Effects Of Different Salts on Discolouration and Morphology of The Tooth - An In Vitro Study

[1]Darshika Raja, [2]V. Vishnu Priya, [3]Abirami Arthanari, [4]Gayathri.R, [5]Kavitha.S [6]Reshma PK

[1]Saveetha Dental College and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamilnadu, India

[2]Saveetha Dental College and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamilnadu, India

[3]Saveetha Dental College and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamilnadu, India

[4]Department of Biochemistry, Saveetha Dental college and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamilnadu, India

[5]Department of Biochemistry, Saveetha Dental college and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamilnadu, India

[6]Department of Oral Pathology, Saveetha Dental college and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamilnadu, India

Corresponding author

V. Vishnu Priya

Professor, Saveetha Dental college and Hospitals Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077, Tamilnadu, India

ABSTRACT:

AIM: The aim of this study is to evaluate the effect of tooth discolouration and morphology changes in teeth by different salts.

INTRODUCTION: Nowadays bleaching procedures are trending to get white teeth at home.The various forms of trayless products includes gels, rinses, dentifices, stripes and paint-on films or pens with different levels of hydrogen peroxide or carbamide peroxide.

MATERIALS AND METHODS: 6 non caries teeth were taken and immersed in table salt and rock salt solutions. Tooth measurements were taken and changes were observed.

RESULT: On day one and day two, there was no change in shape and colour of the tooth. **CONCLUSION**: In our current study, we have observed the effect of different salt on changes in tooth discolouration. There is no effect of different salts on morphology of teeth, when exposed for short duration.

KEYWORDS: Tooth discolouration, novel method, colour stability, tooth bleaching system, table salt, rock salt, innovative technique

INTRODUCTION

Tooth bleaching system is an effective and non-invasive procedure of the teeth. Today dentists have different choices in the variety of at-home-tray based bleaching agents with low concentration of hydrogen peroxide.[1]

The preference for bright white teeth and promotion of dental and facial aesthetics in

the media has contributed to an increase in patient interest for healthy and beautiful teeth.Black extrinsic tooth stain has been under the scope of clinical evidence in recent days and could be associated with aesthetics issues and carries being a concern[2]. External bleaching can be used to remove extrinsic and intrinsic tooth stains.The public has been influenced by the portrayal of perfect white smiles in the media[3].The efficacy of these different methods is dependent upon the particular tooth discolouration that is being treated because of tooth discolouration categorized into intrinsic and extrinsic staining. Tooth whitening is any process that lightens the colour of the tooth.[4]

Intrinsic discolouration may occur due to the changes in the structural composition or changes in dental hard tissues. Extrinsic discolouration occurs outside the substance of the tooth. In the surface of the tooth or in the pellicle extrinsic discoloration takes place.[5] In extrinsic tooth discoloration the extrinsic colour staining is classified into direct extrinsic tooth staining and indirect extrinsic tooth staining.Without the use of abrasive technique intrinsic discolouration cannot be polished.[6]

Restorative intervention may warrended when the patient has discoloration severity. The invasive technique was microabrasion and macroabrasion of hydrochloric acid[7].Tooth bleaching system has been reported successful in reducing the impact of fluorosis. Our team has extensive knowledge and research experience that has translate into high quality publications [8–17]. The aim of this in vitro study is to evaluate the effect of tooth discolouration and morphology changes in teeth [18].

MATERIALS AND METHODS:

The study was done to analyse the effect of different salts on discolouration of the tooth.The study was an in vitro based study.6 non-caries teeth were taken. 2 solutions of table salt and rock salt were taken in a beaker added with distilled water. 3 non caries teeth were put on table salt solution with distilled water and 3 non caries teeth were put on rock salt with distilled water. Before the 6 non- caries teeth were put on the solution measurements were taken. Then the tooth was observed for 2 days in the solution. The tooth was taken out from the solution. Tooth measurements were taken and changes were noted. The measurements were taken on the initial stage and were taken for day 1 and day 2 after immersion in salt solutions.

