

The Use and Effects of Silver Nitrate in Dentistry

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Abstract : In this study, we will talk on intended use of silver nitrate solution which has been used in various medical treatments for many years, being exposed to silver nitrate solution especially during preparation of a scientific study materials and the changes occurring in epidermis. The silver nitrate is the third element used after gold and copper. The silver nitrate is used in various fields; for gingivitis, oral hygiene, to clear up halitosis, in treatment of candidal infections and teeth caries. Conclusion: While the silver nitrate is used in different fields of Dentistry, the widespread use of it is not a matter. In dentistry, the silver nitrate solution is mostly preferred in scientific studies rather than its therapeutic properties. In use of chemical solutions like silver nitrate, protective measures such as gloves, glasses, mask etc. should be taken.

Key Words: Silver Nitrate, Micro Ct, Microleakage

I. INTRODUCTION

The silver nitrate (AgNO_3) is the most important silver salt Pic.1. It represents heavy colorless crystals. Known as the third metal after gold and copper, the silver nitrate has antibacterial effect [1]. Because it dissolves in water and alcohol very easily, it is used as basic substance to obtain a number of silver compounds. Silver has been used for medical treatments throughout history [2].



Pic. 1: Silver Nitrate

Silver nitrate is commonly used to stop the progression of caries, to provide disinfection of cavities, to treat or prevent infections, gingivitis, to maintain dental hygiene, in treatment of halitosis and in other infectious complications [3]. Also silver is used in the treatment of other systemic diseases such as diabetes, obesity, common cold, allergic reactions, psoriasis etc.

II. MATERIALS AND METHOD

2.1. THE PREPERATION OF SILVER NITRATE SOLUTIONS

0.05 N and 0.1 N silver nitrate solutions are commonly used.

2.2. 0.05 N SILVER NITRATE

- 8.495 ± 0.0001 gr silver nitrate is scaled with precession scale.
- 1 L of purified water is poured into the light-proof glass bottle.
- The solution is prepared by pouring the pre-scaled silver nitrate into purified water.
- The solution prepared between 6 or 10 minutes is diluted by mixing.

2.3. 0.1 N SIVER NITRATE

- 16.990 ± 0.0001 gr silver nitrate is scaled with precession scale.
- 1 L of purified water is poured into the light-proof glass bottle.
- The solution is prepared by pouring the pre-scaled silver nitrate into purified water.
- The solution prepared between 6 or 10 minutes is diluted by mixing.

III. THE USAGE AREAS OF SILVER NITRATE IN DENTISTRY

In a study done by Penq et al. in 2012, in vitro, in vivo and clinic researches pointed that silver compounds are agents used in order to prevent or do away with caries in permanent and deciduous teeth. But this solution was stated to cause discoloration and pulpal irritation in lateral teeth. On the other hand, its efficiency on dentine hypersensitivity and pulpal irrigation was evaluated, but not an effective result was obtained. Even the silver nitrate was observed to penetrate to filling materials [4].

Penq et al. consider that the mode of action of silver compound and inhibition of demineralization have an anti-bacterial effect in terms of preventing bacterial cell membrane, stoplasmic enzyme and bacterial DNA replication [4].

Wong et al. evaluated the micro-leakage of different adhesive materials by using silver nitrate solution. They kept waiting the prepared samples in silver nitrate for sometime after thermal cycles of 50C-550C and determined solution penetration using digital positioners and toolmakers [5].

As a result of researches, we see that silver nitrate solution provides advantage for many adhesive materials, in evaluating the leakage of restorative filling materials and micro-leakage of endodontic sealers, cements and many materials. During these studies, computer tomography, Scanning Electron Microscope (SEM), biopsy and various radiographic techniques are used to demonstrate silver nitrate penetration to materials.

Candida infection is among the most widespread fungal infections known in Dentistry. Silver sulphadiazine is the most commonly used topical antimicrobial agent in burn patients. This easily dissolved agent is synthesized from silver nitrate and sodium sulphadiazine. In the studies done in vitro, the efficiency of silver sulphadiazine against *Candida albicans* was demonstrated.[6]

IV. THE EFFECTS OF SILVER NITRATE

A 27-year-old dentist observed black spots on epidermis after silver nitrate penetration while preparing the materials of a scientific work (**Pic. 2**). Discoloration occurred 5 or 6 hours after the work.



Pic. 2: The silver nitrate penetration and colloidal pieces seen as black on Epidermis.

Silver nitrate has been diffused into the epidermis and it formed silver chloride by reacting with chloride in the sweat. Silver chloride is photochemically activated by ultraviolet light and forms the colloidal pieces of metallic silver. The pieces occurring are seen as black and penetrates the epidermis [6].

0.5% solution of low concentration of silver nitrate was demonstrated to inactivate bacteria in vitro works, but in vivo works, this concentration was demonstrated that it didn't have any effect on the growth of epidermal cells [7].

After the emergence of black spots on the epidermis, their contamination with another one or its spread from one part of body to the other parts is not a matter of subject. Because silver nitrate reaction and silver chloride formation happen very quickly [6].

Discoloration can't be eliminated by washing; yet in two or three weeks, the black spots disappear when epidermis renews itself. After contact of the silver nitrate, a quick wash with salty water reduces the spread [8]. The use of this solution in patients with silver nitrate allergy and in pregnancy is contraindicated.

V. CONCLUSION

Silver nitrate is used as therapeutic agents for many years especially in the medical field. Although it is used in different areas in dentistry, the common use of it is not a matter of fact. Rather than its therapeutic property, silver nitrate solution is mostly preferred in scientific works in dentistry.

The most important point to be considered when working with Silver nitrate is to read the instructions on safety data sheet, on the label or on packing of the used material very carefully. Gloves and glasses must be used while preparing the solution. The solution must be kept in a dark place because it reacts with light.

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