

# SILVER FLUORIDE + GLASS IONOMER CEMENT RESTORATION: THE RATIONALE FOR THIS ASSOCIATION

## AUTHOR



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## INTRODUCTION:

Silver Fluoride topical treatments are an important resource for the arrestment of carious lesions in deciduous teeth. The association of fluoride and silver can improve carious tissue remineralization, enhance the resistance of dental hard tissues to further demineralization, promote microorganisms' death and impair bacterial adhesion and growth [Zhao et al., 2018].

However, there are certain clinical situations that represent a challenge for the pediatric dentist to handle, even with the use of Silver Fluoride solutions. The perfect example are occluso-proximal cavities. Due to the shape of the cavity, it's possible to remain retentive sites that allow the growth and maturation of biofilm, and therefore, even with Silver Fluoride solution application, carious lesions may progress. This occurs because the daily contact with toothbrush and fluoride toothpaste is not achievable and the biofilm hidden in these retentive sites becomes more and more cariogenic. In such cases, the effectiveness of the Silver Fluoride treatments alone may be decreased over time and the reactivation of the carious lesion may occur [Mei et al., 2020].

In this clinical scenario, the association of Silver Fluoride solution with a glass ionomer cement restoration may be a smart move to do. The idea is to provide a quicker remineralisation of the carious dentin (by applying silver diamine fluoride), along with an esthetic restoration that seals the cavity, returns tooth shape, eliminates retentive sites, and promotes a suitable biofilm control.

However, the staining of the restoration's cavosuperficial margin is a problem when Silver Fluoride solutions are used alone. To overcome this issue, we suggest the use of Riva Star Aqua Step 1 [AgF] and Step 2 [KI], a combination that is available in Riva Star and Riva Star Aqua [SDI]. Riva Star Aqua was the selected product because it is a silver fluoride cariostatic agent, that has similar performance as silver diamine

fluoride products, without the drawbacks of ammonia-based solutions (without smell, unpleasant taste and soft tissue irritation). Therefore, this paper shows a clinical case report of this association in deciduous teeth, using Riva Star Aqua and Riva Self Cure glass ionomer restorative material.

## CASE REPORT

A 5-year-old patient at deciduous dentition period, sought treatment due to sensitivity during mastication on teeth 74. Clinical exam showed the presence of active occlusoproximal carious lesion, which was classified as ICDAS 6 (**Figure 1**).

No alterations were verified at radiographic exam. The tooth was diagnosed with pulp hyperemia. After discussing with the parents the possible treatment alternatives, the association of Riva Star Aqua + glass ionomer cement restoration was the chosen procedure.

According to the principles of Minimally Invasive Dentistry, selective caries removal was performed with manual instruments (dentin excavators); the cavosuperficial margins of the cavity were kept free from carious tissue (**Figure 2**). It's important to point out that all the restorative procedure was done without local anesthesia and with dental isolation with cotton rolls.

Silver fluoride (Riva Star Aqua - Step 1) was applied into the cavity with a disposable brush applicator (Points - SDI). We advise to do an active application for approximately 1 minute (**Figure 3**). One drop is enough for treating 5 cavities. The excess of the solution was removed with cotton pellets. Immediately after, potassium iodide (KI) (Riva Star - step 2) was applied in the cavity with a new disposable brush applicator (**Figure 4**).

Riva Star Aqua Step 2 must be applied for 3 to 5 times. In the first application, it was possible to see the white precipitation in the cavity. The application was repeated until the solution turned clear. It occurred after 4 applications. The excess of the



solution was removed with cotton pellets and the cavity was washed with a water/air spray for at least 10 seconds.

The cavity was then dried without desiccation and a self cure glass ionomer cement (Riva Self Cure glass ionomer restorative material - SDI) was applied. After matrix and wooden edge adaptation, the tooth was restored and the glass ionomer restoration was protected with a thin layer of dental adhesive (layer of dental adhesive [Zipbond - SDI] **[Figure 5]**).



**Figure 1** Baseline clinical image of tooth 74. It is possible to identify the presence of occlusoproximal lesion, with wide proximal isthmus.



**Figure 2** The carious tissue was removed from the cavo-surface margins to guarantee the best conditions for the adhesive restoration and an adequate sealing of the cavities.



**Figure 3** AgF solution (Riva Star Aqua - Step 1) was applied in the cavity.



**Figure 4** Immediately after step 1, with another disposable tip, potassium iodide (Riva Star Step 2) was applied, to control staining of the tooth.



**Figure 5** Clinical aspect of glass ionomer cement restoration finished.

## DISCUSSION

Although silver fluoride (AgF) application can be considered a definitive treatment in posterior deciduous teeth, it is not unusual the desire for dental restoration: parents and patients want to recuperate teeth shape and esthetics, and the dentists aim to promote a better biofilm control by cavity sealing.

Literature reports have shown that practitioners worried about the staining of the carious cavities after silver fluoride application and, consequently, the blackening of restoration's margins, and the possible non acceptance by the parents/children.

This worry is groundless, if the association AgF + KI (Riva Star Aqua) is used. It is an important advance that certainly widens the use of silver diamine fluoride, since the staining of the teeth is greatly reduced. The possibility of purchasing both solutions together, in one single product, is an extra facility.

The restoration after Riva Star Aqua application can be done in glass ionomer cement or composite resin. All the procedure is in line with the principles of Minimally Invasive Dentistry, that is the remineralisation of the carious dentin and the use of adhesive restorative material, which prevents additional loss of dental tissue. Also, it can be considered a patient friendly procedure, since there is no need to use a high-speed handpiece, rubber dam or local anesthesia which can be a trigger for fear and anxiety in children. Both materials are considered ion-releasing biomaterials, and AgF specifically stimulates remineralization, protects collagen from degradation, provides an adequate pH to favour new mineral formation and repels or constrains bacteria (Slimani et al., 2021).

The main doubt in this situation is whether physicochemical alterations caused by AgF on the demineralised dentin surface might interfere in the adhesion to dentin. A recent published systematic review has demonstrated that the dentin pre-treatment with AgF did not affect the adhesive properties of glass ionomer cement restorations (Jiang et al., 2020). Despite those are in vitro studies, they may be an indicative that the same probably occurs in vivo. A recent study developed by our research group reached that same conclusion (unpublished data).

Therefore, the association of Riva Star Aqua with glass ionomer cement may be considered a good alternative for occlusoproximal restoration in deciduous teeth.

**SDI**

# RIVA STAR AQUA

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## PRODUCTS USED

**SDI**

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