Figure: 1

Figure: 2

RESULTS:

The buccal length, palatal length buccal width palatal width mesial width and distal width were taken on the six non-caries teeth.On day 1 and day 2 there is no change

in buccal length of the 6 non-caries teeth(Figure 3). On day 1 and day 2 there is no change in palatal length of the 6 non-caries teeth(Figure 4). On day 1 and day 2 there is no change in buccal width of the 6 non-caries teeth(Figure 5). On day 1 and day 2 there is no change in palatal width of the 6 non-caries teeth(Figure 6). On day 1 and day 2 there is no change in mesial width of the 6 non-caries teeth(Figure 7). On day 1 and day 2 there is no change in distal width of the 6 non-caries teeth(Figure 8). On day 1 there is no change in the discolouration of the tooth. On day 2 discolouration happened on the six non-carry teeth.

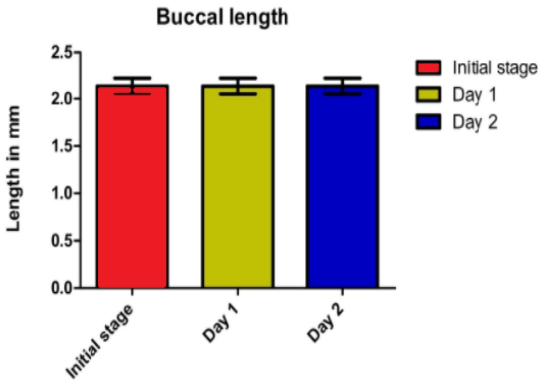

Figure 3: Bar graph explains the buccal length of the teeth. The x-axis represents the days of measurements taken and the y-axis represents the length of the tooth. Red colour denotes the measurements taken on the initial stage before immersion in table salt and rock salt solutions, yellow colour denotes the measurements taken on day 1 and blue colour denotes the measurements taken on day 2 after the tooth was taken out from the table salt and rock salt solutions.

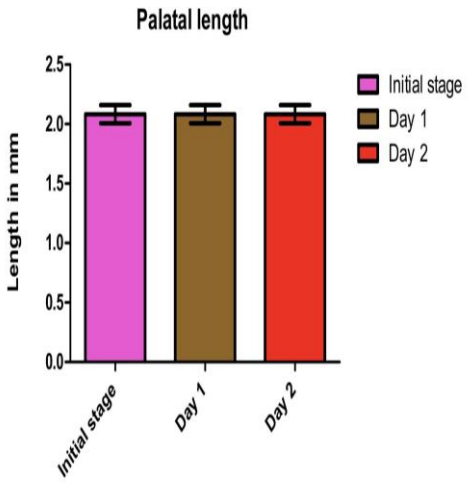

Figure 4 : Bar graph represents the palatal length of the tooth. The x-axis represents the days of measurements taken and the y-axis represents the length of the tooth.Rose colour denotes the measurements taken on initial stage before immersion in the table salt and rock salt solutions solutions, brown colour denotes the measurements taken on day 1 and red colour denotes the measurements taken on day 2 after the tooth was taken out from the table salt and rock salt solution.

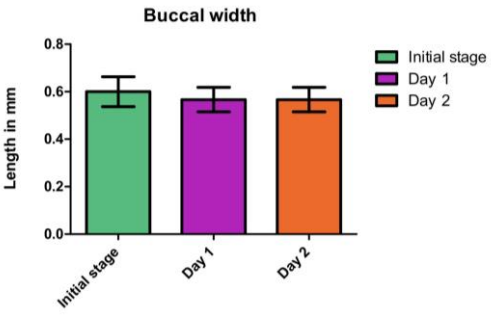

Figure 5: Bar graph represents the buccal width of the tooth. The x-axis represents the days of measurements taken and the y-axis represents the length of the tooth. Green colour denotes the measurements taken on initial stage before immersion in the table salt and rock salt solutions, violet colour denotes the measurements taken on day 1 and orange colour denotes the measurements taken on day 2 after the tooth was taken out from the table salt and rock salt solutions.

