



## **Original Research**

# **Tooth whitening efficacy of commercially available tooth whitening products - An in vitro study**

*Tinesh Dayaa Rao*

*Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha University, 162, Poonamallee High Road, Chennai 600077, Tamil Nadu, India*

**How to cite:** D R Tinesh. Tooth whitening efficacy of commercially available tooth whitening products - An in vitro study. *Int J Endodnd Rehabil* Volume 2023, Article ID 23013003, 6 pages.

*Received:19.11.22*

*Accepted:02.01.23*

*Web Published:30.01.23*

### **ABSTRACT**

**Introduction:** People's quest for attractive appearance has led to an increase in the popularity of tooth whitening. There are numerous over-the-counter tooth whitening products on the market nowadays. It is difficult and confusing for the patient to make a choice among the available materials.

**Aim:** To compare the efficacy of 6% hydrogen peroxide with that of two commercially available tooth whitening products.

**Materials & Method:** Thirty third molars that had been removed were stained with a normal tea solution to Vita colour C4. Following staining, these specimens were given a 6% whitener. Hydrogen peroxide and two other commercially available tooth whitening products namely Colgate Visible White and Glodent toothpaste. Each specimen was whitened over the course of several sessions, each lasting two minutes twice daily for fourteen days. Utilizing the shade guide Vitapan Classical, visual colour measurements were taken on all teeth prior to bleaching and 14 days following the procedure.

**Result:** Shade guide values showed that whereas hydrogen peroxide treatments generated noticeable and statistically significant whitening effects, commercially available teeth whitening solutions had minimal impact on tooth shade. Most specimens were returned to their original shade or darker after bleaching procedures, which represents an average shift of 13.8–15 shade guide units.

**Conclusion:** Commercially available tooth whitening products reduced the staining to some extent.

**Keywords:** *Bleaching, Colgate visible white, Glodent, Hydrogen peroxide*

---

#### *Address for Correspondence:*

Dr. Tinesh Dayaa Rao,

Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha University, 162, Poonamallee High Road, Chennai 600077, Tamil Nadu, India

Phone No: 9500169734

Email: [tineshrao@gmail.com](mailto:tineshrao@gmail.com)

## **INTRODUCTION**

The public places a great deal of weight on tooth colour, and the social and psychological effects of dental stains are becoming less and less acceptable. The dental community's interest in tooth whitening procedures has been reignited by public demand.<sup>1,2</sup> The public now has higher expectations for whiter, more attractive smiles, which has led to a wide range of tooth whitening options. The most popular elective dental procedure nowadays is tooth whitening, which has been shown to be both secure and efficient when done under a dentist's supervision. The public today anticipates prompt service, whiter, more appealing smiles.<sup>3,4</sup> Although the causes of tooth discoloration are numerous and complex, they can generally be divided into two categories: intrinsic and extrinsic. The majority of environmental elements that cause extrinsic staining, also known as external staining, include smoking, colours in food and drink, antibiotics, and metals like iron or copper.<sup>5,6</sup> A stain is produced when coloured substances from these sources are adsorbed into dental pellicle directly onto the surface of the tooth. Intrinsic staining, also known as internal staining, can be caused by a variety of things, including heredity, ageing (as the enamel wears off over time, revealing yellower dentin), antibiotics, excessive fluoride levels, and developmental abnormalities. It can even begin before the tooth has fully emerged. Some dental restorations can discolour teeth after the tooth has emerged. Any procedure that lightens a tooth's colour is considered tooth whitening. A chemical reaction to lighten the tooth's colour or physical removal of the stain are both acceptable methods of whitening. Removal of surface stains, tooth whitening procedures, and surgical approaches to mask the underlying discoloration are all options for treating discoloured teeth.<sup>7,8,9</sup> The purpose of this study was to evaluate the effectiveness of two commercially available tooth whitening treatments with that of 6% hydrogen peroxide.

