

Original Research Article**Alterations in Intercuspal Position in Partially Edentulous Patients**Dr. Mohammadullah^{1*}¹Medical Officer, Department of Prosthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh***Corresponding Author:**

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Abstract: Background: ICP is crucial for the occlusal stability and masticatory efficiency. Partial edentulism affects ICP, predisposing to occlusal imbalances, reduced masticatory performance, and increased prevalence of TMJ diseases. Prosthetic rehabilitation includes restoration of functional occlusion, improving patient satisfaction, and improving quality of life. The purpose of this study was to evaluate changes in the intercuspal position by partially edentulous patients after prosthodontic rehabilitation. **Methods:** This retrospective observational study conducted at Department of Prosthodontics, Bangabandhu Sheikh Mujib Medical University (BSMMU) and beau-dent, Dhaka, Bangladesh from June 2015 to July 2016. Total 100 patients diagnosed with partial edentulism who underwent prosthodontic rehabilitation with complete records documenting pre and post treatment occlusal measurements. The effectiveness of interventions was assessed through statistical analyses such as paired t tests and chi square tests, and the relationship to clinical variables was explored. **Results:** The ICP mean decreased significantly from 2.0 ± 0.25 to 1.30 ± 0.24 mm ($p < 0.001$), and the occlusal contact area increased from 19.5 ± 2.6 to 28.3 ± 2.8 mm² ($p < 0.001$). Removable prostheses were outperformed by fixed prostheses, which improved ICP and occlusal contact. Patients with less missing teeth and shorter duration of edentulism had better outcomes. High satisfaction rates were reported for chewing comfort (75%), improved speech (79%) and prosthesis aesthetics (79%). **Conclusion:** In partially edentulous patients, prosthetic rehabilitation can substantially improve ICP, occlusal contact area, and patient satisfaction. The findings also support individualized treatment and early intervention to maximize outcome.

Keywords: Partial edentulism, Intercuspal position occlusal contact area, Prosthetic rehabilitation.

INTRODUCTION

The intercuspal position (ICP), maximal intercuspal position, is key to functional occlusal stability and masticatory efficiency. It is one of the maximal contact between upper and lower teeth thus it enables clean and efficient chewing, swallowing and joint stabilization. Partial edentulism is a common reason for alterations in ICP, resulting in occlusal imbalance, degraded masticatory performance, and the potential for temporomandibular joint (TMJ) disorders [1, 2]. It is to understand these changes, and how they relate to prosthetic rehabilitation, is important for effective clinical management.

In the absence of dental support, partially edentulous patients encounter significant difficulties in maintaining functional ICP and experience occlusal shifts and reduced contact areas. The degree of alteration is affected by factors including number of missing teeth, duration of edentulism, and preexisting occlusal conditions [3,4]. Restoration of the ICP in these patients, involves addressing not only the missing dentition, but associated changes in the occlusal vertical dimension (OVD) that can affect TMJ mechanics and neuromuscular function [5,6].

Restoring ICP through prosthetic rehabilitation, whether fixed or removable, is about restricting occlusal

contact, and spreading forces to the ideal areas in the dental arch. In cases of extensive tooth loss, fixed prostheses have been shown to offer better occlusal stability and patient satisfaction over removable options [7,8]. Moreover, rehabilitation success is contingent upon optimizing the functional occlusal scheme for long term prosthetic success and oral health [9].

A study was conducted to investigate the changes in ICP and occlusal contact area pre and posttreatment for partially edentulous patients. In addition, we also investigate the relationship between these changes and other clinical variables (number of missing teeth, length of edentulism, prosthetic type). Baseline characteristics such as age, sex, smoking and systemic health were sought to be tested as predictors of treatment outcome.

The results show that prosthetic rehabilitation yields significant reductions in ICP as well as prosthetic occlusal contact area and improve masticatory function and patient satisfaction. These findings highlight the need for individualized treatment planning, which accounts for occlusal relationships prior to treatment and patient specific preferences [10,11].

Additionally, patient reported outcomes including benefits associated with occlusal rehabilitation with respect to chewing comfort, speech improvement and satisfaction of the prosthesis have not been mentioned. A positive relationship between improved prosthetic design and oral health-related quality of life (OHRQoL) in partially edentulous patients is supported by prior research [12]. This study combines approaches for functional and psychosocial aspects which emphasize a holistic approach of prosthetic management.

Finally, this study points to the clinical importance of preserving ICP and optimizing occlusal contact in partially edentulous patients. The findings have important implications for clinicians in the development of evidence based protocols to achieve successful prosthetic rehabilitation.

Objective

The objective of this study were to assess changes in the intercuspal position of partially edentulous patients after prosthodontic rehabilitation.

METHODOLOGY AND MATERIALS

This retrospective observational study conducted at Department of Prosthodontics, Bangabandhu Sheikh Mujib Medical University (BSMMU) and beau-dent, Dhaka, Bangladesh from June 2015 to July 2016. Total 100 patients diagnosed with partial edentulism who underwent prosthodontic rehabilitation with complete records documenting pre and post treatment occlusal measurements such as intercuspal position and occlusal contact area.

