

# Laser Versus Fluoride Varnish in Management of Dentine Hypersensitivity in Non-Carious Lesions: A Randomized Clinical Trial

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## ABSTRACT

**Aim:** The aim of this study is to compare the clinical efficacy of Laser compared to a fluoride varnish in relieving Dentin hypersensitivity (DH) in adult population over a six-month period.

**Methodology:** This study involved eighty-four patients in total. They were split into two groups based on the type of treatment: laser or fluoride varnish as a control group. On the VAS scale, the patient should indicate the level of sensitivity (VAS >5). For BiFluorid 10, a microbrush was used to open the single-dose foil, and a thin layer of varnish was then applied. The teeth in the laser group were cleaned completely and allowed to air dry. The manufacturer's recommended parameters for dentine hypersensitivity were followed when using a low-power diode laser in a non-contact, defocused mode. Sensitivity tests were performed on each patient using a visual analog scale three months, six months, and immediately following application.

**Results:** There was no discernible difference between the two groups' pre-treatment hypersensitivity levels. Both methods significantly reduced pain after therapy. The Laser group's baseline score was substantially lower than the BiFluoride group's. For three months, this pattern persisted. A reversal was seen at the 6-month follow-up, nevertheless, with the BiFluoride group showing noticeably lower sensitivity scores than the Laser group.

**Conclusion:** When compared to pre-treatment levels, both BiFluoride and laser therapy significantly reduce dentin hypersensitivity. At six months, BiFluoride varnish shows better stability and lower sensitivity scores, indicating a longer-lasting impact.

**Keywords:** Dentin Hypersensitivity, Fluoride, Laser, Clinical Trial.

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## Introduction

Diagnosing and treating dentine hypersensitivity (DH), a chronic illness, can be difficult.(1)

Evaporative, chemical, thermal, tactile, or osmotic stimuli can cause dentine hypersensitivity, a brief,

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sharp pain that is controlled by patent dentinal tubules.(2) In an attempt to explain dentine hypersensitivity (DH), several theories have been put forth. The most comprehensible explanation for the cause of pain in DH is now hydrodynamic theory. Thus, a shift in intrapulpal pressure that irritates the dentin/pulp complex is what causes the discomfort.(1)

The most popular products are fluorides. Bifluoride 10, often known as sodium fluoride varnish, is a unique product composed only of natural elements. Its unique combination of 5% calcium fluoride and 5% sodium fluoride enable both long-lasting effects from the insoluble calcium fluoride and rapid fluoride release from the sodium. By applying a layer of varnish to the dentine, it prevents further demineralization. (6) Another practical solution for DH management is the use of laser technology. Diode lasers are low-power lasers that promote normal cell functioning without

producing heat. (7) This is due to the fact that they produce a shift in the electrical potential of the cell membrane, which benefits the cells in terms of analgesia, potential anti-inflammatory effects, and biomodulation. (8)

There is still no ideal treatment in terms of convenience, effectiveness, patient acceptance, and cost-effectiveness, despite the availability of numerous treatment methods at home or in an office. Additionally, there is insufficient clinical information regarding these desensitizing drugs' immediate and long-term effects.

Therefore, the purpose of this randomized clinical research is to determine if laser is more successful than fluoride varnish in treating hypersensitivity of non-carious cervical lesions. In terms of pain assessment in hypersensitivity of non-carious cervical lesions, the null hypothesis is that there will be no difference between laser and fluoride.

### **Materials and Methodology:**

#### **Materials: (Table 1)**

- 1) Fluoride-Based Varnish
- 2) Laser Device

**Table (1): Table of materials and devices used**

Materials	Specifications	Manufacturers
<b>BiFluorid 10</b>	Fluoride Varnish	(Voco, Cuxhaven, Germany)
<b>Mobil Laser</b>	Diode Laser (Semiconductor)	(Hulaser Co., Ltd, South Korea)

#### **Methodology:**

This Randomized Controlled Clinical – Parallel Group Superiority Trial was conducted at the outpatient clinic of the Conservative and Esthetic Dentistry Department of the British University in Egypt following approval from the Research Ethical Committee of the Faculty of Dentistry. 84 patients who met the following eligibility requirements were included in the trial.

**Inclusion Criteria:** 30-60 years old males or females patients with Non carious cervical lesions

**Exclusion Criteria:** Patients who did any periodontal surgeries within the previous 6 months or with bad oral hygiene.