## **MATERIALS AND METHODS**

Thirty third molars that had been removed were stained with a standardised tea solution to Vita shade C4. In screw-capped plastic universal containers, stain formation was carried out at room temperature in a standard tea solution.<sup>10</sup> As a result, after each sample had its first shade established, it was immersed in a normal tea solution. The tea solution was made by infusing 2 g of tea with 100 ml of distilled water for 5 minutes, filtering the infusion through gauze to remove the tea, and storing it for 24 hours. The specimens that the shade guide determined to be shade C4 were approved for the study. Three treatment groups of ten samples each were given thirty samples at random. The manufacturer proposed a permuted order for the placement of the shade tabs, and each was given a numeric value between 1 and 16. (B1, A1, B2, D2, A2, C1, C2, D4, A3, D3, B3, A3.5, B4, C3, A4, C4).<sup>7</sup> These stained specimens were then whitened with 6% hydrogen peroxide and two other commercially available tooth whitening products namely Colgate Visible White and Glodent toothpaste. Each specimen was whitened over the course of several sessions, each lasting two minutes twice daily for fourteen days. All teeth were visually analysed for colour before bleaching and 14 days thereafter using Vitapan Classical as a shade reference.

## **RESULTS**

According to the shade guide, commercially available toothpastes had little impact on tooth shade, but hydrogen peroxide treatments had noticeable, statistically significant, and large whitening effects. The mean value of Colgate Visible White after 2 days was 15.70, after day 5 and day 7 was 14.70, day 10 was 13.60 and day 14 was 12.9. There was a mean value change of 2.8 after 14 days. The mean value of Glodent Toothpaste after 2 days was 15.70, after day 5 and day 7 was 14.70, day 10 was 13.80 and day 14 was 12.7. There was a mean value change of 3.0 after 14 days. This shows there is almost a 2 shade difference after 14 days. The mean value of 6% hydrogen peroxide after 2 days was 13.60, after day 5 was 11.4, day 7 was 8.9, day 10 was 6.3 and day 14 was 4.10. There was a mean value change of 8.5 after 14 days. This shows there is almost a 12 shade difference after 14 days.

**COLGATE VISIBLE WHITE****Descriptive Statistics<sup>a</sup>**

	N	Minimum	Maximum	Mean	Std. Deviation
DAY 2	10	15	16	15.70	.483
DAY 5	10	14	15	14.70	.483
DAY 7	10	14	15	14.70	.483
DAY 10	10	13	14	13.60	.516
DAY 14	10	12	14	12.90	.738
Valid N (listwise)	10				

