

A Review on Chewing Efficiency of Completely Edentulous Patients with Various Dentures

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Abstract:- The chewing ability of completely edentulous patients is compromised due to edentulous state. Hence there is lack of nutrients in such patients. Chewing has direct influence on the body's nutrients, maintenance of the body composition and the general health of patients. Patients with chewing inability are affected to a greater extent. The conventional method for treating edentulous patients is to rehabilitate them with conventional complete dentures. However, advances in implant dentistry have allowed a shift from conventional complete denture to implant-supported overdenture for rehabilitation of edentulous patients and this improves the overall chewing efficiency and the general health. The purpose of this review is to compare the chewing efficiency, masticatory bite force, nutritional status and patient satisfaction among patients wearing complete denture and implant retained overdentures.

Keywords:- Chewing Ability, Completely Edndulous Patients, Chewing Efficiency.

I. INTRODUCTION

The sequelae of being edentulous has its impact on general health. Complete edentulous state results in decreased masticatory function due to loss of teeth and support for facial musculature. Loss of teeth also results in poor esthetics, decreased vertical dimension, and speech impairment. diminished chewing efficiency may lead to inadequate dietary intake.

In a completely edentulous patients chewing efficiency as low as 25% is adequate for complete digestion of food. Studies show that in edentulous patient the masticatory performance to reduce the food size is reduced to one fourth to one seventh of performance of dentate subjects depending on age and type of food [1]. Hence chewing indirectly influences the body's nutrition thereby facilitate the maintenance of the body composition.

The conventional method for treating edentulous patients is to rehabilitate them with conventional complete dentures. However, denture must be adjusted overtime to compensate for progressive tissue changes associated with denture wearing. Patients who wear conventional dentures often complain about the instability of the prosthesis especially during mastication [2]. Denture instability leads to a feeling of insecurity, inefficient mastication, and overall dissatisfaction with the prosthesis. Recent advances in implant dentistry have allowed a shift from conventional complete denture to implant-supported overdenture for oral rehabilitation of edentulous patients [3]. Many studies state that the implant supported overdentures can be one of the treatment of choice for edentulous patients with instable dentures. Implant-retained overdentures have some advantages over conventional complete dentures in terms of chewing efficiency and masticatory bite force. General patient satisfaction improves drastically when compared to non- implant supported denture [2]. Thus denture wearers need 7 times more masticatory cycles to reduce food to half of its size [4]. The aim of this review is to find the satisfaction of chewing ability between complete denture and other dentures in patients with complete dentures.

II. METHOD

A. Selecting criteria

A thorough literature search was done in main databases like PubMed, Embase, Medline, science direct, etc.85 titles were short listed, 54 were included. These 54 articles were screened for abstract manually and 25 articles are shortlisted to match the criteria of the review that is been done and tabulated accordingly in figure 1.

b. inclusion and exclusion criteria

Articles included are related to complete denture wearers, implant supported dentures and over denture wearers. Excluded are the other language article.