Patients were instructed to adhere to general guidelines and sign a printed informed consent form outlining the purpose of the study, a synopsis of the methodology, the advantages and disadvantages of the procedure, and a request that they permit the doctor to follow up with them after the therapy. The

participants were divided into two equal groups at random using computer. Before the intervention, the produced sequential numbers were placed in opaque envelopes, and each participant was asked to choose an envelope that would indicate which intervention group he was allocated to. Teeth were divided into two groups based on the type of desensitizer used: patients in group 1 (G1) were randomly assigned to "Laser Desensitizer," while patients in group 2 (G2) were randomly assigned to "Fluoride-Based Desensitizer." Sensitivity tests were performed on each patient using a visual analog scale three months, six months, and immediately after application. Controlled air stimulus (Evaporative) was applied on the tooth of complain. The patient should point out the degree of sensitivity on the VAS scale (0-10) chart the degree of pain. (VAS >5).

**For Laser Group:** The surfaces of the teeth were carefully cleansed and allowed to air dry.

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Dentine hypersensitivity was treated using a low-power diode laser using the manufacturer's recommended conditions.

**For Fluoride-Based Group:** BiFluorid 10 was the desensitizing agent used. Single-dose containers were used to ensure consistency for clinical application. The tooth surface was air-dried after soft tissue retraction and mechanical cleaning using a paste-free polishing brush. A microbrush was used to open the single-dose foil, and a thin layer of

### Results

The Shapiro-Wilk and Kolmogorov-Smirnov tests were used to examine the normality of the VAS data. The mean, standard deviation (SD), median, and range (IQR) were used to characterize the non-parametric distribution of the data. Both desensitizing agents, BiFluoride and Laser, started with comparable pre-treatment hypersensitivity levels, showing no notable differences initially.

varnish was then applied. A dental syringe was used to air-dry the treated area following a 10–20 second incubation period. Post-treatment protocols required all participants to suspend standard oral hygiene practices for a 24-hour period

Using a visual analog scale (VAS), the post-operative hypersensitivity assessment was carried out immediately after 3 minutes, three months, and six months following application. (2)

Right after treatment, Laser consistently outperformed BiFluoride in reducing sensitivity, with this advantage holding through the three-month mark ( $p = 1.000$ ). By six months, scores edged up slightly for both, though differences between groups persisted ( $p = 1.000$ ). Over time, each agent drove significant reductions from baseline through the early follow-up, followed by a modest rebound later. ( $p = 1.000$ ). (Figure 1)

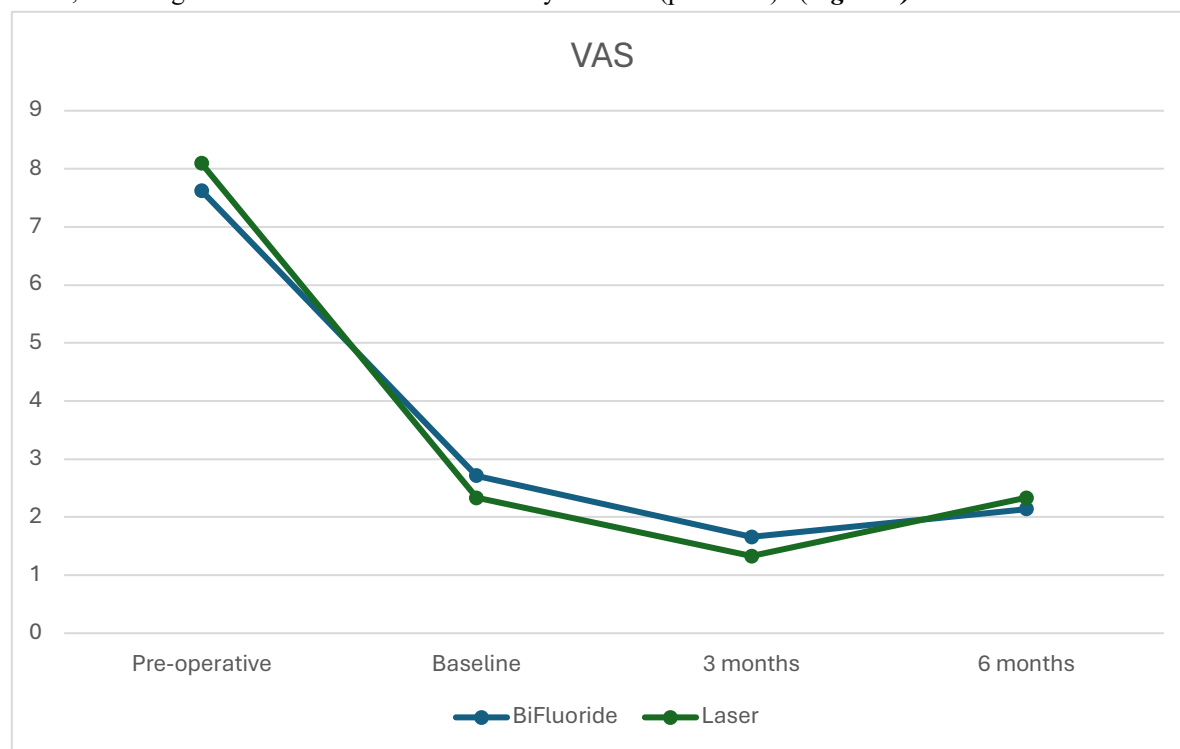


Figure 1: Line chart showing change in VAS within each desensitizing agent through time