Selection Criteria:

Inclusion Criteria:

1. Partial edentulism of patients characterized by Kennedy Class I, II or III.
2. Pre and post treatment occlusal (intercuspal position or occlusal contact area) measurements complete dental records.
3. History of surgical prosthetic rehabilitation.
4. Adults aged 18–75 years.

Exclusion Criteria:

1. Patients with edentulous or conditions requiring complete dentures.
2. Patients with temporomandibular joint (TMJ) disorders with occlusal involvement.

RESULTS

Table 1: Baseline characteristics of patients (n=100)

Variables		Frequency (n)	Percentage (%)
Age	Mean±SD	53±6.5	
Gender	Male	56	56.00%
	Female	44	44.00%
Smoking status	Yes	47	47.00%
	No	53	53.00%
Systemic disease	Yes	31	31.00%
	No	69	69.00%

Demographic and clinical characteristics of the study population (n = 100) are presented in table 1. The

3. Incomplete or ill informed dental records.
4. Patients with a systemic condition which affects oropharyngeal structures, including advanced osteoporosis or unregulated diabetes.
5. Prosthodontic treatment cases that are deemed to have poorly documented, or non-standardized, prosthodontic treatment protocols.

Data collection:

Data collected for this study was retrieved from institutional or clinic databases and dental records and occlusal analysis reports. The data was truly relevant and customized to the patients who met the inclusion criteria and the data was truly checked and consistent. Demographic details (age and gender), classification of partial edentulism (using Kennedy Class I, II and III), type of prosthesis were recorded as were measurements of pre and post treatment intercuspal position and occlusal contact area. Functional and aesthetic outcomes were also assessed by including patient satisfaction data, when applicable. Confidentiality was maintained by anonymizing all data.

Ethical consideration:

This study was consistent with strict ethical principles, to protect patients' rights and privacy of data. Personal identifiers were removed; all data used was anonymized. Only previously collected clinical records were analyzed, and there was no patient involvement and never a risk of harm. The data was taken care to be handled securely and access given only to the authorized personnel. The research was done in such a way as to improve clinical outcomes with no associated harm to patient's rights or welfare.

Statistical analysis of data:

Demographic and clinical characteristics of the sample were summarized with descriptive statistics. Pre and post treatment measurements of intercuspal position were compared using paired t tests; a significance threshold of p<0.05. Associations between prosthetic types and patient outcomes were analyzed with chi square tests. The relationship between intercuspal position changes and factors including duration of edentulism or prosthesis type was evaluated using correlation analyses, using Pearson or Spearman methods. SPSS was used to carry out data analysis to make the data accurate and reliable.

mean age was 53 ± 6.5 years and there was a small male predominance (56%). It found that 47% of participants

were smokers and 31% had systemic diseases. The variables captured these differences and provide context

for understanding prosthetic rehabilitation outcomes in partially edentulous patients.

Table 2: Pre- and Post-Treatment for Intercuspal Position and Occlusal Contact Area in Partially Edentulous Patients (n=100)

Variables	Pre-treatment (Mean ± SD)	Post-treatment (Mean ± SD)	p-value
Intercuspal Position (mm)	2.0±0.25	1.30±0.24	<0.001
Occlusal Contact Area (mm ²)	19.5±2.6	28.3±2.8	<0.001

Table 2 demonstrate significant improvements in functional occlusion following Prosthetic treatment. Post treatment the intercuspal position decreased from a mean of 2.0 ± 0.25 mm pre treatment to 1.30 ± 0.24 mm (p < 0.001). As with occlusal contact area which increased

exponentially from 19.5 ± 2.6 mm² to 28.3 ± 2.8 mm² (p < 0.001). These observations verify the efficacy of the interventions at improving occlusal stability and precision of contact.

Table 3: Relationship between clinical factors and intercuspal position changes (n=100)

Variables	Category	Frequency(n)	Percentage (%)	p-value
Number of missing teeth	1-3	36	36.00%	<0.05
	4-6	45	45.00%	
	≥7	19	19.00%	
Duration of edentulism(year)	<1	28	28.00%	<0.05
	1-5	49	49.00%	
	>5	23	23.00%	
Type of prosthesis	Fixed	57	57.00%	<0.05
	Removable	43	43.00%	
Pre treatment occlusion	Class I	42	42.00%	<0.05
	Class II	34	34.00%	
	Class III	24	24.00%	
Post treatment occlusion	Class I	67	67.00%	<0.05
	Class II	21	21.00%	
	Class III	12	12.00%	

Table 3 investigate how clinical factors affect intercuspal position changes. The survival for patients with fewer (1–3) missing teeth was better than for patients with more (7 or more) missing p < 0.05. Significant also was duration of edentulism with individuals with <1 year of

edentulism having better improvement than those with durations >5 years. Prosthesis type also had a large effect, with removable prostheses clearly winning out over fixed ones. Post treatment class I occlusion increased from 42% to 67% (p < 0.05).