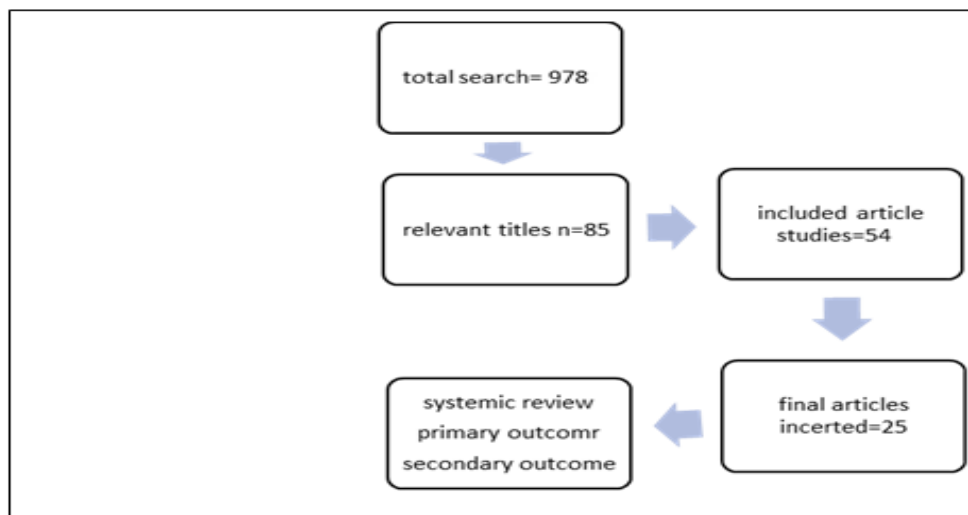


Fig.1:- Flow Chart

B.Tabular Column

s.no	Author	Journal	Study design	Follow up & Mean value	Groups	Methods of evaluation	Results
1.	Maniewicz S, Duvernay E, Srinivasan M, Perneger T, Schimmel M, Müller F.	Clinical Oral Implants Res. 2019 Jan	Swedish study	mean follow-up of 2.7 ± 2.2 years (range: 3 months-7 years). p < 0.001	72 participants IG comprised 16 participants (age = 85.0 ± 6.2 years) the CG comprised 16 (age = 84.8 ± 5.4 years) [complete removable dental prostheses (CRDPs) vs two-implant overdenture (IOD) or a conventional relined of the CRDP.]	colour-mixing test using a bi-coloured chewing gum.	No significant difference
2.	Vaccaro G1, Peláez JI2,3, et al	pLoS one 2018	Canadian study	0,10,15,20 chewing cycles 00 Mean value- p<0.01	N1=80,full dentate patients N2=40 edentulous adults [comparing full dentate patients with	Two-colored chewing gums using combination of computational intelligence and image processing Wilcoxon signed-rank test techniques	Significant increase in masticatory efficiency

					complete denture patients]		
3.	Sharma AJ et al	J Indian prosthodont soc.2017 oct-dec	Crossover clinical trail	5,10,20,30,50 strokes-- 3 months post insertion	(15 patients) N1= conventional denture N2 =implant retained over denture [conventional denture and implant retained over denture]	Chewing 6gms of peanut with 40 strokes	Chewing efficiency: Implant retained denture>CD
4.	Tôrres ACSP1, et al	J Indian prosthodont 2017	RCT Paired study	3,6,12months post insertion Mean value p<0.001 P=0.011	32 Edentulous patients Pre-existing and new denture [comparing quality of denture]	Colorimetric method and OHIP-EDENT questionnaire	No significant difference
5	Jawad S1, Barclay C2, Whittaker W3, Tickle M4, Walsh T4.	BMC Oral Health. 2017 Feb	The pilot study	8 weeks post-placement, and finally at 6 months	46-randomised patients [two mini implants or two conventional implants in the mandible]	gummy jelly-chewing test	No significant difference
6.	Cardoso RG1, Melo LA1,et al	Braz oral Res 2016	NRCT	3months post insertion P=0.001	50 completely edentulous patients wearing bi-maxillary conventional denture [conventional denture and over denture]	Colorimetric method and OHIP-EDENT questionnaire	No significant difference
7	Marcello-Machado RM1,et al	J prosthodont 2017	Cross sectional study		30 complete denture wearers ---2 groups according to mandibular bone atrophy [patients with varying mandibular bone resorbtion]	GOHAI and DIDL	Mandibular bone height does not affect the masticatory function