### Discussion

When exposed dentin is exposed to tactile, thermal, chemical, or osmotic triggers, dentine hypersensitivity (DH), a common dental disorder, manifests as intense, transient discomfort. The dentinal tubules must stay open to provide a direct channel from the oral cavity to the tooth pulp in order for this pain response to take place. The well recognized process is that these external stimuli cause fluid to flow within the unobstructed tubules,

which in turn activates nociceptors at the dentin-pulp junction.(3) (4)(5)

Desensitizing compounds are commonly used in clinical dentistry to treat dentine hypersensitivity (DH).(6) Fluoride varnish is commonly regarded as the gold standard for treating dentin hypersensitivity (DH) because of its safety, convenience of application, and long-lasting effectiveness. The physical occlusion of dentinal tubules, which stops the fluid hydrodynamics that cause pain transmission, is the main reason for its clinical

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success. Additionally, the varnish sticks firmly to the tooth surface, allowing for a prolonged release of fluoride ions that can alleviate symptoms for at least six months. This continuous fluoride supply provides secondary clinical benefits, such as caries prevention and enamel reinforcement, in addition to desensitization.(7)

Bifluorid 10's dual-fluoride composition, which uses both calcium fluoride (CaF) and sodium fluoride (NaF), is responsible for its therapeutic effectiveness..(8)

Since its introduction by Matsumoto et al. in 1985, the use of laser therapy for dentine hypersensitivity has been thoroughly verified in later research.(9) In this investigation, a diode laser (810 nm) was used because of its capacity to produce photobiomodulation. The laser offers a biological method of treating dentin hypersensitivity by penetrating the hard tissues to produce a neural analgesic effect and encourage the creation of tertiary dentin, in contrast to chemical treatments that offer a surface seal.(10)

The current study shows that dentin hypersensitivity (DH) pain scores on the Visual Analog Scale (VAS) are effectively reduced by both BiFluoride and Laser therapies, with quick post-treatment reductions that peak at three months before a partial rebound at six months. While Laser consistently produced decreased VAS values at all follow-ups (baseline, 3 months, 6 months; all [P < 0.001]), pre-treatment scores were similar between groups, demonstrating balanced baselines. In keeping with the occlusive and neuromodulator processes of fluoride varnishes and low-level laser therapy (LLLT), within-group studies showed statistically significant reductions over time for both drugs (both [P < 0.001]). These results are consistent with earlier studies on fluoride-based medications such as Bifluoride (11), which seal dentinal tubules and provide long-lasting comfort by forming calcium fluoride-like deposits. For example, studies describe significant VAS decreases that last up to three to six months, which is like our observed drop from pre-treatment to three months. However, similar late rebounds are attributed to acid problems or mechanical wear(12). The superiority of laser therapy is supported by meta-analyses that demonstrate LLLT (such as diode lasers at 810 nm) beating topicals by 20–30% in short-term efficacy, most likely by photo biomodulation that decreases pulpal inflammation and inhibits the deeper baseline and three-month reductions can be explained by Aδ

nerve fibers(13). Our 6-month rebound in both groups, however, contrasts with several long-term trials where Laser continued to provide benefits after 6 months. This could be because of variations in laser parameters (such as energy density) or patient populations with higher baseline erosion. Reports of fluoride's inferiority to LLLT over the long term are contrasted with Bifluoride's somewhat improved 6-month retention compared to Laser, which may be due to our varnish's high fluoride concentration (NaF + CaF<sub>2</sub>) improving remineralization durability(14). Unlike varied baselines in certain comparisons, no pre-treatment differences support methodological rigor. The lack of a placebo arm and subjective VAS reliance are limitations; evaporative stimuli and histological tubule blockage tests should be included in future experiments. Clinically, Bifluoride gives cost-effective durability while Laser offers quicker relief for severe DH.

### Conclusions

- 1- Dentine hypersensitivity pain is lessened by both BiFluoride and Laser. During the first three months, the laser performs better. Even if some pain returns, differences last up to six months. For quick relief, use a laser; BiFluoride for affordable, long-lasting treatment.
- 2- According to this study, BiFluoride and Laser reduce pain levels for six months. Early on, lasers produce faster outcomes. Results are consistent with their blocking of pain signals. To prevent pain from reoccurring, more study is required.

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