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Patient Satisfaction on Receiving Bio-Functional Prosthetic System (Bps) Denture Verses Conventional Complete Denture Based on Retention, Stability, Aesthetic and Overall Satisfaction of The Patient- A Systematic Review

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Abstract

Aim: The purpose of this systematic review is to comparatively evaluate the patient satisfaction on receiving bio-functional prosthetic system (BPS) denture verses conventional complete denture based on retention, stability, aesthetic and overall satisfaction of the patient.

Material and methods: Electronic searches of dental literature in the National Library of Medicine's PubMed Database, Google Scholar, EBSCO and Pro Quest, Research Gate was performed to identify all peer-reviewed articles in the English literature dealing with overall Satisfaction on Receiving Bio-functional Prosthetic System Complete Denture and Conventional Complete Denture according to the search strategy.

Results: From 63 titles, 8 full text articles were selected based on the inclusion criteria. All selected studies were comparative study between patient overall Satisfaction on Receiving Bio-functional Prosthetic System Complete Denture and Conventional Complete Denture by means of questionnaires/interviews. Although the advantage of BPS conventional denture in each term is considered far more efficient than conventional denture in every aspect, optimally fulfilling the aesthetic, functional and phonetic demand of the patient, it is exceptionally technique sensitive, requires additional

investment and needs special skills and training to achieve the goal.

Conclusion: Bio functional prosthetic system is a novel technique and is superior to the conventional complete denture in esthetics, form, function, and comfort from a patient's perspective. It is designed in such a manner that reduces cases of pressure sores, stomatitis, and oral candidiasis. Due to bilateral balanced occlusion, it achieves a higher stability of the denture in function and resting condition and decelerated the slowed down the resorption process in comparison to ridge atrophy in Conventional dentures.

Keywords: retention, stability, aesthetic and overall satisfaction of the patient. Levels of evidence accepted were Randomized control trials, cohort studies, retrospective clinical studies, prospective studies etc.

Introduction

Edentulism is the result of tooth loss which is considered as a handicap to oral function that has psychosocial impact. It is considered an impediment impacting both patient's quality of life and their nutrition. Although the number of adults losing their natural teeth is diminishing, there are still large numbers of edentulous adults in the population[12]. Globally, substantial proportions of edentulous individuals, particularly among the elderly, need rehabilitation. Patient satisfaction is a critical determinant in the success or failure of complete denture therapy[14]. For the purpose of treating these issues, the prosthodontist needs to have an in-depth knowledge of anatomy, physiology, pathology, and psychology.

Complete denture restores teeth and oral tissues thus providing masticatory, phonetic and aesthetically pleasing appearance which can improve overall wellbeing of an individual. The idea of treating complete denture patients is to restore normal contour, comfort, function, esthetics, and preservation of residual alveolar ridge. [21]

Studies indicate that the great majority of completely edentulous patients are satisfied with their complete dentures while great emphasis is placed on the patients who remain dissatisfied despite the clinical perfection of their oral rehabilitation, as patients' satisfaction with their dentures seems to be associated with their level of comfort.[14]

Furthermore, after denture insertion, patients very often face problems with the denture even after utmost care during fabrication procedure. The most common patient's complaint is traumatic ulcers, caused by dentures. Due to discomfort caused by these traumatic ulcers, patients are hesitant to wear dentures and they doubt the treatment capabilities and treatment plan of dentist. There are various factors which can cause these traumatic mucosal injuries. The most common factors are denture irregularities, overextended denture flanges, improper denture adaptation, improper occlusal contact. Most of these are related to either laboratory or clinical errors during various steps of denture fabrication.

Success of complete denture treatment outcome remains unpredictable due to pain, discomfort, loss of retention and stability of the prosthesis. There is little attention given towards the psychological impact of the patient after receiving the prostheses.[14] Thus, psychological factors provide valuable information for the prediction of the satisfactory outcome of complete denture treatment. It is also important to identify what specifically determines patient satisfaction with dentures. Such identification may enhance patient satisfaction and denture acceptance, consequently improving patient well-being.

