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Original Research

Comparative evaluation of bite force for different prosthetic option in edentulous cases in north Indian population

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***ABSTRACT*:**
Introduction- In order to overcome the problems of conventional complete denture implant overdenture came into existence. This study was designed to determine a better as well as economical treatment option for edentulous mandible in north Indian population. **Material and method-** The study was designed to evaluate the bite force among different dental prosthetic options. 10 patients with conventional denture, 10 with single implant supported overdenture and 10 patients with two implant supported overdenture were selected. Bite force was recorded using bite gauge- an electronic bite gauge which uses the principle of strain gauge to measure the bite force (ASEC solution, Bangalore, India). The strain gauge sensor was kept between 1st molar areas of both the denture unilaterally both right and left side. Patient was asked to exert maximum force and 3 readings were recorded both right and left side. The reading obtained was in Newton. **Result-** The mean value of bite force among all these three treatment modalities was measured and tabulated for both right and left side, ANOVA and post hoc Tukey HSD test was applied to evaluate and compare the retention force among all these three treatment modality. **Conclusion-** A significant difference in retention was found among all the three treatment modalities. However more bite force was there on right side.
Keywords: bite force, overdenture, implant

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INTRODUCTION

Conventional complete denture patients generally complain for decreased retention, denture instability, decreased satisfaction, and reduced masticatory efficiency especially to the mandibular denture. Denture stability, retention and the masticatory function can be improved by dental implants. Long-term studies for comparison of implant overdentures reported no significant difference between them in clinical, radiographically parameters, and patient satisfaction as well[1,2]. However, two implant supported overdenture is regarded as the minimum standard of care for treatment of mandibular edentulous jaw[3]. The financial boundation is a chief problem with most of the patients.

In such case single implant supported overdenture can be an alternative treatment option. Many studies claim that single implant overdentures have a promising results both clinically, radiographically, and better patient satisfaction, in addition to being time-saving, less surgical intervention, and cost-effective[4-8]. However, there are only a few clinical trials that evaluate the single implant overdenture in comparison with the minimum standard of care (i.e., two implants mandibular overdenture). These studies reveal the insignificant difference between two treatment modalities in terms of survival rate, peri-implant bone loss, and patient satisfaction[9-12]. Bite force is considered as an important criterion for the masticatory efficiency and directly related to the masticatory performance[13-14].

MATERIAL AND METHOD

The study was designed to evaluate the bite force among different dental prosthetic options. 10 patients with conventional denture,10 with single implant supported overdenture and 10 patients with two implant supported overdenture were selected following these inclusion and exclusion criteria.

Inclusion criteria:-

1. Patient's age ranged from 55 to 70 years old (mean age of 60 years)
2. Resorbed ridge with an adequate amount of keratinized mucosa
3. Skeletal Class I patients with adequate interarch distance with parallel ridges
4. Free from temporomandibular disorders

Exclusion criteria:-

1. Class II and III skeletal relationship
2. Irradiated patient or patient undergoing chemotherapy
3. Smokers
4. Patients with a history of parafunctional habits (e.g. Clenching or bruxism)
5. Osteoporosis and hyperparathyroidism
6. Systemic diseases with known effect on implant surgery as uncontrolled diabetic

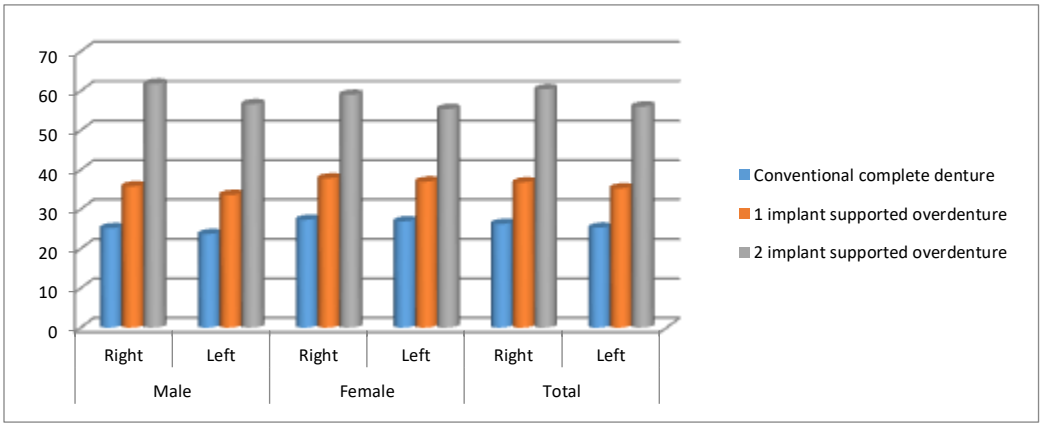
Bite force was recorded using bite gauge- an electronic bite gauge which uses the principle of strain gauge to measure the bite force (ASEC solution, Bangalore, India). The strain gauge sensor was kept between 1st molar areas of both the denture unilaterally both right and left side. Patient was asked to exert maximum force and 3 readings were recorded both right and left side. The reading obtained was in Newton.

RESULTS

The mean value of bite force among all these three treatment modalities was measured and tabulated for both right and left side, ANOVA and post hoc Tukey HSD test was applied to evaluate and compare the bite force among all these three treatment modality.