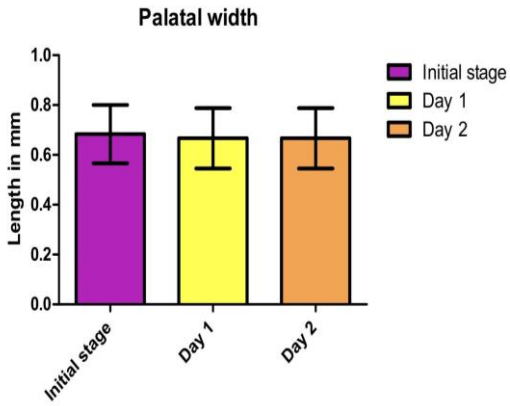

Figure 6: Bar graph represents the palatal width of the tooth.The x-axis represents the days of measurements taken and the y-axis represents the length of the tooth.Purple colour denotes the measurements initial stage of tooth before immersion in table salt and rock salt solutions, yellow colour denotes the measurements taken on day 1 and orange colour denotes the measurements taken on day 2 after the tooth was taken out from the table salt and rock salt solutions.

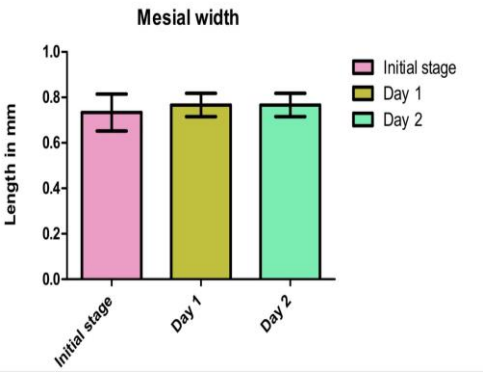

Figure 7:Bar graph represents the mesial width of the tooth. The x-axis represents the days of measurements taken and the y-axis represents the length of the tooth. Pink colour denotes the measurements taken on the initial stage of tooth before immersion in the table salt and rock salt solutions, yellow colour the measurements taken on day 1 and green colour represents the measurements taken on day 2 after taken out from the table salt and rock salt solutions.

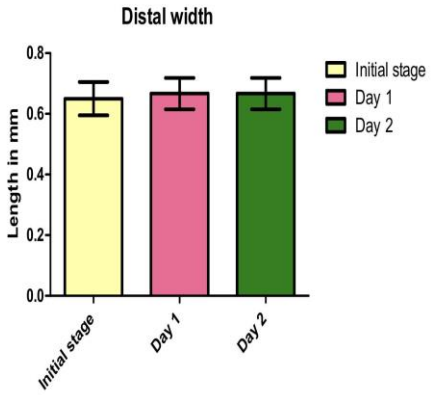

Figure 8: Bar graph represents the distal width of the tooth. The x-axis represents the days of measurements taken and the y-axis represents the length of the tooth. Yellow colour denotes the measurements taken on the initial stage of the tooth before immersion in the table salt and rock salt solutions, pink colour denotes the measurements taken on day 1 and green colour denotes the measurements taken on day 2 of the tooth after taken out from the table salt and rock salt solutions.

DISCUSSION:

The physical characteristics of the minerals included appears to be the major determinant for the mechanical effect, not their quantity to remove enamel surface stains. Tooth bleaching therapy might negatively affect the tooth surface due to the oxidative action[19]. In relation to the colour stability,tray-applied whitening membrane and tray based at-home bleaching system Tooth bleaching therapy can negatively affect the structure of the tooth due to oxidative action[20].