Nevertheless, the feelings and experiences of patients when eating with dentures are also an important

consideration in the assessment of the success of prosthetic rehabilitation. Numerous research into the effect of prosthetic rehabilitation also focuses on clinical outcomes and the functional ability to chew and to eat a nutritionally adequate and balanced diet. The ability to enjoy food and the experience of eating may be as important to health and well-being as the functional ability to consume a healthy diet. Indeed, 'eating is one of the nicest things we do' as a qualitative study about the mouth and old age pointed out.[11]

Even though conventional complete denture is still extensively used for the replacement of missing dentition and the use of it is not expected to decline soon especially in less developed populations with limited economic resources, advancement in conventional denture therapy is still in demand and should be researched and improved.

Therefore, rapidly providing high-quality complete dentures has become one of the most important aspects of removable denture. Novel procedures and methods are being developed to provide a better and a much more efficient method of fabricating complete denture as compared to the techniques conventionally used. Newer methods have a more convenient method of recording impressions, jaw relations and seem to have better esthetic outcomes. This helps in improving the quality of life of edentulous patients and elevates their satisfaction levels. [21]

The great deal of advanced method used nowadays is Bio functional prosthetic System Dentures (BPS), also called biogenic or bio functional, because of the ability to construct dentures which are really like the natural elements they substitute, fulfilling this way aesthetics, functional and phonetic demands of the patient. The BPS system was intended to negate the shortcomings of conventional complete denture techniques.[15]

BPS originated from studies by Rainer Strack of the University of Tübingen in Germany in 1955; a telephotographic study, a three-dimensional photographic. kymographic measurement of occlusal surfaces, and a study on temporomandibular joint morphology; and Orthotype Ivoclar Vivadent molds based on tooth forms sculpted by master dental technician Eugene Schlaich.

The bio-functional prosthetic system Dentures can be defined as "a system consisting of a series of steps from impression taking, bite registration, setup of denture teeth, polymerization and finishing to delivery that are carried out according to the clearly defined BPS procedures, using Ivoclar Vivadent's devices and materials, with the ultimate goal of a happy patient"

The system combines standardized impression-taking techniques with an original approach of capturing the relationship between the maxilla and mandible, the arrangement of the teeth, and denture production, all while requiring a minimum number of patient's visit. The functional composition of the patient is used to manage border moulding and impression making, resulting in denture bases that are incredibly comfortable to wear. Since it is founded on a multidisciplinary effort and methodical approach, this technique delivers optimum form, function, and aesthetics in complete denture prosthesis. Also provides a uniform distribution of the occlusal forces and minimizes the resorption of residual ridge.

In view of these advantages, we conducted a systematic review with the goal of critically analyzing the benefits of Biofunctional prosthetic systems in comparison to Conventional complete dentures based on retention, stability, aesthetic and overall satisfaction of the patient.

Research Question

Patient Satisfaction on Receiving Bio-functional Prosthetic System (BPS) Denture verses Conventional Complete Denture based on retention, stability, aesthetic, and overall satisfaction of the patient.

The criteria for admittance in the systematic review were based on PICO criteria.

PICO criteria

(P) Patients: Edentulous patient globally

(I) Intervention: Treatment done with BPS dentures and conventional complete Dentures

(C) Comparison BPS complete denture verses Conventional Complete Denture

(O) Outcomes: BPS Dentures are better than Conventional Complete Denture based on Retention, Stability, Aesthetic overall satisfaction of the patient.

Methodology

Eligibility criteria

The inclusion criteria for admittance in the systematic review is based on the type of study, namely, clinical studies on humans, assessing

1. Comparison between patient overall Satisfaction on Receiving Bio-functional Prosthetic System Complete Denture and Conventional Complete Denture by means of questionnaires/interviews.
2. Comparison between Patient Satisfaction on Receiving Bio-functional Prosthetic System Complete Denture and Conventional Complete Denture based on retention, mastication, aesthetic, speech by means of questionnaires/interviews.

The exclusion criteria were based on the following:

a. Studies that did not meet the minimum criteria for Systematic review
b. Interventional studies, laboratory research, abstracts, case reports, protocols, personal opinions, letters and posters, review of literature
c. Full-text not available
d. Non-English studies

Information Sources

A systematic search in the National Library of Medicine's PubMed Database, Google Scholar, EBSCO and Pro Quest, Research Gate was performed to identify all peer-reviewed articles in the English literature dealing with overall Satisfaction on Receiving Bio-functional Prosthetic System Complete Denture and Conventional Complete Denture according to the search strategy described in the following sections.

