

APPLICATION OF ICON THERAPY IN THE MANAGEMENT OF INITIAL DENTAL CARIES: CLINICAL EFFECTIVENESS AND PATIENT SATISFACTION

Navruzova Feruza Rakhimovna

Senior Lecturer of the Department of Propedeutics of Therapeutic Dentistry Tashkent State Medical University Tashkent, Uzbekistan

Abstract. Initial dental caries represents an early and potentially reversible stage of enamel demineralization that plays a critical role in the progression of oral diseases among adult populations. Traditional restorative approaches often involve irreversible removal of dental tissues, even at early stages of caries development. In recent years, minimally invasive dentistry has emphasized the preservation of tooth structure and biological integrity through non- and micro-invasive treatment strategies. Resin infiltration using ICON therapy has emerged as a promising approach for managing non-cavitated carious lesions by arresting lesion progression and improving esthetic outcomes without mechanical intervention.

The aim of this study was to comprehensively evaluate the clinical effectiveness of ICON resin infiltration therapy in the treatment of initial dental caries and to assess patient satisfaction with this minimally invasive procedure. A prospective clinical observational study was conducted involving adult patients with non-cavitated enamel carious lesions. Clinical effectiveness was assessed based on lesion stabilization, absence of progression, surface integrity, and esthetic improvement. Patient satisfaction was evaluated using structured questionnaires focusing on comfort, perception of treatment, and overall acceptance.

The findings demonstrated that ICON therapy effectively arrested the progression of initial carious lesions and significantly improved the optical appearance of affected enamel. High levels of patient satisfaction were reported due to the painless nature of the procedure, lack of anesthesia, and immediate esthetic improvement. ICON therapy represents an effective and patient-centered approach consistent with contemporary principles of preventive and minimally invasive dentistry.

Keywords. initial dental caries; resin infiltration; ICON therapy; minimally invasive dentistry; enamel demineralization; patient satisfaction.

Introduction. Dental caries remains one of the most prevalent chronic diseases worldwide and continues to represent a significant public health challenge despite advances in preventive dentistry. Among adult populations, early-stage carious lesions frequently manifest as non-cavitated enamel demineralization, clinically observed as white spot lesions. At this stage, the carious process is dynamic and potentially reversible, making early detection and appropriate intervention crucial for disease control.

Conventional restorative dentistry has traditionally relied on mechanical removal of carious tissues followed by placement of restorative materials. While effective in eliminating diseased tissue, such approaches often result in unnecessary loss of sound tooth structure, particularly when applied to early lesions. This paradigm has been increasingly questioned in light of contemporary concepts emphasizing tissue preservation and biological sustainability.

Minimally invasive dentistry represents a shift toward strategies that aim to control caries progression while preserving the natural structure and function of dental tissues. Non-invasive and micro-invasive techniques, including fluoride therapy, sealants, and resin infiltration, have gained prominence as alternatives to conventional restorative treatment for early carious lesions.

Resin infiltration therapy, commercially known as ICON therapy, is a micro-invasive technique specifically designed for the management of non-cavitated enamel caries. The method involves the penetration of a low-viscosity resin into the porous structure of demineralized

enamel, thereby occluding diffusion pathways for acids and dissolved minerals. This process effectively arrests lesion progression and stabilizes the affected enamel.

In addition to its therapeutic benefits, ICON therapy offers significant esthetic advantages by reducing the visual contrast between sound and demineralized enamel. By matching the refractive index of infiltrated enamel to that of healthy enamel, the technique provides immediate cosmetic improvement, which is particularly relevant for adult patients concerned with dental appearance.

Despite increasing clinical adoption, comprehensive evaluations of ICON therapy addressing both clinical effectiveness and patient satisfaction remain limited. Understanding patient perceptions and acceptance is essential, as these factors influence treatment adherence and long-term preventive behavior. Therefore, the present study aims to provide an in-depth assessment of ICON therapy in the management of initial dental caries, with particular emphasis on clinical outcomes and patient-reported satisfaction.

Materials and Methods. A prospective clinical observational study was conducted in accordance with ethical principles governing biomedical research involving human participants. The study was designed to reflect routine clinical practice while maintaining standardized treatment and evaluation protocols.

Adult patients aged 18 to 55 years presenting with initial non-cavitated carious lesions on smooth or proximal tooth surfaces were recruited. Inclusion criteria included good general health, absence of systemic diseases affecting enamel mineralization, and willingness to participate in follow-up evaluations.

