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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF MASTICATORY EFFICIENCY AND NUTRITIONAL STATUS OF PATIENTS BEFORE AND AFTER A FULL MOUTH REHABILITATAION -PROSPECTIVE CLINICAL TRIAL

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ABSTRACT

Aim: To evaluate masticatory efficiency and nutritional status prior and subsequent to a full mouth rehabilitation therapy

Materials and Methods: The study followed the CONSORT guidelines and was a prospective clinical trial. This trial was conducted on ten patients who were undergoing full mouth rehabilitation. Masticatory efficiency was calculated before the start and 1 month post completion of rehabilitation where the subjects were given 9 grams of peanuts (3 grams - 3 times). The participant was instructed to complete 40 chewing strokes. The masticated food was subsequently collected in a disposable container. Additionally, the participant rinsed their mouth with water twice, and the resulting rinsate was combined with the chewed food in the same disposable container. Following thorough mixing of the chewed food using a glass rod, the mixture was strained through a 10 mesh sieve. This specific test serves the purpose of quantitatively assessing the chewed food. The strained liquid, referred to as the filtrate, was then carefully transferred into tubes and subjected to centrifugation at 3000 revolutions per minute for a duration of 5 minutes. This centrifugal process effectively separated the filtrate into two distinct components: a solid pellet and a liquid supernatant. The supernatant, or the liquid portion, was subsequently discarded, while the pellet, or the solid residue, was weighed using a digital scale. In this study, masticatory performance was quantified according to the methodology proposed by Yurkstas and Manly. This evaluation encompassed assessing particle size, as determined by the size of the sieve employed, by calculating the ratio of the weight of the test food that passed through the sieve to the total weight of the test food that was recovered. This ratio was then expressed as a percentage. The initial wet weight of the materials was computed as the starting point for these calculations. The specimens were then placed in a hotair oven at 40℃ for 8 hours and again the dry weights were measured. Fasting venous blood samples from each participant were collected for means of measuring hemoglobin, total serum calcium, total serum protein, and total cholesterol levels as indicators of nutritional status. The tests were carried out at similar intervals as chewing efficiency.

Results: All of the patients showed a statistically significant improvement in masticatory efficiency post full mouth rehabilitation (p <.001) which was calculated with Yurkstas and Manly formula. There was no significant relationship between age, gender and occlsal scheme provided to the masticatory efficiency pre and post FMR. Paired sample t test revealed that haemoglobin, total serum protein and total ionic calcium showed a significant improvement post full mouth rehabilitation at 1 month follow up (p<0.05). There was no statistically significant difference in cholesterol values.

Conclusion: We can conclude that full mouth rehabilitation leads to a notable increase in masticatory efficiency. A significant improvement in nutritional status was also seen post completion of therapy. There was no influence of age, gender and occlusal scheme on chewing efficiency.

Keywords: *Chewing efficiency, full mouth rehabilitation, nutritional status*

INTRODUCTION

Full mouth rehabilitation, also known as full mouth reconstruction, is a comprehensive and complex dental treatment that aims to restore the function and aesthetics of the entire mouth. This type of treatment is typically recommended for patients who have extensive damage or decay to their teeth, gums, or jaws, or those who suffer from complex occlusal discrepancies Full mouth rehabilitation involves a combination of different dental procedures, which may include crowns, bridges, veneers, dental implants, orthodontics, and periodontal therapy. The specific treatments that are required will vary depending on the individual patient's needs and the extent of their dental problems.[1,2]

Indications for full mouth rehabilitation include a variety of dental issues mainly involving loss of vertical dimension of occlusion. These factors can have a significant impact on a patient's quality of life, including their ability to speak, chew and smile comfortably. Additionally, untreated dental problems can lead to more severe health issues such as infections, chronic pain, and even systemic diseases.[3]

Masticatory efficiency is defined as the number of strokes needed to achieve a certain particle size reduction . Various factors affect chewing efficiency, such as tooth morphology, occlusal contacts, and jaw movements . Studies indicate that compromised chewing efficiency can have adverse effects on nutrition, overall health, and quality of life. Comparing to an ideal dentate state, edentulism leads to a significant decrease in bite force , comminution of food and Body Mass Index (BMI) Improvement in masticatory efficiency as an outcome of a prosthetic rehabilitation is still highly debated in current literature, where there is a significant improvement for completely edentulous people, the results for partially edentulous people are still controversial.[4]

To assess masticatory performance, various tests are performed that involve standardized food items such as chewing gums, carrots, peanuts or meat substitutes. The size of the particles and texture produced is evaluated to determine the quantitative measure of chewing efficiency . The results obtained from these tests can be used to compare pre and post-treatment outcomes. Electromyography (EMG) and bite force analysis are some of the other techniques commonly used to assess masticatory muscle activity patterns, coordination and maximum bite force exerted .[5]