Search Strategy

A literature search was performed using the "Biofunctional prosthetic system" OR "Complete denture prosthesis" AND "Dental", "Full mouth rehabilitation" AND "BPS" "Case Report, Case Series, Clinical Study, Clinical Trial, "OR "Esthetics", "BPS denture", OR "All Metadata" "Biofunctional prosthetic system". The search was limited to articles on adult edentulous populations in the English language published later than 2000.

The search string was ("Biofunctional Prosthetic System Complete Denture"[Mesh] OR BPS [text word] OR Biofunctional Prosthetic System [text word] OR Complete Denture [text word] OR Biogenic)

AND

Conventional Complete Denture [text word] OR Removable Dental Prosthesis

AND

Patient Satisfaction [text word] OR Overall Satisfaction [text word]

AND

Retention

AND

Aesthetic

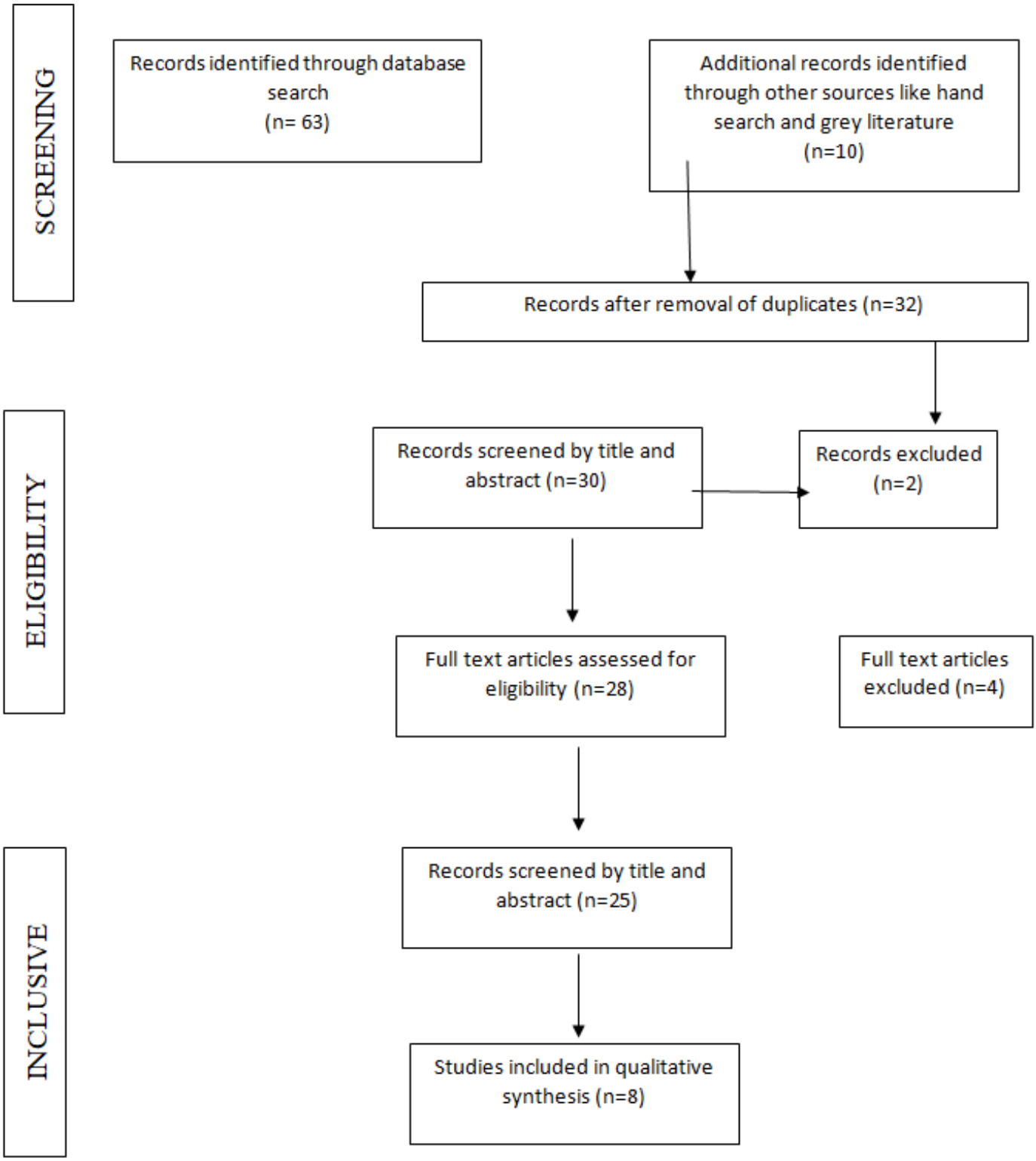
AND

Speech

AND

Mastication

Prisma Flowchart



Results

Author & year	Type of Study	Population	Intervention	Control Or Comparison	Outcome	Conclusion
Kasabwala, 2020	Case Control study	. The database of 86000 patient records were analyzed and patient information was collected. Sample size of 20 patients who were initially provided with conventionally fabricated complete dentures followed by BPS complete dentures were selected	The patients were asked to report their satisfaction levels and quality of life on a VAS scale and in an abbreviated version of the Oral Health-Related Quality of Life [OHIP-EDENT] questionnaire, specifically designed for edentulous patients.	Previously complete denture wearers with currently BPS complete denture wearers	The results of this study indicated that, All the patients preferred BPS complete dentures to be preferable as a long-term prosthesis by all means.	The patients using BPS complete dentures had a much better quality of life. The patient satisfaction levels in case of BPS complete dentures were much higher as compared to that of conventional dentures suggesting that they can be a good alternative to usually made conventional complete dentures
Matsuda 2015	Pilot control study	the sample size was limited to 10 participants	To maintain the “blind” nature of the trial, patients were not informed about the type of dentures they	Complete denture wearers with currently BPS complete denture wearers	Nine out of 10 patients chose to keep the BPSCD rather than the CCD, with one patient choosing the	the BPS produced high-quality complete dentures with satisfactory results and was just as efficient

