International Journal of Research in Health and Allied Sciences

Journal home page: www.ijrhas.com

Official Publication of "Society for Scientific Research and Studies" [Regd.]

ISSN: 2455-7803 Index Copernicus value [ICV] = 68.10;

Original Research

Fracture resistance of teeth undergoing post endodontic bleaching comparison of four treatment modalities

Dr. Madhur Garg[1], Dr. Rinee Khanna[2], Dr. Saurabh Pramanik[3], Dr. Srinkhala[4], Dr.Vandita[5], Dr. Karishma Anna Barrow[6]

[1]M.D.S 3rd year, Department of Conservative Dentistry and Endodontics, Saraswati Dental College, Lucknow, Uttar Pradesh, India;
[2]M.D.S 3rd year, Department of Pediatric and Preventive Dentistry, Saraswati Dental College, Lucknow, Uttar Pradesh, India;
[3]M.D.S 3rd year, Department of Pediatric and Preventive Dentistry, Saraswati Dental College, Lucknow, Uttar Pradesh, India;
[4]MDS 1st year, Department of Conservative Dentistry and Endodontics, Saraswati Dental College, Lucknow, Uttar Pradesh, India;
[5]MDS 2nd year, Department of Conservative Dentistry and Endodontics, Saraswati Dental College, Lucknow, Uttar Pradesh, India;
[6]MDS 2nd year, Department of Conservative Dentistry and Endodontics, Saraswati Dental College, Lucknow, Uttar Pradesh, India;

ABSTRACT:
Background: The present study was conducted to compare four treatment modalities of fracture resistance of teeth undergoing post endodontic bleaching. **Materials & Methods:** The present study was conducted in the department of Endodontics on 50 human mandibular premolars with completely formed apices. Specimens were divided into 5 groups based on bleaching procedures. All the specimens were subjected to fracture resistance test using Universal Testing Machine. **Results:** Fracture resistance in group I was 950.4 N, in group II was 914.6 N, in group III was 1272.4 N, in group IV was 1240.6 N and in group V was 1598.2 N. The difference was significant (P< 0.05). **Conclusion:** Authors found that use of 10% sodium ascorbate antioxidant gel was effective in compensating for the decreased fracture resistance following combination bleaching.
Key words: Bleaching, Fracture resistance, Sodium ascorbate.

Received: 22/06/2020 **Modified:** 18/08/2020 **Accepted:** 22/08/2020

Corresponding author: Dr. Madhur Garg, M.D.S 3rd year, Department of Conservative Dentistry and Endodontics, Saraswati Dental College, Lucknow, Uttar Pradesh, India

This article may be cited as: Garg M, Khanna R, Pramanik S, Srinkhala, Vandita, Barrow KA. Fracture resistance of teeth undergoing post endodontic bleaching comparison of four treatment modalities. Int J Res Health Allied Sci 2020; 6(5):94-97.

INTRODUCTION

Restoration of root canal-treated teeth with a permanent, definitive, post-endodontic restoration is a final step for successful root canal treatment as these teeth are considered more susceptible to fracture.[1] The reason most often cited for this finding has been the dehydration and loss of dentin after the endodontic procedures and the removal of important anatomic structures such as cusps, ridges, and the arched roof of the pulp chamber, all of which provide much of the necessary support for the natural tooth.[2]

Tooth discoloration varies in etiology, appearance, localization, severity, and adherence to tooth structure. It may be classified as intrinsic, extrinsic, or a

combination of both. Scaling and polishing of the teeth remove many extrinsic stains. For more stubborn extrinsic discoloration and intrinsic stain, various bleaching techniques may be attempted. Tooth bleaching can be performed extra-coronally in-home or in-office vital tooth bleaching as well as intra-coronally in root-filled termed as nonvital tooth bleaching.[3]

Dental bleaching results in deterioration of mechanical properties of enamel and dentin such as microhadrness and modulus of elasticity. .It is also associated with a decreased bond strength of adhesive restorations to bleached enamel. This can be reversed with application of 10% sodium ascorbate solution. The general approach is to postpone any bonding procedure for a while after bleaching since the reduction of bond strength has been shown to be temporary. The waiting period for bonding procedures after bleaching has been reported to vary from 24 h to 4 weeks.[4]

The present study was conducted to compare four treatment modalities of fracture resistance of teeth undergoing post endodontic bleaching.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics on 50 human mandibular premolars with completely formed apices. Ethical clearance was obtained before starting the study.

Access cavity preparation followed by calculation of the working length was done. The root canals were be obturated using gutta-percha points using lateral condensation technique with accessory gutta-percha points and AH plus resin sealer. Resin-modified glass ionomer was placed as cervical barrier up to CEJ and light cured for 40 seconds. Specimens were divided into 5 groups.