Research has demonstrated that poor masticatory efficiency can lead to a variety of nutritional deficiencies, such as low levels of protein, calcium, and vitamins . This can result in a range of health problems, including malnutrition, osteoporosis, and cardiovascular disease, especially in older population with worn and torn dentition . Furthermore, compromised chewing ability can lead to digestive problems and reduced appetite, further promoting nutritional deficiencies. Full mouth rehabilitation can address these issues by restoring the natural structure, function and esthetics of the oral cavity.[6]

There have been many researches done on comparing masticatory efficiency prior and subsequent to implant and removable rehabilitation (fixed and removable) but none on effect of a full mouth rehabilitation on the outcome. Thus, the aim of this study is to compare masticatory efficiency and nutritional status of patients prior and subsequent a full mouth rehabilitation.

MATERIALS AND METHODS

Study Design

The current study is a prospective clinical trial that followed the standards published by Consolidated Standards of Reporting Trials. Ethical clearance was obtained from Ethical Committee of Saveetha Dental College and Hospitals, Chennai-SRB/SDC/PROSTHO-2003/22/TH-025.

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Sample Size Calculation

The sample size for the present trial was based on the methodology and results of the study by P.Pera et al.[7] A power analysis was established by G*Power version 3.0.1(Franz Faul universitat , Kiel, Germany). Total minimum calculated sample size of 5 patients rounded to final 10 patients to accommodate an attrition rate of 15% would yield 98 % power to detect significant differences, with effect size of 2.208 and significance level at 0.05.

Recruitment of Participants

The present study took place from March 2021 to January 2023. In accordance with the ethical standards laid down in the 1964 declaration of Helsinki and its later amendments, this prospective clinical trial was conducted with a cohort of ten participants within the age range of 41 to 70 years. The selection of these participants adhered to predefined inclusion and exclusion criteria. Before their formal inclusion in the study, each participant provided informed written consent. A comprehensive briefing was provided to the participants, elucidating the study's nature, the treatments administered, the expected duration of follow-up, as well as potential advantages and risks associated with the treatment. Participants were duly informed of their absolute freedom to discontinue their participation in the study at any point, without any adverse impact on the treatment course they might require. In accordance with the 'CONSORT' guidelines (fig. 1), each phase of this clinical trial was meticulously executed and reported. This meticulous approach was undertaken to ensure the highest standards of research ethics and transparency in the study's execution and documentation.

Inclusion Criteria

- Patients with loss of vertical dimension (Turner and Missirlian Classification).
- Patients with severe attrition.
- Patients with occlusal plane discrepancy.
- Patients with esthetic concerns like Amelogenesis Imperfecta.
- Patients with not >1 teeth missing in one sextant.

Exclusion Criteria

- Long span edentulous area.
- Patients requiring implant placement or a removable prosthesis.
- Mentally unstable patients.
- Patients with temporomandibular joint disorders.

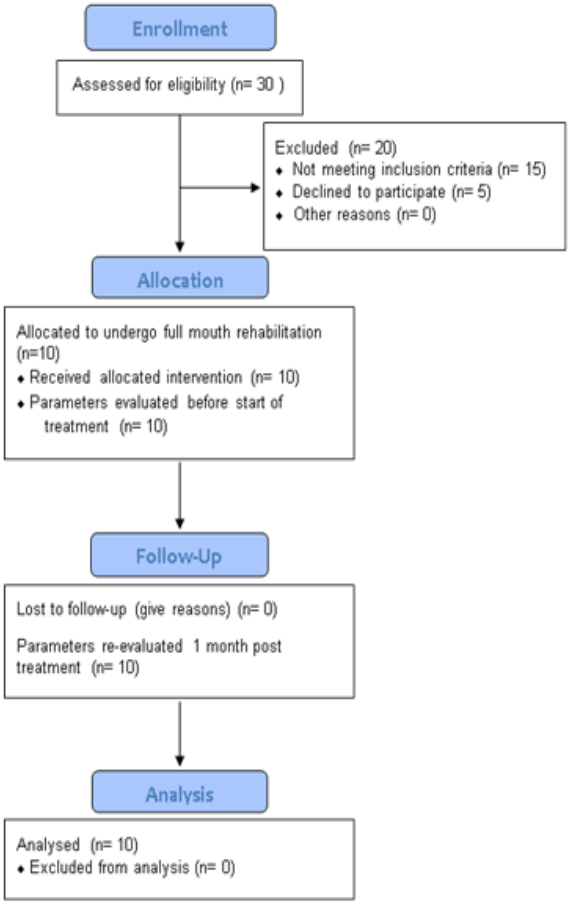

Figure 1. CONSORT Flowchart

Outcome Measures

Nutritional Status (Blood Tests)

In the current trial, fasting venous blood samples from each participant were collected for means of measuring hemoglobin, total serum calcium, total serum protein, and total cholesterol levels as indicators of nutritional status. The tests were carried out before the start of full mouth rehabilitation and 1 month after the therapy was completed. This was done as the turnover rate of albumin (protein) in serum is 3 weeks.[8]All the parameters reflect the dietary intake of the patient and the body's homeostasis.

