Preventive Dentistry

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Lec. 7 Types of fluoride therapy

Topical fluoride therapy:

2. **Professionally applied fluoride**

It is the periodic application of a high concentration of fluoride to the erupted teeth by dentists or dental hygienist every 3, 6, or 12 months in the dental office to prevent or arrest dental caries. The concentrations of fluoride are 9000-19000 ppm, it may reach for some agents to 23000 ppm. Agents can be applied inform of solutions, gel, varnishes, prophylactic pastes or pumice.

Different agents are available as: Sodium fluoride - Stannous fluoride - Potassium fluoride - Zirconium fluoride - Titanium fluoride - Others.

Method of application:

Techniques followed for application of fluoride in the dental office are:

- Paint on technique, by which fluoride material applied to teeth by cotton applicator of brush.
- Tray technique: a small amount of fluoride is added to a tray then inserted in the patient mouth. Trays come in different shapes and types as foam lined or paper, custom vinyl etc.

For both techniques:

1. Teeth are cleaned first (scaling and polishing) to remove dental plaque, calculus, stain and debris. These may interfere with the uptake of fluoride ions and reduce its effectiveness.
2. Teeth are isolated using cotton roll and saliva ejector.
3. The head of the patient tilted forward to avoid accidental swallowing of the materials.
4. The fluoridated agent applied following dryness of teeth for 1-4 minutes.
5. The amount of agent used must not exceed 4 ml to prevent acute toxicity.
6. Use unwaxed dental floss to push the material between teeth.
7. Following treatment ask the patient to expectorate several times.
8. Instruct the patient not eat or drink for at least 30 minutes.
9. The procedure should be repeated every 3 months (fluoridated gel) and every 6 months (fluoridated varnish).

Indications:

In general materials indicated to be use in:

- ✓ Prevention of dental caries.
- ✓ Rampant caries.
- ✓ Sensitive teeth and root caries.

Most common formula used as topical Fluoride therapy (professionally applied):

1) **Sodium fluoride (NaF):**

These materials are available in form of powder, solution or gel. The concentration of fluoride is 2 %. When powder is used 0.2 gram dissolved in 10 ml distilled water.

Advantages:

- It is stable solution because it has a basic pH, chemically stable when stored in plastic or polythene containers.
- It has acceptable taste because a flavoring and sweetening agents can be added.
- Does not cause discoloration of teeth.
- Not irritant to oral tissue.

Disadvantages:

- The anti caries effect is limited.
- The-application procedure needs a long time to be completed.

2) **Stannous fluoride (SnF2):**

It contains cation (stannous) and anion (fluoride), both react with enamel surface forming calcium fluoride, stannous fluoroapatite and hydrated tin oxide.

$$Ca10(PO4)6(OH)2 + 19\ SnF2 \quad >>>>>> \quad 10\ CaF2 + 6Sn3F3PO4 + SnO.H2O$$

These complex agents increase resistance of enamel to acid dissolutions. Stannous fluoride used in form of solutions. It is available in powder that is prepared by dissolving appropriate weight in distilled water. For children the recommended concentration of stannous fluoride is 8% (dissolve 0.8 mg in 10 ml of distilled water). For adolescents and adults the recommended concentration is 10 % (dissolve 1 mg of powder in 10 ml distilled water). It can be recommended in 30% as desensitizing solution.

Advantages:

- Higher efficiency in caries reduction (reduce dental caries 40-50%).
- It is effective in arresting enamel and dentinal caries.
- It has a specific suppression effect against s.mutans.
- It has a non-specific antiplaque effect.

- De sensitization of teeth.
- Has an additive effect by tin ions in addition to fluoride ions.
- It does not need prolonged time for treatment.

Disadvantages of stannous fluoride:

- It causes discoloration of teeth.
- Not stable in aqueous solution, it under goes rapid hydrolysis and oxidation to form stannous hydroxide and stannic ions. These may reduce the effectiveness of fluoride. Thus, stannous fluoride solution needs to be freshly prepared.
- Unpleasant taste, it has metallic astringent taste. No flavoring agent could be added to it.
- Reversible irritation to gingival, as gingival bleaching may occur. Hence, it is not recommended to be used in sever gingival inflammation.

