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Optimisation Of The Manufacturing Method For Overlaid Prosthesis Structured By Teeth And Dental Implants

Turaev Alimjan Bahriddinovich

Samarkand State Medical University, Uzbekistan

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Abstract: Dental defects are a prevalent disease of the dentoalveolar system. The demand for the production of detachable prostheses within the spectrum of prosthetic care is significantly large, ranging from 33% to 68% [4-6]. Following tooth loss, atrophy occurs in the alveolar process of the maxilla and the alveolar segment of the mandible.

Keywords: Partial edentulism, removable dentures, attachments, overlapping dentures, hygiene of removable prosthetic dentures.

Introduction: Dental defects are a prevalent disease of the dentoalveolar system. The demand for the production of detachable prostheses within the spectrum of prosthetic care is significantly large, ranging from 33% to 68% [4-6]. Following tooth loss, atrophy occurs in the alveolar process of the maxilla and the alveolar segment of the mandible. The atrophy process beneath a removable denture is permanent, since the bone fails to accommodate the masticatory stress [13-17]. Alongside bone atrophy, the position of the transitional fold alters. On the vestibular aspect, the arch of the fold flattens and aligns with the denture base, while the attachment sites of the muscles and frenulum shift nearer to the centre of the alveolar ridge. This significantly diminishes the expanse of the denture field, adversely impacting denture retention [2, 18, 19]. It is crucial to avert the complete loss of all teeth in the patient due to these procedures. Prosthetics in the whole absence of teeth do not consistently yield the intended outcome [1, 3]. The

natural teeth in the oral cavity maintain the volume of the jawbone, and even with a limited number of teeth, the retention of a removable prosthesis is significantly more successful than in the full absence of teeth, particularly evident when fabricating a prosthesis for the mandible [20]. Inadequate assessment of periapical tissues results in the extraction of roots that might stabilise a detachable prosthesis, hence enhancing its retention dramatically [21]. Numerous approaches exist for repairing the crown portion of a tooth through various stump post configurations; however, their efficacy in detachable prostheses is not always reliable. Consequently, overlapping prostheses including locking mechanisms and dental implants are gaining popularity in the field of prosthetic dentistry. This type of prosthetic construction can mitigate the atrophy of the alveolar process and enhance the stability of removable prostheses [22]. Lock fasteners alleviate pressure on the mucosa and enhance functional efficiency by redistributing pressure to the supporting teeth, hence positively influencing the stabilisation and retention of prosthetic devices [24]. The diminution of the base border expedites patients' adaption to prostheses, while the inconspicuous attachment parts facilitate the attainment of an optimal aesthetic outcome.

The objective of the study is to enhance the quality of prosthetic therapy for partially edentulous patients by the utilisation of overlapping prostheses anchored by spherical attachments, dental implants, and collapsable dental implants.

METHODS

A total of 27 patients (12 males and 15 females), aged between 59 and 74 years, received treatment at the Department of Orthopaedic Dentistry of Samarkand State Medical University. The disease of dental arches was characterised by isolated teeth with compromised crowns. The objective examination encompassed an external assessment of the face, oral cavity, and mucous membrane of the denture bed, with particular emphasis on evaluating the periodontal status of the remaining tooth roots. Three-dimensional dental computed tomography was conducted to assess the condition of the supporting teeth's bone tissue, as well as in patients with dental implants. The research was conducted using a digital dental computed tomography system equipped with panoramic diagnostic capabilities, specifically the "Kodak 9000 3D". The patients were categorised into three groups for the study. The initial control group comprised 10 patients who received partial removable plate prostheses (6 for the maxilla and 4 for the mandible) fabricated using standard methodologies, while the second group consisted of 9 patients who were fitted with overlapping prostheses featuring spherical attachments (5 for the maxilla and 4 for the mandible) based on our proposed technique. A metal framework was utilised in two overlapping prostheses, integrated with lock fittings and entirely covering the denture base. Two to three dental implants were placed per jaw, together with five overlapping prostheses (two for the maxilla and three for the mandible). A metallic framework was employed in three interlacing prosthesis. The hygienic quality of removable dentures was evaluated using a method that allows for the assessment of plaque accumulation on the prosthesis. The ASKD-DPI denture plaque index (2015) was utilised for assessing the plaque index of removable dentures. Digital data was analysed on a personal computer employing the variation statistics method with the Statistica software program. Outcomes and discourse Following an objective assessment, all patients were diagnosed with "partial edentulism of class I per Kennedy classification, and a complete loss of masticatory efficiency as per Agapov." Following clinical and radiographic evaluations, the dental roots were retained, and custom-fitted stump pin inserts were fabricated. Spherical locking fasteners served as securing components. A dental implantation procedure was conducted including the placement of commercially available, collapsable dental implants. The production of overlapping prostheses with cast stump pin tabs and dental implants with spherical lock fasteners involved obtaining an impression from the jaw, from which the prosthesis was later fabricated, employing either a two-layer, two-stage or a one-stage process with silicone material. During the project, several silicone impression materials were utilised, including C-silicones such as Speedex, Stomaflex, and Zetaplus; And-silicones such as 3M Express, Elite HD, and Ultrasil; in addition to the polyester impression substance 3M Impregnum. The impression was filled with a modelling plastic devoid of ash and exhibiting minimal shrinkage. Design Resin exhibiting a supporting tooth with a moulded steel pin insert and a suprastructure configured as a spherical lock attachment or an implant featuring a spherical abutment. Retention features, comprising longitudinal and transverse grooves, were created on the counterpart of the pin stump insert in the section intended for fixation within the gypsum model to provide optimal mechanical adherence of ash-free plastic to gypsum. Upon the completion of polymerisation of the plastic, a functional model was fabricated using GC FujiRock super gypsum. Upon the crystallisation of the gypsum, the impression was excised to prevent distortion of the structural components and detached from the model. The insertion path of the prosthesis was established on the milling parallelometric device's table using an analytical

