

EFFECTIVENESS OF COMPLETE OVERDENTURE THERAPY AND CONVENTIONAL COMPLETE DENTURE- A COMPARATIVE STUDY

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ABSTRACT

Overdenture treatment helps preserve the alveolar bone around abutment teeth and in adjoining areas due to lowering compressive stresses. Overdenture patients require less frequent relining of the denture base. Overdentures are more stable and functionally more retentive. The incidence of sore spots is less under overdentures. Compared to conventional denture therapy, this treatment mode takes longer to fabricate. Patient satisfaction and acceptance of the overdenture treatment modality are superior to conventional dentures. Alternative. Caries, periodontal involvement. Repairs, relines, and remakes are inevitable. However, if the rate of abutment tooth loss measures success, then overdentures are successful. If the success of overdenture therapy is determined by patient acceptance and quality of retention and support, then overdentures are successful.

KEYWORD: Complete Overdenture, Conventional Complete Denture, Retention, Support.

1. INTRODUCTION:

A dental prosthesis that replaces the lost or missing natural dentition and associated structures of the maxilla and mandible and receives partial support and stability from one or more modified natural teeth. It has been called by various names—Overlay denture, Onlay denture, telescopic denture, hybrid denture, biologic denture, coping prosthesis, superimposed denture & tooth- supported complete denture [1].

Overdenture therapy is essentially a preventive prosthodontic concept since it attempts to conserve the few remaining natural teeth. There are two physiologic principles related to this therapy: the first concerns the continued preservation of alveolar bone around the retained teeth [2], while the second refers to the continuing presence of periodontal sensory mechanisms that guide and monitor gnathodynamic functions. Overdentures help to partly overcome many of the

problems posed by conventional complete dentures, like progressive bone loss, poor stability and retention, loss of periodontal proprioception, low masticatory efficiency, etc. [3].

Patients presenting with a few remaining teeth or teeth with severe periodontal disease were subjected to extensive treatment plans consisting of periodontic and endodontic therapy combined with an energetic restorative technique involving total extraction and construction of removable conventional complete dentures. How is it possible to preserve these remaining teeth and construct a denture over them? The teeth and the alveolar bone are closely interlinked. Without the teeth, the alveolar bone tends to atrophy and resorb. The longer the teeth remain in the alveolar bone, the longer it is preserved [4].

Removable partial denture takes part of its support from the remaining natural teeth. A large removable partial denture utilizing a few remaining teeth for support and retention could result in excessive stress on those teeth. Over some time, mobility and periodontal breakdown may fail abutments [5].

Shortening the natural tooth changes the crown-root ratio. This reduces the lateral stresses. It also reduces lever action on the tooth. The complete denture resting on these shortened teeth exerts largely vertical forces directed toward the bone. Which are better tolerated by the teeth.

The overdenture accomplishes three important goals. First, it maintains teeth as part of the residual ridge. This gives the patient a denture with far more support than any conventional appliance. The second goal achieved by the overdenture is a decrease in the alveolar bone resorption rate by preserving the tooth.

The third goal achieved by the overdenture is an increase in the patient's manipulative skills in handling the denture. With the preservation of the teeth for an overdenture, there is also the preservation of the periodontal membrane surrounding these teeth. This preserves the proprioceptive impulses supplied by the periodontal membrane; thus, a part of the myofascial nervous complex is retained when teeth are maintained [7].

In telescopic overdentures [3], the selected abutment teeth are subjected to periodontal and endodontic therapy and covered with medium (4-5 mm) occlusal converging primary cast copings[1]. Support and frictional retention for the prosthesis are provided either by secondary cast copings fitting over the primary copings and incorporated as an integral part of the denture base or by processing the denture base resin directly over the primary copings cemented onto the abutments. The telescoping between metallic copings directly with acrylic channels in the denture base has merits [8].

