



Fluoride Gels

Full Summary

Description:

Fluoride-containing gels have been used as topical applications for over 50 years in order to help prevent or control dental caries. The gels were historically intended as a professional measure but nowadays are also used for self-application at home. In both cases, a prescription from a dentist is required. There are three principal gel formulations available, *i*) 2% sodium fluoride with neutral or basic pH, *ii*) 1.23% acidulated phosphate fluoride (APF) with pH around 3.5, and *iii*) 1.25% amine fluoride gel (0.25% of the amine fluorides olaflur and dectaflur, and the rest in the form of 1% sodium fluoride). The gels are flavored and colored but contain no abrasive cleaning agents or preservatives. The clinical characteristics high fluoride concentration and a long contact time with the teeth allow the dental professional to place the fluoride gel allowing for long interval between fluoride gel applications.

Use and application:

The treatment is preceded by professional tooth cleaning, rinsing and air drying in all patients with sub-optimal oral hygiene. The gels are applied with the aid of plastic or disposable Styrofoam trays of adequate size for the patient. The tray should cover the entire dentition and reach beyond the neck of the teeth and contact the alveolar mucosa. In rare cases, individual custom fit trays can be considered. A ribbon of gel is placed in the tray which is seated over the entire dental arch. It is recommended that the trays are kept in place for 4 minutes and the patient is advised not to eat, drink or rinse for 30 minutes following the application. Recent findings however suggest that application time for the APF gels can be reduced to 1 minute [Calco et al., 2012]. The frequency of topical fluoride applications is disputed but should be dictated by the conditions and need (or estimated caries risk) of each patient. The preventive benefits are often reported from 2-4



applications per year with 3 to 6 month intervals. Fluoride gel treatments are not intended for children under the age of 6 years.

When fluoride gel is prescribed for home-care use, the recommendation is to apply 1 cm of the gel on a toothbrush once or twice a week for normal tooth brushing, similar to using a dentifrice. Fluoride gels for self-application have a somewhat lower concentration of fluoride (around 1%, 45000 ppm) but nevertheless, the brushing should be supervised for younger schoolchildren.

Effectiveness:

The American Dental Association Council on Scientific Affairs has concluded that fluoride gel is effective in preventing caries in school-aged children [ADACSA, 2007; Poulsen, 2009]. The landmark Cochrane review, published in 2002 and based on 25 studies involving over 7,000 children, displayed a prevented fraction of 28% (95% CI 14%-37%) [Marinho et al., 2002]. The effect in the 14 placebo-controlled trials was however somewhat lower, 21% (95% CI: 14-28%). A similar figure (PF=22%) was estimated in the meta-analysis of van Rijkom et al. [1998]. Since then, six trials on gels have been reported in nine different papers of varying quality [Madlena et al, 2002; van Rijkom et al., 2004; Jiang et al., 2005; Truin and van't Hof, 2005a; 2005b, 2007; Andruskviene et al., 2008; Stokes et al., 2011; Agrawal and Pushpanjali, 2011]. All the recent studies were performed in schoolchildren over 2-4 years and all but one reinforced a significant treatment effect ranging between 18% and 37% for dentin caries lesions. The inclusion of initial caries lesions did not result in any major changes of the estimates [Truin and van't Hof, 2005a; 2007]. However, the clinical relevance of this caries preventive effect has been questioned, especially in low caries populations regularly exposed to topical fluorides in other forms [van Rijkom et al., 2004; Karlsson et al., 2007]. There is little and conflicting reports on the use of supervised self-applied F-gel in the primary dentition and there is insufficient evidence to address whether or not there is difference in the efficacy of NaF vs. APF gels [Marinho, 2009]. Moreover, topical



treatments with fluoride gels do seem not to affect the numbers of cariogenic bacteria in saliva [Lobo et al., 2008].

Fluoride gels have successfully been included as a part of comprehensive community-based prevention programs [Ersin et al., 2008; Andruskviene et al., 2008; Agrawal and Pushpanjali 2011] as well as used to reduce caries activity in patients with fixed orthodontic appliances [Splieth et al., 2011]. Likewise, fluoride gels have been proven useful to avoid recurrent caries in xerostomic patients [Haveman et al., 2003].

Safety:

There is little information on adverse effects or acceptability of fluoride gel treatments but no severe potential health risks have been displayed in a systematic review [Yeung, 2008]. Due to a possible risk of apoptosis, it is suggested to prevent excessive oral mucosa contact when APF-gels are applied on teeth [Tsai et al., 2008].

Cost-effectiveness:

Only few studies are available on the cost effectiveness of fluoride gel programs. The number needed to treat (NNT), indicating the number of patients that need to be treated in order to prevent one decayed missed or filled surface, was calculated to NNT = 18 in a population with a yearly caries incidence of 0.25 DMFS and NNT=3 in a high caries population with an incidence of 1.5 DMFS [Rijkom et al., 1998]. Similar cost-effect relationships were reported by Marinho et al. [2002]. A model estimating lifelong costs of treating dental caries with and without fluoride has shown a favorable outcome concerning home applications of fluoride gel [Splieth and Flessa, 2008]. One study based on data from 100,000 preschool children in Thailand indicated that fluoride gel applications were associated with a slower increase rate in dental visits, caries and pulpitis treatments compared to a control group and the same patterns were found on dental expenditures [Chen and Lin, 2009].



Recommendations:

There is scientific evidence that the professionally and self-applied fluoride gels is associated with reduced caries increment in children, adolescents and adults. Repeated use of fluoride gels is one option among other topically applied fluorides that could be considered to increase fluoride exposure to individuals at risk such as medically compromised persons, patients with reduced salivary flow and those under treatment with fixed orthodontic appliances. Any decision should be balanced by the practitioner's professional judgment and the patient's preferences. Fluoride gels are primarily not a cost-effective alternative for community or school-based programs in communities with low or moderate incidence of caries.



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