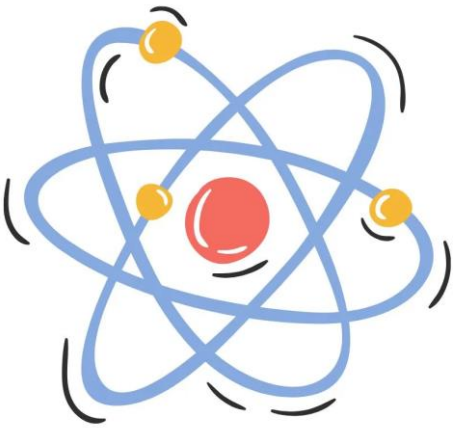

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SMOOTH MOVES VS ROUGH RIDES: TOOTHPASTE WARS ON ENAMEL AND CENTION N SURFACES

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ABSTRACT - Aim: The aim of this study is to compare and evaluate the surface roughness of enamel and Cention N after brushing with herbal toothpaste and non-herbal toothpaste Objectives: The primary objectives include: (1) To analyze the effect of different toothpastes onto surface roughness of – a) Enamel and b) Cention N (2) To compare the effect of different toothpastes onto surface roughness of – a) Enamel and b) Cention N. Materials and Method: 20 Freshly Extracted Human Permanent Maxillary & Mandibular teeth be collected from the Department of Oral & Maxillofacial Surgery, Seema Dental College & Hospital, Uttarakhand. Institutional Consent Form Protocol for extracted human permanent teeth for research study purpose will be followed Results: The results observed after this short study revealed quite difference in the surface abrasiveness after brushing with different toothpastes. Conclusion: In conclusion, this study helped to differentiate the difference in abrasiveness of toothpastes on surface roughness of enamel and Cention N.

Keywords: toothpaste, herbal, non-herbal, toothbrush, surface, roughness, enamel, Cention N, restoration, tooth colored restoration.

INTRODUCTION:

Toothpaste is a vital component of our daily oral care routine, yet its abrasiveness on tooth surfaces, particularly on enamel and dental restorations, has become an area of increasing concern. While toothpaste plays a key role in effectively cleaning teeth and removing plaque, its abrasive properties can lead to issues like tooth wear, increased sensitivity, and other oral health problems when overused[6,7]. This abrasion can affect the enamel directly, and when restorative materials are present, it can also impact these materials[2,8]. The degree of wear depends largely on the specific formulation of the toothpaste used. One of the key consequences of toothpaste abrasiveness is the gradual loss of enamel, which can lead to surface roughness and contribute to conditions like dentinal hypersensitivity[13]. While the abrasives in toothpaste are designed to aid in plaque removal, if not properly monitored, they can cause microdamage to the tooth surface, resulting in non-cariogenic smooth surface lesions over time[13]. For individuals with dental restorations, it's important to consider how toothpastes affect these materials as well, as they too are subject to wear during brushing, which can lead to surface roughening of the restorations.

To evaluate the potential abrasivity of toothpaste, the Relative Dentin Abrasivity (RDA) scale is commonly used. This scale measures the potential for toothpaste to cause wear on tooth surfaces, with an RDA value indicating the level of abrasivity. The American Dental Association (ADA) recommends that toothpaste should have an RDA value of 250 or lower to ensure it is safe for everyday use without posing a risk to tooth enamel or restorations[8].

Among the various restorative materials available today, *Cention N* is a relatively new direct, tooth-colored restorative material that is gaining popularity for dental restorations. Like natural tooth surfaces, *Cention N* is also susceptible to the abrasive effects of tooth brushing, which can lead to wear on its superficial surface over time. The roughness observed on the surface of *Cention N* is primarily due to the exposure of filler particles, which, as they are subjected to brushing forces, contribute to the material's wear.
Cention N is typically supplied in a powder and liquid form. The powder contains non-leachable glass silicates, including a surface-modified calcium barium aluminum fluorosilicate glass filler, as well as an alkaline calcium fluorosilicate glass filler. These fillers have particle sizes ranging from 0.1 to 0.35 micrometers. The size and nature of these particles play a key role in the material's durability and response to mechanical abrasion, influencing its overall performance in restorative applications[1, 2].