Masticatory Efficiency

The subjects were then given 9 grams of peanuts (3 grams - 3 times). The subject was then asked to perform 40 masticatory strokes. The masticated food was gathered and placed within a disposable container. The participant was then provided with water for mouth rinsing, a process repeated twice, and the resultant rinsate was likewise introduced into the same disposable vessel. Following thorough mixing of the chewed food facilitated by a glass rod, it underwent filtration through a mesh sieve with a size of 10. This test helps to determine the quantitative estimation of the chewed food. The filtrate was then collected in tubes and centrifuged at 3000 rpm for 5 minutes. The filtrate split into a solid pellet and a liquid supernatent. The supernatent was then discarded and the pellet was measured in a digital scale. Chewing performance in current study was calculated by the method suggested by Yurkstas and Manly.[9]

Performance assessment encompassed an evaluation for any particle size, as determined by the size of the sieve employed. This evaluation was achieved by dividing the weight of the test food that successfully passed through the sieve by the total weight of the test food that was collected. This resulting fraction was subsequently expressed as a percentage. Initially, the first wet weight was meticulously determined. The test specimens were subsequently subjected to a hot air oven set at a temperature of 40℃ for a duration of 8 hours. Following this drying process, the dry weights of the specimens were reevaluated and recorded. This was done both before the start and 1 month after completion of full mouth rehabilitation.

Statistical Analysis

Descriptive and Inferential statistics were analyzed by IBM SPSS version 22.0 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Descriptive statistics such as mean and standard deviation were calculated for quantitative variables. Qualitative data was represented using percentage/proportion.

The p value was fixed at 0.05. Data normality was checked using the Shapiro Wilk test and it revealed that all variables follow normal distribution. Therefore parametric tests are applied to analyze the data. Paired student t-test was done to compare masticatory efficiency and nutritional status (Haemoglobin, total serum protein, total serum cholesterol, total ionic calcium) before and after full mouth rehabilitation for all the subjects. One way ANOVA was carried out to evaluate relationship between the occlusal schemes, age and gender to the difference in chewing efficiency pre and post treatment.

Ethics Statement

This study was conducted in accordance with the ethical guidelines set forth in the Declaration of Helsinki (1964) and its later amendments. Ethical approval was obtained from the Ethical Committee of Saveetha Dental College and Hospitals, Chennai (Approval number: SRB/SDC/PROSTHO-2003/22/TH-025). The research adhered to the Consolidated Standards of Reporting Trials (CONSORT) guidelines for clinical trials.

Informed Consent Statement

Prior to their participation, all subjects were provided with a detailed explanation of the study's objectives, procedures, potential benefits, and risks. Each participant voluntarily signed a written informed consent form before enrollment in the study. They were informed of their right to withdraw from the study at any stage without any impact on their treatment. Confidentiality of personal data was strictly maintained throughout the study.

RESULTS

Descriptive

The present study recruited a total of 10 participants, 5 females and 5 males with 40% of patients falling under 51-60 years of age group (Figure 2).

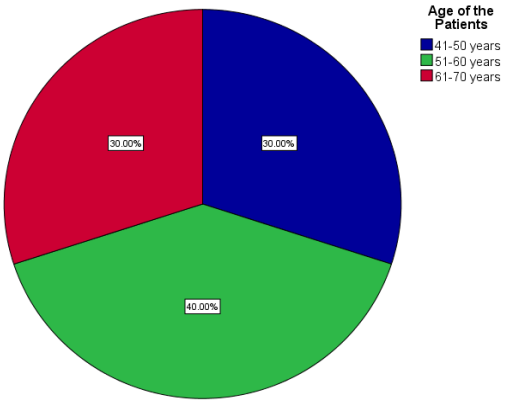

Figure 2. Pie chart representing the distribution of study participants based on age

Each participant underwent a fully tooth supported full mouth rehabilitation therapy by various post-graduate students under the guidance of faculty in the Department of Prosthodontics and Implantology.

Canine guided occlusion was given in 7 cases and group function in others.

Chewing Efficiency

All of the patients showed a statistically significant improvement in masticatory efficiency post full mouth rehabilitation (p= .000) which was calculated with Yurkstas and Manly formula (Table 1,2 and Figure 3).

