

Preferences of Regular Metal Brackets among Patients Reporting to Dental Hospital- An Institutional based Retrospective Study

Running title: Prevalence of regular metal brackets among patients reporting to dental hospital - an institutional based study

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Article Info**Volume 83****Page Number: 2441 - 2450****Publication Issue:****July-August 2020****Abstract:**

The technology used to make orthodontic products and materials has advanced at an exponential rate. Newer materials, methods, and designs are coming up on a daily basis. These products help the orthodontist to give the best functional and aesthetic results to the patient. Orthodontic brackets have evolved from Angle's era to the MBT brackets followed by lingual brackets. These brackets have made the life of the orthodontists much easier. As technology is advancing many more newer materials and designs are coming forward. The aim of the study was to evaluate the frequency of use of regular metal brackets among patients reporting to dental hospital in Chennai, in the period of June 2019- March 2020. The clinical records of 1362 patients undergoing orthodontic treatment were evaluated. The prevalence of patients treated with regular metal brackets according to sex, gender and the different types of orthodontic brackets were assessed. Chi-square test was used to determine associations between variables, while the chi-square test for trends was used to assess the frequency of patients treated with regular metal brackets in comparison to others. The most frequently preferred brackets by patients were the regular metal brackets (99.5%) in comparison to other types of brackets. There was no statistically significant difference in patients treated with regular metal brackets with respect to age and gender. Thus, it can be concluded that the regular metal brackets are still being widely chosen by patients undergoing orthodontic treatment. Hence, awareness of different types of brackets and their uses should be brought among patients undergoing orthodontic treatment.

Keywords: Angle's era; Lingual brackets; Metal bracket therapy (MBT); Orthodontic brackets; Regular metal brackets.

Article History**Article Received:06 June 2020****Revised: 29 June 2020****Accepted: 14 July 2020****Publication: 25 July 2020****INTRODUCTION:**

Recently, the orthodontic market has experienced phenomenal growth in the development and production of orthodontic appliances that are designed to appeal to the patient consumer. Traditionally, the options for bracket style or appliance design were considerably limited for both the patient and provider. However, a shifting paradigm toward dental esthetics (Sarvera and Ackermanb, 2000), increased demand for orthodontic treatment (Keim et al., 2007), consumer driven desire of esthetic treatment alternatives, and a competitive orthodontic industry and profession have all contributed to the development and production of alternative orthodontic appliances and new bracket styles.(Willems and Carels, 2000; Russell, 2005)

Just as each orthodontic appliance is unique in its esthetic qualities, each also has biomechanical benefits and potential limitations. For decades, orthodontic

appliances consisted of custom fitted bands cemented on each tooth, covering nearly half of the exposed tooth surface of erupted crowns. The development of bonded adhesives introduced direct bracket bonding, eliminating altogether or limiting band placement to only posterior teeth. Plastic and ceramic brackets were developed to provide a relatively clear and esthetic alternative to metal braces.(Russell, 2005) About 10 years passed before ceramics were developed for orthodontic applications. The first brackets were milled from single crystals of sapphire (monocrystalline) using diamond tools. These were closely followed by polycrystalline sapphire (alumina) brackets, which are manufactured and sintered using special binders to thermally fuse the particles together. All currently available ceramic brackets are composed of aluminium oxide in one of two forms: polycrystalline or monocrystalline, depending on their distinct method of fabrication.(Kakadiya et al., 2017) Ceramic brackets

provide higher strength, more resistance to wear and deformation, better colour stability and, most important to the patient's superior aesthetics. However, their incorrect use or their wrong indication can lead to several problems such as the high friction of coefficient between the bracket and the archwire; this can interfere in the orthodontic treatment.(Ghafari, 1992; Keith, Jones and Davies, 1993; Tanne et al., 1994; Bishara et al., 1999)

