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Research Article

Evaluation of the Application Effect of Standardized Four-hand Operation in Biofunctional Prosthetic

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Abstract

Objective: To explore the standardized nursing cooperation method in the process of biological functional denture restoration. *Methods*: From January 2022 to January 2024, 82 patients with full edentulous jaws restored with biological functional dentures in the Department of Stomatology, a Grade III level A hospital in Hubei Province were selected. The standardized four-handed operation nursing cooperation was implemented, and the time doctors took the primary impression, the satisfaction rate of doctors with the four-handed operation cooperation ofs nurses, and the satisfaction rate of patients with nursing service were evaluated. *Results*: the average time of the doctors to make the first impression was 32.37±1.30 min, the satisfaction rate of the doctors to the nurses' four-hand operation was 100%, and the satisfaction rate of the patients to the nursing service was 99%. *Conclusion*: The standardized four-hand operation in the process of biological functional restoration system could improve the work efficiency and the satisfaction of doctors and patients, which was worthy of clinical promotion.

Keywords

Biofunctional Prosthetic System, Standardized, Four-Hand Operation

1. Introduction

The loss of dentition is a prevalent oral condition among the elderly, Only 1.7% of elderly patients with edentulous jaws receive implant surgery, and complete denture restoration is the main treatment option for patients [1, 2].

Biofunctional Prosthetic System (BPS) is an efficient and feasible technology for making and repairing complete dentures, BPS uses a standardized production process to implement a complete set of fine operating systems and supporting materials in accordance with standardized procedures, BPS is one of the most complete denture restoration systems in clinical work, which is well recognized by dental restorers and patients with edentulous jaws [3, 4]. Good dental prosthesis medical technology is the basis for obtaining satisfactory prosthesis effect, In addition, the accuracy of impression making, patient compliance and fine perioperative nursing are important factors affecting the repair effect. [5]

Standardized management is a modern management method guided by the basic theories of modern management science such as system theory, information theory and control, and based on the principle of standardization, which runs through the whole process of nursing work and aims to improve personal quality and efficiency as well as work quality and efficiency. [6]

In order to ensure the effect of BPS repair, improve work efficiency and standardize the four-hand operation nursing cooperation, our department has implemented standardized

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nursing cooperation for patients who have completed complete denture restoration with BPS technology since 2022, and achieved good results. The key points of nursing cooperation in the process of BPS technology are summarized as follows.

2. Materials and Methods

2.1. Clinical Data

A retrospective analysis was carried out on 80 patients with total dentition loss from January 2022 to January 2024.

Inclusion criteria: Patients who were confirmed with total dentition loss by oral examination and had low alveolar ridge and normal mucosal color and smoothness, patients with normal consciousness who could cooperate with the treatment plan, and patients with detailed clinical data;

Exclusion criteria: Patients with congenital double-jaw deformity, patients with temporomandibular joint disorders, patients who had received a complete denture, patients with low tolerance to prosthetics, patient with unfavorable compliance, patients who were allergic to narcotic drugs, patients with severe systemic infection, and those with coagulation dysfunction.

2.2. Methods

The Preparation of Initial Impression Management

The prosthetics in our department are currently undergoing export processing, and the BPS repair process primarily consists of four stages: (1) Reinforced the initial impression: During the initial visit, the dental specialist conducted a thorough examination and selected an appropriate median jaw tray based on the patient's dental arch size. Alginate impression material was used to obtain the initial impression, followed by creating a plaster injection mold and hand-adjusted silicone rubber for establishing the occlusal relationship. The plaster model, median occlusal relationship, and design sheet were then sent to the processing plant where individual trays were custom-made for the patient before being returned. (2) Reinforced the final impression: After receiving the individual trays sent back by the factory, our department made an appointment for the patient's first visit, prepared the functional final impression and the occlusal record, and sent them to the factory again, the plaster injection mold maxillary frame, and the technician tried to arrange the teeth. (3) Tried on denture: Followed the patient's satisfaction with the denture try-on during their second visit, a dental technician filled and polished the denture using adhesive. (4) Denture wore: At the third visit, the patient completed the initial wearing of the full denture. Dental nurse implemented standardized nursing cooperation for all patients with toothless jaws, including standardized item preparation, patient preparation, four-hand operation cooperation, etc. The specific procedures were as follows.

