

BioMin Case Study: 2018 Competition



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BioMin Technologies Limited was established in 2014 to develop bioactive glass materials to reduce tooth sensitivity¹

Patient Summary

Background

A 33-year old female patient of Black Caribbean origin attended for an initial hygiene appointment at the practice. She had been referred to the hygienist by her General Dental Practitioner (GDP) to improve her oral hygiene and receive advice on how to reduce her dentine sensitivity.

Medical History

The patient had no pre-existing medical conditions and was not

taking any medication at the time of assessment.

Dental History

The patient had been a regular attender to her GDP for her adult life but had never seen a hygienist. Her last dental exam was within 2 weeks of her hygiene appointment where she was assessed as dentally fit and did not require any restorations (Fig. 1 & 2). All other potential causes of sensitivity (including faulty

restorations and periodontal pain) were eliminated.

Social History

The patient works as a receptionist. She is a non-smoker and consumes up to 5 units of alcohol a week, which usually includes carbonated drinks mixed with spirits. The patient is the primary caregiver to her teenage daughter.

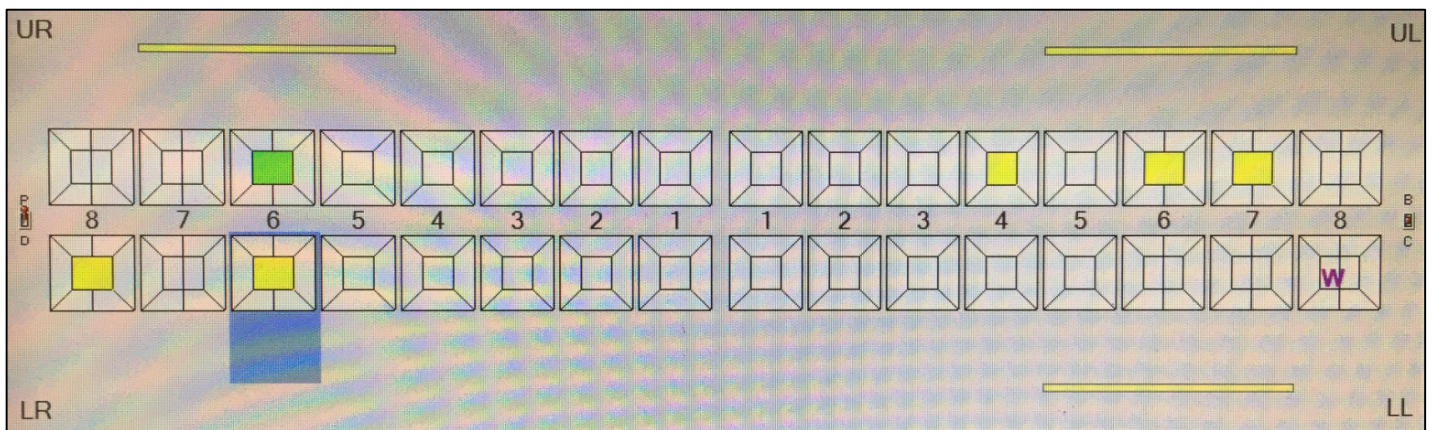


Figure 1: Baseline Dental Charting

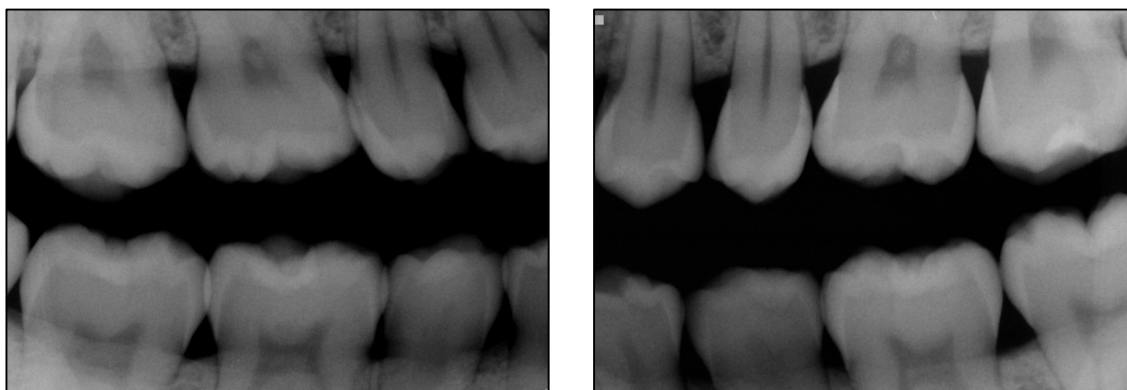


Figure 2: Right and Left Horizontal Bite Wings

Hygiene Assessment

Oral Hygiene Regime

During the initial hygiene appointment, a full assessment of the patient’s current oral hygiene regime and daily habits were determined.

Tooth brushing - The patient brushes twice daily (am and pm) with a manual toothbrush. She would also brush after eating when at home.

Toothpaste - The patient is using a whitening toothpaste twice daily.

Interdental cleaning - The patient flosses 2-3 times weekly, usually when she feels she has food stuck between her teeth.

Mouthwash - The patient is not using a mouthwash but is rinsing her mouth with water after brushing.

Diet - The patient consumes carbonated drinks with alcohol when socialising and drinks water during the day. She liked to snack on sugar-coated sweets but had to stop as it became too painful.

Whitening - The patient started a course of home whitening with 6% hydrogen peroxide within the last 6 months but could not complete the cycle as it exacerbated her current sensitivity.

Indices

Plaque score – An initial plaque score of 22% was recorded using the O’Leary Plaque Index². Soft plaque was recorded along the gingival margins of the upper posterior teeth.

Bleeding score – The initial bleeding score was 19%.
Pocket depths – No probing depths exceeded 3.5mm.
BPE 111/121