Although similar to labial brackets, lingual brackets were introduced in the mid to late 1970's without the requirement of traditional labial 'outside braces'. They are compact and relatively simple for patients to wear, although they are not the only design available. However, there is a perception that the length of the treatment with lingual appliances is excessive and expensive compared with that for labial appliances.(Ling, 2005) A self-ligating bracket was then introduced, it is a ligature less system with a mechanical device built in to close-off the bracket slot. Secure engagement of the main arch wire into the bracket may be produced by a clip mechanism replacing the stainless steel or elastomeric ligature. Both active and passive self-ligating brackets have been developed depending up on the bracket and archwire interaction.(Kakadiya et al., 2017) Two types of self-ligating brackets have been developed: the HANSON SPEED bracket and the ADENTA TIMES bracket and those whose self-ligating clip does not press against the wire such as Aactiva bracket and the more recently developed Damon SL bracket ('A' company).(Thomas, 1998) The reported advantages of SLBs over CBs include greater patient comfort during treatment, fewer visits to orthodontists, overall shorter treatment time, improved anchorage stability, less need for extractions, and better outcomes in terms of occlusal and facial esthetic. However, the prospective clinical studies found no significant differences especially on treatment time and number of visits required for orthodontic treatment.(Machibya et al., 2013) Previously our team had conducted numerous clinical trials (Dinesh et al.,

2013; Felicita, 2017a, 2018; Samantha, 2017; Samantha et al., 2017), in-vitro studies (Ramesh Kumar et al., 2011; Felicita, Chandrasekar and Shanthasundari, 2012; Jain, Kumar and Manjula, 2014; Kamisetty et al., 2015; Sivamurthy and Sundari, 2016; Felicita, 2017b), systematic reviews (Krishnan, Pandian and Kumar S, 2015; Rubika, Sumathi Felicita and Sivambiga, 2015; Viswanath et al., 2015; Vikram et al., 2017) over the past 5 years. This experience led us to work on the current topic. Therefore, the study was aimed to evaluate the frequency of use of regular metal brackets among patients reporting to dental hospital in chennai.

MATERIALS AND METHODS:

A single centre retrospective study was done in an institutional setting. The ethical approval was received from the institution's ethical committee. The study involved selected patients data who are undergoing orthodontic treatment in the institution. The necessary approvals in gaining the data were obtained from the institutional ethical committee (SDC/SIHEC/DIASDATA/0619-0320). The number of people involved in this study includes 3 i.e guide, reviewer and researcher.

Selection of Subjects:

All patients who are undergoing orthodontic treatment in the institution from the time period of June 2019 to March 2020 were selected for this study. There were three people involved in this study (guide, reviewer, and researcher). All available data were taken into consideration and there was no sorting process.

Data Collection:

The patient's details were retrieved from the institution's patient record management software. Data regarding patients age, gender, type of brackets preferred by patients undergoing orthodontic treatment were taken into consideration for this study. Cross verification of the data was done with the help of photographs and radiographs. The data was manually verified, tabulated and sorted.

Inclusion Criteria:

All patients who are undergoing orthodontic treatment in the institution 9-50 years of age were taken into consideration.

Exclusion Criteria:

Patients' records that were incomplete were removed from the study. Repetitive entries were excluded as well. Patients aged less than 9 years and more than 50 years were not included in the study.

Statistical Analysis:

The tabulation of data was analysed using SPSS software. (IBM SPSS Statistics 26.0) The method of

statistical analysis that was used in this study was Chi Square Test to compare two proportions. The analysis was done for: age, gender, type of brackets preferred by patients undergoing orthodontic treatment in this study

RESULTS AND DISCUSSION:

The study included 1362 participants. In this study, we observed that about 99.5% of patients undergoing orthodontic treatment preferred conventional metal brackets in comparison with ceramic brackets (0.3%), lingual brackets (0.1%) and damon brackets. (0.1%) (Figure-1).