Table-4: Patient Satisfaction Post Rehabilitation (n=100)

Variable	Satisfied	Neutral	Dissatisfied	p-value
Chewing comfort	75	16	9	<0.05
Speech improvement	79	14	7	<0.05
Prosthesis comfort	81	10	9	<0.05
Ashthesis	79	13	8	<0.05

Table 4 displays patient satisfaction levels with the functional and aesthetic domains post rehabilitation. Nearly all of the patients were satisfied with chewing comfort (75%), prosthesis comfort (81%), speech improvement (79%) and aesthetics (79%). There were few neutral or dissatisfied responses, and all domains reached statistical significance (p < 0.05). This data provides a strong argument for the overall effects of prosthetic rehabilitation on patient reported outcomes.

DISCUSSION

The findings of this study underscore the critical clinical benefit of prosthetic rehabilitation in partially

edentulous patients especially with regard to improvement in the intercuspal position (ICP) and occlusal contact area. The research focuses on these key parameters and highlights the importance of specific treatment in restoring occlusal function and therefore patient satisfaction.

Rehabilitation was effective in reducing ICP from 2.0 ± 0.25 to 1.30 ± 0.24 mm (p < 0.001), and increasing occlusal contact area from 19.5 ± 2.6 mm² to 28.3 ± 2.8 mm² (p < 0.001). These findings are consistent with clinical evidence that prosthetic interventions stabilize occlusion and improve masticatory efficiency [12, 13]. Improvements in occlusal contact can significantly

increase bite force and perception, and Kampe et al have shown that these improvements can lead to better outcomes as well [13].

The effect of clinical factors, e.g., number of missing teeth, duration of edentulism, type of prosthesis, was noted. Better ICP outcomes were achieved by patients with fewer missing teeth (1–3) versus extensive edentulism (≥ 7 missing teeth; $p < 0.05$). In the literature [14,15], progressive alveolar ridge resorption and compromised occlusal stability were suggested to be associated with reduced success when oral function was resumed following > 5 yrs Edentulism. Overall, prosthetic design was found to play a key role in determining functional and aesthetic outcomes for wearers with fixed prostheses providing consistently better results than removable prostheses [6,10].

Further validation of the success of rehabilitation is the post treatment occlusal classification improvement. Prosthetic interventions restore functional occlusion over a shift from 42% Class I occlusion pre-treatment to 67% post-treatment ($p < 0.05$). With improved occlusal harmony, features such as decreased temporomandibular joint and mastication efficiency [3,5] are consistent with existing principles of functional occlusion.

Rehabilitation metrics of functional and psychosocial benefits are reflected in patient satisfaction metrics. Echoing the importance of addressing patients' functional and aesthetic needs, we report high satisfaction rates regarding both chewing comfort (75%), speech improvement (79%) and prosthesis comfort (81%; $p < 0.05$). Like Souza et al, such outcomes match findings of positive impact by well designed prostheses on quality of life for patients [15]. As Kapur et al. showed, improvements in speech and aesthetics also resonate with studies that show improved patient-reported outcomes with prostheses that address more than one concern [11].

These findings clinically draw attention to the importance of individualized treatment to specific patient characteristics. The advantage of using advanced diagnostic tools, such as computerized occlusal analysis, can offer exact measurements so the results are more predictable. Even early in the process of edentulism, interventions are still critical to prevent negative effects of prolonged edentulism including ridge resorption and occlusal instability, which can reduce treatment success [14].

However, this study has limitations, in that it has a small sample size and took no follow-up longer than 6 months. These findings highlight that future research should seek to validate these with larger cohorts and to investigate durability of functional and psychosocial benefits. Furthermore, studies comparing multiple prosthetic designs, for instance implant vs conventional prostheses, may contribute to the refinement of treatment strategies.

Finally, prosthetic rehabilitation dramatically reduces ICP, occlusal contact area, and increases patient satisfaction in partially edentulous patients. These interventions restore functional and aesthetic balance and so improve the quality of life of the patients. Advances in diagnostic tools and evidence based treatment approaches offers an opportunity for clinicians to optimize rehabilitation outcomes within the provision of evidence based treatment models.

CONCLUSION

Prosthetic rehabilitation achieves effective ICP and occlusal contact area improvement in partially edentulous patients and enhances ICP stability to occlusal contact area ratio (OCAR), masticatory efficiency and patient satisfaction. Removable prostheses performed less well than fixed prostheses. Results were positively influenced by clinical factors, including fewer missing teeth and shorter edentulism durations. These results underscore why early intervention coupled with individualized treatment strategies are imperative to achieve optimal functional and aesthetic results.

Limitations and recommendations

Data was availed from a single center, thus, presented data on a small sample. Early prosthetic rehabilitation should minimize the complications of prolonged edentulism. Better outcomes need individualized treatment plans depending on factors such as how many missing teeth and edentulism duration. Removable options have been shown to have inferior functionality and thus removing them gives way to fixed prostheses, which are superior for stability and functionality. Computerized occlusal analysis can improve the treatment precision. The findings are to be validated with further research using larger sample sizes and further followup.

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