Group 1 specimens were subjected to inside-outside bleaching using 10% hydrogen peroxide followed by composite restoration, group 2 specimens were subjected to inside-outside bleaching with 10% hydrogen peroxide and sodium perborate followed by composite restoration, group 3 underwent bleaching followed by conditioning with 10% sodium ascorbate for 10 min followed by composite restoration, group 4 underwent bleaching followed by conditioning with 10% sodium ascorbate for 10 min followed by composite restoration and group 5 specimens were negative control and subjected to endodontic treatment followed by composite restoration. All the specimens were subjected to fracture resistance test using Universal Testing Machine. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I	Group II	Group III	Group IV	Group V
Technique	10% hydrogen peroxide and composite restoration	10% hydrogen peroxide, sodium perborate and composite restoration	10% sodium ascorbate and composite restoration	10% sodium ascorbate and sodium perborate followed by composite restoration	Negative control
Number	10	10	10	10	10

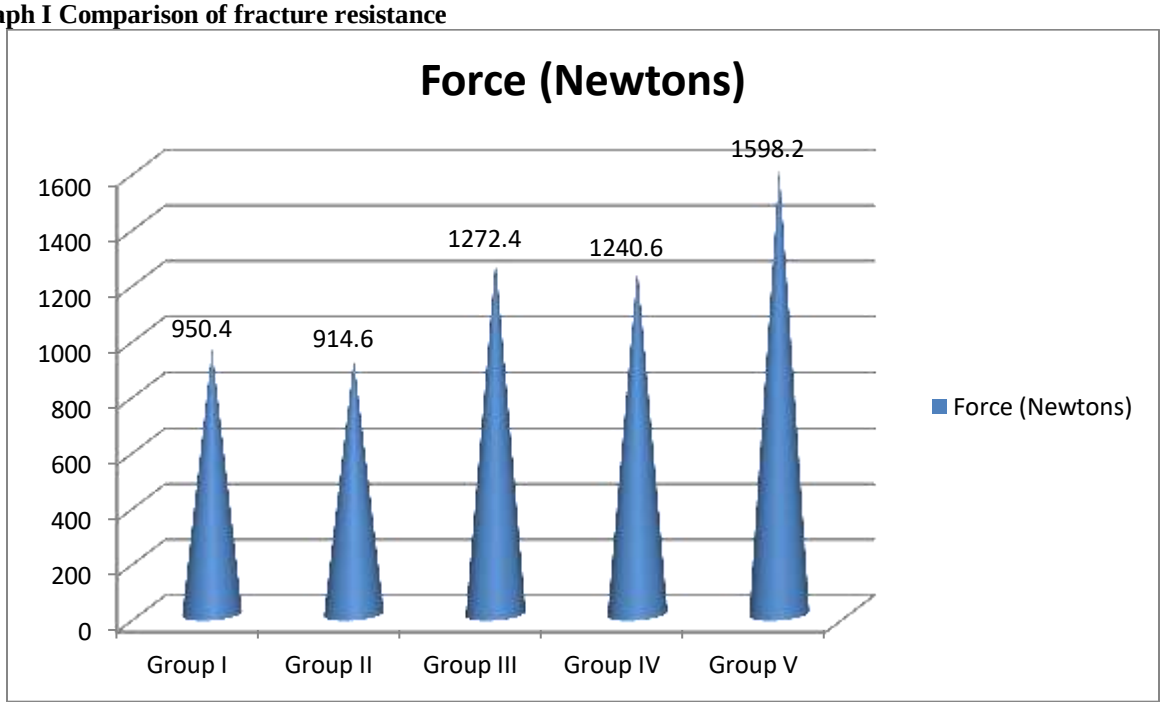
Table I shows distribution of teeth into different groups.

Table II Comparison of fracture resistance

Groups	Force required to fracture specimens (Newtons)	P value
Group I	950.4	0.01
Group II	914.6	
Group III	1272.4	
Group IV	1240.6	
Group V	1598.2	

Table II, graph I shows that fracture resistance in group I was 950.4 N, in group II was 914.6 N, in group III was 1272.4 N, in group IV was 1240.6 N and in group V was 1598.2 N. The difference was significant ($P< 0.05$).

Graph I Comparison of fracture resistance



DISCUSSION

Restoration of root canal-treated teeth is an important step that complements a technically sound endodontic treatment. Thus, root canal treatment should not be considered complete until a coronal restoration has been placed.[5] An optimal final restoration for endodontically treated teeth maintains aesthetics, function, preserves the remaining tooth structure, and prevents microleakage. Therefore, intracoronal strengthening of teeth is important to protect them against fracture, particularly in posterior teeth where stresses generated by occlusal forces can lead to fracture of unprotected cusps.[6]

Some techniques have been suggested to remove the remnant oxygen-free radicals in enamel and dentin after bleaching and also to reverse the compromised infiltration and polymerization of resin at the tooth interface. Cvitko et al[7] proposed to remove the superficial layer of enamel. The present study was conducted to compare four treatment modalities of fracture resistance of teeth undergoing post endodontic bleaching.