Indication of use:

- Primary preventive programs (once or twice a year).
- High risk group and rampant caries (every 3 or 6 months).
- Initial caries (3 or 6 months).
- Desensitizing agents (once a week then every 3-6 months).
- Patients with xerostomia (3- 6 months).
- Patients with hypoplasia or calcifications (as amelogensis imperfecta or dentionogensis imperfecta).
- Root caries.

3) **Acidulated phosphate fluoride (APF):**

The main reaction to change hydroxyapetite to fluoroapetite crystals can be accelerated by either:

1. Increase the fluoride ions concentrations. Increase the concentration of fluoride ions lead to formation of calcium fluoride and phosphate.
2. Lowering the pH of the topical fluoride agents. The presence of acid leads to break down of the outer enamel surfaces (hydrolysis of hydroxyapatite and release of calcium and phosphate).

In both situations, phosphate formed. The increase in phosphate concentration causes the shift in the equilibrium of the reaction to right side that is in the direction of formation of fluoroapatite as well as hydroxyapatite crystals. In another word, the increase in the concentration of fluoride ions and lowering the pH in presence of phosphate lead to increase deposition of ions in form of

fluoroapatite crystals (ie increase fixation of fluoride ions in the enamel surface).

For these reasons scientist suggested that when we add an acid to the fluoride agent, we can achieved a more better results , so they produce acidulated phosphate fluoride . Acidulated phosphate (APF) is composed of NaF to which acid is added. The concentration of fluoride is 1.23%, the acid is in form of orthophosphoric acid the pH is 3.2.

APF comes in form of solution, gel and foam, which reduce dental caries by about 67%.

Advantages of APF:

- Chemically stable when stored in plastic containers.
- Not cause any discoloration of the teeth.
- Taste is acceptable since coloring and flavoring agents can be added.
- The uptake of fluoride ions by enamel is higher. The gel is more preferable than solutions as it increase the time of retention of the materials on the tooth surface. The gelling material is in the form of carboxy methyl cellulose.

Disadvantages of APF:

- The major problem in using APF solution mar it increases salivation, which cause difficulty to control small child. To solve this problem, a new type was introduced which is called (Thioxytropic gel) which has the property of becoming more liquid during pressure which enhance the agent to reach the less acceptable areas of teeth, after removing the pressure the gel will re-harden (viscous) again, thus it will not flow behind the tray to enter the patient throat and lead to salivation, and possibly vomiting.

4) Silver diamine fluoride (SDF):

SDF is a noninvasive treatment option for cavities, using a topical medicine that is painted on the tooth instead of a more invasive surgical (drill and fill) approach. SDF concentration (5% F 44,800 ppm F) recently has been approved by the U.S. Food and Drug Administration (FDA) and currently is used most frequently to arrest dentinal caries. SDF arrests caries by the antibacterial effect of silver and by remineralization of enamel and dentin.

Indications:

- Early childhood caries in babies and toddlers (uncooperative children).
- Individuals at high risk for developing dental caries (e.g., children with special health care needs).
- Rampant caries.
- Hypersensitivity.

Contraindications:

- Teeth that require pulp therapy.
- Individuals at risk for developing a silver allergy.
- Individuals with mouth sore (e.g., stomatitis and ulcerative gingivitis).

Advantages:

- ❖ Low cost.
- ❖ Quick, easy, painless.
- ❖ Less than a drop is needed to treat several caries lesions.
- ❖ Relives sensitivity.
- ❖ Caries arrest rate greater than 80% due to its remenerlisation effect when applied twice yearly.
- ❖ Avoid or delay more invasive restorations.
- ❖ Prevent biofilm adhesion.

Disadvantages:

- ❖ Caries lesions stain black after treatment.
- ❖ Temporarily stain skin with contact.
- ❖ Cavities that trap food may still require restorations.
- ❖ 20% of cavities continue to grow.

