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Original Research

Assessment of passive tactile sensibility associated with Osseointegrated implants in various regions of partially edentulous arch

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ABSTRACT:
Background: Human teeth are innervated by extremely sensitive tactile periodontal mechanoreceptors, which are found in Periodontal Ligaments (PDL) and provide information about tooth loads. The present study was conducted to assess passive tactile sensibility associated with Osseointegrated implants in various regions of partially edentulous arch. **Materials & Methods:** 60 patients who received dental implants of both genders. Using a push-type force measurement gauge, a compressive force was applied along the implant-supported prosthesis's long axis until the patient initially felt pressure, and then it showed the force magnitude that produced the tactile sensation. The FG 5000 A force measurement gauge from Lutron Electronic Enterprises Co., Ltd. was utilized. **Results:** The mean value for no sensation was 2.1 and 2.5, mild sensation was 3.4 and 3.8, moderate sensation was 4.6 and 5.2, intense sensation was 5.1 and 6.4, pain was 5.3 and 7.2 in maxillary anterior and posterior region respectively. The difference was significant ($P< 0.05$). The mean value for no sensation was 2.1 and 2.3, mild sensation was 3.1 and 3.5, moderate sensation was 4.2 and 4.2, intense sensation was 5.1 and 5.7, pain was 5.4 and 6.5 in maxillary anterior and posterior region respectively. The difference was significant ($P< 0.05$). **Conclusion:** The maxillary posterior teeth had the highest force threshold, whereas the mandibular anterior teeth had the lowest threshold compared to all other oral regions. Comparing the anterior and posterior regions, the former showed superior passive tactile threshold measurements.
Keywords: force threshold, maxillary posterior, passive tactile

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INTRODUCTION

Human teeth are innervated by extremely sensitive tactile periodontal mechanoreceptors, which are found in Periodontal Ligaments (PDL) and provide information about tooth loads.[1] Histological, neurophysiological, and psychological evidence of osseoperception shows that replacing teeth with osseointegrated implants can restore a peripheral feedback pathway, though the functional reinnervation surrounding the implant is still unclear. The loss of PDL and the mechanoreceptors causes functional and psychological disturbances.[2]

-supported prostheses allow the jaw to function normally again, improving oral stereognosis and physiological discriminatory capacity. Rich innervation in the jaw bone contributes to the peripheral feedback for implants, which could aid in detecting mechanical deformation during implant loading. The oral tactile sensation can be recorded using a variety of neurophysiological and psychophysical techniques.[3] Studies on neurophysiological tests are limited due to their complexity. Once the receptors in the mouth cavity are stimulated, the Trigeminal Somatosensory Evoked Potentials (TSEP) can effectively record the oral tactile experience.Due to the intricacy of the TSEP examination, psychophysical methods gained popularity and have been the subject of numerous studies.[4,5] The psychophysical method of assessment used well-defined methodologies to determine the threshold level of the sensory receptors and correlated the psychological response of the patients with the physiological functions of the receptors; however, the environment and patient-related factors have an impact on the psychophysical methods.[6]The present study was conducted to assess passivetactile sensibility associated with Osseointegrated implants in various regions of partially edentulous arch.

MATERIALS & METHODS

The study was carried out on 60 patients who received dental implants of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Using a push-type force measurement gauge, a compressive force was applied along the implant-supported prosthesis's long axis until the patient initially felt pressure, and then it showed the force magnitude that produced the tactile sensation. The FG 5000 A force measurement gauge from Lutron Electronic Enterprises Co., Ltd. was utilized. The process was carried out three times. With constant force, the patient was instructed to report their force perception on a visual analogue scale. From no sensation to mild, moderate, strong, and pain, as well as the average force measured, the visual analog scale contains values 0–4.Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I: Passive tactile sensibility associated with osseointegrated implants in maxillary anterior and maxillary posterior region

VAS	Maxillary anterior	Maxillary posterior	P value
No sensation	2.1	2.5	0.72
Mild sensation	3.4	3.8	0.51
Moderate sensation	4.6	5.2	0.05
Intense sensation	5.1	6.4	0.02
Pain	5.3	7.2	0.01
Overall	20.5	25.1	0.01

Table I shows that mean value for no sensation was 2.1 and 2.5, mild sensation was 3.4 and 3.8, moderate sensation was 4.6 and 5.2, intense sensation was 5.1 and 6.4, pain was 5.3 and 7.2 in maxillary anterior and posterior region respectively. The difference was significant (P< 0.05).