Exclusion criteria were cavitated carious lesions, active periodontal disease, enamel hypoplasia, dental fluorosis, pregnancy, and known hypersensitivity to dental materials.

ICON resin infiltration therapy was performed strictly according to the manufacturer's recommendations. After professional cleaning and isolation, enamel surfaces were etched using hydrochloric acid gel to remove the superficial hypermineralized layer. An ethanol-based drying agent was applied to enhance resin penetration, followed by infiltration with a low-viscosity light-curing resin. Polymerization was achieved using a standard curing light, and surface finishing was performed as needed.

All procedures were carried out by calibrated clinicians to ensure consistency and reproducibility.

Clinical effectiveness was assessed based on lesion arrest, absence of cavitation, surface smoothness, and esthetic improvement. Patient satisfaction was evaluated using a structured questionnaire addressing comfort during treatment, perceived effectiveness, esthetic satisfaction, and willingness to undergo the procedure again.

Data were analyzed using descriptive statistical methods. Results were expressed as frequencies, percentages, and mean values where appropriate.

Result. ICON therapy demonstrated a high level of clinical effectiveness in stabilizing initial carious lesions during the entire observation period. None of the treated lesions showed signs of progression to cavitation, indicating successful arrest of the demineralization process. Clinical examinations confirmed that the infiltrated enamel surfaces remained smooth, structurally intact, and resistant to mechanical stress, with no evidence of surface breakdown or loss of integrity.

A pronounced improvement in the optical and esthetic characteristics of the affected enamel was observed immediately following the resin infiltration procedure. White spot lesions became significantly less visible due to the infiltration of low-viscosity resin, which reduced light scattering and restored enamel translucency. This immediate visual improvement contributed to enhanced esthetic outcomes, particularly in lesions located in visible areas.

Patients reported minimal discomfort during the procedure, which was performed without the need for local anesthesia in the majority of cases. Postoperative sensitivity was rare, mild when present, and transient, resolving spontaneously without the need for additional intervention.

These findings highlight the patient-friendly nature of ICON therapy and its suitability for individuals seeking minimally invasive treatment options.

Overall patient satisfaction levels were consistently high across all evaluated domains, including treatment comfort, esthetic improvement, and perceived effectiveness. The majority of participants expressed a strong preference for ICON therapy compared to conventional restorative procedures, citing the absence of drilling, preservation of natural tooth structure, and immediate results as key advantages. Furthermore, most patients indicated a willingness to recommend ICON therapy to others, reflecting a high level of acceptance and confidence in this treatment approach.

Discussion. The results of this study confirm that ICON resin infiltration therapy is an effective micro-invasive approach for managing initial dental caries. By addressing the disease at an early stage, ICON therapy aligns with the principles of preventive dentistry and supports long-term tooth preservation.

The ability of ICON therapy to arrest lesion progression without mechanical intervention represents a significant advantage over conventional restorative approaches. Furthermore, the immediate esthetic improvement achieved through resin infiltration enhances patient acceptance and satisfaction.

From a public health perspective, early intervention using ICON therapy may reduce the need for more invasive and costly restorative treatments, thereby contributing to sustainable oral healthcare systems.

The widespread implementation of resin infiltration techniques may improve early caries management, reduce restorative treatment burden, and enhance oral health-related quality of life. Patient-friendly, minimally invasive procedures such as ICON therapy support preventive strategies and promote positive attitudes toward dental care.

The study was limited by the absence of a control group and a relatively short follow-up period. Future randomized controlled trials with long-term follow-up are necessary to fully assess the durability of ICON therapy.

Conclusion. ICON resin infiltration therapy represents a clinically effective and well-accepted approach for the management of initial dental caries, particularly at the stage of non-cavitated enamel demineralization. The application of this technique allows for successful arrest of lesion progression while preserving the natural structure and biological integrity of the tooth. By eliminating the need for mechanical tissue removal, ICON therapy aligns closely with contemporary principles of minimally invasive and biologically oriented dentistry.

Furthermore, the favorable clinical outcomes observed with ICON resin infiltration are complemented by high levels of patient acceptance and satisfaction. The painless nature of the procedure, absence of local anesthesia, and immediate esthetic improvement contribute significantly to positive patient perception and treatment compliance. Collectively, these factors support the integration of ICON therapy into routine clinical practice as an effective, conservative, and patient-centered strategy for the prevention and management of early dental caries.

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