SDF + Glass Ionomer: Combination Therapy

The medical management of caries

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Dental caries is often described as a restorative problem. A patient presents with a cavitated lesion, and the clinician removes the decay and replaces the missing tooth structure with a restorative material. While restoration remains an important part of treating caries, it does not necessarily address the disease process that caused the lesion in the first place.

As our understanding of caries continues to evolve, so does our approach to treatment. Silver diamine fluoride (SDF) and glass ionomer (GI) restorative materials can be used together to address two different parts of the same problem: arresting the caries process and restoring the tooth.

Rather than thinking of SDF and GI as two separate treatment options, clinicians can consider them complementary tools in the management of caries. SDF can help arrest active caries, while a glass ionomer restoration can seal the lesion, restore form and function, and create a surface that is easier for the patient to keep clean.

This combination can be particularly useful when the goal is not simply to "fix a cavity," but to medically manage the disease while preserving as much healthy tooth structure as possible.

Treating the disease and the defect

One of the advantages of SDF is that it allows clinicians to address active caries without immediately removing large amounts of tooth structure. The silver and fluoride components work together to alter the caries process and help arrest active lesions.

But arresting the disease does not always mean the process is finished.

A carious lesion may still have an irregular surface or a food trap. Even if the lesion is no longer progressing, the resulting anatomy may make plaque control difficult or compromise the function of the tooth.

This is where glass ionomer can become an important part of the treatment.

The combination of SDF followed by a GI restoration allows the clinician to approach the lesion in two steps. First, the caries process is addressed. Then, the tooth is restored, and the lesion is sealed.

In other words, SDF can help manage the biology of the disease, while GI can help manage the anatomy.

Why glass ionomer?

Glass ionomer materials have several characteristics that make them useful in minimally invasive caries treatment. They can chemically bond to tooth structure, release fluoride, and be placed with relatively conservative tooth preparation.

They also provide a practical way to convert an irregular, potentially plaque-retentive carious surface into a smoother, more cleansable surface.

This is particularly important because arresting caries is only part of successful treatment. If the patient continues to have a plaque-retentive cavitation or food trap, the local environment that contributed to the disease remains.

The goal is therefore not simply to stop the lesion from progressing. The goal is to create an environment in which the patient can maintain the tooth.

Fig. 1: Geriatric patient presents with asymptomatic arrested lesion at crown margin on root canal treated #18. Area acts as consistent plaque trap that is difficult to keep clean.

Fig. 1a: Initial presentation of class V lesion



Fig. 1b: Incomplete caries removal and arresting caries with SDF



Fig. 1c: Glass Ionomer placed and polished



The SDF + GI approach

The combination of SDF and glass ionomer has been described as silver modified atraumatic restorative treatment, or SMART. The basic concept is straightforward.

SDF is applied to the carious lesion to help arrest the disease. The lesion can then be sealed with a glass ionomer restorative material.

The amount of tooth structure removed can be limited to what is necessary to provide access, remove unsupported tooth structure when indicated, and create an appropriate environment for the restoration.

This is an important distinction from traditional restorative thinking.

We don't necessarily need to remove every portion of visibly altered dentin simply because it looks different. If the caries has been arrested and the remaining tooth structure can be sealed and maintained, aggressive removal may sacrifice healthy tooth structure without providing a meaningful benefit to the patient.

The restorative material then provides the seal and restores some of the lost form and function.

When does the combination make sense?

Just like SDF alone, the SDF + GI approach works best when used in the right situation.

There are several clinical situations where this combination can be particularly useful.

1. Cavitated lesions that need to be sealed

An active cavitation can be difficult for a patient to keep clean. Even when SDF has successfully arrested the lesion, the remaining anatomy may continue to collect plaque and food.

In these cases, SDF can be used to address the caries, followed by GI to seal the lesion and eliminate the plaque-retentive anatomy.

This can be especially useful when a traditional preparation would require significant removal of tooth structure (Figs. 1a–c).

2. Patients with limited access to care

Some patients have difficulty making multiple appointments. Others have financial limitations, transportation issues, or other barriers that make completing a conventional treatment plan challenging.

For these patients, treatment can sometimes be adapted to the likelihood that they will return. If a patient is unlikely to return, SDF followed by an immediate GI restoration can provide a way to address both the disease and the cavitation during the same visit. If the patient is likely to return, SDF can serve as an interim treatment while the definitive treatment plan is completed. This flexibility is one of the strengths of the combination approach (Figs. 2a–e).

3. Patients who benefit from minimally invasive treatment

Not every carious lesion requires a large preparation. For selected lesions, preserving and disinfecting dentin may be more beneficial than creating a larger preparation simply to remove every area of affected tooth structure.

The clinician still needs to determine whether the tooth is restorable, whether the lesion can be adequately accessed

Fig. 2: Patient presents as emergency with minimal access to care and multiple failed appointments. Tooth #15 fractured and tests vital at time of treatment.

Fig. 2a: PA of initial presentation.