One of the most important methods to remove tooth discoloration was the tooth bleaching system. Vital tooth bleaching techniques and non-vital bleaching techniques are the most common techniques used to remove tooth discolouration[21]. Tooth discoloration has

different etiologies; this can be due to internal discoloration or external discoloration, or a combination of both. Tooth discoloration can be treated by different treatment approaches starting from the least invasive method; such as whitening toothpaste, professional cleaning (scaling and polishing) to remove surface stains and internal bleaching of non-vital teeth.[22] More aggressive methods include external bleaching of vital teeth, microabrasion of enamel with abrasives and acids, macro-abrasives, and crowns or veneers. Bleaching is one of the least aggressive modalities that has gained popularity[23].

This study was done to observe the discolouration and colour stability of the teeth. The study observed that on day 1 there are no changes in the palatal and buccal length of the 6 non-caries teeth immersed in the solution of table salt and rock salt. There are no changes in the buccal, palatal, mesial and distal width 6 non-caries teeth immersed in the solution of table salt and rock salt. There are no changes on the discolouration of the 6 non-caries teeth immersed in the solution of table salt and rock salt. On day 2, there is no change in the palatal and buccal length 6 non-caries teeth.There are no changes on the buccal, palatal, mesial and distal width 6 non-caries teeth immersed in the solution of table salt and rock salt. But discoloration takes place on the 6 non-caries teeth immersed in the solution of table salt and rock salt.

LIMITATIONS:

This study was done only with 6 samples of non-caries teeth. Hence the same study has to be conducted with a large number of teeth.

FUTURE SCOPE:

Further studies may be done to study the ultrastructure of the tooth when it is exposed to different salt solutions. In future more salts have to be used in future to get more discoloration on the tooth.

CONCLUSION:

To conclude, the effect of different salt has changes on tooth discoloration. There is no effect of different salts on morphology of teeth, when exposed for short duration. Long term effects of salts on tooth structure need to be studied in detail.

ACKNOWLEDGEMENT:

The authors would like to thank all the participants for their valuable support and author dental institutions for their support to conduct .

SOURCE OF FUNDING

The present project is supported by

- Saveetha Dental College,
- Saveetha Institute of Medical and Technical Science, Saveetha University
- PKT Nursing Home

AUTHORS CONTRIBUTION

Darshika Raja:Literature search, survey, data collection, analysis, manuscript writing.

Dr. Vishnu priya, Dr Abirami, Dr Gayathri, Dr Kavitha, Dr Reshma :Study design, Data verification, manuscript drafting.

CONFLICTS OF INTEREST:

The authors declare that there are no conflicts of interest in the present study.

REFERENCES:

1. Ermis RB, Uzer Celik E, Yildiz G, et al. Effect of tooth discolouration severity on the efficacy and colour stability of

two different trayless at-home bleaching systems. *J Dent Res Dent Clin Dent Prospects* 2018; 12: 120–127.

