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Original Research

Assessment of relationship between median mandibular flexure and maximum occlusal force in adults

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ABSTRACT:
Background: Median mandibular flexure (MMF) occurs during the opening and protrusive movement. The lateral pterygoid muscle is the most effective muscle in MMF.The present study was conducted to assess relationship between median mandibular flexure and maximum occlusal force in adults. **Materials & Methods:** 76subjects of both genders were enrolled.Maximum occlusal force (MOF)and median mandibular flexure (MMF) and body mass index (BMI) was calculated. **Results:** Out of 76 subjects, males were 30 and females were 40. The mean MOF in males was 54.8 Kg/N and in females was 41.6 Kg/N. The mean MMF in males was 0.60 Kgf and in females was 0.72 Kgf. The difference was significant (P< 0.05). The mean MMF in subjects with BMI <18.5 was 27.8 Kgf, in subjects with BMI 18.5-24.9 was 36.2 Kgf and in subjects with BMI >25 was 52.7 Kgf. The difference was significant (P< 0.05). There was correlation of age with MMF and BMI with MOF (P< 0.05). **Conclusion:** There was no significant correlation between MOF and MMF. Both these were effective factors in the success of prosthetic restorations.
Key words: Maximum occlusal force, median mandibular flexure, lateral pterygoid muscle

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INTRODUCTION

The relationship between vertical facial pattern and masticatory muscle anatomy and function still is controversial in the literature.[1] It has been reported that masseter muscle thickness is correlated to vertical facial pattern, showing that individuals with thicker masseter have a vertically shorter face.[2]

The process of mastication is an essential function for the survival of dentate organisms and has long been a subject of the study in the dental literature.[3] Mandibular shape changes during different degrees of movement, due to the force of the attached muscles and ligaments during the movement of mandible and mastication. Median mandibular flexure (MMF) occurs during the opening

and protrusive movement.The lateral pterygoid muscle is the most effective muscle in MMF.[4]
Maximum occlusal force (MOF) may be considered a measure of masticatory muscles function because represents the effort exerted between the maxillary and mandibular teeth when the mandible is elevated.[5] The large intersubject variability of MOF results from a complex interaction of many factors such as sex, age, body mass index, presence of temporomandibular disorders, size and direction of the masseter muscle, craniofacial morphology, dental occlusal status, periodontal sensitivity, and psychological factors.[6]The present study was conducted to assess relationship between median mandibular flexure and maximum occlusal force in adults.

MATERIALS & METHODS

The present study comprised of 76subjectsof both genders. The consent was obtained from all enrolled subjects.
Data such as name, age, gender etc. was recorded. Maximum occlusal force (MOF)was measured by applying the strain gauge receptor to the first molar region, and median mandibular flexure (MMF) was measured by calculating the variation in the intermolar distance by a digital caliper with an accuracy of 0.01 mm using an impression and resulted in the stone cast during the maximum opening and closed-jaw positions. The body mass index (BMI) also was calculated. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 76		
Gender	**Males**	**Females**
Number	30	46

Table I shows that out of 76 subjects, males were 30 and females were 40.

Table II Assessment of maximum occlusal force and MMF

Parameters	Males	Females	P value
Maximum occlusal force (Kg/N)	54.8	41.6	0.03
MMF (Kgf)	0.60	0.72	0.05

Table II shows that mean MOF in males was 54.8 Kg/N and in females was 41.6 Kg/N. The mean MMF in males was 0.60 Kgf and in females was 0.72 Kgf. The difference was significant (P< 0.05).

Table III Relationship between maximum occlusal force and body mass index

BMI (kg/m2)	MMF (Kgf)	P value
<18.5	27.8	0.01
18.5-24.9	36.2	
>25	52.7	

Table III, graph I shows that mean MMF in subjects with BMI <18.5 was 27.8 Kgf, in subjects with BMI 18.5-24.9 was 36.2 Kgf and in subjects with BMI >25 was 52.7 Kgf. The difference was significant (P< 0.05).