rod. Bushings for lock fasteners were affixed to the lock component constructed from ash-free plastic, and the contours of the prosthesis base were delineated. Occlusal rollers were fabricated from base wax and used in the clinic to ascertain and document the height of the lower third of the face, as well as the dimensions, morphology, and hue of artificial teeth. Artificial teeth were positioned in the laboratory, and wax was substituted with plastic. The locking sleeve was positioned at the base of the overlapping prosthesis, and a metal framework was incorporated to fabricate the frame prosthesis. The completed prosthesis was secured and positioned in the patient's oral cavity at the clinic. Following the application of the fabricated orthopaedic devices, the patients reported minimal discomfort. The self-fixation of dentures in the oral cavity and their removal by patients presented no challenges. The patients were arranged for follow-up appointments at 6, 12, and 24 months. After six months, four patients in the control group exhibited a decline in the stability of the partial detachable plate prosthesis. After 12 months, a decline in fixation was observed in 9 patients from the control group and in 2 patients from the main group, who received replacement prostheses utilising cast stump pin tabs with spherical locking fasteners. After 24 months, patients in the control group observed a decline in the fixation of partial removable plate prostheses, while 3 patients in the main group, who received replacement prostheses utilising cast stump pin tabs with spherical locking fasteners, 1 patient with a frame prosthesis employing cast stump pin tabs with spherical locking fasteners, and 1 patient with an overlapping prosthesis based on cast pin stump inserts with spherical lock fasteners and dental implants featuring spherical abutments, also reported similar issues. Patients were advised to utilise hygiene products for the effective cleaning of removable orthopaedic structures. Korega cleansing tablets, produced by GlaxoSmithKline Healthcare, represent the most easy and cost-effective method for cleaning removable dentures. Korega cleansing tablets comprise a unique formulation of TAED (tetraacetylethylene diamine), which amplifies antimicrobial efficacy against bacteria and fungi responsible for halitosis, sodium carbonate and potassium monopersulfate for stain removal, and the surfactant sodium lauryl sulphate for efficient prosthesis cleansing. The tablets are designed for the everyday maintenance of detachable orthopaedic devices. To achieve optimal results, adhere to the guidelines specified on the packaging: Submerge the prosthesis in Koreg solution for 3-5 minutes. For optimal results, cleanse the denture with Koreg solution with a soft brush, then rinse the prosthesis well under running water. After 12 months, the dental hygiene index scores in the control group were distributed as follows: Three patients exhibited 0-30%; four patients exhibited 31-70%; three patients exhibited 71-100%. Main hospital: nine patients exhibited 0-30%; six patients exhibited 31-70%; two patients exhibited 71-100%. Hygiene was deemed satisfactory in 82% of patients.

CONCLUSIONS

An examination of the orthopaedic management of 27 patients with solitary teeth and dental roots, who were provided with partial removable plates and overlapping prostheses utilising cast stump pin tabs and dental implants with spherical locking mechanisms, indicates that the efficacy of prosthetics is contingent upon the judicious selection of orthopaedic design and the clinical context, alongside an accurate evaluation of the periodontal status of the supporting teeth and the identification of contraindications for the fabrication of cast stump pin inserts with spherical locking fasteners. The suggested technique for producing overlapping prostheses utilising spherical attachments enables the fabrication of prostheses without the need for clinical relocation to install fixation elements in the prosthesis base. Analogous plastic locking fasteners facilitate the immediate simulation of an overlapping prosthesis with fixation elements directly on the model. The precision of the orthopaedic structure generated by this 160 approach is enhanced. This positively influences the quality of fixation and stabilisation of the prosthesis. Consistent washing of dentures is essential for optimal oral hygiene maintenance; Korega cleansing tablets facilitate the achievement of an adequate hygiene standard.

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