

COMPARISON OF PSYCHOMOTOR PERFORMANCE IN SUBJECTS WITH CONGENITAL TOOTH AGENESIS TO THOSE WITH NORMAL DENTITION

BILAL AHMED¹, FCPS (Pak), BDS, **NAZIA YAZDANIE**² PhD (London), MSc (London), BDS, FICD

¹ Department of Prosthodontics, University of The Faisalabad, Faisalabad (Pakistan).

² Department of Prosthodontics, Fatima Memorial College of Medicine & Dentistry, Shadman, Lahore (Pakistan).

Corresponding Author Email: drbilalahmed79@hotmail.com

ABSTRACT

OBJECTIVE: To compare oral psychomotor performance in subjects with congenital tooth agenesis to control subjects having normal full complement of teeth.

STUDY DESIGN: It was a cross sectional comparative study.

PLACE & DURATION: This study was conducted in the Department of Prosthodontics, de'Montmorency College of Dentistry/ Punjab Dental Hospital, Lahore Pakistan from June 15th, 2006 to December 14th, 2006.

PATIENTS & METHODS: Forty subjects with diagnosed tooth agenesis were selected using purposive, non-probability technique. Forty other subjects with normal complement of teeth were also selected as a control group. These were dental students of third and final year. Oral psychomotor performance scores were calculated using specific test samples for both groups. Results were analyzed and compared using descriptive statistical analysis protocol.

RESULTS: Intra oral psychomotor performance time scores were higher in subjects with tooth agenesis 133.7±36.8 as compared to 72.7±32.7 in control group p value < 0.01 t value 7.8). It confirms that the affected subjects had some difficulty in perceiving and then in giving proper intra oral psychomotor response. Mean values and standard deviation were calculated for age, whereas frequency in percentage was calculated for gender and severity of the tooth agenesis state. These groups were compared for any significant differences in the oral psychomotor ability scores using t-test.

CONCLUSION: Intra oral psychomotor performance was impaired in subjects with tooth agenesis as compared to those with normal set of dentition.

KEY WORDS: Oral Psychomotor Performance, Oral Stereognosis, Tooth Agenesis

COI: None declared.

Contribution of Authors: Nazia Yazdanie (NY) was supervisor of research and Bilal Ahmed was main researcher. This manuscript was part of FCPS thesis.

How to cite this article: Ahmed B, Yazdanie N. Comparison of psychomotor performance in subjects with congenital tooth agenesis to those with normal dentition. J Pak Prosthodont Assoc 2013; 01(01): 39-44

INTRODUCTION

Congenital Tooth Agenesis is one of the most frequent form of alteration in the human dentition and manifests itself as the absence of one or more of the normal complement of teeth.¹ It may cause speech and masticatory dysfunction as well as aesthetic problems.² Compromised quality of life affecting individual's social, mental and psychological well being are the main outcomes of these disorders.³

These disorders can be sporadic or familial or can also occur in association with craniofacial anomalies like Hereditary Ectodermal Dysplasia (HED), Reiger's Syndrome, Down's syndrome and Cleft Lip / Palate Syndromes.⁴

Isolated tooth agenesis occurs in up to 1.5% -9 % of the normal population, but its prevalence can rise up to 47.5% in Syndromic conditions. Prevalence is more in females than males by a (ratio 3:2)⁵. Management of these cases can be planned considering the age, socioeconomic status, severity of the condition and expertise available. These range from simple conventional dentures to osseointegrated implants. An interdisciplinary approach employing all components of a health team is highly recommended. Intra oral psychomotor performance (Intra oral motor proficiency) can be utilized to predict the therapeutic effectiveness of prosthodontic rehabilitation. These abilities give a measure of the neuro-muscular control of the subjects and are directly related to the intra oral sensory abilities (Oral stereognostic abilities).