Recession - Recession exposes sensitive dentinal surfaces to the oral cavity. It is therefore important to locate these areas to allow for a definitive diagnosis and implementation of an appropriate treatment plan (Fig. 3). It is important to note that not all exposed dentine is sensitive³.

Erosion – The Basic Erosive Wear Examination (BEWE) is used to monitor and record the severity of erosive tooth wear. The most severe area of erosion from each sextant is recorded and an overall risk of erosion is acquired by adding the total of each sextant⁴. The patient had a low risk of erosion (Fig. 4).

1	1	1
1	1	1

Figure 4: BEWE

Exposed dentine caused by erosion can also lead to sensitivity and it is therefore important to screen the patient for potential signs of erosion to treatment plan appropriately.

Buccal	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	Buccal
Lingual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Lingual
Upper Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Upper Left
Lower Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Lower Left
Lingual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Lingual
Buccal	0	0	0	2	0	0	0	0	0	0	0	1	0	1	0	0	Buccal

Figure 3: Gingival Recession (mm)

Sensitivity

Dentine hypersensitivity is defined as pain arising from exposed dentine typically in response to thermal, chemical, tactile or osmotic stimuli⁵. It is a common oral health issue that is characterised by a sharp pain in response to external stimuli that cannot be explained by any other dental disease⁶.

The patient noted her sensitivity would occur when consuming cold food and drink and when breathing in cold air. She had also noticed that sweet, sugar-containing food and drink would also elicit a sensitive response. She described the pain as a shooting sensation that would last around 10 seconds.

When asked to locate the areas of sensitivity, the patient pointed to the upper and lower central and lateral incisors and the buccal margins of the upper right molars.

The patient stated the sensitivity would occur up to 10 times a day but this could be reduced by avoiding certain foods and drinks. She noticed increased sensitivity during colder weather.

Diagnostic Tests for Sensitivity

By correctly diagnosing dentine hypersensitivity, it is possible to develop and implement an appropriate treatment plan to address the problem effectively⁷.

The Schiff Cold Air Sensitivity Scale:

This test records the sensitivity experienced by the patient when a 1-second application of air is directed towards the buccal surface of each tooth. The response of the patient is given a score from 0-3.

- 0- Subject did not respond to air stimulus.
- 1- Subject responded to air stimulus, but did not request discontinuation of stimulus.
- 2- Subject responded to air stimulus and requested discontinuation or moved from stimulus.