Brewer and Fenton [9] advocated a short dome-shaped reduction of endodontically treated abutments followed by amalgam fillings and overdentures with no castings constriction. Ebel [10] questioned the widespread use of stud-type overdenture attachments over periodontally weakened teeth. According to him, engagement of undercut by soil liners can minimize the need for overdenture attachments. Tallgren [11,12], in longitudinal cephalometric studies of complete denture wearers, reported that alveolar bone loss was progressive, four times more in the lower arch than in the upper. The mandible showed a loss of approximately 10 mm ridge height over 25 years, with the reduction in the maxillary ridge height during the same period being 2.5-3 mm.

Atwood [13] observed that the residual ridge resorption (RRR) after tooth loss was chronic, progressive, cumulative, irreversible and perhaps inevitable. Crum and Rooney [14], in a five-year study of patients wearing overdentures and conventional dentures, reported that the vertical alveolar bone loss in the anterior region under complete mandibular overdentures supported by canine abutments and opposed by complete conventional dentures was only 0.6 mm after five years. In the case of conventional lower dentures, the loss averaged 5.2 mm. Crum and Loisel [15] reviewed the subject of oral perception and proprioception. They concluded that periodontal receptors were important in the overall neurologic mechanisms controlling and monitoring jaw function. Guyer [16] reported that submerged roots effectively maintained the alveolar ridges. Nagasawa et al. [17], from EMG studies of patients wearing complete conventional and overdentures, concluded that periodontal proprioception influenced the efficiency and skill in the cyclic jaw movements.

1.1 Justification:

The use of dental services is still strongly influenced by socioeconomic factors. Cost is an important barrier to limiting the scope of prosthodontic services to the population. When comparing costs, however, it is important to not only the initial cost and the survival rate but also the effect of failures, the possibility of re-treatment, and the risks involved.

Many partially or completely edentulous patients attend the different hospitals and private clinics for both replacement by partial or complete dentures. Those patients are treated with acrylic partial or complete dentures in almost all situations. Using acrylic resin to duplicate the soft tissue tone of each patient can permit the placement of esthetically acceptable dentures. But unfortunately, the prognosis of this type of denture is very poor. Many dissatisfied partial denture patient cases attend in the outpatient department of prosthodontics, BSMMU, with complaints of denture

loosening, movement of denture under functional loading of mastication, unnatural feeling, soreness of mucosa and defective denture.

Using tooth or teeth or roots to prevent and treat chronic tissue irritation from dentures is an excellent alternative. It is beneficial in preserving the health of the remaining denture-supporting tissues. The tooth-supported complete overdenture offered comfort to a significant number of patients in this study who had a history of chronic discomfort with wearing partial dentures. Their masticatory function markedly improved. Mucosa soreness relieved a cent per cent in cases of tooth-supported complete overdenture and reduced tissue irritation. Retention stability and support were also improved in tooth-supported complete overdenture.

In this study, tooth-supported complete overdenture is incorporated with conventional complete denture for the patient's betterment, which justifies the present study.

2. MATERIALS AND METHODS:

Thirty healthy individuals participated in this Prospective Observational study, which was carried out in the Department of Prosthodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh. Each participant suffered from partial or complete edentulism. Each participant was provided either tooth-supported overdenture or conventional complete denture. A convenience sampling procedure was carried out in this one-year study. The inclusion criteria were remaining abutment teeth with good periodontal support, good alveolar bone support, crown-root ratio and morphology of abutment teeth, endodontically treated abutment teeth, partially edentulous arch, and completely edentulous arch.

2.1 Study procedure:

Each patient was evaluated by a thorough medical and dental history, clinical examination, diagnostic model analysis and radiographic examination. The treatment plan was explained to the patients, and the treatment procedure was mentioned. Being assured of the patient's full cooperation, they were finally selected. After providing treatment and instructions on prosthesis maintenance, patients were advised to report for evaluation after 1st Week, 2nd Week, 3rd month, and 6th month. All patients were motivated for their oral hygiene and instructed on oral hygiene procedures in every follow-up visit. All participants were divided into two groups. Group- A consisted of 15 participants wearing tooth-supported complete overdentures, and Group- B consisted of 15 participants wearing conventional full dentures. Abutments were selected after clinical assessment and review of study casts and radiographs. The following factors were considered: relative axial inclinations, periodontal status as revealed by mobility, pocket depth, gingival contours, gingival recession etc., crown root ratio and root morphology, nature of alveolar support, location in the arch, caries involvement endodontic considerations. Ideally, sound teeth in good periodontal health were sought.

