

Personalized Experience Design of Virtual Reality System Based on Oral Implant Model

Mei Yun, Deng Xiangwei

(School of mechanical engineering and automation, University of Science and Technology Liaoning, Liaoning, 114051, China)

E-mail: meiyunliaoning@163.com

Abstract. The purpose of the medical process of oral implant is more convenient, with a personalized user experience; the previous 2D CT data into 3D data, surgical implant template 3D print generated, into the 2D CT data into 3D data input virtual reality system, by the technique of virtual reality simulation planting environment, method of oral implant; change the final of this technology can improve the efficiency of medical work, correct medical errors, to avoid unnecessary problems, enhance the patient experience.

1. Introduction

Since the Swedish scientist Branemark proposed the theory of bone binding in 1960s, oral implant has developed rapidly [1-5]. After nearly fifty scholars and a lot of experimental research and clinical practice, implant restoration has played an important role in dental restoration. Now it has become one of the first choices for missing teeth restoration. Dental implant surgery guide plate is a method for making dental implant guide plates with incomplete missing teeth. The application of implant guide plate can transform the implant design to operative operation accurately, so as to achieve accurate implant placement in operation. In today's medical dental implant field, with the development of planting technology, the concept of "repair guided planting technology" requires that implanted implant can meet the needs of postoperative restoration. Therefore, accurate implant placement is the key to implant restoration. In 1987, Edge implanted implant for implant for the first time, which changed the previous implant experience only with the clinical experience and the preoperative imaging information [6-8].

With the development of science and technology, the application of three-dimensional imaging technology [9-10], computer-aided design and production in stomatology, and the digital planting guide have also come into being. Such as computer aided design and manufacturing (CAD/CAM) planting guide, because of the popularity of 3D printing technology, 3D printing planting guide as a computer-aided design and production of the planting guide has also attracted much attention. 3D printing dental implant guide plate is the implant implant model CBCT scan, three-dimensional reconstruction, and initial simulation of the implantation of models for registration, import error analysis. In the traditional guide under the guidance of the actual implant neck in mesiodistal and buccolingual and vertical deviation values were 0.86±0.16, 0.83±0.20mm, 0.67±0.17mm, the actual implant tip in mesiodistal and buccolingual and vertical deviation values were 1.03±0.13mm, 1.004±0.15mm, 0.76±0.19mm, from the implant neck, tip and the angle values were 1.61±0.15mm, 1.37±0.2mm, 2.89±0.720. in 3D printing plate under the guidance of the actual implant neck in mesiodistal and buccolingual and vertical deviation values were 0.19±0.11mm, 0.13±0.04mm,



0.33+0.10mm, the actual implant tip in mesiodistal and buccolingual vertical deviation, respectively. 0.27+0.11mm, 0.20 0.07mm, 0.46+0.25mm, from the implant neck, and tip angle values were 0.60+0.21mm, 0.4240.10mm.

Most software systems for oral implantology are based on a multi-view approach, often accompanied with a 3D rendered model. A more integrated and realistic 3D approach for implant surgery is desirable, in order to gain a deep and sure knowledge of patient's anatomy before inserting the implants, thus reducing the risk of damaging surrounding structures. Tommaso Chiarelli [11] present a 3D software system where computer graphic techniques have been used to create a smooth and user-friendly 3D environment to work upon for oral implant planning and simulation. Interpolation of the axial slices is used to produce a continuous radiographic volume and to get a isotropic voxel, in order to achieve a correct work context. Freedom of choosing, arbitrarily, during the planning phase, the best cross-sectional plane for achieving correct measurements is obtained through interpolation and texture generation. Correct orientation of the planned implants is also easily computed, by exploiting a radiological mask with radio-opaque markers, worn by the patient during the Computed Tomography (CT) scan. Precision in measures was validated by considering different scans of a dried human partially edentulous mandible, which was scanned several times, with different angular orientations. Precision achieved outperforms usual DentaScan multi-view approaches, and it is comparable with or better than that obtained by the DentalVox tool (from 0.16% to 0.71% error in measures).

With the rapid development of technology, dental implant in the fields of virtual reality technology in the oral cavity (Figure 1) into tooth planting, which is the 2D CT data into 3D data input in virtual reality system, the virtual reality simulation environment for planting, oral dental implant, the virtual nature of the operation to the doctor and patients with personalized surgical experience, so as to promote the further development of the medical field of oral implantology.

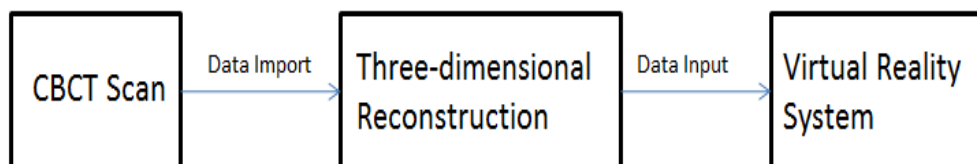


Figure 1. Virtual Reality Technology for Dental Implant

2. Application of virtual reality technology in oral implant model

In recent years, the introduction of virtual reality technology has gradually begun in the field of health care. This technology can not only improve the service level of medical staff, improve the efficiency of disease treatment, but also improve the patient's medical experience and personal health management. As a result, virtual reality technology is also quoted in oral dental implants to bring personalized medical experience and medical experience. The virtual reality system of planting dental plate, virtual reality technology is the key: one is according to the reality of operating environment quantitative data, and through the data to establish the model of dental implant; the two is through the image generation technology to generate space simulation environment; three is through the stereo display technology and sensor technology, the realization of human-computer interaction.

