



# Laser Assisted Root Canal Treatment: A Review

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Complexity of root canal system leads to failure of endodontic therapy so to address this issue lasers have been investigated as an adjunctive. Lasers has been used in direct irradiation of root canal or adjunct to irrigants placed into the canals. Laser assisted root canal therapy has more benefits than traditional root canal therapy. It ensures complete sterilization of root canal.

**KEYWORDS:** Lasers, Root Canal Therapy, Photoacoustic, Disinfection, Benefits

## INTRODUCTION

RCT or root canal therapy is a dental procedure that is performed to treat the pulp of an infected tooth. Laser stands for Light Amplification by Stimulated Emission of Radiation. Lasers work by emitting intense, focused light energy, the specific properties of which can interact with living tissue. Hard tissue lasers (Er: YAG, Er, Cr: YSGG) are used to cut tooth structure, while soft tissue lasers (diode, CO<sub>2</sub>, Argon and Nd: YAG) are used to clean and disinfect canals.<sup>1</sup>

## WHAT IS LASER ASSISTED RCT

This is a procedure where a laser is used to assist the RCT. This is a more safe and effective method than traditional procedures. A laser is used to clean and sterilize the root canal and burn away the remaining tissue, which helps in increasing the success rate of the root canal treatment.<sup>2</sup>

## TRADITIONAL RCT VS LASER ASSISTED RCT

The result of root canal treatment is based on effective disinfection of the root canal and is outlined in table 1.

## MECHANISM OF ACTION

In endodontics, lasers use photothermal and photomechanical effect. In photothermal interaction due to laser irradiation there is rise in temperature which causes denaturation of proteins, increased mitochondrial membrane permeability and ultimately vaporization.<sup>3</sup>

Photomechanical (photo acoustic) interaction causes the generation of shock waves produced due to pulse-laser interaction. When laser energy is stored in tissue

as heat, there is thermoplastic tissue expansion which yields stress. If a pulse is very short the stresses are concentrated in a small region generating very high stresses which can propagate into tissue more intensely and cause physical cellular damage or spallation which is emission of material fragments due to stress that removes surface layers of tissue.<sup>4</sup>

| TRADITIONAL RCT   | LASER ASSISTED RCT  |
|---|---|
| Cleaning and disinfection by mechanical by mechanical debridement and chemicals.              | Along with mechanical and chemical debridement lasers are used. |
| Irrigants and intracanal medicament penetrate 100 microns into dentinal tubules. <sup>2</sup> | Laser light penetrate >1000 microns                             |
| Cannot ensure complete sterilization  | Ensure complete sterilization                                   |
| More aggressive procedure   | Less aggressive   |

**Table 1.** Traditional Vs Laser Assisted RCT

## BENEFITS OF LASER ASSISTED RCT<sup>5</sup>

1. Less aggressive so it helps in reducing post op complications like swelling, pain and bleeding.
2. Lesser chances of re-infection.
3. Less bleeding, so healing is faster.
4. Less time consuming, so can be completed in a single visit in suitable patients.
5. Minimal invasive technique which conserves the tooth structure and avoids loud drilling sound.



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**Submitted on:** 15-May-2022; **Accepted on:** 02-Sep-2022

6. Patient acceptance is high.

### DISADVANTAGES

1. Root canal spaces are curved while laser has straight path.
2. Communication between laser energy and tooth structure may cause elevation in temperature.
3. Require attention to safety precautions and specialized training.
4. Costly and requires maintenance.

### TYPES OF LASERS AND ITS USES<sup>6</sup>

The types of lasers and its uses in depicted in table 2.

| LASERS  | USES  |
|---|---|
| Er, Cr: YSGG (2780nm)<br>Er: YAG (2940nm)                       | Access cavity preparation<br>Cleaning and shaping |
| Er: YSGG (2780nm),<br>Er: YAG (2940nm)<br>and Nd: YAG (1064 nm) | Canal wall preparation                            |
| Argon laser, CO <sub>2</sub> ,<br>Nd: YAG                       | Obturation (VERTICAL<br>CONDENSATION)             |

**Table 2.** Types of Lasers and its Uses

### DELIVERY SYSTEM

The emitted energy can be delivered into the root canal system by:-

1. Thin optical fibre (Nd: YAG, erbium, chromium: yttrium scandium-gallium-garnet [Er, Cr: YSGG], argon, and diode)
2. By a hollow tube (CO<sub>2</sub> and Er: YAG).

### COST OF LASER ASSISTED RCT

The cost of laser root canal treatment in India ranges from 5,000 to 15,000 rupees. However, prices vary based on multiple factors such as the severity of the condition, the location of the teeth, the doctor's experience, the location and the type of hospital.

### CONCLUSION

After several decades of research, the evolution of laser technology at this period of time is in a high degree of refinement. With the introduction of thinner, more flexible and durable laser fibres, its use in endodontics has enormously increased. The New laser system is focusing on upgrading the existing delivery system and fibre type.

Its improved antiseptic efficacy, more effective root canal irrigation, reduced permeability, reduced microleakage, and elimination of the need to use toxic solvents are major benefits for dentists.

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**Cite this article as:**

Thakur S, Bakshi S. Laser Assisted Root Canal Treatment: A Review. Int Healthc Res J. 2022;6(6):RV1-RV3.  
<https://doi.org/10.26440/IHRJ/0606.09481>

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**Source of support:** Nil, **Conflict of interest:** None declared

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