Graph I: Passive tactile sensibility associated with osseointegrated implants in maxillary anterior and maxillary posterior region

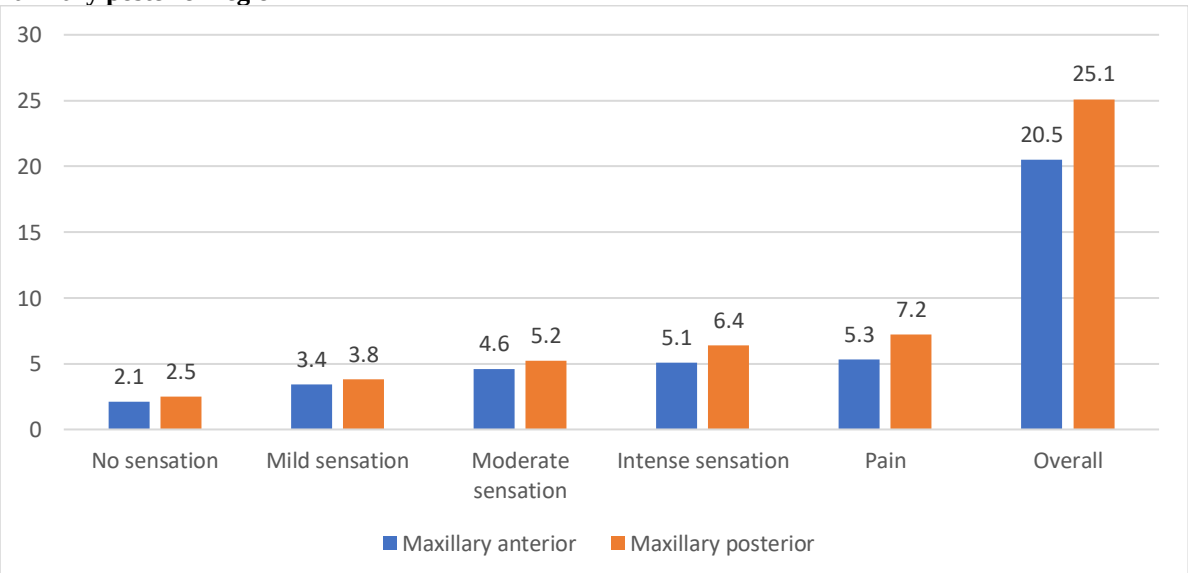
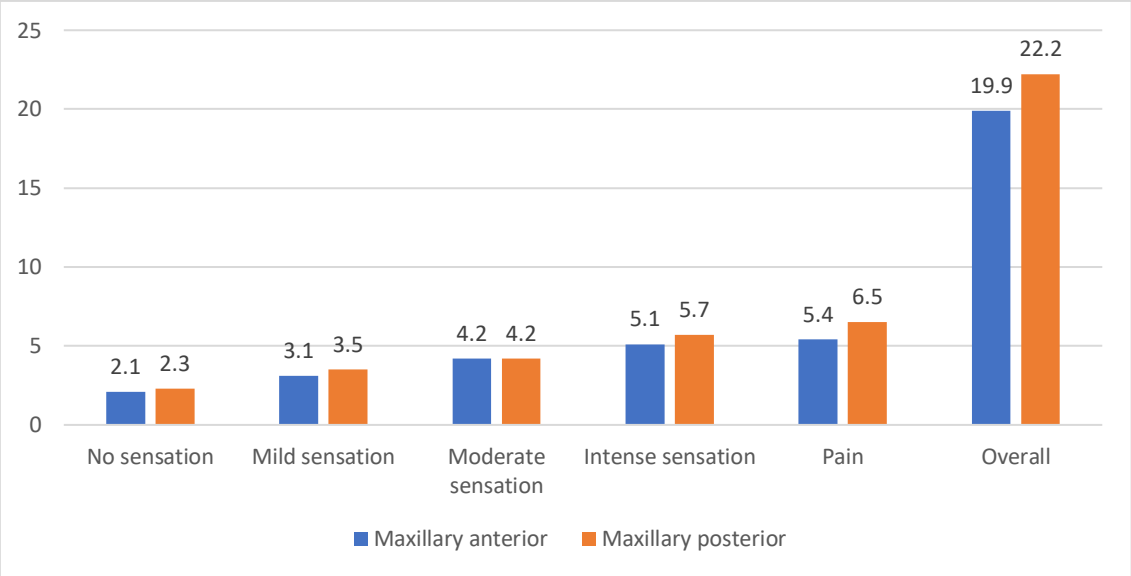