The liquid mainly consists of organic dimethacrylate monomers including Urethane dimethacrylate (UDMA), etc., along with catalyst and other additives[1,2]. The manipulation of material will be done on an oil impervious paper mixing pad, using the plastic mixing spatula as per the manufacturer's instructions of mixing the powder and liquid by dispensing one scoop of powder along with one drop of liquid. This accounts for the powder to liquid ratio of 4.6:1 by weight[1].

The goal of this study is to check the surface roughness of enamel and Cention N after using various toothpastes. The toothpastes that will be included in this study are – a herbal toothpaste and a non-herbal toothpaste.

To be able to study about the surface roughness, a class V cavity will be prepared on the buccal aspect of extracted human teeth (n=20), followed by filling the cavity with Cention N and completing it with finishing and polishing of the

material. These will be then categorized into 2 main groups n=10 and will be brushed for 3 minutes two times a day for 3 months using an automated toothbrush and specific toothpastes for each group. The toothpastes used will be – a herbal toothpaste and a non-herbal toothpaste. These teeth will be continuously placed into an incubator with temperature maintained at 37^0 C and 100% humidity.

The aim of this study embarks on exploration of the impact of dentifrices on natural tooth surface and restorative materials, with focus on Cention N. By delving into this realm, we endeavour to gain insights that will contribute to the advancement of oral care practices, that improve and help us in comprehensive understanding of under which dentifrices can the restorative material perform better.

MATERIALS AND METHOD

Source of Collection of Data:

20 freshly extracted human permanent teeth will be collected for this study. The CDC guidelines for infection control in Dental settings 2003 will be followed.

Inclusion Criteria:

1. Caries Free teeth
2. Teeth with mature root apices
3. Extracted teeth that are periodontally compromised

Exclusion Criteria:

1. Carious Teeth
2. Restored teeth
3. Fractured teeth
4. Teeth with developmental anomalies or cracks

Statistical Analysis:

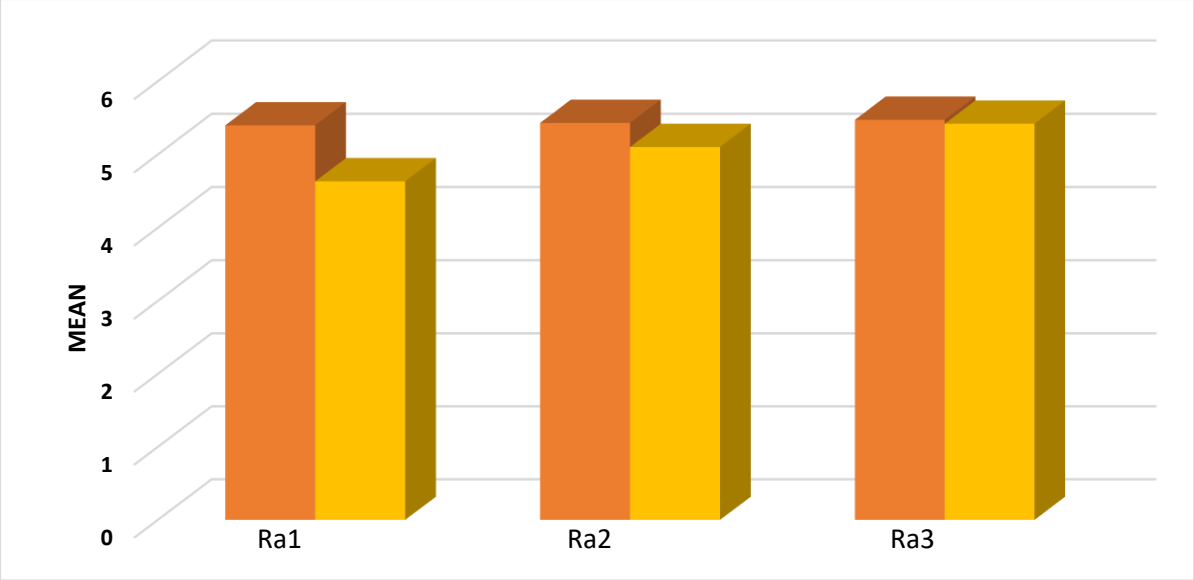
Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables and Graphs. The data was analysed by SPSS (21.0 version). ANOVA was used to check which all variables were following normal distribution. For finding the association among categorical data Chi square test was used. Level of statistical significance was set at p-value less than 0.05

RESULTS

The surface roughness values of enamel surface after brushing with specified toothpaste

TOOTHPASTE	MEAN	SD	STANDARD DEVIATION ERROR
Herbal toothpaste	5.39	0.901	0.285
Non herbal toothpaste	4.63	0.394	0.124