2.1. pre-operation data integration simulation

The oral implant surgery image data into operation before the use of virtual reality technology, the establishment of medical records, the preoperative image data into the system, preliminary judgment

and model and position of the implants in the maxilla, information and system integration with forming a three-dimensional operation environment, the localization of the oral region patients, determine the key steps for data integration operation simulation.

2.2. operation environment simulation

For complex operation, virtual reality system can be studied, and the three-dimensional space of oral part can be clearly defined, so as to provide a path for the safer operation and determine the surgical plan. Usually, body implants in the actual operation in the operation site there will be error between the actual position system, the authenticity of such image data will have deviation, in order to prevent operation error, by simulating the environment of virtual reality technology on the operation, the reappearance of the scene, to guide the oral implant surgery operation simulation by importing the image data of preoperative surgery can be the real scene, simulating the operation path, a variety of ways of operation, can reduce operation error, improve the success rate of surgery.

2.3. cross space time touch exercises

The boundaries of the virtual reality technology across time and space, realize the simulation of multidimensional space, the specialist for remote operation, the trainee can be within this space close touch to expert doctors and cold surgical instruments, through distance learning, close touch, across time and distance, fast and convenient practice. To save time, improve work efficiency; make full use of medical resources. And in the operation process of experts, doctors can carry out simulated training, perform intraoperative tests in person, exercise their own surgical skills, and get expert remote guidance, repeat practice and get more training experience.

2.4. long distance rehabilitation guidance

Patients will go through a period of convalescence, dental implant guide plate in the cavity of surgery, postoperative will appear teeth pain, dislocation and displacement of a series of pressing problems caused by oral disease, can communicate through virtual reality system with the doctor, let the doctor real-time scene conversion to this environment, touch to the patient's pain, understand the needs of patients, remote rehabilitation guidance, can cross the boundaries of space, more efficient completion of the guide, improve the efficiency of doctors, and more quickly to save the patient's pain.

3. Individualized medical experience

In today's era, the application of every technology and the application of every system model should consider user experience. The design should be people-oriented, and the application of technology should be user centered. For medical equipment, doctors and patients design technology should pay attention to let the doctor in the operation process, can not only see the core parameters of the patients, and cannot disperse the attention of doctors, allow doctors to focus on the operation, in the use of this whole process is reflected in the doctor to the patient as the center principle in patient body embodies the concept of good design experience.

3.1 The doctor's experience using virtual reality technology

The doctor in the use of virtual reality system for dental implant surgery, surgical preparation formulation, operative approach, surgical tracking process, there will be a variety of problems; such as surgical preparation, patient image data input to enable doctors to understand the temporary factors, the doctor through the virtual reality technology and more convenient arouse the patient's medical records database, a clearer understanding of patient data, so as to establish the best operative route, the operation of this technique may give doctors a more friendly and intuitive user experience. During the operation, limit the application of virtual reality system across time and space, the doctor can perform remote operation for patients, which not only brings convenience to the experts, save more time, improve work efficiency, can help more patients in the limited time, to bring this technology operation is the spirit of the doctor will experience, completion of the technical operation based on more easily

and efficiently. In the process of operation tracking, doctors can track patients' short-term effect after operation, which is more convenient and convenient for patients. It not only brings convenience to doctors, but also brings convenience to patients.

The operation process of the dental implant guide plate model in the oral cavity, doctors and patients to achieve user experience through virtual reality technology, increase the doctor-patient communication, reduce fatigue, operation complexity, reduce the patients on medical process uncertainty and concerns about the recovery process, make health experience more comfortable.

3.2 The patient's experience using virtual reality technology

When patients in the hospital, surgery, due to the fear of the unknown, usually feel anxious and helpless, change in medical equipment cannot be the case, can be integrated into the new technology, new experience, to reassure patients from various visual angles, improve the patient's feelings. Virtual reality technology can simulate a new dental implant surgery, patients can experience the whole process of dental implant operation in the atmosphere environment, let them personally perceived oral medical instrument cold, so they believe that more medical personnel, to increase confidence in the success of dental implant, to alleviate the psychological pressure, get good experience. Virtual reality technology can realize remote rehabilitation therapy, dental implant success need timely observation correction, regular hospital run to patients feel tired, tired, remote postoperative rehabilitation tracking can effectively solve the time and space differences in regional, more rapid and convenient for patients to provide the first time medical service, bring a new user experience. This kind of empathy, based on the psychological considerations of the patient, helps us to understand the user.

Oral implant experience can be combined by the technology and design phase, for guiding the use of virtual reality application system model, can increase patient comfort and relaxation, and eliminate the patient's loneliness, relieve patients of the planting process of uncertainty and fears, for they simulated a friendly, family planting environment let the experience of dental implant, more personalized, more comfortable.

4. Conclusion

The purpose of the medical process of oral implant is more convenient, with a personalized user experience; the previous 2D CT data into 3D data, surgical implant template 3D print generated, into the 2D CT data into 3D data input virtual reality system, by the technique of virtual reality simulation planting environment, method of oral implant; change the final of this technology can improve the efficiency of medical work, correct medical errors, to avoid unnecessary problems, enhance the patient experience. Oral implant experience can be combined by the technology and design phase, for guiding the use of virtual reality application system model, can increase patient comfort and relaxation, and eliminate the patient's loneliness, relieve patients of the planting process of uncertainty and fears, for they simulated a friendly, family planting environment let the experience of dental implant, more personalized, more comfortable.

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