In present study, we found that fracture resistance in group I was 950.4 N, in group II was 914.6 N, in group III was 1272.4 N, in group IV was 1240.6 N and in group V was 1598.2 N. Antony et al[8] evaluated the fracture resistance of endodontically treated teeth restored with microhybrid composite following combination bleaching and assessed the antioxidizing effect of 10% sodium ascorbate hydrogel on 40 freshly extracted human mandibular premolars. Group 1 (n = 8) specimens subjected bleaching using 10% hydrogen peroxide followed by composite restoration. group 2 (n = 8) specimens subjected to bleaching with 10% hydrogen peroxide and sodium perborate followed by composite restoration; group 3 (n = 8) specimens subjected to conditioning with 10% sodium ascorbate using 10% hydrogen peroxide followed by composite restoration; group 4 (n = 8) specimens subjected to conditioning with 10% sodium ascorbate with 10% hydrogen peroxide and sodium perborate followed by composite restoration; and group 5 (negative control) (n = 8). Statistically significant difference in fracture resistance was present between Group 5 and Group 1 and also between Group 5 and Group 2. Unpaired t-test showed statistically significant difference between Group 1 and Group 3 and also between Group 2 and Group 4.

A study conducted by Shinohara et al[9] has shown that hydrogen peroxide or sodium hypochlorite-induced reduction in bond strength of resin to enamel is reversed with the use of sodium ascorbate as an antioxidant. If the antioxidant treatment of bleached tooth before bonding reverses the reduced bond strength, it may be an alternative to the delayed bonding procedure after bleaching.

Lai et al[10] recommended using sodium ascorbate gel for a duration that corresponds to one third of the bleaching time. Since the duration of bleaching was 9 h which corresponded to an overnight combination of home bleaching, the specimens should have been subjected to 3 h application of antioxidant gel.

Khoroushi et al[11] assessed the fracture resistance of endodontically-treated teeth undergoing combination

bleaching with 38% and 9.5% hydrogen peroxide gels. The specimens were divided into four groups (n = 15) as follows: G I: no bleaching, access cavity restored with resin composite (negative control); G II: bleached for three weeks daily using 9.5% hydrogen peroxide for two hours and three sessions of in-office bleaching using 38% hydrogen peroxide every seven days, then restored (positive control); G III: bleached similar to G II and restored after one week; G IV: bleached similar to G II, along with the use of an antioxidizing agent for 24 hours, then restored. The specimens underwent fracture resistance testing. Significant differences were observed among the study groups ($p < 0.05$). Groups I and II demonstrated the highest and lowest fracture resistance, respectively. The samples that were not bleached (Group I) and the 10% sodium ascorbate gel group (Group IV) demonstrated significantly higher fracture resistance than the positive control group. No significant differences were found between Groups III and II.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that use of 10% sodium ascorbate antioxidant gel was effective in compensating for the decreased fracture resistance following combination bleaching.

REFERENCES

1. DaneshkazemiAR. Resistance of bonded composite restorations to fracture of endodontically treated teeth. J Contemp Dent Pract 2004;5:51-8.
2. Belli S, Erdemir A, Ozcopur M, Eskitascioglu G. The effect of fibre insertion on fracture resistance of root filled molar teeth with MOD preparations restored with composite. Int Endod J 2005;38:73-80.
3. Sagsen B, Aslan B. Effect of bonded restorations on the fracture resistance of root filled teeth. Int Endod J 2006;39:900-4.
4. Ausiello P, De Gee AJ, Rengo S, Davidson CL. Fracture resistance of endodontically-treated premolars adhesively restored. Am J Dent 1997;10:237-41.
5. Magne P, Belser UC. Porcelain versus composite inlays/onlays: Effects of mechanical loads on stress distribution, adhesion, and crown flexure. Int J Periodontics Restorative Dent 2003;23:543-55.
6. Shinohara MS, Rodrigues JA, Pimenta LA. In vitro microleakage of composite restorations after nonvital bleaching. Quintessence Int 2001;32:413-7
7. Cvitko E, Denehy GE, Swift EJ Jr., PiresJA. Bond strength of composite resin to enamel bleached with carbamide peroxide. J Esthet Dent 1991;3:100-2.
8. Antony A, Pillai R, Varghese NO, Sujathan UN, Afzal A, George S. Fracture resistance of teeth undergoing postendodontic bleaching: Comparison of four treatment modalities – An in vitro study. Endodontology 2019;31:150-7.
9. Shinohara MS, Peris AR, Pimenta LA, Ambrosano GM. Shear bond strength evaluation of composite resin on enamel and dentin after nonvital bleaching. J Esthet Restor Dent 2005;17:22-9
10. Lai SC, Mak YF, Cheung GS, Osorio R, Toledano M, Carvalho RM, et al. Reversal of compromised bonding to oxidized etched dentin.J Dent Res 2001;80:1919-24.
11. Khoroushi M, Feiz A, Khodamoradi R. Fracture resistance of endodontically-treated teeth: Effect of combination bleaching and an antioxidant. Oper Dent 2010;35:530-7.