Evaluation of Interocclusal Rest Space among the Patients Attending Dental College and Hospital

Kanchana Shrestha,[1] Prabhat Shrestha,[2] Subodh Lal Karn,[1] Anju Khapung[3]

[1]Department of Prosthodontics and Maxillofacial Prosthetics, People's Dental College and Hospital, Sorahkhutte, Kathmandu, Nepal;
[2]Department of Prosthodontics, Kist Medical College and Teaching Hospital, Gwarko, Nepal;
[3]Department of Community Dentistry, Nepal Medical College, Kathmandu, Nepal.

ABSTRACT

Introduction: Interocclusal Rest Space (IRS) is one of the significant factors that determines an individual's aesthetics, their ability to perform oral functions and in oral reconstructive procedures.

Objective: Evaluation of interocclusal rest space in different age group, sex and Angle's class of malocclusion.

Methods: A descriptive cross-sectional study was conducted among the patients attending People's Dental College and Hospital, Kathmandu. The interocclusal rest space in 321 subjects was determined after measuring the vertical dimension of rest and occlusion with a digital caliper.

Results: The IRS among the participants ranged from 2.11±1.06 -2.58±0.79mm. Age group of 55 years and above had highest mean IRS (2.58 mm) followed by 35-44 years with mean IRS (2.43 mm). There was no statistically significant difference in IRS among the different age groups (P-value 0.29). The mean IRS of the male (2.43mm) was statistically significantly higher than the female (2.02 mm) group (P-value 0.001)

The IRS among participants with Angle's class I, II, and III malocclusion had no statistically significant difference (P-value 0.08) among the three groups.

Conclusions: The mean value of IRS in Nepalese subjects can be considered within the average value of 2-3 mm. The mean values of IRS among the participants were 2.21mm. The average IRS values in males should be considered 0.4 mm more than in females.

Keywords: Freeway space; interocclusal rest space; rest vertical dimension; vertical dimension of occlusion.

INTRODUCTION

Every individual with natural dentition presents a space which is the difference between the rest vertical dimension and the occlusal vertical dimension. This space is termed as interocclusal rest space (IRS).[1] This IRS is considered as one of the factors in determination of an individual's ability to perform oral function, maintains aesthetic harmony in oral reconstructive procedures, and is equally important in several dental specialties.[2]

Determination of the occlusal vertical dimension (OVD) is regarded as being particularly important during treatment with complete and partial dentures where new occlusion has to be established. There are several techniques to establish OVD, but no single one has proven superior to the others. To establish the correct OVD, interocclusal rest space can be used as a simple yet effective method since after functional load, such as mastication and speech, an adequate interocclusal rest space is required to return the muscles to resting length.[3] Inadequate IRS results in cheek biting, angular chilitis as well as disharmony in aesthetics whereas excessive

IRS leads teeth clashing, masticatory inefficiency, tightness of muscles as well as temporomandibular joint disorder.[4]

Most of the studies recommend the value of 2-4mm as being optimal but the ranges of IRS had a variable range from 0.5 to 7mm in studies of different group population.[3, 5,6,7,8]

There is also difference in ranges of IRS in different Angle's classes of malocclusion among various studies.[9,10] It appears that association of IRS within specific population and different classes of malocclusion is inconsistent and invoke this present investigation.

So, the objective of this study is to evaluate the interocclusal rest space and there distribution among different Angle's classes of malocclusion among Nepalese subjects attending People's Dental College and Hospital, Kathmandu, Nepal.

METHODS

A descriptive cross-sectional study was conducted at People's Dental College and Hospital from 17th June to 20th September 2020 after Ethical clearance approval was received from the institutional review committee (IRC) of People's Dental College and Hospital (Reference number: CH No 31, 2077/2078)

A total sample size of 321 subjects were calculated by

$$n = \frac{N}{1+Ne^2}$$

$$= \frac{1,616}{1+1616(0.05)^2}$$

$$= 320.6$$

$$= 321$$

Where,

n = required sample size

N= total number of patient for the study period of months as calculated from average number of patient for past 6 months in OPD=1,616

e = margin of error = 0.05

Participants of age 18 years and above attending People's Dental College and Hospital were included by convenience sampling method.

This study included those participants who had fully erupted dentition and presence of bilateral posterior occlusal stops (third molars were not kept compulsory as criteria of full permanent dentition). Posterior collapse bite, generalized attrition or wear of teeth, unilateral posterior stops, any functional disorder or pain in the neuromuscular system facial asymmetry and /or Mandibulectomy, TMJ disorder were excluded from the study. All subjects were well-informed about this study and had given a written informed consent to participate in the study.

The participants were seated in dental chair in an upright position with the head erected and unsupported. Two artificial landmarks (triangular pieces of adhesive tape) were placed on the participant's tip of nose and chin. Subjects were advised to moisten the lips and swallowed. Rest vertical dimension (VDR) was recorded by a digital caliper with accuracy of 0.01mm (Miyutyo, Model no. CD-6"CSX) after measuring the distance between two tapes. This procedure was repeated three times and average value was recorded. Again, the subjects were advised to occlude in centric occlusion and the vertical dimension at occlusion (VDO) was measured by same digital caliper. The interocclusal rest space was determined as the difference between the two measurements. The molar relationship was then recorded according to Angle's classification I, II, III for each participant. All the measurements were recorded in the early hour of the day to avoid any possibility of muscle fatigue on the interocclusal rest space.[3]

Data was entered in Microsoft Excel and exported to Statistical Package for Social Sciences (SPSS) version 20 for statistical analysis. Descriptive statistics were presented in the form of frequency, percentage, mean and standard deviation. One way ANOVA was used to find the difference in mean IRS among the different age groups and different

occlusion classes. Independent t test was used to find the difference in mean IRS between male and female. Level of significance was set at P-value<0.05.