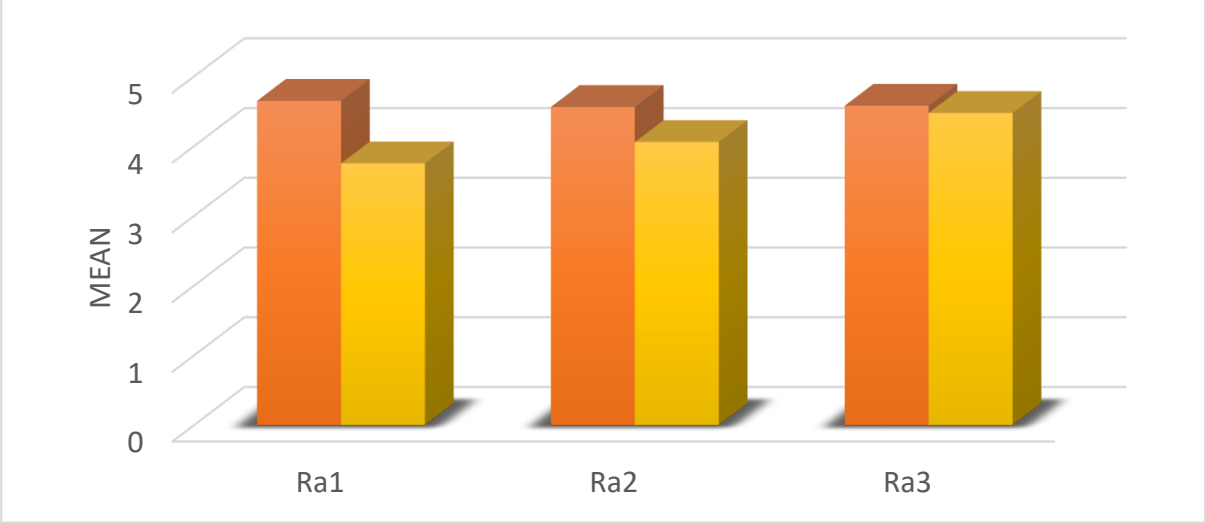
p= 0.025 (<0.05) significant, $\chi^2 = 10.71$



The surface roughness values for Cention N after brushing with specified toothpaste

TOOTHPASTE	MEAN	SD	MINIMUM	STANDARD DEVIATION ERROR
Herbal toothpaste	1.6	0.19	1.44	1.70
Non herbal toothpaste	0.75	0.09	0.66	0.83

$p= 0.033$ (<0.05) significant, $\chi^2 = 10.80$



The Ra value, or Average Roughness, is a measurement of the average difference between the peaks and valleys of a surface, it is the arithmetic mean of the absolute values of the surface height deviations from the mean line.

The mean Ra for enamel surface roughness after brushing with herbal toothpaste (4.56170) was also higher than non herbal toothpaste (4.05910), with a P-value of 0.033, reflecting significant roughness differences.

Cention N restoration surface brushed using herbal toothpaste (5.39790) displayed a significantly higher mean Ra than non herbal toothpaste (4.63420), with a P-value of 0.025, indicating a statistically significant difference.

DISCUSSION

Brushing with dentifrices remains the most common and effective self-care practice for maintaining oral hygiene. While this routine offers significant benefits, such as removing dental plaque and biofilm, and improving overall oral health, improper use of toothbrushes and toothpaste can lead to damage to both hard and soft dental tissues, such as abrasion[5,6]. Abrasion itself is a complex process influenced by multiple factors.

Given that the impact of different toothbrushes and toothpastes on the abrasion process is not fully understood, this in vitro study aimed to explore the role

various types of toothpaste play in causing abrasion. The results showed that after 3 months of brushing, the surface abrasion was significantly greater in the group using Herbal toothpaste. There was significant difference on surface roughness of Cention N where non herbal toothpaste caused relatively lesser abrasion.

However, it's important to note that this study was conducted over a short duration, and thus the long-term effects of toothpaste use could not be assessed. Additionally, the study did not account for the abrasiveness of the toothbrushes themselves.

CONCLUSION

The herbal and non herbal toothpastes are less abrasive on tooth surface compared to the surface of Cention N. Where herbal toothpaste showed more abrasion on surface roughness of enamel and Cention N as compared to non herbal toothpaste.

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