

ESTHETIC PERCEPTION OF PATIENTS UNDERGOING ORTHODONTIC TREATMENT WITH STAINLESS STEEL AND CERAMIC BRACKETS

RESEARCH STUDY

ABSTRACT :

Objectives: The goal of this study is to evaluate the esthetic perception of fixed metal and ceramic preadjusted edgewise brackets, by the patients. **Methodology:** Thirty patients undergoing fixed orthodontic mechanotherapy were selected, where fifteen patients were treated with fixed labial metal appliance (group A) and other fifteen patients with fixed labial ceramic appliance (group B). The scores were tabulated using VAS after 1st week of appliance placement (T1), 2nd week after start of treatment (T2) and 4th week of treatment (T3). **Results:** Independent Student t test was used to compare the mean VAS scores between two study groups at different time intervals. Chi square test was used to compare the different esthetics grading between 02 study groups at different time intervals. Comparison of the mean VAS scores between the two study groups at the time intervals of first week (T1), second week (T2) and fourth week (T3) showed statistically insignificant values for esthetics with metal appliance with the “p- value” greater than 0.001. Ceramic appliance showed a 100% high esthetic scoring during the 1st week (T1) of treatment, 66.7% high esthetic scoring during the second week (T2) and 66.7% scoring of moderately reduced esthetics during the 4th week (T3), thus group A patients complained of unesthetic metallic smile throughout treatment and group B patients showed good esthetics during first and second week but was reduced in the fourth week due to discolouration of the elastic modules. **Conclusion :** The overall esthetic perception was greater for fixed labial ceramic appliance than for fixed labial metal appliance with no or minimal discolouration of the ceramic brackets.

Keywords : Esthetics, metal brackets, ceramic brackets.

INTRODUCTION :

Esthetic concerns continue to remain at the forefront for a significant segment of patients seeking orthodontic treatment. With the increase in awareness regarding oral health and developments in armamentarium and biomechanics, orthodontic patients put higher demands for aesthetic results not only after the treatment but also during the treatment phase.¹

One of the main reasons that motivate patients to start an orthodontic treatment is the esthetic factor and improvement of dental health as a whole. Patients who look for orthodontic treatment present a more critical self-perception, both of the face as well as the teeth, than those

DR. DHARMESH H. S.

Reader*
drdharmi@gmail.com, 9845338403

DR. BHARATHI V. S.

Senior Lecturer*

DR. FAISAL ARSHAD

Senior Lecturer*

*Department of Orthodontics and Dentofacial Orthopedics
Rajarajeswari Dental College and Hospital, Bangalore.

who don't look for orthodontic treatment. However, the use of orthodontic brackets can harm the appearance, even if it is temporary and the use of non esthetic metal brackets for long term treatment are the main reasons for the adult patients to decline the start of orthodontic treatment.²

Stainless steel brackets were widely used in orthodontics, which were considered to be less acceptable by adult patients and considered to be less esthetic, but most metallic brackets used have good physical properties and good corrosion resistance.³

With the introduction of ceramic brackets, which provide excellent optical properties without significant functional compromise, these brackets are durable and allow adequate force control over long treatment periods as their risk for discolouration is minimal.⁴

With many new developments in design and materials Orthodontic treatment has become more comfortable and aesthetically pleasing for adult patients.⁵

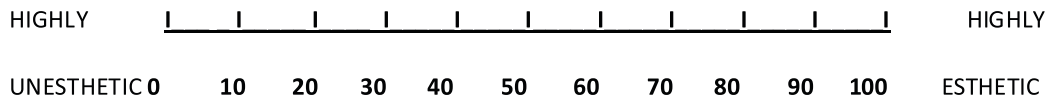
MATERIALS AND METHODOLOGY :

Thirty patients were treated with fixed preadjusted edgewise appliance mechanotherapy were selected. Out of which fifteen patients were treated with fixed labial metal brackets (Group A) and the other fifteen patients were treated with fixed labial ceramic brackets (Group B). All the patients were given post bonding oral hygiene instructions. Written consent forms were obtained from all the participants. All patients were asked to rate their esthetic perception and acceptability on a visual analog scale (VAS) (fig 1). The patients were evaluated on a time interval of first week of treatment (T1), second week of treatment (T2) and fourth week of treatment (T3) for esthetics. The evaluators for esthetics in this present study were the patient themselves.

