ORIGINAL ARTICLE

Comparison of the effect of propolis and Gluma desensitizer on the management of dentin hypersensitivity: A randomized controlled trial

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Abstract

Objective: To compare the effect of propolis and gluma desensitisers on the management of dentin hypersensitivity.

Method: The single-blind, randomised controlled trial was conducted at the Department of Operative Dentistry, Dr Ishrat ul Ebad Khan Institute of Oral Health Sciences, Dow University of Health Sciences, Karachi, from October 2020 to September 2021, and comprised patients with dentin hypersensitivity who had pain scores of at least 2 on the visual analogue scale. The teeth were randomised into propolis group A and Gluma group B. Baseline pain scores were assessed using visual analogue scale and Schiff's sensitivity scores and compared with scores immediately after the intervention, and then after one week and one month of the intervention. Data was analysed using SPSS 23.

Results: Of the 22 patients, 12(54.5%) were females and 10(45.4%) were males. Of the 80 teeth, there were 40(50%) in each of the 2 groups. Significant reduction was observed in dentin hypersensitivity immediately after the application of the desensitising agents ($p<0.05$). However, after one month, Gluma was more effective than propolis ($p<0.05$).

Conclusion: Both Gluma and propolis were found to be effective desensitising agents, but the effectiveness of propolis decreased over one month.

Clinical Trial Number: Clinical Trials.gov: NCT04819867.

Keywords: Dentin hypersensitivity, Desensitizing agent, Gluma desensitiser, Propolis. (JPMA 74: 843; 2024)

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Introduction

Dentin hypersensitivity (DH) is a problem that many people experience. The main symptoms of DH are brief and intense pain, which originates from exposed dentinal tubules that have been stimulated by external factors. These factors can include touch or air flow, temperature changes, or exposure to certain chemicals.[1]

DH-related pain can significantly impact an individual's daily life, interfering with basic activities, such as eating, drinking and even breathing at times.[2,3]

Patients often do not seek professional assistance for DH because they do not consider it to be a significant issue. Instead, when the pain or discomfort intensifies, they typically turn to over-the-counter products to alleviate the sensitivity.[4]

Numerous theories have been proposed to explain the underlying mechanisms of DH. However, the hydrodynamic theory is the most widely accepted.[5]

The theory suggests that the flow of dentinal fluid within the dentinal tubules stimulates nerves throughout the dental pulp, resulting in the sensation of pain. As a result, the primary strategy for managing DH is to block the dentinal tubules. Various methods and agents can be used to achieve this, ranging from laser therapy to fluoride preparations.[5]

In addition to laser therapy and fluoride preparations, other substances, such as strontium, zinc chlorides and potassium oxalate, as well as various dental adhesives can be used to occlude the dentinal tubules and manage DH. The Gluma desensitiser is one such solution, consisting of 5% glutaraldehyde and 35% hydroxyethyl methacrylate (HEMA) solution. When applied, the glutaraldehyde reacts with serum albumin in the dentinal fluid, causing it to coagulate. This coagulation then triggers polymerisation of HEMA, which ultimately leads to plugging of the dentinal tubules.[6-8]

The application of substances, such as Gluma desensitiser, helps to obstruct the dentinal tubules from the inside, thus counteracting the hydrodynamic mechanism that ultimately leads to DH.[9]

Propolis is an organic resin that the honey bees collect from plant and tree exudates. Once collected, it undergoes modifications within the bee hives and is used by the bees to protect their hives and repair any damage or breaches that may have occurred.[10]

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Homeopathic practitioners commonly use propolis as an anti-inflammatory and antiseptic agent. The composition of propolis includes resins 50-60%, waxes 30-40%, essential oils 5-10%, pollen 5%, and microelements, such as aluminum and calcium.[11]

Propolis is known for its various beneficial properties, including its antioxidant, antimicrobial, anti-inflammatory and immunostimulatory effects. Additionally, propolis has been found to aid in wound healing and tissue regeneration.[10,12]

Indeed, propolis has various clinical applications in dentistry. It can be used as a mouth freshener to alleviate halitosis, or bad breath, as a mouthwash to provide relief from denture stomatitis and heal ulcerations, and as a desensitising agent for cervical, dentinal and root caries sensitivity.[13]

The current study was planned to compare the effect of propolis and Gluma desensitisers on DH management.

