



SMART PRODUCTS  
FOR ENDO LOVERS

**Root Canal  
Irrigation  
Using IrriFlex<sup>®</sup>**

**Scientific  
White  
Paper**

# Introduction

## Limitations of Mechanical Preparation and the Importance of Irrigation

The key to the success of an endodontic procedure is the effective elimination of bacteria from the root canal system. However, it has been consistently demonstrated that mechanical instrumentation alone cannot achieve this goal [1]. A recent micro-CT study comparing six common NiTi file systems found that **the percentage of untouched canal walls ranged between 19% and 50% in moderately curved canals** [2].



Figure 1: Tomographic image of unprepared (green) surfaces of root canals after instrumentation [1]. Courtesy of Siqueira JF Jr.

Moreover, anatomical factors such as canal curvature are known to affect the ability of instruments to reach all surfaces [3]. These findings clearly indicate that shaping procedures, while essential, are insufficient to fully disinfect the root canal system. Irrigation therefore plays a

mandatory role in reaching uninstrumented areas, disrupting biofilms, and reducing the microbial load, ultimately influencing the overall outcome of endodontic treatment. This is particularly true in severely curved canals.

## Limitations of current irrigation systems

### Limitations of metallic irrigation needles

Traditional stainless steel irrigation needles are widely used in endodontics. However, they present several limitations that can compromise the effectiveness of root canal disinfection. One significant challenge is their inability to navigate complex canal anatomies. Studies have shown that these rigid needles often fail to reach the apical regions of curved canals, leading to areas that remain inadequately irrigated and harbor residual bacteria [4].

Additionally, the design of metal needles can contribute to the vapor lock effect [5], where air entrapment in the apical portion of the canal prevents effective irrigant delivery. This phenomenon is particularly problematic in the coronal and middle thirds of the root canal system, where the irrigant cannot reach the



Figure 2: Metallic needle in root canal, courtesy of R. Tonini [7].



apical areas, thereby reducing the overall cleaning efficacy.

**Design features of IrriFlex®**

IrriFlex® is a flexible root canal irrigation needle designed to enhance the effectiveness and safety of endodontic irrigation procedures. Unlike conventional metal needles, IrriFlex® is constructed from soft polypropylene, **allowing it to navigate complex root canal anatomies without causing damage to dentinal walls.** This flexibility enables the needle to **reach the apical regions of the canal**, overcoming challenges such as severe curvatures or irrigating conservatively shaped canals [6].

Beyond irrigation performance considerations, IrriFlex® was designed with safety as a top priority: its soft material minimizes canal wall damage and **has been shown to reduce debris extrusion** compared to rigid metallic needles when inserted at comparable depth [8].



The needle features a tapered design with a 30-gauge diameter and a 4% taper, aligning with standard root canal preparations. It is equipped with two side vents positioned back-to-back at the tip, facilitating balanced and controlled irrigant delivery through two lateral jets directed toward the dentinal walls. **This design maximizes shear forces**, aiding in the removal of debris, smear layers, and biofilm, thereby improving the overall cleaning efficacy of the root canal system.

Figure 3: IrriFlex® in a root canal, courtesy of R. Tonini [7].



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