Clinical study of underwater plasma root canal treatment

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Objective:
The goal of root canal treatment (RCT) is to eliminate infected pulp tissue and bacteria to resolve inflammation. For over 100 years, sodium hypochlorite (NaOCl) has been used as an irrigant. However, it has limitations in sterilizing microcanals that instruments cannot reach. To address this, underwater plasma discharge technology has emerged as a promising alternative. This technique uses high-frequency alternating current discharges to generate heat, shrinking organic tissues in the canal and converting moisture into active radicals. These radicals induce powerful oxidation, enabling sterilization of even microcanals. This study evaluates the clinical efficacy and safety of underwater plasma in RCT.
Methods:
From August to December 2024, a clinical study was conducted on 30 patients requiring endodontic treatment at Hallym University Sacred Heart Hospital. Supported by the Korea Health Industry Development Institute and approved by the IRB, all participants provided written consent. Patients were randomly assigned to two groups: the experimental group treated with underwater plasma and the control group treated with NaOCl. Standardized protocols were followed, and evaluations were conducted before treatment, immediately after, and at 2- and 4-month follow-ups. Assessments included periapical radiographs (analyzed using the Periapical Index by two oral and maxillofacial radiology specialists), pain levels (VAS), tooth mobility, and periodontal pocket depth. Data were statistically analyzed.
Results:
No significant differences were observed between the groups in terms of pulp removal efficiency. However, underwater plasma demonstrated superior hemostatic effects, enabling single-session treatments. It minimized canal enlargement, reducing treatment time and preserving tooth structure. Additionally, its built-in impedance feedback system prevented damage to surrounding tissues.
Conclusion:
This study confirms that underwater plasma technology is a clinically stable and effective alternative for RCT. It addresses the limitations of NaOCl-based methods, reduces patient burden, and enhances clinical efficiency. The findings suggest that underwater plasma could introduce an innovative paradigm in RCT. Further clinical data and long-term follow-ups are needed to solidify its role in routine practice.

Profile
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