The more precisely a subject gets information from concerned sensory receptors, the more precisely it will respond to that stimulus.⁶

Various clinical studies have been conducted using oral motor ability (OMA) skills to assess oral stereognosis, to study speech in cleft palate patients, in patients who are excessively aware of the presence of dentures and retch.⁶ These tests have also been applied in dentate and edentulous subjects, to study oral muscular ability in different age groups, as an aid to prosthetic treatment planning, in edentulous subjects rehabilitated with complete removable dentures, and as an assessment to denture adaptability.⁷ More recently studies have been conducted in edentulous patients with Stroke and Parkinson's disease.⁸

No documented literature was available on Intra-oral psychomotor performance in subjects with Tooth Agensis. As these subjects show reduced dental components which not only affect the quantity and quality of perception and proprioception associated with their periodontal ligaments, but also provide less stable solid platform which can hold the objects during their identification and manipulation phase. It was also assumed that as these subjects are not getting proper sensory input, they will be unable to give effective motor response.^{9, 10} Therefore, the purpose of this work was to evaluate these motor abilities in subjects with tooth agensis and then compare them with normal population. These findings can be used as a diagnostic tool in the treatment planning of these affected subjects and can be useful to predict the prognosis of their planned prosthodontic rehabilitation.

The objective of the study was to compare Oral psychomotor performance in subjects with congenital tooth agensis to control subjects having normal complete complement of teeth.

HYPOTHESIS: Intraoral psychomotor performance is impaired in patients with tooth agensis as compared to those with normal dentition.

MATERIALS & METHODS

It was a cross sectional study conducted in the Department of Prosthodontics, de'Montmorency College Of Dentistry / Punjab Dental Hospital, Lahore from June 2006- December 2006. A total of eighty subjects of the same age group were included in the study using purposive, non probability sampling

technique. Forty subjects were with diagnosed tooth agensis and other forty subjects were with normal dentition. The criteria for the inclusion of a subject in the study were; subjects of both genders with age range of 15-25-years and diagnosed to suffer congenital tooth agensis without any previous experience of prosthodontics rehabilitative treatment. Those having cleft lip / palate & other associated craniofacial anomalies or those having mental and/or physical incapacities were not considered. The control group comprised of normal healthy dentition was dental students of third year and final year BDS classes.

Intra oral psychomotor performance tests were used based on work done by Berry and Mahood 11 and later described by Yazdanie.⁷ These tests were conducted on the tooth agensis subjects in the age range of 15-25 years who visited Department of Prosthodontics, de'Montmorency College of Dentistry / Punjab Dental Hospital, Lahore, from June to December 2006, and the findings were compared with subjects of same age group but with a normal healthy dentition. The control group with normal healthy dentition was dental students of third year and final year BDS classes. The procedure and the purpose of the study were explained to the subjects of both groups and their informed verbal consent was obtained. The Research Protocol was permitted by the Ethical Review & Research Committee of the college.

Intra-oral psychomotor performance score was recorded as function of time to assemble a two part plastic inside the mouth with tongue. An increased time taken to assemble the pieces showed increasing level of difficulty. Five pairs of the two plastic parts (patrx and matrix) were used with dimensions of 1.2cm x 1.2cm x 1.2cm. They were numbered 1-5 in order of presentation. The first test pair was holding a squarish projection on the patrx and same sized squarish hole in the matrix with ability to assemble in all directions and positions. Test pair No. 2 was with a rectangular patrx and matrix that could only be assembled in two directions. The third test pair was with a circular, cylindrical patrx and matrix and could be assembled in all directions. The fourth test pair was holding a semicircular patrx and matrix and ability to be assembled in two directions only. Fifth and the last pair was again with a semicircular patrx and matrix but with an additional projection on one piece and depression on the other piece so that it

could only be assembled in one direction that made this pair the most complicated of all.

A number of pairs of test samples were made available for the study and they were properly disinfected prior to use. The test pairs were placed on the tip of the tongue of the subjects separately and they were asked to assemble these using the tongue, palate and teeth but with no manual or visual aid. A maximum of 3 minutes were allowed for assembly of each pair of the test pieces. The time was calculated using a stopwatch. If the subject failed to assemble them within that time, the score was recorded as 180 seconds. The time taken for the assembly of five pairs of test pieces for three times was totaled to give the individuals oral psychomotor performance score time. The maximum time possible for this test was therefore $15 \times 180 = 2700$ seconds. The time for individual test pairs were also calculated. The data was recorded in a pre-structure data sheet.

The data collected were analyzed using simple descriptive statistics employing SPSS version 10.0. Basic variables were age, gender, severity of the condition which was labeled as mild, moderate to severe depending upon number of missing teeth. Mean values and standard deviation were calculated for age, whereas frequency in percentage was calculated for gender and severity of the tooth agenesis state. These groups were compared for oral psychomotor ability scores using t-test.