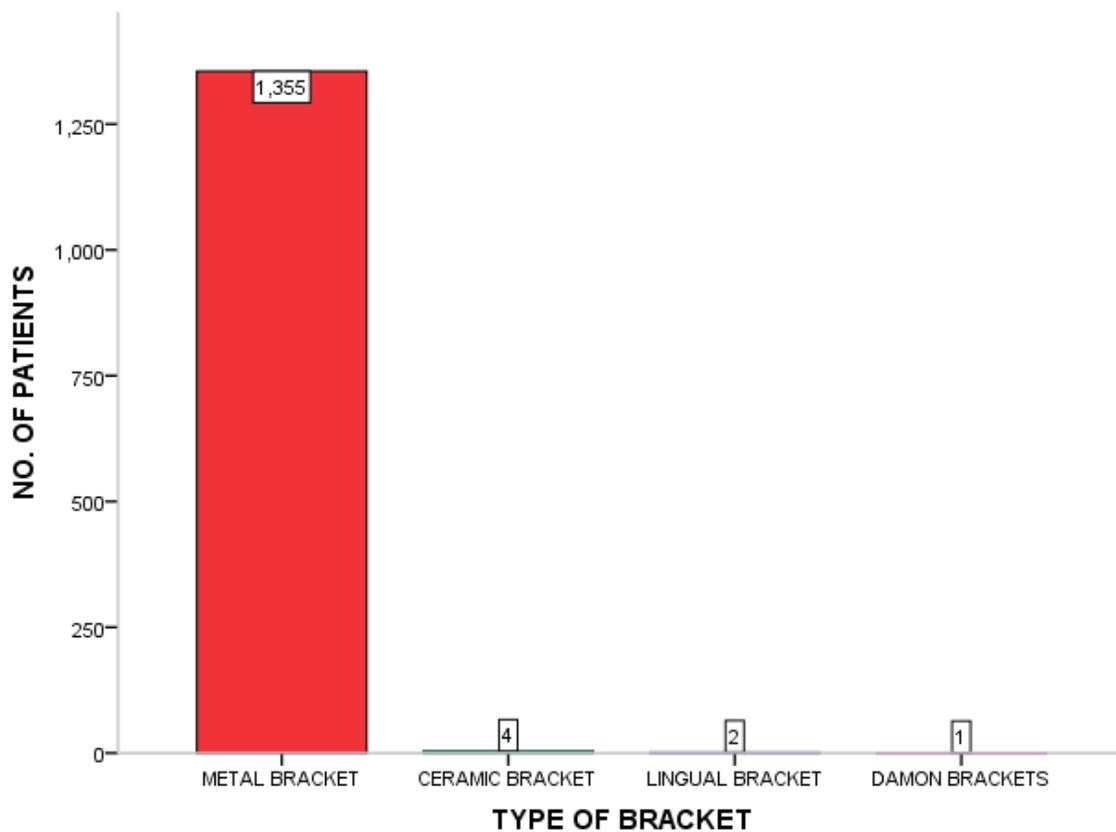


Figure-1: Bar graph representing distribution of different types of brackets preferred by patients undergoing orthodontic treatment. X-axis represents different types of brackets and Y-axis represents the number of patients undergoing orthodontic treatment. Within different types of brackets, the prevalence of patients undergoing orthodontic treatment with conventional metal brackets were the most common 99.5% (red colour) followed by ceramic brackets (0.3% - green colour), lingual brackets (0.1% - green colour) and damon brackets (0.1% - purple colour).

The participants were ranged in the age group of 9-17 years, 18-28 years, 29-50 years. Patients in the age

group of 18-28 years reported with maximum number of orthodontic treatment (54.4%) and the age group between 29-50 years showed the least number of orthodontic treatment (7%) with metal brackets (Figure-2).