			had received or about the differences between the two types. The patients were asked to report their satisfaction levels in an abbreviated version of the Oral Health-Related Quality of Life questionnaire, using Oral Health Impact Profile for edentulous subjects [OHIP-EDENT])		CCD for purely esthetic reasons.	as conventional procedures.

Author & year	Type of Study	Population	Intervention	Control Or Comparison	Outcome	Conclusion
Wiśniewski2016	Case control study	Thirty edentulous women aged 65–80 years with unfavorable prosthetic base conditions were included	In the first stage, conventional denture was given for three months, followed by giving BPD denture later.	method of construction of full prostheses affects the magnitude and symmetry of the occlusal forces that are generated	At the end of three-month follow-up, Conventional denture produced an the average occlusal force was 91.12	generation of larger occlusal forces with Biofunctional prostheses indicates that they have good retention to the prosthetic and a

		in the study		and to study the dynamics of changes in the occlusal forces that occur when using prostheses made according to the Biofunctional system.	N (and the range 35.3–188.6 N) at the right molars, and 75.96 N (17.5–168.9 N) at the left molars Whereas, BPS produced an average of 118.82 N (70.7–150.1 N) at the right molars and 117.59 N (84.5–150.1 N) at the left molars.	symmetrical distribution of occlusal forces over the occlusal surface and a systematic increase in occlusal forces can show that the prosthesis is creating favorable biomechanical conditions for muscle activity base.

Xhajanka 2017	Clinical trial	245 patients of different age, between 35-50 years old, 50-65 years old and above 65 years old (average age:57 years old).	Patients were divided our patients into 2 groups: In the first group were included 133 patients, wearing bio function-al prosthesis in bilateral balanced occlusion.	conventional dentures and verses Bio functional dentures in terms of stability, function, achievement of balanced occlusion, strength, mechanical resistance,	It was achieved a higher stability of the denture in function and resting condition in 86.4% of the cases, compared to 60% in conventional denture cases	BPS more efficient than conventional denture in every aspect.