(i). Reinforced the Initial Impression

(1) *Assessment and education*: Oral health Impact Scale (OHIP-14) was used to measure patients' oral health-related quality of life before treatment, Through the initial interview to understand the patient's restoration goals, combined with the actual situation of the patient's oral cavity, the appropriate restoration plan was formulated [7, 8], The complexity of BPS, the long treatment cycle, and the high frequency of follow-up visits should be communicated to patients in advance. Informed consent is required prior to undergoing the procedure. In addition, in view of patients with many negative emotional problems due to long-term tooth loss, nursing staff took a good nurse-patient relationship as a bridge, took the co-participation diagnosis and treatment mode as the guidance, used professional knowledge and skills to disseminate oral knowledge and aesthetic concepts after restoration to patients [9], encouraged and supported patients through language, body and expression, and patiently and carefully gave answers to questions.

(2) *oral nursing care*: Patients were instructed to gargle with 1% hydrogen peroxide for 1 minute.

(3) *Preparation of material*: Golden Mark, ACCU edentulous jaw tray, syringe, median jaw tray, hand-adjusted silicone rubber, vertical distance ruler, marker, 2 mixing knives, 2 mixing bowls, disposable oral treatment tray, Vaseline cotton swab.

(4) *posture nursing*: Helped the patient assume the appropriate position, preferably supine or a near-supine position. Assisted in facilitating a smooth transition into the desired position by adjusting both the headrest and chair height accordingly. It was not advisable to employ a head-down position, particularly for elderly patients with spinal deformities or respiratory conditions. Patients were informed about adjustments to the chair's positioning in order to prevent any feelings of nervousness, anxiety, or discomfort resulting from sudden changes in elevation [10].

(5) *Health education*: The patient was informed about the safety of the material for taking molds and reassured. The patients were instructed to watch the self-made "five-step coordination method for patients with closed mouth impression", and then the nurses used the biological functional system to train the patients on pronunciation, face and mouth movement. The patients were instructed to complete three movements: first, pouting and making "wu" sound, and then, they were instructed to make mouth retraction and grin and make "yi" sound. The third movement instructs the patient to suck the operator's finger hard with mouth contraction, while pushing and pressing the tongue toward the inside of the tray to perform the swallowing movement.

(6) *Skin care*: Applied petroleum jelly around lips.

(7) Took modulus by BPS, An appropriate size tray was selected, slightly larger than the dental arch, and a gap

of about 3 mm was left between the inner surface of the tray and the tissue to ensure that the impression material could be accommodated, The BPS system uses Accu tray system, high-flow injectable ACCU-Gel and double impression film method of heavy impression material to obtain primary impression. BPS mold taking steps: according to the ratio of gouty powder 30: 15, the "light body" with fluidity is first transferred to the 30 ml needle tube, and then according to the ratio of gouty powder 26: 15, the thick "heavy body" is transferred to the tray. The impression material in the needle tube was evenly injected into the gantry, and the tray was placed into the patient's mouth and removed after solidification. When taking the maxillary mold, the patient should be guided to correctly say "ah" sound. When taking the mandibular mold, the patient should be guided to extend the tongue 3 times and swing the tongue 3-5 times. When taking the intermaxillary distance, the patient should sit in the upright position to swallow. (See Figures 1 and 2)

Figure 1. *Took modulus by BPS in maxillary teeth.*

Figure 2. *Took modulus by BPS in mandibular teeth.*

(8) After impression taking by BPS: Dental nurses helped patients clean up the residual materials around the oral cavity and gargle after taking the molds. Centric Tray, Conduro caliper, and Virtual putty were used to obtain the preliminary intermaxillary distance to assist the doctor to accurately capture the natural shape of the retromolar pad during closed jaw rest [11]. Avoid harming the patient's eyes with flash when taking photos. Inform the treatment progress and follow up as required. After the casts were removed, the doctors sent the casts, the median occlusion relationship, and the design sheet to the processing factory, and the technicians made individual trays for the patients and sent them back. (See Figure 3 and 4)

Figure 3. *Individual trays in maxillary teeth.*

Figure 4. *Individual trays in mandibular teeth.*

(ii). Reinforced the Final Impression

(1) Preparation of material: Virtual heavy body, tray adhesive, light body, vertical distance ruler, marker, disposable dental treatment disc, vaseline cotton swab, 3D joint.

