of the orthodontist's practice. Skeletal attachment minimizes the dependence of the quality of treatment on the patient, allows you to control treatment at each stage and predict more accurately. The key to the successful use of mini-implants in orthodontic practice lies in proper planning.

INTRODUCTION

In order to accurately place the mini-implants in the right position, it is necessary to establish a mechanism for interdisciplinary interaction between a dental surgeon and an orthodontist. In this regard, it is desirable to use CBCT to transmit information about the position of mini-implants. In this case, the orthodontist positions the mini-implant on the CBCT in the most appropriate position for future movement. For accurate positioning of mini-implants, several factors must be considered, including the position of the mini-implant, the angle of the sagittal axis and the angle of the horizontal axis. Navigational surgical templates are a solution to this problem. Currently, navigation templates are used in national and international orthodontic practice to install mini-implants in order to fix orthodontic devices for expanding palatine arches. On the other hand, there is no information about the use of navigation templates at the planning stage of future migration when installing mini-implants. In the international literature, the safe installation of mini-implants in an optimal position has been studied over the past decade. A wire ventilation guide was proposed, which is attached to a fixed arc

device using a ligature wire. The conductor is a series of rings placed at the place of the planned introduction. After fixing the guide wire, intraoral sighting radiographs are made, and the position of the mini-implant is determined by them. The University of Aleppo has also offered the AUSOM tool, which consists of horizontal and vertical parts, a guide and film retention parts. It consists of horizontal and vertical parts, guides and film retention parts. All these instruments involve the use of intraoral sighting radiography to determine the position of mini-implants and do not allow to assess the position of mini-implants in three-dimensional space. Clinical observations of Patient N (36 years old) An abnormal dental position was diagnosed (ICD-10 K07.3.). Patient N consented to orthodontic and surgical treatment, as well as to the processing of personal data by informed consent. To correct the abnormal position of the teeth, it was necessary to install Bio-Ray A-1 PL BSS 2.0 x 14 mm mini-implants (Bio-Ray, Biotech Inc., Taipei, Taiwan) in the third and fourth segments of the outer oblique row. To install mini-implants, it was decided to use a navigational surgical template which is the key to interdisciplinary collaboration. For further work, it was necessary to obtain a CBCT, an actual X-ray examination, and an STL file, the result of an intraoral scan; based on CBCT data, the orthodontist, guided by the presence of a sufficient amount of bone tissue, a plan for future movement and surrounding structures, could choose a physical one In the ImplaStation program (ProDigiDent, USA), virtually modeled mini-implants corresponding to the size of mini-implants were positioned. In the third segment, mini-implants are located in the outer oblique area, parallel to the longitudinal axis of the tooth 3.7, 1.5 mm vestibular to the root 3.7 and 2 mm coronal to the mandibular canal. In the fourth segment, also in the outer oblique region, parallel to the longitudinal axis of the tooth 4.7, 1.5 mm vestibular to the distal root of the tooth 4.7 and 2 mm coronal to the mandibular canal. This stage allowed the dental surgeon to obtain the most accurate information about the required position of the mini-implant. After taking digital optical impressions, control models were created using Autodesk Meshmixer v.3.0 (Autodesk Inc., USA) to verify compliance with the extraoral navigation template.ImplaStation (ProDigiDent, USA) for comparing DICOM and STL files. The comparison was carried out using CBCT and approximate points on the generated surface of the digital 3D model. The coincidence was checked and corrected in axial, coronal and sagittal sections. Soft tissues were used as a reference point for confirmation and correction, since intraoral hard tissues and fixed metal structures generate artifacts (glow) and make it difficult to determine the boundaries of the comparison. The boundaries of the navigation pattern were determined on the STL surfaces of the resulting mini-implants and sleeves. The boundary points were placed and the trajectory of the template introduction was determined. The thickness of the template and the gap between the template and the surface of the optical impression were determined, optimally 0.1 mm. Occlusion holes were

provided in the template to control the fit of the template. Vertical holes were also drilled in the side sections of the guide to control the installation of mini-implants and not interfere with the removal of the template after the installation of the mini-implant. In this case, the two parts of the template were combined to increase the strength of the structure, since it had to be inserted from both sides . The resulting STL files of the navigation template and model were then combined with the STL files of the Anycubic Photon Workshop 3D Slicer Software 3D printer (Anycubic Technology Co., Ltd.). The procedure for installing mini-implants was performed under local anesthesia. The procedure for installing the mini-implant was performed under local anesthesia. Before the start of anesthesia, a navigation template was installed.Mini-implants were installed using a machine drive, a physiodispenser Anthogyr Implanteo LED Implant Motor System (Implanteo® LED; Anthogyr, Sallanches, France), surgical reduction 20:1. An angled tip was used. The transmucosal insertion of mini-implants into bone tissue was carried out through the guide of a navigation template with visual depth control through a slit formed in the guide. Then the navigation template was removed from the patient's mouth, individual removable devices (aligners) were installed and mini-implants were loaded. Patients were instructed about standard recommendations for the care of the mini-implant area. For the patient, this meant confidence that the mini-implants installed using the navigation template are in an optimal position, which leads to gentle personal hygiene in the installation area, i.e. that the stability of the mini-implants can be disrupted in the process of aggressive personal hygiene. the psychological barrier associated with the concern that the stability of mini-implants may be disrupted in the process of active personal hygiene has been eliminated.

RESULT

Currently, techniques for installing mini-implants using navigation technologies are known, including a simple three-dimensional stainless steel stent Felicita AS (2013). It is made on the basis of average anatomical data, the place of administration and, in some cases, orthopantomograms. A U-shaped bend is made at the end of the wire with a distance of 2 mm between the ends, the bend is located at an angle of 20 ° to the remaining straight part of the wire, where the height of the mini-implant is marked, and bends at right angles. In this study, the free part of the wire is held in the channel of the auxiliary molar. The position of the stent is monitored using intraoral sighting radiography [10]. The advantages of this method are simplicity and speed of manufacture, but since this technique is not the result of three-dimensional visual analysis, the positions obtained are also averaged, as in the case of installing mini-implants without the use of navigation techniques. The use of the stent presented in this work directly depends on the presence or absence of a bracket system at the time of installation of the mini-implant,

which makes it difficult to use it in the case of treatment using other devices, unlike the navigation template presented in this work, which is the result of CLCT-based planning. The method of creating a navigation template presented in this paper is relatively time-consuming, but highly accurate and can be remotely controlled by a dentist and orthodontist. The results of this study confirm the feasibility of creating and using navigational surgical templates for the installation of orthodontic mini-implants. The use of navigation techniques allows you to accurately set them to the position planned for CBCT. This avoids complications associated with the installation of mini-implants, ensures the most favorable position of mini-implants and facilitates the implementation of orthodontic treatment plans.

CONCLUSION

The use of navigational surgical templates greatly simplifies positioning and facilitates interdisciplinary interaction between orthodontists and dental surgeons. This allows you to expand the indications for the use of mini-implants in case of bone deficiency. It is important to note the simplicity and speed of manufacture, as well as the relatively low cost of navigational surgical templates. As a result, there is less general concern about whether hygienic care and diet will disrupt the place of installation of the mini-implant. If there is no bone tissue or if the root of the tooth or other anatomical structures are located in the immediate vicinity of the mini-implant installation site, it is recommended to use a navigation template for installing mini-implants.

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