Retention was checked by seating the denture and then attempting to remove the denture at right angles to the occlusal plane. The load was applied upwards and outwards in one canine region to check the retentive force in the contralateral canine. Then, the same procedure was done on the other side. The load was applied by engaging a probe tip at the margin of the labial flange outwards and upwards. Lifting at the distal end indicates improper retention. Grading was done as satisfactory and defective

- Satisfactory –No lifting at the distal end.
- Defective- Easily lifted at the distal end.

Stability was checked by applying pressure with a ball of finger in the premolar and molar region on the side alternatively. This pressure was directed at right angles to the occlusal surface. If pressure on one side caused the denture to tilt and rise from the ridge on the other side, it indicated defective stability. Responses were recorded according to the different grading, such as —

- Satisfactory- No tilting or rising from the ridge at all.
- Defective - Easily tilted and rise from the ridge.

Support was checked by pressing the participant's finger heavily on any tooth. Now, press equally hard on any edentulous area or buccal or lingual gingival tissues. Grading was done satisfactorily and defected.

After the insertion of the prosthesis, the respondents' speech was categorized into three groups: good, fair, and poor based on articulation test or IOWA Pressure Articulation Test. The grading was as follows -

- Good- Clear speech with no nasal tone.
- Fair - Speech with some nasal tone.
- Poor- Speech not clear at all.

Patient compliance in the two groups depended upon the feeling of comfort of the patients. It depended upon feeling

comfortable during the insertion and removal of the prosthesis, tolerance of the denture in the mouth, aesthetics, etc. Compliance, as described by the patients, was categorized into three groups: good, fair and poor-

- Good- Fully satisfied
- Fair- Satisfied
- Poor- Less satisfied

The patients were given the usual home care instructions about wearing and caring for dentures. The importance of maintaining the health of retained teeth was stressed since all the advantages of overdentures solely depended upon their continued presence. Gentle cleaning and massage with a soft toothbrush using fluoride toothpaste, frequent use of mouthwashes, denture removal at night and meticulous denture hygiene with a denture brush and mild soap were explained. The recall visits schedule followed was: after 24 hours, two weekly visits, fortnightly visits and after that every six months. In addition, the patients were free to visit the clinic at any time in case of any problem.

2.2 Evaluations:

At recall visits, the oral health status was monitored. Dentures were assessed for retention and stability, and occlusion was refined. The passivity of contact between the denture and gingival area of the abutments was evaluated. The overdentures were also evaluated against conventional dentures provided to other comparable subjects.

2.3 Data Processing:

After recording, the data were presented in the form of tables. Statistical analysis of the results was done using computer-based statistical software, SPSS 20.00 version (SPSS Inc. Chicago, USA).

3. RESULTS:

In Table 1, It was found that among group-A patients, 60% had retention and stability of tooth-supported overdenture. In contrast, among group-B patients, it was 86.7% and the difference was not statistically significant ($p>0.05$). After treatment, no patient complained of retention and stability in group-A whereas in group-B patients, it decreased to 33.3% and was statistically significant ($p<0.05$).

Table 1: Distribution of patients by retention and stability for tooth-supported overdenture and conventional denture during different study periods (n=30)

Study period	Retention & Stability for denture	Study subjects				Chi-square/ P value
		Group-A (n=15)		Group-B (n=15)		
		No.	%	No.	%	
Per-treatment	Satisfactory	9	60	13	86.7	0.394 ^{NS}
	Defective	6	40	2	13.3	
Post-treatment	Satisfactory	15	100	5	33.3	0.025*
	Defective	0	00	10	66.7	

In Table 2, It was found that among group A 13.3% of patients had support for tooth-supported complete overdenture, whereas among group B patients, it was 6.7%, and the difference was not statistically significant ($p>0.05$). After treatment,, no patient complained of support in group-A patients whereas in group-B patients, it increased to 33.3% and was statistically significant ($p<0.05$).