			In the second group were included 112 patients wearing conventiona-l full dentures in unilateral balanced occlusion. And were observed in 7 years long period.	decubitus, sore and aesthetics		
Baskaran, 2015	Case control study	100 patients, 50 patients who received conventional complete denture and 50 patients who received biofunctional prosthetic system (BPS) complete denture. were randomly selected from the outpatient section of a private dental college hospital.	A questionnaire was filled by the patient. they were grouped based on the scale of very satisfied, satisfied, average, not satisfied, not at all satisfied for different parameters such as i) retention, ii) aesthetics, iii) speech, iv) mastication, v) finishing of the denture, and vi) overall satisfaction for maxillary and	Complete denture wearers with currently BPS complete denture wearers	Results showed that overall satisfaction, 58% of the patients with BPS denture and 28% of the patients with the conventional denture were very satisfied with the denture	This study showed that the biofunctional prosthetic system complete denture is better than the conventional complete denture in every respect from a patient's point of view and a biofunctional prosthetic system complete denture can be recommende-d as a viable option

			mandibular dentures			
Gopal T.M, R S (2020):	Retrospective photographic study	The study included 45 BPS dentures wearer reviewed from the patients records and analyzed the data of 86,000 patient that were documented in a private institute Inclusion Criteria: Patients for whom BPS denture was fabricated, age within 25 to 50 years, both male and female	The data was collected, and photographic analysis was done for all the cases in the above-mentioned time period by 2 reviewers	Outcome variables assessed were correlation between intercanine width and interalar width, smile line, exposure of teeth, shape of teeth used	According to reviewers 62.2% of patients' smiles were attractive.	The overall aesthetic outcome of complete denture constructed with a biofunctional prosthetic system conducted in private university setup was upto the mark
Chandrakal V, Deepmala S(2018)	Case control study	92 patients grouped into two, wearing CCDs and BPS dentures, with an age range between 45 and 87 years. Group I	details of post insertion problems at each visit were recorded by asking questions which followed standard	Complete denture wearers with currently BPS complete denture wearers	Patients wearing CCDs had more problems in first and second appointments and needed corrections in mandibular	It was found that patients wearing complete dentures experienced different postinsertion problems. Most common

		had 44 patients wearing CCDs and group II had 48 patients wearing BPS dentures	questionnaire,		arch frequently compared with maxillary.	problems experienced by patients were pain and discomfort, difficulty with eating, looseness, and esthetics of CCDs compared with BPS dentures
Kumar. A, Venugopalan S, Dharman S 2020	Retrospective study	466 edentulous patients undergoing complete denture treatments with no particular age limit	Extraoral feature of complete denture patients undergone either BPS or conventional technique denture construction	Three facial features were taken into consideration for the study both pre op and post operative as follows and measured accordingly: nasolabial fold , Adequate lip support , Facial wrinkles in patients wearing conventional complete denture vs BPS complete denture	The results of this study showed, nasolabial fold post operative is not so prominent in BPS (58.8%) - compared to conventional method. ($p<0.05$ significant). The facial wrinkles measured only on lower 2/3rd as the complete denture showed facial change on which BPS (60.8%) and conventional method ($p>0.05$	BPS shows better postoperative aesthetic results compared to that of the pre op than the conventional complete denture

					Insignificant). Post operative of adequate lip support in BPS (88.2%) conventional method (p value < 0.05 significant)	

Discussion

Traditional complete dentures have been regarded as useful and cost-efficient treatment option for significant number of edentulous patients. However, success of complete denture treatment outcome remains unpredictable due to post-insertion pain, discomfort, denture sores and loss of retention and stability of the prosthesis.[7] For a dentist, efficient mastication, good aesthetics, speech, and ease of wearing the denture for the patient have been the main concern. Treatment to be a success, not only operator's objectives have to be met with, but most importantly, the patient must be satisfied[1]

As a result of these difficulties, the Bio functional prosthetic system currently emphasizes the idea of a bilaterally symmetrical occlusion with improved shape, function, and aesthetics in a shorter treatment period than the traditional one.[20]

The application of specific impression materials, face bow transfers, articulators, teeth, and denture-base materials makes BPS a preferred procedure in the field of complete denture prosthodontics. The Biofunctional Prosthetic system is the innovative available approach, which prioritizes the principles of bilateral balanced articulation. The system also employs a combination of standardized impression making procedures, a unique method of recording maxillomandibular relationship, teeth arrangement, and denture fabrication, with minimal number of patient's visits. The border molding and impression making is controlled by the patient's functional composition, hence yielding denture bases that are extremely comfortable in use. This technique is ideal since it is based on multidisciplinary effort and methodical approach. The BPS system made by Ivoclar Vivadent (Liechtenstein) is also utilised in maxillary and mandibular reconstructive surgeries for implant-supported over dentures in addition to removable complete dentures.