Clinical technique:

- ❖ Dispense SDF into dappen dish.
- ❖ One drop treats five surfaces.
- ❖ Isolation with gauze or cotton.
- ❖ Dryness.
- ❖ Apply (saturate) the SDF using a micro-brush using a scrubbing motion.
- ❖ Leave it for 1-3 minutes on the carious lesion.

Fluoridated varnishes

These are slow release or semi-slow release agents. Prolonged exposure time and high fluoride reservoir. Fluoride release continues for long time, as for at least 8 hours or even for several weeks according to the type used. Studies showed that the use of fluoridated varnishes resulted in the most significant caries reduction among topical fluoride agents (30- 70%) carries reduction.

Duraphat varnish

It is a professional applied topical fluoride produced by Colgate dental company. It is clinically proven for the prevention of caries and for the treatment of dentine hypersensitivity for 30 days with just one application. It is tinted for easy visualization and sets rapidly on contact with saliva, making it quick and easy to apply.

Mode of action:

Duraphat varnish works in two ways:

- Prevents caries: Forms calcium fluoride on the tooth surface, providing a fluoride reservoir for protection against cariogenic acid attack.
- Controls dentine hypersensitivity: Forms calcium fluoride globules which occlude dentine tubules.

Composition:

1mL suspension contains 50mg sodium fluoride (5%w/v), equivalent to 22,600ppm fluoride ion, [22.6mg fluoride] in an alcoholic solution of natural resins. Ingredients includes: Ethanol, white beeswax, shellac, colophony BP, mastic, sodium saccharin, flavour.

Method of application:

- Duraphat varnish is to be applied by the dentist, and is not for self-medication by the patient.
- Before applying Duraphat, excess plaque should be removed and the teeth dried.
- Duraphat is applied as a thin layer to the most affected areas of dentition using a brush, probe or applicator. Duraphat should preferably be applied to those spots most susceptible to caries attack. The yellowish colour of Duraphat greatly facilitates its application and control. Duraphat sets in the presence of saliva.
- After application, patient is made to sit with mouth open for 4 minutes.
- The patient should not brush the teeth or chew food for 4 hours after treatment. During this time fluids and soft foods may be consumed.

For the application procedure open this link please: https://youtu.be/OyxuAOVHu1Y

Concentrations:

- For primary teeth up to 0.25mL (5.65mg fluoride). For mixed dentition up to 0.40mL (9.04mg fluoride). For permanent dentition up to 0.75mL (16.95mg fluoride).
- For caries prevention, the application is usually repeated every 6 months but more frequent applications (every 3 months) may be made.
- For hypersensitivity 2 or 3 applications should be made within a few days.

Contraindications:

- Hypersensitivity to colophony (natural resin).
- Ulcerative gingivitis.
- Stomatitis.
- Bronchial asthma.

Fluoride protector

It is a polyurethane-based varnish contains 0.9% silane fluoride (0.1%) F, which equal to 1000 parts per million (ppm) in solution. The varnish is acidic and hardness in air in to colorless, transparent film within 2-3 minutes. The silane fluoride is insoluble in water but reacts on contact with saliva releasing small amount of hydrogen fluoride that penetrates enamel more rapidly than other types of fluoride. Fluor Protector is suitable for treating children, adolescents and adults. Given its fluoride content, it is even suitable for treating pre-schoolers.

The protective action of Fluor Protector is based on the following factors:

- Inhibition of demineralization.
- Stimulation of remineralisation.
- Incorporation of fluoride into the lower layers of enamel and repair of initial caries lesions.

Indications:

- Hypersensitivity: Defence against external stimuli in exposed cervicals.
- Superior protection against caries and erosion.

Advantages

- Fluoride concentration of 0.1%.
- Improved treatment of hard-to-reach problem areas.
- Clear, colourless, fast-drying varnish.

For the application procedure open this link please: https://youtu.be/3kQWfaQPj1o

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