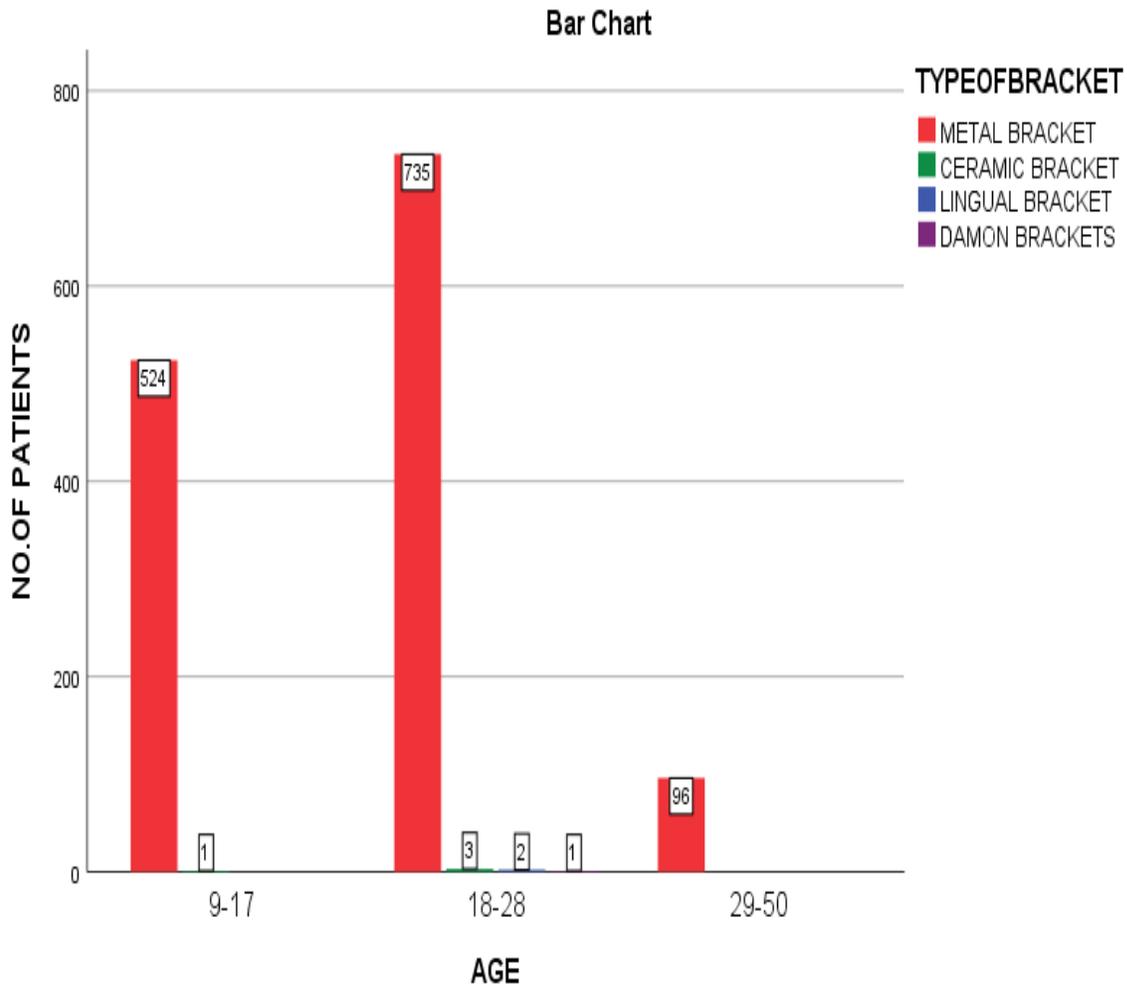


Figure-2: Bar graph representing association of patients treated with different types of brackets according to age. X-axis represents different age groups of patients undergoing orthodontic treatment and Y-axis represents no of patients undergoing orthodontic treatment. Patients in the age group of 18-28 years reported with maximum number of orthodontic treatment (54.4%) and patients in the age group of 29-50 years showed the least number of orthodontic treatment (7%) with metal brackets (red colour). There was a clinical significance but no statistically significant difference was seen in patients undergoing orthodontic treatment with respect to age (chi square value- 3.31, p value >0.05).

52.2% of the patients undergoing orthodontic treatment who preferred regular metal brackets were females and 47.8% of them were males (Figure-3).