Table 2: Distribution of patient's support for overdenture and conventional denture during different study periods (n=30)

Study period	Support overdenture for and denture	Study Subjects				Chi-square / P value
		Group-A (n=15)		Group-B (n=15)		
		No.	%	No.	%	
Per-treatment	Satisfactory	2	13.3	1	6.7	0.564 ^{NS}
	Defective	13	86.7	14	93.3	
Post-treatment	Satisfactory	15	100	5	33.3	0.025*
	Defective	0	00	10	66.7	

Table- 3: showed during different study periods, looseness of tooth-supported complete overdenture and conventional complete denture was found initially among group A, with 13.3% of patients had complaints, and in group B, 6.7% of patients had complaints of looseness of complete denture, and difference was not statistically significant ($p>0.05$). During different study periods, complaints of looseness of complete dentures increased in group B patients, and the difference was not statistically significant ($p>0.05$). However, at the end of the 6th month, the complaints of looseness of complete denture remained static in group-B patients 33.3%, but no patient had complaints of looseness of overdenture in group-A patients.

Table 3: Distribution of patients by the looseness of tooth-supported overdenture and conventional denture during the different study periods (n=30)

Study period	Looseness of overdenture denture	of Study Subjects				Chi-square/ P value
		Group-A (n=15)		Group-B (n=15)		
		No.	%	No.	%	
Baseline	Present	2	13.3	1	6.7	0.335 ^{NS}
	Absent	13	86.7	14	93.3	
1 st Week	Present	0	0.0	5	33.3	0.081 ^{NS}
	Absent	15	100.0	10	66.7	
2 nd Week	Present	0	0.0	5	33.3	0.081 ^{NS}
	Absent	15	100.0	10	66.7	
3 rd month	Present	0	0.0	5	33.3	0.081 ^{NS}
	Absent	15	100.0	10	66.7	
6 th month	Present	0	0.0	5	33.3	0.081 ^{NS}
	Absent	15	100.0	10	66.7	

In Table- 4, Regarding the masticatory efficiency, baseline data indicated that no statistically significant difference was found between the two groups of patients ($p>0.05$). After treatment, the masticatory efficiency increased more in patients treated with tooth-supported complete overdenture in group A than in patients treated with conventional complete denture in group B, and the difference was highly statistically significant ($p<0.05$).

Table 4: Distribution of patients by masticatory efficiency during different study periods (n=30)

Study period	Masticatory efficiency	Study subjects				Chi-square/ P value
		Group-A (n=15)		Group-B (n=15)		
		No.	%	No.	%	
Baseline	Good	2	13.3	1	6.6	0.154 ^{NS}
	Fair	13	86.7	13	86.7	
	Poor	0	0.0	1	6.6	
1 st Week	Good	6	40.0	0	0.0	0.038*
	Fair	9	60.0	13	86.7	
	Poor	0	0.0	2	13.3	
2 nd Week	Good	10	66.7	0	0.0	0.001**
	Fair	5	33.3	13	86.7	
	Poor	0	0.0	2	13.3	
3 rd month	Good	11	73.3	1	6.6	0.001**
	Fair	4	26.7	11	73.3	
	Poor	0	0.0	3	20.0	
6 th month	Good	12	80.0	4	26.7	0.000***
	Fair	3	20.0	10	66.7	
	Poor	0	0.0	1	6.6	

Table 5 showed during different study periods, the incidence of sore spots of mucosa were observed initially in 33.3% of patients in group A. In the 1st week study period, only 13.3% of patients had complaints of sore spots of mucosa and subsequent study period, no patient had complaints of sore spots of the mucosa, whereas among the group B, 80% of patients had complaints of sore spots of mucosa. During the different study period, the sore spots of mucosa

decreased to 26.7% at the end of 6 months. These indicated that the healing rate was very slow in group B than treatment by tooth-supported complete overdenture in group A, and the difference was statistically significant ($p < 0.05$).