Table 1. Values of dry weight, wet weight of the chewed peanuts in grams with standard deviation and chewing efficiency of patients pre and post full mouth rehabilitation.

Patients No	Tooth Supported Full Mouth Rehabilitations					
	Pre- FMR			Post- FMR		
	Wet Weight ± SD (gm)	Dry Weight ± SD (gm)	Masticatory Efficiency	Wet Weight ± SD (gm)	Dry Weight ± SD (gm)	Masticatory Efficiency
1	1.663± 0.15	0.742± 0.11	52.3%	1.851± 0.19	0.884± 0.13	58.1%
2	1.548± 0.21	0.627± 0.10	50.8%	1.694± 0.22	0.726± 0.17	56.4%
3	1.552± 0.13	0.597± 0.09	48.5%	1.705± 0.20	0.661± 0.09	55.3%
4	1.613± 0.20	0.693± 0.12	54.2%	1.692± 0.31	0.804± 0.19	61.2%
5	1.479± 0.17	0.642± 0.08	49.6%	1.642± 0.25	0.735± 0.14	54.4%
6	1.619± 0.24	0.755± 0.13	47.9%	1.802± 0.22	0.977± 0.15	55.7%
7	1.702± 0.25	0.791± 0.18	46.8%	1.930± 0.26	0.985± 0.20	55.8%
8	1.397± 0.19	0.585± 0.10	51.5%	1.612± 0.18	0.744± 0.11	58.2%
9	1.461± 0.16	0.618± 0.08	48.2%	1.667± 0.15	0.794± 0.07	53.6%
10	1.654± 0.23	0.703± 0.14	46.9%	1.884± 0.28	0.899± 0.17	54.3%

Table 2. Paired t test with df and p values for comparison of pre and post FMR chewing efficiency

Chewing Efficiency	Mean	Standard deviation	Standard Error Mean	p value
Pre FMR	49.67	2.46	0.77	0.000
Post FMR	56.20	2.34	0.74	

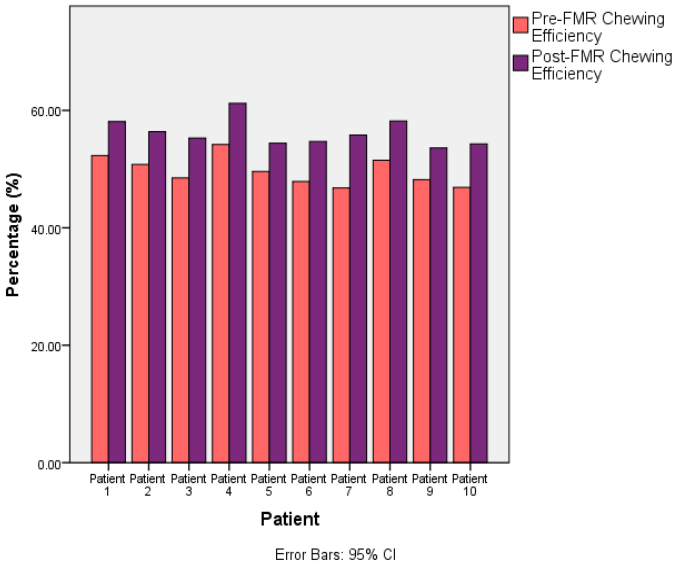

Figure 3. Bar graph depicting the pre and post masticatory efficiency of all the patients included in the study

There was an increase both in the wet weight and dry weight post FMR as well. There was no significant relationship between age, gender and occlusal scheme provided to the masticatory efficiency pre and post FMR (p>0.05).

Nutritional Status

Paired sample t test revealed that haemoglobin, total serum protein and total ionic calcium showed a significant improvement post full mouth rehabilitation at 1 month follow up (p<0.05). There was no statistically significant difference in cholesterol values (Table 3,Table 4 and Figure 4).

Table 3. Descriptives of haemoglobin, total protein, serum ionic calcium and total cholesterol with normal values pre and post full mouth rehabilitation for all the patients.

S.no.	Haemoglobin (12-16gm/dL)		Total Protein (6-8.5gm/dL)		Serum Ionic Calcium (4.4-5.4mg/dL)		Total Cholesterol (<200mg/dL)	
	Pre-FMR	Post-FMR	Pre-FMR	Post-FMR	Pre-FMR	Post-FMR	Pre-FMR	Post-FMR
1	11.80	12.20	7.0	8.0	4.9	5.1	154	146
2	10.50	11.00	6.8	7.9	4.1	4.7	162	158
3	11.00	11.60	5.8	7.5	4.0	4.8	134	146
4	13.00	13.50	6.0	7.8	4.9	5.4	180	175
5	12.50	12.50	6.4	7.6	4.0	4.3	165	160
6	13.00	13.40	5.5	7.2	4.5	5.0	153	146
7	14.00	14.70	5.8	8.1	4.0	4.5	129	135
8	13.00	13.80	6.3	7.5	4.5	4.9	145	145
9	12.20	12.90	6.0	8.3	4.2	5.0	175	178
10	11.00	12.00	5.5	7.1	4.0	4.4	155	161