Table II: Passive tactile sensibility associated with osseointegrated implants in mandibular anterior and mandibular posterior region

VAS	Maxillary anterior	Maxillary posterior	P value
No sensation	2.1	2.3	0.87
Mild sensation	3.1	3.5	0.83
Moderate sensation	4.2	4.2	0.65
Intense sensation	5.1	5.7	0.05
Pain	5.4	6.5	0.01
Overall	19.9	22.2	0.01

Table I shows that mean value for no sensation was 2.1 and 2.3, mild sensation was 3.1 and 3.5, moderate sensation was 4.2 and 4.2, intense sensation was 5.1 and 5.7, pain was 5.4 and 6.5 in maxillary anterior and posterior region respectively. The difference was significant (P< 0.05).

Graph I: Passive tactile sensibility associated with osseointegrated implants in mandibular anterior and mandibular posterior region



DISCUSSION

An osseointegrated implant has a better tactile and vibrotactile capacity, according to psychophysical tests.[7] The sensation resulting from mechanical stimulation of a bone-anchored prosthesis, transduced by mechanoreceptors that may include those found in muscles, joints, mucosal, and periosteal tissues, along with a shift in central neural processing in maintaining sensory-motor function, was defined as the sensory-motor interaction in the most recent consensus statement on osseoperception.[8] The psychophysical approach is the most effective way to capture this tactile sensation from the osseointegrated dental implants on the visual analogue scale.The visual analogue scale is the tool to record the psychophysiologicalresponse to the force applied.[9,10]The present study was conducted to assess passive tactile sensibility associated with Osseointegrated implants in various regions of partially edentulous arch.

We found that mean value for no sensation was 2.1 and 2.5, mild sensation was 3.4 and 3.8, moderate sensation was 4.6 and 5.2, intense sensation was 5.1 and 6.4, pain was 5.3 and 7.2 in maxillary anterior and posterior region respectively. Jenny et al[11]evaluated the passive tactile sensibility associated with osseointegrated dental implant in various regions of the maxillary and mandibular arch. The overall mean value of maxilla was 23.12 N and the standard deviation was ±2.88 N. The overall mean value of mandibular was 22.44 N and the standard deviation of ±2.06 N and there was no significant difference in the threshold for passive tactile perception between maxilla and mandible.

We observed that mean value for no sensation was 2.1 and 2.3, mild sensation was 3.1 and 3.5, moderate sensation was 4.2 and 4.2, intense sensation was 5.1 and 5.7, pain was 5.4 and 6.5 in maxillary anterior and posterior region respectively. Van Steenberghe D[12] indicate that passive tactile sensation of an implant-supported prosthesis is higher than that of a natural tooth. In this study, the passive tactile sensibilities associated with osseo-integrated implant-supported prostheses were recorded in various regions of the oral cavity of partially edentulous patients and compared the sensibilities within the anterior and posterior region of the same arch and between the maxillary and mandibular arches

Haraldson T et al[13]assessed the tactile function with implant-supported prosthesis and compared with

natural teeth and complete dentures. The periodontal mechanoreceptors have varied active and passive discriminative ability of forces. Passive discrimination of the receptors was assessed by the application of controlled forces to the tooth. Active discrimination involves the presence of an object between the teeth and does not solely depend on periodontal receptors. The input from the teeth, periodontium, jaw muscles, TMJ ligaments and, capsules also play a role in active discrimination.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that the maxillary posterior teeth had the highest force threshold, whereas the mandibular anterior teeth had the lowest threshold compared to all other oral regions.

Comparing the anterior and posterior regions, the former showed superior passive tactile threshold measurements.

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