Upper and Lower Right Buccal



Upper and Lower Left Buccal

3- Subject responded to air stimulus, considered stimulus to be painful and requested discontinuation of the stimulus⁸.

The values are added together and the mean Schiff score prior to treatment was recorded as 0.94 (Fig. 5) (Appendix 1).



Upper and Lower Anterior Dentition

As sensitivity can be induced by different forms of stimuli, water and endofrost were also used to stimulate a sensitive response before and after using BioMin™F. for 10 weeks. The tests were carried out using the same method to the Schiff Cold Air Sensitivity Scale where the patient would rate the intensity of the stimulus from 0-3 when applied to the buccal surfaces of each tooth. The mean values for water and endofrost before use of BioMin™F were recorded as 0.69 and 1.19 respectively (Fig. 5) (Appendix 2 and 3).

Dentine Hypersensitivity Experience Questionnaire (DHEQ)

The DHEQ was developed to evaluate the impact dentine hypersensitivity has on an individual's quality of life. The questions are designed to assess functional limitations, social and emotional impacts of dentine sensitivity. A shortened version of the 48 point DHEQ has been developed for use on individual patients for easier clinical application⁹. The questionnaire has been condensed into 15 questions based on the effect of sensitivity on everyday life⁹. The patient would use a 7 point Likert Scale to grade their responses, ranging from strongly disagree (1) to strongly agree (7). The scores were added to obtain a DHEQ score before and after use of BioMin™F. A higher score indicated that dentine hypersensitivity has had a greater detrimental impact on the individual's quality of life (Appendix 4).

Diagnosis / Treatment Plan

As dentine hypersensitivity is the likely cause of the patient's dental pain, the following treatment plan was devised:

Tooth brushing – It was suggested that the patient should brush twice a day for at least 2 minutes. An electric toothbrush with a pressure sensor was suggested to prevent any mechanical trauma to the gingival margin, exposing dentine that could lead to the patient experiencing further sensitivity. An appropriate tooth brushing technique was demonstrated to the patient to ensure soft plaque and bacterial biofilm were effectively removed from the tooth surface and gingival margin to prevent inflammation and periodontal issues. The

patient was advised to wait at least 30 minutes after eating before brushing to ensure any acid from the diet had been neutralised, to prevent loss of enamel and further exposure of dentine.

Toothpaste - The patient was given samples of Biomin™F toothpaste and advised to use twice daily for a 10-week period. The 'spit - don't rinse' method was encouraged to maximise the topical effects of the toothpaste.

The patient agreed to increase interdental cleaning to once daily to prevent any gingival inflammation.

Changes to Diet/Diet Advice

Suggestions were made to the patient to limit her intake of high acid-containing food and drink, to restrict consumption to meal times and to use a straw when consuming acidic drinks.

The patient was fully informed about the case study and agreed to participate. She gave full consent for her details and information to be used and agreed to comply with the instructions and modifications to her daily routines, including twice daily use of Biomin™F toothpaste over a 10-week period.

Follow-up Appointment – 10 Weeks After Initial Appointment

Oral Hygiene - The patient attended her scheduled appointment 10 weeks after initial treatment and changes to her oral hygiene routine began. She had used Biomin™F twice a day for the 10-week period and was no longer rinsing her mouth with water after brushing. The patient was now using an electric toothbrush and was flossing once a day (usually before bed). She stated that she felt the changes to her oral hygiene routine were easy to make as she was keen to 'try anything that would improve my sensitivity.'

Indices - The plaque and bleeding scores had reduced to 11% and 8% respectively.