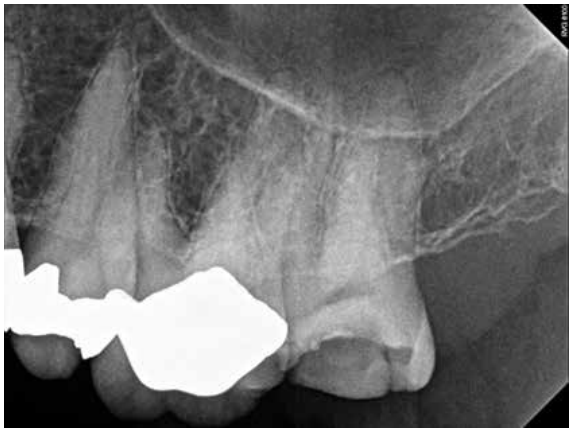


Fig. 2b: Incomplete caries removal and arresting caries with SDF to prevent pulpal exposure



Fig. 2c: Glass Ionomer placed



Fig. 2d: Glass ionomer finished



Fig. 2e: Three-year follow-up BW next time the patient was in the office for a separate emergency



and sealed, and whether the remaining tooth structure can support the restoration (Figs. 3a–d).

When those conditions are met, SDF + GI can provide another option between "do nothing" and a more aggressive conventional restoration.

What about the staining?

The biggest limitation of SDF remains the discoloration associated with arrested caries.

This is especially important when treating anterior teeth or other areas where aesthetics are a primary concern. The possibility of staining should be discussed with the patient before treatment and incorporated into the treatment decision.

The advantage of placing GI over the SDF-treated lesion is that the restoration can cover the discolored carious structure. The clinician should not, however, think of the restoration as simply a way to hide the stain. The purpose of the GI restoration is to seal the lesion, restore anatomy, and create a surface that the patient can maintain.

Aesthetics are certainly part of the discussion, but they should be considered alongside the biological and functional goals of treatment.

One treatment, two objectives

One way to think about combination therapy is to separate the biological and restorative objectives.

SDF:

- Helps arrest active caries
- Provides antibacterial effects
- Supports the mineralization of affected tooth structure
- Can be applied with minimal tooth preparation

Glass ionomer:

- Seals the carious lesion
- Restores tooth anatomy
- Eliminates or reduces plaque-retentive areas
- Provides fluoride release
- Restores some form and function

Neither material has to do everything. The SDF does not need to provide the final anatomy of the tooth, and the glass ionomer does not need to be solely responsible for managing the caries process. Together, they allow the clinician to address both.

Fig. 3: Inactive mesial root caries on vital tooth #32 in a geriatric patient where extractions are contraindicated due to medical history.

Fig. 3a: BW before



Fig. 3b: Initial presentation of cavitated lesion



Fig. 3c: 1st and 2nd applications of SDF to lesion



Fig. 3d: GI applied: view from the buccal and lingual



The importance of case selection

As with any restorative material or caries management technique, case selection is critical. A clinician should consider the extent and activity of the lesion, the remaining tooth structure, the ability to isolate the area, the patient's caries risk, oral hygiene, occlusion, and the likelihood of maintaining the restoration.

A successful SDF + GI restoration also requires that the resulting restoration be non-plaque-retentive and maintainable.

SDF can arrest a lesion, but it cannot overcome a consistently poor oral environment. If plaque and food are allowed to accumulate around or beneath a restoration, the underlying disease process has not truly been addressed.

This is why combination therapy should be viewed as part of a comprehensive caries management plan rather than as a technique that works independently of patient behavior.

A medical approach to restorative dentistry

The idea of using a restorative material to treat the consequences of caries while simultaneously using a therapeutic material to address the disease itself represents an important shift in thinking. We can restore teeth without unnecessarily sacrificing healthy tooth structure, arrest active lesions before definitive treatment, and provide treatment for patients who may not be able to complete a traditional multi-appointment treatment plan. We can also use materials that work together rather than asking one material to accomplish every objective.

This does not mean that every carious lesion should be treated with SDF and glass ionomer. Conventional restorative materials and techniques remain essential parts of comprehensive dental care. The goal is to expand the clinician's treatment options and select the approach that best fits the individual patient.

Looking at the tooth differently

Perhaps the most important change is how we view a carious tooth.

Instead of asking only, "How do I restore this cavity?" we can ask a broader set of questions:

- Is the lesion active?
- Can I arrest the disease?
- How much healthy tooth structure can I preserve?
- Can I eliminate the areas that retain plaque and food?

- What treatment can this patient realistically maintain?

SDF and glass ionomer provide two tools that can help answer those questions.

For the appropriately selected patient, SDF can address the disease while GI restores the tooth. The result is not simply a filled cavity. It is a tooth that has been medically managed, sealed, and returned to a condition that is easier for both the patient and clinician to maintain.

As new generations of glass ionomer materials continue to develop and clinicians become more comfortable incorporating SDF into everyday practice, combination therapy may become an increasingly useful part of the restorative arsenal.

The goal is not to replace traditional dentistry. It is to give clinicians more ways to preserve teeth, manage disease, and provide patients with treatment that is biologically sound, minimally invasive, and maintainable. **DT**



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