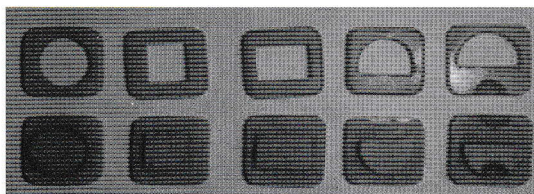


Fig. 1:- Oral Psychomotor Performance Test Pieces

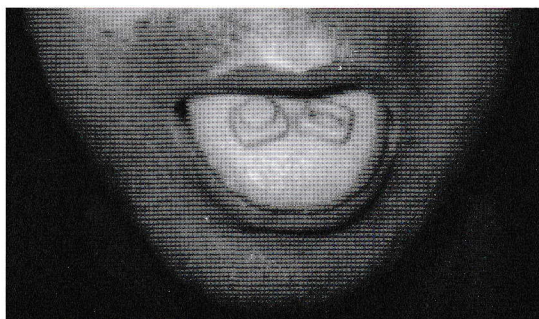


Fig. 2:- Oral psychomotor performance test pair in

situ (Before assembly).

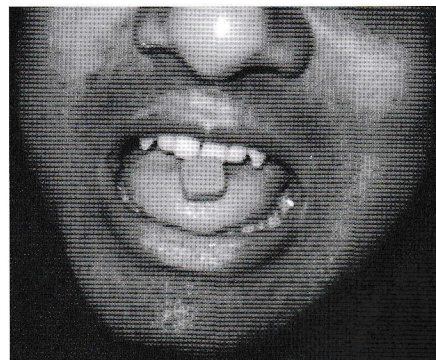


Fig. 3:- Oral psychomotor performance test pair in situ (After assembly).

RESULTS:

Table 1 shows data for the distribution of subjects according to their age. 20.0% were of less than 18 years whereas 41.3% were of age between 22-25 years. Table 2 shows gender distribution of subjects that participated in this study and presents it in terms of frequency and percent. It can be seen that 51.3 % of test subjects were males and 48.8 % were females. Table 3 shows distribution of subjects in this study according to the number of missing teeth; which in turn shows severity of tooth agenesis state in test cases. 11.3% of the test subjects suffered from mild tooth agenesis, 8.8% with moderate and 20.0% were with severe agenesis. The rest 50% were normal subjects with no missing teeth. Table 4 shows comparison of Oral psychomotor performance scores in tooth agenesis patients and subjects with normal dentition. Congenital tooth agenesis patients took more time to assemble these test pairs with significant p value. Table 5 shows comparison of Oral psychomotor performance scores in two groups for individual test pairs. All these test pairs showed significant p values. It also showed level of difficulty in assembling these test samples as circular shaped test pair was the easiest and semicircular test pair with small additional projection proved as the difficult most to assemble.

Table 1:- Distribution of Subjects according to Age Groups. (n=80)

Age	Frequency	Percent
<18	16	20.0
18-20	12	15.0
21-22	19	23.8
>22	33	41.3
Total	80	100.0
Mean age	21:2 ± 2.6	

Table 2:- Distribution of subjects according to Gender. (n = 80)

Gender	Frequency	Percentage
Male	41	51.3 %
Female	39	48.8 %
Total	80	100 %

Table 3:- Distribution of Subjects According to the Severity of Tooth Agenesis. (n =80)

Severity of Tooth Agenesis	Frequency	Percentage
Normal dentition	40	50
Mild Tooth Agenesis	9	11.3
Moderate Tooth Agenesis	15	18.8
Severe Tooth Agenesis	16	20.0
Total	80	100.0

Table 4:- Comparison of Intra Oral Psychomotor Performance Score in Tooth Agenesis Patients and subjects with normal dentition. (n = 80)

Groups	Psychomotor Performance Score (Seconds) Mean ± SD
cases (n=40)	133.7 ± 36.8
Controls (n=40)	72.7 ± 32.7
	t-value = 7.8, p-value < 0.01

Table 5:- Comparison of Intra Oral Psychomotor Performance Scores for individual test pairs in Tooth Agenesis Patients and subjects with normal dentition. (n =80)