a. GROUPS = COLGATE VISIBLE WHITE

**GLODENT TOOTHPASTE****Descriptive Statistics<sup>a</sup>**

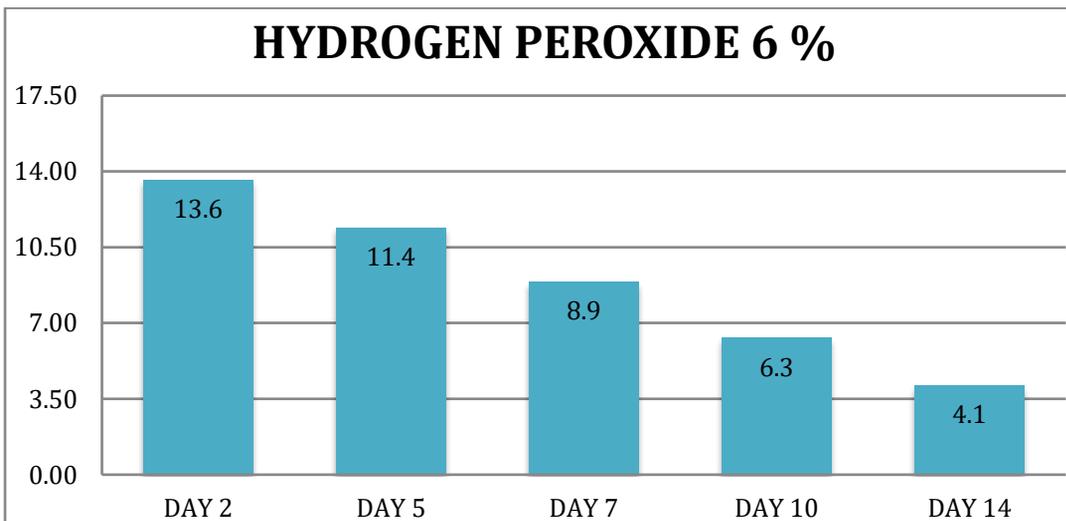
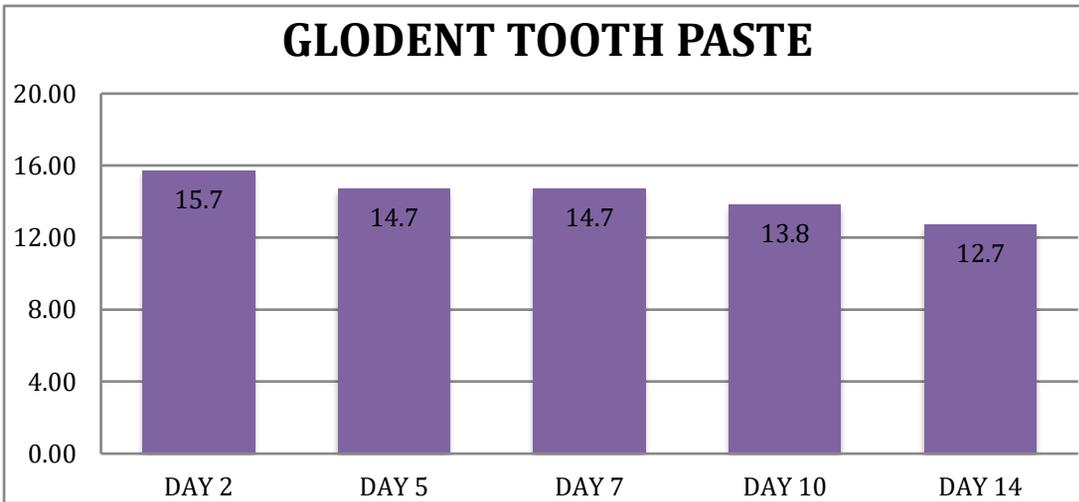
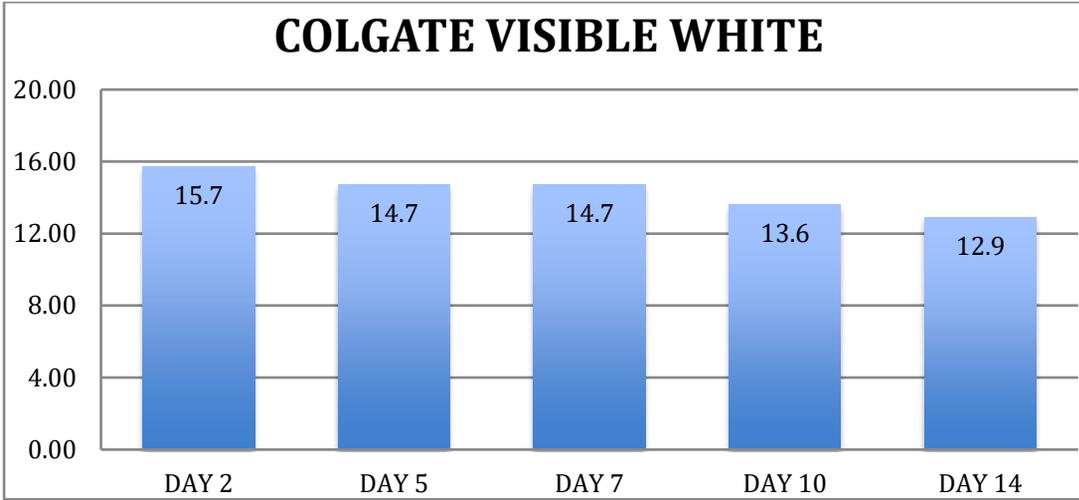
	N	Minimum	Maximum	Mean	Std. Deviation
DAY 2	10	15	16	15.70	.483
DAY 5	10	14	15	14.70	.483
DAY 7	10	14	15	14.70	.483
DAY 10	10	13	14	13.80	.422
DAY 14	10	12	13	12.70	.483
Valid N (listwise)	10				

a. GROUPS = GLODENT TOOTH PASTE

**HYDROGEN PEROXIDE 6%****Descriptive Statistics<sup>a</sup>**

	N	Minimum	Maximum	Mean	Std. Deviation
DAY 2	10	13	14	13.60	.516
DAY 5	10	10	12	11.40	.699
DAY 7	10	8	10	8.90	.738
DAY 10	10	5	8	6.30	.823
DAY 14	10	3	5	4.10	.568
Valid N (listwise)	10				

