－原著－

Bactericidal Effects of Different Root Canal Cleaning Methods on the Microorganisms in the Deep Layers of Root Canal Dentine

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Abstract: The purpose of this study was to establish an efficient root canal irrigation method, in which the root canal wall, which cannot be mechanically cleaned, was chemically irrigated to improve the penetration of the applied drug. Using an artificial infected root canal model, root canal irrigation was performed under the following four conditions.

G1: Irrigation using saline solution
G2: Alternate irrigation using 10% NaClO and 3% H_2O_2
G3: After alternate irrigation, root canal was treated by phosphoric acid etching agent and sodium hypochlorite (NaClO) gel
G4: After ultrasonic treatment in 15% EDTA solution for 60 seconds, ultrasonic irrigation in 10% NaClO solution for 60 seconds

Thereafter, effects of these root canal irrigation methods on the removal of the smeared layer were morphologically and bacteriologically evaluated. Although the smeared layer was not removed by the irrigation using saline solution and alternate irrigation alone, showing no bactericidal effects, removal of the smeared layer was observed in G3 and G4, showing decreases in the bacterial number to less than 1/500,000 by the irrigation. Furthermore, after these types of treatment, the bacterial solution was inserted in the model, and mixture of three antibacterial drugs (3-Mix) was applied as an intracanal medicament. Although no change in the bacterial number was noted in G1 and G2, the bacterial number decreased less than 1/500,000 after 48 hours in G3 and G4. These findings suggested that effective root canal irrigation for removing the smeared layer required ultrasonic irrigation using NaClO and EDTA, or combined use of phosphoric acid etching agent and NaClO gel.

抄録：本研究の目的は，機械的な清掃が困難な根管壁を化学的に洗浄し，その後の貼薬薬剤の浸透性を向上させるための効率的な根管洗浄法を確立することである。そこで，根管より1mm離れた位置に直径1mm深さ3mmの窩洞を形成し，その中にE. coli菌液を封入し，次の条件で根管処置を行い，その後の窩洞内のE. coliの状態を調べた。

1. 生理食塩水による洗浄(G1群)
2. 10%NaClOと3%H_2O_2による交互洗浄(G2群)
3. 交互洗浄後リン酸エッチング剤と次亜塩素酸ナトリウムゲルによる根管洗浄(G3群)
4. 15%EDTA浴下で60秒間超音波処理後，10%NaClO浴下で60秒間超音波洗浄(G4群)

また，洗浄後のスメア層除去効果について形態学的に検討した。その結果，根管の交互洗浄のみではスメア層は除去されず，洗浄による窩洞内のE. coliの殺菌効果が得られなかったが，G3とG4群ではスメア層の除去が観察され，洗浄により窩洞内の細菌数も1/50万以下に減少し，細管の透過性が増大することが明らかとなった。さらにこれらの各洗浄処理後に窩洞に菌液を入れ，根管に3種混合抗菌薬(3-mix)を貼薬したところ，G1，G2群は細菌数に変化は認められず殺菌効果が得られないが，G3とG4群において48h後には細菌数は1/50万以下に減少した。以上の結果から，効果的な根管洗浄にはNaClOとEDTAを用いる超音波洗浄や，リン酸エッチング剤と次亜塩素酸ナトリウムゲル併用によるスメア層除去が有効である事が判明した。