8.	Bhat S1, Chowdhary R2, Mahoorkar S1.	J Indian Prosthodont Soc. 2016 Apr-Jun	pilot study.		10 patients 4 groups- single, two ,three implant retained patients and conventional denture.	Wilcoxon signed rank test	significant increase mastication in single midline implant supported overdenture
9.	Rastogi A1, Srivastava S2, Gaur A3, Dupare A4, Rastogi S5, Kamatagi L6.	J Clin Diagn Res. 2015 Aug	indian study		20 edentulous patients silicone lined and acrylic lined dentures	Intergroup comparisons were done using ANOVA followed by post-hoc assessments using Tukey HSD test EMG recordings	No significant difference
10.	Farias- Neto A1, Carreiro Ada F2. Et al	Compend contin Educ Dent 2015		3 rd and 6 th month after insertion P<0.05	24 edentulous patients wearing new dentures [Complete denture patients]	Colorimetric method	No significant difference in patient satisfaction. Reduction in pain and well adaptation of lower denture
11.	Iegami CM1, Barbosa WF et al	J oral Rehabil. 2014	RCT	P<0.05	20 edentulous patients N1=were given dentures WSM (without 2 nd molar) N2=were given dentures with FDA (Full dental arches) [complete denture wearers with reduced dental arches]	Optocal, an artificial test food.	Within the limitations of this study, placing artificial teeth up to the first molars can be performed when needed without compromising masticatory efficiency
12.	Xu Sun, MD, Jun- Jiang Zhai, et al	Saudi Med J. 2014	RCT		50 edentulous patients [Implant retained mandibular overdenture]	OHIP 49	The ME increased from pre- to post- implant retained mandibular over dentures significantly.

13.	Liu XH1, Liu JZ, Xie ET AL	Beijing Da Xue xue Bao Yi Xue Ban.2013	Pilot evaluation	2,4,6,8,10,12 Weeks P<0.05	10 edentulous patients with severe alveolar ridge absorption [Long - centric occlusal pattern complete denture wearers.]	Masticatory efficiency was measured with spectrophotometer A psychometric questionnaire	No significant difference
14.	Ma CM1, Shen QP, Zhong Q, Dai WA, et al	Shangai kou Qiang Yi Xue. 2012	Comparative study	1,2,3,6 months after wearing P>0.05	60 CASES N1=Patients treated with lingualized occlusal denture N2= semi anatomical [Lingualized occlusal complete denture].	.	Lingualized occlusal complete denture can achieve good masticatory efficiency for edentulous patients with flat or depressed residual ridges
15.	Ribeiro JAI, de Resende CM, et al	J prosthodont 2012	Cross sectional study	Between 2 years and 5 years P<0.05	93 edentulous patients N1= of denture use: ≤ 2 years N2=≥ 5 years [complete denture patients]	colorimetric method Reproducible method	Complete denture quality and masticatory efficiency significantly decreased over time.
16	Preoteasa E1, Marin M, et al	Rev Med Chir Soc Med Nat lasi 2012			36 patients N1=18 treated with newly made conventional prosthesis N2=18 with mini implants anchored over dentures. [complete denture patients and mini implants anchored over dentures]	a ball attachment system	Patients treated with mini implant anchored Over dentures were more satisfied than those treated conventionally.
17.	Cheng T1, Sun G, Huo J et al	J Dent. 2012	RCT	3 months before and after insertion	Patients were assessed 3 months before and 3 months after insertion.	stud (Locator) or a magnetic (Magfit) attachment	No significant difference

				p>0.05	[single implant-retained mandibular overdentures using the stud and magnetic attachments]		
18.	Bajoria AA1, Saldanha S, et al	Gerodontology 2012	SURVERY	30-45 days follow up P<0.05	30 edentulous patients N1= 12 male N2= 18 female [Edentulous patients]	The questionnaire survey	Those patients who were edentulous previously and dissatisfied with their masticatory ability showed improvement after receiving a new set of conventional complete dentures.
19.	Farias Neto A1, Pereira BM et al	Gerodontology 2012	RCT	3 months after insertion P=0.198 P<0.001 P<0.005	29 completely edentulous patients N1= rehabilitated with a mandibular over denture retained by two splinted implants with bar-clip system N2=rehabilitated with a mandibular CD [complete denture patients and mandibular overdenture retained by two splinted implants with bar-clip system]	Colorimetric method	No significant statistical difference was found for masticatory efficiency. Patient overall satisfaction was significantly higher for the mandibular overdenture. In addition, mandibular overdenture patients were significantly more satisfied with chewing experience and retention of the lower denture.
20.	Goiato MC1, Garcia AR, et al	J Prosthodont 2010		Before ,5 months and 1 year after denture insertion	14 asymptomatic patients with severe bone resorption. All patients had worn complete dentures for over 10 years. Recall visits were scheduled at 5 months and 1 year after	Sieve system	An improvement in masticatory efficiency and a reduction in mastication time were observed with the new dentures after 1 year.