RESULTS

The study included 321 study participants of which 143 (44.5%) were males and 178 (55.5%) were females. The age of the study participants ranged from 19 to 61 years with mean age 31.63±10.71 years. The distribution of study participants was 112 (34.9%), 104 (32.4%), 56 (17.4%), 37 (11.5%) and 12 (3.8%) among the 19-24 years, 25-34 years, 35-44 years, 45-54 years and 55 years and above respectively.

Of the total, 274 (85.3%) had class I malocclusion, 24 (7.5%) had class II malocclusion and 23 (7.2%) had class III malocclusion. The mean VDR, VDO and IRS among the study participants were 62.95, 61.31 and 2.21 respectively.

The study participants of age group 55 years and above had highest mean IRS (2.58mm) followed by 35-44 years with mean IRS (2.43 mm). There was no statistically significant difference in IRS among the different age groups (P-value 0.29) (Table 1).

The mean IRS of the male was higher than female (2.43 mm in male and 2.02 mm in female). There was a statistically significant difference in IRS between the male and female (P-value 0.001) (Table 2).

The mean IRS of the study participants with Angle's class I, II, and III malocclusion were 2.23mm, 2.42mm and 1.74 mm respectively. There was no statistically significant difference in IRS among the different classes of occlusion (P-value 0.08) (Table 3).

Table 1: Mean Interocclusal Rest Space among the different age groups

Age group (years)	No.of participants	Percentage (%)	IRS(Mean±SD)mm	P-value
19-24	112	34.9	2.11±1.06	
25-34	104	32.4	2.15±1.13	
35-44	56	17.4	2.43±1.14	0.29
45-54	37	11.5	2.19±1.08	
55 and above	12	3.8	2.58±0.79	

IRS: Interocclusal rest space, SD: Standard deviation, mm: Millimeter

Table 2: Mean Interocclusal Rest Space among the male and female study participants.

Sex	IRS (Mean±SD) mm	P-value
Male	2.43±1.15	
Female	2.02±1.01	0.001*

IRS: Interocclusal rest space, SD: Standard deviation, mm: Millimeter

Table 3: Mean Interocclusal Rest Space among the different occlusion classes of study participants.

Occlusion	IRS (Mean±SD) mm	P-value
Class I	2.23±1.11	
Class II	2.42±0.97	0.08
Class III	1.74±0.86	

IRS: Interocclusal rest space, SD: Standard deviation, mm: Millimeter

DISCUSSION

During the rehabilitation of tooth surface loss and complete edentulous state, estimation and re-establishing the lost facial height is a very critical step. Interocclusal rest space affects the facial esthetics, function and comfort of the stomatognathic system and can also be used for evaluating the vertical dimension.[9]

There is a lot of conflicting data in the literature regarding range of IRS. Irrespective of that, methods used to determine the interocclusal space depends on recording of vertical jaw relation. In retrospective literature, variety of methods are available for determining the VDR which include cephalometric radiographs, phonetics, swallow, and with the mandible in a relaxed posture with the head upright.[4]

In this study, only swallowing method was taken into consideration to determine VDR as this method determines more physiological vertical position than other methods and pattern of mandibular movement is always same even in edentulous, infant as well as in adult during swallowing.[3, 11]

For this analysis, a caliper was used for measuring IRS, as according to Geerts et al. who reported the caliper to be more reliable than Willi's gauge.[12] In adition, other electronic instruments were expensive, sophisticated, required special skill to operate which may not be practical in clinical practice.[4]

In this study, IRS was investigated on 321 patients and suggested that there was statistically insignificant difference in IRS among the different age groups which contradicted with other study.[13] The reason of insignificant difference may be because we only included subjects with minimum teeth wear where as other authors did not take this into consideration and there might have increased IRS due to structural loss.

Group comparison showed that the value of IRS in male was 2.43±1.15 which was significantly higher than in female 2.02±1.01. These results are interesting when correlated with studies done by various other authors [4,9,14] who reported no significant difference in value of IRS between sexes. This could be due to difference of facial height among males and females but this was not a consideration in our study and may be a subject for further studies.

The present study also evaluated the interocclusal rest space in different Angle's classes of malocclusion. The IRS did not reveal any significance association with different classes of occlusion which was similar to study done by Hajimahmoudi et.al.[9]

With the enrollment of multiple subjects, our study provides the IRS ranged from 2.11-2.58mm which is slightly less than the average range from 2-4mm which mentioned on literature [6,9] but various authors found wide range of IRS.[3,7] The different range of IRS might be due to different racial group, different growth of facial pattern of individual.

This study fulfilled its aim but it does have some limitation which includes small sample size with unequal number of participants in different age groups and class of occlusion. More studies are necessary to assess the influence of ethnicity and facial height on IRS.

CONCLUSIONS

Considering the limitations of this study within Nepalese subjects, the following conclusions were drawn:

The mean value of IRS 2.21mm with the range of 2.11-2.58mm. The average value of IRS in Nepalese subjects can be considered within the range of 2-3 mm. In males, the average IRS values should be considered 0.4 mm more than in females and there were no relation between different Angle's class of malocclusion and the IRS.

Conflict of Interest: None

NJHS

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