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EDITORIAL

Managing White Spot Lesions in 2026: Have We Reached a Clinical Consensus?

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A white spot lesion is, at its core, an optical problem with a biological cause. When subsurface enamel loses mineral, whether through caries-related demineralization or developmental hypomineralization, the spaces between the crystals widen and begin to scatter incident light, and the lesion becomes visible to the patient long before it poses any real threat to the tooth (1,2). That visibility is exactly why these lesions weigh so heavily in everyday practice. For years, though, our response to them owed more to the habits of the operator than to the biology of the lesion in front of us. A clinician comfortable with fluoride varnish prescribed varnish; a colleague who had invested in an infiltration kit infiltrated; one trained largely in direct composite reached for a bur. What I want to ask here is whether, in 2026, we can finally claim to do better than that.

Moving Beyond Competing Treatments

Over the past decade, the most useful shift in our thinking has been abandoning the "remineralization versus infiltration versus “restoration" mindset. Rather than treating these approaches as competing options for a single case, evidence supports a unified diagnostic model. Within this model, intervention is dictated by lesion depth, lesion activity, esthetic demand, and patient expectation (2,3). For example, a shallow, active post-orthodontic lesion and a deep inactive molar incisor hypomineralization (MIH) defect clearly require different initial strategies, yet they are evaluated using the same clinical criteria. Our first task is to assess the lesion's specific characteristics; only then do we choose an instrument.

Diagnosis Is the Decision

If the literature agrees on anything, it is that a lesion must be characterized before it is treated. Two features drive almost every decision that follows: activity and depth. An active lesion has a permeable surface that will take up remineralizing ions, and it may even regress once the local biofilm environment is brought under control. An inactive lesion has done the opposite, sealing itself beneath a hypermineralized, pseudo-intact surface that behaves as a diffusion barrier and largely defeats passive therapy (1). Depth, in turn, determines whether any superficial measure can reach the scattering layer at all.

Surface glare often obscures the exact subsurface porosity we are trying to read. Cross-polarized photography eliminates surface glare, making it much easier to map the lesion for initial planning and follow-up. Transillumination works as a practical companion tool to estimate the lesion's depth; because porous, demineralized enamel scatters light rather than letting it pass through, the defect casts a visible shadow that indicates how deep it penetrates. Knowing this depth may dictate the treatment plan. It guides the escalation of care from conservative remineralization and bleaching, up to resin infiltration, microabrasion, macroabrasion, or composite restoration. The simple (and still underused) ethanol wetting test provides a more reliable, repeatable, and real-time picture of depth

and surface barrier integrity immediately following chemical, mechanical, or combined surface preparation (1,4). Artificial-intelligence diagnostic tools are advancing quickly and may eventually add to this, but for now they remain adjuncts, not a substitute for a careful clinical examination.

The Promise and the Ceiling of Remineralization

Remineralization is the most biologically conservative option we have, and it is the right first response to an early, active lesion. Fluoride varnishes, Casein Phosphopeptide-Amorphous Calcium Phosphate (CPP-ACP), and nano-hydroxyapatite products can strengthen the surface and halt progression (5,6). Nevertheless, they seldom improve the appearance of an established, inactive lesion, because their ions cannot cross the pseudo-intact surface barrier to reach the deeper porosity that produces the light scatter (5,6). Remineralization arrests disease; it does not dependably restore esthetics. Treating those two goals as if they were one is a mistake still see made regularly.

Resin Infiltration: Optics, Not Regeneration

Resin infiltration sets out to do something different. It does not attempt to rebuild lost mineral; it alters the optical behavior of the tissue. Once the surface barrier has been opened, a low-viscosity TEGDMA resin is drawn into the porosities by capillary action, displacing the air and water that scatter light with a medium whose refractive index (RI=1.52) sits close to that of sound enamel (RI=1.62). The chalky look then largely fades (2,7). Inactive lesions need surface preparation, typically, by the provided hydrochloric acid gel, or often using a modified microabrasion initial step, before the resin can penetrate. Also, deep developmental defects may require longer infiltration times; and pigmented lesions should not simply be infiltrated without prior bleaching, since doing so risks locking the discoloration permanently into the matrix (4,7). Infiltration works well because it is targeted, not because it suits every case.

When Restoration Is the Conservative Choice

While modern dentistry rightly prioritizes micro-invasive techniques, the temptation to view the need for a composite restoration as a small defeat must be avoided (5,6). When a discolored lesion is cavitated, structurally compromised, or deep enough that further abrasion would breach the safe limits of enamel, a carefully placed body-shade composite, often layered over infiltrated margins to soften the optical transition, is in fact the conservative outcome (2,3). Minimally invasive dentistry describes a hierarchy of escalation, not a prohibition on restoration. The discipline lies in working through the non- and micro-invasive options first, and then restoring with intent when the lesion genuinely warrants it.

Microabrasion and Macroabrasion

When first introduced, enamel microabrasion was primarily used for the management of superficial enamel discoloration, especially mild to moderate dental fluorosis. Microabrasion is a chemo-mechanical technique combining acid-mediated enamel softening with mechanical abrasion. Hydrochloric acid (6–18%) or phosphoric acid (37%) selectively demineralizes the superficial enamel, while abrasive particles applied via a rotary instrument remove a thin dysplastic layer. This process produces a compacted, polished surface that reduces light scattering and improves optical uniformity (8).

Macroabrasion was introduced as a conservative option for the management of deeper localized enamel stains and defects that were not amenable to microabrasion alone. Macroabrasion is more invasive but remains significantly more conservative than veneer preparation. It involves localized enamel reduction to remove defects, creating a small volumetric deficit that is subsequently restored with resin infiltration and/or composite, preserving the majority of the enamel substrate and supporting adhesive durability (9).

The Bleaching-Infiltration Question

For stained enamel opacities, such as those seen in fluorosis, MIH, and traumatic hypomineralization, current evidence favors bleaching before resin infiltration whenever intrinsic chromogens are present, since infiltrating first can trap residual discoloration within the porous matrix (10,11). For unstained white opacities, including post-orthodontic white-spot lesions and non-pigmented fluorotic lesions, the picture is less settled. Infiltration before bleaching has been proposed, on the strength of in vitro work suggesting reduced peroxide penetration and a preserved esthetic outcome, but that sequence remains experimental and still needs proper clinical validation (10).

Have We Reached Consensus?

In part, yes. There is now wide agreement that activity and depth should be diagnosed before any treatment begins; that remineralization arrests disease but rarely beautifies; that infiltration is the treatment of choice for masking non-cavitated, unstained lesions once the surface barrier has been breached; that restoration is warranted once structure is lost; and that pigmented lesions are bleached before, not after, infiltration. Characterizing the lesion, active or inactive, shallow or deep, stained or unstained, and then matching the intervention to that characterization along the continuum must be considered. What remains unsettled is the best way to sequence combined therapies, how durable these results prove over years rather than months, and how well they hold up against the outcomes patients themselves notice. The most encouraging long-term evidence yet available, comes from case reports of macroabrasion, infiltration, and composite holding stable margins and color across three to four years (1,2).

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