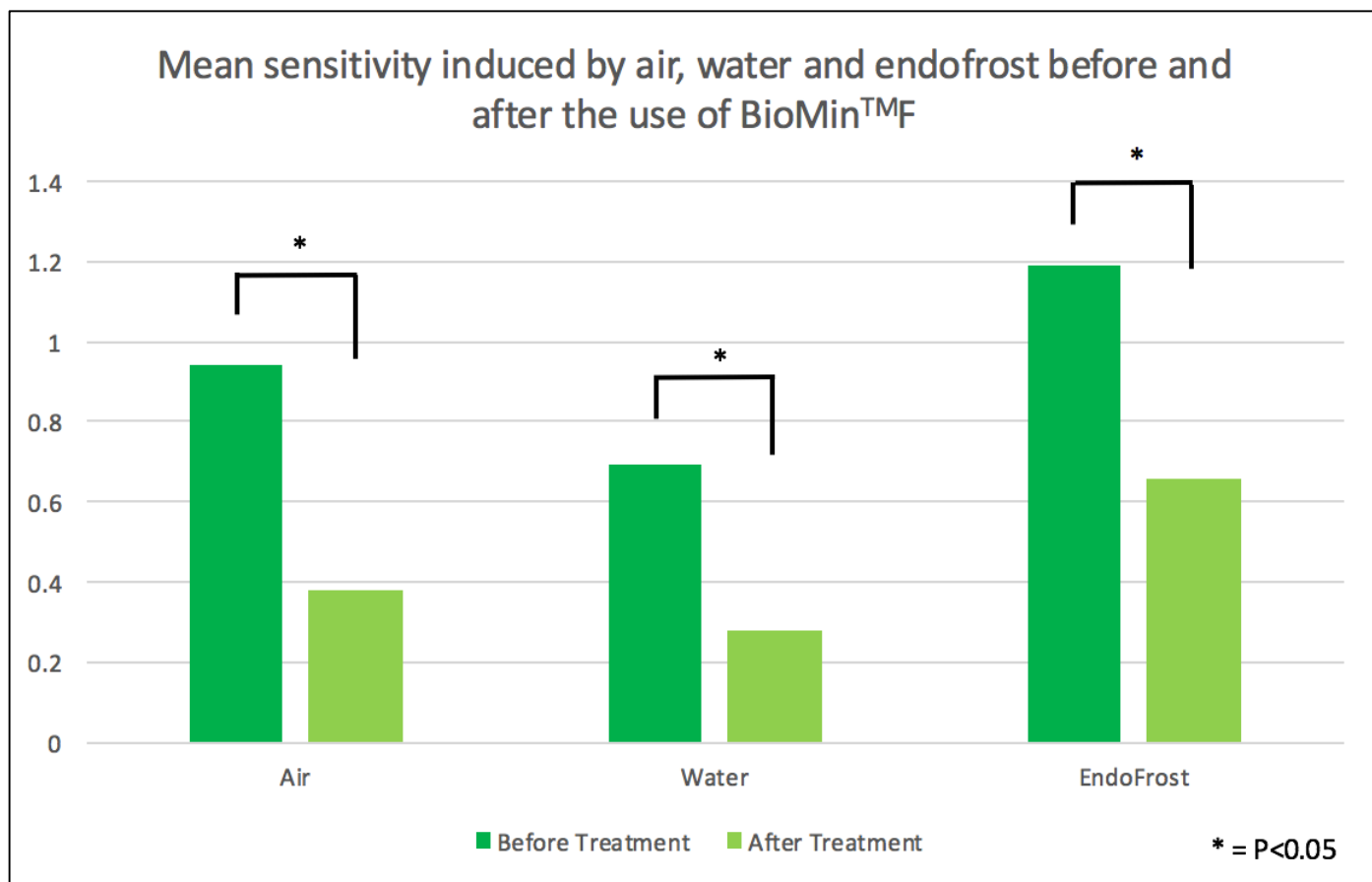


Figure 5: Mean sensitivity induced by air, water and endofrost before and after the use of BioMin™F

Results

Fig. 5 shows the patient's response to cold air prior to treatment and after a 10-week period of using BioMin™F toothpaste. The mean obtained from the Schiff Cold Air Sensitivity Scale had significantly reduced from 0.94 to 0.38. Analysis using a paired t-test ($P<0.05$) showed that the decrease in mean is significantly different, suggesting that the reduction in sensitivity is due to use of BioMin™F and improvement in oral hygiene and not a result of chance (Appendix 1).

There was also a significant decrease in the mean sensitivity experienced when stimulation occurred with water and endofrost after the 10-week trial. The mean sensitivity triggered by water reduced from 0.69 to 0.28 ($P<0.05$), whilst the mean sensitivity triggered by endofrost reduced from 1.19 to 0.66 ($P<0.05$). This again suggests that BioMin™F has had a beneficial effect on the patient's sensitivity (Fig. 5) (Appendix 2 and 3).