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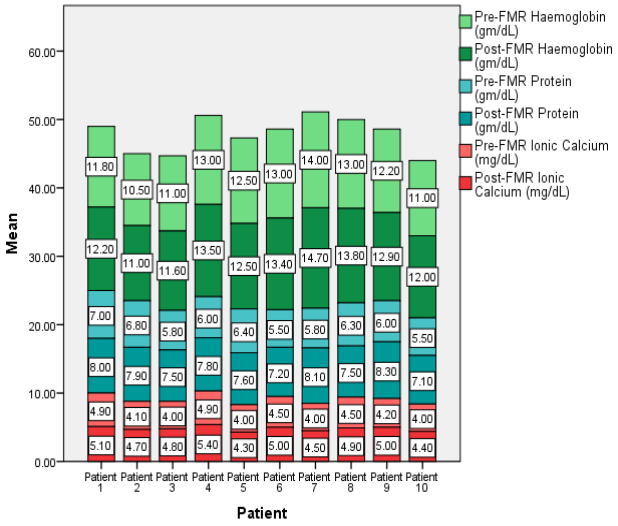

Figure 4. Stacked bar graph depicting the pre and post FMR values of haemoglobin, total protein and serum ionic calcium for all patients.

Table 4. Paired sample t test with df and p values for all the parameters included for nutritional status (p<0.05 is taken as significant)

Nutritional Parameters	Mean	Standard Deviation	Standard Error Mean	p value
Pre-FMR Haemoglobin (gm/dL)	12.20	1.11	.35	.000
Post-FMR Haemoglobin (gm/dL)	12.76	1.11	.35	
Pre-FMR Protein (gm/dL)	6.11	.51	.16	.000
Post-FMR Protein (gm/dL)	7.70	.38	.12	
Pre-FMR Ionic Calcium (mg/dL)	4.31	.36	.11	.000
Post-FMR Ionic Calcium (mg/dL)	4.81	.34	.10	
Pre-FMR Cholesterol (mg/dL)	155.20	16.31	5.15	.927
Post-FMR Cholesterol (mg/dL)	155.00	13.91	4.39	

DISCUSSION

Full mouth rehabilitation is a comprehensive dental treatment approach aimed at restoring the function, aesthetics, and occlusal stability of the entire dentition. It involves a combination of restorative, prosthetic, and periodontal procedures tailored to address various dental issues, such as extensive tooth loss, occlusal discrepancies, and functional impairments. By considering the unique needs and goals of each patient, full mouth rehabilitation aims to improve oral health, enhance masticatory function, and ultimately enhance the individual's overall quality of life. The complexity and individualized nature of full mouth rehabilitation make it a multifaceted and challenging endeavor, requiring careful planning, collaboration among dental specialists, and a comprehensive understanding of the patient's specific dental needs and expectations.[10]

Effect of FMR on Masticatory Efficiency

Masticatory efficiency refers to the ability to effectively chew and grind food, leading to the formation of a bolus that can be easily swallowed and digested. It plays a vital role in nutrient intake, digestion, and overall nutritional status.[11,12] Evaluating masticatory efficiency provides insights into the functional outcomes of full mouth rehabilitation, especially in cases where individuals have experienced significant dental issues or have undergone extensive dental procedures.

The present study is a prospective clinical trial carried out in 10 adults who underwent full tooth supported full mouth rehabilitation by different post graduate students. An individual pre and post treatment comparision was done thereby reducing risk of bias.

The assessment of masticatory efficiency can be performed using various methods, including subjective assessment (patient-reported outcomes), objective measurements (particle size distribution analysis), or functional tests (such as chewing performance tests using artificial test foods). These assessments help quantify the effectiveness of mastication, the degree of impairment, and potential improvements resulting from full mouth rehabilitation. In current study particle size distribution of peanuts was evaluated after specific masticatory strokes, when passed through a 10 mesh sieve. Particle size distribution analysis stands out as the preferred method for calculating masticatory efficiency due to its ability to capture the complexity, heterogeneity, and dynamic nature of the mastication process. Its ability to provide detailed information regarding food particle breakdown during chewing allows for a comprehensive assessment of masticatory efficiency.[13]

All the patients showed a significant increase in masticatory efficiency along with the wet and dry weight ($p<0.05$).