					receiving new denture [complete denture patients with severe bone resorption]		
21.	Muller K1, Morais J,	Braz Dent J.2008	RCT	1 year before and after $p>0.05$	53 patients (58% men, 42% women; mean age = 53). [complete denture patients]	Food Frequency Questionnaire and a Masticatory Function Questionnaire	No significant difference
22.	Chen L1, Xie QF, Yang ZH, et al	Zhonghua Kou Quiang Yi Xue Za Zhi. 2003		$P<0.01$	42 subjects were rehabilitated with CD, COD and IOD respectively and wore the dentures at least half a year. [complete denture (CD), complete overdenture (COD) and implant-supported overdenture (IOD)]	Masticatory Function Questionnaire Blood tests were performed to measure plasma parameters of diet intake Chewing almond and jujube. mandibular movement trace	The average chewing efficiency of almond and jujube in the IOD patients was higher than that in the CD group ($P < 0.01$), and the chewing efficiency of almond in COD group was higher than that in the CD group. In the IOD group, there were more patients with regular chewing cycle centralized end traces in mandibular movement than those in the CD group and COD group.
23.	Koshino H1, Hirai T, et al	Int J Prosthodont, 2002			28 complete denture wearers (mean age 75.6 years) [Complete denture wearers with the mandibular residual ridge shape]	Replica of the ridge obtained with heavy-body silicone impression material. The basal area of the replica was measured by a digitizer, sieve method	There was a significant correlation between the masticatory efficiency and basal area, volume, and height of the residual ridge. The basal area showed the strongest correlation

24.	Allen F1, McMillan A.	Clin Oral implants Res,2002			<p>N1= subjects who requested and received implants to stabilise a complete fixed or removable prosthesis. (IG, n = 26), N2= edentulous subjects who requested implant prostheses, but received conventional dentures. (CDG2, n = 35). N3= edentulous subjects who requested and received conventional dentures.</p> <p>[Implant and complete denture patients]</p>	Questionnaire	<p>. Subjects who received implant prostheses reported significant improvement in chewing hard and soft foods. CDG2 subjects also reported improvement, but CDG1 subjects reported no change or even deterioration following treatment. Despite reported improvement in satisfaction with comfort and ability to chew food, 30-50% of IG and CDG2 subjects still avoided eating foods such as carrot and apple.</p>
25.	Suzuki K, Ishikawa C et al	Nihon Hotetsu Shika Gakkai Zasshi. 1989		5-10 years of wearing period P=38.5%	72 patients [complete denture wearers covering 10 years]	Chewing peanuts Kamaboko (steamed fishpast)	<p>There was significant difference in the masticatory efficiency with peanuts between the group needed new denture and the group not needed but there was no significant difference with Kamaboko.</p>

Table 1:- case study related to masticatory efficiency in edentulous patients

III. DISCUSSION

This article reviews about masticatory/ chewing efficiency, nutrition status, quality of life among complete denture patients with implant retained overdentures and complete overdentures.

Complete edentulous condition is associated with anatomical, functional, and psychological changes in patients. In complete dentures, the absence of stability,

retention, and reduced chewing ability are common complaints contributing to poor quality of life.

The type of dentures evaluated were conventional complete denture, implant supported dentures, tooth supported over dentures. Both objective and subjective evaluation were done to assess the chewing efficiency. The methods most commonly used to assess in subjective methods were colorimetry method [5,6,14,19,23], chewing peanuts or gummy [7,9,13,18,20,29], haematological investigation assessing various nutrients value [26] and

sieve methods for particle size [24,27]. Objective methods used are physcometric method [17,21], food frequency and masticatory frequency questionnaire and other questionnaire [12,15,22,25,28], OHIP [8,10,16,], GOHAI AND DIDL [11].