Anecdotal - The patient had been trying foods that she would usually avoid as she was keen to see if the toothpaste had made a difference to her sensitivity. She reported that she was able to now eat ice pops comfortably and would only experience a reduced feeling of sensitivity around her posterior teeth when eating sugar-coated sweets.

The DHEQ 15 was completed before and after the 10-week period with the DHEQ score reducing from 80 to 45.

Conclusion

The patient reported a reduction in sensitivity at the end of the 10-week study. She was now able to consume food and drink that would have previously induced a sensitive response.

Although anecdotal evidence from the patient was positive, it cannot be used alone to verify the effects of BioMin™F. It is important to collect data using diagnostic tests (Schiff Cold Air Scale and DHEQ etc) in combination with statistical analysis to determine whether BioMin™F did help to reduce overall sensitivity. As the reduction in sensitivity to air, water and endofrost was deemed significant ($P < 0.05$), we can determine that use of BioMin™F in combination with improvements to oral hygiene resulted in a reduction in dentine sensitivity, as reported by the patient.

As the changes made to her oral hygiene routine were minimal, the patient feels she is able to carry these adaptations forward and continue using them in her daily regime. The positive feedback on the taste, texture and ease of use of the toothpaste, as reported in the anecdotal evidence, contributed to the patient's compliance and desire to continue use of BioMin™F after the study had concluded.

References

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- 6- Baker SR, Gibson BJ, Sufi F, Barlow A, Robinson PG (2014) The Dentine Hypersensitivity Experience Questionnaire: a longitudinal validation study, *Journal Clinical Periodontology*, 41 pp 52–59
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- 9- Machuca C, Baker S, Sufi F, Mason S, Barlow A and Robinson P (2014) Derivation of a short form of the dentine hypersensitivity experience questionnaire, *Journal of Clinical Periodontology*, 41(1) pp 46-51

Appendix

1.

After	0	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	After
Before	0	2	1	1	1	1	1	1	1	2	1	2	1	1	0	0	Before
Upper Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Upper Left
Lower Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Lower Left
Before	0	0	1	2	1	1	1	3	1	2	1	1	0	0	0	0	Before
After	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	After

Schiff Cold Air Sensitivity Scale – Before and After BioMin™F

2.

After	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	After
Before	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	Before
Upper Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Upper Left
Lower Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Lower Left
Before	0	1	1	1	1	1	2	3	1	2	1	1	1	0	0	0	Before
After	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	After

Sensitivity Induced by Water – Before and After BioMin™F

3.

After	0	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	After
Before	0	2	2	1	0	0	2	1	1	3	2	1	1	1	0	0	Before
Upper Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Upper Left
Lower Right	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	Lower Left
Before	0	2	1	1	1	3	2	3	2	3	1	1	1	0	0	0	Before
After	0	1	1	0	0	1	1	2	1	2	1	1	0	0	0	0	After

Sensitivity Induced by Endofrost – Before and After BioMin™F

4.

Dentine Hypersensitivity Experience Questionnaire – 15 ⁸	
1.	Having sensations in my teeth takes a lot out of the pleasure out of eating and drinking
2.	It takes a long time to finish some foods and drinks because of sensations in my teeth
3.	There have been times when I have had problems eating ice cream because of these sensations
4.	I have to change the way I eat or drink certain things
5.	I have to be careful how I breathe on a cold day
6.	When eating some foods I have made sure they do not touch certain teeth
7.	Because of sensations I take longer than others to finish a meal
8.	I have to be careful what I eat when I am with others because of the sensations in my teeth
9.	Going to the dentist is hard for me because I know it is going to be painful as a result of sensations in my teeth

10.	I've been anxious that something I eat or drink might cause sensations in my teeth
11.	The sensations in my teeth have been irritating
12.	The sensations in my teeth have been annoying
13.	Having these sensations in my teeth make me feel old
14.	Having these sensations in my teeth make me feel damaged
15.	Having these sensations in my teeth makes me feel as though I am unhealthy