Materials and Methods

The single-blind, randomised controlled trial (RCT) was conducted at the Department of Operative Dentistry, Dr Ishrat ul Ebad Khan Institute of Oral Health Sciences (DIKIOHS), Dow University of Health Sciences, Karachi, from October 2020 to September 2021. After approval from the institutional ethics review board, the study was registered with Clinical Trials.gov (NCT04819867). The sample size was determined using Power Analysis and Sample Size software (NCSS, Kaysville, Utah, USA) 11, with an independent sample t-test at a 95% confidence interval (CI) and 80% power. The mean values used for the calculation were 0.6±0.58 for propolis and 0.31±0.459 for Gluma.[2] The sample was raised using nonprobability purposive sampling technique from among those who visited the out-patient department (OPD) complaining of pain.

Those included were patients aged 20-60 years having DH who were diagnosed as having hypersensitive teeth with non-carious cervical lesions. These teeth were then further evaluated on air blast stimulus and scores were recorded. Patients having at least two hypersensitive teeth and exhibiting pain scores of at least 2 on the Visual Analogue Scale (VAS)[14] were included.

Teeth that had fractures, cracks, extensive restorations were excluded. Those with dentures or any orthodontic appliance, patients having history of psychological disease or taking pain-killers on a daily basis were also excluded.

After taking written informed consent, the patients were randomised into propolis group A and Gluma group B. Those who failed to return for follow-up after undergoing initial treatment were excluded.

Before the application of the desensitising agents, baseline scores were obtained on evaporative air blast stimulus. The stimulus was examined by applying air from a triple air-water syringe for 1-2 seconds while keeping it 1cm away from the particular isolated tooth surface to prevent desiccation of the dentinal surface.[15] Patient was blinded as the patient did not know which out of the two desensitizing agents was being applied to their tooth. Randomization was done by opaque sealed envelopes. Cotton rolls were used to isolate the affected tooth. The application procedure was then followed by first cleaning the affected area in order to remove debris or plaque. After drying the tooth surface with a cotton pellet, a bonding brush was used to apply a 30% ethanolic extract of propolis onto the hypersensitive site in group A. The site was left to dry for 1 minute. In group B, Gluma desensitiser (Heraeus Kulzer, Hanau, Germany) was applied as per the manufacturer's instructions, ensuring that the desensitising agents did not come into contact with any other surface of the oral mucosa. The patients were instructed not to rinse, eat or drink for at least 30 minutes after the desensitising agent was applied. The patients were also advised to avoid using any other desensitising agent during the one-month intervention period.

DH in response to the air blast stimulus was evaluated at baseline as well as immediately, one week and one month post-intervention, using Schiff's sensitivity scale[15] and VAS.

Data was analysed using SPSS 23 and Microsoft Excel 2016. Categorical variables were analysed by calculating frequencies and percentages. To compare score differences between the two groups, Mann-Whitney test was used. Wilcoxon test was used to compare the pain scores at different time points with the baseline scores. $P \leq 0.05$ was considered statistically significant.

Results

Of the 22 patients, 12(54.5%) were females and 10(45.4%) were males. Of the 80 teeth, there were 40(50%) in each of the 2 groups. Both groups showed significant difference immediately after intervention and at 1-month follow-up, but there was no significant difference after 1 week of application between the groups. Propolis was more effective immediately after the application, whereas Gluma was more effective on 1-month follow-up (Table 1).

Baseline pre-intervention scores of both groups were compared with all post-intervention time points (Table 2).

Table-1: Comparison of dentin hypersensitivity (DH) scores between propolis and gluma desensitisers on air blast stimulus.

Air blast test at different time	Propolis Median (IQR)	Gluma Median (IQR)	*p*-value
Visual Analogue Scale			
Baseline	6 (3.8)	6 (3)	0.381
Immediate	2 (1.7)	4 (2)	<0.001
1 week	3 (2)	3 (1)	0.158
4 week	5 (2)	2 (1)	<0.001
Schiff Sensitivity Score			
Baseline	2 (1)	2 (1)	0.435
Immediate	1 (0)	1.5 (1)	<0.001
1 week	1 (1)	1 (0)	0.058
4 week	2 (0)	1 (0)	<0.001

IQR: Interquartile range.

Table-2: Simultaneous comparison of scores of air blast test of propolis and gluma at all time points.

	Propolis Median (IQR)	Gluma Median (IQR)
Visual Analogue Scale		
Baseline – Immediate		
Baseline	6 (3.7)	6 (3)
Immediate	2 (1.7)	4 (2)
p-value	<0.001	<0.001
Baseline - 1 week		
Baseline	6 (3.7)	6 (3)
1 week	3 (2)	3 (1)
p-value	<0.001	<0.001
Baseline - 4 week		
Baseline	6 (3.7)	6 (3)
4 week	5 (2)	2 (1)
p-value	<0.001	<0.001
Schiff Sensitivity Score		
Baseline – Immediate		
Baseline	2 (1)	2 (1)
Immediate	1 (0)	1.5 (1)
p-value	<0.001	<0.001
Baseline - 1 week		
Baseline	2 (1)	2 (1)
1 week	1 (1)	1 (0)
p-value	<0.001	<0.001
Baseline - 4 week		
Baseline	2 (1)	2 (1)
4 week	2 (0)	1 (0)
p-value	0.059	<0.001

IQR: Interquartile range.