In this study 12 articles chewing efficiency of complete denture base line and after 12 weeks [8,10,11,14,15,18, 19,22,24,25,27,29], 1 article comparing complete denture wearers and completely dentate patients [6], 10 articles comparing complete denture and patients with implant supported dentures [5,7,12,13,17,20,21,23,26,28], 2 articles related to implant supported dentures comparing mini implants and conventional implant [9,16]. Table 2 shows the content

Out of 25 articles had reviewed about 20 methods were used to find out the masticatory efficiency, denture

quality and patient satisfaction. Only 9 methods show positive results towards masticatory efficiency [6, 7, 12, 16, 18, 20, 22, 23, 24, 26-29] the rest of the methods shows negative results that is no difference in masticatory efficiency [5, 8,9,10,11,13,14,15,17,19,21,25]. Of the 25 articles the masticatory efficiency of complete denture, implant retained overdenture and complete overdenture were compared. Table 3 and table 4 shows the results.

The chewing efficiency that were evaluated by subjective and objective methods showed significant difference in between the groups in few studies. The objective method of evaluation revealed better patient satisfaction. However, there appears to be no concrete evidence to prove that patient’s nutritional status has improved or has not lost.

s.no	GROUPS	Articles included
1	Conventional complete denture at baseline and 12 weeks	12
2	Complete denture and full dentate patients	1
3	Conventional complete denture & implant supported denture	10
4	Implant supported denture at baseline and 12 weeks	2

Table 2:- groups of the 25 articles

The objective methods used questionnaire to assess the chewing efficiency with patient satisfaction score. Higher scores reflected good patient satisfaction indicating that the patient is comfortable with chewing. Nutritional status of the patient are best evaluated from serum levels of the nutrients. In this review there was one study that assessed the serum

levels of the samples studied and there was significant difference in the nutrition status of the patients with implant denture. From the results of the study included, though there appears to be significant improvement in the nutrition status of the patients, a thorough nutrition analysis at baseline and after 12 weeks is required to prove the results.

S.no	Methods	Groups compared
1	Chewing peanut with 40 strokes	Complete denture and implant retained overdenture
2	Sieve system	Complete denture with mandibular residual ridge shape
3	haematological investigation	Cd, complete overdenture and implant retained overdenture
4	Questionnaire, (quality of life (qol), Ohip 49, Gohai and didl	Cd & implant

Table 3:- The positive results showing groups and methods are given below

s.no	METHODS	GROUPS COMPARED
1	Colorimetric method	COMPLETE DENTURE
2	Physcometric method	LONG CENTRIC OCCULUSAL PATTERN OF CD
3	questionnaire(OHIP)	COMPLETE DENTURE, CD & OVERDENTURE.

Table 4:- The negative results showing groups and methods are.

III. RESULT

On comparing the results masticatory efficiency, nutritional status improved in the patients wearing implant retained overdentures comparing to complete denture patients. However, the results are positive in CD only when the patients receive new set of denture replacing the old set after several years of usage. The quality of denture is also gets improved compared to the old set of dentures. However, in some of the CD patients without replacing the new set of dentures some methods like lingualized occlusal contact shows improvement in their chewing efficiency. In one of the article says that there was a significant correlation

between the masticatory efficiency and basal area, volume, and height of the residual ridge. The basal area showed the strongest correlation.

On comparing the 3 sets of patients including Complete denture (CD), Complete overdenture (COD) and implant retained overdenture(IOD) by chewing the almonds and jujube. The masticatory efficiency was improved in COD & IOD whereas there is no difference in CD patients

IV. CONCLUSION:

From the systematic reviews which are discussed above, we conclude that in order to check the masticatory efficiency, nutritional status, and patient satisfaction of among complete denture, implant retained overdenture, and complete overdenture wears, the above mentioned methods are not sufficient to provide the exact results which is required to justify. From the above methods we learn that chewing efficiency gets improved in implant retained overdentures compared to complete denture patients. Nutritional status which were evaluated using blood test alone does not give the exact result towards the health status and the periodic evaluation of nutrition levels are very important in order to get the exact results. In many other methods questionnaires were used. They do not give us the accurate results because the patients won't have the patience and the knowledge to acknowledge about the questionnaire. Not only the methods mentioned above but also others methods that are present other than the ones that are taken in consideration in this study must be used to evaluate the masticatory efficiency, nutritional status etc, in order to obtain proper conclusion.

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