(2) preparation of the patients: Gargled with 1% hydrogen peroxide in a comfortable position for 1 minute and applied vaseline around the mouth.

(3) The final impression was made with the cooperation of

doctors and nurses: During the final impression taking, the patient was instructed to stimulate muscle movement by sucking, lateral mandibular movement for 5-8 times, and alternate lip purse and smile for 5-8 times [12]. did a good job of saliva suction and nursing. The saliva suction position could be placed under the tongue or throat area of the patient, and kept the operating area free of water, saliva, and stains. took the right-handed doctor as an example, the nurse should stand in the four-handed 3-point working position when taking the maxillary tooth impression, and the four-handed 2-point working position when taking the mandibular teeth. When the material was flexible, the sitting position could be used to take the mold. During the process of taking the mold, the standing position of the nurse should ensure that the doctor can not only see all the conditions in the patient's oral cavity smoothly, but also observe the patient's situation during the whole operation and give timely feedback to the doctor within the field of view of the patient. In the process of mixing the light and heavy body, attention should be paid to the influence of the thin consistency of the material on the mold taking and the adaptability of the patient to the material. Nurses timely adjusted the dilute consistency of the material according to whether the patient had nausea, vomiting, dizziness and other discomfort. The dental nurses should observe the facial expression and comfort of the patients when performing the Gothic bow. If the patient's facial expression was abnormal, the doctor should be promptly alerted to postpone the operation until the problem was solved. The operation time should be shortened as far as possible to improve the success rate and take photos if necessary. then, Sent the final impression to the factory (See Figures 5 and 6), The technician would send the semi-finished denture back to us after the trial arrangement (See Figures 7 and 8).

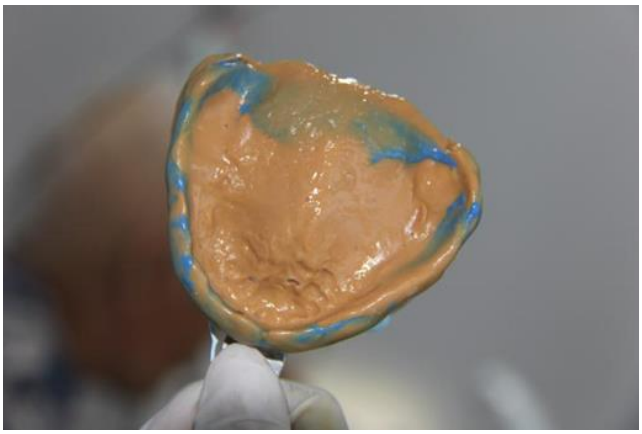

Figure 5. *Final impression in maxillary teeth.*

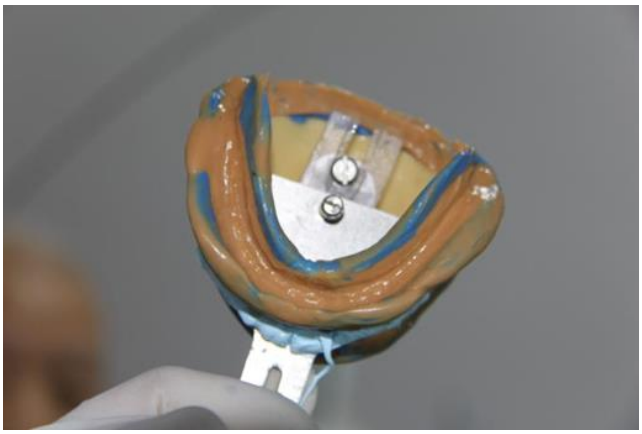

Figure 6. *Final impression in mandibular teeth.*

Figure 7. *Semi-finished denture in maxillary teeth.*

Figure 8. *Semi-finished denture in mandibular teeth.*

(iii). Tried on Denture

(1) Preparation of material: Low speed straightening machine, articulator paper, grinding head, alcohol gauze block, three - use gun, disposable oral treatment plate, mouthwash cup.

(2) Doctors and nurses cooperated to try the denture on the patient: After guiding the patient to wear the artificial teeth correctly, the arrangement and occlusion relationship of the artificial teeth were checked. The nurse passed the mirror and asked the patient whether there was tenderness and whether the face was satisfied. If there is no problem, it will be sent back to the pro-

cessing factory. The technician will fill the glue to complete the denture and then send it back. When the patients were escorted away, they were asked to bring a few snacks, such as apples, cookies, and sesame flowers, to the next visit to experience the final denture wearing effect.

