

Comparison of two negative pressure systems and syringe irrigation for root canal irrigation: an *ex vivo* study

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Abstract

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Aim To compare in a laboratory study two negative pressure systems and syringe irrigation, regarding the delivery of a contrast solution (CS) to working length (WL) and into simulated lateral canals and the effective volume of irrigant aspirated during negative pressure irrigation.

Methodology Twenty single-canaled incisor training models were constructed with six simulated lateral canals each (2, 4 and 6 mm to WL) and a size 40, 0.04 taper apical size canal. Each model underwent all irrigation procedures (EndoVac at WL (EndoVac-0) and WL–2 mm (EndoVac-2), iNP needle with negative pressure (iNPn) and syringe irrigation with the iNP needle (iNPs) and a 30-G side-slot needle placed at WL (SIO) and WL–2 (SI2) mm in a cross-over design. CS was delivered at 4 mL min⁻¹ for 60 s with a peristaltic pump and a recovery device collected the volume (in mL) of irrigant suctioned by the negative pressure groups. The irrigation procedures were digitally recorded, and a still image of the 60-s time-point of irrigation was evaluated for CS distance

to WL (in millimetres) after irrigation and penetration into lateral canals (3-point scale). Statistical tests used were Kruskal–Wallis and Dunn's test.

Results EndoVac-0, iNPn and iNPs had median distances of CS to WL of 0 mm, followed by SIO (0.2 mm), SI2 (0.7 mm) and EndoVac-2 (1.7 mm). There were no significant differences between EndoVac-0, iNPn, iNPs and SIO, but these were significantly different to SI2 and EndoVac-2 ($P < 0.05$). There were no significant differences between the volume of CS delivered by syringe irrigation and that collected by iNPn (4 mL), but these were significantly greater than EndoVac-0 (2.8 mL, $P < 0.001$) and EndoVac-2 (2.85 mL, $P < 0.001$), which were not different to each other ($P = 1.0$). The irrigation procedures were ineffective at penetration into lateral canals.

Conclusion iNPn, EndoVac-0, iNPs and SIO achieved greater irrigant penetration to WL. iNPn was able to collect a median volume of CS (4 mL) similar to that delivered by syringe irrigation (iNPp, SIO and SI2). An adequate irrigant penetration into lateral canals could not be achieved by any of the systems.

Keywords: lateral canals, negative pressure irrigation, root canal irrigation, volume, working length.

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Introduction

The finding that at least 35% of the canal walls remain untouched by instrumentation (Peters *et al.* 2001) emphasizes the importance of chemical