Table 5: Distribution of patients by incidence of sore spots of mucosa for overdenture and conventional denture during different study periods (n=30)

Study period	Sore spots of mucosa	Study subjects				Chi-square/ P value
		Group-A (n=15)		Group-B (n=15)		
		No.	%	No.	%	
Baseline	Not relieved	5	33.3	12	80.0	0.035*
	Relieved	10	66.7	3	20.0	
1 st Week	Not relieved	2	13.3	11	73.3	0.004**
	Relieved	13	86.7	4	26.7	
2 nd Week	Not relieved	0	0.0	10	66.7	0.031*
	Relieved	15	100.0	5	33.3	
3 rd month	Not relieved	0	0.0	10	66.7	0.031*
	Relieved	15	100.0	5	33.3	
6 th month	Not relieved	0	0.0	4	26.7	0.000***
	Relieved	15	100.0	11	73.3	

In Table- 6 showed, comfortless was improved statistically significantly ($p < 0.05$) in group-A patients compared to group-B patients.

Table 6: Distribution of patients by comfortness during different study periods (n=30)

Study Periods	Comfortness	Study subjects				Chi-square/ P value
		Group-A (n=15)		Group-B (n=15)		
		No.	%	No.	%	
Baseline	Fair	14	93.3	11	73.3	0.040*
	Poor	1	6.6	4	26.7	
1 st Week	Good	5	33.3	0	0.0	0.001**
	Fair	9	60.0	12	80.0	
2 nd Week	Poor	1	6.6	3	20.0	0.000***
	Good	11	73.3	0	0.0	
3 rd month	Fair	4	26.7	12	80.0	0.000***
	Poor	0	0.0	3	20.0	
6 th month	Good	12	80.0	3	20.0	0.000***
	Fair	3	20.0	9	60.0	
6 th month	Poor	0	0.0	3	20.0	0.004**
	Good	13	86.7	8	53.3	
6 th month	Fair	2	13.3	6	40.0	0.004**
	Poor	0	0.0	1	6.6	

In Table- 7, the analysis of data indicated that initially, no statistically significant difference was found between two groups of patients in terms of phonation ($p > 0.05$). On 1st and 2nd week of the study period, statistically significant improvement in phonation was observed in both groups of patients ($p < 0.05$). At three months and but at the end of 6 months study period, the improvement was a little bit lower in group-A patients, and the difference was not statistically significant ($p > 0.05$).

Table 7: Distribution of patients by phonation during different study periods (n=30)

Study period	Phonation	Study subjects				Chi-square/ P value
		Group-A (n=15)		Group-B (n=15)		
		No.	%	No.	%	
Baseline	Good	5	33.3	3	20.0	

1 st Week	Fair	9	60.0	10	66.7	0.182 ^{NS}
	Poor	1	6.6	2	13.3	
	Good	10	66.7	8	53.3	
2 nd Week	Fair	4	26.7	7	46.7	0.018*
	Poor	1	6.6	0	0.0	
	Good	12	80.0	8	53.3	
3 rd month	Fair	3	20.0	7	46.7	0.027*
	Poor	0	0.0	0	0.0	
	Good	12	80.0	9	60.0	
6 th month	Fair	3	20.0	6	40.0	0.079 ^{NS}
	Poor	0	0.0	0	0.0	
	Good	11	73.3	10	66.7	
	Fair	4	26.7	5	33.3	0.389 ^{NS}
	Poor	0	0.0	0	0.0	

Chi-square test is done to determine the p value, n= Number of patients, p<0.05, *= Significant, **/***= Highly significant, NS= Not significant



Figure-1: Overdenture Prosthesis



Figure- 2: Conventional Complete Denture Prosthesis

4. DISCUSSIONS:

This prospective observational study was conducted to observe comfotless, masticatory efficiency, phonation, sore spots of mucosa, looseness, retention, stability and support of the overdentures and conventional dentures.