Although no previous studies have evaluated

chewing efficiency for FMR patients, there have been multiple publications on comparison of chewing efficiencies pre and post prosthodontic rehabilitation. Providing support to full prosthetic dental solutions through oral implants appears to yield favorable impacts on parameters such as the thickness of the masseter muscle, the maximum bite force, and overall chewing efficiency. However, it's worth noting that the specific design and nature of the implant-supported prosthetic apparatus employed may exert varying degrees of influence on the extent of these effects.[14-18]

Differences in various attachment systems have also been seen in implant supported overdentures.

There is contradictory evidence on the need for a shortened dental arch or restoration with a removable partial dentures, where some studies demonstrate that only implant supported replacement beyond SDA show significant improvement in chewing efficiency on other hand some have established that a removable prosthesis beyond SDA helps in improving chewing efficiency [19] and some say that SDA is equivalent to an RPD .[20]

Effect of Full Mouth Rehabilitation on Nutritional Status

The current literature is highly contradictory on the effects of various prosthetic rehabilitations on nutrient intake.[21-23] This is predominantly because nutritional intake is shaped not solely by the function of chewing but also by a multitude of other factors, including habits, preferences, cultural practices, as well as financial and logistical considerations . However, it's noteworthy that the findings from the current study revealed a substantial rise in protein, calcium, and iron (related to hemoglobin) consumption following full-mouth rehabilitation, even in the absence of any dietary guidance from the research team. This is in agreement with previous studies on change in dietary intake.[24-25]

Furthermore, individuals who wear removable dentures and experience reduced chewing efficacy are at a heightened nutritional risk, primarily because they tend to have a lower frequency of consuming fruits and vegetables. It appears that enhanced masticatory capability is linked with a higher likelihood of making healthier dietary selections among patients who have undergone prosthodontic rehabilitation. The augmented calcium intake subsequent to the utilization of Full Mouth Rehabilitation (FMR) is closely linked to enhanced bone health, fortifying both the structure and functionality of bones, consequently mitigating the risk of osteoporosis and associated fractures . Elevated iron levels may be correlated with an increased consumption of meat, a factor that could potentially elevate cholesterol levels.[26]

However, it's noteworthy that no discernible variation in cholesterol levels was observed following FMR, suggesting that the heightened iron intake might be attributed to an increased consumption of vegetables and/or lean meats.

Effect of Age and Gender on Masticatory Efficiency

The ability to orally process foods can affect food intake and food choices among vulnerable populations, including elderly and consumers with decreased eating capability. Masticatory function is frequently impacted in the elderly population. In fact, research indicates that as individuals age, there is a progressive rise in the number of cycles required to adequately chew a standard piece of food. This aging-related phenomenon is associated with greater particle size reduction during chewing and an extended duration of the chewing sequence.[27] In a study by Ikebe et al[28] showed that age does not directly impact masticatory performance within an individual's own set of teeth. This discovery implies that the decline in masticatory performance associated with age can be mitigated if one retains their natural teeth. The influence of age is presently understood as the consequence of a cumulative effect of various stressors on orofacial structures and function. In current study no difference was found between masticatory efficiency and age groups of patients. It should be noted that unlike other cross-sectional studes the age gap between the subjects was not huge.

Regarding gender, the influence on chewing efficiency is less clear. Some studies have suggested that there may be gender differences in masticatory performance, with males generally exhibiting higher chewing efficiency than females. These differences have been attributed to variations in muscle mass, bite force, and jaw morhology between genders.[29,30] However, conflicting findings have also been reported, and the influence of gender on chewing efficiency remains a subject of debate.[31,32] In current trial there was no difference seen ($p>0.05$).

Effect of Occlusal Scheme on Masticatory Efficiency

Several investigators have studied the effect of occlusal schemes on chewing ability, both objectively and subjectively in complete denture patients. Results of studies have shown different results for different study designs, which have led to

controversy in the outcomes [33]no difference was noted between canine guided and group function occlusion in current trial.

In conclusion, evaluating masticatory efficiency and nutritional status in full mouth rehabilitation plays a critical role in assessing the functional outcomes and nutritional well-being of patients. Objective assessment methods and biochemical markers help quantify the impact of full mouth rehabilitation. In the context of evaluating different types of prostheses, paired studies represent a more robust design. This choice minimizes the impact of intraindividual confounding factors, enhancing the validity of the comparisons being made.

It is essential to acknowledge and consider potential limitations that may affect the study's findings and conclusions. Some possible limitations include a small sample size which may limit the statistical power and the ability to detect significant differences between the pre and post-intervention groups accurately. The trial's findings may be influenced by selection bias as the participants might not be representative of the broader population. Differences in patient demographics, treatment techniques, and clinical settings could affect the generalizability of the results to other populations or contexts. The trial's duration may impact the ability to capture long-term changes in masticatory efficiency and nutritional status accurately. Short-term assessments may not fully reflect the sustained effects of full mouth rehabilitation on these outcomes. Recognizing and transparently discussing these limitations is essential for researchers and clinicians to understand the potential impact and applicability of the study's conclusions.