The visual analogue scale (VAS) is a psychometric response scale which can be used in questionnaires. The VAS originated from continuous visual analogue scales developed in the field of psychology to measure well-being. VAS is usually a horizontal line, 100 mm in length anchored by a

word descriptors at each end. The patient marked on the line the point that they feel represented their perception of their current state. The VAS score is determined by measuring in millimetres from the left hand end of the line to the point that the patient marks.

Fig : 1



Score Interpretation:

- # Highly Esthetic – 76mm – 100mm
- # Mildly Reduced Esthetics – 51mm – 75mm
- # Moderately Reduced Esthetics—26—50mm
- # Highly Unesthetics—0—25 mm

RESULTS :

TABLE-1 :

GROUP A : RESULTS TABULATED USING VAS: FIXED LABIAL METAL APPLIANCE ASSESSED FOR ESTHETICS AT AN INTERVAL OF 1ST WEEK (T1), 2ND WEEK (T2) AND 4TH WEEK (T3) OF TREATMENT.

| Group A: Fixed Metal Appliance | 1 st week (T1) | 2 nd week (T2) | 4 th week (T3) |
|--------------------------------------|------------------------------|------------------------------|------------------------------|
| 1. | 20 | 20 | 20 |
| 2. | 27 | 22 | 20 |
| 3. | 30 | 25 | 21 |
| 4. | 18 | 53 | 24 |
| 5. | 34 | 60 | 18 |
| 6. | 19 | 62 | 55 |
| 7. | 35 | 27 | 60 |
| 8. | 37 | 30 | 27 |
| 9. | 39 | 32 | 30 |
| 10. | 40 | 34 | 34 |
| 11. | 42 | 32 | 36 |
| 12. | 45 | 36 | 38 |
| 13. | 55 | 40 | 40 |
| 14. | 58 | 44 | 44 |
| 15. | 60 | 48 | 45 |

TABLE-2 :

GROUP B : RESULTS TABULATED USING VAS: FIXED LABIAL CERAMIC APPLIANCE ASSESSED FOR ESTHETICS AT AN INTERVAL OF 1ST WEEK (T1), 2ND WEEK (T2) AND 4TH WEEK (T3) OF TREATMENT.

| Group B Fixed Ceramic Appliance | 1 st week (T1) | 2 nd week (T2) | 4 th week (T3) |
|---------------------------------------|------------------------------|------------------------------|------------------------------|
| 1. | 77 | 77 | 20 |
| 2. | 80 | 80 | 25 |
| 3. | 82 | 82 | 21 |
| 4. | 77 | 85 | 22 |
| 5. | 78 | 87 | 20 |
| 6. | 80 | 85 | 27 |
| 7. | 84 | 87 | 30 |
| 8. | 86 | 88 | 32 |
| 9. | 85 | 90 | 34 |
| 10. | 80 | 85 | 38 |
| 11. | 82 | 55 | 40 |
| 12. | 85 | 57 | 44 |
| 13. | 88 | 60 | 48 |
| 14. | 82 | 65 | 32 |
| 15. | 85 | 68 | 34 |

Statistical Analysis :

The frequency description of all study parameters was done using number and percentage for categorical variables, whereas mean & SD for continuous data.

