A Study of Lateral Condensation in Curved Canal Prepared by Engine-driven Rotary Instruments

OYAMA Yukiya, OGURA Yoko and KATSUUMI Ichiroh

Department of Endodontics and Operative Dentistry, The Nippon Dental University, School of Life Dentistry at Tokyo
(Chief: Prof. KATSUUMI Ichiroh)

Abstract: The purpose of the present study was to evaluate the difference in the condensation of gutta-percha point depending on the types of spreaders in curved root canal models. Root canal obturation was performed by the lateral condensation method using 8 types of spreaders of different materials and sizes in curved root canal models made of resin with taper of 6/100 under the assumption that root canal preparation was conducted by using an engine-driven rotary instrument. Specifically, root canal obturation was carried out according to the lateral condensation method using the following spreaders: 2 types of stainless steel spreaders by DentalEZ Inc. (Star Dental D11T [S-D11T], and Star Dental D11 [S-D11]); 4 types of Ni-Ti spreaders by Roeko Inc. (NiTi #15[R-15], NiTi #25[R-25], NiTi #35[R-35], and NiTi D11T[R-D11T]); and 2 types of Ni-Ti spreaders by Brasseler Inc. (Naviflex NT D11T[B-D11T], and Naviflex NT 4SP[B-4SP]). The difference of condensation by each of these spreaders was evaluated by determining the ratio of gutta-percha point (gutta-percha condensing ratio) in the CT image of the root canal as seen at each of the positions 1, 2, 3, 4, 5, 6 and 7 mm from the root apex as taken by micro-focus X-ray CT. The following results were obtained.

The average values of gutta-percha condensing ratio in the total CT images taken at the positions of 1 to 7 mm were: 93.9% in S-D11T spreader, being the highest, followed by B-D11T (93.7%), S-D11 (86.1%), R-25 (85.3%), R-D11T (85.2%), R-15 (82.9%), R-35 (76.8%) and B-4SP (76.2%), in decreasing order, and root canal seal was insufficient. It was found that the influence of the type of spreader on the gutta-percha condensing ratio was highly significant. In the gutta-percha condensing ratio as seen in the CT images at the positions of 1 to 7 mm, S-D11T showed a high value of 90.8% or more at the position of each of the CT images, and B-D11T showed a high value of 90.5% or more. In contrast, R-35 showed a low value of 65.9% at the position of 6 mm, and B-4SP also exhibited a low value of 69.4% at the position of 4 mm. It was found that the condensing ratio decreased in a form similar to the shape of a ship's hull. Also, in R-25, R-15, R-D11T and S-D11, local decrease of the condensing ratio was seen.

These results reveal that, when selecting a spreader for a curved root canal, it is essential to put priority on the diameter of the spreader and on the insertion property and condensation property of the spreader to the root canal by taper rather than the flexibility of the material used.

Key words: Curved root canal, Lateral condensation method, Spreader, Ni-Ti