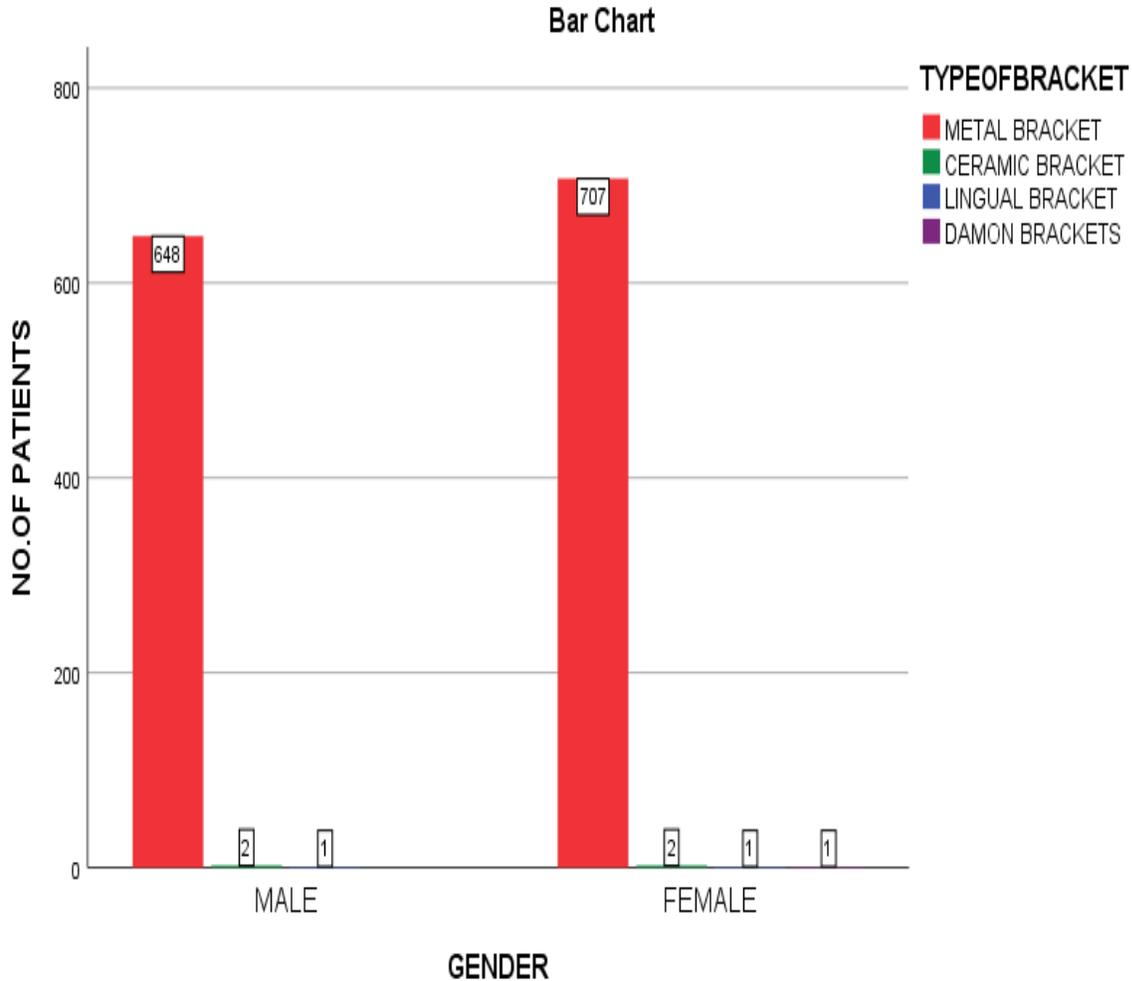


Figure-3: Bar graph representing association of patients treated with different types of brackets according to gender. X-axis represents gender distribution and the Y-axis represents no of patients undergoing orthodontic treatment. 52.2% of the patients undergoing orthodontic treatment who preferred regular metal brackets were females and 47.8% of them were males (red colour). There was a clinical significance but no statistically significant difference was seen in patients undergoing orthodontic treatment with respect to gender (chi square value- 0.92, p value >0.05).

In our study, the most common type of bracket preferred by the patients were the conventional metal brackets (99.4%) which is in line with the study of GAC MicroArch®, which was rated significantly lower than all ceramic appliances in the research of Zuichkovski et al, rated significantly higher than ceramic brackets in the youngest age group in this study and showed a similar trend in the second age group.(Zuichkovski et al., 2008) However, it is contradictory to the findings of the previous research (Redd and Shivapuja, 1991; Loftus et al., 1999) reported the following hierarchy of appliance preferences: ceramic appliances > ceramic self-ligating > all hybrid and stainless steel appliances. They concluded that patients prefer appliances with less metal show. From the data of our study, in each age group, three of the top four rated appliances were all-metal brackets. Consequently, ceramic and hybrid brackets comprised the bottom four appliance preferences in the two younger age groups. This data makes it apparent that reducing metal show in appliances is not the driving factor for esthetics among the majority of children and adolescents.