a. GROUPS = HYDROGEN PEROXIDE 6 %



## DISCUSSION

The Visual Shade Guide assessment showed that commercially available tooth whitening products improved the specimen colour slightly. Glodent tooth paste contains extracts of papain and bromelain which are proteolytic enzymes. These proteolytic enzymes facilitates stain removal by disruption of protein portion of the pellicle that forms on the surface of teeth, thus removing the stains that are bound to these proteins.<sup>11,12</sup> As claimed by manufacturer Colgate visible white contains whitening accelerators namely silica and pyrophosphate that helps in exfoliation of stains and polish of teeth surface.<sup>13,14</sup> The treatment with 6% hydrogen peroxide produced marked and statistically significant whitening effects. The usage of hydrogen peroxide in various concentrations has always been the gold standard for teeth whitening.<sup>15</sup> It has been widely used in concentrations ranging from 35% - 6%.<sup>16</sup> In the present study 6% hydrogen peroxide was used as it is considered safe. Peroxide was once thought to whiten teeth by destroying the chromophores and altering them into more translucent molecules that reflect light less. Later research established that hydrogen peroxide whitens teeth by oxidizing the organic matrix of the teeth, turning it into an opaque whiter substance.<sup>17</sup>

## CONCLUSION

Hydrogen peroxide being the gold standard, bleached the teeth more effectively as compared to commercially available tooth whitening products. Commercially available tooth whitening products may be considered when mild staining is present.

**Financial support and sponsorship** – Nil

**Conflicts of interest** - There are no conflicts of interest.

## REFERENCES

1. Haywood VB, Heymann HO. Nightguard vital bleaching. *Quintessence Int* 1989; 20:173-6.
2. Watts A, Addy M. Tooth discoloration and staining. A review of the literature. *Br Dent J* 2001; 190:309-16.
3. Greenwall L. Bleaching techniques in restorative dentistry. London: Martin Dunitz; 2001; 88-172.
4. Friedman S. Internal bleaching: long term outcomes and complications. *J Am Dent Assoc* 1997;128(Suppl):51-4.
5. Russell CM, Dickinson GL, Johnson MH. Dentist-supervised home bleaching with ten per cent carbamide peroxide gel: a six month study. *J Esthet Dent* 1996; 8:177-82.
6. Howard J. Patient-applied tooth whiteners. *J Am Dent Assoc* 1992; 132:57-60.
7. Kowitz GM, Nathoo SA, Rustogi KN, Chemielewski MB, Wong R. Clinical comparison of Colgate platinum tooth whitening system and Rembrandt gel plus. *Compend Contin Educ Dent* 1994;17: S46-51.
8. Matis BA, Cochran MA, Eckert G, Carlson TJ. The efficacy and safety of a 10% carbamide peroxide bleaching gel. *Quintessence Int* 1998; 29:555-63.
9. Reinhardt JW, Eivins SC, Swift EJ. Clinical study of night- guard vital bleaching. *Quintessence Int* 1993;24: 379-84.

10. Addy A, Moran J, Newcombe R, Warren P. The comparative tea staining potential of phenolic, chlorhexidine and adhesive mouth rinses. *J Clin Periodontol* 1995; 22:923-8.
11. McCaslin AJ, Haywood VB, Potter BJ, Dickinson GL, Russell CM. Assessing dentin colour changes from night guard vital bleaching. *J Am Dent Assoc* 1999; 130:1485-90.
12. Heymann HO, Swift EJ, Bayne SC, May KN, Wilder AD, Mann GB, Peterson CA. Clinical evaluation of two carbamide peroxide tooth whitening agents. *Compend Contin Educ Dent* 1998; 19:359-62.
13. Chakravarthy PK, Acharya S. Efficacy of extrinsic stain removal by novel dentifrice containing papain and bromelain extracts. *Journal of Young Pharmacists*. 2012 Oct 1;4(4):245-9.
14. Papathanasiou A, Bardwell DS, Kugel G. A clinical study evaluating a new chairside and take-home whitening system. *Compend Contin Educ Dent* 2001; 22:289-94.
15. Gerlach RW, Zhou X. Vital bleaching with whitening strips: summary of clinical research on effectiveness and tolerability. *J Contemp Dent Prac* 2001; 2:1-15.
16. Haywood VB. History, safety and effectiveness of current bleaching techniques and application of the night guard vital bleaching technique. *Quintessence Int* 1992; 27:471-88.
17. Joiner A. Review of the effects of peroxide on enamel and dentine properties. *Journal of dentistry*. 2007 Dec 31;35(12):889-96.



Published by MM Publishers  
<https://www.mmpubl.com/ijendorehab>

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 International License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

Copyright © 2023 Tinesh Dayaa Rao