Table : Mean values of bite force (in N) of both the genders using conventional dentures, single implant supported overdenture and 2 implant supported overdenture

Gender	Side	Conventional complete denture	1 implant supported overdenture	2 implant supported overdenture
Male	Right	25.20 ±2.17	35.80±3.42	61.80±2.588
	Left	23.70 ±2.51	33.60±3.64	56.60±2.88
Female	Right	27.30 ±2.81	37.80±3.03	59.00±3.93
	Left	26.92± 3.03	37.00±3.32	55.40±2.07
Total	Right	26.25± 1.48	36.80±1.41	60.40±1.97
	Left	25.31± 2.27	35.30±2.403	56.00±0.845



Graph no. 1: Mean values of bite force (in N) of both the genders in all three groups

One-way ANOVA showing intergroup comparison between all three study groups in relation to bite force

source	sum of squares SS	degrees of freedom νν	mean square MS	F statistic	p-value
treatment	2,196.2024	2	1,098.1012	233.6231	1.7533e-08*
error	42.3028	9	4.7003		
total	2,238.5052	11			

*p-value<0.05 is significant

Tukey HSD results

Treatments pair	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inferfence
Conv vs 1-implant	9.4741	0.0010053	** p<0.01
Conv vs 2-implant	29.9075	0.0010053	** p<0.01
1-implant vs 2-implant	20.4334	0.0010053	** p<0.01

DISCUSSION

Numerous people wearing conventional dentures report that they cannot eat many foods, particularly those that are hard or tough. This forces them to change their diets in unhealthy ways and causes their nutrition to be poorer than that of people with natural teeth.

The conventional denture is no longer recommended as the first choice because of the obvious disadvantages of reduced retention and stability, difficulty in speech and chewing, accelerated residual ridge resorption and overall psychological effect on the elderly individual wearing them. From 1970-1980 overdenture became popular and widespread in dentistry. These implants supported overdenture provided excellent support and stability. Patients find the implant overdenture to be significantly more stable, and they rate their ability to chew various foods as significantly easier in addition, they are more comfortable and speak more easily with implant overdentures. The McGill Consensus[15] statement on overdentures – according to this consensus there is now overwhelming evidence that a two implant overdenture should become the first choice of treatment for the edentulous mandible.

Thomsaon did an investigation to examine the patient satisfaction with conventional complete dentures and mandibular implant overdentures opposing conventional maxillary dentures 6 months after delivery. Sixty edentulous subjects (aged 65-75 years) were randomly assigned to either a mandibular conventional denture or an overdenture supported by two implants with ball shaped retentive anchors. Patient rated their general satisfaction and other features of their prosthesis, together with the ability to eat certain food items, on 100 mm visual analog scales before assignment and after 2 and 6 months. General satisfaction ratings were higher in the implant group than in the conventional denture group by approximately 36% (mean difference 22.3 mm). It was concluded that edentulous seniors who received mandibular implant overdentures opposing a conventional denture rated their satisfaction approximately 36% higher than did a comparable group provided with new dentures.[16]

Krennamair conducted a study to examine whether a single symphyseal implant would suffice for adequate anchorage of a Mandibular complete denture in elderly patients (octogenarians) , and whether this surgically , prosthetically, and financially simple concept would also satisfy patients needing replacement of the Mandibular dentition. In this study nine patients with a mean age of 82.2 years underwent placement of a single symphysealendosseous implant and anchorage of a complete denture using a ball attachment. Standardized recall examinations, including patient response and inspections of the peri-implant soft tissue and bone conditions, were carried out at 3- to 6-month intervals for a period of 11/2 years. It was found that anchorage with a single implant led to both a significant improvement in patients' subjective satisfaction (P < .01) and a significant reduction in reported symptoms (P < .01). During the observation phase, pocket depth and bone resorption initially increased around implants but stabilized after the sixth month. Denture management (placement and removal) also improved during the recall period (P < .01). Significantly oral rehabilitation by Mandibular complete dentures anchored on a single implant can be considered an economical therapeutic alternative to a conventional Mandibular complete denture for very old patients[17].

Galen reported the use of single midline implant to retain a mandibular complete overdenture on the compromised atrophic alveolar ridge. A 55 year old female patient was rehabilitated with the single implant in the mandibular midline because the alveolar ridge was resorbed at both the foraminal areas and placement of an implant would increase the chances of pathological fracture. The single midline implant was the most suitable treatment option for such a case. The

author recommended the use of single midline implant retained mandibular overdenture in patient with financial constraints. Certain health risks and limited treatment options associated with a compromised atrophic mandible. More randomized clinical trials are needed to validate this treatment modality[18].

The average mean retention force for right side was 26.25± 1.48N, 36.80±1.41 N and 60.40±1.97 N for conventional denture, single implant supported overdenture and two implant supported overdenture ; however for left side their values were 25.31± 2.27N, 35.30±2.403N and 56.00±0.845 N.while comparing these values a significant difference was found among all these modalities. More retention was fond on right side than left side.

CONCLUSION

A significant difference in retention was found among all the three treatment modalities. However more bite force was there on right side.

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