This study showed that tooth-supported complete overdenture was more comfortable in 86.7% of the patients in group A than 53.3% in group-B patients were treated with conventional complete denture. However, in subsequent periods, the feeling of comfort improved significantly in group A patients compared to group B patients.

Christensen [18] in studies involving natural dentitions. Overdentures and complete dentures showed that dimensional perception was most acute in patients with natural dentitions, followed by those wearing overdentures, and least in the case of complete denture patients. Crum and Loisel [19] reviewed the subject of oral perception and proprioception and concluded that periodontal receptors had an important role in the overall neurologic mechanisms controlling and monitoring the jaw function.

In this study, tooth-supported complete overdenture improved chewing or masticatory function in 80% of patients. Baseline data showed that masticatory efficiency had no statistically significant difference between the two groups of patients. After treatment, the masticatory efficiency increased more in patients treated with tooth-supported complete overdenture than conventional complete overdenture treatment, and the difference was highly statistically significant.

After a lapse of 6 weeks from the insertion, the masticatory efficiency was evaluated based upon the patient's subjective judgment, questioning by the dentist regarding the nature of food and eating habits of the patient and the ability to chew roasted groundnuts one by one. Of the 32 overdenture patients, 19 were rated as good, 11 as satisfactory and one as poor compared to conventional denture patients for whom the corresponding values were 8, 14 and 10, respectively [8]. A previous study showed masticatory efficiency improved in 60% of patients [8].

Data analysis indicated that initially, no statistically significant difference was found between two groups of patients in terms of phonation. On 1st and 2nd week of the study period, statistically significant improvement in phonation was observed in both groups of patients. 3rd month at the end of 6 month study period, the improvement was slightly lower in group-A patients and the difference was not statistically significant.

This study found fair to good tissue health of the patients examined. Pressure sore spots of tissue were relieved (100%) by using tooth-supported complete overdenture. It was observed that initially, 33.3% of patients in group-A patients had soreness in the mucosa. At 1st Week follow up, only 13.3% had complaints of soreness of mucosa, whereas among group B patients, 80% had complaints of soreness of mucosa, and following treatment, the soreness of mucosa decreased to 26.7% at the end of 6 months. These indicated that the healing rate was very slow in conventional treatment than in treatment by tooth-supported overdenture. Patients with overdentures reported fewer incidences of sore spots in relation to prostheses [8].

Looseness was absent in tooth-supported complete overdentures. During Packing, acrylic flows easily on the tissue surface of the model under pressure and occupies the place of all resorbed tissue. It reproduces the minute details of tissue and closely adapts with the tissue surface. As close adaption is one factor for retention and all the resorbed tissues are filled by this material, denture becomes firmly adapted to the denture-bearing areas. In this study, in most cases, retention, stability and support were good in 33.3% of patients.

The superior stability and retention of the overdenture were apparent from the insertion phase itself. Of the 30 lower complete overdentures. The stability and retention were rated good for 17, satisfactory for 12, and poor for one prosthesis. The corresponding values in the above categories for the 30 lower conventional complete dentures were 6, 11 and 13, respectively. A previous study showed masticatory efficiency improved in 60% of patients [8].

5. CONCLUSION:

Overdenture treatment helps preserve alveolar bone around abutment teeth and in adjoining areas due to lowering compressive stresses. Overdenture patients require less frequent relining of the denture base. Overdentures are more stable and functionally more retentive. The incidence of sore spots is less under overdentures. Compared to conventional denture therapy, this treatment mode takes longer to fabricate. Patient satisfaction and acceptance of the overdenture treatment modality is superior when compared to conventional dentures. Alternatively, Caries, periodontal involvement. Repairs, relines, and remakes are inevitable. However, if success is measured by the rate of abutment tooth loss, then overdentures are successful. If the success of overdenture therapy is determined by patient acceptance and quality of retention and support, then overdentures are successful.

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