Independent Student t test was used to compare the mean VAS scores between two study groups at different time intervals. Chi square test was used to compare the different esthetics grading between 02 study groups at different time intervals. The level of significance [P-Value] was set at $P < 0.05$

TABLE-3

| Comparison of mean VAS scores between 02 study groups at different time intervals using Independent Student t test | | | | | | | | |
|--|--------------------|----|------|------|-------|-----------|---------|---------|
| Time | Group | N | Mean | SD | S.E.M | Mean Diff | t | P-Value |
| 1st Wk | Metallic Appliance | 15 | 37.3 | 13.4 | 3.5 | -44.8 | -12.513 | <0.001* |
| | Ceramic Appliance | 15 | 82.1 | 3.4 | 0.9 | | | |
| 2nd Wk | Metallic Appliance | 15 | 37.7 | 13.2 | 3.4 | -39.1 | -8.382 | <0.001* |
| | Ceramic Appliance | 15 | 76.7 | 12.3 | 3.2 | | | |
| 4th Wk | Metallic Appliance | 15 | 34.1 | 13.0 | 3.4 | 3.0 | 0.739 | 0.67 |
| | Ceramic Appliance | 15 | 31.1 | 8.8 | 2.3 | | | |

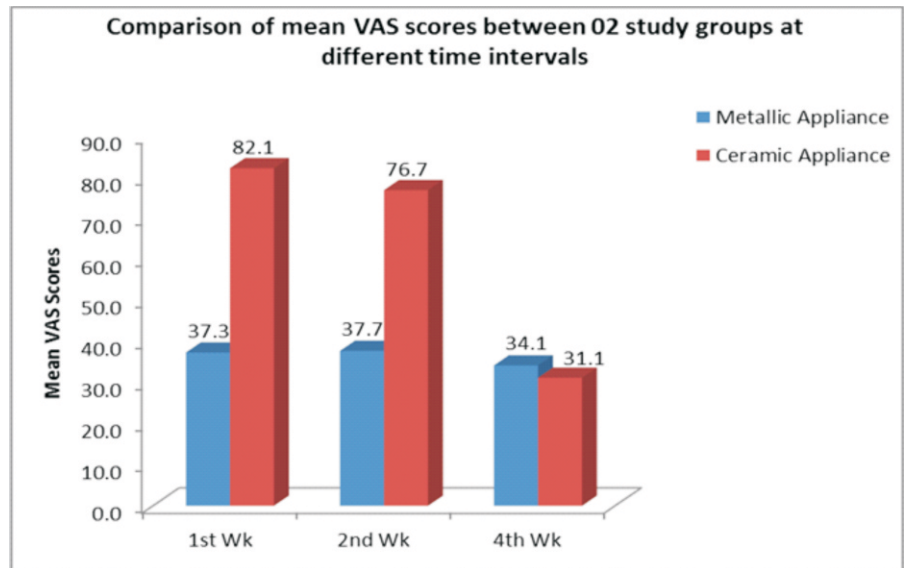
* - Statistically Significant

TABLE-4

| Comparison of different esthetics grading between 02 study groups at different time intervals using Chi square test | | | | | | | |
|---|--------------------------|--------------------|-------|-------------------|--------|----------------------|---------|
| Time | Esthetics Grading | Metallic Appliance | | Ceramic Appliance | | χ ² Value | P-Value |
| | | n | % | n | % | | |
| 1st Wk | Highly Unesthetics | 3 | 20.0% | 0 | 0.0% | 30.000 | <0.001* |
| | Mod. Reduced Esthetics | 9 | 60.0% | 0 | 0.0% | | |
| | Mildly Reduced Esthetics | 3 | 20.0% | 0 | 0.0% | | |
| | Highly Esthetics | 0 | 0.0% | 15 | 100.0% | | |
| 2nd Wk | Highly Unesthetics | 3 | 20.0% | 0 | 0.0% | 22.500 | <0.001* |
| | Mod. Reduced Esthetics | 9 | 60.0% | 0 | 0.0% | | |
| | Mildly Reduced Esthetics | 3 | 20.0% | 5 | 33.3% | | |
| | Highly Esthetics | 0 | 0.0% | 10 | 66.7% | | |
| 4th Wk | Highly Unesthetics | 5 | 33.3% | 5 | 33.3% | 2.222 | 0.33 |
| | Mod. Reduced Esthetics | 8 | 53.3% | 10 | 66.7% | | |
| | Mildly Reduced Esthetics | 2 | 13.3% | 0 | 0.0% | | |
| | Highly Esthetics | 0 | 0.0% | 0 | 0.0% | | |