Although ceramic brackets, lingual brackets solve the problem of esthetic, they can cause enamel abrasion, fracture more easily and have a high coefficient of friction, increasing resistance to sliding mechanisms. Moreover, the efficacy of tooth movement using ceramic brackets is significantly lower than that of metal brackets.(Arash et al., 2015) As technology advances soon these brackets will also be obsolete and newer ones would take their place keeping up with the technological advancement is a tough job. The rise in quality also comes with a rise with cost. The orthodontist should wisely choose the bracket system that would be best for the selected case and also fulfill the aesthetic requirements of the patient.(Walton et al., 2010)

CONCLUSION:

The findings of the present study shows that the most frequently preferred brackets by patients were the regular metal brackets (99.5%) in comparison to other types of brackets although, there was no statistically significant difference in patients treated with regular metal brackets with respect to age and gender. Hence, it can be concluded that the regular metal brackets are still being widely chosen by patients undergoing orthodontic treatment. Therefore, awareness of different types of brackets and their uses should be brought among patients undergoing orthodontic treatment.

AUTHOR CONTRIBUTIONS:

All authors discussed the results and contributed to the final manuscript. H.Firdus Fareen and Sri.Rangalakshmi carried out the experiment and wrote the manuscript.

CONFLICT OF INTEREST:

The researcher claims no conflicts of interest.

REFERENCES:

1. Arash, V. et al. (2015) 'In vitro evaluation of frictional forces of two ceramic orthodontic brackets versus a stainless steel bracket in combination with two types of archwires', *Journal of orthodontic science*, 4(2), pp. 42–46.
2. Bishara, S. E. et al. (1999) 'Comparison of the debonding characteristics of two innovative ceramic bracket designs', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 116(1), pp. 86–92.

3. Dinesh, S. P. S. et al. (2013) 'An indigenously designed apparatus for measuring orthodontic force', *Journal of clinical and diagnostic research: JCDR*, 7(11), pp. 2623–2626.
4. Felicita, A. S. (2017a) 'Orthodontic management of a dilacerated central incisor and partially impacted canine with unilateral extraction - A case report', *The Saudi dental journal*, 29(4), pp. 185–193.
5. Felicita, A. S. (2017b) 'Quantification of intrusive/retraction force and moment generated during en-masse retraction of maxillary anterior teeth using mini-implants: A conceptual approach', *Dental press journal of orthodontics*, 22(5), pp. 47–55.
6. Felicita, A. S. (2018) 'Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The slingshot method', *The Saudi dental journal*, 30(3), pp. 265–269.
7. Felicita, A. S., Chandrasekar, S. and Shanthasundari, K. K. (2012) 'Determination of craniofacial relation among the subethnic Indian population: a modified approach - (Sagittal relation)', *Indian journal of dental research: official publication of Indian Society for Dental Research*, 23(3), pp. 305–312.
8. Ghafari, J. (1992) 'Problems associated with ceramic brackets suggest limiting use to selected teeth', *The Angle orthodontist*, 62(2), pp. 145–152.
9. Jain, R. K., Kumar, S. P. and Manjula, W. S. (2014) 'Comparison of intrusion effects on maxillary incisors among mini implant anchorage, j-hook headgear and utility arch', *Journal of clinical and diagnostic research: JCDR*, 8(7), pp. ZC21–4.
10. Kakadiya, A. et al. (2017) 'Recent Advancements in Diagnostic Aids in Orthodontics - A Review', *SM Dentistry Journal*, pp. 1–8. doi: 10.36876/smd.1016.
11. Kamisetty, S. K. et al. (2015) 'SBS vs Inhouse Recycling Methods-And Invitro Evaluation', *Journal of clinical and diagnostic research: JCDR*, 9(9), pp. ZC04–8.
12. Keim, R. G. et al. (2007) '2007 JCO Orthodontic Practice Study. Part 1: Trends', *Journal of clinical orthodontics: JCO*, 41(10), pp. 617–626.
13. Keith, O., Jones, S. P. and Davies, E. H. (1993) 'The Influence of Bracket Material, Ligation Force and Wear on Frictional Resistance of Orthodontic Brackets', *British Journal of Orthodontics*, pp. 109–115. doi: 10.1179/bjo.20.2.109.
14. Krishnan, S., Pandian, S. and Kumar S, A. (2015) 'Effect of bisphosphonates on orthodontic tooth movement-an update', *Journal of clinical and diagnostic research: JCDR*, 9(4), pp. ZE01–5.
15. Ling, P. H. (2005) 'Lingual orthodontics: history, misconceptions and clarification', *Journal*, 71(2), pp. 99–102.
16. Loftus, B. P. et al. (1999) 'Evaluation of friction during sliding tooth movement in various bracket-archwire combinations', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 116(3), pp. 336–345.
17. Machibya, F. M. et al. (2013) 'Treatment time, outcome, and anchorage loss comparisons of