Future scope involves inclusion of other types of full mouth rehabilitations (tooth tissue supported vs. shortened dental arch) with a larger sample size and longer follow ups so that results are more indicative of generalized population.

CONCLUSION

Within limitations of the current trial, we can conclude that full mouth rehabilitation leads to significant increase in masticatory efficiency. A significant improvement in haemoglobin, serum total protein and serum ionic calcium levels post completion of therapy. There was no influence of age, gender and occlusal scheme on chewing efficiency.

Author Contributions

- **Varun Wadhwani**: Conceptualization, Data Collection, Analysis, and Manuscript Writing
- **Deepak Nallaswamy**: Study Design, Supervision, and Critical Review of the Manuscript
- **Suresh Venugopalan**: Methodology, Statistical Analysis, and Interpretation of Results
- **Saravanan Sekaran**: Statistical Analysis, and Interpretation of Results
- **Dhanraj Ganapathy** (Corresponding Author): Project Administration, Final Manuscript Editing, and Approval

DECLARATIONS

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Conflict of Interest

The author declares that he has no conflict

Ethical Approval

Not Applicable

Informed Consent

Not Applicable

REFERENCES

1. Shukri NMM, Duraisamy R, Balasubramaniam A, Ganapathy D: Evaluation of Implant and Prosthesis Survival Rates Based on Crestal Bone Loss. J Long Term Eff Med Implants. 2023, 33:1–14.
2. Jain AR, Nallaswamy D, Ariga P, Philip JM: Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ce ramic restorations. Contemp Clin Dent. 2013, 4:531–5.

..Varun Wadhwani, Deepak Nallaswamy, Suresh Venugopalan, Dhanraj Ganapathy.Comparative Evaluation of Masticatory Efficiency and Nutritional Status of Patients Before and After a Full Mouth Rehabilitation-A Prospective Clinical Trial. Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3)89-98. doi:10.58240/1829006X-2025.3-89

3. Labh AK, Bennis MA, Mani G: Prevalence of Peri-implantitis and Peri-implant mucositis among implant patients: A dental university based study. J Long Term Eff Med Implants. 2021, 31:59–64.

4. Campos Sugio CY, Mosquim V, Jacomine JC, et al.: Impact of rehabilitation with removable complete or partial dentures on masticatory efficiency and quality of life: A cross-sectional mapping study. J Prosthet Dent. 2022, 128:1295–302.

5. Soni R, Yadav H, Pathak A, Bhatnagar A, Kumar V: Comparative evaluation of biting force and chewing efficiency of all-on-four treatment concept with other treatment modalities in completely edentulous individuals. J Indian Prosthodont Soc. 2020, 20:312–20.

6. Pasam N, Arora A, Gilra S: Full Mouth Rehabilitation: A Simple Approach to a Complex Problem. LAP Lambert Academic Publishing; 2012.

7. Pera P, Bassi F, Schierano G, Appendino P, Preti G: Implant anchored complete mandibular denture: evaluation of masticatory efficiency, oral function and degree of satisfaction. J Oral Rehabil. 1998, 25:462–7.

8. Mester S, Evers M, Meyer S, et al.: Extended plasma half-life of albumin-binding domain fused human IgA upon pH-dependent albumin engagement of human FcRn in vitro and in vivo. MAbs.2021,13.: 10.1080/19420862.2021.1893888

9. Yurkstas A, Rs M: Value of different test foods in estimating masticatory ability. J Appl Physiol. 1950, 3.: 10.1152/jappl.1950.3.1.45

10. Kumar JS, Rakshagan V, Arun M: Survival of implant-supported full-mouth rehabilitation among patients reporting to a private dental institution. J Long Term Eff Med Implants. 2021, 31:19–25.

11. Okada K, Enoki H, Izawa S, Iguchi A, Kuzuya M: Association between masticatory performance and anthropometric measurements and nutritional status in the elderly. Geriatr Gerontol Int. 2010, 10:56–63.

12. Devi BV, Ahmed N, Ganapathy D, Maiti S, Pandurangan KK: Expectation of treatment outcomes in complete denture wearers. J Adv Pharm Technol Res. 2022, 13:S277–81.

13. Eberhard L, Schindler HJ, Hellmann D, Schmitter M, Rammelsberg P, Giannakopoulos NN: Comparison of particle-size distributions determined by optical scanning and by sieving in the assessment of masticatory performance. J Oral Rehabil. 2012, 39:338–48.

14. Müller F, Hernandez M, Grütter L, Aracil-Kessler L, Weingart D, Schimmel M: Masseter muscle thickness, chewing efficiency and bite force in edentulous patients with fixed and removable implant-supported prostheses: a cross-sectional multicenter study. Clin Oral Implants Res. 2012, 23:144–50.