2. Muntean A, Sava S, Delean AG, et al. Toothpaste Composition Effect on Enamel Chromatic and Morphological Characteristics: In Vitro Analysis. *Materials* ; 12. Epub ahead of print 16 August 2019. DOI: 10.3390/ma12162610.
3. Morimoto S, Nagase DY, Tedesco TK, et al. Effect of bleaching agents on black tooth stains caused by chromogenic bacteria: 10 years follow-up case report. *RGO - Revista Gaúcha de Odontologia* 2018; 66: 187–193.
4. Chakravarthy PK, Acharya S. Efficacy of Extrinsic Stain Removal by Novel Dentifrice Containing Papain and Bromelain Extracts. *Journal of Young Pharmacists* 2012; 4: 245–249.
5. Caries and other reasons for restoring teeth. *Restorative Dentistry* 2007; 57–72.
6. Carey CM. Tooth whitening: what we now know. *J Evid Based Dent Pract* 2014; 14 Suppl: 70–76.
7. Alali J, Alanazi H, Alyousef H, et al. Teeth discoloration removal and management: a review. *International Journal of Medicine in Developing Countries* 2020; 1070–1074.
8. Neelakantan P, Grotra D, Sharma S. Retreatability of 2 mineral trioxide aggregate-based root canal sealers: a cone-beam computed tomography analysis. *J Endod* 2013; 39: 893–896.
9. Aldhuwayhi S, Mallineni SK, Sakhamuri S, et al. Covid-19 Knowledge and Perceptions Among Dental Specialists: A Cross-Sectional Online Questionnaire Survey. *Risk Manag Healthc Policy* 2021; 14: 2851–2861.
10. Sheriff KAH, Ahmed Hilal Sheriff K, Santhanam A. Knowledge and Awareness towards Oral Biopsy among Students of Saveetha Dental College. *Research Journal of Pharmacy and Technology* 2018; 11: 543.
11. Markov A, Thangavelu L, Aravindhan S, et al. Mesenchymal stem/stromal cells as a valuable source for the treatment of immune-mediated disorders. *Stem Cell Res Ther* 2021; 12: 192.
12. Jayaraj G, Ramani P, Herald J. Sherlin, et al. Inter-observer agreement in grading oral epithelial dysplasia – A systematic review. *Journal of Oral and Maxillofacial Surgery, Medicine, and Pathology* 2015; 27: 112–116.
13. Paramasivam A, Priyadharsini JV, Raghunandhakumar S, et al. A novel COVID-19 and its effects on cardiovascular disease. *Hypertension research: official journal of the Japanese Society of Hypertension* 2020; 43: 729–730.
14. Li Z, Veeraraghavan VP, Mohan SK, et al. Apoptotic induction and anti-metastatic activity of eugenol encapsulated chitosan nanopolymer on rat glioma C6 cells via alleviating the MMP signaling pathway. *Journal of Photochemistry and Photobiology B: Biology* 2020; 203: 111773.
15. Gan H, Zhang Y, Zhou Q, et al. Zingerone induced caspase-dependent apoptosis in MCF-7 cells and prevents 7,12-dimethylbenz(a)anthracene-induced mammary carcinogenesis in experimental rats. *J Biochem Mol Toxicol* 2019; 33: e22387.
16. Dua K, Wadhwa R, Singhvi G, et al. The potential of siRNA based drug delivery in respiratory disorders:

Recent advances and progress. *Drug Dev Res* 2019; 80: 714–730.
17. Mohan M, Jagannathan N. Oral field cancerization: an update on current concepts. *Oncol Rev* 2014; 8: 244.
18. Thomson AD, Athanassiadis B, Kahler B, et al. Tooth discolouration: Staining effects of various sealers and medicaments. *Australian Endodontic Journal* 2012; 38: 2–9.
19. Dölle K, Honig A. Laboratory Bleaching System for Oxygen and Ozone Bleaching. *Asian Journal of Chemical Sciences* 2018; 4: 1–12.
20. Sharma LTCS. BIOMODIFICATION OF TOOTH DISCOLOURATION. *INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCE AND HEALTH CARE*; 6. Epub ahead of print 2019. DOI: 10.26808/rs.ph.i9v6.02.
21. Çelik E, Betül AKA, Yazkan B, et al. Efficacy and Colour Stability of Two Different at-Home Bleaching Systems: One-year Randomized Controlled Clinical Trial. *Turkiye Klinikleri Journal of Dental Sciences* 2018; 24: 93–105.
22. Wakeel AE, El Wakeel A, Fadel M, et al. CLINICAL EVALUATION OF TWO DIFFERENT BLEACHING SYSTEMS (FLASH AND ZOOM) ON POST BLEACHING HYPERSENSITIVITY (A RANDOMIZED CLINICAL TRIAL). *Egyptian Dental Journal* 2018; 64: 1673–1680.
23. Burrows S. A Review of the Efficacy of Tooth Bleaching. *Dental Update* 2009; 36: 537–551.