- self-ligating and conventional brackets’, *The Angle Orthodontist*, pp. 280–285. doi: 10.2319/041912-326.1.
18. Ramesh Kumar, K. R. et al. (2011) ‘Depth of resin penetration into enamel with 3 types of enamel conditioning methods: a confocal microscopic study’, *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 140(4), pp. 479–485.
19. Redd, T. B. and Shivapuja, P. K. (1991) ‘Debonding ceramic brackets: effects on enamel’, *Journal of clinical orthodontics: JCO*, 25(8), pp. 475–481.
20. Rubika, J., Sumathi Felicita, A. and Shivambika, V. (2015) ‘Gonial Angle as an Indicator for the Prediction of Growth Pattern’, *World Journal of Dentistry*, pp. 161–163. doi: 10.5005/jp-journals-10015-1334.
21. Russell, J. S. (2005) ‘Aesthetic orthodontic brackets’, *Journal of orthodontics*, 32(2), pp. 146–163.
22. Samantha, C. et al. (2017) ‘Comparative Evaluation of Two Bis-GMA Based Orthodontic Bonding Adhesives - A Randomized Clinical Trial’, *Journal of clinical and diagnostic research: JCDR*, 11(4), pp. ZC40–ZC44.
23. Samantha, C. (2017) ‘Comparative Evaluation of Two Bis-GMA Based Orthodontic Bonding Adhesives - A Randomized Clinical Trial’, *Journal Of Clinical And Diagnostic Research*. doi: 10.7860/jcdr/2017/16716.9665.
24. Sarvera, D. M. and Ackermanb, J. L. (2000) ‘Orthodontics about face: The re-emergence of the esthetic paradigm’, *American Journal of Orthodontics and Dentofacial Orthopedics*, pp. 575–576. doi: 10.1016/s0889-5406(00)70204-6.
25. Sivamurthy, G. and Sundari, S. (2016) ‘Stress distribution patterns at mini-implant site during retraction and intrusion--a three-dimensional finite element study’, *Progress in orthodontics*, 17, p. 4.
26. Tanne, K. et al. (1994) ‘Frictional forces and surface topography of a new ceramic bracket’, *American Journal of Orthodontics and Dentofacial Orthopedics*, pp. 273–278. doi: 10.1016/s0889-5406(94)70047-8.
27. Thomas, S. (1998) ‘A comparative in vitro study of the frictional characteristics of two types of self-ligating brackets and two types of pre-adjusted edgewise brackets tied with elastomeric ligatures’, *The European Journal of Orthodontics*, pp. 589–596. doi: 10.1093/ejo/20.5.589.
28. Vikram, N. R. et al. (2017) ‘Ball Headed Mini Implant’, *Journal of clinical and diagnostic research: JCDR*, 11(1), pp. ZL02–ZL03.
29. Viswanath, A. et al. (2015) ‘Obstructive sleep apnea: awakening the hidden truth’, *Nigerian journal of clinical practice*, 18(1), pp. 1–7.
30. Walton, D. K. et al. (2010) ‘Orthodontic appliance preferences of children and adolescents’, *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 138(6), pp. 698.e1–12; discussion 698–9.

31. Willems, G. and Carels, C. E. (2000) '[Developments in fixed orthodontic appliances]', *Nederlands tijdschrift voor tandheelkunde*, 107(4), pp. 155–159.
32. Ziuchkovski, J. P. et al. (2008) 'Assessment of

perceived orthodontic appliance attractiveness', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 133(4 Suppl), pp. S68–78.