Shapes	Mean ± SD Cases (n=40)	Mean ± SD Controls (n=40)	t value	p value
Square	20.6 ± 13.1	11.6 ± 10.9	3.32	p < 0.01
Rectangle	27.1 ± 11.2	17.8 ± 8.9	4.08	p < 0.01
Circular	7.07 ± 2.7	4.25 ± 3.1	4.27	p < 0.01
Semicircular	43.8 ± 23.1	23.2 ± 17.3	4.49	p < 0.01
Semicircular with small Additional projection	124.10 ± 33.7	63.9 ± 32.7	8.08	p < 0.01

DISCUSSION

Intra-oral psychomotor performance can be used to diagnose and evaluate the motor control functions of the oral cavity. This capability of the nervous system of given subjects can quantify its integrity and its ability to perform intra-oral coordinated functions with localized oral structures. Intact intra oral structures obviously gain better sensory information concerning shape or form of the objects and they will be able to transmit more precise information to the nervous control system which then reacts more appropriately and efficiently to give a proper effective response. Any anatomical or functional deficit can pose a delay or break in this cycle and can disturb the final output which leads to impairment of these abilities.

Literature shows the use of these abilities in diagnosing and making treatment planning in different clinical scenarios. Various studies show the benefits of diagnosing intra oral psychomotor performance in designing and predicting the treatment outcomes of subjects suffering from cleft palate,⁵ parafunctional habits,¹² stroke and Parkinsonism.⁸ Intraoral motor ability (OMA) skills can be utilized in designing dental prosthesis and predicting denture adaptability.⁷ Intraoral psychomotor performance has also been discussed in relation to masticatory abilities.¹³ dental conditions¹⁴ age related changes,¹⁵ oral hygienic conditions^{16,17} and fetal alcohol syndrome.¹⁸

The present study was conducted to identify the intra-oral motor deficits associated with hypodontia / partial anodontia in congenital tooth agenesis patients and then to compare these changes with subjects having normal dentition. Intra-oral

psychomotor proficiency is considered to be associated with intact healthy dentition. It not only provides periodontium associated proprioceptive responses but also provides a stable platform which holds and supports the given intra oral objects.

On the contrary, congenital tooth agenesis patients suffer a compromised dental component which directly relate to the disturbed quality of life especially in severe cases,¹⁹ thus the results show disturbed oral stereognosis and psychomotor performance.

Intra-oral psychomotor performance scores represent the motor responsiveness of the subjects and it is related directly with the oral stereognostic scores of these subjects. As more precisely, a subject gets information about the surrounding environment, he can give more precise and more accurate response.²⁰ But along with these sensory-motor inter relationships, other stomatognathic structures are also important for effective and accurate responsiveness.

Tooth agenesis patients showed a significant difficulty in assembling the two part test pieces when compared to subjects with normal dentition (Table 4). This may also be considered to be related to reduced number of dental structures which could help to hold the test pieces. This finding appears in accordance with a study that showed higher psychomotor proficiency Scores in edentulous subjects.⁷

However, it confirms that the motor responsiveness of the tooth agenesis subjects is significantly reduced and it can be directly related to the reduced oral stereognostic scores.²¹ We can also predict that as the subjects get impaired information about the form of test pieces; he/she is unable to give a proper and precise response. This finding correlates with that of Berry and Mahood which states that the oral psychomotor performance is related to sensory feedback and there is a strong interrelationship between oral stereognosis and purposeful oral psychomotor performance.¹¹

When oral psychomotor performance scores were evaluated for all different shapes in two groups (Table 5), it was found that semicircular test pieces with small additional projections appeared more difficult for both groups whereas circular shaped patrix and matrix were the easiest. However, tooth agenesis subjects showed significant difficulty in assembling all

the five test pieces when compared to normal subjects (control group).

This was in accordance with previous findings that as subjects showed reduced oral stereognosis scores, they showed significantly higher oral psychomotor performance scores.¹¹

On the basis of all these different studies, it is concluded that the oral psychomotor performance tests are reliable diagnostic tools in designing as well as predicting the outcomes of any treatment modality for rehabilitation of intra-oral hard and soft tissues and it should be employed in management planning in complex clinical scenarios.²²

CONCLUSION

Congenital tooth agenesis subjects showed a significant difficulty in intra oral manipulation of test objects when compared to subjects with normal dentition. These findings showed that oral psychomotor performance was significantly impaired in subjects presenting tooth agenesis.