15. Zarb GA, Hobkirk J, Eckert S, Jacob R: Prosthodontic Treatment for Edentulous Patients - E-Book: Complete Dentures and Implant-Supported Prostheses. Elsevier Health Sciences; 2013.

16. Chen L, Xie Q, Feng H, Lin Y, Li J: The masticatory efficiency of mandibular implant-supported overdentures as compared with tooth-supported overdentures and complete dentures. J Oral Implantol. 2002, 28:238–43.

17. ELsyad MA, Eaes T, Mohamed SS, Mahrous AI: Within-patient evaluation of chewing efficiency and maximum bite force of conventional dentures, fixed prostheses, and milled bar overdentures used for All-on-4 implant rehabilitation of atrophied mandibular ridges: A short-term randomized trial. Clin Implant Dent Relat Res. 2022, 24.: 10.1111/cid.13104

18. Agarwal S, Ashok V, Maiti S, Agarwal V: Dentists' preference toward fixed versus removable implant prosthesis on edentulous jaws to improve quality of life. J Long Term Eff Med Implants. 2022, 33:83–9.

19. Omo JO, Sede MA, Esan TA: Masticatory efficiency of shortened dental arch subjects with removable partial denture: A comparative study. Niger J Clin Pract. 2017, 20:459–63.

20. Wallace S, Samietz S, Abbas M, McKenna G, Woodside JV, Schimmel M: Impact of prosthodontic rehabilitation on the masticatory

performance of partially dentate older patients: Can it predict nutritional state? Results from a RCT. J Dent. 2018, 68:66–71.

21. Tsai AC, Chang TL: Association of dental prosthetic condition with food consumption and the risk of malnutrition and follow-up 4-year mortality risk in elderly Taiwanese. J Nutr Health Aging. 2011, 15.: 10.1007/s12603-010-0299-z

22. Morais JA, Heydecke G, Pawliuk J, Lund JP, Feine JS: The effects of mandibular two-implant overdentures on nutrition in elderly edentulous individuals. J Dent Res. 2003, 82.: 10.1177/154405910308200112

23. Hamdan NM, Gray-Donald K, Awad MA, Johnson-Down L, Wollin S, Feine JS: Do Implant Overdentures Improve Dietary Intake? A Randomized Clinical Trial. J Dent Res. 2013, 92:146S.

24. Tsai AC, Chang TL: Association of dental prosthetic condition with food consumption and the risk of malnutrition and follow-up 4-year mortality risk in elderly Taiwanese. J Nutr Health Aging. 2011, 15.: 10.1007/s12603-010-0299-z

25. Kagawa R, Ikebe K, Inomata C, et al.: Effect of dental status and masticatory ability on decreased frequency of fruit and vegetable intake in elderly Japanese subjects. Int J Prosthodont. 2012, 25.:

26. Hjermann I, Velve BK, Holme I, Leren P: Effect of diet and smoking intervention on the incidence of coronary heart disease. Report from the Oslo Study Group of a randomised trial in healthy men. Lancet. 1981, 2.: 10.1016/s0140-6736(81)91338-6

27. Peyron M-A, Blanc O, Lund JP, Woda A: Influence of age on adaptability of human mastication. J Neurophysiol. 2004, 92:773–9.

28. Ikebe K, Matsuda K-I, Kagawa R, Enoki K, Yoshida M, Maeda Y, Nokubi T: Association of masticatory performance with age, gender, number of teeth, occlusal force and salivary flow in Japanese older adults: is ageing a risk factor for masticatory dysfunction? Arch Oral Biol. 2011, 56:991–6.

29. Park S, Shin W-S: Differences in eating behaviors and masticatory performances by gender and obesity status. Physiol Behav. 2015, 138:69–74.

30. Ketel EC, Aguayo-Mendoza MG, de Wijk RA, de Graaf C, Piqueras-Fiszman B, Stieger M: Age, gender, ethnicity and eating capability influence oral processing behaviour of liquid, semi-solid and solid foods differently. Food Res Int. 2019, 119:143–51.

31. van der Bilt A, Fontijn-Tekamp FA: Comparison of single and multiple sieve methods for the determination of masticatory performance. Arch Oral Biol. 2004, 49:193–8.

32. Hatch JP, Shinkai RS, Sakai S, Rugh JD, Paunovich ED: Determinants of masticatory performance in dentate adults. Arch Oral Biol. 2001, 46.: 10.1016/s0003-9969(01)00023-1

33.Trapozzano VR, Lazzari JB: An experimental study of the testing of occlusal patterns on the same denture bases. 1952. J Prosthet Dent. 2005, 94:489–98.