Graph I Table II Relationship between maximum occlusal force and body mass index

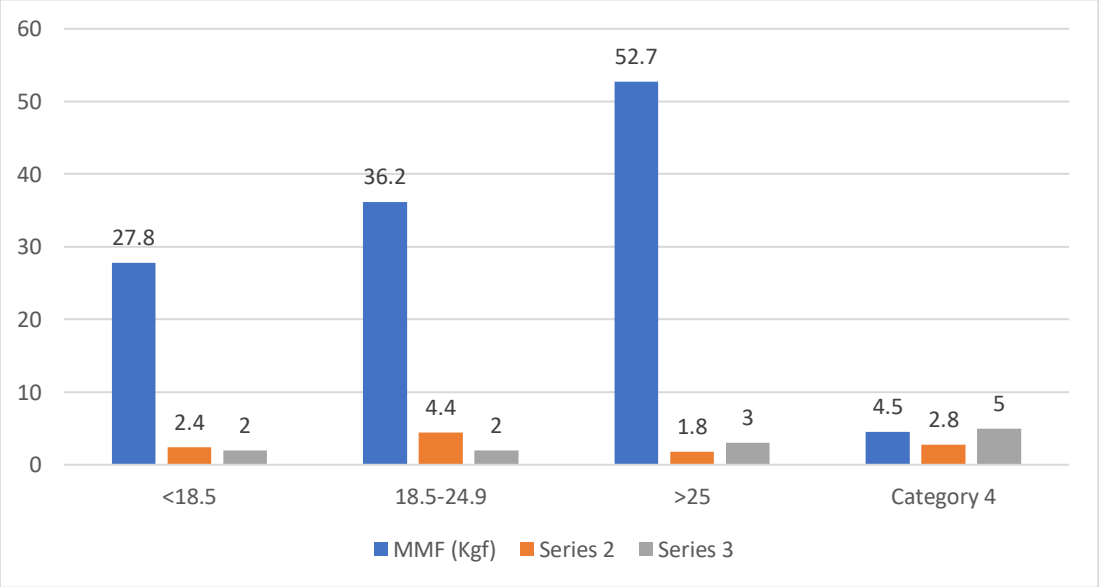

Table IV Relationship between median mandibular flexure, masticatory muscle force, age, and body mass index

Parameters	MMF (r/p)	MOF (r/p)	BMI (r/p)
Age	-0.24/0.02	0.0/0.91	-0.07/0.51
BMI	0.04/0.09	0.50/0.00	-
MOF	-0.04/0.72	-	-
MMF	-	-	-

Table IV shows that there was correlation of age with MMF and BMI with MOF (P< 0.05).

DISCUSSION

Regarding mandibular elastic deformation, medial convergence, corporal rotation and dorsoventral shear occur simultaneously during functional movements and are related to muscular closing forces and jaw position.[7] Medial mandibular flexure (MMF) is a mandibular deformation characterized by a decrease in arch width during jaw opening and protrusion movements because of the functional contraction of the lateral pterygoid muscles, causing high strain in the symphyseal region.[8] Therefore, it would be reasonable to expect that stronger muscles would be associated with larger mandibular flexure.[9] The influence of geometric facial factors on mandibular deformation is unclear as only a few measures have been found to be statistically significant. For example, some in vivo studies observed that the highest values of mandibular deformation occurred in subjects with lower symphysis height.[10]The present study was conducted to assess relationship between median mandibular flexure and maximum occlusal force in adults.

We found that out of 76 subjects, males were 30 and females were 40.Ebadian B et al[11]evaluated any relationship between MOF and MMF in a sample of adults. A sample of 90 volunteers were recruited (45 men and 45 women). MOF was measured by applying the strain gauge receptor to the first molar region, and MMF was measured by calculating the variation in the intermolar distance by a digital caliper with an accuracy of 0.01 mm using an impression and resulted in the stone cast during the maximum opening and closed-jaw positions. The body mass index (BMI) also was calculated.There was no statistically significant relationship between MOF and MMF (P = 0.78), but there was a significant association between MOF and BMI (P < 0.001, r = 0.475) and gender.

We found that mean MOF in males was 54.8 Kg/N and in females was 41.6 Kg/N. The mean MMF in males was 0.60 Kgf and in females was 0.72 Kgf. Shinkai et al[12] assessed whether the variation in vertical facial pattern is related to the variation inMOF and medial mandibular flexure in 51 fully-dentate adults. Subjects were divided into three groups: Dolichofacial (n = 6), Mesofacial (n = 10) and Brachyfacial (n = 35). Bilateral MOF was measured using a cross-arch force transducer placed in the first molar region. For MMF, impressions of the mandibular occlusal surface were made in rest (R) and in maximum opening (O) positions. The impressions were scanned, and reference points were selected on the occlusal surface of the contralateral first molars. MMF was calculated by subtracting the intermolar distance in O from the intermolar distance in R. No significant difference of MOF or MMF was found among the three facial patterns (P = 0.62 and P = 0.72, respectively). BMI was not a significant covariate for MOF or MMF (P > 0.05). Sex was a significant factor only for MOF (P = 0.007); males had higher MOF values than females.

We found that mean MMF in subjects with BMI <18.5 was 27.8 Kgf, in subjects with BMI 18.5-24.9 was 36.2 Kgf and in subjects with BMI >25 was 52.7 Kgf. The difference was significant (P< 0.05).Abdel-Latif et al[13] indicated a simultaneous correlation between all four patterns of mandibular elastic change and masticatory muscle strength. Increased strain on masticatory muscle can increase the bone density in regions where flexural forces are applied to the mandible.

We found that there was correlation of age with MMF and BMI with MOF (P< 0.05). The study of Chen et al[14] on the factors influencing mandibular flexural changes showed that an increase in bone density was one of the factors reducing the amount of MMF. Based on the results of this study, it can be concluded that the increase in dimensional changes due to increased muscle strength is almost neutralized by increasing the bone density. There was a negative correlation between age and MMF; the amount of MMF being decreased with a rise in the age of the participants.

The limitation the study is small sample size.

CONCLUSION

Authors found that there was no significant correlation between MOF and MMF. Both these were effective factors in the success of prosthetic restorations.

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