REFERENCES

1. The Glossary of Prosthodontic Terms. The Academy of Prosthodontics. J Prosthet Dent 2005;94:76.
2. Peres RC, Scarel RM, Silva ER, de Conto F, Line SR. Absence of association between transforming growth factor beta-1 promoter polymorphisms and hypodontia. Angle Orthod 2004;74:665-71.
3. Scarel RM, Trevilatto PC, Di Hipolito O Jr, Camarago LE, Line SR. Absence of mutations in the homeodomain of MSX 1 gene in patients with hypodontia. Am J Med Genet 2000;92:346-9.
4. Vastardis H. The genetics of tooth agenesis: new discoveries for understanding by agenesis in the primary dentition. Am J Orthod Dentofacial Orthop 2000;117:650-6.
5. Slayton RL, Williams L, Murray JC, Wheeler JJ, Lidral AC, Nishimura CJ. Genetic association studies of cleft lip and/or palate with hypodontia outside the cleft region. Cleft Palate Craniofacial J 2003;40:274-9.
6. Wright S. Oral awareness and oral motor proficiency in retchers. J Oral Rehab 1981;8:424-30.

7. Yazdanie N. Oral stereo gnosis and oral motor ability, an assessment to denture adaptability. *Pak Oral Dental J* 2002; 22:185-90.
8. Leung KC, Pow EH, McMillan AS, Wong MC, Li LS, Ho SL. Oral perception and oral motor ability in edentulous patients with stroke and Parkinson's disease. *J Oral Rehabil* 2002 ; 29:497-503.
9. Ahmed B, Yazdanie N. Hypohidrotic Ectodermal Dysplasia (HED). *J Coll Physicians Surg Pak* 2006;16:61-3.
10. Ahmed B, Yazdanie N. Hypodontia and Microdontia Associated with Hereditary Ectodermal Dysplasia. *J Coll Physicians Surg Pak* 2009;19:192-4.
11. Berry DC, Mahood M. Oral stereognosis and oral motor ability in relation to prosthetic treatment. *Br Dent J* 1966;120:179-85.
12. Dahan JS, Lelong O, Celant S, Leysen V. Oral perception in tongue thrust and other oral habits. *Am J Orthod Dentofacial Orthop* 2000;118:385-91.
13. Hirano K, Hirano S, Hayakawa I. The role of oral sensorimotor function in masticatory ability. *J Oral Rehabil* 2004;31:199-205.
14. Koshino H, Hirai T, Ishijima T, Ikeda Y. Tongue motor skills and masticatory performance in adult dentate, elderly dentate and complete denture wearers. *J Prosthet Dent* 1997;77:147-52.
15. Fucile S, Wright PM, Chan I et al. Functional oral motor skills: Do they change with age?. *Dysphagia* 1998;13:195-201.
16. Jalil RA, Cornick DE. Relationship between oral hygiene state and levels of oral sensory perception and motor ability. *J Nihon Univ Sch Dent* 1994;36:175-82.
17. Felder R, James K, Brown C, Lemon S, Reveal M. Dexterity testing as a predictor of oral care ability. *J Am Geriatr Soc* 1994;42:1081-6.
18. Becker M, Warr-Leeper GA, Leeper HA Jr. Fetal Alcohol Syndrome: A description of oral motor, articulatory, short-term memory, grammatical, and semantic abilities. *J Commun Disord* 1990;23:97-124.
19. Wong ATY, McMillan AS, McGrath C. Oral health related quality of life and severe hypodontia. *J Oral Rehabil* 2006;33:869-873.
20. Kroonenberg PM, Oort FJ, Stebbins GT et al. Motor function in Parkinson's disease and supranuclear palsy: simultaneous factor analysis of a clinical scale in several populations. *BMC Med Res Methodol* 2006;6:26.
21. Ahmed B, Mirza KM, Butt AM, Hussain M, Yazdanie N. Oral Stereognostic Ability in Hypodontia Patients. *Pak J Med Research* 2010;49:14-7.
22. Ahmed B, Hussain M, Yazdanie N. Oral Stereognostic Ability: A Test of oral perception. *J Coll Physicians Surg Pak* 2006;16:794-8.