(iv). Denture Wore

(1) Preparation of material: Low speed straightening machine, articulator paper, grinding head, alcohol gauze block, three - use gun, disposable oral treatment plate, mouthwash cup, Prepared high point indicator if necessary.

(2) Doctors and nurses cooperated to wear dentures for the patient: The patients were instructed to eat snacks after wearing the denture correctly, and their feelings were inquired, and the partial denture was adjusted and polished to patient satisfaction. (See Figures 9 and 10).

(3) Health education: Patients tend to have foreign body sensation, drooling, slurred speech, and even nausea when they first wear dentures [13], encouraged patients to insist on wearing it and gradually adapt to it. No strong force should be used when wearing the denture, and the denture should be gently worn in the direction of the common insertion path of the denture to avoid breaking the plastic base or deformation of the stainless steel wire. If there was slight pain and discomfort, the denture should be used for a period of time. If the pain was obvious, the denture should be removed in time and not worn temporarily. It was best to put the denture in 2 hours before going to the hospital to facilitate the analysis of the cause of the pain. During the initial denture wearing period, the patients usually start with a soft diet, and transition to a normal diet after a good adaptation. The dentures should be removed in time after eating, rinsed carefully, cleaned with a soft brush or low-solubility baking soda, and immersed in cold water before sleeping [14]. In addition, if the denture had some wear and tear during the use of the denture, if the tooth surface was worn and flattened, the denture was not fit with the teeth, there was more food impaction, and the denture was damaged and deformed, it should be treated in time.

Figure 9. *Partial denture in maxillary teeth.*

Figure 10. *Partial denture in mandibular teeth.*

2.3. Evaluation

(1) The successful time of taking the first impression: the time of taking the first impression was recorded. The shorter the time of taking the first impression, the higher the working efficiency. (2) Doctors' satisfaction with nurses' cooperation: doctors' satisfaction with nursing process was evaluated by nursing satisfaction scale, with a total score of 100 points and very satisfied $\geq$ 80 points. Satisfaction score was 60-79; Dissatisfaction $\leq$ 59 points. (3) Patient satisfaction: The visual analogue scale (VSA) of denture satisfaction was filled in immediately after wearing teeth for satisfaction survey [15], including tooth aesthetics, oral language function, masticatory function, comfort and retention function. The best score was 100 points, and the worst was 0 points.

3. Results

In this study, the average time of the doctors to make the first impression was 32.37±1.30 min, the satisfaction rate of the doctors to the nurses' four-hand operation was 100%, and the satisfaction rate of the patients to the nursing service was 99%. The results were good.

4. Discussion

Edentulism is a common disease in stomatology, which affects the appearance and is closely related to the health of patients. The application of BPS technology has updated the traditional workflow of complete denture restoration, and making complete dentures according to the steps and materials of BPS can improve the success rate of complete denture production and patient satisfaction [3, 16]. However, due to the relatively low treatment compliance of elderly patients, the decline of facial muscle activity, and the lag of understanding and imitation ability, the failure rate of impression is increased and the work efficiency is low. Studies showed [17] that efficient nursing cooperation could improve patients' comfort and compliance, increasing the success rate of impression and work efficiency. The standardized operation process optimizes the nursing process based on the conven-

tional nursing method to achieve the effective cooperation of doctors, nurses and patients [18]. Whole-course fine nursing provides targeted and humanized nursing services for patients, alleviates patients' anxiety, and patients are satisfied with the restoration effect. There is no tenderness in the later stage, and the denture retention is good, which significantly improves the quality of life of patients and is worthy of clinical promotion.

5. Conclusion

The standardized four-hand operation nursing cooperation in the process of biological functional restoration system could enhance the nurses' awareness of active cooperation, effectively shorten the successful time of primary impression preparation, standardized the medical cooperation process, implement the seamless medical cooperation mode, improve the work efficiency and the quality of diagnosis and treatment, and improve the satisfaction of doctors and patients, which was worthy of clinical promotion.

Abbreviations

BPS Bio-functional Prosthetic System

Author Contributions

Li Zhang: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

Tingting Chen: Methodology, Software

Ting Wei: Data curation, Investigation, Supervision, Writing – review & editing

Conflicts of Interest

All the authors do not have any possible conflicts of interest.

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