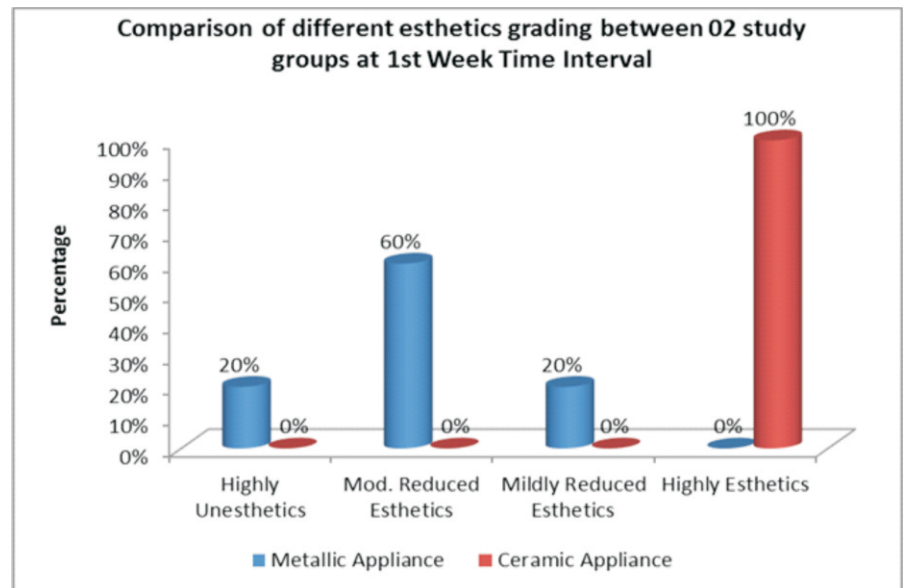
GRAPH 1:

Ceramic appliance showed a high esthetic scoring during the first (T1) and second week (T2) and was reduced during the 4th week (T3).



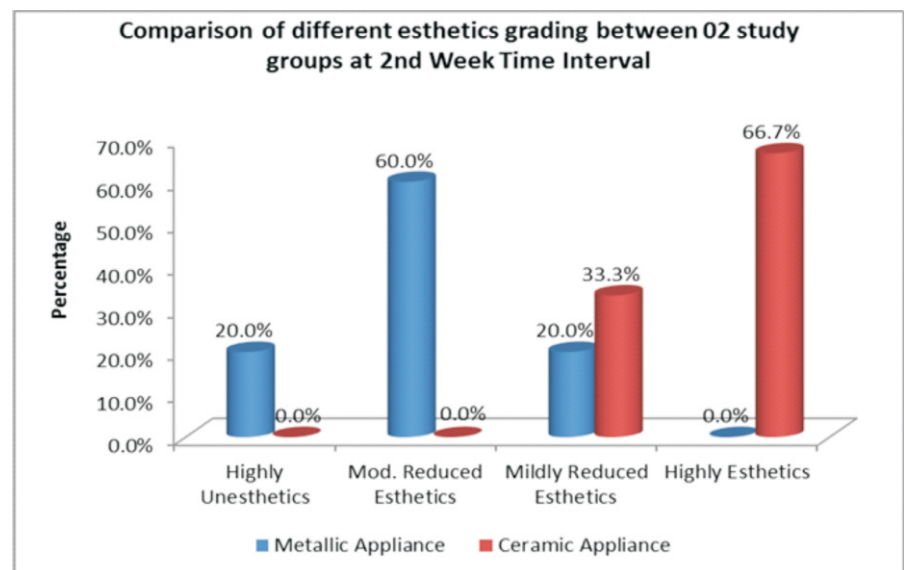
GRAPH 2:

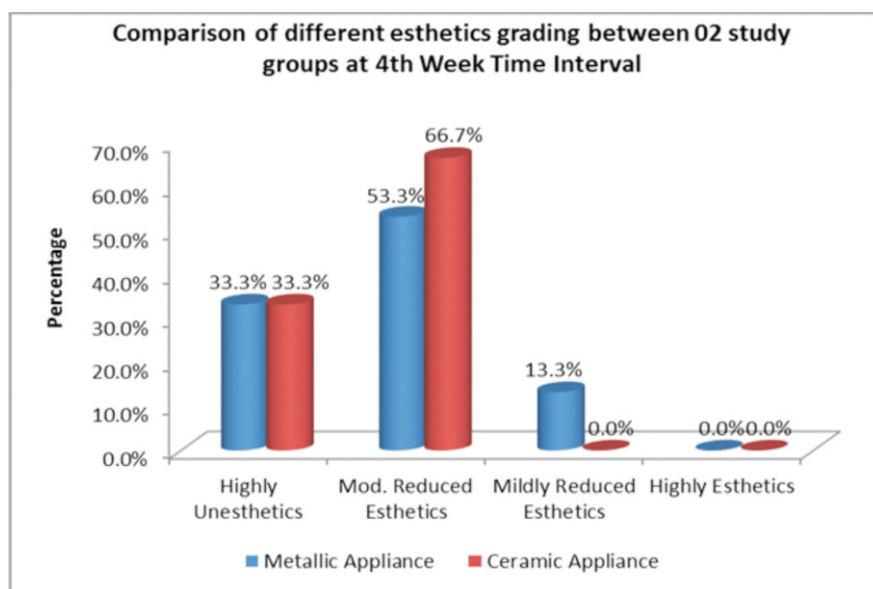
Ceramic appliance showed a 100% high esthetic scoring during the 1st week(T1) of treatment.



GRAPH 3:

Ceramic appliance showed a 66.7% high esthetic scoring during the second week (T2).





GRAPH 4 :

Ceramic appliance showed 66.7% scoring of moderately reduced esthetics during the 4th week (T3).

RESULTS :

Comparison of the mean VAS scores between the two groups using independent student t test during the first week (T1) for metallic appliance showed a mean value of 82.1 and a standard deviation of 13.4. Ceramic appliance showed a mean value of 82.1 and a standard deviation of 3.4 and the mean difference between the two during the first week (T1) was -44.8 and was found to be statistically significant with $p < 0.001$ (table 3 & graph 1).

During the second week (T2) of treatment, metal appliance showed a mean value of 37.7 and a .S.D. of 13.2, ceramic appliance showed a mean value of 76.6 and a standard deviation of 12.3, thus the mean difference between the two during the second week of treatment (T2) was -39.1 and was found to be statistically significant with $p < 0.001$ (table 3 & graph 1).

During the fourth week of treatment (T3), metal appliance showed a mean value of 34.1 and a .S.D. of 13, ceramic appliance showed a mean value of 31.1 and a standard deviation of 8.8, with a mean difference between the two during the fourth week (T3) was 3.0 and was found to be statistically insignificant with $p > 0.001$ (table 3 & graph 1).

Comparison of the mean VAS scores between the two study groups during the first week (T1) and second week (T2) showed that the p value < 0.001 and was statistically significant, but was insignificant during the fourth week (T3) with p value > 0.001 , as the elastic modules showed discolouration during the fourth week of treatment which led to decreased esthetic scoring. (table 3 & graph 1)

Comparison of the different esthetic grading between the two study groups using chi square test during the first week of treatment (T1) for metallic appliance showed a high esthetic scoring of 20%, moderately reduced esthetics of 60% and mildly reduced esthetics of 20%. Ceramic appliance

showed a high esthetic scoring of 100% during the first week thus the p value was statistically significant $p < 0.001$ (table 4 and graph 2).

During the second week of treatment (T2), metallic appliance showed a high esthetic scoring of 20%, moderately reduced esthetics of 60% and mildly reduced esthetics of 20%. Ceramic appliance showed mildly reduced esthetics by 33.3% and high esthetic scoring of 66.7% during the second week, thus the p value was statistically significant $p < 0.001$ (table 4 and graph 3).

During the fourth week (T3) metal appliance was highly unesthetic with 33.3% scoring, moderately reduced esthetics of 53.3% and mildly reduced esthetics of 13.3%. Ceramic appliance showed a highly unesthetic scoring of 33.3%, moderately reduced esthetics of 66.7% during the fourth week of treatment (T3) with $p > 0.001$ thus statistically insignificant (table 4 and graph 4).