In addition to the benefits of technique, many dentists are aware of the significance of psychological factors in patients' rejection of technically sound dental prostheses. Out of many, one of the few controlled investigations of this problem was conducted by Lefer, Pleasure, and Rosenthal They demonstrated that patients "involved" in selecting dentures which were esthetically pleasing to them had fewer complaints, less correction visits, and fewer denture rejections than had a group of "noninvolved" control patients. These results can be interpreted in at least two ways. The first is that patients respond better to their dentures when their dentist takes a "nonauthoritarian" approach and lets them choose their

own set of dentures. The second is that the patient responds more favorably when he is given those dentures which are most esthetically pleasing to him.

Recent publications also include reports on the application of BPS in preventative prosthodontics for tooth-supported overdentures.[3]

Baskaran et al conducted a comparative study to evaluate the relationship between patient satisfaction with the newly constructed prostheses using Biofunctional and conventional technique, on patient's satisfaction based on questionnaire survey of various aspects ranging from retention and aesthetics to thickness and smoothness of the denture, revealing very satisfactory response level using BPS denture.

Matsuda KI et al did a crossover trial to evaluate clinical acceptability of BPS over conventional complete dentures, which showed high quality complete dentures in terms of occlusal feel, comfort, esthetics, and retention with satisfactory results. The Oral Health Impact Profile for edentulous subjects, Japanese version (OHIP-EDENT-J) also revealed complete absence of pain, psychological discomfort, functional difficulties including speech and mastication. BPS complete dentures have great retention because the lingual flanges are designed to allow for the typical movements of the tongue and the surrounding muscular forces are in equilibrium.

Cunha et al. reported that BPS method for complete denture fabrication can restore the masticatory function to a level comparable to that of a conventional protocol, both physiologically and according to the patient's perceptions[22].

Gopal et al, conducted a retrospective photographic study, to evaluate the overall aesthetic outcome of complete denture constructed with a Biofunctional prosthetic system which also included determinants like comfort and function, concluding that complete dentures made with a Biofunctional prosthetic system produced an overall pleasing esthetic result.

It can be put forward that Biofunctional prosthetic system, a novel technique is superior to the conventional complete denture in esthetics, form, function, and comfort from a patient's perspective and increased patients Oral Health Quality of Life (OHQoL). It is also noted that dental practitioners with a small amount of clinical training can quickly produce complete dentures and satisfactory results with this method.

Although the advantage of BPS conventional denture in each term is considered far more efficient than conventional denture in every aspect, optimally fulfilling the aesthetic, functional and phonetic demand of the patient, it is exceptionally technique sensitive, requires additional investment and needs special skills and training to achieve the goal.

Summary & Conclusion

Patient's management requires satisfaction with the quality of work done by the dentist, but the success of the treatment is greatly determined by the amount of patient satisfaction. Therefore, patient satisfaction assessment should be a routine part of any dental practice after the treatment is complete. This helps in constant improvement in the quality of services provided.

From the studies included, it can be concluded that Bio functional prosthetic system is a novel technique and is superior to the conventional complete denture in esthetics, form, function, and comfort from a patient's perspective. It is designed in such a manner that reduces cases of pressure sores, stomatitis, and oral candidiasis. Due to bilateral balanced occlusion, it achieves a higher stability of the denture in function and resting condition

and decelerated the slowed down the resorption process in comparison to ridge atrophy in Conventional dentures. The results achieved in the process can be sustained in to the following index:

- Subjective Data Evidence
- Clinical Data Evidence
- Adjacent Results

Subjective Data are those gathered directly from patients, who state that Biofunctional Prosthesis' adjustment process is quicker.

Clinical Data Evidence: Based on continuous patient monitoring, it is possible to assess the patient's adaptation to both types of dentures, chewing process, functional stability, decubitus, aesthetics, phonetics, etc.

Adjacent results: On observation of patients from the implementation period to recalls. The number of adjustments, in terms of stability during mastication, phonetic and rest, was lesser in Biofunctional Prosthesis than in conventional Dentures.

Hence, completely edentulous patients, a Bio functional prosthetic system complete denture can be advocated as a viable option.

Additionally, dental professionals with little to no clinical experience can use this technique to efficiently make complete dentures with acceptable outcomes.

Therefore, workshops and trainings for the construction of Bio Functional Prosthetic System Denture should be undertaken for clinicians in the field of advanced complete denture fabrication techniques.

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