Discussion

The current study showed that propolis was more effective when assessed immediately after application, but Gluma was more effective on 1-month follow-up visit.

DH, one of the most common clinical conditions, is characterised by sharp pain of short duration. This pain can be initiated by various stimuli, such as tactile, thermal or chemical. To provide relief and reduce sensitivity, a number of products have been used to date. Mostly, the treatment options available are used as topical applications. They act by occluding the dentinal tubules or by sealing them. Their effects are usually temporary. Recently, lasers are being used to provide desensitising effect. The comparison of the effectiveness of these products and their long-term effects is still an area of medical research worldwide. The current study was part of that global effort, and compared the efficacy of Gluma desensitiser and propolis desensitisers on alleviating DH immediately, after 1 week and after 4 weeks of single topical application.

Several materials have been used for DH management. Since it is a temporary solution, the search for an agent with long-lasting effect is still going on. An in vitro study[16] revealed that after the initial application of Gluma, most of the tubules got partially occluded and a few of them got completely occluded. The use of Gluma desensitiser resulted in a higher number of partially occluded tubules and a lower number of completely occluded tubules. This partial and complete occlusion was the result of protein precipitation and coagulation after its reaction with glutaraldehyde and HEMA.[17,18] The temporary effect was due to the reversible action of HEMA, which allows the reopening of tubules.[19] The current study yielded similar results with long-lasting reduction in DH at 1-month.

The results of the current study are further strengthened by another study which compared Gluma, Pro-Relief and Copal F for the reduction of DH. It applied the agents and assessed tactile and air blast stimuli on VAS, and evaluated DH after 10 minutes, and on days 7, 14 and 28. It found Gluma to be more effective at 10 min and on day 28 of application, concluding that Gluma could be an in-office material of choice when treating DH patients.[20]

Similar results were found by another study which compared Gluma desensitiser with Clearfil S3 Bond and a single-bottled bonding agent in reducing DH, and evaluated the efficacy after periodontal procedures. It evaluated DH scores at baseline, on days 1, day 7 and after 1 month. Response to air blast stimulus was marked on VAS. It also found Gluma to be more effective at 1-month follow-up.[21] Such similar results between these study and the current study may be attributed to similar study designs and demographics.

Propolis has high content of flavanoids that suppress the formation of free radicals. They bind heavy metals in ions, resulting in a desensitising effect. It was concluded from previous in-vivo studies that propolis has a positive effect on DH. Mahmoud et al. carried out a pioneer study to check its effectiveness.[17] In the current study, it was observed that

there was a significant reduction in DH severity. However, it did not have a long-term effect and repeated applications may result in DH reduction.

A study proposed that propolis, when compared to a single-bond universal system, was equally effective in reducing DH.[14] Another study concluded that propolis was a natural agent for DH treatment.[22] The current study found propolis to be as effective as Gluma after 1 week. However after 1 month, the effect of propolis had decreased.

There are studies in which the effect of propolis was evaluated after multiple applications after 1 week and 1 month.[23] The current study assessed the effect of propolis and Gluma desensitiser for 1 month after single application. This would help to evaluate the effect of single application of an agent. Long-term effect of a single application of an agent would make it cost-effective and comfortable to the patient. However, multiple applications in the current study might have shown a significant DH reduction in the propolis group.

There are several methods to evaluate the effect of a desensitising agent. Since they are all subjective, and multiple factors can influence the pain perceived, therefore, to date none of the methods is completely successful in the measurement of pain. Therefore, in the current study, pain measurement was evaluated on two scales which is a strength of the study[24] as scores obtained from both the scales helped in better evaluation of the pain perceived.

The current study has limitations. There can be several factors other than DH influencing the pain perceived. Studies comprising more teeth and subjects, with a variety of desensitising agents, and evaluation at multiple time points are needed for more more practical assessment. Also, the current study used only a single stimulus when the use of more stimuli could have been more apprpriate for obtaining reliable results.

Conclusion

Both gluma and propolis had a significant impact immediately after application, but the effectiveness of propolis decreased with time.

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Conflict of Interest: None.

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Author Contribution:

MS: Data conception, design, acquisition, analysis, interpretation.
SAJ: Final approval.
MA: Data interpretation.