Thus, in this study group A patients (fixed labial metal appliance) showed decreased esthetics throughout the treatment and complained of a “metallic unesthetic smile” whereas group B patients (fixed labial ceramic appliance) showed high esthetic satisfaction during the first and second week of treatment but was decreased during the fourth week of treatment due to discolouration of the elastic modules and minimal or no discolouration of the ceramic brackets.

DISCUSSION :

The adult demand for orthodontic treatment showed a considerable increase in most of the cases due to esthetic reasons. It would be reasonable to assume that patients, especially adults, would not only be concerned about their esthetics at the end of the orthodontic treatment but also during the process of the treatment.²

Studies have shown that highest attractiveness is for

the lingual brace, but the same has low acceptability and large metal brackets have the lowest attractiveness and acceptability among the other bracket systems, adults preferred to treat their children with more esthetic appliance. The attractiveness of the orthodontic appliance is as follows: lingual brackets>ceramic bracket with ceramic wire>ceramic bracket with metal wire>hybrid bracket>small metal bracket> large metal bracket.^{5,2}

Studies conducted by Seandra et al and Rosvall M.D. et al, have evaluated the characteristics of both dental and facial esthetics, by rating photographic records with a visual analog scale (VAS), which has been a valid method of assessing dental attractiveness with two weekstime interval. Results of the VAS scores showed that the adolescents recorded similar scores between smiles with or without ceramic brackets. On the other hand, smiles with metal brackets, regardless of the ligature colour used, were considered less pleasant.^{2,8}

The various review articles on esthetic orthodontics shows the increasing number of adult patients seeking orthodontic treatment motivated due to esthetic considerations with the introduction of ceramic brackets, where fixed orthodontic appliances have been the backbone of orthodontic biomechanical technique.^{1,6}

In this study the evaluators for esthetic perception were the patients themselves who were treated with fixed metal and fixed ceramic bracesun like the study conducted by Seandra et al and Salahi et al where evaluators were lay persons and the results obtained from this study and the above mentioned study were similar with ceramic brackets being more esthetically acceptable and metal brackets being considered as less esthetically acceptable brackets which gave a metallic smile to the patients.^{2,7}

VAS scores were used to evaluate the esthetic perception of the patients treated with fixed metal and ceramic braces similar to the study conducted by seandra et al.²

CONCLUSION :

The esthetic perception with fixed labial metal appliance was always less than that of the fixed labial ceramic appliance therapy during the treatment. The esthetic perception with fixed Labial ceramic appliance was greater during the first week of treatment and gradually reduced during the second week of treatment and showed highly decreased esthetics during the 4th week of orthodontic treatment due to discolouration of the elastic modules. The esthetic perception with the fixed labial metal appliance was less throughout the treatment whereas, in ceramic it was decreased over a period of 4 weeks. The overall esthetic perception was however greater for fixed labial ceramic appliance than for fixed labial metal appliance and the patients with fixed metal appliance complained of unesthetic metallic smile throughout the treatment.

REFERENCES :

1. Aesthetic Orthodontics: An Overview. Orthodontic Journal of Nepal, Vol.4, No.2, Dec 2014.
2. Impact of brackets on Smile esthetics: Laypersons and orthodontic Perception 2012
3. Stainless steel brackets for orthodontic application. European Journal of orthodontics 2005, june 27(3).
4. Ceramic brackets in search of an Idea. Trends biomater, Vol 20 (2). 2007
5. Advances in fixed appliance design and use:2. Auxilliaries, adhesives, appliance care and debonding. Pubmed-NCBI-1992, Oct:19(8): 331- 5
6. Metal Free Orthodontics: A Review. International Journal of Preventive and Clinical Dental Research 2014; 1(4): 100- 106, oct- dec
7. Evaluation of Percieved acceptability: Beauty and Value of different orthodontic brackets. 2015
8. Attractiveness, acceptability, and value of orthodontic appliances. American Journal of orthodontics and Dentofacial Orthopedics. 2009 march; 135(3): 276